NORTH CAROLINA'S

2000 § 303(d) List

North Carolina Department of Environment and Natural Resources

Division of Water Quality

April 3, 2000 (Final Draft Submitted to EPA)

Contents

NORTH CAROLINA'S 2000 § 303(D) LIST (SIX PARTS, 112 PAGES TOTAL)

What is the § 303(d) List?

The § 303(d) list is a comprehensive public accounting of all impaired waterbodies. An impaired waterbody is one that does not meet water quality standards including designated uses, numeric and narrative criteria and anti-degradation requirements defined in 40 CFR 131. The standards violation might be due to an individual pollutant, multiple pollutants, pollution, or an unknown cause of impairment.

North Carolina's list of impaired waterbodies must be submitted to EPA by April 1 of every even year (40 CFR 130.7). The list includes waterbodies impaired by pollutants, such as nitrogen, phosphorus, and fecal coliform bacteria, and by pollution, such as hydromodification and habitat degradation. The source of impairment might be from point sources, nonpoint sources and atmospheric deposition. Some sources of impairment exist across state lines. North Carolina has listed impaired waterbodies regardless of whether the pollutant or source of pollution is known and whether the pollutant/pollution source(s) can be legally controlled or acted upon by the State of North Carolina. Waterbodies on Federal lands are listed.

Identifying Impaired Waters

North Carolina has considered all practical existing and readily available data and information in preparing the § 303(d) list. Sources solicited for "existing and readily available data and information" includes, but is not limited to the following sources:

- 1998 § 303(d) list;
- Clean Water Act § 305(b) report;
- Clean Water Act § 319 nonpoint source assessments;
- Waterbodies where specific fishing or shellfish bans and/or advisories are currently in effect;
- Waterbodies for which effluent toxicity test results indicate possible or actual excedences of State water quality standards;
- Waterbodies identified by the State as impaired in its most recent Clean Lake Assessment conducted under § 314 of the CWA;
- Drinking water source water assessments under § 1453 of the Safe Drinking Water Act;
- Trend analyses and predictive models used for determining designated use, numeric and narrative standard compliance;

- Data, information, and water quality problems reported from local, State, or Federal agencies, Tribal governments, members of the public, and academic institutions.

Methodology

North Carolina believes that the process used for completing § 305(b) reports is sufficient to characterize the quality of the waterbodies in the state including those impaired waterbodies required to be listed under § 303(d). As such, North Carolina relies heavily on the existing § 305(b) reporting methodology for the "decision rules" used to identify impaired waterbodies.

The use support ratings for the Lumber, Tar Pamlico, Catawba, French Broad, New and Cape Fear river basins have been updated since the 1998 § 303(d) list was approved. These waters were rated using the methodology found in *Water Quality Progress in North Carolina, 1998-1999 305(b) Report*, *March, 2000* and have been summarized in Appendix I. The updated basins are identified in the § 303(d) list tables with Title Case basin headers. The remaining basins have not been updated since the § 303(d) 1998 list was approved and were assessed using the methodology found in *Water Quality Progress in North Carolina 1996-1997, 305(b) Report, June, 1999*. These basins are identified in the list with UPPERCASE basin headers.

The conceptual relationship between the § 305(b) report and the § 303(d) list is presented in Figure 1. The full text of use support methodology can be found in *Water Quality Progress in North Carolina, 1998-1999 305(b) Report*, *March, 2000*. The methodology includes a description of the North Carolina's overall approach to listing and an explanation of how North Carolina considered all existing and readily available data and information, bioassessments and physical/chemical monitoring. North Carolina's methodology is strongly based on the aquatic life use support guidelines available in the § 305(b) guidelines (EPA-841-B-97-002A and -002B). Priority setting and scheduling is discussed later in this document.

There are two primary paths for a water to follow in order to be listed on the § 303(d) list:

- Use support ratings of Not Supporting (NS) or Partially Supporting (PS);
- Site-specific fish consumption advisories posted by Department of Health and Human Services, Environmental Epidemiology Section;

The § 305(b) Report methodology discusses in detail the use of the following types of information in making use support determinations:

- Physical/chemical data and information;
- Biological data and information;
- Aquatic and riparian habitat data and information;

- Data quality and age;
- Weight of evidence used to determine whether waterbodies are impaired;
- Number and degree of exceedences of numeric or narrative criteria and designated uses used to determine whether waterbodies are impaired.

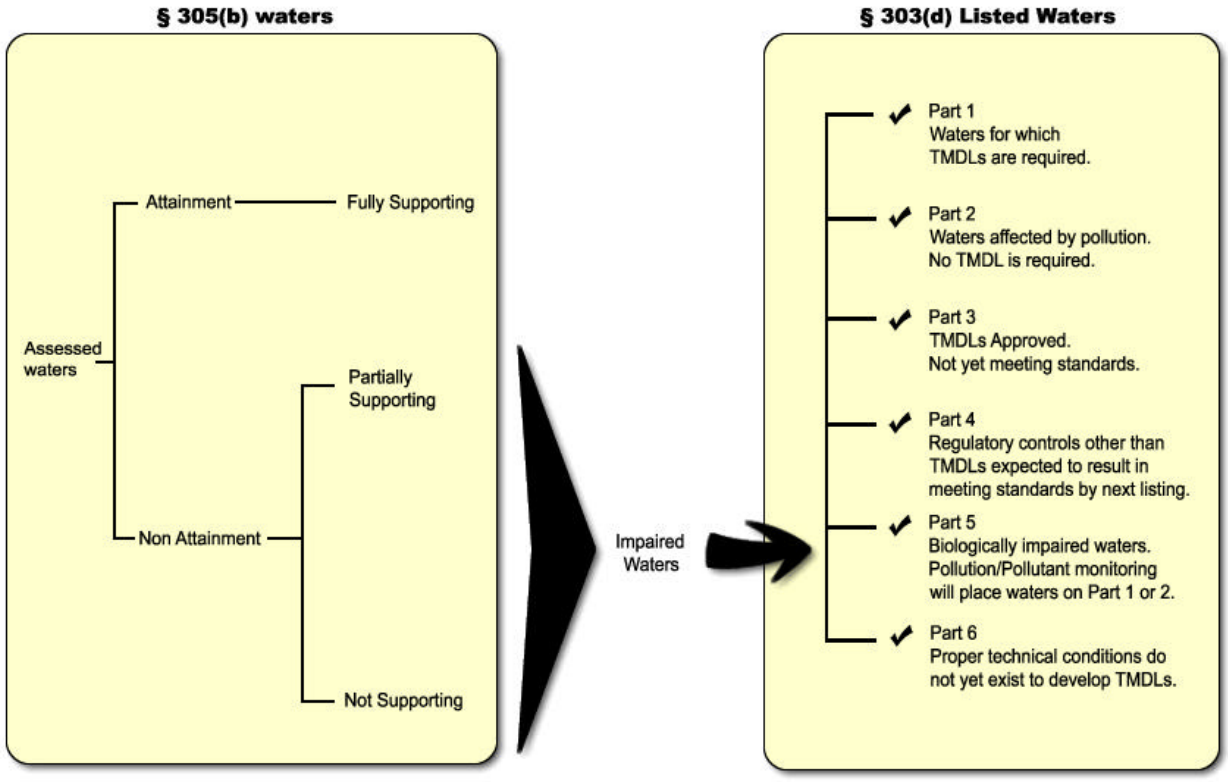


Figure 1: Conceptual Relationship Between § 305(b) and § 303(d) (adapted from EPA 841-D-99-001)

Resolving Disagreements with Other Jurisdictions

Copies of draft § 303(d) lists are sent to neighboring States and authorized Tribal representatives for comment. Where disagreements with other jurisdictions involving waterbodies crossed by State or authorized Tribal boundaries exist, DWQ will work with the other state or authorized Tribal representative to resolve the differences by considering the available data and knowledge of both agencies.

All Existing and Readily Available Data

North Carolina actively solicits "existing and readily available" data and information. The data solicitation is performed 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 is accepted during solicitations. High levels of confidence must be present in order for outside quantitative information to have weight equal to information from the Water Quality Section. This is particularly the case when considering a waterbody for the 303(d) list. Outside quantitative information is reviewed for several characteristics including a quality assurance plan, monitoring frequency, locations of monitoring, and laboratory credentials. Data that are not of sufficient quality to assess use support are considered when identifying future monitoring sites. The methodology for evaluating outside data is presented in Appendix III. The form and substance of an actual solicitation is illustrated in Appendix IV. A non-exclusive list of sources of data and information considered in § 305(b) reporting and § 303(d) list development is presented in Appendix V.

In summary, DWQ solicits and requires the following:

- Information and letters regarding the uses of surface waters for boating, drinking water, swimming, aesthetics, and fishing may be submitted.
- Summary reports and memos including distribution statistics, data collection and QA/QC methods.
- Raw data should be submitted electronically and accompanied by documentation of quality assurance methods used to collect and analyze the samples.
- If information includes summaries of chemical or biological sampling data, maps showing sampling locations must be included.
- Contact information must be provided with submittals.

Format of the § 303(d) List

In anticipation of proposed revisions to 40 CFR part 130, North Carolina has begun to make the structural changes prescribed in the August 23, 1999 draft rule. The year 2000 § 303(d) list reflects many of the changes that have been proposed by EPA but are not yet final.

EPA's draft rules require the 303(d) lists to include four sections. North Carolina's 2000 list has been divided into six parts to reflect comments made on the draft rules by North Carolina and other states. The 6 part format meets the requirements of existing rules, and future lists

will meet requirements of any revised federal rules. A summary of the six parts of the list is provided below. A more detailed discussion is found in the preface to each Part of the list.

- **Part 1 -** Waterbodies impaired by a *pollutant* as defined by EPA. "The term pollutant means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into the water." TMDLs will be submitted for all water/pollutant combinations listed in Part 1.

- **Part 2 -** Waterbodies impaired by *pollution*, not by a *pollutant*, are included on Part 2 of the list. EPA defines *pollution* as "The man-made or man-induced alteration of the chemical, physical, biological and radiological integrity of the water" in the CWA section 502(19). EPA believes that in situations where the impairment is not caused by a *pollutant*, a TMDL is generally not the appropriate solution to the problem. In keeping with the principle that the § 303(d) list is an accounting of all impaired waterbodies, however, these types of waterbodies will remain on Part 2 of the list until water quality uses and standards are attained by some other means.

- **Part 3 -** Waterbodies for which EPA has approved or established a TMDL and water quality standards have not yet been attained. Monitoring data will be considered when evaluating Part 3 waterbodies for potential delisting. Waters will be moved to Part 1 of the list if updated information and data demonstrate that the approved TMDL is inadequate.

- **Part 4 -** Waterbodies for which TMDLs are not required because other required regulatory controls (e.g., NPDES permit limits, Phase I Federal Stormwater Permits, etc.) are expected to attain water quality standards by the next regularly scheduled listing cycle.

- **Part 5 -** Biologically impaired waterbodies with no identified cause of impairment. Roughly half of the waters on North Carolina's § 303(d) list appear on Part 5. Identification of the cause(s) of impairment will precede movement of these waters to Parts 1 and 2 of the list. EPA recognized that in specific situations the data is not available to establish a TMDL and that these specific waters might be better placed on a separate part of the 2000 § 303(d) list (64 FR, 46025, August 23, 1999). Data collection and analysis will be performed in an attempt to determine a cause of impairment. North Carolina's proposed plan for managing biologically impaired waterbodies can be found in the preface to Part 5 of the list.

- **Part 6 –** The *proper technical conditions* do not yet exist to develop a TMDL. "*Proper technical conditions* refers to the availability of the analytical methods, modeling techniques and data base necessary to develop a technically defensible TMDL. These elements will vary in their level of sophistication depending on the nature of the pollutant and characteristics of the segment in question" (43 FR 60662, December 28, 1978). These are waters that would otherwise be on Part 1 of the list. In the proposed TMDL regulations, EPA again recognized that in some specific situations the data, analyses, or models are not available

to establish a TMDL and that these specific waters might be better off on a separate part of the 2000 § 303(d) list (64 FR, 46025, August 23, 1999). North Carolina seeks EPA technical guidance in developing technically defensible TMDLs for these waters. DWQ has included fecal impaired shellfishing waters on this part of the list. North Carolina's approach to managing fecal coliform impaired shellfishing waters is outlined in the preface to Part 6.

Figure 2 illustrates the generalized relationship between the 6 parts of the 2000 § 303(d) list.

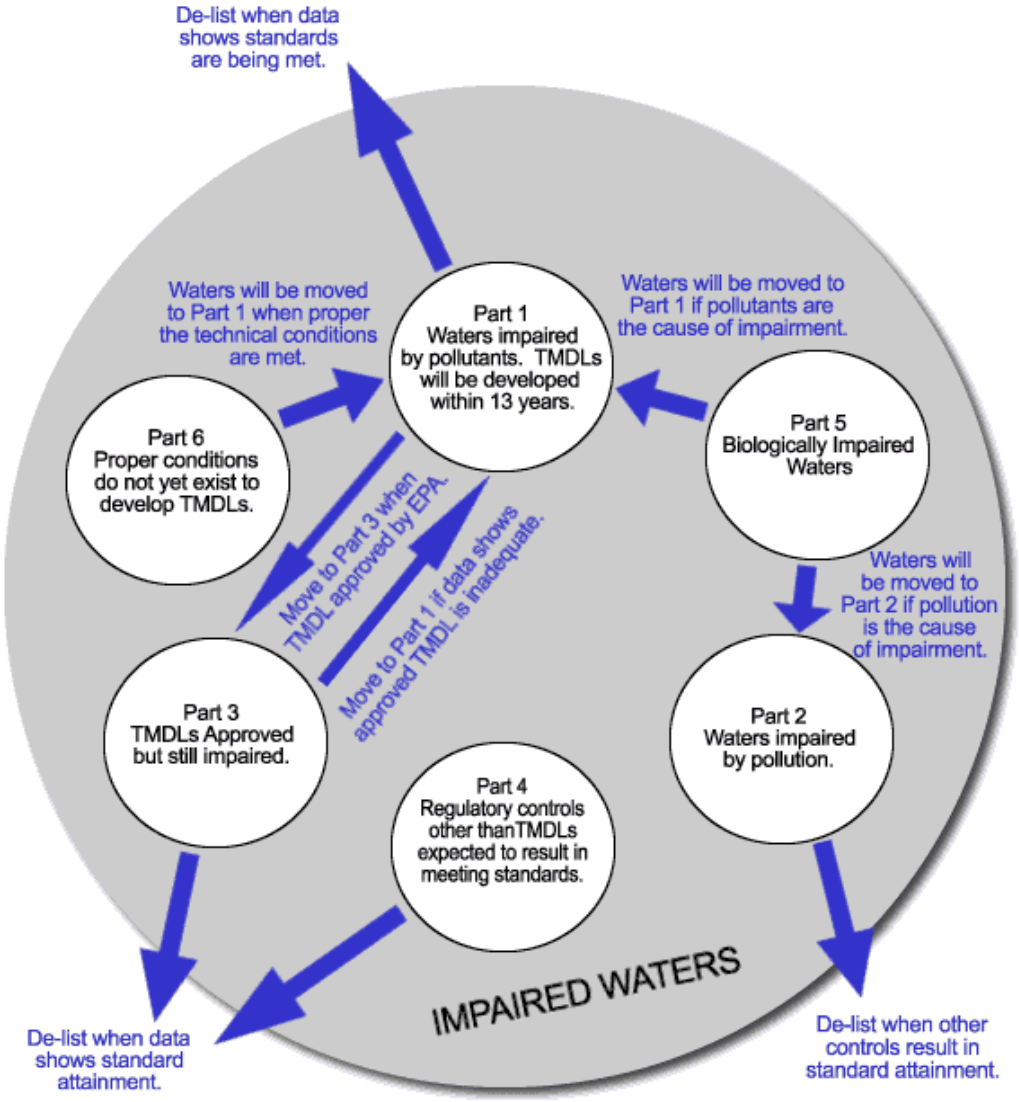


Figure 2 Relationships between the six parts of the list (adapted from EPA 841-D-99-001)

Data Elements

The data included in the 2000 § 303(d) list are:

- Name and location of the waterbody;
- Unique waterbody ID (same as that used in the § 305(b) Report)
- Type of waterbody and size of the impaired area;
- Designated uses of the impaired waterbody (Class);
- Subbasin in which the waterbody is located;
- Pollutant or type of pollution causing the impairment (when known);
- Identified possible sources of the pollutant or pollution;
- Restoration Approach;
- Priority (where applicable);
- Date of TMDL approval (where applicable).

The "cause" and "source" data elements used in the list are identical to those used in § 305(b) Waterbody System databases. A summary of the relevant codes for identifying sources and approaches is found on the page immediately following § 303(d) tables. Note that the "Cause" and "Source" data elements are not related in North Carolina's 2000 § 303(d) list. Due to the way in which past § 305(b) databases have been constructed, all possible sources of impairment are listed for all causes. Beginning in 2002, causes and sources will be related.

Prioritization

North Carolina has developed a priority ranking scheme that reflects the relative value and benefits those waterbodies provide to the State. The priority ranking system is designed to take into account the severity of the impairment, especially threats to human health and endangered species, and the designated uses of the waterbody as required by CWA § 303(d)(1)(A).

A priority of High, Medium or Low has been assigned to all waterbodies on Parts 1, 4, 5 and 6 of the list. The priority scheme is outlined in Figure 2. The categories and factors are presented in Tables 1 & 2.

Figure 3 TMDL and Monitoring Priority Ranking Scheme (adapted from EPA 841-D-99-001)

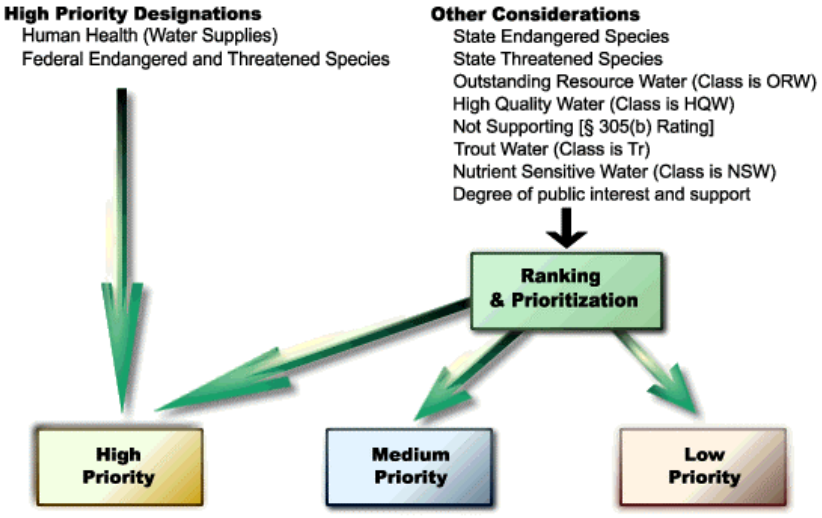


Table 1 TMDL and Monitoring Priority Categories

Cumulative Score	Priority
Less than 3	Low
Greater than or equal to 3	Medium
Greater than or equal to 6	High

Table 2 Factors Used to Determine Priority

Factor	Score	Minimum Priority
Water Supply	+6	High
Federal Endangered Species	+6	High
Federal Threatened Species	+6	High
State Endangered Species	+3	Medium
State Threatened Species	+3	Medium
Outstanding Resource Water (Class is ORW)	+3	Medium
High Quality Water (Class is HQW)	+3	Medium
Trout Water (Class is Tr)	+2	Low
Nutrient Sensitive Water (Class is NSW)	+2	Low
Not Supporting [§ 305(b) Rating]	+2	Low
Degree of public interest and support	+2	Low

A high priority is assigned to all waterbodies that are classified as water supplies. A high priority is also automatically assigned to all waterbodies harboring species listed as endangered or threatened under § 4 of the federal Endangered Species Act (ESA). A medium priority has minimally been assigned to waters harboring State listed endangered and threatened species. As a way of addressing anti-degradation concerns, classified outstanding resource waters and high quality waters start at the medium priority. The remaining waters on the list are prioritized according to severity of the impairment (non-supporting waters receive +2) and other classified use factors.

Scheduling TMDLs

TMDLs on Part 1 of the § 303(d) list are at many different stages on the path to an approved TMDL. Some require additional data collection to adequately define the problem in TMDL terms. Some require more outreach to increase stakeholder involvement and "buy-in." Others need to have a technical strategy budgeted and scheduled. Some are almost ready for submittal to EPA for approval. As the current regulations require, North Carolina has listed waters targeted for TMDL development within the next two years. Targeted waters are listed in Appendix VII.

The movement of waters from Part 5 to Part 1 of the list is going to require a large allocation of resources. North Carolina has used "biological impairment" to place the majority of waters on the § 303(d) list. Additional consideration and data collection is necessary if the establishment of a TMDL for waters on Part 5 is to be expected. It is important to understand that the identification of waters on Part 5 of the list does not mean that they are low priority waters. The problem parameter identification (PPI) approach is a high priority for the state of North Carolina. However, it should be noted that it may take significant resources and time to determine the cause of impairment. The PPI approach is also a declaration of need for more data and more time to adequately define the problems and whether they are affected by *pollution*, *pollutants* or a combination.

North Carolina believes it to be both practical and honest to schedule TMDL development for only those waterbodies where we have some information about the cause of impairment. Scheduling TMDLs for waters that may not be impaired by a *pollutant* is misleading and counterproductive.

North Carolina will submit TMDLs within 13 years of first listing starting with the approved 1998 § 303(d) list. TMDLs for waters first listed in 1998 or earlier will be developed by 2011. As a general rule, TMDLs will be addressed according to highest priority in accordance with the rotating basinwide planning approach. See Figure 3 for a Gantt style chart representation of North Carolina's basinwide planning schedule. Due to the wide range of complexities encountered in TMDL development, TMDLs will not necessarily be submitted to EPA in order of priority. See Figure 4 for an illustration of the conceptual development schedule.

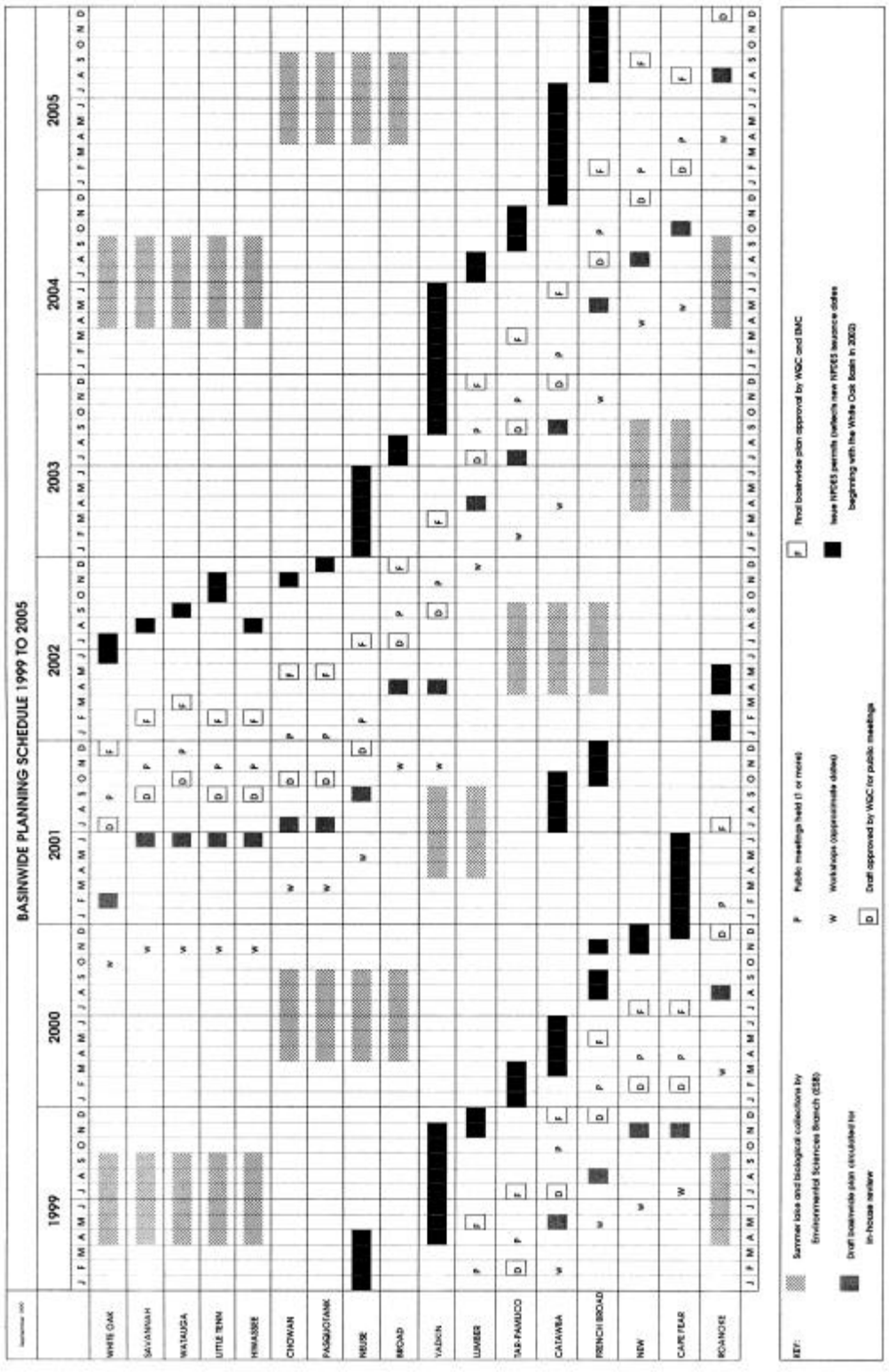


Figure 3 North Carolina's Basinwide Planning Schedule (September, 1999)

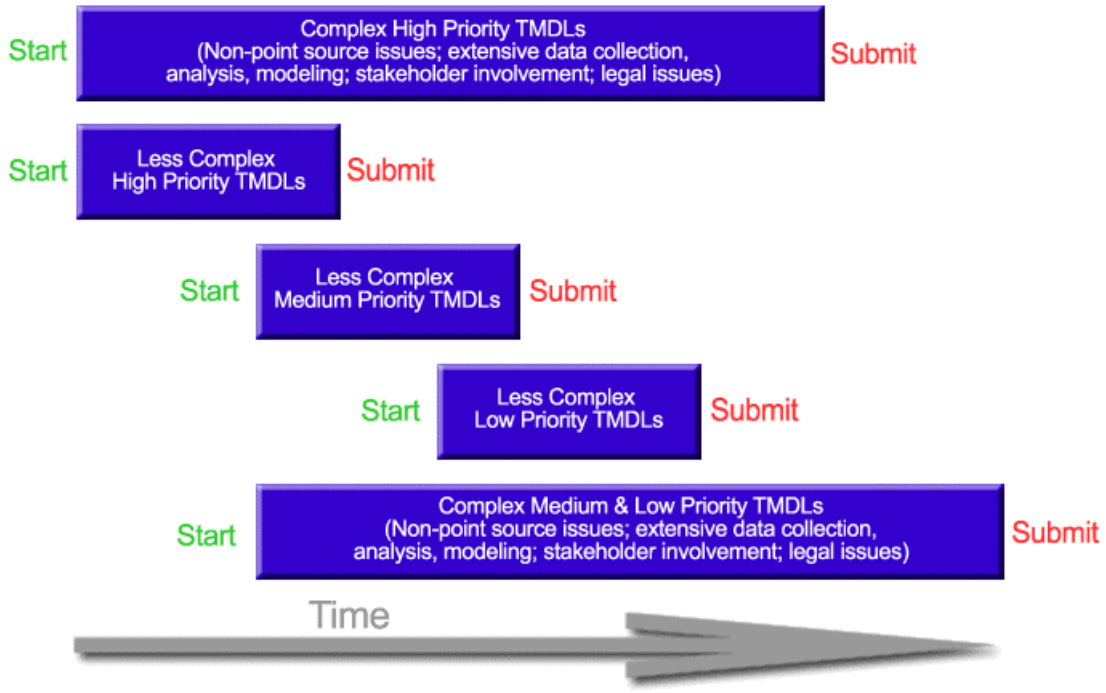


Figure 4 Generalized Conceptual TMDL Development and Submission Schedule

Georeferencing System

The geographical location of each waterbody on the approved list will be made available to the public as an ArcView® GIS shapefile. This GIS coverage is compatible with BASINS 2.0; EPA's nationally distributed modeling and analysis platform. The shapefile will be finalized and made available to the public in a timely manner after the entire 2000 § 303(d) list is approved. Due to the time and expense necessary to develop § 303(d) GIS coverages, DWQ can only submit finalized recordsets to North Carolina's Center for Geographic Information and Analysis (CGIA) for processing.

Delisting Criteria

North Carolina relies heavily on the existing § 305(b) reporting methodology to complete the § 303(d) process. In general, waters will be removed from the § 303(d) list when data shows that a water is fully supporting its uses. In some cases, mistakes have been discovered in the original listing decision and the mistakes are being corrected. The list of waters that have been removed relative to the approved 1998 list is attached in Appendix IX. The memo from the Environmental Sciences Branch, *Summary of 303(d) Stream Reaches Determined to be Inappropriate for Rating, Using Current Biological Criteria, January 19, 2000*, is attached in Appendix X for reference.

Waters appearing on the previously approved § 303(d) list will be removed from the § 303(d) lists under the following circumstances:

- Updated § 305(b) use support Rating of Fully Supporting;
- Applicable water quality standards are being met (i.e. no longer impaired for a given *pollutant*);
- The basis for putting the water on the list is determined to be in invalid (i.e. was mistakenly identified as impaired in accordance with 40 CFR 130.7(b)(6)(iv) and/or *National Clarifying Guidance for State and Territory 1998 Section 303(d) Listing Decisions*, Robert Wayland III, Director Office of Wetlands, Oceans, and Watersheds, Aug 27, 1997 (Appendix VIII);
- Water quality variance has been issued for a specific standard (e.g. chloride);
- Removal of fish consumption advisories;
- Typographic listing mistakes (i.e. the wrong water was identified).

APPENDICES

Appendix I: Use Support Methodology

INTRODUCTION TO USE SUPPORT

Waters are classified according to their best intended uses by North Carolina's Division of Water Quality. Determining how well a waterbody supports its designated uses (*use support* status) is another important method of interpreting water quality data and assessing water quality.

Surface waters (streams, lakes and estuaries) are rated as either *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, secondary recreation and swimming) are fully supported, partially supported or not supported. For instance, waters classified for fishing and water contact recreation (Class C for freshwaters or SC for saltwaters) are rated as fully supporting if data used to determine use support (such as chemical/physical data collected at ambient sites or benthic macroinvertebrate bioclassifications) did not exceed specific criteria. However, if these criteria were exceeded, then the waters would be rated as partially supporting or not supporting, depending on the degree of exceedence.

Streams that are either partially supporting or not supporting are considered *impaired* and are rated based on specific criteria discussed more fully below. There must be a specified degree of degradation before a stream is considered impaired. This differs from the word impacted, which can refer to any noticeable or measurable change in water quality, good or bad. Streams which have no or inconclusive data to determine their use support are listed as not rated (NR).

Direct comparison of use support numbers from the 2000 305(b) report and past reports is not appropriate. Methods for determining use support ratings and pollution causes and sources have evolved through time. States are required to use the methods recommended by EPA for national consistency, and these methods change as well. Therefore, it is not appropriate to compare summary data from one 305(b) report to another. The only appropriate way to examine water quality trends is to compare changes station by station with one analytical methodology.

INTERPRETATION OF DATA

The assessment of water quality presented in this document involved evaluation of available water quality data to determine a waterbody's use support rating. In addition, an effort was made to determine likely causes (e.g., habitat degradation or nutrients) and sources (e.g., agriculture, urban runoff, point sources) of waterbody degradation. Data used in the use support assessments include biological data, chemical/physical data, lakes assessment data, and shellfish sanitation surveys from the NC Division of Environmental Health (as

appropriate). Although there is a general procedure for analyzing the data and determining a waterbody's use support rating, each waterbody is reviewed individually, and best professional judgment is applied during these determinations.

Interpretation of the use support ratings compiled by the Division of Water Quality (DWQ) should be done with caution. The methodology used to determine the ratings must be understood, as should the purpose for which the ratings were generated. The intent of use support assessments by basin is to gain an overall picture of the water quality, to describe how well waters support the uses for which they were classified, and to document the relative contribution made by different pollution sources.

The data are not intended to provide precise conclusions about pollutant budgets for specific watersheds. Since the assessment methodology is geared toward general conclusions, it is important not to manipulate the data to support policy decisions beyond the accuracy of these data.

FRESHWATER STREAM USE SUPPORT

Assessment Methodology

Many types of information are used to determine use support assessments and to determine causes and sources of use support impairment. A use support data file is maintained for each of the 17 river basins. In these files, stream segments are listed as individual records. All existing data pertaining to a stream segment are entered into its record. In determining the use support rating for a stream segment, corresponding ratings are assigned to data values where appropriate. The following data and the corresponding use support ratings are used in the process.

1. Monitoring Data

Benthic Macroinvertebrate Bioclassification

Criteria have been developed to assign bioclassifications ranging from Poor to Excellent to each benthic sample based on the number of taxa present in the intolerant groups Ephemeroptera, Plecoptera and Trichoptera (EPTs) and the Biotic Index (BI), which summarizes tolerance data for all taxa in each collection. The bioclassifications are translated to use support ratings as follows:

Bioclassification	Rating
Excellent	Fully Supporting
Good	Fully Supporting
Good-Fair	Fully Supporting
Fair	Partially Supporting
Poor	Not Supporting

Fish Community Structure

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 index incorporates information about species richness and composition, trophic composition, fish abundance and fish condition. The index is translated to use support ratings as follows:

NCIBI	Rating
Excellent	Fully Supporting
Good	Fully Supporting
Good-Fair	Fully Supporting
Fair	Partially Supporting
Poor	Not Supporting

Phytoplankton and Algal Bloom Data

Prolific growths of phytoplankton, often due to high concentrations of nutrients, sometimes result in "blooms" in which one or more species of alga may discolor the water or form visible mats on top of the water. Blooms may be unsightly and deleterious to water quality, causing fish kills, anoxia, or taste and odor problems. An algal sample with a biovolume larger than 5,000 mm^3/m^3, density greater than 10,000 units/ml, or chlorophyll *a* concentration approaching or exceeding 40 micrograms per liter (the NC state standard) constitutes a bloom. Best professional judgment is used on a case-by-case basis in evaluating how bloom data should be used to determine the use support rating of specific waters. The frequency, duration, spatial extent, severity of blooms, associated fish kills, or interference with recreation or water supply uses are all considered.

Physical/Chemical Data

Chemical/physical water quality data are collected monthly through the Ambient Monitoring System. A five-year window of data is analyzed for the percent of samples exceeding NC state standards for most physical/chemical parameters. Percent exceedences correspond to use support ratings as follows:

Standards Violation*	Rating
Criteria exceeded ≤10%	Fully Supporting
Criteria exceeded 11-25%	Partially Supporting
Criteria exceeded >25%	Not Supporting

*Percentages are rounded to the nearest whole number. A minimum of ten samples is needed.

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

Data for copper, iron and zinc are not used according to the percent excess scheme outlined above. Because these metals are generally not bioaccumulative and have variable toxicity to aquatic life because of chemical form, solubility and stream characteristics, they have *action level* standards. 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. Best professional judgement is used to determine which streams have metal concentrations at potentially problematic levels. Streams with high metal concentrations are evaluated for toxicity, and they may be rated as PS or NS if toxicity tests or biomonitoring (e.g., benthic macroinvertebrate communities) indicate problematic metal levels.

Fecal coliform bacteria data are not used alone to determine a partially or not supporting rating. The geometric mean is calculated using monthly samples, and if the geometric mean is above 200 colonies per 100 ml, fecal coliform bacteria are listed as a problem parameter. Because North Carolina's fecal coliform bacteria standard is 200 colonies per 100 ml for the geometric mean of *five samples taken in a thirty-day period*, fecal coliform bacteria are listed as a cause of impairment for the 303(d) list only when the standard is exceeded.

2. Source and Cause Data

In addition to the above data, existing information is documented for potential sources and causes of stream degradation. It is important to note that not all impaired waterbodies have sources and/or causes listed for them. Additionally, fully supporting waterbodies may have sources and/or causes of stream degradation as well. Staff and resources do not currently exist to collect this level of information for all waterbodies. Much of this information is obtained through the cooperation of other agencies (federal, state and local), organizations and citizens.

Point Source Data

Whole Effluent Toxicity Data: Many facilities are required to monitor whole effluent toxicity by their NPDES permit or by administrative letter. Streams that receive a discharge from a facility that has failed its whole effluent toxicity tests may have that facility listed as a potential source of pollution.

Daily Monitoring Reports: Streams which receive a discharge from a facility significantly out of compliance with permit limits may have that facility listed as a potential source of pollution.

Nonpoint Source Data

Nonpoint sources of pollution (i.e., agriculture, urban and construction) are identified by monitoring staff, other agencies (federal, state and local), land use reviews, and public workshops.

Problem Parameters

Causes of stream degradation (problem parameters), such as habitat degradation and low dissolved oxygen, are also identified for specific stream segments where possible. For streams with ambient water quality stations, those parameters which exceed the water quality standard =11 percent of the time for the review period are listed as a problem parameter. Zinc, copper and iron are listed as problem parameters if levels are high enough to impact the biological community (see *Physical/Chemical Data* section). Fecal coliform bacteria are listed as a problem parameter if the geometric mean is greater than 200 colonies per 100 ml. For segments without ambient stations, information from reports, other agencies and monitoring staff is used if it is available.

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, stream bed scour, lack of riparian vegetation, loss of pools or riffles, and loss of woody habitat.

3. Outside Data

DWQ actively solicits outside data and information. Data from outside DWQ, such as USGS ambient monitoring data, volunteer monitoring data, and data from academic researchers, are screened for data quality and quantity. If data are of sufficient quality and quantity, they are incorporated into use support assessments. A minimum of ten samples over a period of two years is needed to be considered for use support assessments. The way the data are used depends on the degree of quality assurance and quality control of the collection and analysis of the data. Data of the highest quality are used in the same fashion as DWQ data to determine use support ratings. Data with lower quality assurance may be used to pinpoint causes of pollution and problem parameters. They may also be used to limit the extrapolation of use support ratings up or down a stream 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.

4. Monitored vs. Evaluated

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

Refer to the following summary for an overview 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[1] with data[2] ≤5[3] years old.
	Monitored/Evaluated (ME)	Stream segment[1] is unmonitored but is assigned a use support rating based on another segment of same stream for which data[2] ≤5[3] 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.
	Evaluated/Old Data (ED)	Monitored stream segments1 with available data2 >5 years old3.
Not Rated	Not Rated (NR)	No data available to determine use support. Includes unmonitored streams that are direct or indirect tributaries to stream segments rated PS or NS.

1 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).

2 Major data sources include benthic macroinvertebrate bioclassifications, fish community structure (NCIBI), and chemical/physical monitoring data.

3 From the year that basin monitoring was done.

5. Assigning Use Support Ratings to Freshwater Streams

At the beginning of each assessment, all data are reviewed by subbasin with the monitoring staff. Discrepancies between data sources are resolved during this phase of the process. For example, a stream may be sampled for both benthic and fish community structure, and the benthic bioclassification may differ from the NCIBI (i.e., the bioclassification may be FS while the NCIBI may be NS). To resolve this, the final rating may defer to one of the samples (resulting in FS or NS), or it may be a compromise between both of the samples (resulting in PS).

After reviewing the existing data, use support ratings are assigned to the streams. If one data source exists for the stream, the rating is assigned based on the translation of the data value as discussed above. If more than one source of data exists for a stream, the rating is assigned according to the following hierarchy:

Benthic Bioclassification/Fish Community Structure
Chemical/Physical Data
Monitored Data >5 years old
Compliance/Toxicity Data

This is only a general guideline for assigning use support ratings and not meant to be restrictive. Each segment is reviewed individually, and the resulting rating may vary from this process based on best professional judgment, which takes into consideration site-specific conditions.

After assigning ratings to streams with existing data, streams with no existing data are assessed. Streams that are direct or indirect tributaries to streams rated FS receive the same rating (with an evaluated basis) if they have no known significant impacts, based on a review of the watershed characteristics and discharge information. Streams that are direct or indirect tributaries to streams rated PS or NS, or that have no data, are assigned a NR rating.

LAKE USE SUPPORT

The complex and dynamic ecosystem interactions that link chemical and physical water quality parameters and biological response variables must be considered when evaluating use support. In general, North Carolina assesses use support by determining if a lake's *uses*, such as water supply, fishing, and recreation, are met; violations of water quality standards are not equated with use impairment unless uses are not met. In following this approach, use support for agriculture, aquatic life propagation, maintenance of biological integrity, wildlife, recreation, and water supply can be holistically evaluated.

Nutrient enrichment, or eutrophication, is one of the main causes of lake impairment. Several water quality variables may help to describe the level of eutrophication. These include pH, chlorophyll *a*, dissolved oxygen, phosphorous, nitrogen, turbidity, total dissolved gases, and other quantitative indicators, some of with 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.

North Carolina does not determine eutrophication related use impairment with the quantitative assessment of an individual water quality variable (i.e. chlorophyll *a*). Likewise, North Carolina 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. All of these parameters are used to develop an overall use support rating. Thus, the weight of evidence approach is most appropriate to determine use support in terms of nutrient enrichment 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 complaints;
- algal bloom reports;

- macrophyte observations;
- reports from water treatment plant operators;
- reports from lake associations;
- fish kill reports;
- taste and odor observations;
- aesthetic complaints;
- frequency of noxious algal activity;
- reports/observations of the NC Wildlife Resources Commission.

Specific examples illustrating how lake use support is determined can be found in Appendix II: "Determining Use Support for Eutrophication Related Water Quality Variables."

SALTWATER USE SUPPORT

Assessment Methodology

Estuarine waters are delineated according to Division of Environmental Health (DEH) shellfish management areas (e.g., Outer Banks, Area H-5) for use support assessment (for map of shellfish management areas, see 1996 305(b) report). As with the freshwater assessments, many types of information are used to determine use support ratings and to determine causes and sources of use support impairment for saltwater bodies. The following data sources are used when assessing estuarine areas:

1. DEH Sanitary Surveys

DEH is required to classify all shellfish growing areas as to their suitability for shellfish harvesting. Growing areas are sampled continuously and reevaluated every three years to determine if their classification is still applicable. Classifications are based on fecal coliform bacteria sampling, locations of pollution sources, and the availability of the shellfish resource. Growing waters are classified as follows:

- *Approved Area* - an area determined suitable for the harvesting of shellfish for direct market purposes.
- *Conditionally Approved-Open* - waters that are normally open to shellfish harvesting but are closed on a temporary basis in accordance with management plan criteria.

- *Conditionally Approved-Closed* - waters that are normally closed to shellfish harvesting but are open on a temporary basis in accordance with management plan criteria.

- *Restricted Area* - an area from which shellfish may be harvested only by permit and subjected to an approved depuration process or relayed to an approved area.

- *Prohibited Area* - an area unsuitable for the harvesting of shellfish for direct market purposes.

2. Chemical/Physical Data

Chemical/physical water quality data are collected monthly through the Ambient Monitoring System. The total number of samples and percent exceedences of the NC state standards are used for use support ratings (see methods for freshwater streams). Parameters are evaluated based on the salt waterbody classification and corresponding water quality standards.

Fecal coliform bacteria data from DWQ ambient monitoring are considered for SB and SC waters (saltwaters not classified by DWQ for shellfishing), but are not used alone to determine a partially or not supporting rating. The geometric mean is calculated using monthly samples, and if the geometric mean is above 200 colonies per 100 ml, fecal coliform bacteria are listed as a problem parameter. Because North Carolina's fecal coliform bacteria standard for SB and SC waters is 200 colonies per 100 ml for the geometric mean of *five samples taken in a thirty-day period*, fecal coliform bacteria are listed as a cause of impairment for the 303(d) list only when the standard is exceeded.

3. Phytoplankton and Algal Bloom Data

Prolific growths of phytoplankton, often due to high concentrations of nutrients, sometimes result in "blooms" in which one or more species of algae may discolor the water or form visible mates on top of the water. Blooms may be unsightly and deleterious to water quality, causing fish kills, anoxia or odor problems. An algal sample with a biovolume larger than 5000 mm^3/m^3, density greater than 10,000 units/ml, or chlorophyll *a* concentrations approaching or exceeding 40 ug/l (the NC standard) constitutes a bloom. Best professional judgment is used on a case-by-case basis in evaluating how bloom data should be used to determine the use support rating of specific waters. The frequency, duration, spatial extent, severity of blooms, associated fish kills, or interference with recreation or water supply uses are all considered.

4. Assigning Use Support Ratings to Estuarine Waters

Saltwaters are classified according to their best use. When assigning a use support rating, the waterbody's assigned classification is used with the above parameters to make a determination of use support. The following table describes how these factors are combined in use support determination.

DWQ Classification	DEH Shellfish Classification	Chemical/Physical Data[1]
Fully Supporting		
SA	Approved or Conditionally Approved-Open	standard exceeded ≤10% of measurements
SB & C	Does not Apply	standard exceeded ≤10% of measurements
Partially Supporting		
SA	Prohibited2, Restricted or Conditionally Approved-Closed	standard exceeded 11-25% of measurements
SB & SC	Does not Apply	standard exceeded 11-25% of measurements
Not Supporting		
SA	Prohibited[2] or Restricted	standard exceeded >25% of measurements
SB & SC	Does not Apply	standard exceeded >25% of measurements

1. Percentages are rounded to the nearest whole number. A minimum of ten samples is needed.
2. DEH classifies some SA waters as prohibited, because DEH does not sample them due to the absence of a shellfish resource. DEH is federally required to prohibit harvesting in such areas, although actual fecal coliform bacteria concentrations are unknown. These waters are not rated (NR) for use support.

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, but different DWQ use classifications may be assigned to separate segments within DEH management areas. In determining use support, the DEH classifications and management strategies are only applicable to those areas that DWQ has classified as SA (shellfish harvest waters). This will result in a difference of acreage between DEH areas classified as conditionally approved-closed, prohibited or restricted and DWQ waterbodies rated as PS or NS. For example, if DEH classifies a 20-acre waterbody as prohibited, but only 10 acres have a DWQ use classification of SA, only those 10 acres classified as SA will be rated as partially supporting their uses based on DEH information. DWQ areas classified as SB and SC are rated using chemical/physical data, phytoplankton data, and algal bloom and fish kill data.

5. Cause and Source Data

See methods for freshwater streams.

6. Outside Data

See methods for freshwater streams.

Appendix II: Determining Use Support for Eutrophication Related Water Quality Variables

Section 305(b) of the Federal Clean Water Act requires that each state report biennially on the extent to which waters provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water. Additionally, section 303(d) requires each state to identify those waters within its boundaries for which effluent limitations are not stringent enough to implement any water quality standard applicable to such waters. The state shall establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of such waters. As a result of this legislation, decisions must be made on how to report this information.

Water quality standards that are related to eutrophication concerns have been designed to provide an opportunity for the proactive management and protection of designated uses. In North Carolina, substantial monitoring programs have been developed to gather information on a number of water quality variables to determine if water quality standards are being achieved. Specific numerical and narrative criteria have been constructed by regulation (15A NCAC 2B.0200) to guide these decisions. Thus, many biological, chemical and physical variables can be used to quantitatively evaluate the degree of attainment of water quality standards. However, in order to determine if a water body is meeting designated uses related to eutrophication concerns, a comprehensive assessment of many factors that may limit the attainment of a particular use must be performed. Biological integrity, a designated use, can be directly evaluated through the monitoring data obtained from benthic macroinvertebrate studies. However, this method of assessment is not a suitable tool for all bodies of water. Lakes, estuaries, swamps and other very slow moving waters are not easily evaluated with this technique. Yet, these are the very same waterbodies that are most susceptible to excessive amounts of biological productivity (hypereutrophication), which may lead to severe use impairment. An assessment of phytoplankton (algae) communities may be utilized in natural lake systems to evaluate biological integrity. However, as a stand-alone assessment tool this approach is not suitable for man-made reservoirs. In many cases reservoirs are constructed by need in areas that have already been impacted by land use changes and development. Thus, biological ecoregion approaches may not be applicable to use support especially in artificial reservoirs that were not designed to mimic natural systems.

If designated uses are not being supported, that is, if waters are impaired as a result of eutrophication, then proactive management measures must be augmented with more aggressive restoration measures in order to provide for rehabilitation of the designated uses. Because a use restoration strategy has the potential for basinwide economic and social impacts, decisions related to eutrophication use impairment must be carefully weighed.

Several water quality variables may 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 these have specific water quality standards. But in order to appropriately evaluate the attainment of use support a clear weight of evidence

approach must be used. This approach can be flexibly applied depending on the amount and quality of available information. The approach uses multiple quantitative water quality variables, third party reports, analysis of water quality complaints, algal bloom reports, macrophyte observations, reports from lake associations, fish kill reports, taste and odor observations, aesthetic complaints, the episode frequency of noxious algal activity and reports and comments from the Wildlife Resources Commission. The weight of evidence approach must be carefully and professionally evaluated. In following this approach, use support suitability for agriculture, aquatic life propagation, maintenance of biological integrity, wildlife, recreation, water supply for drinking, culinary or food processing purposes, can be holistically evaluated.

It may be generally agreed that excessive amounts of the hypereutrophication causal variables, nitrogen and phosphorus, are the principal culprits in eutrophication related use impairment. Indeed, these causal variables are important concerns, however, climate and hydrology factors and the 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. The basis for regulatory control of nutrient over-enrichment must rely on biological responses to nutrient delivery as well as environmental effects. It is not appropriate to determine eutrophication related use impairment with the quantitative assessment of an individual water quality variable (i.e. chlorophyll a). Nor is it appropriate to utilize a fixed index composed of several water quality variables, which does not have the flexibility to adapt to numerous hydrological situations. Without presentation of detailed technical explanations and examples, it must be acknowledged that there are highly complex and dynamic ecosystem interactions which link measures of water quality variables and biological response variables to the determination of waterbody use support. And because of this dynamic complexity a weight of evidence approach must be used as a protocol in determining use support attainment utilizing all sources of readily available information.

Presented below are two examples of determining use support in lakes. The Farmer Lake example demonstrates that although a few observations of water quality variables may have exceeded a particular water quality standard, the designated uses of the reservoir are being fully supported. The Santeetlah Lake example demonstrates that use support can be segmented for different parts of a lake. This example also demonstrates frequent violations of water quality standards and use impairment for swimming and biological integrity.

Farmer Lake Example

Farmer Lake has been determined to be supporting its designated uses and has exceeded the chlorophyll a water quality standard twice out of fifteen observations (13%).

Farmer Lake, a 368-acre water supply reservoir for the City of Yanceyville was built in 1983 in Caswell County. The lake is used extensively for fishing with a boat ramp located near the dam. Farmer Lake has a maximum depth of 40 feet (12 meters). The watershed land uses include agriculture and forested land.

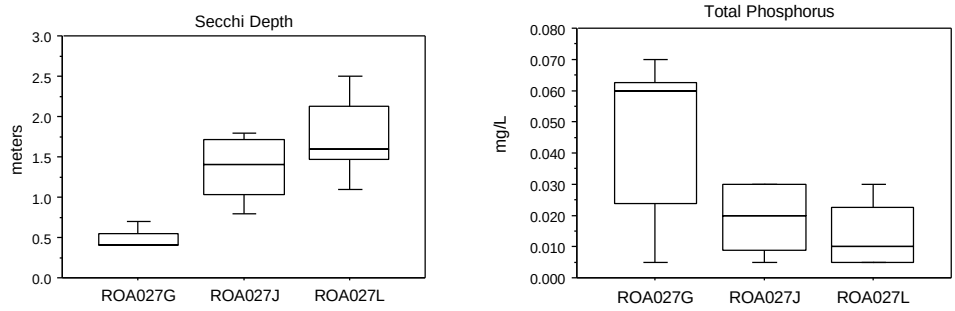
Farmer Lake was most recently monitored by DWQ in June, July and August 1999. In July and August, the chlorophyll a value for the upstream lake sampling site (ROA027G) was greater than the state water quality standard of 40 mg/L. Metals were within applicable state water quality standards. Calculated NCTSI scores for Farmer Lake indicated that this lake was mesotrophic in June and eutrophic in July and August.

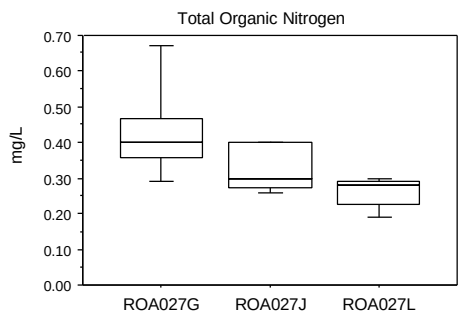
Historical data collected at Farmer Lake from 1991 through 1999 for the four constituents of the NCTSI (Secchi depth, total phosphorus, total organic nitrogen and chlorophyll a) are summarized using box and whisker plots. Mean Secchi depths demonstrated an increase from the upstream lake sampling site to the sampling site near the dam, while mean total phosphorus and mean total organic nitrogen have decreased from the upper end of the lake to near the dam. Mean chlorophyll a values have been greatest at the upper end of the lake as compared with both the mid-lake sampling site and the sampling site near the dam. Since 1991, there have been nine observations for dissolved oxygen that were greater than the water quality standard for total dissolved gases of 110%. However, the maximum observed value was 120.

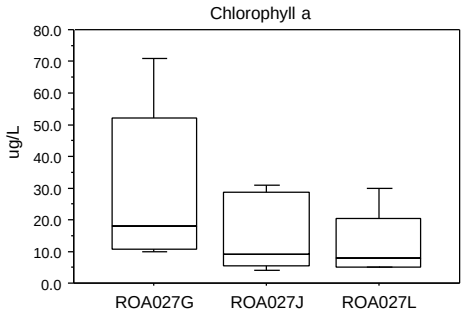
There have been no reports of noxious algae blooms or fish kills in Farmer Lake. There have also been no public complaints regarding taste or odor problems in water taken from this lake. The watershed has been relatively stable with no new development (Bill Carter, Director of Public Utilities, Town of Yanceyville, pers com.). Even though 13% of the chlorophyll a observations have been greater than the water quality standard, the lake is considered to fully support designated uses. Proactive investigation of nutrient enrichment at the most upstream location should be further evaluated as resources and priorities allow.

Carter, B. November 2, 1999. Director of Public Utilities, Town of Yanceyville, NC. Personal communication

Farmer Lake Data Analysis, 1991 – 1999 (n = 5 per station).







Farmer Lake Historical NCTSI Data. (Lake means)					
Date	**NCTSI**	**TP**	**TON**	**CHLA**	**SECCHI**
8/3/1999	1.0[E]	0.03	0.33	44	1.6
7/7/1999	0.1[E]	0.01	0.36	30	1.4
6/10/1999	-0.3[M]	0.03	0.29	8	1.2
8/23/1994	0.7[E]	0.04	0.40	7	0.8
8/29/1991	0.6[E]	0.04	0.31	11	1.1

Farmer Lake individual values					
Date m/d/yr	**Sampling Station**	**Secchi meters**	**TP mg/L**	**TON mg/L**	**CHL a µg/L**
8/03/1999	ROA027G	0.4	0.07	0.40	71
8/03/1999	ROA027J	1.8	0.01	0.40	31
8/03/1999	ROA027L	2.5	<0.01	0.19	30
7/07/1999	ROA027G	0.7	0.03	0.40	46
7/07/1999	ROA027J	1.4	<0.01	0.40	28
7/07/1999	ROA027L	2.0	<0.01	0.29	17
6/10/1999	ROA027G	0.4	0.06	0.29	10
6/10/1999	ROA027J	1.7	0.02	0.30	6
6/10/1999	ROA027L	1.6	0.01	0.30	8
8/23/1994	ROA027G	0.4	0.06	0.67	11
8/23/1994	ROA027J	0.8	0.03	0.28	4
8/23/1994	ROA027L	1.1	0.02	0.24	5
8/29/1991	ROA027G	0.5	0.07	0.38	18
8/29/1991	ROA027J	1.1	0.03	0.26	9
8/29/1991	ROA027L	1.6	0.03	0.28	5

Santeetlah Lake Example

(Information for this example has been summarized, as space constraints do not allow for a detailed presentation. Individual reports are available which expand on the information presented here).

The mainstem of Santeetlah Lake has been determined to be supporting its designated uses and the West Buffalo Creek arm of the reservoir has been determined to be impaired, and is partially supporting uses for swimming and biological integrity. The Snowbird Creek arm of the reservoir is experiencing accelerated eutrophication and cannot tolerate additional contributions of algae stimulating nutrients. Management strategies need to be developed to restore the uses on the Buffalo Creek arm of the reservoir and additional proactive strategies should be developed on the Snowbird Creek arm of the reservoir to insure that water quality standards will be met and to prevent any future use impairment. Management strategies should focus on the point sources of nutrients in these areas.

Santeetlah Lake is an oligotrophic mountain reservoir located near Robbinsville (Graham County). The lake is owned by the Aluminum Company of America (ALCOA) and used for hydroelectric power generation and public recreation. The mean hydraulic retention time is 161 days. Tributaries to the lake include the Cheoah River, Santeetlah Creek, Snowbird Creek, West Buffalo Creek and East Buffalo Creek. Santeetlah Lake has a water quality classification of B Trout, designating it suitable for public swimming and protected for the propagation and survival of trout.

During 1993 and again in 1999, The Division of Water Quality conducted special studies of Santeetlah Lake and some of its tributaries in response to algal bloom complaints from residents and vacation homeowners. These complaints focused on the continuing occurrence of nuisance algal blooms on the West Buffalo Arm of the lake. Although the main body of the lake has indicated few water quality concerns, the West Buffalo Creek and Snowbird Creek arms of the lake have experienced nuisance algal blooms, elevated total phosphorus and chlorophyll a levels. These eutrophic conditions have been observed since 1989.

Results of the 1993 and 1999 studies indicated elevated nutrient concentrations and nutrient loads at stream monitoring sites downstream of commercial trout farms. Nutrient concentrations were especially high immediately downstream of the trout farms on West Buffalo Creek. Algal growth potential tests (AGPT) determined that locations downstream of the West Buffalo Creek trout farms were capable of supporting nuisance algal blooms, while sites upstream were not. During the 1993 study, nuisance algal blooms were observed in the West Buffalo Creek arm from June through October even though chlorophyll a levels were not excessive.

During the Summer of 1998, the Asheville Regional Office received a significant number of complaints about noxious algal blooms on the West Buffalo Arm of the lake. In response monitoring was conducted by DWQ documenting a bloom of the blue-green algae, Anabaena . In 1998, a vacation homeowner expressed concern about the safety of swimming in the West Buffalo Creek arm of Santeetlah Lake to Linda C. Sewall, Director of the Division of Environmental Health. Attached to her letter of response (recommending against swimming in these waters during algal blooms) was a report by Doug Campbell, MD, MPH on health effects from exposure to blue green algae.

During the 1999 study, blue green algal blooms were again observed and chlorophyll a levels frequently exceeded the water quality standard in the West Buffalo Creek Arm of the lake.

The state water quality standard for dissolved oxygen saturation is 110%. In 1999, there were 32 violations of this standard observed within the water column at lake stations. The highest number of these violations occurred on the West Buffalo arm during the months of June and July. pH went above the standard three times at lake stations on the West Buffalo Creek arm of the lake.

State water quality standards stipulate that chlorophyll a in trout waters is not to exceed 15µg/L. Violations of this standard were the most numerous on the Buffalo Creek arm of Santeetlah Lake with four of the twelve measurements exceeding the standard. The West Buffalo and Snowbird Creek arms each exceeded the standard three of the twelve measurements.

The average phytoplankton bio-volume in West Buffalo Creek arm was 3 times as high as the Santeetlah Creek arm of the lake and 1.5 times greater than the Snowbird Creek Arm. West Buffalo Creek had the highest number of algal blooms. A surface bloom was reported in the West Buffalo arm from late June to mid July. The bloom consisted mainly of Anabaena and culminated in a die off that turned the water a blue-white color. The largest difference between algae community composition of the arms and the main stem was in the amount of problem taxa, such as the Anabaena. Anabaena was not found in the main stem of the reservoir, yet it had an average biovolume of 384 mm3/m3 for the West Buffalo arm and 355 mm3/m3 in the Snowbird Creek arm of the reservoir. The Anabaena population in Snowbird appeared and disappeared quickly while the bloom persisted for weeks in the Buffalo Creek arm of the lake. The amount of Anabaena in the West Buffalo arm was more that twice that of the Snowbird arm yet it was rarely found in the main stem.

The Division of Water Quality has conducted ambient monitoring of Santeetlah Lake since 1981. This monitoring has included the collection of chemical and physical parameters at three stations located in the main body of the lake. From this data TSI Scores for the lake have been derived. TSI scores give an indication of the productivity of the lake (Oligotrophic <-2.0, Mesotrophic –2.0 to 0, Eutrophic 0 to 5.0, and >5.0 Hypereutrophic). Historically, scores for Santeetlah Lake have been oligotrophic (<-2.0). However, scores calculated for 1999 indicated some of the first mesotrophic scores ever calculated for the lake. As a result of these evaluations NPDES permit holders have been notified of the possibility of additional controls.

Historic NCTSI Scores (Does not include special studies tributary information)

Date	Sampling Station #	Secchi (m)	Chla µg/L	TP mg/L	TON mg/L	TSI Score
810812	LAKE AVE	3.5	4	0.01	0.19	-3.6[O]
820804	LAKE AVE	2.9	5	0.01	0.20	-3.8[O]
870805	LAKE AVE	3.1	3	0.02	0.20	-3.3[O]
931018	LAKE AVE	3.3	2	0.02	0.16	-4.8[O]
940830	LAKE AVE	3.0	2	0.01	0.20	-4.5[O]
990727	LAKE AVE	4	16	0.005	0.27	-2.4[O]
990809	LAKE AVE	3.6	13	0.005	0.26	-2.5[O]
990824	LAKE AVE	3.4	7	0.02	0.21	-1.5[M]

Appendix III: Procedure for Soliciting and Evaluating Outside Data for 305(b) and 303(d) Purposes

Section 303(d) of the Clean Water Act requires states to consider all readily available data sources when preparing the 303(d) list of impaired waters. This document describes the procedures used to actively solicit information and the fate of such information within the basinwide planning process.

EPA rules to implement section 303(d) of the Clean Water Act require states to "assemble and evaluate all existing and readily available water quality-related data and information" when developing the biennial 303(d) list (EPA 1999). Many other agencies, universities, industries, municipalities, and environmental groups perform studies on North Carolina's surface waters. This information can be used for determining use support ratings for waters of the state. These ratings are published regularly both in the basin plans and the biennial 305(b) report. Additionally, the 305(b) ratings are the basis for North Carolina's 303(d) list. Thus, any information that has been considered in the use support ratings is also considered when developing the 303(d) list.

All data, reports, models and other information not collected by the Division of Water Quality-Water Quality Section are considered outside data. The procedure for soliciting and evaluating outside information is outlined below as well as in the attached flowchart, Figure 1.

Step 1. Mail solicitations to other government agencies, basinwide and NPDES stakeholders and issue a press release. Both the solicitations and the press release explicitly state that the information may be used in the 303(d) listing process. Generally, solicitations and press releases indicating agency interest in outside data will be issued in October of the year prior to the summer lake and biological sampling performed by the Environmental Sciences Branch of the Water Quality Section. Solicitations are mailed for those basins scheduled to be evaluated in the coming summer. The general basinwide planning schedule, shown in Figure 2, shows when the solicitations are mailed to stakeholders each year. The agency is interested in all information that citizens may provide. While water quality data is preferred, qualitative statements are also welcome. A copy of a recent solicitation is attached. In the future, the schedule for soliciting outside information will be posted on the Water Quality Section website.

Step 2. Accept responses to solicitation received by the due date. Generally, solicitations will be mailed in October with a deadline in January of the new year. Thus, approximately 60 days will pass between the notice of solicitation and the deadline. Compelling information received after the deadline may be processed at the discretion of the Division.

Step 3. Is the response a basinwide comment? Although the solicitations state that basinwide comments are not actively sought, some may take the opportunity to comment on the basinwide process. Basinwide comments may include comments regarding current basin plans or the public review process, or may include complaints regarding general policies in a particular basin or statewide. These comments are forwarded to the Planning and Assessment Unit.

Step 4. Is the information related to a lake or saltwater system? Use support for lake, estuarine, and saltwater systems is performed by the Environmental Sciences Branch Use Support Coordinators (includes the Intensive Survey and Biological Assessment Units). Any information obtained on these types of waters is forwarded to this unit for evaluation.

Step 5. Is the information quantitative? Both quantitative and qualitative information is accepted in the consideration of outside information. However, each type of information is evaluated differently. Quantitative information generally includes some field work involving the collection of data, whether chemical or biological. Qualitative information includes statements about water quality perception (e.g., the fishing is bad).

Quantitative Information

Step 1. Were raw data submitted? This step is to identify the data requiring additional processing by Water Quality Section Personnel.

If raw data were submitted, follow track a; if not, follow track b.

Step 2a. If raw data were submitted, were they submitted in an electronic format? If raw data were not received in an electronic format, the stakeholder will be contacted to attempt to get data in electronic format. Depending upon the response of the stakeholder, this may be the last step in the evaluation of the outside data.

Step 3a. Process data for use support. If raw data are in an electronic format, process the data to determine relevant benchmarks for use support.

Steps 4a and 2b. Conduct a Level of Confidence Review (LOC Review) of data/report. The LOC review will determine how to integrate the outside data/report into use support. This step is especially important when evaluating a waterbody for which data indicate some impairment. Before placing this waterbody on the state's 303(d) list, there should be a high level of confidence in the information suggesting the waterbody is impaired. The description of the LOC review is shown below.

Steps 5a and 3b. Distribute information based on LOC review. If information is considered Level 1, forward to use support coordinator. If information is considered Level 2, forward to both use support coordinator and ESB: Biological Assessment Unit for further monitoring.

Qualitative Information

Step 1. Review qualitative information.

Step 2. Determine if Water Quality Section or other outside information exist for waterbody(ies) in question. Search the available quantitative information to determine if other comments/information have been obtained for the waterbody(ies) in question. If WQS or other outside quantitative information exists, continue to Step 3. If not, forward qualitative information to ESB: Biological Assessment Unit for future monitoring.

Step 3. Review and summarize relevant information.

Step 4. Does the relevant quantitative information support or refute the qualitative information? If the two are in agreement, forward the qualitative comment and review to the use support coordinator. If the two are not in agreement, conduct additional review or monitoring to determine the status of the waterbody(ies) in question.

References

Environmental Protection Agency (EPA). 1999. Proposed Revisions to the Water Quality Planning and Management Regulation; Proposed Rule. Fed Reg. 64:46012-46055 (August 23, 1999)

Procedures for determining a Level of Confidence (LOC) for outside data

This type of review will be conducted whenever quantitative information for lotic systems are received from stakeholders outside of the Water Quality Section. Quantitative information includes reports or studies that summarize raw data and raw data in electronic database formats. The review is conducted to determine how quantitative information may be used in the 305(b)/303(d) process.

High levels of confidence must be present in order for outside information to have equal weight as information from the Water Quality Section. This is particularly the case when considering a water body for the 303(d) list. Thus, there are three levels of confidence for outside quantitative information. The use of the information will depend upon criteria described below.

Level 1. Information is suitable for direct use in 305(b) and 303(d) processes. The Planning and Environmental Sciences Branches must agree on data to be placed at this level. Sampling and analysis must be in accordance with 15A NCAC 2B .0103. Information from bordering state agencies (e.g., South Carolina Department of Health and Environment Control) and the U.S. Geological Survey will be Level 1 data if monitoring frequency is sufficient as outlined below.

Level 2. Information is not suitable for direct use in 305(b) or 303(d) processes. Information considered as Level 2 generally fails to meet one or more of the criteria for Level 1 information, but is still considered useful as supporting evidence or to direct future monitoring. Some stakeholder information may be Level 2 information.

Level 3. Information is not suitable for direct use in 305(b) or 303(d) processes. Information is not suitable for identifying additional monitoring needs.

Level of Confidence Review Criteria

Criteria	Level 1	Level 2	Level 3
Monitoring frequency: at least 10 samples available for more than a 1 year period	Yes	Yes/No	No
Monitoring locations are appropriately sited and mapped	Yes	Yes	No
State Certified Laboratory used for sample analysis. Analysis according to 15A NCAC 2B .0103	Yes	Yes / No	No
Quality assurance plan is available that describes sample collection and handling	Yes, rigorous scrutiny	Yes / No	No

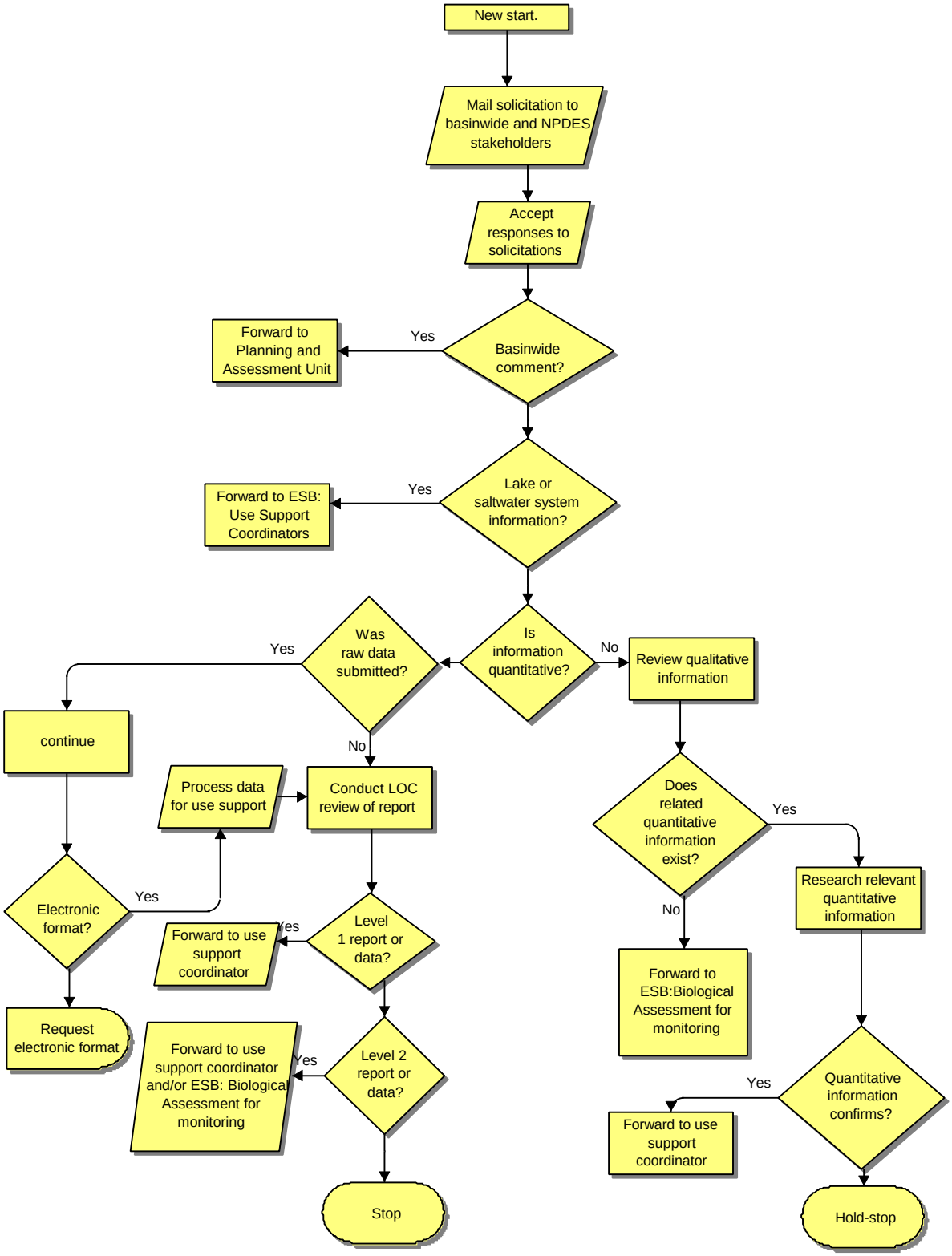


Figure 1 Procedure for Soliciting and Evaluating Outside Information

Appendix IV: Example of Data Solicitation

Cape Fear River Basin

Solicitation for Water Quality Information

December 1998

Information should be sent to:

Ms. Michelle Woolfolk
NCDENR-DWQ
Post Office Box 29535
Raleigh, NC 27626-0535
(919) 733-5083 ext.505

All information must be postmarked by March 12, 1999 in order for DWQ to consider it for use in the 2000 basinwide water quality plan. For questions about upcoming workshops and the basinwide planning schedule, please contact Suzanne Hoover of the NCDENR -DWQ at (919) 733-5083 (extension 573).

The North Carolina Department of Environment and Natural Resources, Division of Water Quality (NCDENR-DWQ) invites all interested parties to submit water quality information relevant to the Cape Fear River Basin. The Cape Fear River Basin includes the Haw, Deep, South, and Black Rivers. Submitted information will be used to assess the health of the waters in the basin. This information is relevant to the development of the Cape Fear Basinwide Water Quality Plan and as a reporting requirement to the US EPA under Section 303(d) of the Federal Clean Water Act. NCDENR-DWQ staff will evaluate submissions to determine if they are applicable and useful to the basinwide planning process or 303(d) reporting requirements.

Comments concerning any water quality management program or process are not solicited at this time. These comments on process or programs may be given during public workshops and meetings to be held in the basin beginning in 1999.

Submission Criteria:

- **Information and letters** regarding the uses of surface waters for boating, drinking water, swimming, aesthetics, and fishing may be submitted.
- **Summary reports** and memos including distribution statistics will be accepted. Information collected between January 1993 and December 1998 will be considered. Information must be scientifically valid and verifiable by NCDENR-DWQ staff.
- **Raw data** should be submitted electronically and accompanied by documentation of quality assurance methods used to collect and analyze the samples.

If information includes summaries of chemical or biological sampling data, maps showing sampling locations must be included. The name and telephone number of a contact person must also be provided with information submitted. NCDENR-DWQ will call this person if questions arise concerning the information.

Information not received as specified in this solicitation may not be considered.

Electronic Database Tips ...

- Dates must be within range specified herein.
- Qualifiers will be in separate fields and must be defined (e.g. < is non-detected value)
- Pollutant name, with units, must be defined. STORET codes may also be used.
- All sampling locations must be shown on maps
- For co-located samples at multiple depths, depths must be specified in a separate field.
- Electronic data will be accepted in ASCII, spreadsheet (e.g., Excel, Quattro Pro, Lotus), or database (e.g., Access, dBase, or SAS) platforms.

Planning Branch - Water Quality Section
NC DENR Division of Water Quality
Post Office Box 29535
Raleigh, NC 27626-0535

Cape Fear River Basin

Solicitation for Water Quality Information

Appendix V: Sources Data and Information (Non-exclusive List)

Data and information received from following sources were considered for use in the § 305(b) reporting and § 303(d) listing process. This list is presented to help characterize the breadth of sources considered in the development of the § 303(d) list. The list that follows is non-exclusive.

Albemarle-Pamlico Citizens Water Quality Monitoring Program
Allen, R.R., B.R. Crowson and S.R. Riggs.
Burlington Reservoir Assistant Lake Warden
Carolina Power and Light Company
Cary/Apex Water Treatment Plant
Catawba Riverkeeper
Champion International
Charles Watkins (private citizen)
City of Burlington
City of Fayetteville
City of Gastonia, Dept of Public Works and Utilities
City of Henderson
City of High Point
City of Raleigh Parks and Recreation Department
City of Reidsville Water Treatment Plant
City of Wilmington Public Works Department
City of Wilson Public Utilities Department
Clay, J.W.
Clean Water Fund of North Carolina
Department of Earth Sciences, Western Carolina University
Department of Environmental Sciences and Engineering,University of North Carolina at Chapel Hill
Duke Power Company
Fish and Wildlife Associates
Forsyth County Parks and Recreation
Gary Beecham (private citizen)
Gaston County QNRCC
Gerard H. Magee, Jr. (private citizen)
Graham-Mebane Water Treatment Facility
High Point Lake Water Treatment Plant
J.D. Mackintosh Water Treatment Plant
John H. Kerr Reservoir Powerhouse
Jones Lake State Park
Lake Brandt Lake Warden
Lake Higgins Lake Warden
Lake Townsend Lake Warden
Little Tennessee Watershed Association
Lynch, J.M. and S.L. Peacock
Max L. Carver (private citizen)
Mecklenberg County Department of Environmental Protection
Mecklenburg County of Environmental Protection
Nantahala Power and Light Company
Neuse River Foundation
Normandeau Associates, Inc.
North Carolina Department of Health and Human Resources, Division of Epidemiology
North Carolina Division of Parks and Recreation
North Carolina Division of Parks and Recreation, Hanging Rock State Park
North Carolina Division of Water Resources
North Carolina Power
North Carolina Wildlife Resources Commission
North Carolina Wildlife Resources Commission, Division of Inland Fisheries
Orange Water and Sewer Authority (OWASA)
Robert Marsh (private citizen)
Save Our Rivers, Inc.
Singletary Lake State Park
South Carolina Department of Health and Environmental Control
South Carolina Department of Health and Environmental Control, Bureau of Water
Tallassee Power Company (TAPOCO)
Tapoco Project
Tennessee Valley Authority
The City of Kings Mountain
Town of Boiling Springs
Town of Carthage
Town of Highlands Water Treatment Facility
Town of Hope Mills
Town of Kernersville Parks and Recreation Department
Town of Maiden
Town of Pittsboro
Town of Ramseur Water Treatment Plant
Town of Roxboro
Town of Siler City
Town of Southern Pines
Town of White Lake
Town of Yanceyville
Trinity Center
U.S. Army Corps of Engineers
U.S. Department of Agriculture, Soil Conservation Service
UNCA Environmental Quality Institute
United States Environmental Protection Agency
US Geological Survey
US Marine Corps
Virginia Power
Water Resources Research Institute
Western Piedmont Council of Governments

Appendix VI: Decision Factors Used in § 305(b) Reporting and § 303(d) Listing Process.

ID	Decision Factor
-99	Lakes assessment
0	No code listed
100	QUALITATIVE (EVALUATED) ASSESSMENT - UNSPECIFIED
110	Information from local residents
120	Surveys of fish and game biologists/other professionals
130	Land use information and location of sources
140	Incidence of spills and/or fish kills
150	Monitoring data more than 5 years old
170	Best professional judgement
175	Occurrence of conditions judged to cause impairment
180	Screening models (desktop models; models not calibrated or verified)
190	Biological/habitat data extrapolated from upstream or downstream waterbody (tribbing)
191	Physical/chemical data extrapolated from upstream or downstream waterbody (tribbing)
192	Physical/Chemical data from outside source (lesser degree of confidence in quality)
200	PHYSICAL/CHEMICAL MONITORING
210	Fixed station physical/chemical monitoring, conventional pollutants only
220	Non-fixed station physical/chemical monitoring, conventional pollutant only
222	Non-fixed-station monitoring, conventional, during key seasons and flows
230	Fixed station physical/chemical, conventional plus toxic pollutants
231	Highest quality fixed-station P/C, conventional plus toxicants
240	Non-fixed station physical/chemical, conventional plus toxicants
242	Non-fixed station physical/chemical, conv plus toxicants, key seasons,flows
250	Chemical monitoring of sediments
260	Fish tissue analysis
270	PWS chemical monitoring (ambient water)
275	PWS chemical monitoring (finished water)
300	BIOLOGICAL MONITORING
310	Ecological/habitat surveys
315	Regional reference site approach
320	Benthic macroinvertebrate surveys
321	RBP III or equivalent benthos surveys
322	RBP I or II or equivalent benthos surveys
330	Fish surveys
331	RBP V or equivalent fish surveys
340	Primary producer surveys (phytoplankton, periphyton, and/or macrophyton)
350	Fixed station biological monitoring
400	PATHOGEN MONITORING
410	Shellfish surveys
420	Water column surveys (e.g., fecal coliform)
430	Sediment analysis
440	PWS pathogen monitoring (ambient water)
450	PWS pathogen monitoring (finished water)
500	TOXICITY TESTING
510	Effluent toxicity testing, acute
520	Effluent toxicity testing, chronic
530	Ambient toxicity testing, acute
540	Ambient toxicity testing, chronic
550	Toxicity testing of sediments
600	MODELING
610	Calibrated models (calibration data are less than 5 years old)
700	INTEGRATED INTENSIVE SURVEY (field work exceeds a 24hr period, multimedia)
710	Combined sampling of water column, sediment, biota for chemical analysis
720	Biosurveys of multiple taxonomic groups (e.g., fish, invertebrates, algae)
800	ASSESSMENTS BASED ON DATA FROM OTHER SOURCES
810	(VOL.) Chem./phys. monitoring data by quality-assured volunteer program
820	(VOL.) Benthic macroinvertebrate surveys by quality-assured volunteers
830	(VOL.) Bacteriological water column sampling by quality-assured volunteers
840	(Effl.) Discharger self-monitoring data
850	(Ambt.) Discharger self-monitoring data
860	Other Agencies/Organizations provided monitoring data
870	Drinking water supply closures or advisories (source-water quality based
900	DISCREPANCY IN AQUATIC LIFE ASSESSMENT RESULTS
910	Physical/Chemical ALUS; Discrepancy among different data types
920	Biological/Habitat ALUS; Discrepancy among different data types
930	Toxicity Testing ALUS; Discrepancy among different data types
940	Evaluated (qualitative) ALUS; Discrepancy among different data types
950	Tributary to PS/NS stream

Appendix VII: Waters Targeted for TMDL Development

Appendix VIII: National Clarifying Guidance for State and Territory 1998 Section 303(d) Listing Decisions

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 27 1997

RECEIVED
SEP 5 1997
WATER QUALITY
PLANNING BRANCH

OFFICE OF WATER

MEMORANDUM

SUBJECT: National Clarifying Guidance For 1998 State and Territory Section 303(d) Listing Decisions

FROM: Robert H. Wayland III, Director
Office of Wetlands, Oceans, and Watersheds

TO: Water Division Directors, Regions I-X
Directors, Great Water Body Programs
Water Quality Branch Chiefs, Regions I-X

States and Territories (referred to collectively in this memorandum as "States") have made significant progress in developing their section 303(d) lists since the 1992 revision of the water quality management and planning regulations (at 40 CFR Part 130). The attached guidance clarifies several key policies related to listing of waters under section 303(d) for the 1998 listing cycle. The attached guidance is intended to supplement existing EPA section 303(d) listing guidance; all existing national guidance is also applicable to development of the 1998 lists, except with regard to those issues that are explicitly addressed and clarified in today's guidance.

Today's clarifying guidance applies only to the State section 303(d) lists of waters due on April 1, 1998, as required by 40 CFR section 130.7. EPA has convened an advisory committee under the Federal Advisory Committee Act to recommend long-term changes to the TMDL program. After the Federal advisory committee on TMDLs presents its recommendations to the Administrator in mid-1998, EPA may propose significant changes to current regulations, as well as the policies presented in this guidance and other existing guidance, which would then govern the development and approval of State section 303(d) lists for the year 2000 and beyond.

Today's guidance is one of several interim steps that EPA is taking to strengthen the TMDL program while the Federal advisory committee deliberates. The attached guidance addresses only a limited number of key issues that must be clarified before the 1998 section 303(d) lists are submitted to EPA. Other issues not addressed here will be addressed in future guidance or regulations, after consideration of the advisory committee's recommendations.

Important Reminders

The increased scrutiny that we all face as we assist States in implementing the TMDL program requires that we do our best to help States develop approvable and defensible section 303(d) lists in 1998. Therefore, in addition to the clarifications set out in the attached guidance, I would like to highlight several issues that we have addressed in past guidance:

- First, I ask that you each work closely with your Regional Counsel's Office and with each of your States to ensure that there is a complete administrative record supporting every list approval and disapproval decision.

- Under 40 CFR section 130.7(b)(5), States must consider all "existing and readily available water quality-related data and information" in compiling section 303(d) lists. EPA regulations provide that such data and information should be actively solicited from various sources, including local, State, or Federal agencies, the public, or academic institutions (40 CFR section 130.7(b)(5)(iii)). In addition, the information contained in EPA's Index of Watershed Indicators is appropriate to consider as part of the listing process, but should not form the only documentation upon which a listing decision is based. In making decisions to approve or disapprove State section 303(d) lists, EPA should evaluate whether States have used all "existing and readily available water quality-related data and information."

- EPA's regulations require a State to include an impaired waterbody on the State's section 303(d) list if pollution controls (including technology-based effluent limitations for point sources and best management practices (BMPs) for nonpoint sources) are not stringent enough to implement any applicable water quality standards (40 CFR section 130.7(b)). EPA's *Guidance for 1994 Section 303(d) Lists* (November 26, 1993) clarifies that, if "BMPs or [Coastal Zone Act Reauthorization Amendments] management measures have been established or implemented and water quality standards have been attained or are expected to be attained in the near future, then the waterbody need not be included on the section 303(d) list." This 1993 guidance also clarifies that "near future" in this context should normally be viewed as prior to the required date for the next section 303(d) list.

- Consistent with EPA regulations (40 CFR section 130.7(b)(4)), States should include on the 1998 section 303(d) lists an identification of the specific pollutant(s) causing or expected to cause exceedances of applicable water quality standards. The 1998 lists should also indicate whether the waterbody is impaired for one or more pollutants.

- Finally, several States have chosen to provide to EPA an annual update to their section 303(d) list. 40 CFR section 130.7(d) requires that States submit section 303(d) lists to EPA "on April 1 of every even numbered year." EPA is therefore not required to take a

formal approval or disapproval action on an annual list update. However, I ask that each Region respond in some way to any such updates, if the update is provided prior to the April 1, 1998 list submission deadline, either by informally advising the State of the adequacy of the update or by advising the State that such an update should be incorporated into the State's 1998 list submittal.

State Assistance

A number of efforts are underway to assist States in implementing the TMDL program. Without your help, many of these efforts would not be possible.

First, the President's FY 1998 Budget requests substantially increased resources directly aimed at helping States succeed in their section 303(d) listing and TMDL activities. EPA technical and program assistance resources supporting section 303(d) activities would be increased by 10 FTE and $8 million in available contract support. State 106 grants would also be increased by $5 million for State section 303(d) responsibilities. EPA technical and program assistance for nonpoint source management would be increased by $5 million in available contract support. These funds have been requested by the President, but will not be available unless appropriated by the Congress.

To provide additional technical assistance to the States, EPA's Office of Science and Technology has begun a series of Regional workshops on BASINS, a tool that will allow States to organize and display geographic information and model pollutant loadings to characterize the overall condition of specific watersheds. In addition, OWOW's Assessment and Watershed Protection Division is working with the Regional TMDL Coordinators and others to complete a series of protocols for developing TMDLs for nutrients, bacteria, clean sediment, and variable flow situations. These TMDL protocols will be peer reviewed in the Fall of 1997, at which time they will be made available to the States in draft form. We will also provide technical and financial assistance to a number of States in FY 1998 to help establish Reach File 3 georeferencing capabilities for waterbodies on 1998 section 303(d) lists.

To help administer the TMDL program, we are currently developing a TMDL tracking system -- a data management system to track and analyze State and EPA activities and commitments related to section 303(d), including the status of State lists, identification of listed waters, TMDL development schedules, and any court ordered obligations. A prototype of the system will be tested during the Fall of 1997.

Thank you for your continued hard work and dedication. If you have any questions, please call me or Geoff Grubbs, Director of the Assessment and Watershed Protection Division, at (202) 260-7040, or ask your staffs to contact your Headquarters TMDL liaison or Don Brady, Chief, Watershed Branch, at (202) 260-1261.

Attachment

cc: Mike Llewelyn, President, ASIWPCA
Alan Hallum, Chair, ASIWPCA Watershed Task Force
All Members, TMDL FACA Committee
TMDL Coordinators, Regions I-X

NATIONAL CLARIFYING GUIDANCE FOR 1998 STATE AND TERRITORY CLEAN WATER ACT SECTION 303(d) LISTING DECISIONS

The following guidance clarifies several key policies related to development of Clean Water Act section 303(d) lists by States and Territories (referred to collectively in this guidance as "States"). It applies only to the State lists of impaired waters[1] due on April 1, 1998, as required by 40 CFR section 130.7. It is very important that States meet this deadline since EPA will be reviewing the State lists in April 1998 and taking appropriate action, consistent with applicable regulations and guidance.

Today's guidance clarifies existing EPA section 303(d) listing guidance documents, i.e., *Guidance for Water Quality-based Decisions: The TMDL Process* (April 1991); *Supplemental Guidance on Section 303(d) Implementation* (August 12, 1992); *Approval of 303(d) Lists, Promulgation Schedules/Procedures, Public Participation* (October 30, 1992); and *Guidance for 1994 Section 303(d) Lists* (November 26, 1993). These national guidance documents remain applicable to the development of the 1998 lists except with regard to those issues that are explicitly addressed and clarified below.

Waterbodies Where Water Quality Standards Are in the Process of Being Revised

State section 303(d) lists and the subsequent development of TMDLs are linked to applicable State water quality standards. 40 CFR section 130.7(b)(1) provides that waterbodies included on State section 303(d) lists are those waterbodies for which pollution controls required by local, State, or Federal authority, including technology-based or more stringent point source effluent limitations or nonpoint source best management practices, are not stringent enough to implement any water quality standard applicable to such waters. 40 CFR section 130.7(b)(3) defines "water quality standard applicable to such waters" as "those water quality standards established under section 303 of the [Clean Water] Act, including numeric criteria, narrative criteria, waterbody uses, and antidegradation requirements."

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[1] EPA's regulations, at 40 CFR section 130.2(j), define "water quality-limited segment" as "any segment where it is known that water quality does not meet applicable water quality standards, *and/or is not expected to meet* applicable water quality standards, even after the application of the technology-based limitations required by sections 301(b) and 306 of the Act" (emphasis added). Therefore, for the 1998 listing cycle, States should consider both impaired and threatened waters for inclusion on their 1998 section 303(d) lists. For ease of reference, the phrase "impaired waters" as used in this guidance refers to both impaired and threatened waters.

States may revise their water quality standards to address changes such as a Use Attainability Analysis (as provided by 40 CFR section 131.10), development of a site-specific criterion, or updated science. Several States have asked whether they may exclude waters from the State section 303(d) lists if a water quality standard is in the process of being revised to be less stringent than the standard that is in effect. They are concerned that once the water quality standard has been revised, a waterbody that was water quality-limited under the old water quality standard may not be water quality-limited under the revised water quality standard.

A decision not to list because a water quality standard is in the process of being revised would be inconsistent with the regulations cited above and the Clean Water Act, which require a State to identify "those waters within its boundaries" where controls "are not stringent enough to implement *any water quality standard applicable to such waters*" (section 303(d)(1)(A) of the Clean Water Act, emphasis added). Therefore, for the 1998 listing cycle, States should include on their section 303(d) lists waters that do not meet an applicable water quality standard at the time of listing, even if the standard is in the process of being revised to be less stringent. If the standard is in fact revised in the future, the water may be removed from the section 303(d) list at that time provided the water no longer meets the listing requirements. States have the discretion, of course, to assign a low priority to those waters where there is a likelihood that they may be removed from the list in the near future.

Standards Exceedances Due to Atmospheric Deposition of Pollutants

In past section 303(d) lists submitted to EPA, some States have included waterbodies that do not meet applicable water quality standards due to pollutants from atmospheric deposition, while other States have not listed such waterbodies. 40 CFR section 130.7(b)(1), which requires State section 303(d) lists to include water quality-limited waterbodies still requiring TMDLs, does not differentiate between exceedances of applicable standards based on the source of pollution.

Although EPA recognizes that controlling pollutants from atmospheric deposition may be difficult, section 303(d) and the implementing regulations at 40 CFR section 130.7 do not allow the decision to include a waterbody on a State section 303(d) list to depend upon the ease with which a source of a pollutant can be controlled. Further, EPA's *Guidance for 1994 Section 303(d) Lists* (November 26, 1993) specifies that "[t]he section 303(d) list provides a comprehensive inventory of waterbodies impaired by *all sources*, including point sources, nonpoint sources, or a combination of both" (emphasis added).

For the 1998 State section 303(d) lists, States should include waterbodies that do not meet an applicable water quality standard due entirely or partially to pollutants from atmospheric deposition. For sources of the airborne pollutant located within State boundaries, States should consider the extent to which existing air pollution control authorities in State Implementation

Plans adopted pursuant to the Clean Air Act and local ordinances could be used or enhanced to further reduce emissions of the air pollutant and abate the associated water quality problem. In those cases where atmospheric deposition is associated with long-range transport of pollutants across State boundaries and sources and effects are not completely understood at this time, EPA Regional Offices should take a leadership role to join the air pollution and water pollution programs of the Region and the involved States, and to create a regional research and abatement strategy.

Waterbodies Impaired by Temperature

Even though State section 303(d) lists provide a comprehensive inventory of waterbodies impaired by all sources, States have not listed waterbodies with temperature problems under section 303(d) in a consistent manner. For the 1998 State section 303(d) lists, waterbodies that do not meet an applicable State water quality criterion for temperature or a designated use due to temperature should be listed. Listing is appropriate because the applicable water quality standard is not met. Heat, the cause of the impairment, is defined as a "pollutant" under section 502(6) of the Clean Water Act and can be allocated. It is immaterial to the listing decision whether the source of the temperature-related impairment is a thermal discharge or solar radiation. Both are sources of heat, and the heat can be allocated through the TMDL process.

Waterbodies Impaired by an Unknown Source or an Unidentified Pollutant

40 CFR section 130.7(b)(1) provides that waterbodies included on State section 303(d) lists are those waterbodies for which pollution controls required by local, State, or Federal authority, including technology-based or more stringent point source effluent limitations or nonpoint source best management practices, are not stringent enough to implement any water quality standard applicable to such waters. In addition, 40 CFR section 130.7(b)(4) requires States to identify, in each section 303(d) list submitted to EPA, the "pollutants causing or expected to cause violations of the applicable water quality standards."

These regulatory provisions apply even if the source of the pollutant cannot be identified at the time of listing. Therefore, for the 1998 listing cycle, waterbodies impaired by an unknown source should be included on 1998 State section 303(d) lists, as long as there is a pollutant associated with the impairment. Listing may be based on pollutant loadings from unknown point and nonpoint sources, and includes situations where a pollutant is found in fish tissue such that there is an exceedance of applicable water quality standards, but the pollutant is not traceable to a particular source.

In addition, 40 CFR section 130.7(b)(4) requires States to include on their lists an identification of the *specific* pollutant(s) causing or expected to cause exceedances of applicable water quality standards. In some situations, however, a *specific* pollutant has not been identified

at the time of listing. Therefore, for the 1998 listing cycle, where a water is impaired but a specific pollutant has not been identified, States should, if possible, indicate on the 1998 State section 303(d) lists the class of pollutants (e.g., metals or nutrients) causing, or believed to be causing, the impairment. Moreover, for the 1998 listing cycle, States should indicate whether the water is impaired for one or more pollutants.

Waterbodies Impaired Solely by Physical Barriers to Fish Migration

If a waterbody is not meeting its designated use, the applicable water quality standard is also not met and the waterbody is therefore impaired. In some situations, a physical barrier to fish migration (e.g., a culvert) can result in an impairment to a waterbody's use as an aquatic fishery. The TMDL process may be used to establish load allocations for pollutants that are preventing the attainment of water quality standards. In the specific case of a physical barrier to fish migration such as a culvert, however, there is no pollutant to allocate and the TMDL process is not appropriate. Therefore, for the 1998 section 303(d) lists, States are not required to list waterbodies where the use impairment results solely from a physical barrier to fish migration.

Waterbodies "Not Expected to Meet" Water Quality Standards

40 CFR section 130.2(j) defines water quality-limited segments as those waterbodies "where it is known that water quality does not meet applicable water quality standards, and/or *is not expected to meet* applicable water quality standards" (emphasis added). 40 CFR section 130.7(b)(4) requires States to identify, in each section 303(d) list submitted to EPA, the "pollutants causing or *expected to cause* violations of the applicable water quality standards" (emphasis added). In addition, 40 CFR section 130.7(b)(5)(1) requires States to consider waters identified in the State's most recent section 305(b) report as "threatened" as part of the "existing and readily available water quality-related data and information" considered when developing the section 303(d) list.

Therefore, States should consider inclusion of both impaired and threatened waters on their 1998 section 303(d) lists. EPA's *Guidance for Water Quality-based Decisions: The TMDL Process* (1991) also recommended that threatened waters be included on State section 303(d) lists. However, EPA has never articulated a time frame for this expectation that water quality standards will be exceeded in the future.

For the 1998 section 303(d) lists, a reasonable time frame is the two-year section 303(d) listing cycle itself. States should therefore include a waterbody on the 1998 section 303(d) lists

if the waterbody presently meets an applicable water quality standard, but is expected to exceed that standard before the next list submission deadline, i.e., April 2000.

In making determinations whether waterbodies are expected to continue to meet water quality standards, States should use the definition of "threatened" in the *Guidelines for Preparation of the 1996 State Water Quality Assessments (305(b) Reports)*, issued in May 1995. These guidelines state on page 3-3 that:

> A waterbody is fully supporting but threatened for a particular designated use when it fully supports that use now but may not in the future unless pollution prevention or control action is taken because of anticipated sources or adverse pollution trends . . . States should use this category to describe waters for which actual monitoring or evaluative data indicate an apparent declining water quality trend (i.e., water quality conditions have deteriorated, compared to earlier assessments, but the waters still support uses).

EPA and States are currently in the final stages of revising the section 305(b) guidelines for the 1998 section 305(b) reporting cycle. This definition has not been changed for 1998, and should be used as the basis for determining whether a waterbody is expected to continue to exceed a water quality standard before April 2000.

Removal of Previously Listed Waterbodies from Section 303(d) Lists

EPA's *Guidance for 1994 Section 303(d) Lists* (November 26, 1993) describes two instances when a previously listed waterbody may be removed from a State's section 303(d) list prior to TMDL development: (1) if such waterbody is meeting all applicable water quality standards (including numeric and narrative criteria and designated uses) or is expected to meet these standards in a reasonable timeframe (e.g., two years) as a result of implementation of required pollutant controls; or (2) if, upon re-examination, the original basis for listing is determined to be inaccurate.

EPA's *Guidance for 1994 Section 303(d) Lists* (November 26, 1993) also describes several circumstances under which a previously listed waterbody could be retained on a State's section 303(d) list after a TMDL had been established (and approved by EPA) for that waterbody. 40 CFR section 130.7(b)(1) describes the section 303(d) list as "water quality-limited segments still requiring TMDLs." This regulatory language is best interpreted to mean that, once a TMDL has been established (and approved by EPA) for a waterbody, that waterbody may be removed from the State's next section 303(d) list.

For purposes of the 1998 listing cycle, the State may (but is not required to) remove a previously listed waterbody from its 1998 section 303(d) list if a TMDL has been approved by

EPA for that waterbody. However, if a waterbody is listed for more than one pollutant and a TMDL for one of the pollutants has been approved, that waterbody may be removed from the 1998 section 303(d) list *for that pollutant*, but not for the remaining pollutants.

Tracking the implementation of TMDLs is crucial. EPA and States should ensure that mechanisms are in place to track previously listed waterbodies that have been removed from a subsequent section 303(d) list. Such mechanisms may include reporting under section 305(b) and updates to State Water Quality Management Plans under 40 CFR section 130.6.

Waterbodies Impaired by Nonpoint Sources Only

EPA has consistently interpreted section 303(d)(1)(A) to apply to *all* waterbodies that do not meet applicable water quality standards, except for those where certain technology-based or other requirements will achieve standards. Consistent with long-standing EPA policy, regulations, and practice, States should include waterbodies impaired by nonpoint sources alone on 1998 section 303(d)(1)(A) lists, including such waterbodies on Federal lands.

Georeferencing Listed Waterbodies

It is important to accurately identify the location and extent of waterbodies on State section 303(d) lists. EPA's Reach File Version 3.0 (RF3) is a data base that interconnects and uniquely identifies the 3.2 million stream segments or "reaches" that comprise the Nation's surface water drainage system. The process of geographically referencing (georeferencing) involves the assignment of reach addresses to these waterbodies in order to establish their locations relative to one another in a manner similar to street addresses.

To the extent possible, States should use RF3 for georeferencing 1998 State section 303(d) listed waterbodies in a nationally consistent manner. When georeferencing to RF3 is not possible, States should provide the latitude and longitude of the start and end of the listed waterbody; when such waterbody is a lake or reservoir, States should use the latitude and longitude of the center of the waterbody. By georeferencing 1998 State section 303(d) lists to RF3, States and EPA will be able to analyze and track patterns, trends, and progress on local, State, regional, and national scales. Also, States will be able to analyze upstream/downstream relationships, as well as effectively link section 303(d) information to other water quality information, such as industrial dischargers, drinking water supplies, streams affected by fish consumption advisories, wild and scenic rivers, and section 305(b).

While some States have already assigned RF3 addresses to section 303(d) listed waterbodies, others have used a stream addressing system other than RF3 or have not yet georeferenced their section 303(d) lists. In FY 1998, EPA will provide technical and financial assistance to help a number of States who either have been using a stream addressing system

other than RF3 or have not yet georeferenced their section 303(d) lists to assign RF3 addresses to section 303(d) lists.

Indian Tribes

Protection of Tribal treaty rights and historic and accustomed uses can be an important consideration as States develop their section 303(d) lists. Therefore, when identifying State waters needing TMDLs, EPA strongly encourages States to cooperate closely with Tribes to assure that appropriate attention is given to Tribal concerns.

In addition, several States have included waters in Indian country on their section 303(d) lists in previous listing cycles. For the 1998 listing cycle, EPA's approval actions will extend to all the waterbodies on 1998 State section 303(d) lists with the exception of those waters that are within Indian country, as defined at 18 USC section 1151. For 1998, EPA will take no action to approve or disapprove State section 303(d) lists with respect to those waters within Indian country. EPA or eligible Indian Tribes, as appropriate, will retain responsibilities under section 303(d) for those waters. In addition, EPA approval actions of State section 303(d) lists do not constitute a finding of State and/or Tribal jurisdiction over particular waters.

Finally, this guidance does not address other section 303(d) listing requirements for waters in Indian country because circumstances are different from those of most States. However, a long-term approach, including new policies and guidance, is needed for developing section 303(d) lists for waterbodies in Indian country, as well as for developing and implementing TMDLs. The Office of Wetlands, Oceans, and Watersheds is working with EPA's American Indian Environmental Office and others to develop specialized TMDL policies and guidance for these waterbodies.

Appendix IX: Delisted Waters (Relative to Approved 1998 § 303(d) List)

Appendix X: Summary of 303(d) Stream Reaches Determined to be Inappropriate for Rating

Division of Water Quality
Biological Assessment Unit
January 19, 2000

MEMORANDUM

To: Ruth Swanek

Through: Jimmie Overton
Trish Finn MacPherson

From: Larry Eaton
Kathy Herring

Subject: Summary of 303(d) Stream Reaches Determined to be Inappropriate for Rating, Using Current Biological Criteria.

BACKGROUND

Many streams are on the North Carolina 303d list based on old benthic macroinvertebrate samples. The Biological Assessment Unit recognizes that some of those samples were inappropriately rated at the time the sample was taken. Most of those samples fall into three major categories of streams: small streams, swamp streams, and Triassic Basin streams (or small Slate Belt streams). This memo presents a justification for why each of these stream types should not be rated using present benthos criteria. This is followed by individual listing of each of the streams, with a photo and description of the site where available. All the streams listed in this memo have been visited by DWQ Biological Assessment Unit staff since they were put on the 303d list to verify that, if we were asked to sample that site today, we would not apply a rating to the data. Most of the sites were visited in 1999, but a few of the swamp streams had been visited, or sampled, earlier and were not revisited. Appendix A is a list of all data for sites which are now considered inappropriately rated.

Small streams

Many investigations have indicated a positive relationship between stream size and species richness (Minshall et al. 1985, Feminella 1996). There are several reasons for reduced taxa richness in smaller streams. Small streams have lower habitat diversity than larger streams. This includes a narrower range of current speeds, and a more uniform temperature regime. Small streams tend to dry up or have reduced flow during drought periods. There is often lower productivity in undisturbed headwater streams.

To determine the extent of change in taxa richness of benthic macroinvertebrate populations in North Carolina, DWQ looked at the effects of stream size on EPT taxa richness (Biological Assessment Unit Reports B-910328 and B-911120). These two studies collected data from unimpacted watersheds in the mountain ecoregion. The objective was to start with first order streams, and then choose additional downstream locations with increasing stream width. The results of those studies indicated an increase in taxa richness with increasing stream size.

As a result of those studies, separate classification criteria were developed for high quality mountain streams. Taxa richness values are corrected for such mountain streams that are 1-2 meters (or drainage are of 1 square mile) and 3-4 meters (or drainage area of less than 3.5 square miles) wide before a rating can be assigned. However, similar criteria have not been established for piedmont and coastal plain streams. Unfortunately, small unstressed piedmont and coastal plain streams are much more difficult to find than mountain streams, and unimpacted watersheds large enough to do a similar upstream to downstream comparison have been nearly impossible to find.

DWQ's Wetlands Unit has produced a draft internal guidance document, which distinguishes physical and biological differences between ephemeral and perennial channels. This document may help establish biological criteria for small streams, however potential daily, seasonal and annual variability is likely to limit sensitivity of biological measures. Current operating procedures for the Biological Assessment Unit discourage sampling in these small streams. However, as in the past, requests are made by our regional office staff or others, to collect benthos data for special investigations in small streams. For those studies, samples may still be collected, and comparison of the benthic communities undertaken, but no bioclassification is or will be assigned.

Swamp Streams

The Biological Assessment Unit of DWQ began, in 1992, to develop a sampling method for non/slow flowing and swamp streams. The reasons for this were many. Our sampling methods and criteria for flowing streams relied heavily on the number of EPT taxa for water quality evaluations. Swamp streams did not support many EPT taxa because they have naturally low dissolved oxygen levels and often low pH values as well. Around this same time we began working with the Mid Atlantic Coastal Streams (MACS) Workgroup, made up of the seven mid Atlantic coastal states. The goal of that workgroup was to develop a sampling method for coastal plain streams and eventually to develop metrics for analyzing the data from coastal plain streams, because present evaluation metrics did not work well. Our reasons for developing swamp methods were the same. Present evaluation metrics nearly always gave bioclassifications that were too low considering the watershed characteristics. Even sites that should have little or no human impact were getting low ratings. We had also avoided sampling many coastal plain areas because we knew our criteria were inappropriate for such streams. In addition, we were finding that we sometimes collected a sample from a stream when it was flowing, only to go back to the same site later that year or in a following year to find no flow at all. We, therefore, realized we should not have evaluated a stream that stops flowing part of the year with criteria for flowing water streams.

We then developed a benthic sampling methodology for swamp streams, tested the method, and sampled in winter high flow and summer low flow conditions during 1992 and 1993. In 1994 we evaluated the data from reference swamp streams, sampled more swamp streams in 1995 and developed draft swamp stream criteria in 1996. All the data appeared to indicate that the BI values could separate differences in impact, but only during winter high flow conditions. In the summer, all sites were too similar to provide meaningful data. The swamp criteria also use a habitat evaluation score and fisheries data when available. We have since (1997) modified the coastal habitat form and are doing more in-house training to gain more consistent scoring.

In 1997, there still had been insufficient sampling of reference swamp streams to use the ratings without reservation for such things as use support. We planned to do more reference swamp sampling in 1997, but Hurricane Fran impacted too many coastal streams and our reference sites had impacted fauna. In 1998 and 1999, we again sampled reference swamp streams and took weekly or biweekly pH measurements to try and determine how much variation in pH occurs in the swamp streams. Before we can move the criteria from the draft stage to final criteria, we must evaluate year-to-year variation at reference swamp sites, variation among reference swamp sites, the effect of small changes in pH on the benthos community, whether the habitat evaluation can be improved, and the role fisheries data should play in the evaluation. In this light, the data should not be used for use support.

The following streams have been verified to be swamp streams since they were put on the 303d list, but were not revisited in 1999. They should be removed from the list for the reasons described above. When swamp criteria are finalized these sites will be analyzed with the new criteria if samples were taken in winter using swamp methods.

Steam Name	Index #	Subbasin	Site/Last Sample Date	Status/Comments
Goshen Swp	18-74-19	030622	SR 1302, US 117, NC 403, Duplin Co, 5/93	Swamp stream
Cypress Cr	18-74-55-2	030623	NC 53, Pender Co, 3/98	Swamp stream
Burnt Swp	14-10-8-4-(0.5)	030752	Above RR, SR 1515, Robeson Co, 6/91	Swamp stream
Ashpole Swp	14-30	030754	NC 41, SR 2258, Robeson Co, 3/96	Swamp stream
Monie Swp	15-17-1-12	030757	SR 1006, Columbus Co, 3/96	Swamp stream
Brown Marsh	15-4-1-1	030758	SR 1700, Bladen Co, 3/96	Swamp stream
White Marsh	15-4	030758	Above US 74, old RR grade, Columbus Co, 9/94	Swamp stream
Burnt Mill Cr	30-8-1	030152	NC 37, Chowan Co, 2/95	Swamp stream
Conoconara Swp	23-33	030208	NC 561, Halifax Co, 2/99	Swamp stream
Cashie R	24-2-(1)	030210	SR 1219, Bertie Co, 2/99	Swamp stream
Ahoskie Cr	24-14-1	030101	NC 42, Hertford Co, 8/95	Swamp stream
Cutawhiskie Cr	25-4-8-8	030101	SR 1141, Hertford Co, 8/95	Swamp stream

Potecasi Creek

Potecasi Creek at NC 11, near Union, is an ambient chemistry site and a USGS gage site. Benthos have been collected from the site in 1984, 1986 and 1989, and Fair bioclassifications assigned. The site was described in the 1996 Chowan Basin Assessment Report as a relatively large (12 meters wide), deep (1-2 meters), swamp steam with a sandy substrate. This site was visited in 1995 during basinwide sampling, but

could not be sampled due to lack of observable flow (2.3 cfs on August 8, 1995). However, this is not a typical swamp stream, in comparison to the others listed in the table above, because of it's large size and more channelized nature. USGS flow records from this site (attached) indicate long periods of each year when flow is near 0 cfs-see especially 1988, 1990, 1993, 1994 and 1997. Even though this stream was flowing in the summers when sampled, this documented flow record is the basis for deciding that it is inappropriate to rate this stream. We would not expect a fauna in a stream with such extended periods of no flow to be comparable to the fauna of a stream that flows all the time. Since the site was 1- 2 meters deep in July 1989, when mean flow for the day was 16 cfs, it will most likely not be possible to sample the site in February for a swamp sample. Mean July flows for the period of record are 108 cfs, while February mean flows are 488 cfs.

Triassic Basin Streams

Most of the Piedmont is underlain by belts of metamorphic and metavolcanic rocks. An exception is the Triassic Basin, which extends from Moore County, up through Chatham County into Wake, Durham and Granville counties in the Neuse River basin. The broad, flat terrain of the Triassic Basin is one of the most anomalous features of the Piedmont. With its meandering streams, wide floodplains, old oxbow ponds and extensive swamps, it is more similar to the coastal plain than the more usual Piedmont topography. This flat terrain was created by freshwater deposits rather than marine, reflecting its origin as an interior rift valley. During the Triassic period (250 million years ago) crustal plate tectonic movement created large faults where blocks of the crust slipped downward to create basins. These basins, or valleys, formed inland seas which eventually became filled with sediments. (Hall and Boyer 1992) The Triassic Basin is underlain by basalt and fine-grained sedimentary rocks, which include sandstone, siltstone, and shale. These rocks have low porosity and permeabilities, and support a lower potential for sustained base flows. Many sites in the Triassic Basin have 7Q10 discharges equal to zero flow (USGS 1998).

DWQ has conducted biological investigations from stream sites within the Triassic Basin, however all benthic macroinvertebrate data have resulted in Fair or Poor bioclassifications. Many of these investigations were conducted during winter surveys as part of DWQ's first basinwide monitoring program for the Cape Fear River basin. In 1998, more attention was paid to the Triassic Basin streams in the Cape Fear River basin in preparation for the second round of basinwide monitoring. Crawley Creek was selected as a reference site for the Triassic Basin because it appeared to have little or no disturbance to its forested watershed of 14 square miles. In February 1998 it was 7 meters wide, and deeply incised with a completely clay bottom substrate. A benthos sample was collected and found to have only 10 EPT taxa, with most of those winter taxa. In July 1998, the stream was dry.

Another example comes from McLendon's Creek. A site in the lower watershed at SR 1628 was sampled in the winter and summer of 1993, resulting in Fair bioclassifications. In March 1998, an attempt was made to resample this site but the water was too deep. The stream at that time was about 10 meters wide with water depth greater than 1.5 meters. In July 1998, there was water in a deep pool at the bridge with areas of dry stream bed above and below the pool. Bottom substrate was mainly gravel, sand and silt, and erosion was evident along the banks. All upstream bridge crossings were looked at, but no sites were found with flowing water, even though there was water in the stream at these upstream sites.

The drastic change in the nature of these two streams between seasons with low flow summers is characteristic of Triassic Basin streams. After the 1998 sampling attempts, it was clear to DWQ biologists that the present benthos and fish criteria for flowing water streams should not be applied to any streams in the Triassic Basin. These streams do not behave as typical piedmont streams and therefore the use of piedmont classification criteria is inappropriate.

The following streams were verified in 1998 to be in the Triassic Basin and should not be rated for the reasons just given. The very low flows during the summer of 1998, reduced these streams to pools of water between dry stream bed.

Steam Name	Index #	Subbasin	Site/Last Sample Date	Status/Comments
White Oak Cr	16-41-6-(3.5)	030605	SR 1603, Wake Co. 2/98	Triassic Basin
Northeast Cr	16-41-1-17-(0.7)	030605	SR 1102, Durham Co. 2/98	Triassic Basin
Richland Cr	17-30-5-2	030610	SR 1640, Moore Co. 4/98	Triassic Basin
McLendons Cr	17-30	030610	SR 1628, Moore Co. 9/98	Triassic Basin
Indian Cr	17-35	030610	SR 2306, Chatham Co. 2/93	Triassic Basin
Big Govenors Cr	17-32-(7)	030610	SR 1625, Moore Co. 9/98	Triassic Basin
Little Pocket Cr	17-37-4	030611	NC 42, Lee Co. 9/98	Triassic Basin
Cedar Cr	17-39	030611	SR 2142, Chatham Co. 2/98	Triassic Basin
Big Buffalo Cr	17-40	030611	SR 1403, Lee Co. 9/93	Triassic Basin
Georges Cr	17-41	030611	SR 2142, Chatham Co. 9/98	Triassic Basin
Little Buffalo Cr	17-42	030611	SR 1420, Lee Co. 2/93	Triassic Basin

Small Slate Belt Streams

Another distinct geological region within the piedmont ecoregion is the Carolina Slate Belt. This is an extensive formation in North Carolina, ranging from just east of Charlotte northeastward across the state through Moore and Chatham counties in the Cape Fear River basin to Henderson in the Roanoke River basin. This geologic formation consists mainly of metamorphosed sedimentary and igneous rocks, with most of the igneous rocks being volcanic. Slate belt streams with small watersheds can have periods of very low flows and tend to stop flowing in summer. This is similar to the Triassic Basin streams discussed above and should not be rated for the same reasons.

Bear Creek

Bear Creek is a tributary of the Rocky River in the Cape Fear River basin. It was sampled for benthos at three different sites in 1990 and 1991. The two most upstream sites were given a Fair rating, which put the stream on the 303d list from source to SR 2189. The third benthos site was Good-Fair. In 1998, a fish community sample resulted in a Good rating at SR 2187, which is less than two miles downstream from SR 2198, but above the old benthos Good-Fair site. That sample collected 398 fish representing 19 species. In 1999, the fish community site was part of a seasonal study and was to be sampled in April, June and September. The April 1999 sample produced only 142 fish, but still had 17 species. The previous fall (of 1998) had been dry for extended periods of time. In June, there were only pools of water in the stream and a sample could not be collected. The low flows in this stream continued all summer,

and another fish community sample was collected in October to determine the effect of the low flows on the fishery. In that sample only 56 fish were collected, representing 14 species. If ratings were applied to the 1999 samples, they would be Fair and Poor. It was decided that the documented low flows in this slate belt stream and the documented change in the fish community, resulting just from a change in flow, provided justification for not rating the biological samples from Bear Creek.

Falls Creek, SR 1606

This is a slate belt tributary of the Deep River in the Cape Fear River basin. It is about 6 meters wide (drainage area = 15 square miles) with a predominantly boulder and rubble substrate, good riffles and a variety of pool sizes. The land at the sampling site was completely forested. Fair bioclassifications were given during basin assessments from winter benthos samples in 1993 and 1998. The abundance of the mayfly Stenonema femoratum indicates that this is a stream with very low summer flows that are inhibiting the development of a normal stream community. This is reinforced by few taxa that were not winter species and a lack for filter feeding caddisflies. A fish community sample in 1998 was rated Good. More species of fish (26) were collected from Falls Creek than any other stream in the Cape Fear River basin and this was the only site where the federally endangered Cape Fear shiner (Notropis mekistocholas) was found. This suggests that this is not an impaired stream, and that it is not appropriate to rate this slate belt stream using current benthos criteria.

ADDITIONAL NC STREAMS NOT APPROPRIATELY RATED

CAPE FEAR RIVER BASIN

Steam Name	Index #	Subbasin	Site/Last Sample Date	Status/Comments
Candy Cr	16-5	030601	SR 2700 Guilford Co. 10/99	Too small to rate.
Brush Cr*	16-11-4-(2)	030602	US 220 Guilford Co. 9/98	No flow, backwater area of Lake Brandt
UT at Guilford College*	16-11-5-1-(2)	030602	Friendly Rd, Guilford Co., 9/98	Too small to rate
Northeast Cr	16-41-1-17-(0.3)	030605	SR 1121, Durham Co., 11/99	Too small to rate.
UT Cone Mills Club	17-11-1-(2)	030609	SR 3430, Guilford Co,. 10/99	Too small to rate, limited flow.
Kenneth Cr*	18-16-1-(1)	030607	US 401, Wake Co., 9/98	Too small to rate
Kenneth Cr*	18-16-1-(2)	030607	SR 2772, Wake Co., 9/98	Too small to rate
Little Cross Cr*	18-27-4-(1)	030615	Off Bragg Blvd, Cumberland Co., 9/98	Braided channel, swamp, not rateable
Pedler Branch*	18-31-16	030615	US 401 and NC 20, 2/90 Visited 9/98	Too small to rate, (2m)
UT Bones Cr*	18-31-24-2	030615	Nr SR 1400, Cumberland Co. 9/98	Too small to rate, no flow
Barlow Branch*	18-74-2	030621	Bell St. be Mount Olive 5/93 Visited 9/98	Too small to rate, limited flow
Panther Creek*	18-74-19-3	030622	Nr NC 50 be Cates Pickle 5/93 Visited 9/98	Too small to rate
Herrings Marsh Run*	18-74-19-16	030622	SR 1508 and SR 1306, Duplin Co. 5/93 Visited 9/98	Too small to rate
Grove Creek*	18-74-21	030622	SR 1301, and NC 11 Duplin Co. 5/94 Visited 9/98	Too small to rate
Persimmon Branch*	18-74-25-1	030622	Private road off SR 1801, Duplin Co, 9/90 Visited 9/98	Too small to rate
Burgaw Cr	18-74-39a	030623	Above Osgood Canal., 12/87	No Flow, not rated

* A field reconnaissance was conducted at these locations in September 1998. It was determined that these streams should not be rated, using the same criteria as those used for the sites investigated in 1999. The Cape Fear River basin, in 1998, was the first basin where Biological Assessment Unit staff were asked to resample all 303d streams that were on the list because of biological data. However, digital photographs and detailed descriptions were not made at that time, if the decision was made not to sample the streams.

Description of Streams Investigated, October, November, December 1999.

Candy Creek, SR 2700, Guilford Co., 10/99

This small (1m wide) tributary to the Haw River, had some riffle areas and good instream habitat, but the substrate was all sand and pools were infrequent. Breaks were common in the riparian zone, and banks were unstable and eroded.

Candy Creek

Northeast Creek, SR 1121, Durham Co., 12/99

This stream was basically a channelized ditch above the NC 55 bridge crossing, and not flowing. At the SR 1121 (Cornwallis Rd) site, one bridge upstream, the stream was still channelized with limited flow at a constricted area caused by a debris dam. The stream was 2m wide, with no riffle areas, little instream habitat, and a silty substrate, except for the bridge rubble.


Northeast Creek

UT at Cone Mills Club (UT Polecat Creek), SR 3430, Guilford Co. 11/99

This small (2m wide) stream had very limited flow (only at the culvert). There were no riffle areas, little instream habitat, and the substrate was nearly all sand.


UT Polecat Creek

Burgaw Creek, Pender Co

There are two sections of this small creek that are on the 303d list. The upper section, above Osgood canal and the Burgaw WWTP was only sampled once, in December 1987. At that time there was no flow in the creek and the sample was Not Rated. No basin assessment since that time has tried to rate this stream segment, so it appears that this segment was inappropriately placed on the list due to benthos. The

lower stream segment, below the WWTP has been rated Poor or Poor-Fair by both benthos and fish and so should remain on the list.

CATAWBA RIVER BASIN

Steam Name	Index #	Subbasin	Site/Last SampleDate	Status/Comments
Stewart Creek	11-137-1-2	030834	SR 2050 Mecklenburg Co. 2/90	Too small to rate, Ditch fauna
Sixmile Creek	11-138-3	030836	SR 3445, Mecklenburg Co. 3/87	Too small to rate, no flow for extended periods

Stewart Creek at SR 2050, Mecklenburg Co.
This site lays on the northwestern outskirts of Charlotte. After two days of rain, the stream was only 1.5 m wide. Development is occurring in the watershed as Charlotte expands, but most appeared to be downstream. Fauna collected here included salamanders, which only inhabit the smallest streams where fish can't eat their eggs.

Macroinvertebrates collected here reflected winter conditions (the stonefly Sweltsa and mayfly Stenonema were abundant) and low flow (crayfish and the odonates Gomphus and Calopteryx). This stream was too small to rate.


Stewart Creek

Sixmile Creek at SR 3445, Mecklenburg Co.
Even after rain previous to sampling, the stream was only 3m wide, very shallow (0.3m), with little flow (<1 ft/sec). The presence of many Gambusia (mosquito fish) indicate that while this stream does not dry up, it does stop flowing for extended periods of time.


Sixmile Creek

The macroinvertebrate community mirrored this observation, with crayfish, oligochaetes, midges (including Chironomus), odonates (Macromia, Gomphus and Progomphus), beetles (Dineutus, Hydroporus, Scirpis), and snails (Menetus and Ferrissia) – all of which are tolerant to still water. While the turbidity in the stream may suggest some impacts from the surrounding residential area and sewer line, the presence of the stonefly Leuctra and the mayfly Eurylophella suggested that water quality is not the largest problem with this stream.

HIWASSEE RIVER BASIN

Stream Name	Index #	Subbasin	Site/Last SampleDate	Status/Comments
Brown Creek	1-52-34	02	SR 1515, Cherokee Co.	Too small to rate

Brown Creek, SR 1515, Cherokee Co., 08/99

Brown Creek is a very small (1m wide) stream that runs through a residential section of Andrews, and then through a cow pasture, before flowing into the Valley River. This stream is too small to rate using current criteria.

Brown Creek upstream of Pisgah Road culvert

Brown Creek looking downstream from Pisgah Road culvert.
The downstream section of the creek was fenced off at the culvert.

LUMBER RIVER BASIN

Steam Name	Index #	Subbasin	Site/Last SampleDate	Status/Comments
Porter Swamp	14-27	030751	SR 1503 Columbus Co. 3/96	Swamp, use swamp criteria
Hog Swamp	14-30	030754	NC 41, Robeson Co. 3/96	Swamp, use swamp criteria
L. Shoeheel Cr	14-34-3	030755	SR 1405, Scotland Co. 4/96	Swamp, fish only
Toms Fork	15-17-1-10	030757	SR 1118, Columbus Co. 4/92	Swamp, fish only

All streams visited in this basin, were clearly swamp-like in nature. Most had braided channels. With rain the previous day, water at all sites extended onto large floodplains, inundating the roots of cypress trees.

Porter Swamp at SR 1503, Columbus Co.
The main channel of this braided stream was 45m wide, with water in the flood plain extending over 100m in each direction. The local land use was entirely forest. Both fish and benthos, using swamp methods, were collected here in 1996, and a rating will be applied when swamp criteria are finalized.


Porter Swamp

Hog Swamp at NC 41, Robeson Co.

The channel at this site was 40m wide, with water extending another 100m onto the floodplain. The most recent benthos sample at this site (1996) gave little evidence of impairment.

Hog Swamp

Little Shoeheel Creek at SR 1405, Scotland Co.

This stream is probably ephemeral during periods of low flow and should not be rated using current criteria. Water flow under the road was constricted to two 1m diameter culverts. Even though the water level was to the top of these culverts, water flow was barely perceptible, even under high flow conditions. This stream was rated Poor in 1996 using fish criteria, however when a benthos collection was attempted later that year, portions of the stream was dry and no part was flowing. Recent fish methods testing of streams experiencing low flow conditions document a depauperate fish community during and following a low flow event until recolonization occurs.

Little Shoeheel Creek

Toms Fork Creek, SR 1118, Columbus Co.

This was the smallest stream visited in the Lumber basin as part of this survey. Even at winter time flows after rain, the stream was only 5 m wide. It is highly probable that this stream dries up in summer. It most assuredly stops flowing.

Toms Fork Creek

NEUSE RIVER BASIN

Steam Name	Index #	Subbasin	Site/Last SampleDate	Status/Comments
Hare Snipe Cr	27-33-12-(1)	02	Off Ray Road, Wake Co.	Too small to rate (1-2m) drains subdivision, lots of sediment
Mill Cr	27-57-18	06	SR Johnston Co. 7/91	Too small to rate (2m)
Southwest Cr	27-80	05	SR 1804, Lenoir Co. 08/95	Barely detectable flow, may stop in dry summer, swamp stream, not rateable.
Creeping Swp	27-97-5-3	09	NC 43, Pitt Co. 08/91	Swamp, not rateable
L Chinquapin Cr	27-101-11	11	SR 1131, Jones Co.7/91	Too small (2m) to rate
Beaverdam Swp	27-101-3	11	US 258, Jones Co., 01/00	Swamp, not rateable.

Hare Snipe Creek off Ray Road, Wake Co.

This site is upstream of Lake Lynn, located in the Sandy Ridge subdivision on Ray Road. The stream here is very small, only 2m wide. There is a lot of sediment from new home construction in its riparian zone. Another site, at US 70 was sampled on 2/95. At that site the creek was 6m wide, with good instream habitat, but the macroinvertebrate fauna was not very diverse. This sample further downstream had an EPT count of only 10, resulting in a Fair classification and should remain on the 303(d) list.

Hare Snipe Cr


Hare Snipe Cr upstream


Hare Snipe Creek upstream riparian zone

Mill Creek, SR 2399, Johnston Co., 12/99

This site is below the old Kenly WWTP, which no longer discharges. The stream here is too small to rate (2m wide). There was good flow, riffle areas, and snag habitat. There was an extensive forested riparan zone upstream, but downstream the old WWTP was on the left side leaving about a 6m forested buffer.


Mill Creek

Southwest Creek, SR 1804, Lenoir Co., 12/99
This is a 12-13m wide tributary stream of the Neuse River. The stream at this site is channelized, had barely detectable flow, and no riparian zone. The question about this stream is whether it is a swamp or a Coastal A. It has been rated in the past (summer of 1991 and 1995) using CA criteria, which is incorrect. This stream is more characteristic of a swamp stream and should not be rated using current criteria.


Southwest Creek

Creeping Swamp, NC 43, Pitt/Craven County Line, 12/99
This stream is definitely a swamp, and should not be rated with current criteria. The stream was muddy, no defined channel (braided), with cypress and tupelo trees.

Creeping Swamp

Little Chinquapin Creek, SR 1131, Jones County

This small (2m wide) black water tributary to the Trent River, probably becomes a series of stagnant pools in the summer. It is too small to rate using current criteria. An uptream site investigated on the same day can be described as a deep, mucky channelized ditch.

Little Chinquapin Creek

Little Chinquapin Creek - upstream dredged and channelized site.

Beaverdam Swamp, US 258, Jones Co., 01/00

This braided channel swamp stream was 12m wide at the bridge with an extensive floodplain and no visible flow. This stream can not be rated using current criteria.

Beaverdam Swamp, US 258

Beaverdam Swamp, US 258

ROANOKE RIVER BASIN

Steam Name	Index #	Subbasin	Site/Last Sample Date	Status/Comments
Anderson Swp Cr	23-8-6-(1)	06	I-85, Vance Co. 2/90	Too small to rate. 1m wide, muddy.

Anderson Swamp Creek, I-85, Vance Co.

This stream is too small to rate using current criteria. It is 1m wide.

Anderson Swamp Creek

TAR RIVER BASIN

Steam Name	Index #	Subbasin	Site/Last Sample Date	Status/Comments
Whiteoak Swp	28-78-7-(2)	02	SR 1428, Edgecombe Co. 5/88	Swamp stream
Briery Br	28-83-4-1-1	03	NC 124, Edgecombe Co. 09/90	Too small to rate (2m)

Whiteoak Swamp, SR 1428, Edgecombe Co., 12/99

This is a swamp stream and not rateable using current criteria. Beyond the bridge area this tannic stream was 2-3m wide and not flowing. This stream was sampled and rated using EPT methods in May, 1988. These methods are not appropriate for rating this stream type.

Whiteoak Swamp

Briery Branch, NC 124, Edgecombe County

This is a small stream (2m wide), that flows through a field at this site. There was no flow at the time of this investigation. The second photo shows the wider, stagnant bridge pool. Beyond this pool, the stream is much smaller, too small to rate.

Briery Branch

Briery Branch

YADKIN RIVER BASIN

Steam Name	Index #	Subbasin	Site/Last Sample Date	Status/Comments
UT Lick Cr	UT Lick Cr 2 505		SR 2505, Davidson Co. 5/86	Too small to rate. 1-2m wide beyond culvert.
UT Lick Cr	UT Lick Cr 47		NC 47, Davidson Co. 5/86	Too small to rate (1m), hardly any water. Wet weather drainage thru town.
Cedar Cr	12-102-13-(2)a	05	NC 801, Davie Co. 6/90	Too small to rate (3m).
Jimmy's Cr	12-119-7-4-2	07	SR 2020, Davidson Co.6/90	Too small to rate (2-3m).
UT Reedy Cr	13-17-8	030711	Off SR 2821, Mecklenburg Co. 10/84	Too small to rate (1-2m) drains subdivision, lots of sediment
Lower Long Br	27-57-18	030713	SR 2001, Stanley Co. 6/91	Too small to rate (2m)
Wicker Br	13-17-40-4	030714	SR 1940, Union Co. 05/89	Too small to rate (0.5m in flowing area)

UT Lick Creek, SR 2505, Davidson Co.

This stream is too small to rate using current criteria. It is 2-3m wide beyond the culvert area. The water was muddy and the water level was high when visited, due to rainfall the previous night and that morning. This stream under normal conditions is probably only 1m wide.

UT Lick Creek, NC 47, Davidson Co.

This site is at the corner of Newsom and Anderson Streets in downtown Denton. It is 1m wide here and is basically a wet weather drainage ditch. Most of the stream is buried under the town of Denton, and should not be rated.

Cedar Creek, NC 801, Davidson Co.

This stream varies from 1-3m in width. It was quite muddy when observed, due to rainfall the previous night and that morning. This also accounts for the high water level. The riparian zone was forested, instream habitat consisted of snags and undercut banks. This stream is considered too small to rate.

Jimmy's Creek, SR 2020, Davidson Co.

This site was 2-3m wide after a heavy rain event. When sampled in 1990, it was recorded as being 2 meters wide. This stream is too small to rate using current criteria.

UT Reedy Creek off SR 2821, Mecklenburg Co.

This small (2m), shallow stream, even after rain, appears to be prone to erosion due to high flows (2m+

vertical banks), but still supports a surprisingly intolerant community. UTReedy Creek

Salamanders, good indicators of streams too small to rate, were present here. Macroinvertebrate diversity was higher here than most other similarly sized streams in the Charlotte area, indicating few water quality problems. The following intolerant taxa were found: Allocapnia, Hydropsyche, Chimarra, Ephemerella, and Baetis flavistriga .

(Lower) Long Creek at SR 2001, Stanley Co.

This small (2m), shallow (0.1m) stream flows through a rural area of mixed land use of forest and residential homes.

Salamanders, an indicator of streams too small to rate, were common here, as were taxa indicative of pooled waters: Crustacea (crayfish, amphipods, isopods), oligochaetes, dipterans, beetles (dytiscids, Dubiraphia, Helichus) and the snail Physella. Several intolerant taxa were collected here (Baetid mayflies – two tailed and Baetis propinquus gp, and the stoneflies Allocapnia, Clioperla and a small perlodid) indicating no major water quality problems.

Wicker Branch at SR 1940, Union Co.

While most of this stream was 7 m wide and shallow (0.3m), these areas were not flowing, even after rain. The only areas of flow in this stream were small, shallow, areas between rocks (<1m wide, 0.1m deep).

The rocky nature of this stream indicates that this stream is located in the Slate Belt ecoregion, an area where many streams stop flowing in the summer.

Salamanders were found here, indicating that this area was probably too small to rate. Some still water species were found here (amphipods, oligocheates, dipterans, beetles and the pond limpet Laevapex fuscus). There was also a high abundance of the intolerant stoneflys Leuctra and Taeniopteryx and mayflys Baetis and Stenonema.

Wicker Branch

Miscellaneous Sites Not Visited in 1999

Kendrick's Creek

Kendrick's Creek (Mackeys Creek) in the Pasquotank River basin should be removed from the list. It was sampled and evaluated in 1984 using freshwater sampling methods and criteria. The site was not sampled since that time because it is in an estuarine area. The site is located at the mouth of the creek near Albemarle Sound. This site is an ambient chemistry sties and salinity data indicates salinities, while low, do reach as high as 0.5 ppt . Conductivity values are consistently over 200 umhos/cm, and have been recorded as high as 6,600 in late summer.

Quewhiffle Creek

Quewhiffle Creek in the Lumber River basin was revisited in March 1998 to assess changes in the fauna at SR 1214, since it was last sampled in 1989. This stream was very small, 1-2 meters wide, with good flow, and was dominated by the intolerant caddisfly Chimarra. The abundance of this taxa, in contrast to the low EPT taxa richness of 7, clearly indicate that this stream is too small to rate using present criteria.

Cokey Swamp, Little Cokey Swamp and UT Otter Creek

These sites in the Tar River basin were evaluated in December 1998 to determine whether the ratings were still valid. The attached memo dated February 17, 1999 states that all three sites would not be rated using current criteria, and provides details of the evaluation.

Whitehurst Creek

Whitehurst Creek in the Tar River basin was sampled in 1992 to evaluate the fauna before the stream was relocated in anticipation of the phosphate mine expanding into its area. The original memo about the study did not rate the samples because the stream was essentially a ditch, about 2 meters wide. It is not clear why ratings were put into the DWQ database, the stream was too small to rate then, and now exists as a reconstructed stream. Consultants for the phosphate mine send current data on the relocated stream to the DWQ Wetlands Unit, and the present fauna is comparable to the original stream fauna.

References

Feminella, J.W. 1996. Comparison of benthic macroinvertebrate assemblages in small streams along a gradient of flow permanence. Journal of the North Amrican Benthological Society 15(4): 651-669.

Minshall, G.W., R.C. Peterson, Jr. and C.F. Minz. 1985. Species richness in streams of different size from the same drainage basin. American Naturalist 125: 16-38.

Hall. Stephen P. & Marjorie W. Boyer. 1992. Inventory of the natural areas and wildlife habitats of Chatham County, NC. Triangle Land Conservancy and County of Chatham.

USGS. 1998. Low-Flow Characteristics and Discharge Profiles for Selected Streams in the Neuse River Basin, NC. Water-Resources Investigations Report. 98-4135.

U. S. Geological Survey. 1993. Low-Flow Characteristics of Streams in North Carolina. U.S. Geological Survey Water-Supply Paper 2403. 29pp.

cc: Scott Almond

Appendix A. All prior NC DWQ benthos data for sites considered inappropriately rated. Listed by basin and subbasin.

CPF 01

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Candy Cr, SR 2700, Guilford	B-6	16-5	6/90	59/10	6.61/5.72
			6/85	69/11	6.96/6.17

CPF 02

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
UT Horsepen Cr, Friendly Rd, Guilford	B-8	16-11-5-1-(2)	9/98	51/6	6.80/6.58
			9/92	43/4	7.58/7.04

CPF 05

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Northeast Cr, SR 1102, Durham	B-6	16-41-1-17-(0.7)	2/98	-/7	-/6.57
			2/93	58/9	6.82/6.05
			3/87	29/3	7.72/6.51
Northeast Cr, SR 1100, Durham	B-7	16-41-1-17-(0.7)	2/93	35/7	6.82/5.83
			3/87	27/0	7.97/-
			12/86	-/4	-/640
			4/85	62/7	7.38/6.09
White Oak Cr, SR 1603, Wake	B-12	16-41-6-(0.7)	2/98	-/10	-/5.17
White Oak Cr, NC 751, Chatham	B-13	16-41-6-(2)	2/93	-/13	-/4.82

CPF 07

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Kenneth Cr, US 401, Wake	B-9	18-16-1-(2)	9/98	67/18	5.97/5.14
Kenneth Cr, nr SR 2772, be F-V, Wake	B-10	18-16-1-(2)	9/98	44/6	6.97/5.60
			9/90	47/3	7.53/6.51

CPF 09

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
UT Polecat Cr, nr SR 3430, Guilford	B-9	17-11-2-(2)	7/90	33/1	8.87/7.42

CPF 10

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Falls Cr, SR 1606, Moore	B-11	17-27	2/98	-/17	-/4.89
			2/93	-/18	-/4.61
Buffalo Cr, NC 22, Moore	B-12	17-28	2/98	-/27	-/3.93
			2/93	-/20	-/3.51
McLendons Cr, SR 1210, Moore	B-13	17-30	11/84	84/28	5.33/4.27
McLendons Cr, SR 1628, Moore	B-14	17-30	8/93	61/8	6.75/5.15
			2/93	-/13	-/5.59
Big Governors Cr, SR 1625, Moore	B-16	17-32	2/98	45/11	6.64/5.44
			2/93	49/10	6.26/4.48
Crawley Cr, nr SR 1625, Moore	B-17	17-32-2	2/98	-/10	-/5.47

CPF 11

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Indian Cr, SR 2306, Chatham	B-2	17-35	3/93	-/10	-/5.18
Little Pocket Cr, NC 42, Lee	B-4	11-37-4 (2)	2/98	-/14	-/4.57
			2/93	-/16	-/5.04
Cedar Cr, SR 2142, Chatham	B-5	17-39	2/98	-/16	-/5.09
			2/93	-/13	-/5.28
Big Buffalo Cr, SR 1403, Lee	B-6	17-40	8/93	-/4	-/6.12

			2/93	-/12	-/5.13
Georges Cr, SR 2142, Chatham	B-7	17-41	2/93	-/15	-/4.83
Georges Cr, SR 2150, Chatham	B-8	17-41	2/98	-/4	-/4.25
Little Buffalo Cr, SR 1420, Lee	B-10	17-42	2/93	-/5	-/7.09

CPF 12

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Bear Cr, SR 2333, Chatham	B-11	17-43-16	8/91	73/16	6.78/5.56
Bear Cr, SR 2189, Chatham	B-12	17-43-16	8/91	69/15	6.51/5.58
Bear Cr, SR 2155, Chatham	B-13	17-43-16	7/90	-/15	-/4.83

CPF 15

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
UT Bones Cr, be Sunset MHP, Cumberland	B-24	18-31-24-2	1/89	6/0	9.49/-
Little Cross Cr, ab lake nr Bragg Blvd, Cumb.	B-8	18-27-4-(1)	9/98	48/12	5.98/4.58
			4/90	-/2	-/2.52
Pedler Br, NC 20, Hoke	B-13	18-31-16	2/90	36/2	8.29/6.33
Pedler Br, US 401, Hoke	B-14	18-31-16	2/90	16/0	8.46/-

CPF 21

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Barlow Br, Bell St in Faison, Duplin	B-4	18-74-2	5/93	26/0	8.88/-
			6/86	8/0	9.63/-

CPF 22

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Goshen Swp, SR 1302, Wayne	B-3	18-74-19	5/93	62/8	6.66/5.30
Goshen Swp, US 117, Duplin	B-4	18-74-19	5/93	51/11	6.68/5.44
Goshen Swp, NC 403, Duplin	B-5	18-74-19	5/93	56/10	6.67/5.57
Panther Br, NC 50, Duplin	B-6	18-74-19-3	12/86	64/11	6.59/5.10
Panther Br, be Faison UT, Duplin	B-7	18-74-19-3	5/93	35/1	8.26/6.22
			12/86	10/0	8.05/0
UT Herrings Marsh Run, SR 1508, Duplin	B-9	18-74-19-16	9/93	-/8	-/4.89
			9/92	-/7	-/5.22
			9/91	-/2	-/5.68
Herrings Marsh Run, SR 1508, Duplin	B-10	18-74-19-16	9/93	0/0	0/0
			9/92	-/8	-/4.94
			9/91	-/14	-/4.43
Herrings Marsh Run, SR 1306, Duplin	B-11	18-74-19-16	9/96	48/4	7.03/6.68
			9/95	55/9	6.61/5.50
			9/94	69/8	7.32/5.77
			9/93	71/15	7.02/5.45
			9/92	72/13	6.58/5.13
			9/91	67/11	6.13/4.87
			9/90	74/10	6.79/5.44
			1/90	-/13	-/5.08
Persimmon Br, ab Beulaville, Duplin	B-22	18-74-25-1	9/90	45/4	6.98/6.62
Persimmon Br, be Beulaville, Duplin	B-23	18-74-25-1	9/90	31/0	7.53/0

CPF 23

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Burgaw Cr, at old RR track, Pender	B-6	18-74-39	12/87	37/0	8.85/-
Burgaw Cr, NC 117, Pender	B-7	18-74-39	12/87	14/0	9.44/-
Cypress Cr, NC 53, Pender	B-11	18-74-55-2	3/98	-/9	-/5.70
			3/93	-/9	-/5.88

CTB 34

Site	Site #	Index#	Date	S/EPT S	BI/BIEPT
Stewart Cr, SR 2050, Mecklenburg	B-9	11-137-1-2	02/90	37/14	6.31/4.17

CTB 38

Site	Site #	Index#	Date	S/EPT S	BI/BIEPT
Sixmile Cr, SR 3445, Mecklenburg	B-2	11-138-3	03/87	67/22	5.26/3.58

CHO 01

Site	Map #	Index #	Date	S/EPT S	BI/BIEPT
Ahoskie Cr, NC 42, Hertford	B-3	25-14-1	08/95	61/7	7.67/6.19
			02/95	59/8	6.95/5.66

CHO 02

Site	Map #	Index #	Date	S/EPT S	BI/BIEPT
Potecasi Cr, NC 11, Hertford	B-4	25-4-8	07/89	66/11	7.28/6.07
			07/86	53/6	7.39/5.95
			07/84	53/7	6.87/5.05
			07/83	60/9	7.39/6.32
Cutawhiskie Swp, SR 1141, Hertford	B-5	25-4-8-8	08/95	49/4	6.80/6.13
			02/95	46/3	7.24/5.70

LUM 50

Site	Map #	Index#	Date	S/EPT S	BI/BIEPT
Quewhiffle Cr, SR 1214, Hoke	B-12	14-2-14	04/89	40/12	4.94/3.46
			01/84	27/4	6.47/3.75

LUM 51

Site	Map#	Index#	Date	S/EPT S	BI/BIEPT
Porter Swp, SR 1503, Columbus	B-19	14-27	03/96	41/6	7.34/3.20
			03/92	60/6	7.66/6.94
			09/91	- /3	-/6.59

LUM 52

Site	Map#	Index#	Date	S/EPT S	BI/BIEPT
Burnt Swamp, ab RR, Robeson	B-3	14-10-8-4	06/91	41/4	7.09/5.88
Burnt Swamp, SR 1515, Robeson	B-4	14-10-8-4	06/91	44/5	7.40/5.59

LUM 54

Site	Site #	Index#	Date	S/EPT S	BI/BIEPT
Ashpole Swp, NC 41, Robeson	B-1	14-30	03/96	51/10	6.67/5.84
			09/91	-/8	-/5.64
Ashpole Swp, SR 2258, Robeson	B-2	14-30	06/86	45/3	8.08/7.79
Hog Swamp, SR 2262, Robeson	B-3	14-30-7	03/96	51/13	6.66/6.10
			09/91	-/8	-/6.62

LUM 57

Site	Site #	Index#	Date	S/EPT S	BI/BIEPT
Monie Swp, SR 1006, Columbus	B-6	15-17-1-12	03/96	33/6	7.34/6.75
			09/91	-/5	-/7.04

LUM 58

Site	Site #	Index#	Date	S/EPT S	BI/BIEPT
White Marsh, ab US 74 Bus, Columbus	B-1	15-4	09/94	49/3	7.48/3.93
White Marsh, at old RR grade, Columbus	B-2	15-4	09/94	38/2	8.27/7.42
Brown Marsh Swp, SR 1700, Bladen	B-3	15-4-1-1-1-1	03/96	41/2	7.95/4.92

NEUSE 02

Site	Site #	Index#	Date	S/EPT S	BI/BIEPT
Hare Snipe Cr, NC 70, Wake	B-30	27-33-12-(2)	02/95	-/10	-/4.88

NEUSE 05

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Southwest Cr, SR 1804, Lenoir	B-5	27-80	08/95	-/6	-/5.95
			07/91	-/11	-/5.46

NEUSE O6

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Mill Cr, off SR 1390, Johnston	B-10	27-57-18	03/88	39/8	6.89/4.68
Mill Cr, off SR 1390, Johnston	B-11	27-57-18	07/91	56/5	7.25/6.57
			03/88	23/1	8.61/5.81

NEUSE 11

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Beaverdam Swp, US 258, Lenoir	B-3	27-101-3	07/91	-/6	-/5.68
L Chinquapin Cr, SR 1131, Jones	B-7	27-101-11	07/91	-/7	-/5.79

PAS 52

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Burnt Mill Cr, NC 37, Chowan	B-4	30-8-1	02/95	41/2	7.85/8.81

PAS 53

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Kendricks Cr, nr Mackeys, Washington	B-1	30-9-(2)	07/84	55/4	7.97/6.76
			07/83	42/3	8.46/7.31

ROA 06

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Anderson Swp Cr, I-85, Vance	B-6	23-8-6-(1)	02/90	49/13	6.95/5.71

ROA 10

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Cashie R ab WWTP, Bertie	B-1	24-2	06/84	37/0	8.61/-
Cashie R be WWTP, Bertie	B-2	24-2	06/84	41/0	8.39/-
Cashie R, SR 1219, nr Lewiston, Bertie	B-3	24-2	06/84	43/2	8.22/7.00
			07/83	34/2	8.54/7.00

Tar 02

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
White Oak Swp, SR 1428, Edgecombe	B-24	28-79-23	05/88	-/11	-/5.13

Tar 03

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Cokey Swp, SR 1141, Edgecombe	B-4	28-83-3	04/89	36/3	7.89/4.10
Cokey Swp, SR 1601, Edgecombe	B-5	28-83-3	08/97	84/24	5.87/4.61
			07/92	64/14	6.06/5.46
Little Cokey Swp, at Branch Cr, Edgec.	B-6	28-83-3-1	04/89	26/0	7.67/-
Little Cokey Swp, SR 1614, Edgecombe	B-7	28-83-3-1	04/89	11/0	8.66/-
Little Cokey Swp, SR 1158 ab UT, Edge.	B-8	28-83-3-1	05/92	42/0	8.44/-
Little Cokey Swp, be UT, Edgecombe	B-9	28-83-3-1	05/92	46/1	8.15/6.22
Little Cokey Swp, SR 1141, Edgecombe	B-10	28-83-3-1	04/89	39/2	8.19/2.96
Briery Br, NC 124, Edgecombe	B-12	28-83-4-1-1	09/90	51/3	7.47/5.70
UT Otter Cr, SR 1113, Edgecombe	B-16	28-86	09/90	51/1	7.70/6.22

Tar 07

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Whitehurst Cr W-Pr, SR 1937, Beaufort	B-32	29-28-7-(1)	02/92	13/1	8.76/2.52
Whitehurst Cr S-Pr, SR 1937, Beaufort	B-33	29-28-7-(1)	02/92	18/2	8.77/4.37
Whitehurst Cr, SR 1941, Beaufort	B-34	29-28-7-(1)	02/92	30/2	8.58/3.49

YAD 05

Site	Site#	Index#	Date	S/EPT S	BI/BIEPT
Cedar Cr, NC 801, Davie	B-2	12-102-13-(1)	06/90	-/10	-/5.98
Cedar Cr, ab Quarry, Davie	B-3	12-102-13-(2)	06/90	63/13	6.51/5.79

YAD 07

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Jimmys Cr, SR 2020, be Quarry, Davidson	B-31	12-119-7-4-2	06/90	58/14	6.23/5.48
Jimmys Cr, ab Quarry, Davidson	B-32	12-119-7-4-2	06/90	58/15	6.22/5.74

YAD 13

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT
Lower (Little) Long Br, SR 2001, Stanly	B-8	13-17-31-4	06/91	47/7	6.63/4.70
Lower (Little) Long Br, be NC 138, Stanly	B-9	13-17-31-4	06/91	54/15	6.73/5.84

YAD 14

Site	Site #	Index#	Date	S/EPT S	BI/BIEPT
Wicker Br, SR 1940, Union	B-10	13-17-40-4	05/89	60/10	6.52/5.45
			05/88	62/11	6.41/4.54

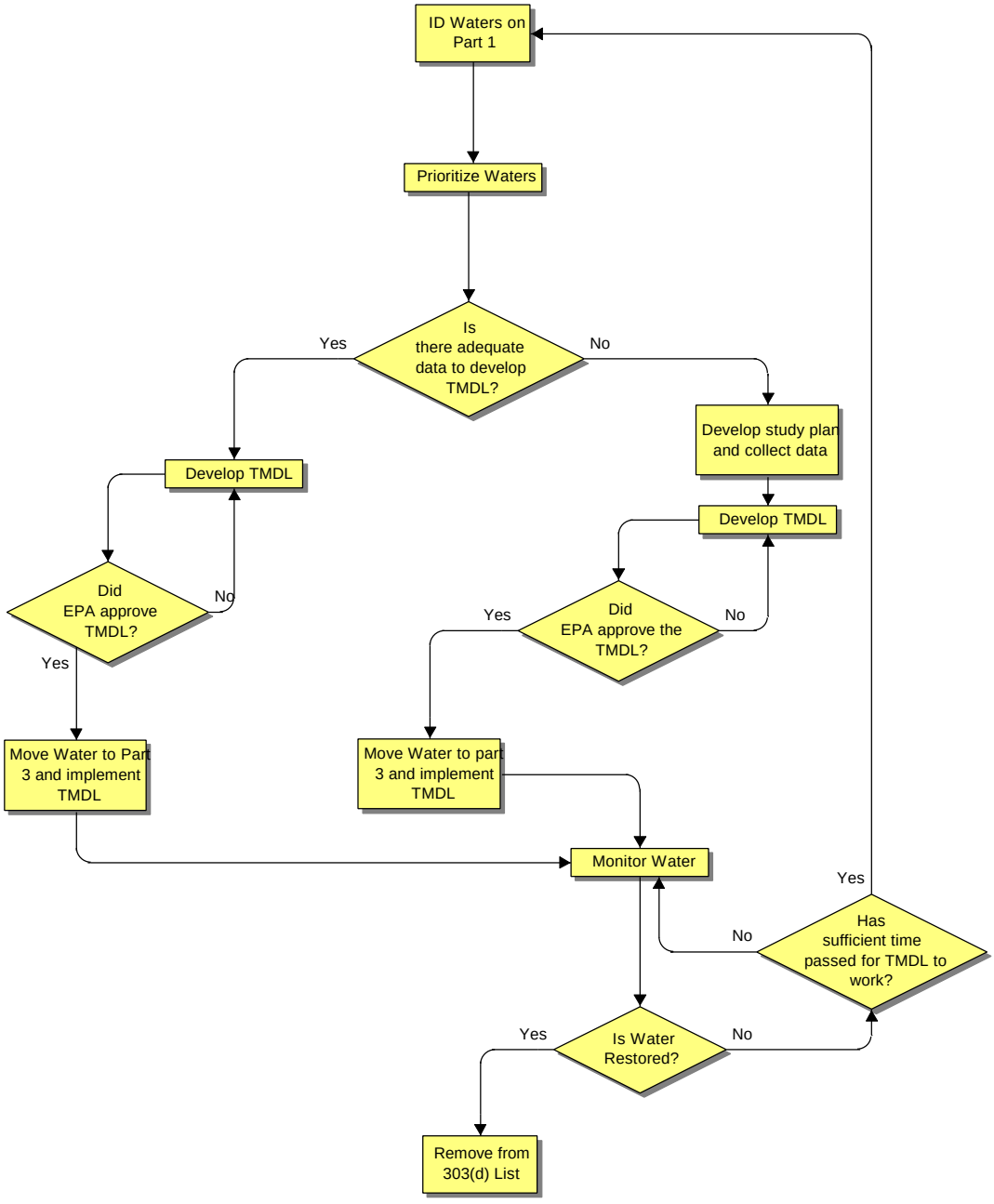
2000 § 303(d) List

NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WATER QUALITY

Part 1

Waterbodies impaired by a *pollutant* as defined by EPA are included on Part 1 where the proper technical conditions exist to develop TMDLs. "The term pollutant means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into the water." TMDLs will be established for all waterbodies listed on Part 1. A generalized flow chart outlining North Carolina's approach to Part 1 listed waters follows.

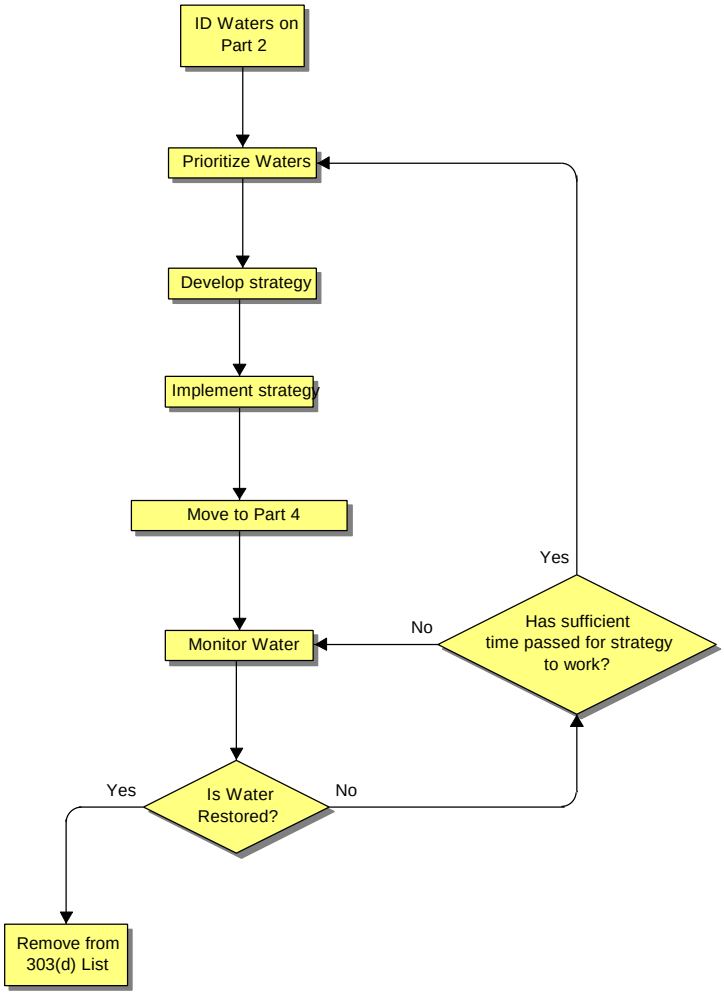
Method to Address Part 1 Waters



Part 2

Waterbodies impaired by *pollution*, not by a *pollutant*, are included on Part 2 of the list. EPA defines *pollution* as "The man-made or man-induced alteration of the chemical, physical, biological and radiological integrity of the water" in the CWA section 502(19). EPA believes that in situations where the impairment is not caused by a *pollutant*, a TMDL is generally not the appropriate solution to the problem. In keeping with the principle that the § 303(d) list is an accounting of all impaired waterbodies, however, these types of waterbodies will remain on Part 2 of the list until water quality uses and standards are attained by some other means. A generalized flow chart outlining North Carolina's approach to Part 2 listed waters follows.

Method to Address Part 2 Waters



Part 3

Waterbodies for which EPA has approved or established a TMDL and water quality standards have not yet been attained. Monitoring data will be considered when evaluating Part 3 waterbodies for potential delisting. Waters will be moved to Part 1 of the list if updated information and data demonstrate that the approved TMDL is inadequate.

Part 4

Waterbodies for which TMDLs will not be attempted because other required regulatory controls (e.g., NPDES permit limits, Stormwater Program rules, etc.) are expected to attain water quality standards by the next regularly scheduled listing cycle.

Part 5

Biologically impaired waterbodies with no identified cause of impairment. Identification of the cause(s) of impairment will precede movement of these waters to Parts 1 and 2 of the list. EPA recognizes that in specific situations the data is not available to establish a TMDL and that these specific waters might be better placed on a separate part of the 2000 § 303(d) list (64 FR, 46025, August 23, 1999). Data collection and analysis will be performed in an attempt to determine the cause(s) of impairment. A generalized flow chart outlining North Carolina's approach to Part 5 listed waters follows the discussion of specific issues below.

"Sediment" Impaired Waters

Streams listed as sediment-impaired in the past were placed on the § 303(d) list because bioassessment indicated that a rating of NS or PS was appropriate. For most biologically impaired streams, little information was available to indicate the likely cause of impairment. During this time period North Carolina did not distinguish between "problem parameters" and "causes of impairment" when developing our § 305(b) reports and § 303(d) list. That is, these documents did not make a distinction between when a pollutant/form of pollution was flagged as a potential concern (problem pollutant) and when it could be clearly identified as the reason (cause) of biological impairment.

Sediment was often flagged when personnel from various agencies felt that sediment was present in a stream or that sedimentation was a potential issue. This evaluation was highly subjective, without any common understanding regarding the meaning of "sediment" (e.g. it may refer to sedimentation, bank erosion, channelization, lack of riparian vegetation, loss of pools or riffles, loss of woody habitat, or stream bed scour, etc.) or agreement regarding what degree of impact was likely to result in significant impacts on biota. Due to a lack of resources, no attempt was generally made to measure sediment, to verify that sedimentation was actually a cause of impairment, or to undertake chemical/physical sampling to identify other potential causes of impairment. If bioassessment indicated impairment, such streams thus appeared on the § 303(d) list with sediment noted as the cause of impairment.

Were such circumstances to occur today, sediment would potentially be flagged as a problem pollutant for 305(b) purposes, but sediment would not be noted as a cause of impairment on the § 303(d) list unless additional evaluation provided data confirming the nature and degree

of impact. Rather, these streams would today be placed on the § 303(d) list as biologically impaired waterbodies for which no problem pollutant had yet been identified.
Based on the limited information currently available on these streams (i.e., streams listed as sediment-impaired in the past using the method described above), we are not confident that addressing sediment issues will actually improve the unacceptable biological condition of these waterbodies that led to their listing. We believe it is most appropriate to consider the cause of impairment of these streams as unknown. We have therefore placed them on Part 5 of the § 303(d) list. Sediment issues will be carefully examined when we evaluate the potential causes of impairment for these waterbodies.

Watershed Assessment and Restoration Project

During 2000 and 2001 the Division's Watershed Assessment and Restoration Project (WARP) will investigate the causes and sources of biological impairment in eleven watersheds where the reason for biological impairment is currently unknown or unverified. Roughly half of the waters on the North Carolina's § 303(d) list fall into this category. The intent of the project is to collect sufficient information to determine whether these waters should be placed on Part 1 or Part 2 of § 303(d) list. Waters found to be impaired for both habitat degradation and specific pollutants will be listed on Part 1 and Part 2.

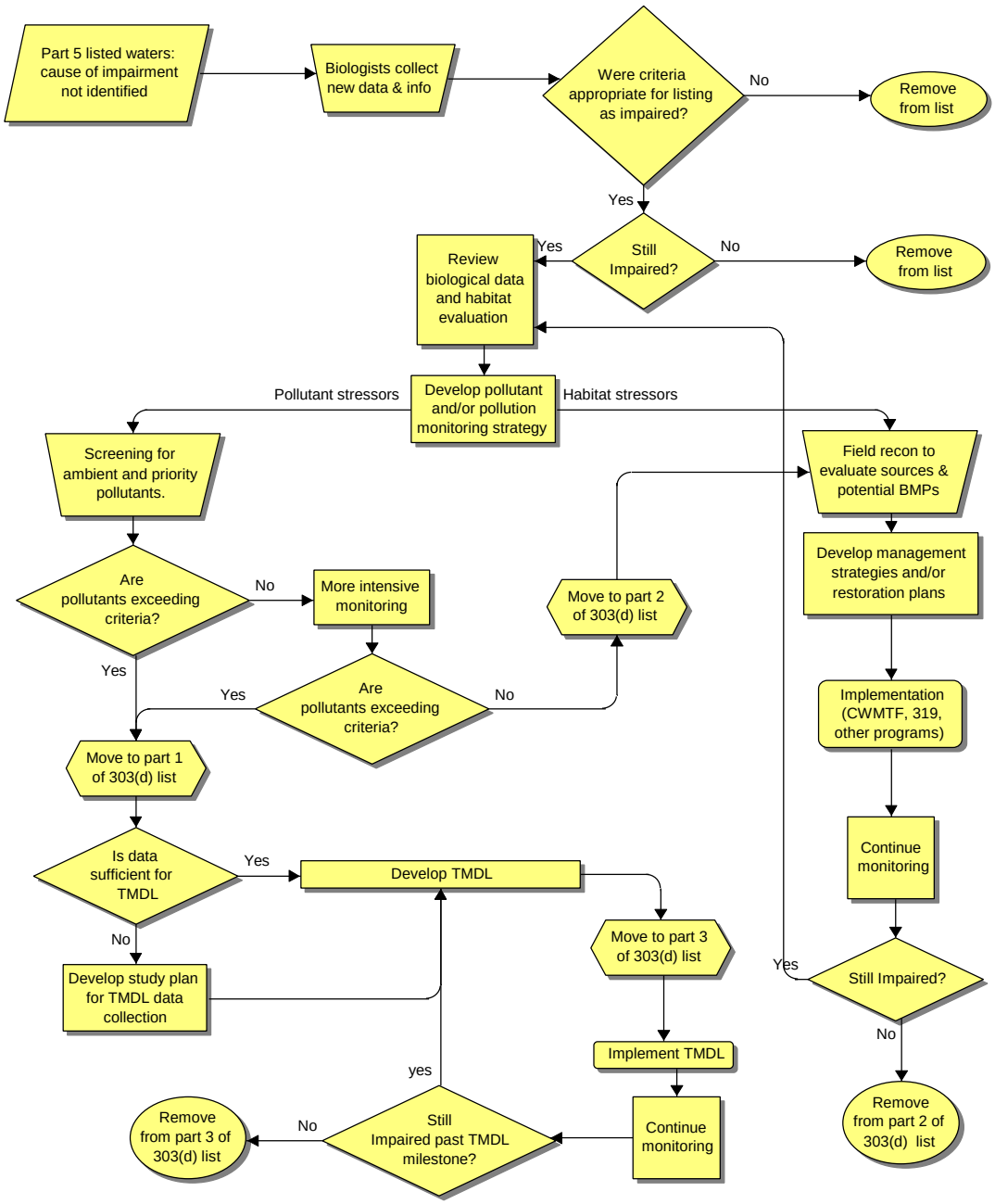
The primary purpose of this initiative is to undertake a thorough watershed and water quality assessment of the waters involved, laying the groundwork for a range of water quality restoration activities. The project will not develop TMDLs, develop rules or fund the implementation of water quality improvement measures. However, the project will outline the types of BMPs or restoration activities that should be undertaken to address the identified causes and sources of pollution. For waterbodies which are moved to Part 2 of the list, this can serve as the basis for management strategies to address the identified pollution problems and restore the uses of these waters. The Clean Water Management Trust Fund (CWMTF), the state agency funding WARP, finances a range of water quality improvement initiatives and is a likely source of resources for implementing restoration activities in these waters.

For waterbodies which are moved to Part 1 of the list, monitoring data collected during the project will document the pollutants which are the cause of impairment and provide data to estimate pollutant loads (though additional sampling may be necessary in some watersheds to adequately characterize pollutant loadings). Recommendations for BMPs and management activities will also be made for these waters. In some watersheds, local governments and other stakeholders may use these recommendations as the basis for undertaking water quality improvement activities prior to TMDL development. Where TMDL development is necessary, information collected during the project will facilitate the development of load allocations and implementation plans.

104 (b) (3) Project

A grant awarded under section 104(b)(3) will fund the investigation of causes and sources of biological impairment in five small watersheds across the state. Although structured differently, the goals of the 104(b)(3) project are essentially identical to those of the Watershed Assessment and Restoration Project. The project aims to provide the missing information necessary to determine whether a pollutant and/or habitat stressor is (are) the cause of biological impairment. When these stressors are identified, North Carolina will place the assessed waters on Parts 1 and/or 2 of § 303(d) list, as appropriate. It is North Carolina's expectation that the information derived from these comprehensive watershed assessments will provide the foundation for use restoration strategies and TMDLs.

Method to Address Part 5 Waters



Part 6

The *proper technical conditions* do not yet exist to develop TMDLs for waters listed on Part 6. "*Proper technical conditions* refers to the availability of the analytical methods, modeling techniques and data base necessary to develop a technically defensible TMDL. These elements will vary in their level of sophistication depending on the nature of the pollutant and characteristics of the segment in question" (43 FR 60662, December 28, 1978). These are waters that would otherwise be on Part 1 of the list. In the proposed TMDL regulations, EPA again recognizes that in some specific situations the data, analyses, or models are not available to establish a TMDL and that these specific waters might be better off on a separate part of the 2000 § 303(d) list (64 FR, 46025, August 23, 1999). North Carolina seeks EPA technical guidance in developing technically defensible TMDLs for these waters. DWQ has included fecal coliform impaired shellfishing waters on this part of the list.

Approach to Fecal Coliform Impaired Estuarine Waters

North Carolina has an extensive area of shellfish waters that are temporarily or permanently closed due to fecal coliform impairment. Fecal coliforms are bacteria that originate in the intestinal tracts of warm blooded animals and their abundance is thought to be a relative indicator of the presence of pathogens in the water.

Sources include failing septic systems, improperly managed animal operations, leaking sewer lines, domestic wastewater treatment plants, marinas and wildlife.

The challenge at this stage is such that a useful TMDL cannot be readily developed as water quality models for fecal coliform in coastal waters are very resource intensive and the results have high uncertainty. DWQ's inability to develop TMDLs for shellfish waters is due to complex estuarine hydrodynamics that require sophisticated monitoring and modeling to characterize, and diffuse sources that are difficult to specifically identify. Thus, the state of the science is not at a point where technically defensible TMDLs can be developed in these waters.

The impairment, however, is manageable; efforts to address it are underway. These efforts include projects by the White Oak River Watershed Advisory Board, the Army Corps of Engineers, the NC Division of Environmental Health, N.C. State University, and NC DWQ. The White Oak River Watershed Advisory Board (WORAB) educates local officials and citizens about the problem and its causes. Also, WORAB is using a separate Section 319 award to implement best management practices to slow and filter stormwater runoff. Shoreline surveys to identify septic system failures and apparent sources are being conducted by Shellfish Sanitation of the NC Division of Environmental Health. Shellfish

Sanitation is also sampling at seasonal frequencies for fecal coliform and *E. coli* at 235 stations in high use coastal recreational areas, some of which are adjacent to shellfish areas.

The Army Corps of Engineers is leading a joint federal, state and local effort in the Lockwoods Folly watershed to develop a study plan that will help to define the important water quality issues and set the stage for a phased plan of action to address findings. The Lockwoods Folly project will get underway when a Feasibility Cost Sharing Agreement is signed by all parties. The current budget of the proposed project exceeds 2.5 million dollars.

The state extension agency at NC State University is performing applied research to curb fecal coliform loading through stormwater management in numerous coastal subwatersheds, including Bear Creek, Jumping Run Creek, Wilson Bay, Shallotte River and Pettiford Creek. These five watersheds contain a variety of land uses; this will enable DWQ to learn about particular loading issues associated with all of the major sources. The extension projects all contain a public education component as well.

An aspect of this work that has relevance to TMDL development is that the extension team has quantified the hydrology in all but the Pettiford Creek subwatershed.

NC DWQ has received a Section 319 award for source assessment in the Bogue-Core Sounds watershed. This is an opportunity to extend the state of science in coastal fecal coliform management. The other projects mentioned are designed to address the problem without identifying specific sources of bacteria. For instance, the NC State extension projects' goal is to slow down the delivery of stormwater from heavily ditched and drained catchments. To learn more about specific sources, DWQ has contacted NC State extension about developing a bacteriological DNA library as part of the Bogue-Core Sounds project. Such a method produces accurate identification of the source animal(s), which makes source tracking much more feasible. With significant sampling and quantified hydrology, DNA typing may enable source specific loads to be quantified.

Clearly, quantifying the hydrology and completing DNA typing on each shellfish area would be a costly and lengthy process. Perhaps some of the steps can be streamlined after the first few studies. For instance, a DNA library may take two years to construct, but once it is complete, it may be useful for identifying host sources over a broad area.

There is also research being done to assess caffeine as a conservative tracer of human waste. This is a more cost and time efficient method than DNA typing. It is limited though, in that it only gives an indication of human contribution to the problem.

It is likely that DWQ will not be able to submit a TMDL for fecal coliform bacteria loading to shellfish waters in the next 303(d) listing cycle. The current work should lead to decreases in pathogen loading, so that the long-term goal of use restoration may be attained. In that event, a TMDL would not be needed. If the current work does not attain water quality standards, it will provide important source information that is necessary for TMDL development. DWQ will commit to examining new modeling approaches and the

associated data requirements needed to address this problem. DWQ will report on progress made in this regard through periodic updates, and will reevaluate in the next listing cycle whether proper technical conditions for TMDL development exist.

Method to Address Part 6 Waters