2016 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 Resources 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 as rules that form the foundation of controls that protect lakes, rivers, streams and other waterbodies from pollution. These rules, once adopted by the North Carolina Environmental Management Commission (EMC), 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. Water quality criteria as numeric levels and/or narrative statements with accompanying frequency, magnitude and duration protective of the beneficial 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, and are "impaired" as determined through the listing methodology as approved by the Environmental Management Commission, and need a TMDL. 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. This portion of the CWA is codified in 33 U.S.C. § 1313.

303(D) LIST AND ASSESSMENT METHODOLOGY PUBLIC COMMENT

The NC Environmental Management Commission, in accordance with NCGS § 143B-282(c), will "implement the provisions of subsections (d) and (e) of 33 U.S.C. § 1313 by identifying and prioritizing impaired waters…" The NC Environmental Management Commission will provide the public an opportunity to review and comment on any significant proposed changes to the methodology used for creating the 303(d) list. The Environmental Management Commission will strive to provide the public comment opportunity in even-numbered years prior to the assessment in the following odd-numbered year. An additional public comment opportunity to review the draft 303(d) list will also be provided in the months before the list is submitted to the Environmental Protection Agency for approval.

EPA APPROVAL OF THE 303(D) LIST

Federal law requires the State to submit a 303(d) list to EPA every two years, by April 1st of every even numbered year. 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 and may include additional waters that they determine should be included on the list based on their opinions and policies.

DATA WINDOW AND DATA SETS FOR 303 (D) LIST

Data that does not pass the Quality Assurance process shall not be used in determining the assessment of waterbodies for 303(d) purposes. Data once extracted from the EPA Storet Database are further scrutinized and filtered by the DWR to assure only the highest quality data are used for assessment purposes. See Table of Data Qualifiers. Data and information used for the 2016 assessment were collected in calendar years 2010-2014. Assessments based on older data are carried forward if newer data or information were not available to change the previous assessment decision. Older data will not be automatically excluded particularly when its inclusion could be used to augment small sets of more current data.

ASSESSMENT METHODS

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

1) 10 percent exceedance method with 90% statistical confidence, used for most numeric water quality standards. Where applicable, biological rating is also considered for assessment of metals.
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 to assess waters classified as "SA".
6) Fish advice and advisories with fish tissue data method to assess fish consumption.

More than one method could be used on any individual AU (i.e. Assessment Unit, waterbody segment, or waterbody) depending on the data available and the water quality classification.

1. ASSESSING NUMERIC CRITERIA

The following sets of evaluations will be used for the 2016 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 used for assessment of the parameter including any parameter-specific good causes for not assessing in Category 5.

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

See Table: "North Carolina Surface Water Pollutant Standards for Metals, Effective 01/01/2015"

CADMIUM (AQUATIC LIFE) CRITERIA

See Table: "North Carolina Surface Water Pollutant Standards for Metals, Effective 01/01/2015"

CHLORIDE (AQUATIC LIFE) CRITERIA

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

CHLORINE (AQUATIC LIFE) CRITERIA

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

CHROMIUM (AQUATIC LIFE) CRITERIA

See Table: "North Carolina Surface Water Pollutant Standards for Metals, Effective 01/01/2015"

COPPER (AQUATIC LIFE) CRITERIA

See Table: "North Carolina Surface Water Pollutant Standards for Metals, Effective 01/01/2015"

CYANIDE (AQUATIC LIFE) CRITERIA

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

FLUORIDE (AQUATIC LIFE) CRITERIA

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

LEAD (AQUATIC LIFE) CRITERIA

See Table: "North Carolina Surface Water Pollutant Standards for Metals, Effective 01/01/2015"

NICKEL (AQUATIC LIFE) (WATER SUPPLY) CRITERIA

See Table: "North Carolina Surface Water Pollutant Standards for Metals, Effective 01/01/2015"

ZINC (AQUATIC LIFE) CRITERIA

See Table: "North Carolina Surface Water Pollutant Standards for Metals, Effective 01/01/2015"

TURBIDITY (AQUATIC LIFE) CRITERIA

The turbidity criteria are 50 nephalometric 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. 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.

- 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 DWR 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

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