

2014 303(d) Listing Methodology

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INTRODUCTION

The water quality assessment process is a framework used by the North Carolina Division of Water Quality to interpret data and information to determine whether a waterbody is meeting water quality standards. This framework is critical to providing a balanced and consistent comparison of data and information with North Carolina water quality standards. This document provides methods to assess a parameter into Category 5 (the 303(d) list) only.

WATER QUALITY STANDARDS AND CLASSIFICATIONS

Water quality standards are an integral part of water quality assessment. Water quality standards are state regulations that form the foundation of controls that protect lakes, rivers, streams and other waterbodies from pollution. These rules must be approved by the US Environmental Protection Agency to ensure compliance with the Clean Water Act. The rules are in Title 15A of the North Carolina Administrative Code (NCAC). These rules include:

1. Beneficial use designations (classifications) (*e.g.*, recreation, water supply, aquatic life)
2. Numeric levels and narrative statements (water quality criteria) protective of the use designations.

Under the Clean Water Act, states must review their water quality standards and classifications every three years and make any modifications necessary to meet federal requirements and to protect waters of the state. This process is known as the Triennial Review.

Surface water classifications are designations applied to surface water bodies, such as streams, rivers and lakes, which define the best uses to be protected within these waters, and carry with them an associated set of water quality criteria to protect those uses. Surface water classifications are one tool that state and federal agencies use to manage and protect all streams, rivers, lakes, and other surface waters in North Carolina. Each classification has associated criteria that are used to determine if the designated uses are being protected.

For detailed information on Water Quality Standards and Classifications please visit <http://portal.ncdenr.org/web/wq/ps/csu>.

CLEAN WATER ACT SECTIONS 305(B) AND 303(D)

The 305(b) report and 303(d) list are products of the water quality assessment. Under federal law and regulation, States must perform a water quality assessment every two years and report results to EPA. The 305(b) report is a list of all waters in the state with associated assessments.

The 303(d) list is part of the 305(b) report. The 303(d) list is a list of waters that exceed water quality criteria, as determined through the assessment methodology. The name of the list comes from Section 303(d) of the federal Clean Water Act (CWA), which requires States to identify and establish a priority ranking for waterbodies for which existing controls are not stringent enough to attain and maintain applicable water quality standards, and to establish total maximum daily loads (TMDLs) for the pollutants responsible.

303(D) LIST AND ASSESSMENT METHODOLOGY PUBLIC COMMENT

The public will have an opportunity to review the entire water quality assessment process in the summer of even-numbered years prior to the assessment in the following odd-numbered year. The NC Environmental Management Commission will review and approve the 303(d) listing methodology before it is applied. A public review of the draft 303(d) list itself will continue to occur in the months before the list is submitted to the Environmental Protection Agency for approval.

EPA APPROVAL OF THE 303(D) LIST

Current federal rules require States to submit 303(d) lists every two years, by April 1st of every even numbered year. EPA is required to approve or disapprove the state-developed 303(d) list.

Because 303(d) is a federal program under the Clean Water Act, EPA has final authority on the 303(d) list. EPA reviews the state-submitted 303(d) list. EPA will then ensure the list has identified all waterbodies that exceed criteria. EPA identifies additional waters that should be included on the list.

ASSESSMENT METHODS

There are six different general assessment methods for water quality standards assessment:

- 1) **(New for 2014)** 10 percent exceedance method with 90% statistical confidence, used for most numeric water quality standards.
- 2) Biological rating method used to assess benthic and fish community collections.
- 3) Pathogen criteria method to assess recreation standards.
- 4) Swimming advisory method to assess waters with postings.
- 5) Shellfish growing area assessment method.
- 6) Fish advice and advisories with fish tissue data method.

More than one method could be used on any individual AU depending on the data available and the water quality classification.

1. ASSESSING NUMERIC CRITERIA

The following sets of evaluations will be used for the 2014 assessment for these parameters: chlorophyll-*a*, dissolved oxygen, MBAS, mercury, nitrate/nitrite, pH, temperature, toxic substances, and turbidity. For each parameter there is a brief discussion of the standard and other criteria used for assessment of the parameter including any parameter-specific good causes for not assessing in Category 5.

(New for 2014) The true frequency of criteria exceedances cannot be measured. It must be estimated from a set of samples, which introduces statistical uncertainty. The degree of uncertainty depends on the sample size. NC will use a nonparametric hypothesis testing approach based on the binomial distribution. The binomial method allows a quantifiable level of statistical confidence (90%) for listing decisions, which provides a 10% probability of listing an assessment unit when it

should not be listed. The null hypothesis is that the overall exceedance probability is less than or equal to the 10% exceedance allowance.

- Exceeding Criteria-Category 5
 - Greater than 10% exceedance with greater than or equal to 90% confidence
 - Sample size is greater than nine.

The standards (criteria) and additional considerations are included for each parameter as applicable.

CHLOROPHYLL A (AQUATIC LIFE) CRITERIA

Chlorophyll *a* (corrected): Not greater than 15 µg/l in trout waters. Not greater than 40 µg/l for lakes, reservoirs, and other waters subject to growths of macroscopic or microscopic vegetation.

DISSOLVED OXYGEN (AQUATIC LIFE) CRITERIA

The dissolved oxygen (DO) criterion for trout waters is not less than 6.0 mg/l. For non-trout waters it is not less than 4.0 mg/l with a daily average of not less than 5.0 mg/l. The DO criterion for salt waters is 5.0 mg/l. There are exceptions to these standards for classified Sw or swamp waters, lake coves or backwaters, lake bottom waters, poorly flushed tidally influenced streams or embayments and estuarine bottom waters *if the lower values are due to natural conditions*.

- Exceeding Criteria-Category 5
 - Greater than 10% exceedance with greater than or equal to 90% confidence
 - Sample size is greater than nine.
 - AU is not a class Sw or swamp like

MBAS (WATER SUPPLY) CRITERIA

The MBAS (methylene blue active substances) criterion is not to exceed 0.5 mg/l in water supply waters. This criterion is to protect aesthetic quality of water supplies and to prevent foaming.

MERCURY -WATER COLUMN (FISH CONSUMPTION) CRITERIA

The mercury criterion is 0.012 µg/l for all NC waters.

NITRATE/NITRITE (WATER SUPPLY) CRITERIA

The NO₂+NO₃-N criterion is 10 mg/l for water supply waters.

PH (AQUATIC LIFE) CRITERIA

The pH criteria are between 6.0 and 9.0 standard units for freshwater and between 6.8 and 8.5 for saltwater. pH can be as low as 4.3 for classified swamp waters if this is due to natural conditions.

NC has an exception process for waters that are swamp-like but are not formally classified as Sw or swamp waters. These swamp-like waters are in the coastal plain and are usually near classified Sw waters or have been sampled using swamp biocriteria. Swamp streams stop flowing in summer months, but have visible flow during late winter. For more information, see the Benthos SOP at <http://portal.ncdenr.org/web/wq/ess/bau>.

- Exceeding Criteria-Category 5
 - Greater than 10% exceedance with greater than or equal to 90% confidence
 - Sample size is greater than nine.
 - AU is not a class Sw or swamp like

TEMPERATURE (AQUATIC LIFE) CRITERIA

The temperature criteria are 29 °C for mountains and Piedmont AUs, 32°C for lower Piedmont and coastal plain waters and 20°C for supplemental classified Trout waters. See full standard for details.

TOXIC SUBSTANCES

ARSENIC (AQUATIC LIFE) (WATER SUPPLY) (HUMAN HEALTH) CRITERIA

The arsenic criteria are 50 µg/l for all NC waters for protection of aquatic life and 10 µg/l for water supply waters and 10 µg/l to protect human health in all waters. For assessment purposes the 10 µg/l was used as the evaluation level. The 50 µg/l has only been exceeded rarely in saltwaters.

CADMIUM (AQUATIC LIFE) CRITERIA

The cadmium criteria are 0.4 µg/l for trout waters, 2.0 µg/l for non-trout waters and 5.0 µg/l for salt waters.

CHLORIDE (AQUATIC LIFE) CRITERIA

The chloride criterion is not to exceed 230 mg/l in all NC waters.

CHLORINE (AQUATIC LIFE) CRITERIA

The chlorine (residual) criterion is not to exceed 17 µg/l in all NC waters.

CHROMIUM (AQUATIC LIFE) CRITERIA

The chromium criterion is 50 µg/l for in all NC waters.

COPPER (AQUATIC LIFE) CRITERIA

The copper criteria are 7 µg/l fresh waters and 3 µg/l for salt waters.

CYANIDE (AQUATIC LIFE) CRITERIA

The cyanide criterion is not to exceed 5 µg/l in all NC waters.

FLUORIDE (AQUATIC LIFE) CRITERIA

The fluoride criterion is not to exceed 1.8 mg/l in all NC waters.

LEAD (AQUATIC LIFE) CRITERIA

The lead criterion is 25 µg/l (recoverable) for in all NC waters.

NICKEL (AQUATIC LIFE) (WATER SUPPLY) CRITERIA

The nickel criteria are 88 µg/l for freshwater, 8.3 µg/l for saltwater and 25 µg/l for classified water supplies.

ZINC (AQUATIC LIFE) CRITERIA

The zinc criterion is 50 µg/l for all NC waters.

TURBIDITY (AQUATIC LIFE) CRITERIA

The turbidity criteria are 50 nephelometric turbidity units (NTU) for freshwaters, 25 NTU for reservoirs and estuarine waters, and 10 NTU for supplemental classified Trout waters.

2. ASSESSING NARRATIVE AQUATIC LIFE CRITERIA USING BIOLOGICAL RATINGS

Narrative criterion: Waters shall be suitable for aquatic life propagation and maintenance of biological integrity. NC uses benthic and fish community data to assess biological integrity. Biological integrity means the ability of an aquatic ecosystem to support and maintain a balanced and indigenous community of organisms having species composition, diversity, population densities and functional organization similar to that of reference conditions (15A NCAC 02B .0202). Refer to <http://portal.ncdenr.org/web/wq/ess/bau> for more information on the biological monitoring program including SOPs.

- Exceeding Criteria-Category 5
 - Poor, Fair, and Severe biological ratings

3. ASSESSING RECREATION CRITERIA USING PATHOGEN INDICATORS

FECAL COLIFORM BACTERIA CRITERIA

The criteria are fecal coliforms not to exceed a geometric mean of 200/100 ml (MF count) based on at least five consecutive samples examined during any 30-day period and not to exceed 400/100 ml in more than 20 percent of the samples examined during such period. This standard is a freshwater standard. NC uses this standard as the assessment method in freshwaters.

- Exceeding Criteria-Category 5
 - There are at least five samples collected within a 30-day period and
 - Geometric mean is greater than 200 colonies/100ml of water or
 - Greater than 20% of the samples exceed 400 colonies/100ml

ENTEROCOCCI BACTERIA CRITERIA

The enterococcus criterion in NC is not to exceed a geometric mean of 35 enterococci per 100 ml based upon a minimum of five samples within any consecutive 30 days. NC uses this criterion for assessment of saltwaters. Data for this assessment are collected by DMF Recreational Water Quality Monitoring program (http://portal.ncdenr.org/c/document_library/get_file?uuid=89ecc697-deb0-4e2c-a18d-5e1609242628&groupId=38337).

- Exceeding Criteria-Category 5
 - There are at least five samples collected within a 30-day period and
 - Geometric mean of 35 enterococci per 100 ml

4. ASSESSING SHELLFISH HARVESTING CRITERIA USING GROWING AREA CLASSIFICATION

Waters that are classified for shellfish harvesting for market purposes (Class SA) are assessed using DMF Shellfish Sanitation growing area classifications. These classifications are based on fecal coliform exceedances and sanitary surveys. DWQ will work with DMF to continue to better identify the spatial extent of the growing area classifications. Mapping issues in coastal areas have made it difficult to coordinate the two datasets.

- Exceeding Criteria-Category 5
 - Class SA water
 - Growing area classification is Not Approved

5. ASSESSING FISH CONSUMPTION CRITERIA USING ADVICE AND ADVISORIES

Fish consumption was assessed based on site-specific fish consumption advisories developed using fish tissue data. Advisories and advice are developed by DHHS using fish tissue data collected by DWQ and others. See <http://epi.publichealth.nc.gov/fish/current.html> for all advice and advisories.

- Exceeding Criteria-Category 5
 - Fish consumption advisory in place for AU
 - AU has site specific fish tissue data