Painter, Andy

From: Eric Romaniszyn <romaniszyne@yahoo.com>
Sent: Monday, January 20, 2014 12:06 PM
To: Painter, Andy
Subject: 2014 Draft 303d list

Categories: 2014 303d comment

Hi Andy,

Thanks for the opportunity to comment on the draft 2014 list.

We agree with classification of Fines Creek to Category 5. We have seen a build up of sediment in recent years. While being listed isn't good, it will open up many doors for technical and financial resources. There are many great conservation-minded folks living up there who are ready to help.

We also believe Raccoon Creek should up Category 5. I see it is a 4c in the 2012 list. There is a tremendous amount of sediment in this subwatershed and some of our volunteer-based data indicated significant degradation. One of its tributaries, Ratcliff Cove Branch has been documented as contributing some of the highest sediment loads in the county.

Thanks again for the opportunity.

Eric

Eric Romaniszyn
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Painter, Andy

From: Mcnutt, Cam
Sent: Friday, January 24, 2014 8:19 AM
To: Chad Ham
Cc: 'Calamita, Paul'; Painter, Andy
Subject: RE: 303d list
Attachments: ChadHam_Fact_Sheet.pdf

Categories: 2014 303d comment, 2014 303d data request

Chad.
Attached are the fact sheets for your request. They are in one document.
For the recategorization the justification was incorrect for 21 changes. I have changed them to indicate a Criteria Exceedance was the reason to recategorize from 1 to 5. This will be reflected in the next update.
Thanks
Cam

From: Chad Ham [mailto:chad.ham@faypwc.com]
Sent: Friday, January 24, 2014 8:08 AM
To: Mcnutt, Cam
Cc: 'Calamita, Paul'
Subject: 303d list

Hi Cam,

Could I get a fact sheet for Buckhorn reek 18-7-(11); Cross Creek 18-27-(3)b; Kenneth Creek 18-16-1-(2); Lick Creek 18-4-(2); Little Cross Creek 18-27-4-(1)a; UT at Cross Creek POTW 18-27-(3)cut2?

Also, I noticed on the list of Individual Assessment Changes From 2012, there are several that the commentary doesn't seem to match the change. For example, Cross Creek 18-27-(3)b went from 1 to 5 for pH. I think that means it doesn't meet the standard and needs a TMDL. But the comment states "The assessment and the interpretation of more recent or more accurate data in the record demonstrate the parameter of interest is meeting criteria." I saw that on several listings. So it would appear that either the rating is wrong or the commentary is wrong.

Chad

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Painter, Andy

From: Tom Davis <tdavis@orangecountync.gov>
Sent: Friday, January 24, 2014 9:13 AM
To: Painter, Andy
Subject: Info for NC 303d list
Attachments: Orange County Final Benthics Report 2013.pdf

Categories: 2014 303d comment

Andy-

Please consider the attached benthic macroinvertebrate sampling report with regard to the 2014 Use Assessment process.

If you have any questions regarding this information, please do not hesitate to contact me. Orange County is planning to conduct additional benthic sampling in the near future.

Thank you-

Thomas W. Davis, P.G.
Water Resources Coordinator
Orange County Department of Environment, Agriculture, Parks and Recreation
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919-245-2513

BIOLOGICAL MONITORING OF THREE STREAMS IN ORANGE COUNTY, NORTH CAROLINA

June 2013

LENAT CONSULTING SERVICES
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RALEIGH, NC 27612
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HOW TO READ THIS REPORT

This is the first report by Lenat Consulting Services (LCS) on water quality of streams in Orange County, outside of the Carrboro and Chapel Hill city limits. Note, however, that LCS annually samples a large number of streams in both Carrboro and Chapel Hill, especially Bolin Creek and tributaries.

Water quality is assessed by sampling an important component of the stream biota – the benthic macroinvertebrates. These are mostly the larvae of aquatic insects, including many groups often imitated by fly-fisherman. Long lists of species are primarily confined to the appendices, but the reader will often find species names used in the discussion, especially in regard to *tolerant* or *intolerant* species. **In order to comprehend many of the summary tables, the reader should understand the terms "EPT taxa richness" and "biotic index", and should understand how bioclassifications are assigned to streams** (see Methods section).

INTRODUCTION

Water quality in **Collins Creek, the East Fork of the Eno River and the West Fork of the Eno River** was evaluated in June 2013 by sampling the benthic macroinvertebrate community. Information is also available from sampling by the NC Division of Water Quality (DWQ) at two sites on Collins Creek in May 2012 and one site on Collins Creek in June 2013. Both DWQ and LCS collected samples from Morgan Creek at NC 54 in May-June 2013. The June 2013 LCS collections followed a period of heavy rain, and all sites had elevated water levels and very turbid water.

Benthic macroinvertebrates, especially aquatic insects, are associated with the substrates of streams, rivers and lakes. This group of aquatic species is especially useful as an indicator of biological integrity.

There are several reasons for using biological surveys in monitoring water quality. Conventional water quality surveys do not integrate fluctuations in water quality between sampling periods. Therefore, short-term critical events may often be missed. The biota, especially benthic macroinvertebrates, reflect both long and short-term conditions. Since many species in a macroinvertebrate community have life cycles of a year or more, the effects of a short-term pollutant will generally not be overcome until the following generation appears.

Macroinvertebrates are useful biological monitors because they are found in all aquatic environments, they are less mobile than many other groups of organisms, and they are small enough to be easily collectable. Moreover, chemical and physical analysis for a complex mixture of pollutants is generally not feasible. The aquatic biota, however, show responses to a wide array of potential pollutants, including those with synergistic or antagonistic effects. Additionally, the use of benthic macroinvertebrates has been shown to be a cost-effective monitoring tool (Lenat 1988). The sedentary nature of the benthos ensures that exposure to a pollutant or stress reliably denotes local conditions, and allows for comparison of sites that are in close proximity (Engel and Voshell 2002).

Analysis of stream life is one way to detect water quality problems (Rosenberg et al 1986). Different kinds of stress will often produce different benthic macroinvertebrate communities. For example, the species associated with organic loading (and low dissolved oxygen) are well known. More recent studies have begun to identify the biological impacts of sedimentation and toxic stress. Identification at, or near, the species level is desirable for many groups of organisms (Resh and Unzicker 1975), and recent work by Lenat and Resh (2001) has shown the benefits of precise taxonomy for both pollution monitoring and conservation biology.

Organisms cannot always be identified at the species level, thus counts of the number of kinds of stream organisms often include identifications at higher levels (genus, family, etc.). Each different type of organism in these situations is called a "taxon" and the plural

form of this word is "taxa". Thus "taxa richness" is a count of the number of different types of organisms.

METHODS

All collection methods are derived from techniques used by the NC Division of Water Quality (Lenat 1988). These methods have been in use by North Carolina since 1982, and have been thoroughly tested for accuracy and repeatability. More details can be found at their web site: http://portal.ncdenr.org/web/wq/ess/bau.

Three of DWQ's collection methods have been used in this study by LCS or DWQ biologists: intensive "Standard Qualitative" collections, more rapid "EPT" collections, and Qual-4 collections. These three methods are briefly described below.

Standard Qualitative Method – Overview [East and West Forks of the Eno River]

The standard qualitative technique (also referred to as "Full Scale" collections) includes 10 separate samples and is designed to sample all habitats and all sizes of invertebrates. This collection technique consists of two kick net samples (kicks), three sweep-net samples (sweeps), one leaf-pack sample, two fine-mesh rock and/or log wash samples, one sand sample, and visual collections. Invertebrates are separated from the rest of the sample in the field ("picked") using forceps and white plastic trays, and preserved in glass vials containing 95% ethanol.

Organisms are picked roughly in proportion to their abundance, but no attempt is made to remove all organisms. If an organism can be reliably identified as a single taxon in the field, then no more than 10 individuals need to be collected. Some organisms are not picked, even if found in the samples, because abundance is difficult to quantify or because they are most often found on the water surface or on the banks and are not truly benthic.

Organisms are classified as Abundant if 10 or more specimens are collected, Common if 3-9 specimens are collected, and Rare if 1-2 specimens are collected.

EPT Method – Overview [Morgan Creek, DWQ samples from Collins Creek in 2013]

The EPT method is a more rapid collection technique, limited to 4 samples: 1 kick, 1 bank sweep, 1 leaf pack and visuals. Furthermore, collections are limited to the most intolerant "EPT" groups: Ephemeroptera, Plecoptera and Trichoptera. Note that the EPT method is a subset of the standard qualitative method described above.

Qual-4 Method – Overview [Collins Creek]

The Qual-4 method uses the same 4 samples as the EPT method, but all benthic macroinvertebrates are collected. DWQ uses this method to evaluate small streams (drainage area < 3 square miles) and assigns ratings based solely on the biotic index values. This method is intended for use, however, only in perennial streams.

Assigning Bioclassifications - Overview

The ultimate result of a benthos sample is a bioclassification. Bioclassifications used by NC DWQ are **Excellent, Good, Good/Fair, Fair** or **Poor** for standard qualitative samples; they are based on both EPT taxa richness and the biotic index values. A score (1-5) is assigned for both EPT taxa richness and the NC biotic index. The final site classification is based on the average of these two scores. In some situations, adjustments must be made for stream size or the season, but such adjustments were not required for this study.

EPT Criteria

The simplest method of data analysis is the tabulation of species richness and species richness is the most direct measure of biological diversity. The association of good water quality with high species (or taxa) richness has been thoroughly documented. Increasing levels of pollution gradually eliminate the more sensitive species, leading to lower and lower species richness. A

score from 1 to 5 is assigned to each site, with 1 for Poor EPT taxa richness and a 5 for Excellent EPT taxa richness (see below).

The relationship of total taxa richness to water quality is nonlinear, as this metric may increase with mild enrichment. Taxa richness for the most intolerant groups (Ephemeroptera + Plecoptera + Trichoptera, EPT S) is more reliable, but must be adjusted for ecoregion. Piedmont criteria were used for this study.

Biotic Index Criteria
To supplement EPT taxa richness criteria, the North Carolina Biotic Index (NCBI) was derived as another (independent) method of bioclassification to support water quality assessments (Lenat 1993). This index is similar to the Hilsenhoff Biotic Index (Hilsenhoff, 1987) with tolerance values derived from the NC database. Biotic indices are based on a 0-10 scale, where 0 represents the best water quality and 10 represents the worst water quality. Abundance values used in the biotic index calculation are 10 for Abundant taxa, 3 for Common taxa, and 1 for Rare taxa. The highest values (>5.1) indicate the worst water quality and receive a score of 5; the lowest values indicate Excellent water quality and receive a score of 1 (see below)

NC Division of Water Quality: Scoring for Biotic Index and EPT taxa richness values for Piedmont streams (Standard Qualitative collections)

Score	BI Values	EPT Values
5	<5.14	>33
4.6	5.14-5.18	32-33
4.4	5.19-5.23	30-31
4	5.24-5.73	26-29
3.6	5.74-5.78	24-25
3.4	5.79-5.83	22-23
3	5.84-6.43	18-21
2.6	6.44-6.48	16-17
2.4	6.49-6.53	14-15
2	6.54-7.43	10-13
1.6	7.44-7.48	8-9
1.4	7.49-7.53	6-7
1	>7.53	0-5

Derivation of Final Bioclassification for Standard Qualitative Samples
For most piedmont streams, equal weight should be given to both the NC Biotic Index value and EPT taxa richness value in assigning bioclassifications. For these metrics, bioclassifications are assigned from the following scores:

Excellent: 5 Good: 4 Good-Fair: 3 Fair: 2 Poor: 1

"Borderline" values are assigned near half-step values (1.4. 2.6, etc.) and are defined as boundary EPT values $\pm$1 (except coastal plain), and boundary biotic index values $\pm$0.05. The two ratings are then averaged together, and rounded up or down to produce the final classification. When the EPT and BI score differ by exactly one unit, the EPT abundance value is used to decide on rounding up or rounding down.

Small Stream Criteria (For Collins Creek)
Small streams (<4 meters wide) are expected to have lower EPT taxa richness relative to larger streams. NC DWQ has developed criteria for small piedmont stream based solely on biotic index values:

Excellent	<4.4
Good	4.4-5.4
Good-Fair	5.5-6.0
Fair	6.1-7.0
Poor	>7.0

FLOW DATA

The fauna of Slate Belt streams in Orange County has been frequently affected by droughts in recent years, with many streams becoming entirely dry during severe droughts. Changes due to water quality problems cannot be discerned without taking into consideration this natural stress. The data below is taken from the USGS web site, using data from 1999 to 2013. The USGS measures daily flow at Morgan Creek at NC 54 and Cane Creek. The Cane Creek site, however, may be affected by the upstream Cane Creek Reservoir, so we show here only the Morgan Creek flow information.

Mean Monthly flow (cfs) in streams most similar to Bolin Creek, 1999-2009.

Morgan Creek nr White Cross (Drainage area 8.3 square miles)

Year	Month: 1	2	3	4	5	6	7	8	9	10	11	12
1999	13	4	5	10	0.9	0.5	0.4	0.09	40	8	7	4
2000	11	15	7	11	3	4	12	4	3	1.3	1.7	2.2
2001	2.4	6	17	12	3	5	1.1	0.6	0.2	0.1	0.1	0.3
2002	7	4	4	2	0.7	0.03	0.04	0.01	0.04	6	4	15
2003	6	20	32	39	11	7	6	3	2	2	2	5
2004	2	8	5	4	3	0.4	0.7	5	7	2	4	3
2005	7	7	15	6	2	0.7	0.3	0.2	0.01	0.2	0.6	7
2006	3	2	2	2	0.7	1.7	5	0.08	0.5	1.9	16	6
2007	13	7	9	12	1.8	0.6	0.2	0.002	0.000	0.008	0.003	0.2
2008	0.4	1.3	9	6	2	0.4	1.6	4	15	0.3	1.4	9
2009	5	3	19	6	3	4	0.4	0.2	0.05	0.05	7.7	18.7
2010	13	21	7	3	4	0.6	0.1	0.02	0.6	0.3	0.6	0.8
2011	0.7	1.4	3	4	1.1	0.1	0.6	0.004	0.01	0.05	0.2	3
2012	2	3	7	3	2	0.5	0.2	0.3	8	0.8	0.5	0.8
2013	2	5	4	3								

Low flows (less than 0.5 cfs) are highlighted in yellow; severe low flows (less than 0.1 cfs) are highlighted in red. Values past September 2012 are median monthly values (not means).

SAMPLING SITES

-Collins Creek (**CC1**), above SR 1006: DWQ, 17 May 2012.

-Collins Creek, NC 54 (**CC2**): DWQ 17 May 2012, LCS 10 June 2013.

-Collins Creek, SR 1539 (Chatham County) (**CC3**), DWQ 04 June 2013.

-Cane Creek, SR 1114 (**Cane**), 17 May 2012.

-Morgan Creek, NC 54 (control site) (**MC**): DWQ 04 June 2013, LCS 29 May 2013.

-East Fork Eno River (just above split of the East and West Forks) (**EF**): LCS 10 June 2013.

-West Fork Eno River (just above split of the East and West Forks) (**WF**): LCS 10 June 2013.

Bold Type indicates the abbreviations used for tables in this report.

All streams are located in the Carolina Slate Belt, an ecoregion characterized by rocky streams and clay soils. The impervious clay soils have limited groundwater storage, with a large proportion of rainfall going directly into streams. This causes very high flows after heavy rainfall, but very low flows during drought conditions.

Table 1A gives data on habitat ratings and substrate composition at the three sites sampled in 2013. The habitat rating is based on standard Division of Water Quality procedures, and produces a value between 0 and 100. All sites had adequate habitat to support a diverse macroinvertebrate community.

Table 1A. Site characteristics, June 2013, Orange County Streams. Habitat Scoring = 0-100

Stream	CM	IH	BS	PV	RH	BSV	LP	RVZW	Total	
Collins Cr	5	15	13	7	12	12	8	10	82	Only 3 meters wide
West Fk Eno R	5	16	13	5	8	12	8	10	77	Infrequent riffles
East Fk Eno R	5	15	11	4	7	12	8	10	72	Infrequent riffles More silt than the West Fork

Habitat Components: CM = Channel Modification (0-5), IH = Instream Habitat (0-20), BS = Bottom Substrate (1-15), PV = Pool Variety (0-10), RH = Riffle Habitats (0-16), BSV = Bank Stability and Vegetation (0-7 for both left and right banks), LP = Light Penetration (0-10), RVZM = Riparian Vegetative Zone Width (0-5 for both left and right banks).

PRIOR BIOLOGICAL DATA

Benthic macroinvertebrates have been collected in Orange County for over 30 years. One of the first publications was a list of species found in Cane Creek, prior to the existence of the Cane Creek Reservoir (Lenat 1983). The NC Division of Water Quality has multiple collections from Orange County, usually either the standard qualitative or EPT samples.

LCS macroinvertebrate collections

There has been extensive biological monitoring of streams within the Carrboro and Chapel Hill city limits. Reports by LCS to the town of Carrboro can be obtained at http://www.townofcarrboro.org/pzi/Env/Water/bcmonitor.htm.
Reports by LCS to the town of Chapel Hill can be obtained at http://www.townofchapelhill.org/index.aspx?page=412.
These reports can also be obtained by contacting David Lenat at Lenatbks@mindspring.com.
There are 5 sites sampled annually on Bolin Creek and over 20 tributary sites.

DWQ macroinvertebrate collections

The following Orange County data are summarized from DWQ Neuse and Cape Fear basin reports. Ratings assigned by the Biological Assessment Unit are given in Excel files that can be downloaded at http://portal.ncdenr.org/web/wq/benthosdata. Basin reports (which are incomplete for some years) can be seen at http://portal.ncdenr.org/web/wq/ess/reports.

-*Morgan Creek at NC 54*: This site was rated as Good or Excellent in 6 samples from 1985 to 2000, with EPT taxa richness of 22-36 for standard qualitative samples; the higher values are from winter and spring samples. Drought conditions from September 2002 to March 2003 caused a sharp decline in EPT taxa richness (2-12) and sampling during another drought in March 2008 also produced low EPT taxa richness (12). In between these low-flow events, the stream usually recovers to Good or Good-Fair conditions, with EPT taxa richness of 18-26. The overall pattern suggests a long-term decline in water quality.

-*Cane Creek, SR 1114*: Samples from 1986 to 1998 usually produced a Good or an Excellent rating, although Good-Fair ratings occurred in the summer of 1993. As with Morgan Creek, higher EPT taxa richness was observed for winter and spring samples. Subsequent samples have produced only Good-Fair ratings, suggesting a decline in water quality.

-*Cane Creek, SR 1100, NC 54, SR 1958.* Single samples from these locations produced Good or Good-Fair ratings, although these samples were from 1984 and 1994.

-*Collins Creek, SR 1539*, Chatham County. This site was rated as Poor in 1986, but received Good-Fair ratings in 1998 and 2003.

-*Sevenmile Creek, SR 1120*. Mostly Good-Fair ratings were observed from 1991 to 2010.
-*West Fork Eno River, SR 1004*. Good-Fair from a single sample in 2007.

-*Eno River, SR 1004*. Good from 1985 to 2000; Good-Fair in 2005 and 2006. Declining water quality?

-*Eno River, SR 1336*. Good-Fair in most years from 1991 to 2006, but only Fair in 2010. This was probably due to drought effects.

-*Eno River, SR 1561*. Good in 2000 and 2005, Good-Fair in 2006.

-*Eno River, SR 1559* (Cabes Ford). This site was sampled 8 times from 1991 to 2006, with 3 Excellent ratings, 5 Good ratings, and one Good-Fair (2005). There is some suggestion of declining water quality as shown be declining EPT taxa richness, but analysis is complicated by the repeated droughts during this period.

-*Eno River at US 70*. Good or Good-Fair in 1988 and 1989, declining to Fair in 1994. This data is too old to evaluate present conditions in this part of the Eno River.

-*South Fork Little River, SR 1558*. Good in 2000 and 2005, Good-Fair in 2010

-*North Fork Little River, SR 1519*. Good-Fair in 2000

-*North Fork Little River, SR 1558*. Good-Fair in 2000, but Good in 1995, 2005 and 2010.

-*New Hope Creek, SR 1730*. Good-Fair in 2003

-*New Hope Creek, SR 1734*. Good in 1993. This site was also sampled in April 2010 by LCS as part of a DOT project on bridge effects (Lenat, 2010), producing a Good rating. This project showed that the lower part of New Hope Creek supported some unusual species, including the highly intolerant caddisflies, *Agapetus* and *Wormaldia*. Further upstream, the fauna was limited by low summer flows. DOT biologists recorded eight mussel species at this site.

The best water quality appears to be in the headwaters of the Little River, some parts of the Eno River and the lower segment of New Hope Creek. A site in one of these areas might be the best "control" for any future work, rather than relying on Morgan Creek. Better results might be obtained by sampling earlier in the year, as most slate belt streams suffer from low summer flows. DWQ biologists will be recommending earlier sample dates for Slate Belt streams, as part of the standard procedures for the collection of basin-wide samples that occur on a 5-year rotation.

A recent (20 June 2013) collection of adult insects from the Little River in Durham County (Boris Kondratieff, Colorado State University) suggested excellent water quality in the Little River just below the North and South Forks. Although final results have not yet been provided, he collected a very rare and intolerant mayfly (*Pseudiron centralis*) at this location, with at least 3 stonefly species. A good diversity of stoneflies (Plecoptera) is also an indication of good water quality.

RESULTS AND DISCUSSION (Table 1, Appendix 1)

Collins Creek. Three sites have been sampled on Collins Creek in 2012-2013: a headwater site above SR 1006 (CC1), a middle site at NC 54 (CC2), and a recovery site downstream in Chatham County (CC3). The NC 54 site is below an area of "biosolids application". A DWQ study (May 2012) assigned a Poor bioclassification to both upstream sites, concluding that "Collins Creek may suffer from organic pollution from upstream sources which may be exacerbated by low summer flows, as well as fluctuations in dissolved oxygen and decreased habitat availability for benthic fauna. Drought conditions in the summer of 2011 likely further stressed the Collins Creek catchment." Possible upstream problems included grazing of Beef cattle, very low summer flows and poor habitat. This portion of Collins Creek had a habitat score of only 63 (out of a possible 100).

The abundance of the tolerant midge *Chironomus* indicated organic loading at both CC1 and CC2 in May 2012. Furthermore, the abundance of the air-breathing snail *Physa* (especialy at CC2) suggested low dissolved oxygen in this segment of the stream. Both sites had low EPT taxa richness (4-5) and a high biotic index. Note that the rating assigned by DWQ to CC2 (Poor) was based on the low EPT taxa richness value; a rating using the biotic index would have produced a Fair rating for this site.

Resampling of Collins Creek (CC2) by LCS in June 2013 still found low EPT taxa richness (4), but with higher EPT abundance and a lower biotic index value compared to the 2012 collections (Table 1). Two intolerant caddisfly species were common in 2013 (*Diplectrona modesta* and *Chimarra* sp.) and there were no species found at CC2 in 2013 that would indicate organic loading. The abundance of *Physa*, however, still suggested some problems with low dissolved oxygen. Based solely on the biotic index value (5.9), CC2 received a Fair rating in 2013 using the new DWQ small-stream criteria. Much of this improvement may be related to better flow conditions (higher rainfall) in the winter and spring of this year.

Sampling at the downstream Chatham County site by DWQ biologists in June 2013 indicated substantial recovery, with an EPT taxa richness of 11. This produced a Fair rating, but it is likely that a more extensive standard qualitative collection would have produced a Good-Fair rating, especially if collections were made earlier in the year.

These data clearly show improving water quality in Collins Creek from upstream to downstream. Although the macroinvertebrate fauna suggests organic loading and low dissolved oxygen as the primary problems, the culprit does not appear to be the application of biosolids. The composition of the macroinvertebrate community indicated substantial improvement between 2012 and 2013, although much of this change may be due to better (higher) flow conditions in winter and spring of 2013.

East Fork Eno River. The East Fork of the Eno River was sampled just above the confluence of the East and West Forks. Although there was good flow at this site in June 2013, the faunal composition suggested that this site may not have sufficient flow to support a diverse macroinvertebrate community during typical summer months. There have been no prior benthic macroinvertebrate collections in this segment of the Eno River catchment. Based primarily on a relatively low EPT taxa richness (8), this site was assigned a Fair bioclassification. The biotic index was within the Good-Fair range, but low EPT abundance resulted in the overall Fair rating. Infrequent riffles, a high silt load and low summer flows probably influenced this rating more than any water quality problems. The scarcity of filter-feeding species (which are flow-dependent) at this site supported the hypothesis that the fauna of the East Fork is limited by low flows during part of the year. Groups which are less flow-dependent were fairly diverse at this site, with 10 odonates (dragonflies/damselflies), 17 midge species and 5 molluscs. One of the dragonflies collected here, *Dythemis velox*, is rarely seen in DWQ's stream samples. Note that sampling earlier in the year (February-April) might produce a higher rating.

West Fork Eno River. The West Fork of the Eno River had had one prior DWQ collection in July 2007. This collection was limited to EPT species and produced a Good-Fair rating. Like the East Fork samples (see above), the LCS collection in June 2013 produced a Fair rating for the West Fork.

Water quality at this site appeared to be better than the East Fork site, with higher EPT taxa richness (10 vs. 8) and a lower biotic index (5.9 vs. 6.2). As with the East Fork, the EPT taxa richness is in the Fair range, while the Biotic Index is in the Good-Fair range. The data is too limited at this time to determine if there has been a true decline in water quality for the West Fork between 2007 and 2013; the repeated summer droughts in recent years might be responsible for this change in bioclass.

Comparisons of LCS and DWQ collections. Both groups collected an EPT sample at Morgan Creek at NC 54 in the spring of 2013: May 29 for LCS, June 05 for DWQ. The macroinvertebrate community is changing very rapidly even during this short time period, with emergence of winter species and hatching of summer species. However, the results were very close, with 17 EPT species in the LCS collections and 18 EPT species in the DWQ collections. This suggests that both groups are producing very comparable results.

Review of data (especially DWQ collections) in other parts of Orange County. Orange County has a significant number of streams with a Good or Excellent rating, although many of these sites are vulnerable to development pressures. Due to the “Slate Belt” geology found in most parts of Orange County, most of the smaller streams are limited by low summer flows, especially during the frequent droughts recorded in recent years. This interaction between geology and flow has caused many supposedly perennial streams in Orange County to act as intermittent streams, with the greatest diversity of benthic macroinvertebrates in winter and early spring. DWQ staff has struggled with this problem, and has started to sample the Slate Belt streams outside of the usual summer months. In 2013, they scheduled sampling of such Slate Belt streams in June, but a review of these collections suggests that an even earlier collection (February-April) might give more reliable results. I would suggest that any future benthos sampling in Orange County might also wish to schedule collections earlier in the year, after consultation with the staff of DWQ’s Biological Assessment Unit.

Morgan Creek at NC 54 has often been used as a reference site for sampling in Orange County, but a review of data from this site suggests a long-term decline in water quality, probably due to upstream development, combined with summer low-flow problems. More reliable results might be obtained by sampling in the headwaters of the Little River or lower New Hope Creek. Portions of the Eno River also have Good bioclassifications. A program to monitor the areas of best water quality would generate useful information, as these areas may require special efforts to preserve their high water quality as development spreads outward from our urban centers.

Table 1. Taxa richness** by group and summary parameters, Orange County streams, Spring samples 2012-2013. CC = Collins Creek, Cane = Cane Creek, MC = Morgan Creek, EF = East Fork Eno River, WF = West Fork Eno River.

Date:	5/12	5/12	6/13	6/13	5/12	5/13	6/13	6/13	6/13
Collector	DWQ	DWQ	LCS	DWQ	DWQ	LCS	DWQ	LCS	LCS
Sample Type:	Qual-4	Qual-4	Qual-4	EPT	Full	EPT	EPT	Full	Full
Site:	CC1	CC2	CC2	CC3	Cane	MC	MC	EF	WF
Ephemeroptera	0	1	0	5	6	11	11	3	3
Plecoptera	1	1	1	1	1	1	1	1	0
Trichoptera	2	2	3	5	2	5	6	4	7
Coleoptera	4	6	4		7			5	4
Odonata	2	2	0		2			10	5
Megaloptera	0	0	0		3			3	3
Diptera: Misc.	3	5	2		5			5	3
Diptera: Chironomidae	7	9	13		13			17	16
Oligochaeta	2	1	5		1			3	2
Crustacea	3	3	2		3			3	3
Mollusca	3	3	1		6			5	4
Other	1	1	3		1			2	1
Total Taxa Richness	28	34	34	-	50	-	-	61	50
EPT Taxa Richness	5	4	4	11	9	17	18	8	10
EPT Abundance	7	13	26	44	42	89	92	30	41
NC Biotic Index	7.2	6.5	5.9	-	5.7*	-	-	6.2	5.9
Rating	Poor	Poor	Fair	Fair	G-F	G-F	G-F	F	G-F

DWQ = NC Division of Water Quality, LCS = Lenat Consulting Services, G-F = Good-Fair. See Methods section for an explanation of Sample Type; see Sampling Sites for more details on site location.
*Seasonally corrected.
**Taxa richness is a count of the number of different kinds of organisms; "EPT" refers to the group of most intolerant species (Ephemeroptera. Plecoptera and Trichoptera).

REFERENCES

Engel, S.R. & J.R. Voshell, Jr. 2002. Volunteer Biological Monitoring: Can it accurately assess the ecological condition of streams? American Entomologist 48 (3): 164-177.

Hilsenhoff, W.L. 1987. An improved biotic index of organic stream pollution. Great lakes Entomologist 20: 31-39.

Lenat, D.R. 1983. Benthic macroinvertebrates of Cane Creek, North Carolina, and comparisons with other southeastern streams. Brimleyana 9: 53-68.

Lenat, D.R. 1988. Water quality assessment of streams using a qualitative collection method for benthic macroinvertebrates. Journal of the North American Benthological Society 7: 222-233.

Lenat. D.R. 1993. A biotic index for the southeastern United States: derivation and list of tolerance values, with criteria for assigning water quality ratings. JNABS 12: 279-290.

Lenat, D. R. 2010. Comparisons of benthic macroinvertebrates collected upstream and downstream of bridges in the coastal plain, piedmont and mountains of North Carolina, March-April 2010. Lenat Consulting Services, report to NC DOT.

Lenat, D.R. and V.H. Resh. 2001. Taxonomy and stream ecology - The benefits of genus and species-level identifications. Journal of the North American Benthological Society, in press.

North Carolina Division of Water Quality. 2013. Memo: Results of macroinvertebrate assessments investigating effects of biosolids applications on Collins Creek and general wate quality in the Cane Creek watershed, Orange County, NC, HUC 003030002.

Rosenberg, D. M., H. V. Danks, and D. M. Lehmkuhl. 1986. Importance of insects in environmental impact assessment. Environmental Management 10: 773-783.

Appendix 1. Benthic macroinvertebrates collected from Orange County streams, May-June 2013 . R=Rare, C=Common, A=Abundant.

Site:	CC2	CC3	MC	MC	EF	WF
Collector:	LCS	DWQ	LCS	DWQ	LCS	LCS
Method:	Qual4	EPT	EPT	EPT	Full	Full
EPHEMEROPTERA						
Maccaffertium modestum	-	R	A	A	A	C
Stenonema femoratum	-	R	A	C		
Stenacron interpunctatum	-	C	A	A	A	A
Stenacron pallidum	-	C	R	R	-	-
Leucrocuta aphrodite	-	-	A	A	-	-
Baetis flavistriga	-	-	C	A	-	-
Baetis pluto	-	A	-	C	-	-
Plauditus dubius gr	-	-	R	-	-	-
Caenis spp	-	-	C	R	-	-
Eurylophella doris	-	-	-	-	-	R
Paraleptophlebia sp	-	-	C	R	-	-
Habrophlebia sp	-	-	C	C	-	-
Isonychia sp	-	-	-	C	-	-
Hexagenia sp	-	-	R	-	R	-
PLECOPTERA						
Perlesta spp	A	A	A	A	R	-
TRICHOPTERA						
Cheumatopsyche spp	A	A	A	A	C	A
Hydropsyche betteni	-	R	R	C	R	C
Diplectrona modesta	C	-	-	-	-	-
Chimarra spp	C	C	A	A	-	A
Lype diversa	-	-	-	-	-	R
Oecetis persimilis	-	-	-	-	C	-
Mystacides sepuchralis	-	-	-	-	-	R
Ceraclea sp (pupa)	-	R	-	-	-	R
Neophylax oligius	-	-	R	R	-	-
Neophylax Atlanta	-	-	-	R	-	-
Pycnopsyche lepida gr	-	-	-		R	R
Pycnopsyche sp	-	-	-	R	-	-
Anisocentropus pyraloides	-	-	C	-	-	-
Hydroptila sp	-	R	-	-	-	-
COLEOPTERA						
Macronychus glabratus	-				C	-
Dubiraphia sp	-				R	-
Stenelmis crenata	C				-	-
Helichus spp	A				R	C
Agabus sp	R				-	-
Neoporus spp	A				C	A
Neoporus mellitus gr	-				-	R
Dineutus sp	-				A	C

	CC2 LCS Qual4	EF LCS Full	WF LCS Full
ODONATA			
Argia spp	-	R	-
Gomphus sp	-	A	R
Dromogomphus spinosus	-	R	-
Stylogomphus albistylus	-	-	C
Macromia sp	-	C	C
Dythemis velox	-	R	-
Libellula sp	-	R	-
Somatochlora sp	C	R	-
Sympetrum spp	-	R	-
Baesiaeschna janata	-	C	R
Boyeria vinosa	-	C	R
MEGALOPTERA			
Sialis sp	-	A	A
Nigronia serricornis	-	R	R
Corydalus cornutus	-	R	A
DIPTERA: MISC.			
Hexatoma sp	-	C	C
Tipula spp	C	C	C
Palpomyia complex	-	R	A
Simulium spp	C	R	-
Anopheles sp	-	R	-
DIPTERA: CHIRONOMIDAE			
Ablabesmyia mallochi	-	C	R
Conchapelopia group	A	A	C
Clinotanypus pinguis	-	R	R
Natarsia sp	R	-	-
Procladius sp	-	R	-
Brillia sp	-	-	R
Parametriocnemus lundbecki	A	-	C
Rheocricotopus robacki	-	R	-
Tvetenia bavarica gr	C	-	-
Xylotopus par	-	R	-
Cryptochironomus spp	R	-	C
Dicrotendipes simpsoni	R	-	-
Dicrotendipes fumidus	-	R	-
Microtendipes spp	C	A	C
Paratendipes sp	-	R	R
Phaenopsectra spp	-	A	-
Phaenopsectra flavipes gr.	R	-	R
Polypedilum flavum	A	C	A
Polypedilum aviceps	-	-	C
Polypedilum illinoense	-	R	R
Polypedilum fallax	R	-	-
Polypedilum scalaenum	-	-	R
Stenochironomus sp	-	C	-
Tribelos sp	-	A	-
Micropsectra sp	R	-	-
Paratanytarsus sp	C	R	C
Rheotanytarsus spp	C	C	C
Tanytarsus spp	-	C	C

	CC2 LCS Qual4	EF LCS Full	WF LCS Full
OLIGOCHAETA			
Limnodrilus spp			
(hofmeisteri)	R	-	-
Nais spp	R	-	-
Lumbriculidae			
Lumbriculus variegatus	A	C	C
Ecclipidrilus spp	R	-	-
Megadriles	C	R	C
Cambarinicolidae	-	C	-
CRUSTACEA			
Crangonyx spp	-	-	C
Hyallela azteca	-	A	C
Caecidotea sp	R	-	-
Cambarus spp	R	A	-
Procambarus acutus	-	R	A
MOLLUSCA			
Campeloma decisum	-	R	R
Physa spp	A	C	-
Helisoma anceps	-	A	R
Micromenetus dilatatus	-	R	-
Sphaerium spp	-	R	A
Corbicula fluminea	-	-	A
OTHER			
Hirudinea			
Placobdella parasitica	-	R	-
Helobdella elongata	R	-	-
Hemiptera:			
Corixidae	R	-	-
Belostoma sp	R	-	-
Hydracarina	-	A	A

Painter, Andy

From: Pete Varvaris <peter.varvaris@gmail.com>
Sent: Friday, January 31, 2014 8:17 PM
To: Painter, Andy
Subject: Draft 2014 303(d) list

Categories: 2014 303d comment

First, I want to express my thanks for the state and federal governments' inspections and monitoring of our water resources. I'm generally a free enterprise person who believes in limited government, but environmental protection is one of the many areas of needed and very helpful government regulation and oversight. I think it is very important that we not permit anyone to pollute the very water ways that we all rely on for drinking water and other uses.

I don't have a particular issue other than to say that it seems like Lake Norman is not as clean as it should be. I don't know what the sources of pollution are, if any, but it seems to me like that is a major water resource for recreation but also, mainly, for drinking, cooking, etc. Anything that can be done to clean it up, and/or prevent people or companies from polluting Lake Norman and the entire Catawba River basin, would be very important to me.

Thank you for the work you do.

Sincerely,

Pete Varvaris

Statesville, NC
704-928-5391

Painter, Andy

From: Frank Harris <frank@sykessupply.com>
Sent: Monday, February 03, 2014 9:47 AM
To: Painter, Andy
Subject: Shallotte River

Categories: 2014 303d comment

Mr. Painter,
I have a home on the river's west side. The shellfish signs are constantly moving back and forth and seem to be trending towards the ICW. The water quality does not seem to have declined over the past 15 years. I realize that the signs are for everyone's safety and provide a necessary source of income for a few locals.
Please add the Shallotte River to your list of areas to test the water quality in hopes that the shellfishing area will be enlarged.

J Frank Harris
Sykes Supply Company
336.227.2723
Frank@sykessupply.com

Painter, Andy

From: Ben Peierls <peierls@unc.edu>
Sent: Monday, February 03, 2014 6:33 PM
To: Mcnutt, Cam
Cc: Painter, Andy
Subject: Comment 2014 draft 303d assessments

Categories: 2014 303d comment

Cam (and Andy),

Thanks again for speaking with me earlier today, Cam.

I wanted to make an official comment on the 2014 draft 303d assessments based on the Neuse River Estuary fact sheet you sent me.

For AU 27-(104)b, it appears that the ModMon data at station J8925000 (ModMon station 100) were not included. There were 106 samples, of which
7 were > EL for chlorophyll a.

Also, I had another question regarding AU delineation. Do you know the background or have a document that references the original creation of the AUs on the Neuse Estuary? They are not quite the same as the Use Support Areas in the TMDL, although there are some similarities.

Thank you very much.

Ben

--
Benjamin L. Peierls, Ph.D.
University of North Carolina at Chapel Hill Institute of Marine Sciences
3431 Arendell Street
Morehead City, NC 28557
VOICE: 252-726-6841 x135
FAX: 252-726-2426
peierls(at)unc.edu

Painter, Andy

From: Bill Freyer <bill.freyer@gmail.com>
Sent: Wednesday, February 05, 2014 8:36 AM
To: Painter, Andy
Subject: Water quality assessment list - public comment

Categories: 2014 303d comment

Mr. Painter

I live on the Shallotte River on Shell Point Rd. I have seen the line for no shell fishing gradually move down the river toward the Intracoastal Waterway. I no longer can clam or harvest oysters in front of my house. I would like to see the water quality of the Shallotte River improve so we can enjoy the river.

Regards,

Bill&Toni Freyer

Painter, Andy

From: jennell.harris@gmail.com
Sent: Wednesday, February 05, 2014 11:53 AM
To: Painter, Andy
Subject: Water quality

Follow Up Flag: Follow up
Flag Status: Completed

Categories: 2014 303d comment

The Shallotte River has been our vacation home since 2000. We have watched the oyster beds increase beside our pier. We have enjoyed clamming over the years on a sandbar. Increasingly, the river is filling with silt on the Shell Point road side. We are wondering about the Wildlife folks continually closing our area to clamming etc. What plans are being made to check our water quality and to dredge ? Each year we see the porpoises in front of our house and have felt, they would not swim so far upriver if the quality is poor. How can we help with providing insight into our river concerns.

Sincerely,
Jennell H. Harris

Sent from my iPad

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Public Works Department
101 CITY HALL PLAZA | DURHAM, NC 27701
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March 11, 2014

Mr. Andy Painter
Planning Section
NC Division of Water Resources
1617 Mail Service Center
Raleigh, NC 27699-1617

Dear Mr. Painter

The City of Durham Stormwater & GIS Services Division of the Public Works Department is pleased to provide comments on the draft 2014 303(d) List. This list was provided for public notice on January 23, 2014. As a National Pollutant Discharge Elimination System (NPDES) Phase I municipality, the City of Durham is required to develop implementation plans for each surface water with a US Environmental Protection Agency (EPA) approved TMDL. Thus, it is important for the City to review and verify any new surface water/pollutant combination appearing on the 303(d) list, including the justification and methodology for including assessment units on the list.

The Stormwater & GIS Services Division advocates for the availability of lists of impaired waters with and without TMDLs on the NC Division of Water Quality (DWQ) web site. New development in the city of Durham is required to install stormwater control measures to meet nutrient management strategy requirements, water supply watershed requirements, and to minimize loads to impaired stream segments. By publishing all impaired stream segments, whether or not a TMDL is required, our development community is able to access the relevant information with a minimum of effort.

The Stormwater & GIS Services Division believes that the listing for Third Fork Creek for hardness is incorrect and that it should be removed from the list of impaired waters. Assessment unit 16-41-1-12-(1) , Third Fork Creek from source to a point 2.0 miles upstream of NC Highway 54, was already included on the 2010 and 2012 303(d) lists for low dissolved oxygen and elevated zinc, however hardness was added in 2014. There are two problems with the methodology for including hardness on the 303(d) list: the length of the impaired segment and the application of the water supply criteria.

1. Length of impaired segment. The monitoring data were collected at Highway 55 south of North Carolina Central University at a DWR RAMS monitoring location during 2007 and 2008 (B2970000). This location is approximately 5 miles upstream of the bottom of the assessment unit. Another stream of equal size merges with the monitored stream approximately 1.2 miles downstream of the RAMS monitoring location, with yet another major tributary merging into Third Fork Creek approximately 4.5 miles downstream of the monitoring location. A new, shorter, assessment unit is warranted since the hydrology is significantly modified by additional inflow twice between the monitoring location and NC

Highway 54. A shorter assessment unit is consistent with long-standing practices in the use support methods from previous basinwide management plans. (The current 303(d) methodology lacks information on the methods to determine the size or length of assessment units.)

2. Application of water supply criteria. The monitoring location at NC Highway 55 is located in a part of the creek that was subsequently reclassified from C NSW to WS-V NSW as part of the Jordan Lake Nutrient Management Strategy rules. Therefore, this location is subject to Session Law 2012-187, Section 12.1. This provision states the following:

   > Rules adopted by the Environmental Management Commission pursuant to S.L. 2009-216 and S.L. 2009-486 to implement nutrient management strategies for the B. Everett Jordan Reservoir and the Falls of the Neuse Reservoir watersheds **shall not be interpreted to apply surface water quality standards set out in 15A NCAC 2B .0218(3)(e) through (3)(h) to waters designated in the nutrient management rules as WS-V** except where: (i) the designation of WS-V is associated with a water supply intake used by an industry to supply drinking water for their employees; or (ii) standards set out in 15A NCAC 02B .0218(3)(e) through (3)(h) are violated at the upstream boundary of waters within those watersheds that are classified as WS-II, WS-III, or WS-IV. This section shall not be construed to alter the nutrient reduction requirements set out in 15A NCAC 2B .0262(5) or 15A NCAC 2B .0275(3).

   The hardness criteria should not be applied to a waterbody reclassified to WS-V as part of the Jordan Lake NMS rules unless standards are violated at the upstream boundary of waters classified WS-I through WS-IV. The City of Durham believes this was an error on DWR's part, which potentially began with the assignment of an unusually long assessment unit that extends to the WS-IV boundary.

The City of Durham Public Works Department continues to be engaged in water quality issues raised at the state level. We appreciate the opportunity to provide comments to NCDWR, and are very encouraged that NCDWR has incorporated EMC review of the 303(d) listing methodology and the list to be submitted to the US Environmental Protection Agency. If you have any questions about these comments, please contact me at (919) 560-4326 ext. 30219 or John Cox at extension 30212.

Sincerely,

Michelle Woolfolk
Civil Engineer III

c: Paul Wiebke, Assistant Director of Public Works
Marvin Williams, Director of Public Works
Vicki Westbrook, Deputy Director of Water Management
Don O'Toole, Senior Assistant City Attorney

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February 18, 2014

Ms. Kathy Stecker
Chief, Modeling and Assessment Branch
Water Quality Planning Section
North Carolina Division of Water Resources
1611 Mail Service Center
Raleigh, NC 27699

Subject: Request for reassignment of Northeast Creek to Category 4c of the 303 (d) list for dissolved oxygen; and supplemental information for sources of sediment loads to assist with development of a turbidity TMDL

Dear Ms. Stecker:

Thank you for meeting with Stormwater & GIS Services on June 27, 2013 to discuss the water quality modeling project for Northeast Creek in the City of Durham. At this meeting, we discussed the modeling results which indicate that the dissolved oxygen impairment in Northeast Creek can be attributed to hydromodification and low base flows that are common in the Triassic basin. Since water quality parameters were not found to be the cause of low dissolved oxygen in the segment of Northeast Creek within the City of Durham, we would like to request reassignment of Northeast Creek to category 4c on the 2014 303 (d) list.

I have also included a final modeling report for PCSWMM that shows the TSS source loads by jurisdiction, upland, stream bank erosion, or point sources as discussed in the meeting. City hopes that this information will inform any future regulatory decision-making (e.g., TMDL development for turbidity) by NCDWR in the Northeast Creek segment within the City of Durham.

This project represents another successful partnership between local and state government officials in developing a robust model that informs an effective strategy to improve water quality in North Carolina. Thank you for considering this request. I have attached a copy of the meeting summary from June 27, 2013 and a final copy of the dissolved oxygen modeling report. In the final report, we have incorporated all

suggestions and changes that were discussed during the meeting or provided during the review period by your team.

If you have any questions, you can contact me at 919-560-4326 ext. 30271 or by email at sujit.ekka@durhamnc.gov or Michelle Woolfolk at 919-560-4326 ext. 30219 or by email at michelle.woolfolk@durhamnc.gov.

Sincerely,

Sujit Ekka, PE, PH
Civil Engineer III
Stormwater & GIS Services Division

c: Michelle Woolfolk, Assistant Water Quality Manager, City of Durham
Paul Wiebke, Assistant Director of Public Works, City of Durham
Adugna Kebede, Senior Environmental Specialist, Water Quality Planning Section, NC Division of Water Resources

Painter, Andy

From: Calamita, Paul <paul@aqualaw.com>
Sent: Thursday, February 20, 2014 10:29 PM
To: Painter, Andy
Cc: Stecker, Kathy
Subject: Listing Methodology Rational
Attachments: NCWQA Comments on 2014 List and Methodology.doc

Categories: 2014 303d comment

Mr. Painter:

I hope you are doing well.

More than a year ago, the NCWQA members communicated with DWR staff to understand the changes which DWR was contemplating regarding the State's 303(d) listing methodology. Local governments across NC are affected by impaired waters in terms of wastewater and stormwater obligations as well as impacts on community growth and development. In addition to discussions with DWR officials, we have also consulted materials from USEPA and other leading State water agencies to aid our understanding.

DWR's rationale for its listing methodology and 2014 list is embodied in a number of technical memos, guidances, discussions, and presentations, especially during the past two years as part of the EMC's consideration of these issues. Because DWR's rationale affects each listing, we want to ensure that we understand the methodology's technical and policy underpinnings. Accordingly, the NCWQA members have developed the attached summary of our understanding of DWR's rationale and policy decisions embodied in the methodology and 2014 list. We ask that DWR respond to our summary by letting us know if any aspect of our understanding is incorrect. In essence, we ask DWR to go on the record and provide the Department's concurrence in our understanding of the methodology/2014 list rationale/basis.

We believe the recent enhancements to the Department's approach warrant having DWR develop a consolidated and updated rationale document for its methodology and 2014 list. If that is not possible at this time, our summary (as DWR may correct it in the Department's response to comments) may serve as an interim consolidation document available to all stakeholders to facilitate their understanding of these highly technical and challenging issues.

Thank you for considering our summary of the Departments methodology/2014 list rationale and our request for DWR's concurrence with our understanding or clarifications should our understanding be either incorrect or incomplete on any material aspect. We also ask that our comments/summary be shared with the EMC members.

Best,

Paul Calamita
General Counsel
NCWQA

NORTH CAROLINA WATER QUALITY ASSOCIATION

Understanding of DWR's Technical Rationale Behind the North Carolina 2014 303(d) Listing Methodology

In the 2014 303(d) Listing Methodology, the North Carolina Division of Water Resources ("DWR") adopted a nonparametric hypothesis testing approach based on the binomial distribution for use in assessing numeric water quality criteria for chlorophyll-*a*, dissolved oxygen, methylene blue active substances ("MBAS"), mercury, nitrate/nitrite, pH, temperature, toxic substances, and turbidity. This document is intended to memorialize our understanding of the Department's rationale for its updated listing methodology. We ask that the Department include this as a formal comment on the listing methodology and 2014 303(d) list that will be sent to USEPA. We expressly ask the Department to respond to this comment by stating with specificity should the Department disagree with any aspect of our understanding of the Department's rationale.

While the Department and EMC members have articulated their views on the 10% provision for many years and more recently the 90 percent confidence level and minimum sample size, we believe it will facilitate public understanding of these concepts if the Department pulls its rationale into one consolidated technical document. If the Department concurs in our memorialization of the rationale, we ask that DWR endorse our understanding in the response to comments. Moreover, we believe that all stakeholders could benefit from a consolidated summary of the Department's listing rationale. Accordingly, we urge DWR to publish on its website either this document or a document developed by DWR that explains its rationale.

Our understanding is that for these parameters, an assessment unit will be listed as impaired (Exceeding Criteria-Category 5) when three criteria are all met:

- Greater than 10% of the data exceed the criteria
- With at least a 90% statistical confidence level, and
- The sample size exceeds nine.

The following summarizes our understanding of DWR's rationale in selecting this assessment methodology and DWR's demonstration that this methodology (1) properly identifies those waters that are not reasonably anticipated to attain water quality standards, (2) is accurate and scientifically defensible, and (3) properly implements North Carolina's EPA-approved water quality standards.

In determining whether water quality data support an impairment listing, two distinct issues are addressed by DWR's assessment methodology. First, DWR has assigned a probability value of p_o=10% to account for uncertainties with respect to data quality as well as extreme conditions and variability; the probability value represents the maximum proportion of samples that may exceed the applicable water quality for the water not to be deemed to be actually impaired. Second, DWR has assigned a confidence level of α=90% to address whether the available data upon which the listing decision will be based are sufficiently representative of water quality conditions in the assessment unit as a whole.

DWR uses the binomial method to address the reality of limited data quantity and quality by using statistical analyses to identify persistent exceedances likely to indicate actual water quality violations in the ambient water. "The assessment challenge is to interpret the limited amount of sample data to determine whether an apparent violation of standards warrants listing a segment as impaired,"[1] and DWR's assessment methodology allows it to do so in what we consider to be an accurate, reasonable, statistically-sound manner.

I. Explanation of Binomial Distribution Method and Comparison to the Raw Score Method

For the 2014 303(d) listing cycle, we understand that DWR is transitioning from a "raw score" to a "binomial distribution" assessment methodology. DWR previously employed a raw score assessment methodology, which EPA has recommended for conventional pollutants, pursuant to which a water will be listed as impaired "when more than '10% of measurements exceed the water quality criterion.'"[2] The National Research Council has recommended that EPA endorse statistical approaches, such as the binomial hypothesis test, "that can more effectively make use of the data collected to determine water quality impairment than does the raw score approach."[3] Beginning with the 2014 303(d) listing cycle, we understand that DWR is employing the binomial method in order to explicitly manage error rates, reduce false-positive errors, take into account sample sizes, establish the confidence level associated with the assessment, and address sampling and analytical errors and non-representative sampling bias.

A. Statistical Methodology

In conducting water quality assessments, DWR uses hypothesis testing in which the water's true exceedance probability for the pollutant (p) is compared with the probability value for allowable

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[1] Eric P. Smith, et al., *Statistical Assessment of Violations of Water Quality Standards under Section 303(d) of the Clean Water Act*, 35 ENVTL. SCI. & TECH. 606, 607 (2001), *available at* http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303d_policydocs/297.pdf.

[2] EPA, Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 3014 of the Clean Water Act at 39 (July 29, 2005) (*quoting* EPA, Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates (Sept. 1997); EPA, Consolidated Assessment and Listing Methodology – Toward a Compendium of Best Practices (July 2002)), *available at* http://www.epa.gov/owow/tmdl/2006IRG/report/2006irg-report.pdf.

[3] National Research Council, ASSESSING THE TMDL APPROACH TO WATER QUALITY MANAGEMENT at 61 (2001), *available at* http://www.nap.edu/openbook.php?isbn=0309075793.

exceedances (p_o = 0.10).[4] The null hypothesis (H_o) is that the water is not impaired for the pollutant at issue, while the alternative hypothesis (H_1) is that the water is impaired. The null and alternative hypotheses are respectively expressed as:

$$H_o: p \leq p_o \text{ or } p \leq 0.10$$

$$H_1: p > p_o \text{ or } p > 0.10$$

DWR will only designate a water as being impaired if it accepts H_1: $p > 0.10$ at the 90% confidence level.

Water quality data can be expressed in terms of a binomial distribution, in which pollutant concentration samples are assigned *yes*/*no* dichotomous responses.[5] Each sample for a specific pollutant is expressed as one of two possible alternatives: either "*yes*, the measurement exceeds the numeric criterion," or "*no*, the measurement does not exceed the numeric criterion."[6] The binomial distribution depends on sample size (n) and the true exceedance probability (p). The total number of *yes* responses is represented by a binomial random variable (x).

The exceedance probability cannot be known with 100% certainty because it depends on the unknown pollutant distribution. Therefore, it must be estimated. The sample proportion of *yes* ($\hat{p} = X/n$) is considered the best point estimator of the true exceedance probability because it is the unbiased estimator with the lowest variance. However, because $\hat{p}$ is a random variable that varies among samples, "[m]odern statistics strongly recommends the use of a confidence interval estimation approach that takes into account the variability of the estimator."[7] This approach "allows us to incorporate our uncertainty in the true parameters of the distribution into our comparison to the regulatory standard."[8] The confidence interval approach yields identical results to the hypothesis testing approach.[9]

Nonparametric confidence limits on the 90th percentile of a distribution may be defined by calculating the cumulative binomial distribution ($Bin(x; n, p)$) for the dataset.[10] The cumulative binomial distribution is represented by the following formula:[11]

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[4] Eric P. Smith, et al., *Statistical Assessment of Violations of Water Quality Standards under Section 303(d) of the Clean Water Act*, 35 ENVTL. SCI. & TECH. 606, 607 (2001). For the reasons explained in Part II below, DWR has assigns a probability value of 10% allowable exceedances for most numeric water quality criteria.
[5] Pi-Erh Lin, et al., *A Nonparametric Procedure for Listing and Delisting Impaired Waters Based on Criterion Exceedances* at 3 (Oct. 2000), *available at* http://www.dep.state.fl.us/water/tmdl/docs/Supdocument.PDF.
[6] *See id*.
[7] *Id*. at 4.
[8] Robert D. Gibbons, *A Statistical Approach for Performing Water Quality Impairment Assessments Under the TMDL Program*, 39 J. AM.WATER RESOURCES ASS'N 841-49 (Aug. 2003), *available at* http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303d_policydocs/202.pdf.
[9] Pi-Erh Lin, et al., *A Nonparametric Procedure for Listing and Delisting Impaired Waters Based on Criterion Exceedances* at 6-7 (Oct. 2000), *available at* http://www.dep.state.fl.us/water/tmdl/docs/Supdocument.PDF.
[10] *See*, Robert D. Gibbons, *A Statistical Approach for Performing Water Quality Impairment Assessments Under the TMDL Program*, 39 J. AM.WATER RESOURCES ASS'N 841-49 (Aug. 2003), *available at* http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303d_policydocs/202.pdf.

$$Bin(x; n, p) = \sum_{i=0}^{x} \binom{n}{i} p^i (1-p)^{n-1}$$

where $\binom{n}{i}$ denotes the number of combinations of n samples taken i at a time, and $\binom{n}{i} = \frac{n!}{i!(n-i)!}$.

This equation yields the cumulative binomial probability that a population with a given exceedance probability (here, p=10%) will have x violations out of a sample size of n.[12] Binomial probabilities can be calculated using the Microsoft Excel BINOMDIST or BINOM.DIST functions.[13]

The binomial method is applied to determine the number (critical value) of exceedances of water quality standards necessary to reject the null hypothesis and list the waterbody as impaired for a given sample size. In applying the binomial method for water quality assessment, the cumulative binomial probability is compared to the desired confidence level (here 90%). For a given sample size, the number of exceedances (x), corresponding to the lowest cumulative binomial probability greater than or equal to the confidence level, is the critical value.[14] Where x values are greater than or equal to the critical value, the water is deemed impaired. For the closest cumulative binomial probability value below the 90% confidence level, the corresponding x value is the maximum number of exceedances for that sample size for which the waterbody will not be listed as impaired.[15]

In comparison to the raw score method, the binomial method requires a slightly higher percentage of samples to exceed the water quality standard in order for a water to be listed as impaired. The difference in required percent exceedances between the binomial and raw score methods decreases with increased sample size. We understand that DWR has determined that it is reasonable to require a stronger showing of impairment by way of a slightly higher percentage of exceedances where fewer data points are available, in order to ensure that exceedances in a small data set truly reflect impaired conditions in the waterbody.

Beyond the statistics, we believe DWR's conclusion is supported by several practical factors. First, impaired waters determinations are required to be made every two years; typically, at each new assessment point, newer and/or additional data are available to add to the database for a segment and bolster the power of the statistical determination of standards attainment or non-attainment. Note that DWR typically uses a five-year data set for 303(d) determinations. Second, in addition to the new and/or additional data, the exercise of this biannual reevaluation

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[11] *Id.*
[12] *Id.*
[13] *See* Microsoft Office, BINOM.DIST Function, http://office.microsoft.com/en-us/excel-help/binom-dist-function-HP010335671.aspx; Microsoft Office, BINOMDIST, http://office.microsoft.com/en-us/excel-help/binomdist-HP005209005.aspx.
[14] *See*, Robert D. Gibbons, *A Statistical Approach for Performing Water Quality Impairment Assessments Under the TMDL Program*, 39 J. AM.WATER RESOURCES ASS'N 841-49 (Aug. 2003), *available at* http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303d_policydocs/202.pdf.
[15] *See* Pennsylvania Department of Environmental Protection, Chemistry Statistical Assessments at 8, *available at* http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/Methodology/ChemistryEvaluations.pdf.

of standards attainment itself subjects segments to repeated evaluations and opportunities for 303(d) listings, and the practicalities are that, once listed, a segment will be difficult to remove, and it will eventually receive more intense data review by virtue of the TMDL process.

To ensure our understanding of DWR's methodology, we have prepared Table 1 below, which shows the minimum number of exceedances required to list a water as impaired using the binomial method with a 10% probability value and 90% confidence level, as compared to the raw score method with a straight 10% exceedance value, at sample sizes between ten (the minimum sample size required by DWR's assessment methodology) and one hundred.

Table 1: Minimum Number of Exceedances Required to List Waters as Impaired (Critical Value) Using the Binomial Method and Raw Score Method

Sample Size	Critical Value	
	Binomial Method	Raw Score Method
10	2	2
11	2	2
12	3	2
13	3	2
14	3	2
15	3	2
16	3	2
17	3	2
18	3	2
19	4	2
20	4	3
21	4	3
22	4	3
23	4	3
24	4	3
25	4	3
26	5	3
27	5	3
28	5	3
29	5	3
30	5	4
31	5	4
32	5	4
33	6	4
34	6	4
35	6	4
36	6	4

Sample Size	Critical Value	
	Binomial Method	Raw Score Method
37	6	4
38	6	4
39	6	4
40	6	5
41	7	5
42	7	5
43	7	5
44	7	5
45	7	5
46	7	5
47	7	5
48	8	5
49	8	5
50	8	6
51	8	6
52	8	6
53	8	6
54	8	6
55	8	6
56	9	6
57	9	6
58	9	6
59	9	6
60	9	7
61	9	7
62	9	7
63	9	7

Sample Size	Critical Value	
	Binomial Method	Raw Score Method
64	10	7
65	10	7
66	10	7
67	10	7
68	10	7
69	10	7
70	10	8
71	10	8
72	11	8
73	11	8
74	11	8
75	11	8
76	11	8
77	11	8
78	11	8
79	11	8
80	12	9
81	12	9
82	12	9
83	12	9
84	12	9
85	12	9
86	12	9
87	12	9
88	12	9
89	13	9
90	13	10

Sample Size	Critical Value	
	Binomial Method	Raw Score Method
91	13	10
92	13	10
93	13	10
94	13	10

Sample Size	Critical Value	
	Binomial Method	Raw Score Method
95	13	10
96	13	10
97	14	10
98	14	10

Sample Size	Critical Value	
	Binomial Method	Raw Score Method
99	14	10
100	14	11

In Table 1 above, the critical values for the binomial methodology were calculated with the Microsoft Excel function BINOM.INV(n, p_o, α), which computes the smallest value for which the cumulative binomial distribution is greater than or equal to the alpha value (90%) for a given sample size.[16]

The binomial method is particularly applicable to ambient water quality data because it does not involve an assumption regarding the distribution of the water quality parameter.[17] Unlike some other data which may frequently be characterized by a typical statistical distribution, the multiple and varying causes contributing to ambient pollutant concentrations lead to no such predictable distributions. Because it is non-parametric, this method may be employed for all water quality parameters without an estimate of variance or other understanding of distribution. The nonparametric hypothesis testing approach based on the binomial distribution is appropriate for assessing water quality data because such nonparametric tests are applicable to data that may not be normally, etc., distributed. It is also appropriate for data sets that may include data points below the level of detection, which commonly occurs in the water quality context,[18] because by definition it is not possible to define the distribution parameters of such data.

B. Error Rates Support Use of Binomial Method

Due to limited sample sizes and potential for human error, 303(d) assessments always involve some risk for Type I (false positive) and Type II (false negative) errors.[19] A Type I error occurs where an unimpaired water is incorrectly listed as impaired; this type of error may result in substantial public and private costs from developing and implementing an unwarranted total

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[16] *See* Microsoft Office, BINOM.INV Function, http://office.microsoft.com/en-us/excel-help/binom-inv-function-HP010335677.aspx; *see also* The Excel BINOM.INV Function, http://www.excelfunctions.net/Excel-Binom-Inv-Function.html. The BINOM.INV function is available in Excel 2010, replacing the previous CRITBINOM function which performs the same function in previous versions of Excel. *See* Microsoft Office, CRITBINOM Function, http://office.microsoft.com/en-us/excel-help/critbinom-function-HP010335640.aspx.

[17] *See* Robert D. Gibbons, *A Statistical Approach for Performing Water Quality Impairment Assessments Under the TMDL Program*, 39 J. AM.WATER RESOURCES ASS'N 841-49 (Aug. 2003), *available at* http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303d_policydocs/202.pdf.

[18] *See* EPA, Determination Upon Review of Amended Florida Administrative Code Chapter 62-3-3, Identification of Impaired Waters, Appendix A: Detailed Review of the IWR Binomial Statistical Test, at 1 (2008).

[19] National Research Council, ASSESSING THE TMDL APPROACH TO WATER QUALITY MANAGEMENT at 57 (2001); Eric P. Smith, et al., *Statistical Assessment of Violations of Water Quality Standards under Section 303(d) of the Clean Water Act*, 35 ENVTL. SCI. & TECH. 606, 607 (2001).

maximum daily load and complying with unnecessary water quality based effluent limitations.[20] Conversely, a Type II error occurs where an impaired water is incorrectly listed as being unimpaired, which may result in environmental and/or public health issues.[21] At any given sample size, there is an inverse relationship between Type I and II error rates.[22] Given that neither type of error can be completely eliminated, "water quality managers must choose (directly or indirectly) the tolerable amount of error."[23] The binomial hypothesis test allows the State to "*explicitly* control and make trade-offs between error rates."[24] Impaired waters listings are specifically a State responsibility under both North Carolina and federal law, subject to the State identifying impaired (and unimpaired) waters based on good cause, and accurate data and modeling.[25] The policy and public interest judgments between Type I and Type II error rates are a matter for the State, as long as those judgments are made reasonably.

Error rates decrease with increasing sample sizes.[26] One of the advantages of the binomial method is that it takes sample sizes into account, while the raw score approach does not allow for any consideration of sample size.[27] In this regard, the binomial method is preferable to the raw score approach because, as the National Research Council explains, "[c]learly, 1 out of 6 measurements above the criterion is a weaker case for impairment than is 6 out of 36."[28]

The binomial approach has been shown to yield substantially fewer Type I errors than the raw score approach at all sample sizes.[29] While the binomial approach has higher Type II error rates than the raw score approach at low sample sizes, the error rates converge to zero as sample sizes increase.[30] Thus, concerns about false negative errors may be alleviated by increasing sample sizes. Overall, statistical methods, including the binomial approach, "have controllable error rates that may be made reasonably small while the raw score method has a large error rate."[31] Statistical studies have concluded that "the Binomial method can be easily applied to address the balancing of error rates, using the same data . . . used to apply the raw score approach."[32]

Figure 1 below, developed by Eric P. Smith, et al., shows the difference in average error rates for the binomial method and other statistical approaches in comparison to the raw score method. This graph demonstrates the superiority of the binomial method over the raw score method in terms of controlling error rates, particularly at higher sample sizes. The spikes in the trend lines

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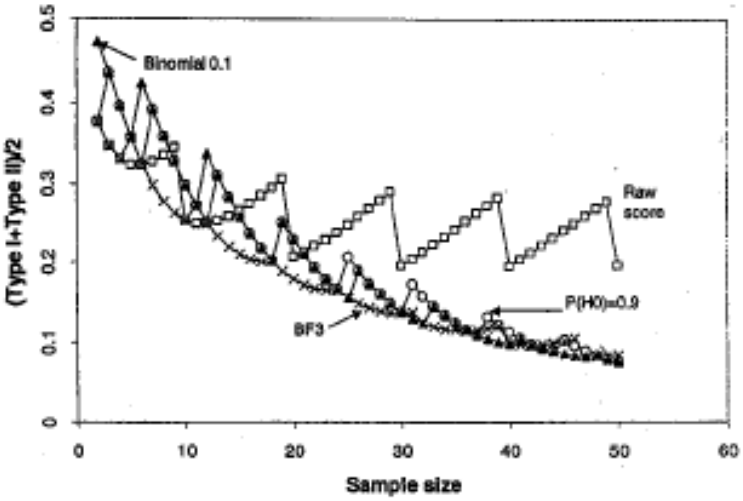
[20] Eric P. Smith, et al., *Statistical Assessment of Violations of Water Quality Standards under Section 303(d) of the Clean Water Act*, 35 ENVTL. SCI. & TECH. 606, 606 (2001).
[21] *Id.*
[22] National Research Council, ASSESSING THE TMDL APPROACH TO WATER QUALITY MANAGEMENT at 57 n.12 (2001).
[23] Eric P. Smith, et al., *Statistical Assessment of Violations of Water Quality Standards under Section 303(d) of the Clean Water Act*, 35 ENVTL. SCI. & TECH. 606, 607 (2001).
[24] National Research Council, ASSESSING THE TMDL APPROACH TO WATER QUALITY MANAGEMENT at 57 (2001).
[25] 40 C.F.R. § 130.10(d)(7).
[26] National Research Council, ASSESSING THE TMDL APPROACH TO WATER QUALITY MANAGEMENT at 57 (2001).
[27] *Id*.
[28] *Id*.
[29] Eric P. Smith, et al., *Statistical Assessment of Violations of Water Quality Standards under Section 303(d) of the Clean Water Act*, 35 ENVTL. SCI. & TECH. 606, 609 (2001).
[30] *Id*. at 610.
[31] *Id*.
[32] *Id*. at 612.

are associated with changes in the critical value of exceedances necessary to support an impairment listing.[33]

Figure 1: Average Error Rates for the Binomial Method and other Statistical Approaches and the Raw Score Method[34]



DWR has acknowledged that the binomial approach involves tradeoffs between Type I and Type II error rates. However, we understand that DWR has determined that the advantages of the significant decrease in Type I errors by switching to the binomial method outweigh the disadvantages of possible increases in Type II errors. Type I errors can be extremely costly for both public and private entities. Incorrectly listing a stream as impaired, when it is in fact unimpaired, triggers a requirement for DWR to develop a TMDL, which can be an arduous and expensive planning process that must be financed by the state's taxpayers. Those planning costs are the tip of the regulatory cost iceberg as those misdirected plans in turn trigger unwarranted compliance costs on private entities (such as complying with unnecessarily stringent water quality based effluent limitations or other steps) to improve water quality that in actuality already satisfies applicable water quality standards. Type I errors can also have negative environmental impacts because they divert resources away from streams with actual impairments.[35]

Any relatively small increase in Type II error rates is mitigated by the biannual process of 303(d) listing determinations; every two years, the data for a stream segment are reviewed again, providing a continual process of identifying impaired waters. Also, North Carolina's typical practice of basing determinations on five years of data provides additional statistical power for making these determinations correctly. Therefore, we understand that DWR has concluded that the binomial method is preferable to the raw score method because the substantial decrease in Type I errors outweighs the potential increase in Type II errors.

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[33] *Id*. at 608-09.
[34] This graph is reproduced from Eric P. Smith, et al., *Statistical Assessment of Violations of Water Quality Standards under Section 303(d) of the Clean Water Act*, 35 ENVTL. SCI. & TECH. 606, 610 (2001).
[35] *Id*. at 611.

II. The 10% Probability Value is Both Necessary and Appropriate

The 10% probability value for criterion excursion establishes the signal strength from the data necessary to determine that the ambient water actually exceeds water quality standards.[36] It is equivalent to the 90th percentile of the sample distribution.[37] The 10% probability value functions as a practical adjustment to compensate for uncertainty due to sampling and analytical errors, extreme conditions, and variability. It reasonably represents the proportion of erroneously high values in the overall set of water quality data, regardless of sample size. DWR considers the 10% probability value to be conservative and protective of the state's waters while properly limiting both Type I and Type II errors.

The choice of the 10% probability value is, like the other factors that support the State's listing methodology, specifically a State responsibility. This decision appears to us to be based on good cause and accurate data and modeling. We support this State policy judgment, finding that it is reasonably and rationally adopted.

A. The 10% Probability Value Addresses Uncertainty in Data Quality

DWR's methodology states that it is applying the 10% probability value in water quality assessments for chlorophyll-*a*, dissolved oxygen, MBAS, mercury, nitrate/nitrite, pH, temperature, toxic substances, and turbidity to address concerns regarding uncertainty of data quality, among other considerations.

DWR makes 303(d) listing decisions based on a large quantity of data collected by numerous sources, including DWR's Ambient Monitoring System, NPDES Discharge Monitoring Coalitions, DWR's Biological Assessment Unit; the NC DENR Division of Environmental Health; the United States Geological Survey; local governments; environmental groups; and industry, municipal and university coalitions.[38] Because of the vast quantity of data involved, as well as the fact that much of it is collected and analyses arranged for by third-party sources, DWR cannot guarantee the reliability and accuracy of all the data upon which 303(d) decisions are made. We suspect that DWR is dealing with hundreds of thousands of data points for every listing cycle.

According to DWR's methodology, DWR estimates that at least 10% of the data points are erroneously high values due to sampling and analytical errors. We understand that this is consistent with USGS' finding that ten percent of Florida's data are erroneous. Such erroneously high data may result from errors during sample collection, handling, reporting, blank contamination, transcription reversals, and laboratory matrix interference, among other errors.[39] For example, a laboratory technician may use improper testing procedures or drop a decimal

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[36] EPA, Determination Upon Review of Amended Florida Administrative Code Chapter 62-3-3, Identification of Impaired Waters, Appendix A: Detailed Review of the IWR Binomial Statistical Test, at 2 (2008).
[37] *See* Robert D. Gibbons, *A Statistical Approach for Performing Water Quality Impairment Assessments Under the TMDL Program*, 39 J. AM.WATER RESOURCES ASS'N 841-49 (Aug. 2003), *available at* http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303d_policydocs/202.pdf.
[38] NCDENR, Water Quality Data Assessment, http://portal.ncdenr.org/web/wq/ps/mtu/assessment#4.
[39] EPA, Determination Upon Review of Amended Florida Administrative Code Chapter 62-3-3, Identification of Impaired Waters, Appendix A: Detailed Review of the IWR Binomial Statistical Test, at 9 (2008).

point in transcribing a test result, or equipment may be miscalibrated or otherwise malfunction during sample measurement, and such errors may go undetected. Therefore, it is essential that the assessment methodology take into account uncertainty regarding data reliability so that sampling and analytical errors do not cause unimpaired streams to be included on North Carolina's 303(d) list. DWR has chosen to address data quality concerns by assigning a probability value of 10%, so that a water will only be listed as impaired if more than 10% of data exceed the water quality standard. The NCWQA strongly supports this approach.

B. The 10% Probability Value Addresses Exceedances from Extreme Conditions and Variability

DWR has indicated to us that in addition to addressing uncertainties regarding data reliability, the 10% probability value also accounts for occasional exceedances due to extreme conditions and natural variability. Where no more than 10% of samples exceed water quality standards, it is reasonable not to include a waterbody on the state's 303(d) list because a small percentage of valid samples may exceed numeric water quality standards without causing the water's designated uses to be impaired.[40] This conclusion is in part based on the integral role that duration of exceedance and exceedance return frequencies play in the establishment of the numeric values of EPA water quality criteria and State water quality standards.

Impairment listings and resulting TMDL requirements should not be based on samples collected during unusual or extreme conditions that result in outlier data points. For example, during the "first flush" of stormwater, pollutant levels are likely to vary significantly from normal (e.g., event mean) levels, and any samples taken during such events are likely to be unrepresentative of normal water quality conditions.[41] Concentrations of pollutants including suspended solids, nutrients, and trace metals, tend to peak near the beginning of a storm event prior to peak stormwater flows, resulting in "a disproportionately greater discharge of mass relative to the proportion of volume discharged during a storm event."[42] Criteria exceedances from "first flush" events are typically short-term excursions that do not impact the stream's biological community. Unusual or extreme conditions also tend to correlate with non-use or non-exposure because of both human and ambient organism avoidance. The 10% probability value helps to weed out such occasional exceedances attributable to extreme events and reduces the influence of unrepresentative outlier data points.

For naturally variable pollutants, such as dissolved oxygen, temperature, pH, and turbidity, which fluctuate for non-anthropogenic reasons, a 10% allowable rate of ambient conditions actually exceeding water quality standards is "consistent with EPA's general recommendations

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[40] *See* Florida Department of Environmental Protection, Florida's Methodology for Identifying Surface Water Impairments Due to Metals at Chapter 4. (Jan. 2007).
[41] *Id*. at 3.3.1.
[42] Liesl L. Tiefenthaler and Kenneth C. Schiff, *Effects of Rainfall Intensity and Duration on First Flush of Stormwater Pollutants*, 2001-2002 Southern California Coastal Water Research Project Annual Report, at 209 (2002), *available at* ftp://sccwrp.org/pub/download/DOCUMENTS/AnnualReports/2001_02AnnualReport/21_ar40-liesl.pdf.

for such pollutants" and "represent a reasonable choice for attainment decisions."[43] For example, dissolved oxygen levels are affected by a variety of factors, including: temperature, salinity, altitude, flow, stream channel, biological activity, and quantity of organic matter.[44] Thus, levels of dissolved oxygen and other naturally variable pollutants can vary significantly over time in the same waterbody due to natural processes. Given that conservative numeric water quality criteria for such parameters are set near or within the range of pollutant concentrations resulting from natural variability, temporary exceedances may be the result of natural processes in a healthy stream, rather than indicating a true impairment of the water's designated uses.[45] Therefore, we concur with DWR that it is necessary for North Carolina's assessment methodology to take into account such variability by allowing up to 10% of samples to exceed water quality standards.

Intermittent exceedances of numeric water quality criteria, whether the result of natural variability or anthropogenic sources, do not necessarily interfere with a water's designated uses. Therefore, North Carolina's statistical assessment methodology makes allowances for low frequency exceedances with the 10% probability value.

The 10% probability value is consistent with the derivation of water quality standards that have assumed frequency, magnitude, and duration of exceedances.[46] EPA has recognized that "all numeric water quality criteria have three elements: magnitude (e.g., how much), duration (e.g., how long at the specified magnitude), and frequency of exceedance (e.g., how often for the specified duration period), regardless of whether they are explicitly described in state water quality standards."[47] North Carolina's water quality standards were not developed with the intention that they are never to be exceeded. The State's water quality standards for chlorophyll-*a*, dissolved oxygen, MBAS, mercury, nitrate/nitrite, pH, temperature, toxic substances, and turbidity have an assumed frequency of exceedances of not more than 10%. We support the Department's position on this key technical issue.

C. The 10% Probability Value is Applicable to Toxic Substances

We understand that DWR is applying the binomial method with the 10% probability value for most numeric water quality standards, including toxic substances. For a number of robust reasons, DWR has chosen to apply this methodology for toxics instead of the "1-in-3 year methodology" recommended by EPA guidance, under which a water would be listed as impaired

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[43] EPA, Amended Decision Document Regarding Florida Department of Environmental Protection's Section 303(d) List Amendments for Basin Groups 1, 2, and 5, at 19 (Sept. 2, 2009), *available at* http://www.hillsborough.wateratlas.usf.edu/upload/documents/fl09303d_decisiondoc_090209.pdf.
[44] *Id*., Appendix F: Assessing Ambient Data For Naturally Variable Parameters Against Numeric Water Quality Criteria, at 2-3.
[45] *Id*., Appendix F: Assessing Ambient Data For Naturally Variable Parameters Against Numeric Water Quality Criteria, at 2.
[46] EPA, Water Quality Handbook, Chapter 3: Water Quality Criteria (40 CFR 131.11) (Mar. 2012), *available at* http://water.epa.gov/scitech/swguidance/standards/handbook/chapter03.cfm#section5.
[47] EPA, Amended Decision Document Regarding Florida Department of Environmental Protection's Section 303(d) List Amendments for Basin Groups 1, 2, and 5, Appendix F at 1 (Sept. 2, 2009), *available at* http://www.hillsborough.wateratlas.usf.edu/upload/documents/fl09303d_decisiondoc_090209.pdf.

for aquatic life criteria for toxics if there is more than one exceedance of the criteria in any three-year period.[48]

1. The 1-in-3 Methodology is Not Required and is Inaccurate

Like the raw score method, the 1-in-3 year methodology is problematic because it does not take into account the importance of sample size.[49] While the raw score method at least considers the proportion of samples that exceed the water quality standards, the 1-in-3 year methodology would require a finding of impairment whether two exceedances in a three year period are out of a total of two samples or two-hundred samples, even though the latter would be much less likely to indicate truly impaired ambient conditions. Larger datasets are more likely to include samples collected during brief extremes, such as the "first-flush" of stormwater, which are too short-lived to impact the biological community. In determining whether a stream is impaired, it is essential to take sample size into account in order to address such issues. However, this essential consideration is ignored by the 1-in-3 year methodology.

DWR also has repeatedly rejected the 1-in-3 year methodology because it is overly conservative given that the field studies upon which the recommendation was based primarily focused on recovery time from severe biological degradation caused by extreme events.[50] Reliance upon these unrepresentative studies resulted in an overestimation of necessary recovery time from routine non-compliance under real world conditions rather than assumed worst case scenarios.. Such studies do not support the need for a three year recovery period for typical exceedances of toxics water quality standards, which are much more likely to be marginal than large excursions.[51]

As a legal matter, we believe that DWR has the discretion not to use the 1-in-3 year methodology because it is neither mandated by the Clean Water Act nor promulgated as a regulation by EPA. Therefore, it is not a binding legal requirement on the State. We support DWR's continued rejection of EPA's 1-in-3 year methodology (particularly given that it has not undergone the public safeguards of rulemaking).

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[48] *See* EPA, Consolidated Assessment and Listing Methodology: Toward a Compendium of Best Practices at 4-6 (July 2002), *available at* http://water.epa.gov/type/watersheds/monitoring/calm.cfm.

[49] *See* Florida Department of Environmental Protection, Florida's Methodology for Identifying Surface Water Impairments Due to Metals at 2.2.2.B. (Jan. 2007).

[50] EPA, Technical Support Document for Water Quality-based Toxics Control at 9, 36, D-4 to D-5, Responsiveness Summary at 9-11 (1991), *available at* http://www.epa.gov/npdes/pubs/owm0264.pdf. For example, the field studies relied upon by EPA included cases where fish or benthos were severely damaged due to acutely toxic spill events, severe drought, and electrofishing to the point of population crash. Florida Department of Environmental Protection, Florida's Methodology for Identifying Surface Water Impairments Due to Metals at 2.2.2.A. (Jan. 2007).

[51] *See* EPA, Technical Support Document for Water Quality-based Toxics Control, Responsiveness Summary at 10 (1991), *available at* http://www.epa.gov/npdes/pubs/owm0264.pdf ("EPA recognizes that the chemical and ecological field data summarized in Chapter 1 suggest that successive excursions well above the criteria would be needed to cause severe impacts. EPA also recognizes that the probability of large excursions can be calculated to be extremely small compared to the probability of marginal excursions.").

2. The 10% Probability Value Is Appropriate for Toxic Substances

The 10% probability value is a appropriate for toxic substances because the 10% probability value accounts for sampling and analytical errors, to which toxics data are particularly prone, as well as occasional exceedances from extreme events and natural variability.

Sampling and analytical errors are common in testing for levels of toxic substances in surface waters, and the 10% probability value reduces the risk that spurious excursions resulting from such errors result in improper listings of waters for metal impairments. Toxics are particularly susceptible to sampling and analytical errors in part due to the very low pollutant concentrations commonly at issue.[52] Measuring low-concentration pollutants is challenging because "various operations performed on the sample during its preparation for the stage of final determinations can be a source of many errors crucially affecting the final result of the analysis."[53] Even low levels of contamination can dramatically affect results when sampling for low-concentration constituents. Where clean sampling and analytical methods are not properly used for measuring toxic pollutants, the resulting data are unsuitable for 303(d) listing purposes.

Scientific literature reveals that conventional sample handling methods used in measuring freshwater metals levels often result in significant rates of erroneously high data due to contamination artifacts.[54] For example, the sample composition may be distorted by "[t]he contact of analytes present in both gas and liquid mixtures with the walls of vessels, tubing and appliances [which] crucially affects the concentration levels of trace . . . components."[55] Due to the ubiquitous presence of metals and other inorganic analytes in laboratories and analytical reagents, errors in toxics measurements tend to be skewed toward values higher than actual concentration levels, increasing the risk of incorrectly including unimpaired waters on the state's 303(d) list.[56]

Another reason for high error rates in toxics data is the fact that numeric criteria for many toxic substances are near the practical quantitation limit ("PQL"). For example, North Carolina's aquatic life criteria for cadmium are 0.4 µg/l for trout waters, 2.0 µg/l for non-trout waters, and 5.0 µg/l for salt waters, while the PQL for cadmium is 1 µg/l.[57] There is significant uncertainty in data values close to detection limits, so the risk of erroneously high data points increases

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[52] *See, e.g.*, 40 C.F.R. Pt. 136 App. D (methods for metals, coefficient of variation ("CV") uniformly increasing as sample concentration decreases); *see also* 40 C.F.R. Pt. 136 App. D (2011 & prior) (additional analytical methods—same conclusion).
[53] Jacek Namieśnik, *Trace Analysis—Challenges and Problems*, 32 CRITICAL REVIEWS IN ANALYTICAL CHEMISTRY, 271, 274 (2002).
[54] *See* Gaboury Benoit, et al., *Sources of Trace Metal Contamination Artifacts during Collection, Handling, and Analysis of Freshwater*, 69 ANALYTICAL CHEMISTRY 1006-1011 (1997); *see also* Herbert L. Windom, et al., *Inadequacy of NASQAN Data for Assessing Metal Trends in the Nation's Rivers*, 25 ENVTL. SCI. & TECH. 1137 (1991).
[55] Jacek Namieśnik, *Trace Analysis—Challenges and Problems*, 32 CRITICAL REVIEWS IN ANALYTICAL CHEMISTRY, 271, 274 (2002).
[56] *See* Florida Department of Environmental Protection, Florida's Methodology for Identifying Surface Water Impairments Due to Metals at 3.1.4. (Jan. 2007).
[57] Inorganic and Microbiological Parameter PQLs, http://portal.ncdenr.org/c/document_library/get_file?uuid=3c35da73-5e5b-4b80-be3b-e3693f69beb2&groupId=38364.

where the criteria are near the PQL.[58] Additionally, the method for determining detection limits may lead to false positives due to bias and variability in methodological noise and sensitivity, and errors may result from incorrect reporting of values below detection limits.[59]

As mentioned above, DWR bases 303(d) decisions on large quantities of data collected by numerous third parties in addition to state agencies. Because DWR lacks the resources to conduct comprehensive screening of all of this data to ensure reliability, it is necessary for the assessment methodology to factor in uncertainties regarding data quality for toxic substances and other pollutants to prevent waters from being listed as impaired due to erroneously high data points.

While EPA guidance recommends the use of a 10% exceedance approach for conventional pollutants,[60] EPA has also approved the use of a 10% probability value for toxic and non-conventional pollutants in other states due to concerns with data quality.[61] EPA recognizes that "[t]he 10% probability value reflects the fact that the universe of samples assessed by [the state] are likely to include many unreliable and thus unrepresentative requirements, which do not accurately reflect the condition of the ambient water."[62] We wholeheartedly agree.

In addition to high rates of sampling and analytical error, toxics data are also subject to short-term storm-related increases and diurnal variability, which are additional factors supporting North Carolina's 10% probability value. Like other parameters, the levels of toxic substances can vary significantly during the "first flush" of stormwater.[63] Exceedances of water quality criteria due to such "first flush" events are unlikely to impact the biological community due to the short term nature of the increase in toxics levels.[64] Additionally, the concentrations of many toxic substances have also been observed to fluctuate diurnally.[65] For example, one study measured diurnal increases in zinc concentrations of 70-500% and diurnal increase in manganese of 17-152%, primarily due to in-stream geochemical processes.[66] That study concluded that "[d]iel cycles of dissolved metal concentrations should be assumed to occur at any time of year

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[58] *See* Florida Department of Environmental Protection, Florida's Methodology for Identifying Surface Water Impairments Due to Metals at 3.1.5. (Jan. 2007).
[59] *Id*.
[60] EPA, Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 3014 of the Clean Water Act at 39 (July 29, 2005), *available at* http://www.epa.gov/owow/tmdl/2006IRG/report/2006irg-report.pdf.
[61] *See, e.g.*, EPA, Amended Decision Document Regarding Florida Department of Environmental Protection's Section 303(d) List Amendments for Basin Groups 1, 2, and 5, at 19 (Sept. 2, 2009), *available at* http://www.hillsborough.wateratlas.usf.edu/upload/documents/fl09303d_decisiondoc_090209.pdf.
[62] *Id*. at 20.
[63] For example, a strong "first-flush" phenomenon has been observed for cadmium, zinc, and copper. John J. Sansalone and Steven G. Buchberger, *Partitioning and First Flush of Metals in Urban Roadway Storm Water*, 123 J. ENVTL. ENGINEERING 134 (1997).
[64] *See* Florida Department of Environmental Protection, Florida's Methodology for Identifying Surface Water Impairments Due to Metals at Chapter 4 (Jan. 2007).
[65] *See* David A. Nimick, et al., *Seasonality of Diel Cycles of Dissolved Trace-Metal Concentrations in a Rocky Mountain Stream*, 47 ENVTL. GEOLOGY 603 (2005); *see also* Christopher L. Shope, et al., *The Influence of Hydrous Mn–Zn Oxides on Diel Cycling of Zn in an Alkaline Stream Draining Abandoned Mine Lands*, 21 APPLIED GEOCHEMISTRY 476 (2006).
[66] David A. Nimick, et al., *Seasonality of Diel Cycles of Dissolved Trace-Metal Concentrations in a Rocky Mountain Stream*, 47 ENVTL. GEOLOGY 603 (2005).

in any stream with dissolved metals and neutral to alkaline pH."[67] Applying North Carolina's 10% probability value to toxic pollutants prevents occasional exceedances from the "first flush" of stormwater and diurnal variability from triggering unwarranted 303(d) listings.

III. The 90% Confidence Level is Both Necessary and Appropriate

The 90% confidence level is the probability that sample data with a given number of criteria exceedances could be drawn from an overall population for the stream where the overall exceedance probability value is 10%.[68] While the 10% probability value accounts for uncertainties in data quality and occasional allowable exceedances, the 90% confidence level addresses the representativeness of the sample data.[69] A confidence value for a given sample size "represents the degree to which a small sample set could disproportionately represent erroneously high values."[70] The 90% confidence limit is associated with a Type I error rate of approximately 10%, (i.e., there is a 10% probability of listing an assessment unit when it should not be listed).

Where the 10% exceedance methodology is used alone, without a confidence level requirement, the false positive rate tends to be "quite high, particularly for small sample sizes and lognormal distributions [e.g., for waters affected by anthropogenic sources], conditions which typify routine practice."[71] As explained in Part I.B. above, applying a confidence level through the use of the binomial method in water quality assessment, allows for consideration of the significance of sample sizes and substantially decreases the risk of incorrectly listing a waterbody.

While other states using the binomial method have selected confidence levels between 80% and 95%,[72] "any statistical conclusion that has a confidence level of less than 90% is considered not acceptable by most statistical practitioners."[73] Therefore, we support DWR's adoption of a confidence level of 90%. Higher confidence levels are associated with lower rates of Type I errors but higher rates of Type II errors. In an effort to balance the potential for false positive and false negative errors, we believe that DWR properly selected a confidence level of 90%. The selected 90% confidence level is statistically robust but involves a lower risk of Type II errors than would a 95% confidence level.

We understand that where greater than 10% of samples exceed the numeric criteria, but the confidence level is less than 90%, the water will be listed as Category 3 (Unable To Determine if

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[67] *Id*.
[68] *See* Conrad Carlberg, STATISTICAL ANALYSIS: MICROSOFT EXCEL 2010, at 124 (2012) (the binomial distribution function "returns the probability that a sample with the given number of defectives can be drawn from a population with the given probability of success.").
[69] EPA, Determination Upon Review of Amended Florida Administrative Code Chapter 62-3-3, Identification of Impaired Waters, Appendix A: Detailed Review of the IWR Binomial Statistical Test, at 14-15 (2008).
[70] *Id*. at 15.
[71] Robert D. Gibbons, *A Statistical Approach for Performing Water Quality Impairment Assessments Under the TMDL Program*, 39 J. AM.WATER RESOURCES ASS'N 841-49 (Aug. 2003), *available at* http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303d_policydocs/202.pdf.
[72] Washington Department of Ecology, Binomial Distribution (2004), *available at* http://www.ecy.wa.gov/programs/wq/303d/2002/2004_documents/binomialclarification.pdf.
[73] Pi-Erh Lin, et al., *A Nonparametric Procedure for Listing and Delisting Impaired Waters Based on Criterion Exceedances* at 16 (Oct. 2000), *available at* http://www.dep.state.fl.us/water/tmdl/docs/Supdocument.PDF.

Meeting or Exceeding Criteria) and slated for further monitoring. Thus, if a waterbody exceeds the probability value but there are concerns about representativeness of the data, DWR will resolve the uncertainty through additional monitoring. If the additional monitoring indicates an impairment, the assessment unit will be listed in the subsequent 303(d) listing cycle.

The choice of the 90% confidence level is, like the other factors that support the State's listing methodology, specifically a State responsibility. In our judgment, the selection of the 90% confidence level is rational, based on accurate data and modeling, and a reasonable State policy judgment.

IV. A Minimum Sample Size of Ten is Both Warranted and Appropriate

DWR has decided that 303(d) listing decisions must be based on a sample size greater than nine. This minimum sample size requirement is necessary to improve the statistical strength of DWR's listing methodology by reducing error rates. We strongly support this approach.

DWR's sample size requirement is supported by scientific literature. A technical report by Pi-Erh Lin, et al., concluded that a minimum of ten samples should be required in order to list a water as impaired on a state's 303(d) list.[74] Likewise, a study by Robert D. Gibbons found that "statistical power computations . . . revealed that the nonparametric approach should never be used when fewer than 10 samples are available."[75] Smaller sample sizes lead to greater uncertainty in estimating the true probability of a pollutant exceeding the state's water quality standards.[76] A sample size less than ten is less likely to be representative of conditions in the water body as a whole. Requiring impairment decisions to be based on an increased number of samples decreases the risk of error in the 303(d) listing process. Although it would be preferable for sample sizes to be at least twenty in applying the binomial method,[77] DWR chose a minimum sample size of ten in light of the fact that "[c]ost realities, given the need for statewide monitoring and the fact that most monitoring is for enforcement of point source discharge permits, results in a limited number of stations and samples for each station."[78]

Figure 1 in Part I.B. above provides a graphical demonstration of the significant decrease in error rates with increased sample sizes for the binomial method and other approaches. The clear trend in the graph strongly supports DWR's decision to require a minimum sample size before a water may be listed as impaired in order to minimize error rates. We strongly support this listing criterion and its application to the 2014 list.

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[74] *Id*. at 1.
[75] Robert D. Gibbons, *A Statistical Approach for Performing Water Quality Impairment Assessments Under the TMDL Program*, 39 J. AM. WATER RESOURCES ASS'N 841-49 (Aug. 2003), *available at* http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303d_policydocs/202.pdf. Note that statistical power is the probability that the statistical method will detect a real exceedance (i.e., reject the null hypothesis when it is false).
[76] Pi-Erh Lin, et al., *A Nonparametric Procedure for Listing and Delisting Impaired Waters Based on Criterion Exceedances* at 15 (Oct. 2000), *available at* http://www.dep.state.fl.us/water/tmdl/docs/Supdocument.PDF.
[77] *See* Eric P. Smith, et al., *Statistical Assessment of Violations of Water Quality Standards under Section 303(d) of the Clean Water Act*, 35 ENVTL. SCI. & TECH. 606, 612 (2001) ("When sample sizes are around 20-25, the assessment process can confidently rely on statistical procedures to manage and measure type I and type II errors.").
[78] *Id*. at 606.

WAKE COUNTY NORTH CAROLINA

Environmental Services

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March 5, 2014

Mr. Andy Painter
North Carolina Department of Environment and Natural Resources
Division of Water Resources
Raleigh, NC 27699-1621

BY EMAIL to Andy.Painter@ncdenr.gov, et al.

Re: Public Comments - 2014 Water Quality Assessment and Draft 303(d) List – Wake County

Dear Mr. Painter:

Wake County appreciates the opportunity to comment on the draft 2014 303d list and use support assessments for impaired waters of the State. Our County maintains its long-standing commitment to protecting water quality, as evidenced by its adoption, maintenance and enhancement of local water supply watershed policies and regulations since 1984. As of 2012, Wake County had 228 stream miles on the 303d list and most of the County's jurisdiction falls under one of three different nutrient management strategies: Neuse River Basin, Falls Lake or Jordan Lake. We are keenly interested in the biennial use assessments --- in particular how they relate to the Falls Lake Nutrient Management Strategy.

Background

Under the Falls Lake Rule, the Division is charged with performing periodic use assessments to judge progress on compliance with the goal of attaining nutrient related water quality standards downstream of Highway NC -98 no later than January 15, 2016 and in the lower Falls Reservoir (below Highway NC -50 in Wake County) no later than 2021. When the Division finds based on two consecutive use support assessments, that nutrient-related water quality standards are attained in a segment of Falls Reservoir, it shall notify affected parties in that segment's watershed that further nutrient load reductions are not required.

2014 Changes for Falls Lake

The 2014 use assessment recategorized three segments of Falls Lake from the 4b category - not meeting standards to category 1b - meeting standards or category 3b1 (>10% criterion exceeded, 90% statistical confidence criterion not met = inconclusive). See attached map to identify related segments:

AU: 27-(5.5) b2 Ledge Creek Arm

2014 changed from 2012 category 4b not meeting standards to category 1b meets standards (only 5.7% of samples exceeded criteria)

AU: 27-(5.5) b3 from Ledge Creek Arm to Lick Creek Arm

2014 changed from 2012 category 4b exceeding criteria to category 3b1 (>10% criterion exceeded (11.89% or 4/34 samples > std.), 90% statistical confidence criterion not met = inconclusive

AU: 27-(5.5) b4 – from Lick Creek Arm to Falls Dam

2014 changed from 2012 category 4b exceeding criteria to category 1b meets standards (only 1 sample of 139 > std.)

Comments

Based on the 2014 data, the Lower Lake (below Highway 50) meets water quality standards. Of significant note, the nutrient related water quality standards have been attained in the Lower Lake before the North Carolina Environmental Management Commission has taken even the initial step in the nutrient management strategy, that of approving the model stormwater program for implementation by local governments.

Given the cost to implement the Falls Lake Nutrient Management Strategy is estimated at approximately $950 million and is expected to have a large and widespread economic and social impact; it is imperative that public and private resources be used in the most cost effective and beneficial manner. Measures/expenditures should not be required by local governments in segments of the Lake that meet water quality standards or where the data is inconclusive to demonstrate that a problem exists.

To ensure that a nexus exists between action required by local governments under the rule and the failure of a Lake segment(s) to meet water quality standards, we request the following actions by the Division:

a. Review the data for prior use assessments for Falls Lake and apply the protocol new in 2014 to determine if any segments that were previously deemed not meeting standards, would meet water quality standards under the new protocol or if the data is inconclusive.

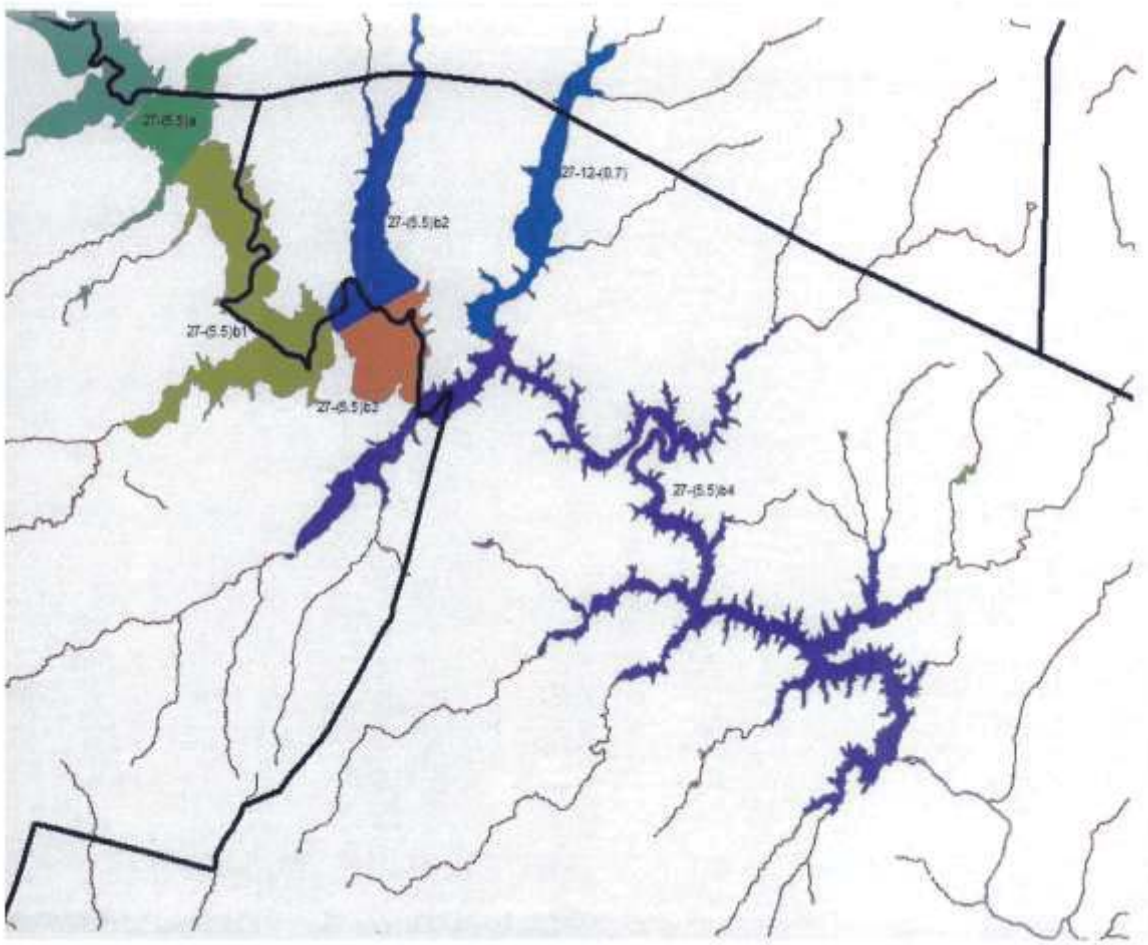
b. If the Division finds based on review of data in past use assessments, using the >10% frequency of exceedance and a 90% confidence criteria, that nutrient-related water quality standards are attained for two consecutive use assessments, it shall notify affected parties in that segment's watershed that further reductions are not required.
c. Clarify that the intent of the new protocol is to increase the statistical reliability of data and to establish a threshold that requires both a >10% frequency of exceedance and a 90% confidence criteria.

We thank the staff of the Division of Water Resources for assisting us with our information requests in this process. If you have any questions, please feel free to contact me by email of telephone.

Sincerely,

Melinda Clark
Watershed Manager, Wake County Environmental Services, Water Quality Division
P.O. Box 550
Raleigh, NC 27602
919-856-5531
melinda.clark@co.wake.nc.us

Cc: Mr. Tom Reeder, Director, N.C. Division of Water Resources
Mr. Tom Fransen, Deputy-Director, N.C. Division of Water Resources
Ms. Kathy Stecker, Supervisor, N. C. Division of Water Resources
Mr. Benne Hutson, N. C. Environmental Management Commission
Mr. Steve Tedder, N. C. Environmental Management Commission
Mr. Britt Stoddard, Director, Division of Water Quality, Wake County Environmental Services


27-(5.5)a
27-12-(0.7)
27-(5.5)b2
27-(5.5)b1
27-(5.5)b3
27-(5.5)b4

Painter, Andy

From: Forrest Westall <Forrest.Westall@Mcgillengineers.Com>
Sent: Thursday, March 06, 2014 2:05 PM
To: Painter, Andy
Cc: Stecker, Kathy; Mcnutt, Cam; Fransen, Tom; Reeder, Tom
Subject: Comments on NC's Draft 303(d) List and Related Use Support Information

Categories: 2014 303d comment

To: Andy Painter
Subject: Draft 303(d) List

Consistent with the notice for NC's Draft Section 303(d) List under requirements of the Federal Clean Water Act and directions on submission of public input, we provide the following comments:

We appreciate the efforts of the Environmental Management Commission and the Division of Water Resources in working toward ways to enhance the public's ability to access information and better understand the water quality assessment process in North Carolina. Since NC has recently established a new protocol for the assessment of water quality data in determining use support of its waters, this draft list is the first developed using the new procedure. The UNRBA made a special request to the DWR for detailed fact sheets covering the data collections and the decisions made concerning the water quality assessments and the 303(d) updates. These fact sheets were expeditiously provided by Division staff. Staff should be commended for providing timely access to this enhanced information. Thank you for the opportunity to provide comments on the draft 303(d) list, the listing methodology, and the additional information posted on the on the DWR water quality assessment website at http://portal.ncdenr.org/web/wq/ps/mtu/assessment.

A number of quality documents have been created that make a complete public review of the water quality assessment process possible for the very first time. However, we do feel that there are some important considerations that should be looked at before DWR and the EMC move forward with the 303(d) process.

The 303(d) process has the potential to result in tremendous impact to the regulated and interested public. The listing of a waterbody on the 303(d) List sets in motion a powerful regulatory process focused on developing required actions to promote restoration of waters where water quality data indicates they are "impaired" relative to the State's Water Quality Standards. As a result, it is strongly recommended that the State carefully consider the public review comments on the draft list and the associated supporting documentation before the final draft list is submitted to EPA.

As the UNRBA is composed of 14 local government organizations, these individual jurisdictions may also offer comments on the 303 listing process documents on your website. The comments I am providing are more general in nature and focus primarily on the presentation of the listing material and the process DWR and the EMC are following to finalize the draft list for submission to EPA. I offer the following:

- The timing of the public review process and the presentation of the list to the EMC overlap and may not allow the EMC the opportunity to review and consider all of the comments before they review the list on March 13th. The notice of the list calls for comments to be filed no later than March 14th, a day after the draft list is presented as an informational item at the March EMC Meeting. This is a crucial point when considering the potential impacts of 303(d) listings. It is also my understanding that the agency intends to send the State's Draft 2014 303(d) List to EPA the first of April. This provides little time for the agency to respond to public comment. The role of the EMC in reviewing or "approving" the list before it goes to EPA is also not clear. Overall, the process timeline for the finalization of the draft list for submittal to the EPA lacks clear identification of the approval at the State level.

- It is likely difficult for some individuals searching DWR's 303(d) website to put into perspective the full variation of stream categories and to distinguish between what is a listed stream in relation to previous listing decisions. The first link on the site referenced above under the right hand box is the draft 2014 303(d) list. Though the draft list when opened up clearly lists at the top that this list is for Category 5 waters, I have had several individuals contact me about waters in Falls Lake that do not appear on this list. From the agency's perspective and those folks that work with this information on a consistent basis, it is understood that waters that are impaired, but that fall under a TMDL or management strategy are category 4b waters. DWR has done a commendable job of including on this site a wealth of background information on the 303(d) process, but in the key area of the draft 2014 list, an interested person will likely jump to the draft list rather than the background information. A brief paragraph at the top of the draft list would help greatly in avoiding a whole host of initial questions. Additionally, since DWR does a tremendous amount of work to assess all waters with data and to make individual waters decisions on listing, the comprehensive Statewide Assessment covers all waters evaluated. That information, as the agency staff knows very well, represents a file with over 1,000 pages. I have great respect for the work done on use support assessment and realize it is difficult to cover every possibility, but I would recommend a "required" first read at the top of the Draft 2014 List box to help avoid basic questions.

- In regard to the issue of not including waters with TMDL's or management strategies in place on the "303(d) List," it would be helpful to have a list of 4b waters included as a separate section of the 303(d) list with more detail on these waters. The State currently provides more complete summary information on the Category 5 waters (no TMDL or management strategy in place) than for the category 4. This would be helpful in the consideration and review of the waters of Falls Lake.

- The 2014 Water Quality Assessment Process Document provides helpful information for understanding the 303(d) and the 305(b) assessments in North Carolina and it incorporates explanations for the statewide assessment. This document suggests that waters will be assigned to categories that are either Exceeding Criteria, Meeting Criteria, or that other evaluations are based on Inconclusive Data. However, the draft 2014 Statewide Assessment Document is not clearly using these terms in the category definitions. The draft Statewide Assessment report should be modified to include these terms for each category. The 2014 Water Quality Assessment Process Document should be reviewed for consistency with water quality standards. Many water quality thresholds in the document are applied to all waters (not just fresh waters) however saltwater standards are not the same as fresh waters and the document should be corrected for each parameter to make this clear.

- The draft 2014 Statewide Assessment report to EPA now includes a total of 40 categories. It is not clear why there is a need for so many categories since the EMC established only one threshold that requires <u>both a 10% frequency of exceedance and a 90% confidence criteria</u>. The number of categories should be consolidated to categories that are either Exceeding Criteria, Meeting Criteria, or that evaluations are Inconclusive. Most of the new categories seem to use a 10% frequency threshold for evaluation. This reflects a criteria that is no longer included in DWR's approved listing procedure. These added categories are not consistent with the EMC's decision to require a 90% confidence level <u>and</u> a greater than 10% frequency for "listing" an evaluated waterbody. Proceeding with the Assessment report as is may lead to misunderstanding at the Federal level and could result in some unwelcome "unintended" consequences of providing categories beyond those identified in the State's EMC approved listing methodology.

- The draft 2014 303(d) list does not include any mention of water segments on the prior 303(d) list. It would be convenient to include a separate list of waters that are recommended for de-listing from category 5.

- The EMC has made great strides in providing the public an increased sense of confidence in the water quality assessment process. Considering the many cases where sampling is limited the addition of a 90% confidence level to the criteria makes perfect sense. Previous assessments based only on a 10% criteria resulted in the

identification of waters needing a TMDL or management strategy where the amount of data and the confidence that a real water quality problem existed was not supportable. It is just good public policy to avoid potentially costly actions to address issues that simply are not well established. In addition, impacts to actual designated uses should be prioritized for TMDLs or management strategies over just numerical standards deficiencies.

- The Upper Neuse River Basin Association is pleased to see that there are no new listings of impaired waters on the draft 2014 303(d) report for the Falls Lake area. Furthermore, our review of the *chlorophyll a* water quality assessment changes for Falls of the Neuse Reservoir from 2012 to the draft 2014 assessment is encouraging in relation to algae related nutrient impacts. This review indicates there are six water quality segments in Falls Lake. For *chlorophyll a* three segments are categorically unchanged and three other segments are no longer exceeding the EMC's criteria of >10% frequency over 40ug/L and with a 90% confidence. This observation is summarized in the table below.

Three segments continue to exceed chlorophyll a data criteria and have a management strategy in place.
Segment 27-(1)
From source confluence of Eno River Arm of Falls Lake and Flat River Arm of Falls Lake to I-85 Bridge
No Change in Category remains Category 4b Exceeding Criteria with a management strategy in place.

Segment 27-(5.5)a
Falls Lake From I-85 bridge to Panther Creek
No Change in Category remains Category 4b Exceeding Criteria with a management strategy in place.
Of 36 samples 52.8 percent exceeded 40ug/L with 100% confidence

Segment 27-(5.5)b1
Falls Lake From Panther Creek to Ledge Creek Arm
No Change in Category remains Category 4b Exceeding Criteria with a management strategy in place.
Of 69 samples 21.7 percent exceeded 40ug/L with 99.7% confidence

Three segments are no longer exceeding the data criteria for chlorophyll a and have a management strategy in place.
Segment 27-(5.5)b2
Ledge Creek Arm of Falls Lake
Change Category from 4b to Category 1b now meeting criteria and a management strategy in place
Change based on more recent or more accurate data that demonstrate the parameter is meeting criteria
Of 35 samples 5.7 percent (2) exceeded 40ug/L

Segment 27-(5.5)b3 Falls Lake From Ledge Creek Arm to Lick Creek Arm (884.3 Acres)
Change Category from 4b to category 3b1 (> than 10% exceeded 40ug/L but less than 90% confidence)
Change based on assessment methodology change per EMC in 2013.
Of 34 samples 11.8 percent (4) exceeded 40ug/L with 55.3 % confidence

Segment 27-(5.5)b4 Falls Lake From Lick Creek Arm to Falls Dam
Change Category from 4b to Category 1b now meeting criteria and a management strategy in place
Change based on more recent or more accurate data that demonstrate the parameter is meeting criteria
Of 139 samples only one exceeded 40ug/L

We express again our thanks to DWR and the EMC for the work done on the use support assessment efforts in NC and for providing extensive background on its decision-making process. We remain hopeful that the agency will provide more opportunity to incorporate public comments into the process, better define the review of the EMC, and give full consideration of these steps prior to the list being submitted to EPA. The Division and the EMC have invested a large amount of energy and effort in improvements to the State's assessment protocol on numeric water quality standard comparisons and we would encourage the agency to simplify the submittal to EPA to prevent any confusion when communicating its 303(d) decisions to the Federal agency.

If I can answer any questions concerning these comments, please let me know.

Forrest R. Westall

Forrest R. Westall, Sr.
Executive Director

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March 05, 2014

Mr. Andy Painter
Modeling and Assessment Branch
NCDENR, Division of Water Resources
1611 Mail Service Center
Raleigh, N.C. 27699 – 1617

Re: Comments on 2014 Draft 303(d) List

Dear Mr. Painter:

The Neuse River Compliance Association (NRCA) appreciates this opportunity to review and comment on the 2014 Draft 303(d) List. We would like to take this opportunity to thank the Division in its efforts to enhance the understanding of the water quality assessment process in North Carolina. A number of new documents have been created to help the public understand the water quality assessment process yet it still remains a challenge. Our comments are listed below:

- As noted above we appreciate the opportunity to provide comment on the draft 303(d) list but we feel it is important to comment on the methodology and the statewide water quality assessment as these documents will be an integral part of the document sent to the USA Environmental Protection Agency.

- We would like to thank the Division for providing the detailed facts sheet when requested.

- We would like to congratulate the Environmental Management Commission (EMC) for enhancing an increased sense of confidence in the water quality assessment process. The addition of a 90% confidence level to the assessment process will reduce the unnecessary 303(d) listing of water segments without sufficient samples to support confident 303(d) impairments. It will also focus the 303(d) list to only waters with 90% confidence that the sampling data yields a 10% frequency over the standards. Further, water quality impacts to actual designated uses should be prioritized for TMDL's over numerical standards deficiencies that lack statistical confidence in sampling information.

- The current draft 303(d) list clearly identifies water segments that are water quality limited however the 2014 Statewide Assessment Document does not clearly define which of the 40 categories are either "Exceeding Criteria", "Meeting Criteria", or are based on "Inconclusive Data". All of the definitions listed on the first few pages should be clear and consistent with the EMC's decision to incorporate confidence with the use of a 10% frequency. Specifically, **Category 3a1** currently reads Greater than 10% criterion exceeded; 90% statistical confidence criterion not met. This definition is misleading and could be interpreted as having two different criteria (one for 10% frequency and another for confidence). Rather this definition should be replaced with the following: **Data are inconclusive less than 90% confidence that the water quality standard for this parameter has been exceeded more than 10% frequency.** This suggested revision is consistent with the EMC approved methodology. Other similar category 3 definitions should be similarly modified.

- The 2014 Water Quality Assessment Process Document should be reviewed for consistency with water quality standards. Many water quality thresholds in the document are applied to all waters (not just fresh waters) however saltwater standards are not the same as fresh waters and the document should be corrected for each parameter to make this clear.

- The draft 2014 Statewide Assessment report to EPA now includes a total of 40 categories. It is not clear why there is a need for so many categories since the EMC established only **one** threshold that requires a 10% frequency with a 90% confidence criteria. The number of categories should be consolidated to categories that are either Exceeding Criteria, Meeting Criteria, or that evaluations are Inconclusive.

- The draft 2014 303(d) list does not include any mention of water segments on the prior 303(d) list. It would be convenient to include a separate list of waters that are going to be de-listed from Category 5.

- The NRCA notes that the draft 303(d) list has greatly reduced the listings in the estuary "not meeting" the chlorophyll-A standard for the assessment period. However we remain concerned that this is not the result of or due to a successful TMDL listed water body when, in fact, total nitrogen has continued to increase at the Neuse Estuary. The estuary is now shown under a different category, but even with the expanded categories (40), there is not a category for TMDL listed water bodies that are not achieving the intended goal and are not slated for reexamination.

Again we would like to comment the Division's effort in producing the draft 303(d) listing and the supporting documents that accompany it. If you have questions or require additional information please let us know.

Sincerely,

Daniel F. McLawhorn, Chair

cc: NC EMC
NCDENR DWR Staff
NRCA Board
Glenn Dunn
Haywood M. Phthisic, III

I. 2014 Water Quality Assessment Process Document Comments -

The Water Quality Assessment Process document can be found at the following link: http://portal.ncdenr.org/c/document_library/get_file?uuid=e922692c-57de-49bc-a805-dea37147e2b1&groupId=38364 .

This document is intended to be a comprehensive description of NC's water quality assessment process for Clean Water Act Section 305(b) and 303(d) purposes. Thus the document goes beyond the EMC approved 303(d) methodology and incorporates explanations for the statewide Integrated Report. Generally speaking the document appears out of date and should be modernized because it provides a substantial amount of insight into the water quality assessment process and provides a valuable tool to enhance the understanding of water quality management in the state.

Comments:

1. The hyperlink to the EPA guidance on assessment categories at the end of paragraph number 3 is not active.
2. The document (page 7) suggests that *"For the 2014 assessment the terms Exceeding Criteria, Meeting Criteria, Inconclusive Data, and No Data will be used when assigning waters/pollutants to the assessment categories described below.* However, please note that the draft 2014 Integrated Report (IR) does not use these terms in the definitions of the numerous categories. It is suggested that the definitions in the beginning of the draft report be modified to include these terms as they are most appropriate.
3. The listserv hyperlink on page 7 is not active.
4. Page 8 mentions Appendix B summarizing 2012 assessments but Appendix B is not included with the document.
5. Page 8, Category 1 Assessed Parameters does not include "**category 1f"** or "**category 1r"** which are listed in the draft 2014 integrated report.
6. Page 8, Category 3a, 3b, and 3t assessments are discussed but the draft 2014 IR has a number of categories that are not discussed including categories 3c, 3cr, 3r, 3v, 3z.
7. Category 5e as described in this document is not found in the draft IR for 2014.
8. Page 10, six methods are described for assessment. It is suggested that DWR consider adding an additional method for determining impacts to public drinking water supplies. For example, recent issues related to the discharge of fly ash may stimulate a need for additional assessment methods for determining use support impacts beyond the numerical water quality standards.
9. The numeric criteria for pH assessment on page 12 of the document does not mention the narrative standard "15A NCAC 02B .0211 3(g) *pH: shall be normal for the waters in the area, which generally shall range between 6.0 and 9.0 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;*
   Since waters shall be "normal" according to the standards what is the listing criteria for waters that have highly altered pH due to the discharge of wastewater? This issue should be addressed in the document.
10. The Chloride discussion on page 12 should be amended to read as follows: The chloride criterion is not to exceed 230 mg/l in all **fresh** NC waters.

Notice that salt water classifications do not have a water quality standard for Chloride. Also notice that Water Supply classifications have a water quality standard of 250 mg/L chloride. This appears unexplainable since the Class C Fresh Water standard is 230 mg/L.

11. The discussion for residual chlorine on page 12 should be amended to read as follows: The chlorine (residual) criterion is not to exceed 17ug/L in all NC **fresh** waters. Notice that salt water classifications do not have a water quality standard for residual chlorine.
12. The discussion on page 13 of 50ug/L for Chromium should reflect **fresh** waters only. The salt water criterion should be listed as 20ug/L according to 15A NCAC 02B .0220 (3)(m)(iii).
13. The discussion of 5ug/L for Cyanide should reflect **fresh** waters only. The salt water criterion should be listed as 1ug/L
14. The page 13 discussion of 1.8mg/L for Fluoride should reflect **fresh** waters only. There is no water quality standard for Fluoride in salt water classifications.
15. The document criteria of 50ug/L for Zinc should reflect **fresh** waters only. The salt water criterion should be listed as 86ug/L
16. The entire list of reporting categories found in the front material of the draft IR should be amended to explicitly state that waters are either Exceeding Criteria, Meeting Criteria, or they are Inconclusive/Insufficient data to make an assessment. The 2014 Water Quality Assessment Process document clearly states this approach but the 2014 draft IR fails to be explicit about these determinations.

II. 2014 North Carolina Integrated Reporting Category Definitions Comments.

The draft 2014 North Carolina Integrated water quality assessment report to EPA now includes a total of 40 different categories. These categories are presented below and were excerpted from the Individual Assessment Changes from 2012 report found on the web at http://portal.ncdenr.org/c/document_library/get_file?uuid=4ec5e941-890d-40f4-b534-1ffd07e03c37&groupId=38364

Category 5 is the 303(d) list. Note that the previous version of the Integrated Report from 2012 had about 16 categories. The 2014 draft report includes an expanded description of the Category #3 segments. Actually, Category 3 now includes 26 different categories or sub-categories. This expanded categorization could be evaluated in terms of both positives and negatives. On one hand, the expanded categories provide an opportunity for the reader to gain further insight about the data used for the assessment. On the other hand, the expanded categories go well beyond the EPA categorical guidance and beyond the EMC decisions to require both a 10% frequency of exceedance and a 90% confidence criteria. This is easily compared in Table 1 below. For example 25 of the new categories fall under the EPA category 3a – meaning the segment is not rated because of inconclusive data.

Comments -

1. The EMC, to date, has not approved or disapproved the entire Integrated Report Methodology. Choosing to prioritize a focus on Category 5 - the 303(d) methodology for

now. Given that DWR has greatly increased the number of Integrated Report categories and sub-categories (40 categories) within the current draft report it is recommended that the EMC review the implications of these changes to the Integrated Report and consider consolidating the number of categories and sub-categories reported to EPA. Currently there are some inconsistencies in the various Integrated Report supporting documents which appear to be related to greatly expanded sub-categories and sub-sub-categories. This is a rather unnecessary distraction and at a minimum should be applied consistently across the various supporting documents. See variations at:
→ http://portal.ncdenr.org/c/document_library/get_file?uuid=2dd49e8e-c5f5-41a6-90ca-dd72ad30327c&groupId=38364
→http://portal.ncdenr.org/c/document_library/get_file?uuid=0717a102-f6c2-43f3-acb2-de7ca2b0ab16&groupId=38364
→http://portal.ncdenr.org/c/document_library/get_file?uuid=e922692c-57de-49bc-a805-dea37147e2b1&groupId=38364

Clearly there are benefits to DWR in tracking the various issues related to the Integrated Report categories. The use of these new categories and subcategories does allow for additional discriminations and provides greater insight to the data. However it is suggested that relevant information can be tracked with comments rather than creating new sub-categories and sub-sub-categories. For example, Category 3 in the 2012 Integrated Report included water segments that were not rated and included about 4 sub-categories. The current draft Integrated Report now has about 26 different sub-categories of Category 3. The new Category 3 sub-categories do not appear to be harmonious with the EMC's decision to require a 90% confidence level and a greater than 10% frequency of exceedance. Therefore, there is no longer a need to categorize waters greater than a 10% frequency without a 90% confidence level. Previously (2012) waters in the category 3 group were "not rated". The draft Integrated Report now indicates whether or not these waters exceeded a 10% frequency threshold even if they fail to meet the 90% confidence criteria and no longer uses the "not rated" definition. The numerous DWR sub-categories seem to invite the potential possibility for EPA to challenge the EMC decision for the new 303(d) listing methodology. Alternatively, most of these sub-categories could be consolidated within the EPA Category 3a and DWR could track the various issues in another manner.

2. The EMC and the Division of Water Resources should be congratulated for their expanded efforts to share information with the public on the new 303(d) list and the new Integrated Report process. On an individual case by case request they have also provided fact sheets that clarify who contributed data to the assessment process, the results of previous assessments, actual summaries of raw data collected at each station, as well as the level of confidence. In short, the fact sheets are fantastic and provide a level of detail that greatly enhances the assessment understanding. While the EMC should be applauded for improving the assessment process, DWR staff should be commended for providing this information in a timely manner. This type of information makes the assessment process transparent and understandable. With that stated, there will no doubt be errors discovered in the water quality assessments simply based on the magnitude of information that must be reported, computed, and verified. This process with an

expanded public comment time frame augmented with the detailed fact sheets makes for a much improved public process. When setting priorities for establishing a TMDL time table the EMC should consider the magnitude of the problem as well as the time duration of the problem.

3. The entire list of reporting categories found in the front material of the draft IR should be amended to explicitly state that waters are either Exceeding Criteria, Meeting Criteria, or they are Inconclusive/Insufficient data to make an assessment. The 2014 Water Quality Assessment Process document clearly states this approach but the 2014 draft IR fails to be explicit about these determinations.

Table 1.

	The complete list of Integrated reporting categories for 2014	
Category	**Definitions**	EPA category
1	Parameter assessed was meeting criteria	1
1b	Parameter assessed was meeting criteria and there is a management strategy in place for the assessed parameter	1
1f	Fish tissue collected in Assessment Unit with no advisories other than statewide Mercury advice	1
1nc	Parameter assessed was exceeding some criteria but it was determined that the exceedances were due to natural conditions	1
1r	Parameter assessed was meeting criteria and there are ongoing restoration activities	1
1t	Parameter assessed was meeting criteria and there is an approved TMDL in place for the assessed parameter	1
3a1	Greater than 10% criterion exceeded, 90% statistical confidence criterion not met	3a
3a2	3a2 Greater than 10% criterion exceeded, 90% confidence criterion met, N <10	3a
3a3	3a3 Benthos or fish community data are inconclusive	3a
3a4	3a4 Fecal coliform GM>200 and/or 20% of samples >400, 5 samples in 30 days criterion not met	3a
3a5	3a5 Low DO- Greater than 10% criterion exceeded, natural conditions assessment needed	3a
3a6	3a6 Low pH- Greater than 10% criterion exceeded, natural conditions assessment needed	3a
3a7	3a7 Fish consumption advisory in place with no site specific fish tissue data for the parameter	3a
3a8	3a8 Enterro for the Asmnt Period is Meeting Criteria	3a
3a9	3a9 Temperature criteria exceeded in Class Tr water with no assessment of thermal discharges	3a
3b1	Greater than 10% criterion exceeded, 90% statistical confidence criterion not met, management strategy in place for parameter	3a
3b2	Greater than 10% criterion exceeded, 90% confidence criterion met, N <10, management strategy in place for parameter	3a
3b3	3b3 No data or information to make assessment, management strategy in place for parameter	3a
3c1	Greater than 10% criterion exceeded, 90% statistical confidence criterion not met, non-pollutant is reason for exceedance	3a
3c2	Greater than 10% criterion exceeded, 90% confidence criterion met, N <10, non-pollutant is reason for exceedance	3a
3cr	3cr DMF RecMon Advisory Days is 61	3a
3r1	Greater than 10% criterion exceeded, 90% statistical confidence criterion not met, ongoing restoration activities in place to address parameter	3a
3r2	Greater than 10% criterion exceeded, 90% confidence criterion met, N <10, ongoing restoration activities in place to address parameter	3a
3r3	No data or information to make assessment, ongoing restoration activities in place to address parameter	3a
3t1	Greater than 10% criterion exceeded, 90% statistical confidence criterion not met, approved TMDL in place for parameter	3a
3t2	Greater than 10% criterion exceeded, 90% confidence criterion met, N <10, approved TMDL in place for parameter	3a
3t3	3t3 No data or information to make assessment, approved TMDL in place for parameter	3a
3v1	Greater than 10% criterion exceeded, 90% statistical confidence criterion not met, exceedance due to permitted facility with a variance	3a
3v2	Greater than 10% criterion exceeded, 90% confidence criterion met, N <10, exceedance due to permitted facility with a variance	3a
3v3	3v3 No data or information to make assessment, exceedance due to permitted facility with a variance	3a
3z1	3z1 Data not assessed against a NC water quality standard	3a
3z2	3z2 No data or information to make assessment	3c
4b	4b Exceeding Criteria, with 4b demonstration for the parameter	4b
4c	4c Exceeding Criteria, non-pollutant is reason for exceedance	4c
4cr	4cr DMF Recmon Swimming Advisory Posted	4c
4s	4s Biological data exceeding criteria, another aquatic life parameter is assessed in category 4 or 5	4c
4t	4t Exceeding Criteria, approved TMDL for assessed parameter	4a
4v	4v Exceeding Criteria, exceedance due to permitted facility with a variance	4c
5	5 Exceeding Criteria, no approved TMDL in place for assessed parameter	5
5r	Exceeding Criteria, no approved TMDL in place for assessed parameter, ongoing restoration activities in place to address parameter	5

III. 2014 North Carolina 303(d) Listing Methodology Approved by the North Carolina Environmental Management Commission March 14, 2013 and Updated January 13, 2014 to reflect the consolidation of the Division of Water Resources Comments -

The 2014 North Carolina 303(d) Listing Methodology Approved by the Environmental Management Commission is located here: http://portal.ncdenr.org/c/document_library/get_file?uuid=1f1d590f-a096-4eba-9853-c5dab2c5c431&groupId=38364

The goal of the Clean Water Act (CWA) is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 U.S.C §1251(a)). Under section 303(d), states, are required to develop lists of waters for which technology-based regulations and other required controls are not stringent enough to meet the water quality standards. The law requires that states establish priority rankings for waters on the lists and develop Total Maximum Daily Loads (TMDLs), for these waters. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards. By adopting a methodology to address 303(d) listing criteria North Carolina is able to begin the process of determining which waters must be restored to meet water quality standards.

The 303(d) program is a component of the water-quality based regulatory approach and links water quality standards to NPDES permit limits and TMDL's. However, few regulatory approaches are included within the CWA to regulate diffuse non point sources that may contribute to the non-attainment of a water quality standard. Thus NPDES permit holders often become the focus of regulation and controls. As a result, the 303(d) process often results in strict limitations on NPDES discharges because they cannot add additional loading of impairing pollutants (40 CFR 122.4(i)). NPDES permits must also be consistent with approved TMDLs (40 CFR 122.44(d)(1)(vii)(B)). However no such controls on non point sources are federally required under the Clean Water Act.

Although the Federal Clean Water Act was passed in 1972, North Carolina, and many other states, did not submit an official 303(d) list for many years. NC's first official 303(d) list was submitted in 1990 and NC's first TMDL was approved in 1995.

Prior to 1997, the North Carolina Division of Water Quality had the responsibilities of monitoring and reporting CWA 305(b) and 303(d) water quality assessments. These reports were sent to EPA every other year. However, in 1997 the North Carolina General Assembly revised the NC General Statutes to place the 303(d) responsibility with the EMC. 143B-282(c): *"The Environmental Management Commission shall implement the provisions of subsections (d) and (e) of 33 U.S.C. § 1313 by identifying and prioritizing impaired waters and by developing appropriate total maximum daily loads of pollutants for those impaired waters. The Commission shall incorporate those total maximum daily loads approved by the United States Environmental Protection Agency into its continuing basinwide water quality planning process"*. Notwithstanding the 1997 revisions to the general statutes, the NC Division of Water Quality continued to determine listing methods and to provide a list of 303(d) waters to the EPA with little involvement by the EMC until 2012. Subsequently, the EMC took an active role in establishing the 303(d) listing methodology for the 2014 listing cycle. Many members of the

EMC also participated in stake holder meetings to discuss changes to the listing methodology for 2014. Selected stakeholders contributed significant comments on the methodology prior to the adoption by the EMC on March 14, 2013. Some of the stake holders offering comments on the 2014 303(d) listing methodology included: the Charlotte Mecklenburg Storm Water Services, the NC Farm Bureau, the US EPA, Duke Energy, the Waterkeepers Carolina, the NC League of Municipalities, the NC Department of Transportation, Dr. Michael A. Mallin UNCW, and the NC Water Quality Association (WQA).

Water quality monitoring provides the data to characterize waters (305b) and identify water bodies that do not meet water quality standards (303d). The CWA requires that each state monitor and assess the health of all waters and report their findings every two years to EPA. Unfortunately there is always a limitation of available resources for collecting water quality samples so inference must be used based on the available monitoring data rather than monitoring for each parameter for each and every day. The available monitoring data is used to develop a list (303(d)) of "water-quality limited segments" regardless of whether or not these segments are meeting designated uses such as recreation or water supply.

Comments -

1. Because the 303(d) list is part of the 305(b) report the DWR request for comments only on the 303(d) lists fails to consider the significance of the entire integrated reporting process. Categories beyond the category 5 listings have the potential to set the stage for prioritization of management strategies and thus it is recommended that DWR solicit comments on the entire integrated report not just the 303(d) category. Page 4, paragraph 1, of the 303(d) methodology indicates that *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.* Because of the interrelated issues in listing methodology it is suggested that the EMC have an opportunity to review the complete integrated reporting process and not just the 303(d) listing methodology.

2. DWR and the EMC should be congratulated for their efforts to make the 303(d) listing process more understandable, transparent, and open for public comment. The DWR has made great strides toward this initiative. The following web-published documents have greatly increased the knowledge and awareness of the regulated community who are heavily impacted by these important decisions.

- Draft 2014 303(d) List for Review - Updated 1/23/14
- 2014 303(d) Listing Methodology
- Guide to the 303(d) list
- New 303(d)Listings for 2014
- Draft 303(d) List by County
- Draft 303(d) List by Municipality
- Draft 2014 Statewide Integrated Report including Category Definitions
- Water Quality Assessment Process
- Individual Assessment Changes from 2012

3. Page 4, of the 303(d) methodology indicates that there are 6 Assessment Methods. It is suggested that DWR consider adding an additional method for determining impacts to public drinking water supplies. For example, recent issues related to the discharge of fly ash may stimulate a need for additional assessment methods for determining use support impacts beyond the numerical water quality standards.

4. DWR has not adequately addressed EPA's concerns to provide a scientifically defensible rational to support the use of a tolerance level using a10% exceedance frequency for a numerical water quality standard. DWR could review the certified analytical labs precision and accuracy as a means of quantifying uncertainty in numerical data. This exercise alone could document a greater than 10% margin of error. Additional numerical uncertainties include monitoring under extreme climate circumstances such as flow below 7Q10 conditions, sample contamination, reagent contamination, and poor performing instruments. Water quality standards are adopted with large safety factors normally in excess of 10%. DWR properly quantifying these issues would be able to document that a 10% frequency threshold represents a *de minimis* part of water quality standards attainment and therefore perhaps put this issue to rest. If such an effort were explored perhaps DWR would discover that a more appropriate quantification of uncertainty might be as high as 20% a value more closely aligned with analytical variability of acceptance for commercial laboratories. It is not beneficial for DWR to continue to ignore EPA's desire to explain the basis for a ten % especially since the EMC has approved a ten percent threshold that includes a 90 percent confidence factor.

5. DWR had previously indicated that category 5 listings for Copper and Zinc would not be addressed with TMDL's or other management strategies until new standards are adopted and impairment is confirmed with new data. This statement is not reflected in the current listing methodology. Further, there is no attempt to explain a priority setting approach in establishing TMDL's. It may not be feasible for the EMC to prioritize TMDL development for each and every water body segment that is not meeting water quality standards. However, the EMC should explicitly adopt **Priority Setting Principals** to guide the process. For example, water bodies that have been placed into category 5 based on a single biological sample should be a low priority.

6. Benthic Macroinvertebrate monitoring for aquatic life support assessment should not initiate a 303(d) listing based on a single sample. Monitoring strategies and field work schedules should be developed and prioritized to **revisit** all locations with a single impaired sample prior to the conclusion of the five year assessment window. This would greatly increase the confidence of a 303(d) determination. If the two biological assessments do not agree then the water segment should be placed in category 3.

7. DWR should enhance the awareness of the **Re-categorized list** with explicit mention in the 303(d) listing methodology. The current EMC approved methodology implies that water segments that were listed on the 2012 303(d) list and are not on the current 2014 303(d) list will be officially delisted upon EPA approval. For the 2014 cycle this suggests approximately 250 segments will be delisted based on a review of the document on individual assessment changes from the 2012 cycle (a.k.a. the Re-categorized list).

This Re-categorized list is an extremely helpful document and DWR should be applauded for this enhanced level of transparency as each change has a justification. This re-categorized document aids reviewers of the 303(d) list in determining why an assessment has been moved from one category in 2012 to a different category in 2014. In terms of transparency, it is not readily apparent why the 303(d) list does not include an appendix of water segments intended to be de-listed from Category 5 in the prior assessment.

8. The EMC is to be applauded for their efforts to include the binomial approach in the evaluation of the 303(d) listing methods. The use of a statistically derived confidence level is a sound scientific assessment technique for determining whether or not a threshold has been crossed based on a limited number of monitoring samples. Thanks to the EMC's March 2013 unanimous decision, North Carolina is like nearly 20 other states that have included a similar statistical approach to enhance the confidence of 303(d) listings. Previous assessments had the potential of 303(d) listings based on less than a 50/50 probability chance of being correct. For example, using the raw score approach, 19 water quality observations with only two of these exceeding the water quality standard would have resulted in a 303(d) listing because more than 10% exceeded the criteria. However, based on this example it would indicate only a 42 % confidence level that the true value was greater than 10%. Ideally water quality standards should have an explicit quantifiable description of four components for any numerical parameter: magnitude, duration, frequency, and confidence. Currently, North Carolina's water quality standards do not explicitly have all of these components. Future modifications of the water quality standards should address these issues. Over the decades, water quality standards have evolved from permit targets to their current use as decision thresholds for 303(d) impairment. It is very encouraging that the EMC has included a confidence factor in the 303(d) methodology. Clearly this is not the establishment of a new water quality standard but a quantifiable assessment of the statistical confidence in the 303(d) listing decision based on a limited, and highly variable, number of sampling observations. Originally, DWR only assessed data through the "10% rule"; if no more than 10% of the sample values were greater than the applicable standard, then the water was deemed to fully support the designated use protected by that standard. However, statistically, the 10% rule tends to overstate the number of impaired waters by declaring a water segment impaired when in reality it is not. To counteract this potential error, the binomial approach will typically not list compliant waters. The following states have incorporated 303(d) statistical probability components in to their listing methods (most have utilized a 90% confidence level similar to the EMC's decision): Alabama, Arizona, California, Colorado, Delaware, Florida, Iowa, Kansas, Maryland, Mississippi, Montana, Nebraska, Nevada, North Carolina, North Dakota, Pennsylvania, Tennessee, and Texas.

9. Previously, DWR indicated that it would initiate a **prioritization** of waters for further action based on magnitude and frequency of exceedance criteria. The current listing methodology does not address this issue nor has the EMC **prioritized** waters according to the NC General Statutes 143B-282(c): *"The Environmental Management Commission shall implement the provisions of subsections (d) and (e) of 33 U.S.C. § 1313 by identifying and **prioritizing impaired waters** and by developing appropriate total*

maximum daily loads of pollutants for those impaired waters. The Commission shall incorporate those total maximum daily loads approved by the United States Environmental Protection Agency into its continuing basinwide water quality planning process". **To more effectively allocate resources and identify significant and problematic impairments that impact designated uses the methodology should incorporate a priority setting process meaningful to the citizens of the state**.

10. The numeric criteria for pH assessment on page 5 of the 303(d) methodology does not mention the narrative standard "15A NCAC 02B .0211 3(g) *pH: shall be normal for the waters in the area, which generally shall range between 6.0 and 9.0 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;*
Since waters shall be "normal" according to the standards what is the listing criteria for waters that have highly altered pH due to the discharge of wastewater? This issue should be addressed in the 303(d) listing methodology.

11. The 303(d) listing criteria for Chloride on page 6 should be amended to read as follows: The chloride criterion is not to exceed 230 mg/l in all **fresh** NC waters.
Notice that salt water classifications do not have a water quality standard for Chloride. Also notice that Water Supply classifications have a water quality standard of 250 mg/L chloride. This appears unexplainable since the Class C Fresh Water standard is 230 mg/L.

12. The 303(d) listing criteria for residual chlorine on page 6 should be amended to read as follows: The chlorine (residual) criterion is not to exceed 17ug/L in all NC **fresh** waters. Notice that salt water classifications do not have a water quality standard for residual chlorine.

13. The 303(d) listing criteria of 50ug/L for Chromium should reflect **fresh** waters only. The salt water criterion should be listed as 20ug/L according to 15A NCAC 02B .0220 (3)(m)(iii).

14. The 303(d) listing criteria of 5ug/L for Cyanide should reflect **fresh** waters only. The salt water criterion should be listed as 1ug/L

15. The 303(d) listing criteria of 1.8mg/L for Fluoride should reflect **fresh** waters only. There is no water quality standard for Fluoride in salt water classifications.

16. The 303(d) listing criteria of 50ug/L for Zinc should reflect **fresh** waters only. The salt water criterion should be listed as 86ug/L

17. Currently, available water quality monitoring data is used to develop the 303(d) list of water segments that do not meet water quality standards regardless of whether or not these segments are meeting their intended designated uses such as recreation or water supply. It is therefore suggested that the list no longer be referred to as **impaired waters** but rather "water-quality limited segments".

IV. New Listings for the 2014 Draft 303(d) Report in the Neuse Basin Comments -

New listings for North Carolina's 2014 draft 303(d) report can be found at the following web link: http://portal.ncdenr.org/c/document_library/get_file?uuid=c36b70c1-de5f-495c-9e99-f024e822580e&groupId=38364 .

For the 2014 listing cycle there are eight new water body segments in the Neuse Basin for new 303(d) designations.

Lower Neuse Basin

1.	Dawson Creek Class SA,HQW,NSW for Enterococcus	segment #27-125-(6)a)
2.	Dawson Creek Class SA, HQW,NSW for Enterococcus	segment #27-125-(6)b)
	Upper Neuse Basin	
3.	Beddingfield Creek Class C, NSW for Benthos	segment #27-37
4.	Middle Creek Class C, NSW for fish community	segment #27-43-15-(4)a1
5.	Mill Creek (Moorewood Pond) dissolved oxygen	segment # 27-52-1b
6.	Snipes Creek Class C, NSW dissolved oxygen	segment #27-57-12
7.	UT to Mine Creek Benthos	segment # 27-33-14aut8
8.	UT to Swift Creek (lake Benson) Benthos	segment # 27-43-(5.5)but

Comments:

1. Mill Creek/Moorewood Pond is a Reservoir in Johnston County, NC with an elevation of 167 feet, above sea level. Moorewood Pond is also known as Bryan Pond and Woods Pond. If the low dissolved oxygen observations were collected below the influence of the reservoir or occurred due to reservoir stratifications then this should not be considered a violation of water quality standards.

2. Dawson Creek is located just outside of the town of Oriental, NC. It is a new 303(d) listing based on recreational swimming criteria of Enterococcus site C92 and C92a. For station C92 there were three sampling events in 2012 with elevated concentrations (306 and 288 and 75) August 13, July 24 and May 23 respectively. For station C92a similar results were obtained on the same days (406, 624, and 99). Prior to listing on the 303(d) list unusual climatic events should be considered. Such as when violent severe thunderstorms swept through Eastern North Carolina in July of 2012. The deadly thunderstorms were fueled by the extreme heat affecting the Southeast, coupled with unusually high levels of moisture. The extraordinary heat and moisture caused high levels of atmospheric instability rarely seen. The Morehead City NWS office indicated this is a truly rare occurrence. Also consider the effects of Tropical Storm Beryl (May 2012).

3. Beddingfield Creek is located near Shotwell Road in Johnston Co. The new listing draft 303(d) report indicates that this segment was listed for Benthos based on a 2011 collection. However, in 2009 Beddingfield Creek received a Good bioclassification, had 18 EPT taxa and was given a 5.2 biotic index. The report indicated that *"Much of the catchment drains the Clemmons State Forest and some of the land in the drainage area*

appears to be owned by the City of Raleigh and may be part of their wastewater application area. Many unique taxa were collected only at this location including the mayflies Serratella deficiens and Baetis flavistriga, stoneflies Eccoptura xanthenses and Leuctra, caddisflies Diplectrona modesta and Neophylax oligus and the beetle Ancytarsus biocolor. This site represents the best water quality conditions noted during this investigation and should receive watershed protection. "

Ecosystem Enhancement Program information found here:
http://view.officeapps.live.com/op/view.aspx?src=http%3A%2F%2Fwww.nceep.net%2Fservices%2Flwps%2FWake_Johnson_collaborative%2FDRAFT%2520Benthic%2520Macroinvertebrate%2520Community%2520Report.doc

It is suggested that 303(d) decisions should not be based on a single biological sample. Just two years prior (2009) Beddingfield Creek was rated as good for benthos. Additional review and sampling should explain this discrepancy. Perhaps EPT abundance was reduced from earlier sampling due to natural climatic conditions.

V. Individual Assessment Changes for the Mainstream of the Neuse River below Falls of the Neuse Reservoir from the 2012 list to the draft 2014 303(D) list and the integrated report changes list.

Changes in the listing categories for the draft 2014 Integrated Report which includes changes to the draft 2014 303(d) status for waters in North Carolina are found on the DWR web site at: http://portal.ncdenr.org/c/document_library/get_file?uuid=4ec5e941-890d-40f4-b534-1ffd07e03c37&groupId=38364

Neuse River Basin category changes to water body segments are found on pages 37 through 44. Within the Neuse River Basin there are a total of 46 segments that have categorical changes. Approximately 17 of these categorical changes were justified based on EMC approval of new listing methods for the 2014 cycle. Approximately 30 segments were categorically changed with a justification that included more recent or more accurate data. On occasion there was some overlap in the justifications.

There are 12 mainstream segments on the Neuse River with categorical changes below Falls of the Neuse Reservoir. These changes are summarized in Table 2 below. Of particular importance please note that most listings for chlorophyll a in the Neuse River estuary have been changed from not meeting the water quality standard to now meeting the water quality standard for this assessment period. It appears that only two mainstream Neuse River Estuary segments are listed in the integrated report as 4t – exceeding criteria with an approved TMDL. These segments are:

27-(104)a NEUSE RIVER Estuary From a line across Neuse River from Johnson Point to McCotter Point to a line across Neuse River from 1.2 miles upstream of Slocum Creek to 0.5 miles upstream of Beard Creek (middle model segment)

27-(96)b2 NEUSE RIVER Estuary From Trent River to a line across Neuse River from Johnson Point to McCotter Point (part of upper model segment)

Table 2. Summarized Changes in listing categories for the mainstream Neuse River below Falls Lake From 2012 Integrated Report to the draft 2014 Integrated Report

Segment Number	Stream Segment Description	Parameter Name	From 2012 Category	To 2014 Category	Category Change Justification
27-(36)	Neuse River from Beddingfield Creek to 0.2 mi dns Johnston County SR1700	Copper and Zinc	5	3a1	new listing method
27-(38.5)	Neuse River 0.2 mi dns Johnston County SR1700 to 1.4 mi dns Johnston Co SR1908	Copper	5	1	more recent or accurate data
27-(49.5)	Neuse River from 1.7 mi ups Bawdy Creek to 0.5 mi ups of Richardson Bridge SR 1201	Turbidity	5	3a1	new listing method
27-(22.5)c	Neuse river From Crabtree Creek to Auburn Knightdale Road	Turbidity	5	1	more recent or accurate data
27-(22.5)c	Neuse river From Crabtree Creek to Auburn Knightdale Road	Copper	5	3a1	new listing method
27-(50.375)a	Neuse River Richardson Bridge/SR1201 to 0.75 mi ups of Mocassin Creek	Turbidity	5	3a1	new listing method
27-(49.75)	Neuse River 0.5 mi ups Richardson Bridge Rd/SR1201 to Johnston County intake at SR1201	Turbidity	5	3a1	new listing method
27-(118)a1a	Neuse River Estuary at Camp Don Lee	Chlorophyll a	4t	1t	more recent or accurate data
27-(96)b1	Neuse River Estuary from Bachelor Creek to Trent River	Chlorophyll a	4t	1t	new listing method
27-(104)b	Neuse River Estuary from 1.2 mi ups Slocum Cr to 0.5 mi ups Beard Cr line fr Wilkenson Pt to Cherry Point	Chlorophyll a	4t	1t	more recent or accurate data
27-(118)a2	Neuse River Estuary line from Adams Cr to Wiggins Point to mouth of Neuse Point of Marsh	Chlorophyll a	4t	1t	more recent or accurate data
27-(96)b2	Neuse River Estuary from Trent River to a line from Johnson point Point to McCotter Point	Copper	5	3a1	new listing method
27-(118)a1	Neuse River Estuary from a line Wilkinson Point to Cherry Point to a line from Adams Cr to Wiggins Point	Chlorophyll a	4t	1t	more recent or accurate data

By special request, DWR provided detailed fact sheets covering the data collections and the decisions made concerning both 305(b) and 303(d) updates to the Integrated Report. These documents provide specific details identifying which monitoring programs contributed data for assessment purposes. This information provides a great deal of benefit to the interested stake holders and DWR should be commended for this enhanced information. Take for example, segment **27-(104)a** with listing category 4t in the draft IR (exceeds criteria for chlorophyll a). According to the fact sheet provided by DWR this segment is represented by chlorophyll a collections from three different agencies generating a robust data set. The following chlorophyll *a* sample locations and pertinent summary statistics provide clear insight as to why segment **27-(104)a** remains on the IR list as not meeting the chlorophyll a standard of 40ug/L.:

Table 3.

Station Number	Number of samples	Number > evaluation level of 40	% > evaluation level of 40
J8902500	54	9	16.7
J8903500	1	1	100
J8910000	56	4	7.1
J8903500	106	21	19.8
J8903600	106	17	16
JA110	84	8	9.5
JA102	84	13	17.9
JA103	85	3	3.5
JA105	85	8	9.4
JA108	87	10	11.5
totals	748	94	12.6

Please note that segment **27-(96)b2** had similar statistics for chlorophyll a with a total number of 224 observations 31 of which exceeded the standard of 40ug/L or 13.8%. This kind of readily available information provides confidence in the listing decisions based on robust data sets. Again, DWR's efforts to provide this information are appreciated. This information suggest the

future possibility that these segments could be considered meeting the chlorophyll *a* standard with just a 3 or 4 % reduction in the frequency of samples over 40ug/L.

Comment -

1. Changes related to the parameter **chlorophyll *a*** in the Neuse Estuary are related to an assessment of more recent data rather than any changes in assessment methodology. An error in the Re-categorized document (highlighted in yellow Table 2 above) is segment **27-(96)b1** which is shown with a justification indicating **new listing methodology**. This justification is believed to be in error because the **category 1t** definition indicates that the parameter is meeting criteria. This justification should be changed to "more recent or accurate data". The Re-categorized document should have no justifications based on a "New EMC method changes" for any category 1t listings. This type of error can easily be corrected by DWR through appropriate search queries of their internal databases.

Painter, Andy

From: lynne and glenn <lynneandglenndulken@gmail.com>
Sent: Sunday, March 09, 2014 4:50 AM
To: Painter, Andy
Cc: Schuyler Conard
Subject: Fwd: Ostin Creek
Attachments: 20140221_134302.jpg; 20140221_134214.jpg; 2011-10-02_11-47-55_472.jpg; Droid pictures 12-5-10 184.jpg

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: 2014 303d comment

Good morning Mr Painter,

Thank you for helping us address the issue of erosion and the silting in of one of North Carolinas most beautiful trout streams, Ostin Creek, and the disastrous consequences to Lake Adger.

We have the great fortune and misfortune to live at the mouth of Ostin Creek where it empties into Lake Adger. We have owned this land for 16 years and have watched what was a beautiful piece of nature turn into a mud slime. When we first bought this land 16 years ago, Ostin creek was a beautiful mountain steam where round pebbles and river rock could be seen clearly on the river bottom. All the way from the water falls above the covered bridge down to Lake Adger, Ostin creek was a beautiful, pristine mountain stream, clear and easily navigable by canoe or kayak. Ostin creek was then designated a registered trout stream.

Since that time sediment has run so heavily that Ostin creek is several feet deep in mud and a huge delta has formed at the mouth of the creek spreading more than a hundred yards into the lake. When we first bought our property at Lake Adger, we measured the depth of the water at the "swimming rock" where we like to swim. This rock outcropping is on the lake and directly across a small cove approximately 50 yards from the mouth of Ostin Creek. In 1997 the water depth at the rock was 25 feet. We measured it again in 2011 and it was 12 feet. Today it is between 6 and 8 feet depending on lake levels.

The bigger cove, one of the most beautiful parts of Lake Adger, next to her only island, is now polluted by a massive and encroaching delta of mud spreading from Ostin Creek. In the middle of the cove where the water was certainly deeper than the 25 feet we measured at the rock outcropping, the water is now between 1 foot at high water and 0 feet - dry land (actually wet, exposed mud) when lake levels are low.

The destruction of property values, the destruction to wildlife, the sports of fishing and boating, and the beautiful natural vista is profound. Whatever the state can do to remedy this would be most appreciated. We hope the state will first of all find where the silt is coming from and stop the problem at its source. I believe the source is a combination of new development, but mostly farmers tilling fields up stream with no silt control. We then hope the state will proceed to dredge the entire cove so that it is again navigable and restored to its natural condition.

We are more than willing to help by working with the state to put a monitoring station on our land at a mutually agreed upon site up Ostin Creek. Please let me know how we may help further. I have many pictures of the damage done and will be glad to help in any way I can.

Thank you so much,

Glenn Dulken

Painter, Andy

From: Price, Eric <eric.price@my.lr.edu>
Sent: Sunday, March 09, 2014 10:02 PM
To: Painter, Andy
Subject: 303d List Comments

Categories: 2014 303d comment

Dear Mr. Painter,

My name is Eric and I am an Environmental Science major student at Lenoir-Rhyne University. I also am an outdoor enthusiast and love western NC. I am really thankful for the NC Department of Environment and Natural Resources and the work that you all do around the entire state. It's a department I'd be proud to work for!

With what I have learned in school and the training I have received in the process, I write to you about the placement of Harper Creek on the 303d list. I have taken the Environmental Monitoring class at Lenoir-Rhyne University as part of my required curriculum and participated in benthos and fish assessments. While I have not personally done benthos sampling on Harper Creek to assess it, I know that it's a narrative criteria based parameter and that without proper sampling, the data could be skewed or misrepresentative. If there is something causing the benthos to be in the fair criteria, I want to find out how it can be retuned back to it's natural condition, but I am curious, with the type of waters that this creek is designated as, if benthos fair level isn't something natural occurring.

I spend a lot of time around Wilson Creek which Harper Creek is a tributary to, for fun and volunteer clean ups. I specifically hike on the trail that follows along beside Harper Creek as I'm backpacking to South Harper Creek falls. Knowing the area pretty well and knowing how pristine the water is in that creek, I'm concerned as to why Harper Creek is on the list.

For those reasons, I'm asking for further research and testing on Harper Creek. These are ORW and trout waters. They feed into Wilson Creek, which as I'm sure you know, is a Wild and Scenic River. These are some of the best waters in the state. I'm willing to help in any way I can to preserve this area. I feel like we need to protect these waters, first by making sure there is a problem, second by finding the cause of the problem, and third by creating a plan to solve the problem and acting upon it.

Thank you for taking the time to take and review these public comments. I hope they all work for the good of North Carolina as a whole. Thanks for consideration of my personal comments, and again, I'm willing to help if ever you'd need assistance.

Sincerely,
Eric Price

2916 Freezer Locker Road
Hudson, NC 28638
828-851-1748

Painter, Andy

From: Elizabeth Lamb <dibbitlamb@gmail.com>
Sent: Thursday, March 13, 2014 5:48 PM
To: Painter, Andy
Cc: Mary Walter; Renee McDermott; Tommy Lytle; Babs Strickland; carole bartol
Subject: 2014 Water Quality Assessment "Draft" List

Categories: 2014 303d comment

Dear Andy Painter,

As one who lives in the Area drained by the Pacolet and Green Rivers, the management of water quality on both rivers is important to me. Since the protection of the Green River is addressed in your above-mentioned draft list, I would like to add my comments regarding the stewardship of the river.

1.More monitoring of the quality of the benthic population is needed, both to assess the problems that might be present and to establish a base-line for the future.

2.There is a major problem with sedimentation and erosion around and in Lake Adger - the extent and possible mitigation needs to be carefully studied by NCDENR.

3. While the 4 streams flowing into Lake Adger are classified as Class C, suitable for trout, they has not been monitored, and there seems to be too much sedimentation in all of them to support this.

The Green River is a beautiful river, and the Green River Gorge has a deserved reputation for beauty and for recreational use, but Lake Adger and the areas above, and below the lake have not been so regarded, in large part because of the above mentioned sedimentation and erosion. I would hope that NCDENR will take note these matters in your Water Quality Assessment of 2014.

Thank you for your time,

Elizabeth Lamb
President
Pacolet Area Conservancy
850 Trade St.
Tryon, NC 28722

Painter, Andy

From: Schuyler Conard <schuylerconard@gmail.com>
Sent: Thursday, March 13, 2014 6:22 PM
To: Painter, Andy
Subject: Public Comment on the DRAFT 2014 303(d) List
Attachments: Recap of Discussion with Green River Watershed Alliance.docx

Categories: 2014 303d comment

Dear Mr. Painter,

Thank you for this opportunity to give my public comment regarding the 2014 list of streams, rivers and lakes that are not meeting state water quality requirements. My concern is that the Green River Watershed, in Polk County, is not being adequately monitored or assessed by the state to even make this determination of meeting water quality standards or not (303(d)list). The GRW is a Subbasin to the Broad River Basin and I am not seeing any of our waterbodies listed as Category 5/Impaired but perhaps that is because many were not evaluated in the first place.

In 2013 a Green River Watershed Assessment was performed by Altamont Environmental, Inc for Isothermal Planning and Development Commission. This project was funded through a 2012 Clean Water Act 205(j) Grant by the NCDENR, DWR and is a Supplement to the NCDWQ Broad River Basinwide Quality Plan (see link below). This report looked at all existing reports, water quality data, historical records, local/state agency&resident interviews and conducted visual inspections throughout a 60 sq. mile area of the GRW in Polk County. 182 stream miles were studied, including the Green River, Lake Adger,along with the following tributaries; Casey Branch, Brights-Cove-Gadd-Ostin-Panther-Pullium-Rotten-Rash and Silver Creeks. The concluding, relevant points from this report are; 1) Water Quality data within this GRW study area was not abundant.There are no DWQ ambient water quality stations, no Watershed Assessment Team Projects, no Watershed Assessment/Restoration Programs and no Local Watershed Plans existing in the GRW. 2) 22 of the 31 assessed "priority sites"(or 70%) established for the report, exhibited signs of erosion, channel incision, sediment accumulation and/or potential for downstream sediment impact. In addition large, heavily sedimented depositional islands and water shallowness was documented at Panther and Ostin Creeks along with their coves, the Green Rivers flow entrance into Lake Adger and throughout the Public Marina areas. Further, actively eroding banks were observed throughout the Lake Adger which contributes directly to the sediment problem 3)The "NC DWQ Broad River Basin Plan: Green River Watershed 2008 Report" states that sedimentation observed in many streams is likely leading to habitat degradation and that further investigation is needed to determine if sediment is" *impairing*" the Green River Watershed. River Basin Plan Reports are now augmented to 10year cycles so this will not be updated until 2018!

I have been intensely involved with the Green River Watershed in Polk County for the last 4.5 years and represent the "Green River Watershed Alliance", a citizen advocacy organization working on all levels with all partners/stakeholders to address the health of our waterways with initiatives that promote clean water, responsible stewardship/management and the sustainability of this valuable natural resource. The fulfillment of the 2013 GRW Assessment Report was the end result that occurred primarily because of effective, successful on-going working partnerships with NCDENR/DWR staff and participation in the WNC Water Quality Collaborative Summits, facilitated by Ted Campbell and Chuck Cranford and to this I and the Green River Watershed is entirely grateful. This completed study, however, raises red flags of big stressors here which seem to warrant a closer look, as data/testing is minimal, so that proper protection and management, on all levels, can be triggered.

So to this end, GRWA has been in contact with Cam McNutt and Eric Fleet with DWR(see attached email 2/21/14 for details) to request that our GRW in Polk County gets some additional state water quality or benthos monitoring sites established. Particularly of concern is that there is only one benthic monitored site, AB-23 or AU#9-29-(33), located near Laurel Branch Creek, along the whole 37 mile stretch(from Cove Creek to White Oak Creek) of the Green River in Polk County and reported condition of the river deteriorates gradually after this site, as it approaches and feeds into the Lake Adger. Also the 4 tributaries flowing into Lake Adger that are presently Classified as "C", Tr.(Trout) waters since 1964 have never been monitored to support these classifications. Testimony and observations in the 2013 GRW Assessment Report describe heavily sedimented conditions that are uninhabitable for cold water trout, thus there is concern these streams may not meet water quality standards IF they were tested or adequately assessed by the state .

Other pressing issues are that part of the GRW in Polk County is pending Reclassification into (Lake Adger Watershed) WS IV, drinking water status. All above mentioned water bodies will be within the newly designated "Protected or Critical Areas" and would need monitoring in order to protect the water quality for this new use and their ongoing
Class "C" recreational uses. Just to complicate matters even further is that the political climate in Polk County remains unresponsive towards addressing water quality concerns with protective/preventive watershed policy making or planning despite exhaustive efforts like GRWA numerous presentations, the 2013 Green River Assessment Report and even pending Reclassification of its waters.

In closing, the Green River Watershed is an internationally famous & spectacular resource for all recreational users and is worthy of adequate monitoring, planning and protections to keeping it this way or mitigating the found stressors. Effectively protecting the health of our Green River waterways cannot begin without this vital first step of assessing the water quality so I hope NCDENR will respond to these concerns with some state level monitoring methods of said waterbodies.

This is my Public Comment on the 2014 water quality assessment list in behalf of our Green River Watershed in Polk County.

Thank you, Sky Conard/ Green River Watershed Alliance

http://portal.ncdenr.org/c/document_library/get_file?uuid=b97ab065-8e18-42ed-8da8-aa5c87a06f97&groupId=38364

to
cam.mcnutt ,
ericfleek

This is copy of email sent on Feb 21, 2014

Dear Fellows,

Just wanted to recap conversation between all of us, yesterday, as of its importance level to the Green River Watershed down here in Polk County. Thank you both for taking the time. I understand the limited resources the State is left with these days and appreciate your efforts to help us protect our vital waterways.

We are speaking of establishing new water quality parameters;Ecological/Biological Integrity/Benthos monitoring sites for somewhere along the Green River, after AB23 site (AU#9-29-(33) which is near Laurel Branch Creek and in the 4 tributaries entering Lake Adger (Ostin, Silver, Rotten and Panther Creeks).

Support of Need for above additional state monitoring sites are several. Discussed were; 1) Only one site, AB23, is monitored along this whole 37 mile stretch along the Green River, Polk County.{Based on the 2012 NC Integrated Report, this site revealed an "Excellent Bioclassification" for benthos Integrity in 2010 and perhaps these waters here could be pursued for reclass. to HQW or ORW for further protection and a revisit to site in 2014 might be warranted per Cam}. Any proposed new site established down stream from AB23 (and before the Lake) would be in the "Protected or Critical Area" zones with Reclassification of Lake Adger Watershed WS IV. I suggested a good new site could be on Silver Creek Road (Rt # 1138), that crosses over the Green River Bridge. It provides easy road access to the river, is not on private property and is after the confluence of Brights Creek and before the entrance into Lake Adger Reservoir where this catchall for all the sediment is accumulating(refer pg.16 of GRW Assessment Report). Also informed Eric that Brights Creek development is under new(motivated) management and they are gearing up to build a $4 million pool/spa ,Hotel, etc and have a permitted d/c. So State may like to consider revisiting(2014) their "Good/Fair Bioclass/Integrity Fish Com, site AU#9-29-38-1 or AF31 from 2010 which was downgraded from 2005 "Good Bioclass"(due to "thick sediment/turbidity found). Please input the documentation of observed sedimented conditions of Brights Creek on page 15 of the report; "Assessment of the Green River Watershed: A Supplement to the NC Division of Water Quality Broad River Basinwide Water Quality Plan" 2013 produced by Altamont Environmental, Inc. These are presently Class C, Tr. waters and would be in the proposed "Protected Area", just outside the "Critical Area" of LA Watershed WSIV. The owner of Brights Creek has verbalized to me that there are no trout in these waters due to shallow and overheated conditions. Eric said he would speak with his fish guy about all this... 2) The above named 4 tributaries flowing into the Lake Adger Reservoir are classified C,Tr. waters by the state since1964, per Cam, and have never been monitored to support their classifications.These waterbodies are pending reclassification into (Lake Adger Watershed) WS IV, drinking water status and in the "CA" and "PA" which heightens the level of importance/priority/need of establishing new monitoring sites to protect the water quality. Please input professional observations of heavily sedimented conditions found in said specified streams(pg 17-20) in Altamonts GRW Assessment Report 2013. Access to these creeks is doable and resident Glenn Dulken of Ostin Creek (participant in study, pg.12) said he would be delighted to cooperate and show state where best/easiest to access via his property. Panther Creek access could easily be right off Lake Adger Rd, after 1 lane bridge, across from LA Community North entrance before flowing into the reservoir. Silver Creek access is also easy from Lake Adger Parkway(south side) and Rotten Creek, not so easy but we can discuss later.

Also discussed was that GRWA would have Altamont Environmental Engineers weigh in as to their professional opinion of where best suited new sites might be. I have just emailed them and am awaiting response. I expressed asap as we were thinking possibility of new sites to be established 2014?.

Green River Watershed Alliance would be submitting Public Comment to NCDENR on the 2014 released draft of 303(d) list (water quality assessment list) as well in order to use as a platform to advocate dire need to establish new state monitored sites within the GRW. I aim to solicit support from all GRWA partners/colleagues to do this as well. Julie Mayfield, director of WNCA and Hartwell Carson, French Broad River keeper have already agreed to put forth Public Comment in support of above.

I went on to explain that as things stand now, the Green River is the most" famous, forgotten River" because despite its international notoriety from the Narrows Kayak Race Competition, GR Games, GR Gorge Zipline Adventures, Trout Fly fishing,etc....the protection, proper management/monitoring and restoration for it has not hardly begun! Furthermore, In several recent meetings with majority Polk County Commissioners and the Green River Watershed Alliance,there is no intention to adopt any further local erosion/sediment controls or protective ordinances for their watershed nor any BMP'S watershed plans despite the obvious needs documented in the 2013 GRW Assessment Report, my numerous presentations, dissertations or in preparation of providing public drinking water with reclassification of Lake Adger Watershed WS IV.

That's about it for now, lets keep in touch.

Thanks again and let me know whatever I can do to help to pursue this needed project.

Sincerely,
Sky Conard/Green River Watershed Alliance, working for Clean/Sustainable Waters in Polk County since 2009
704-299-1424

Painter, Andy

From: Ray Gasperson <ray4polk@yahoo.com>
Sent: Friday, March 14, 2014 10:20 AM
To: Painter, Andy
Subject: Public Comment concerning Green River waterrshed and Lake Adger in Polk County, NC

Categories: 2014 303d comment

Dear Mr. Painter,

I am a Polk County Commissioner, now in my 6th year on the BOC, and I would like to take this opportunity to support the apparent need to support further official State water monitoring stations within Polk County Green River Watershed. These stations would help provide the data needed to understand the present health of these waterways and aid in the development of plans to improve the quality of the watershed.

During the time that I have been a resident of Polk County (since 2001), I have taken many boat trips on Lake Adger. I have noticed the sediment accumulation in the lake to get increasingly worse. Polk County government owns the lakebed up to the high water level including the dam. Therefore, the county is responsible to the taxpayers on making wise use on the spending of tax dollars. I believe that water monitoring stations within the proposed WS IV would be valuable in helping with long term budgeting in the county's annual budgets for expenses related to sediment removal from the lake.

Thank you,

Ray Gasperson
Polk County Commissioner

Painter, Andy

From: Dave Mayes <Dave.Mayes@wilmingtonnc.gov>
Sent: Friday, March 14, 2014 10:35 AM
To: Painter, Andy
Cc: Jennifer Butler; Mcnutt, Cam
Subject: 303d list comments

Categories: 2014 303d comment

Andy: The City of Wilmington offers the following comment concerning the draft 303d list of impaired waters.

Howe Creek–

- Howe Creek is listed as impaired for DO on 303d List for a portion of Howe Creek, however, the DO impairment is not listed on the specific fact sheet for Howe Creek that Cam McNutt sent us. Why not?

Thanks for the opportunity to review.

David B. Mayes, P.E.
Stormwater Services Manager
City of Wilmington, Public Services Department
209 Coleman Dr | PO Box 1810
Wilmington, NC 28402
Ph: 910.341.5880 | Cell: 910.470.1869
dave.mayes@wilmingtonnc.gov
www.wilmingtonnc.gov

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Painter, Andy

From: John R Jacobson <jjacobson@washjeff.edu>
Sent: Friday, March 14, 2014 2:28 PM
To: Painter, Andy
Subject: Reclassification of the Neuse Estuary

Categories: 2014 303d comment

As a resident of New Bern knowledgeable about the estuary and also a keen observer of the macro conditions of the Neuse Estuary, I find your reclassification of the Estuary from a category 5 to a 1 contrary to available information and my observations. Let me list my concerns.

1. Your own Neuse Basin Plans and updates for the last five years demonstrate a failure to reach nutrient reduction goals.
2. Available information from the UNC-CH Marine monitoring of the Estuary demonstrates a continuing if not increasing nitrogen loading.
3. Any attempt to trace a linear tracking of fish-kills in the Estuary shows a increase over the last ten years.
4. The fact that A. Invadens has caused bloomed each Spring and Fall for the last two years to cause fish-kills with sores demonstrates there exists ripe conditions for the flourishing of that microorganism at optimal temperature and salinity.
5. Any attempt to track the qualities of a vast, dynamically shifting estuary--by fresh waster, salt water and wind-driven tidal action--with limited station monitoring and over only 5 years doesn't begin to characterize the impairments.

I trust that you will reconsider or table for further investigation and consideration the reclassification of any section of the Neuse River Estuary.

Sincerely,
John Jacobson
508 Metcalf St.
New Bern, NC 28560

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

MAR 14 2014

Mr. Tom Fransen
Chief
Water Resources Management Section
Division of Water Resources
North Carolina Department of Environment
and Natural Resources
1617 Mail Service Center
Raleigh, North Carolina 27699-1617

Subject: Comments on the State of North Carolina's Draft 2014 303(d) List

Dear Mr. Fransen:

Thank you for the opportunity to comment on the North Carolina's draft 2014 303(d) list. Section 303(d)(1) of the Clean Water Act (CWA) directs states to identify those waters within its jurisdictions for which effluent limitations are not stringent enough to implement any applicable water quality standard (WQS). Non-attainment of the WQSs is determined by examining all existing and readily available water quality-related data and information. The assessment methodology constitutes the decision process that a state uses to conduct this examination. It is important that the assessment methodology be consistent with applicable WQSs. It should also be consistent with sound science and statistics.

Section 303(d)(2) of the CWA directs states to submit the section 303(d) list to the U.S. Environmental Protection Agency and the EPA is required to approve, partially approve/disapprove, or disapprove that list. The EPA's decision will be based on a determination that the State reasonably considered all existing and readily available data and information and listed all waters not attaining WQSs. Where waters and/or impairments are being *delisted* from the previous list, the State must demonstrate "good cause" (40 CFR 130.7(b)(6)(iv)). To demonstrate "good cause," the State is expected to provide justification, which can be included in the list or the assessment methodology, of why the water and/or impairment was delisted.

Where the EPA can conclude that the State's assessment methodology properly implements applicable WQS and federal 303(d) regulations for each category of impairment, the methodology will be used as the basis for approval. Where that conclusion cannot be made, the EPA will conduct an independent assessment and review water quality data for each relevant category to determine if additional impairments should be added to the 303(d) list. The EPA has provided a framework to help in developing an appropriate methodology [*Consolidated Assessment and Listing Methodology (CALM) – Toward a Compendium of Best Practices*, July 2002, http://water.epa.gov/type/watersheds/monitoring/calm.cfm].

During this and previous evaluations of NC 303(d) submittal packages, the EPA Region 4 identified portions of the State's assessment and listing methodology that may result in failure to identify all impaired waters. These are: (1) the State's use of the "greater than ten percent exceedance" test as a

method to assess toxic pollutants; and (2) provisions that limit the use of data based on sample size and age of data.

Toxics

NC's WQSs for toxics, as currently documented in the NC Division of Water Resources' (DWR) *Redbook* (Amended Effective May 1, 2007; available on the DWR Classification and Standards Unit webpage: http://portal.ncdenr.org/web/wq/ps/csu), are specified as "maximum permissible levels." Because the NC WQSs do not define the conditions of toxicity (acceptable duration and frequency), one interpretation of the WQSs could be that no digressions are permissible in the waters of the state; i.e., one sample value over the applicable criterion is cause for listing the water as impaired. The DWR has assessed its waters for toxics by assigning impairment to waters with a greater than ten percent exceedance frequency of the criteria, with at least 90% statistical confidence level and the sample size exceeds nine.

Use of the ten percent "rule of thumb" for interpreting water quality data is usually considered appropriate for conventional or naturally variable pollutants. However, it is not consistent with toxics criteria expressed as "maximum permissible levels." See Section G (*How should statistical approaches be used in attainment determinations?*) of Part IV *(Issues Concerning the Development and Use of an Assessment Methodology*) of the EPA's *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act* (http://www.epa.gov/owow/tmdl/2006IRG).

For toxics, the EPA CWA section 304(a) guidance recommends an average frequency for criteria excursions not to exceed once in three years. The EPA selected this frequency of criteria exceedance based on derivation of the nationally-recommended criteria. From Section 3.1.2 of the EPAWater Quality Standards Handbook: Second Edition (EPA-823-B-12-002; http://water.epa.gov/scitech/swguidance/standards/handbook/):

> **Frequency for Aquatic Life Criteria**
>
> To predict or ascertain the attainment of criteria, it is necessary to specify the allowable frequency for exceeding the criteria. This is because it is statistically impossible to project that criteria will never be exceeded. As ecological communities are naturally subjected to a series of stresses, the allowable frequency of pollutant stress may be set at a value that does not significantly increase the frequency or severity of all stresses combined.
>
> The EPA recommends an average frequency for excursions of both acute and chronic criteria not to exceed once in 3 years. In all cases, the recommended frequency applies to actual ambient concentrations and excludes the influence of measurement imprecision. The EPA established its recommended frequency as part of its guidelines for deriving criteria (Appendix H). The EPA selected the 3-year average frequency of criteria exceedance with the intent of providing for ecological recovery from a variety of severe stresses. This return interval is roughly equivalent to a 7Q10 design flow condition. Because of the nature of the ecological recovery studies available, the severity of criteria excursions could not be rigorously related to the resulting ecological impacts. Nevertheless, the EPA derives its criteria intending that a single marginal criteria excursion (*i.e.*, a slight excursion over a l-hour period for acute or over a 4-day period for chronic) would require little or no time for recovery. If the frequency of marginal criteria excursions is not high, it can be shown that the frequency of severe stresses, requiring

measurable recovery periods, would be extremely small. The EPA thus expects the 3-year return interval to provide a very high degree of protection.

The State may use an alternative scientifically defensible methodology if it can show that the methodology is no less stringent than the WQS (40 CFR 131.11(b)) and can demonstrate that the alternative frequency component fully protects aquatic life. The EPA has not received information that shows the State's methodology for toxics properly implements the WQS, as currently specified. The DWR is not required to use the EPA-recommended one-in-three method. However, the DWR has not provided a scientifically defensible rationale to support their methodology for toxics (ten percent exceedance, with confidence levels). Until the DWR provides this rationale, the EPA will continue to conduct an independent assessment and review water quality data to determine if additional toxics impairments should be added to the 303(d) list.

Age of Data and Sample Size

NC's assessment methodology contains provisions for limiting the use of data based on the age of data (five year window) and sample size (greater than nine samples). We recommend States not automatically exclude data that is older than 5 years, particularly when its inclusion could be used to augment small sets of more current data. The assessment methodology could include a list of circumstances that would explain why the data is no longer reliable or representative. We acknowledge that the DWR has not excluded data older than 5 years for metals. The State suspended the collection of routine total recoverable metals in 2007 in anticipation of the development of new metals water quality standards and there have been very limited metals data collected since then. In previous 303(d) assessments, the DWR indicated that metals-impaired waters would not be delisted solely on the basis that the metals data "aged out" of the prescribed data window.

As to minimum sample size provisions in the State assessment methodology, the EPA has two significant concerns. First, the methodology should allow listing where data demonstrates sufficient exceedances of a criterion, even though the minimum sample size (>9 samples) have not yet been collected. For example, NC's methodology specifies 2 exceedances out of 10 samples are necessary to determine that a waterbody is impaired. Where a waterbody has 2 exceedances, regardless of the total number of samples, there is no need to collect the full 10 samples to pass the assessment methodologies exceedance threshold. Such waterbodies should be identified as impaired. Also, many states make the decision of whether a small number of data points can adequately support a conclusion of impairment or non-impairment based on whether the evidence for the small number of samples is "overwhelming." An overwhelming evidence test could consider such factors as the magnitude of exceedance over water quality standards, or the frequency at which standards were exceeded, or other lines of evidence (e.g., biological, physical, tissue, or sediment data) could be consulted in making an impairment decision on small data sets. Section 4.3 of the EPA's *CALM* guidance, referenced above, discusses this issue in detail.

The DWR's data sets for metals and most other parameters of concern are of high quality (refer to the Ambient Monitoring System Quality Assurance Project Plan on the DWR website: http://portal.ncdenr.org/web/wq/ess/eco/ams/qapp) and because only high quality data is accepted for use support decisions (see criteria for submitting data for regulatory use on the DWR website: http://portal.ncdenr.org/web/wq/ps/mtu/assessment#5), the number of samples used in listing decisions is typically small. In order for the EPA to conclude that the State's process is consistent with federal requirements for consideration of all existing and readily available data and information, the State

should revise its methodology to allow consideration of older data and data contained within smaller data sets for future section 303(d) lists.

In summary, the EPA will consider the state's methodology, to the extent that it reflects a reasonable interpretation of NC's WQSs and sound science, in determining whether to approve or disapprove the section 303(d) list. Regardless of the suitability of the methodology, the EPA must review the list for consistency with the relevant provisions of the CWA and the regulations.

Thank you for the opportunity to comment. If you have questions, please contact me at 404-562-9125 or Ms. Andrea Zimmer, Chief, Monitoring and Information Analysis Section at 404-562-9306.

Sincerely,

Joanne Benante

Joanne Benante
Chief
Water Quality Planning Branch
Water Protection Division

cc: Andy Painter, NCDWR
Cam McNutt, NCDWR
Kathy Stecker, NCDWR

Painter, Andy

From: McIntire, Mark <Mark.McIntire@duke-energy.com>
Sent: Friday, March 14, 2014 2:49 PM
To: Painter, Andy
Subject: draft 303(d) list comments

Categories: 2014 303d comment

Good afternoon. Please accept these comments on the draft 2014 303(d) list from Duke Energy.

The draft 2014 303(d) list includes Belews Creek and identifies that the Creek (including Belews Lake) is impaired for temperature. Duke Energy's Belews Creek Steam Station began commercial operation in 1974. Belews Lake was created to provide cooling water for the station and was conceived and has always operated as a cooling water reservoir. Indeed, the NPDES discharge permit has always contained a thermal limit that does not apply within the reservoir itself but at the spillway to the Dan River. The permit defines the "ambient temperature" as the average daily temperature at the spillway, approximately 5.3 miles downstream from the station. While not technically a thermal variance, it seems clear that the construct of the original permit that persists to this day was intended to serve a similar purpose. Considering the compliance location for temperature clearly defined in the NPDES permit and the fact that Belews Lake was constructed to serve as a cooling reservoir for the Belews Creek Steam Station, we believe inclusion of Belews Lake on the 303(d) list is inappropriate.

If you have questions, please do not hesitate to contact me.

Regards,
Mark

Mark McIntire, PE, BCEE, CRM
Director, Environmental Policy & Affairs
Duke Energy Corporation | 410 S. Wilmington Street | NCRH 13 | Raleigh, NC 27601
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Charlotte-Mecklenburg STORM WATER Services

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March 13, 2014

Mr. Andy Painter
N.C. D.E.N.R. - Division of Water Resources
Planning Section
1617 Mail Service Center
Raleigh, NC 27699-1617

Re: Draft 2014 303(d) List of Impaired Waters in Charlotte

Dear Mr. Painter

The Storm Water Services Division of the City of Charlotte (CMSWS) wishes to provide comments for consideration by the N.C. Division of Water Resources (NCDWR) regarding the North Carolina Draft 2014 303(d) List of Impaired Waters.

2014 303(d) Listing: Little Sugar Creek (AU 11-137-8c) and McAlpine Creek (AUs 11-137-9a,b,c,d) for Biological Impairment (Benthos and/or Fish Community)

In 2005, NC DENR DWR (formerly DWQ) finalized Total Maximum Daily Loads for Turbidity in Long Creek, McAlpine Creek, Sugar Creek, Little Sugar Creek, Irwin Creek, Henry Fork and Mud Creek in North Carolina. Those TMDLs were applicable to water body assessment units: 11-137-9 a, b, c, d and 11-137-8 c located in Charlotte, NC.

In 2000, 2008 or 2010, these same segments of Little Sugar Creek and McAlpine Creek were placed on the 303(d) list for Biological Impairment (Benthos and/or Fish Community) as a Category 5 (water body does not meet criteria and does not have an approved TMDL) listing.

In accordance with the 2014 NC 303(d) listing methodology, CMSWS concludes that the above mentioned segments of Little Sugar Creek and McAlpine Creek should be correctly categorized as 4s (Biological data exceeding criteria, another aquatic life parameter is assessed in category 4 or 5). In this case, the other aquatic life parameter is turbidity.

We suggest that these Little Sugar Creek and McAlpine Creek be categorized as ***Category 4s*** stream segments.

If you have any questions, please contact me at 704-432-0970 or at jfrost@charlottenc.gov to discuss.

Sincerely,

Jennifer Frost
City of Charlotte, Storm Water Services Division

SOUTHERN ENVIRONMENTAL LAW CENTER

Telephone 919-967-1450 | 601 WEST ROSEMARY STREET, SUITE 220 CHAPEL HILL, NC 27516-2356 | Facsimile 919-929-9421

March 14, 2014

By First Class Mail & Email

Mr. Andy Painter
N.C. Department of Environment and Natural Resources
Division of Water Resources, Planning Section
1617 Mail Service Center
Raleigh, NC 27699-1167
andy.painter@NCDENR.gov

Re: North Carolina's Draft 2014 §303(d) List

Dear Mr. Painter:

The Southern Environmental Law Center appreciates the opportunity to comment on the above-referenced list on behalf of the Neuse Riverkeeper Foundation, the Pamlico-Tar River Foundation, Pamlico-Tar RIVERKEEPER, North Carolina Conservation Network, Haw River Assembly, Yadkin Riverkeeper, Inc., Rocky River Heritage Foundation, the French Broad Riverkeeper, Western North Carolina Alliance, and the Waterkeeper Alliance. The comments that follow discuss the historical context of the 2014 listing decision, explain our objections to the application of the newly adopted listing methodology, identify concrete examples of objectionable listing decisions in the proposed draft, and suggest revisions to the draft 2014 §303(d) list.

I. The Clean Water Act and the § 303(d) List: Combating Water Pollution

The Clean Water Act was enacted in 1972 to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters."[1] To achieve this goal, the Act requires the establishment of direct limitations on the discharge of pollutants—i.e., "effluent limitations."[2] The Act also provides for the issuance of permits incorporating these limitations and forbids the discharge of pollutants without such a permit.[3]

The Act also recognizes the need for additional protective measures when effluent limitations prove insufficient to ensure water quality. Accordingly, every two years, each state is

[1] 33 U.S.C. § 1251(a).
[2] 33 U.S.C. § 1311(b)(1)(A), (B); *see also* N.C. Gen. Stat. § 143-215 (discussing North Carolina's establishment of effluent limitations). "Prior to 1972, the focus of federal efforts to abate water pollution was measurement of the quality of receiving waters." *Friends of the Earth, Inc. v. Gaston Copper Recycling Corp.*, 204 F.3d 149, 151 (4th Cir. 2000) (citing Water Quality Act of 1965, Pub. L. No. 89–234, 79 Stat. 903).
[3] 33 U.S.C. § 1311(a).

required by Section 303(d) of the Act to identify waters within its jurisdiction for which required effluent limitations are not stringent enough to implement applicable water quality standards.[4] The resulting compilation of impaired waters is known as the "303(d) list." Once these waters are identified as impaired, the Act requires the state to establish a total maximum daily load ("TMDL") to further limit the presence of the pollutant or pollutants that cause the impairment.[5]

Thus, the proper identification of impaired waters and the prompt development of responsive TMDLs are essential to improving the quality, and preserving the best use, of the State's waters. Unfortunately, the draft 303(d) list proposed by North Carolina fails to identify properly the State's impaired waters or ensure the development and implementation of necessary TMDLs. Of particular concern, the State recently adopted a new listing methodology, the application of which substantially increases the likelihood that impaired waters will not receive the additional protection required by the Act.[6] As implemented, it reclassifies well over 100 polluted water bodies as "unimpaired," with no improvement in their water quality since their listing, and no assurance that they do—or will—meet water quality standards. In fact, the new methodology appears to have been designed to remove those protections from waters that have already been identified as impaired. As discussed in more detail below (Section V), this feature of the EMC's new methodology does not comply with EPA guidance on removing waters from the State's 303(d) list.

II. Decreasing the Role of Scientific Experts: The Need for Delegation

In a departure from well-established precedent, this new methodology was developed by North Carolina's Environmental Management Commission ("EMC"), rather than by the staff of the State's Department of Environment and Natural Resources ("DENR"). Granted, the EMC is statutorily required to "implement the provisions of subsections (d) and (e) of 33 U.S.C. § 1313 [Clean Water Act §303] by identifying and prioritizing impaired waters and by developing appropriate total maximum daily loads of pollutants for those impaired waters."[7] However, prior to 2013, the EMC effectively delegated to staff within DENR's Division of Water Quality the

[4] 33 U.S.C. § 1313(d)(1)(A). EPA regulations provide that states need not list waters where the following controls are adequate to implement the applicable water quality standards: (1) technology-based effluent limitations required by the CWA; (2) more stringent effluent limitations required by federal, state, or local authority; and (3) other pollution control requirements required by federal, state, or local authority. *See* 40 C.F.R. § 130.7(b)(1).

[5] 33 U.S.C. § 1313(d)(1)(C).

[6] As stated by the EPA, the "methodology is the key to improving the validity of State categorizations of water quality." U.S. EPA, GUIDANCE FOR 2006 ASSESSMENT, LISTING AND REPORTING REQUIREMENTS PURSUANT TO SECTIONS 303(d), 305(b) AND 214 OF THE CLEAN WATER ACT 39 (July 29, 2005) (hereinafter "2006 Guidance").

[7] N.C. Gen. Stat. § 143B-282(c).

authority to approve the assessment methodology.[8] This practice demonstrated appropriate deference to the scientific expertise of agency personnel.[9]

In 2012, the EMC chose to reevaluate this longstanding practice and solicited public comment regarding whether, and to what extent, it should be involved in developing future assessment methodologies. Multiple environmental groups encouraged the EMC, in light of the highly technical nature of the assessment methodology, to continue to defer to the scientific expertise of DENR staff. Nevertheless, in response to pressure from the regulated community, the EMC chose to expand its own role in the development of the assessment methodology. The predictable result is a new methodology that, without scientific justification, decreases the likelihood that waters will be listed as impaired. Stated differently, rather than protect the State's waters *through* TMDLs, the EMC chose to protect regulated interests *from* TMDLs and from related pollution-reduction requirements.

III. The Old Methodology: A Shaky Foundation

To be clear, prior to the EMC's most recent revisions, there were problems with the State's methodology; indeed, some of those problems were identified by the United States Environmental Protection Agency ("EPA") in 2012.[10] For instance, the EPA repeatedly questioned the State's decision to limit the amount of data under consideration,[11] a weakness that remains and even increases with the new methodology. One notable problem with the methodology was how the State assessed attainment of numeric water quality standards.

Prior to 2013, 303(d) listing decisions related to numeric water quality standards used the "10% rule." That is, if more than 10% of samples exceeded the numeric standard, the water

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[8] This delegation of authority was never formalized. In practice, however, the methodology had always, prior to 2013, been developed and approved by DENR's Division of Water Quality, the duties of which now fall under the Division of Water Resources. The EMC regularly approved the methodology adopted by DENR staff without substantive revision.

[9] The overwhelming majority of the appointees to the EMC are not required to have any expertise in water pollution control; seven of the 15 appointees are not required to have any scientific expertise whatsoever. *See* N.C. Gen. Stat. § 143B-283. Indeed, legislation in 2013 increased the number of at-large appointees and decreased the percentage of appointees required to have scientific expertise. 2013 N.C. Sess. Laws 2013-360 § 14.23(a) (July 26, 2013).

[10] *See* EPA REGION 4, PARTIAL APPROVAL OF THE STATE OF NORTH CAROLINA'S 2012 303(d) LIST SUBMITTAL 4 (Aug 10, 2012) (hereinafter "Partial Approval 2012"), *available at* http://www.epa.gov/region4//water/tmdl/northcarolina/documents/20120808_%20nc_303d_listapproval_decisiondocument.pdf.

[11] *See, e.g., id.* at 7 (stating the North Carolina's limitation of data under consideration was "overly restrictive"). The 2012 Methodology required consideration of at least 10 samples taken within the five-year assessment period in order to assess compliance with a specific parameter. *See* N.C. DENR, 2012 ASSESSMENT METHODOLOGY 4-5 (March 27, 2012). As explained below, the new methodology exacerbates problems created by the limitation of the sample size.

body (i.e., "assessment unit") was listed as impaired for that parameter, as long as there were at least 10 samples taken within the assessment period.[12]

EPA has expressed limited support for application of the 10% rule to "conventional pollutants" (i.e., not toxic pollutants), as long as application of the rule is "consistent with the manner in which the applicable [water quality criteria] are expressed."[13] North Carolina, however, does not express numeric water quality criteria for conventional pollutants in a way that is consistent with application of the 10% rule.[14] Generally speaking, North Carolina's numeric criteria are written as "maximum permissible levels" or values "which shall not be exceeded." EPA has cautioned against the use of the 10% rule to assess attainment of criteria expressed in this manner.[15] And where the 10% rule is employed in this way, EPA requires the State to "provide a rationale for why such an application of the rule is a reasonable approach to evaluation of data against water quality standards."[16] When reviewing draft 303(d) lists in the past, EPA has allowed North Carolina to use the 10% rule to assess compliance with certain numeric water quality standards because application thereof did not, according to EPA's independent review, result in unjustified delisting decisions.[17]

In contrast, EPA has consistently warned against using the 10% rule to assess attainment of numeric water quality standards for toxic substances.[18] As recently as 2012, EPA objected to North Carolina's use of the 10% rule in the assessment methodology for toxics and other "non-

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[12] For instance, under the 10% rule, if 60 samples were taken during the five-year assessment window, an assessment unit would only be listed if seven or more samples exceeded limits for a given criterion.

[13] 2006 Guidance, *supra* note 6, at 39; *see also* 14 Ariz. Admin. Reg. 3340 (Aug. 22, 2008) (quoting EPA's response to Arizona's proposed 303(d) list as follows: "EPA's 2006 Integrated Report Guidance (pg. 39) clarifies that we do not recommend the application of a 10% exceedance threshold for conventional pollutants (particularly within the context of a binomial statistical test) unless the 10% rule is specifically consistent with the state water quality standards (e.g. for a standard expressed as a 90th percentile value))."

[14] The primary numeric criteria related to water quality in North Carolina are stated in 15A N.C. Admin. Code 02B .0100, .0200, and .0300.

[15] 2006 Guidance, *supra* note 6, at 40 ("In the case of 'instantaneous maxima (or minima) never to occur' criteria use of the ten percent rule typically leads to the belief that segment conditions are equal or better than specified by the WQC, when they in fact are considerably worse. (That is, pollutant concentrations are above the criterion-concentration a far greater proportion of the time than specified by the WQC.)"); *see also* U.S. EPA, GUIDANCE FOR 2004 ASSESSMENT, LISTING AND REPORTING REQUIREMENTS PURSUANT TO SECTIONS 303(d), 305(b) AND 214 OF THE CLEAN WATER ACT 31 (July 21, 2003) (hereinafter "2004 Guidance") (" [I]t is questionable to apply the decision rule that a water is not impaired if 'criteria (are) exceeded in < 10 percent of measurements' to WQC expressed as 'the instantaneous concentration of the pollutant shall not be greater than ___ :g/L, at any time.' The problem is that the 10% rule could be interpreted in such a way to allow the concentration of the pollutant in a water to be greater than the criterion concentration at some very high frequency–perhaps even once every 10 seconds.").

[16] 2004 Guidance, *supra* note 15, at 31.

[17] The EPA approved North Carolina's use of the 10% rule to assess attainment with "naturally variable parameters" for DO, pH, temperature and turbidity. *See* Partial Approval 2012, *infra* note 10, at 11. The EPA also approved use of the 10% rule when assessing chlorophyll-a impairment. *Id.* at 12.

[18] 2006 Guidance, *supra* note 6, at 39; 2004 Guidance, *supra* note 15, at 30 ("Use of the 10% rule when performing attainment determinations regarding effects of toxics is not appropriate unless the State's WQS regulations or WQS guidance specifically authorizes use of this rule for such pollutants.").

conventional pollutants."[19] EPA expressly stated that North Carolina had failed to "demonstrate that the ten percent frequency methodology for toxics is no less stringent than the 1-in-3 frequency methodology recommended in EPA's assessment guidance."[20]

The EMC had an opportunity, when adopting a new methodology, to fix the problems with the 10% rule. Instead, the EMC ignored EPA guidance. As explained below, the draft list is therefore invalid insofar as it resulted from improper use of the 10% rule, as augmented by the new methodology.

IV. The 2014 Methodology: Perpetuating Pollution

Rather than addressing problems with the application of the 10% rule, the EMC approved a listing methodology for 2014 that unnecessarily creates new ones.[21] The new methodology for assessing compliance with numeric criteria is described as follows:

> 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.[22]

The use of undefined statistical jargon such as "null hypothesis" in the assessment methodology is itself problematic.[23] However, additional clarification, while necessary to enable meaningful public participation in the listing process,[24] would not address substantive problems

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[19] Partial Approval 2012, *supra* note 10, at 14-15.

[20] *Id.* at 14; *see also* 2004 Guidance, *supra* note 15, at 26-27 (explaining EPA's preference for the 1-in-3 frequency methodology).

[21] The new methodology was approved on March 14, 2013 and amended on January 13, 2014 to reflect the consolidation of DENR's Division of Water Quality into the Division of Water Resources.

[22] N.C. DENR, 2014 NORTH CAROLINA 303(d) LISTING METHODOLOGY 4-5 (Jan. 13, 2014) (hereinafter "2014 Methodology"). Although the summary was prepared by DENR, it is undisputed that the methodology itself was dictated by the EMC.

[23] As stated by EPA,

> The methodology should provide a clear explanation of which analytic tool the state intends to use and under which circumstances. This documentation should be especially clear in the case where the State's WQS regulations and other regulations and guidance doesn't explicitly address issues such as the selection of key sample statistics (arithmetic mean concentration, median concentration), or a percentile (e.g., 85th percentile), null and alternative hypotheses, sample sizes, confidence intervals, and Type I and Type II error thresholds.

2004 Guidance, *supra* note 15, at 27; *see also id.* at 29 (stating that the methodology should be explained "in 'plain English'").

[24] *See* 2006 Guidance, supra note 6, at 25 ("EPA encourages the state to provide opportunities for public participation in the development of the Integrated Report and demonstrate how it considered public comments in its final decisions.")

with the new methodology. Essentially, the new methodology supplements the pre-existing 10% rule by adding a requirement of "90% statistical confidence" that the 10% threshold would be exceeded in any random sample of the water.[25] There are three basic problems with this approach.

First, application of the 10% rule already limited the effect of sampling and analysis error. As stated by EPA, the 10% exceedance allowance is "intended to account for measurement error and the potential that small data sets may not be fully representative of receiving water conditions."[26] In other words, the 10% rule addressed the concern that "the true frequency of criteria exceedances cannot be measured" by discounting a certain number of exceedances as unrepresentative of the environmental health of the sampled water body. Moreover, unlike some states, North Carolina carefully screens the data that it uses to create the 303(d) list.[27] In order to be considered for 303(d) listing purposes, "data must meet certain requirements"[28] and "undergo detailed review to evaluate [its] accuracy, precision, and representativeness."[29] So North Carolina cannot justify the same level of concern about unrepresentative data that has justified use of assessment methodologies in other states where additional measures were necessary to screen out unrepresentative data.

Second, the new methodology effectively treats the 10% rule as a new water quality standard. The new methodology seeks to determine whether the probability is 10% or lower that a random hypothetical sample would show an exceedance. In other words, the new methodology seeks to assess the likelihood of compliance with the 10% exceedance allowance rather than the likelihood of compliance with the actual numeric water quality standard established by rule.

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[25] 2014 Methodology, *supra* note 20, at 4.

[26] 2004 Guidance, *supra* note 15, at 30.

[27] In contrast, for instance, Florida makes 303(d) listing decisions on the basis of a data set that, in addition to being much bigger than that considered by North Carolina, also includes large amounts of data of questionable quality submitted by third parties. As such, Florida "needed to either limit the data that could be used to only that which could be rigorously evaluated for data quality and representativeness, or develop an assessment methodology that allowed for computerized, statistical evaluation of the data." U.S. EPA, Determination Upon Review of Amended Florida Administrative Code Chapter 62-3-3, Identification of Impaired Waters app. A 8 (February 19, 2008). Florida chose the latter approach, and EPA approved of a methodology similar to that employed by North Carolina to create the proposed 303(d) list. However, unlike Florida, North Carolina adequately regulates the quality of data submitted by third parties, so it cannot proffer the same justifications for using the new methodology as did Florida.

[28] N.C. DENR, Submittal Instructions: Data for Potential Regulatory Use, *available at* http://portal.ncdenr.org/c/document_library/get_file?p_l_id=1169848&folderId=689969&name=DLFE-72004.pdf. As stated by DENR,

> Generally, analytical data generated by non-DWR parties for regulatory purposes will be required to meet the same data quality requirements as internal activities. SOPs for collection and analysis must be available and must be consistent with DWR SOPs. Any laboratory generating data that are offered for DWR's regulatory consideration must have an established Quality Program appropriate for the expected data use. The laboratory must be certified for all parameters by EPA or DWR, where such certification exists. The data received must be in a format specified by DWR and must be of acceptable quality.

Id.

[29] *Id.*

However, North Carolina's numeric water quality standards are written to establish a maximum permissible level of a specific pollutant, not a maximum permissible percentage of exceedances. The State concedes that the change in methodology is responsible for delisting at least 130 assessment units without any evidence of an improvement in water quality.[30] The State must not, in effect, change water quality standards by selecting a new assessment methodology.[31]

The third problem with the new methodology is related to use of the binomial distribution and the 90% confidence requirement.[32] The binomial distribution method states, in this context, that there is a probability (p) that any water quality sample will reveal an exceedance of a specific water quality criterion and a corresponding probability ($1 - p$) that the sample will not reveal an exceedance. Since p is unknown, we start with an assumption of the value of p and see if it is rejected by data. Importantly, if the data does not reject our assumption, we can only conclude that the observed data set provides insufficient evidence to reject the assumption; we cannot make the stronger conclusion that the alternative is true. Stated differently, those seeking to reject the assumption bear the burden of proof.

The principal danger of the State's use of this methodology lies in the selection of the starting assumption, i.e., the "null hypothesis." Under the new methodology, "[t]he null hypothesis is that the overall exceedance probability is less than or equal to the 10% exceedance allowance."[33] In other words, the State is starting with the assumption that waters are not impaired and requiring proof to the contrary sufficient to reject this assumption. And even where more than 10% of actual samples exceed the numeric standard, the State will not list waters where the 90% confidence level is not achieved.[34]

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[30] As of March 11, 133 assessment units had been moved from Category 5 to Category 3 in the State's draft 303(d) list. N.C. DENR, 2014 DRAFT RECATEGORIZED ASSESSMENTS (Feb 21, 2014), *available at* http://portal.ncdenr.org/c/document_library/get_file?uuid=3ce82559-6f78-4011-85a2-63ced60a2b5e&groupId=38364. The vast majority of these waters were recategorized from Category 5 to Category 3a1, meaning more than 10% of samples exceeded the water quality standard, but the data failed to demonstrate the 90% confidence level required under the new methodology. *Cf.* Appendix A (listing segments that went from Category 5 to Category 3a1). Notably, another 33 assessment units were moved from Category 4 to Category 3 based solely on the application of the new methodology.

[31] *See Florida Public Interest Research Group Citizen Lobby, Inc. v. EPA*, 386 F.3d 1070, 1090 (11th Cir. 2004)("[I]f waterbodies that under pre-existing testing methodologies would have been included on the [303(d)] list were left off the list because of the Impaired Waters Rule, then in effect the Rule would have created new or revised water quality standards, even if the language of the regulation said otherwise.").

[32] To be clear, these statistical methods are not inherently flawed. It is only their specific application in this context that becomes problematic.

[33] 2014 Methodology, *supra* note 20, at 5.

[34] N.C. DENR, 2014 WATER QUALITY ASSESSMENT PROCESS 8 (2014) (Category 3a is also used when "greater than or equal to 10% of samples exceed criteria with less than 90% confidence, and there is no approved TMDL.").

In defiance of EPA guidance, North Carolina makes no attempt to justify this starting assumption.[35] This is particularly troubling because, as explained by the EPA, "[s]tarting with the assumption that a water is 'healthy' when employing hypothesis testing means that a water will be identified as impaired, and placed in Category 4 or 5, only if substantial amounts of credible evidence to refute the presumption that the water is not impaired are brought to light."[36] Compared to the old methodology, the new methodology requires more samples showing an exceedance before the sampled water will be included on the 303(d) list.[37] For instance, consider a sample size of 60, which correlates to monthly samples taken during the five-year assessment window. Whereas the old methodology required seven samples showing an exceedance to classify the sampled water body as impaired and put it on the 303(d) list, the new methodology requires 10 samples showing an exceedance.

The statistical jargon employed by the new methodology masks the fact that it substitutes a *fiction* – the "null hypothesis," or starting assumption, that certain water bodies are clean and unpolluted – for what we already *know*: that they are polluted, as shown by years of data that placed them on previous 303(d) lists of impaired waters.

Moreover, North Carolina makes no attempt to address the probability that waters that are in fact not meeting water quality standards have been left off of the 303(d) list.[38] As evidenced by the requirement of 90% confidence, the State is far more concerned with the probability of improperly listing "healthy" segments than with failing to list an unhealthy segment.[39] In short, by putting the burden of proof on those trying to demonstrate the need for additional pollution controls, the State is increasing the likelihood that waters in need of a TMDL will not get one.[40]

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[35] 2004 Guidance, *supra* note 12, at 28 ("[I]f hypothesis testing is used, the State should explain why it chose either 'meeting WQS' or 'not meeting WQS' as the null hypothesis."). Of course, here, North Carolina would need to explain why it chose "meeting the 10% exceedance allowance" or "not meeting the exceedance allowance," which it does not. This underscores the fact that the State is using the new methodology to supplant existing water quality standards.

[36] *Id.* Moreover, "[i]f the null hypothesis is 'meeting standards,' there were no previous data on the segment, and no additional existing and readily available data and information are collected, then the 'null hypothesis' cannot be rejected, and the segment would not be placed in Category 4 or 5." 2006 Guidance, *supra* note 5, at 40.

[37] *See infra* Appendix B.

[38] *But see* 2004 Guidance, *supra* note 12, at 29 ("The methodology should describe in 'plain English' the likelihood of not only: (1) deciding to list a water that in reality is not impaired (Type I error if the null hypothesis is "water OK"), but also (2) the probability that a water that is in fact is not meeting WQS has been left off the Category 4 and 5 lists (Type II error in this case).").

[39] 2006 Guidance, *supra* note 5, at 40 ("Picking a high level of significance for rejecting the null hypothesis means that great emphasis is being placed on avoiding a Type I error (rejecting the null hypothesis, when in fact, the null hypothesis is true)."). Indeed, under North Carolina's new methodology, "the probability of not listing an assessment unit when it should be listed is not considered." N.C. DENR, 2014 WATER QUALITY ASSESSMENT PROCESS 11 (2014).

[40] *Id.* ("With a fixed number of samples, as the probability of Type I error decreases, the probability of a Type II error increases."). Since, for most segments, sampling is conducted on a monthly basis, the State's efforts to decrease the likelihood of improperly listing a "healthy" segment (Type I error) increase the likelihood that "unhealthy" segments will not be listed. *See* KANSAS DEPT. OF HEALTH AND ENVIRONMENT, DURATION AND FREQUENCY FOR ASSESSING NUMERIC CRITERIA 2 (Jan. 10, 2011) ("The binomial approach will

V. The New Methodology Does Not Constitute "Good Cause" for Delisting

Unsurprisingly, the State's application of the new methodology resulted in removal of a large number of waters from the 303(d) list, i.e., removing waters from Category 5. The State has not shown "good cause" for removing these waters.[41] Instead, it claims that its adoption of a new methodology constitutes "good cause" for the delisting decision.[42] However, according to the EPA, "[w]aters should generally remain in Category 5 until a TMDL is established unless there is reason to believe that conditions that led to the initial listing have changed (WQSs are attained, actions justifying inclusion in Category 4, etc.), or that the basis for the initial listing was in error."[43] The State has offered no argument that the conditions that led to the original listing have changed for any of the 130 or more water bodies proposed to be delisted; nor has the State argued that any of the initial listing decisions to list these water bodies were in error.[44] The only justification provided for delisting was the EMC's adoption of a new listing methodology.

EPA, however, has clearly stated that delisting based on application of a new methodology "should only occur if it is determined by EPA that the new methodology is technically sound, consistent with the State's WQSs, and is deemed statistically reasonable."[45] EPA has not made this determination. Indeed, as demonstrated by the concrete examples below, application of North Carolina's new methodology has resulted in delisting numerous assessment units that are still in need of the pollution protection afforded by a TMDL.[46] The State erroneously moved all of these waters from Category 5 to Category 3.[47]

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typically not list compliant waters, but it can leave truly impaired waters off the list, particularly when the number of samples is small.")

[41] See 40 C.F.R. § 130.7 ("Good cause includes, but is not limited to, more recent or accurate data; more sophisticated water quality modeling; flaws in the original analysis that led to the water being listed in the categories in § 130.7(b)(5); or changes in conditions, e.g., new control equipment, or elimination of discharges."). EPA may require the State to demonstrate "good cause" for its listing decisions. *Id.*

[42] *See* N.C. DENR, 2014 WATER QUALITY ASSESSMENT PROCESS 10 (2014).

[43] 2004 Guidance, *infra* note 15, at 9.

[44] Indeed, these listing decisions were based on the 10% rule, which, as explained above, has elevated importance under the new methodology.

[45] 2004 Guidance, *infra* note 15, at 11.

[46] This includes the delisting of an assessment unit from the North Toe River—AU 7-2-(21.5)—that was specifically placed *back* on the list in 2012 by the EPA after the State declined to place it in Category 5.

[47] *But see* U.S. EPA, INFORMATION CONCERNING 2010 CLEAN WATER ACT SECTIONS 303(d), 305(b), AND 314 INTEGRATED REPORTING AND LISTING DECISIONS 6 (May 5, 2009) ("EPA also expects that waters identified as impaired and listed on the 303(d) list in the previous reporting cycle will not be removed from the list and placed into Category 3 in the subsequent listing cycle unless the State can demonstrate good cause for doing so, consistent with EPA regulations (40 CFR § 130.7(b)(6)(iv)). The State should explain why the data and information that formed the basis for the original listing is no longer sufficient for determining that the water is still impaired.").

VI. Objectionable Delisting Decisions: Impairments Ignored Under the New Methodology

While 259 impaired waters were removed from the 303(d) list from 2012 to 2014, at least 130 of those were removed solely due to a change in the assessment methodology. Based on previous inclusion on the 303(d) list, these waters were entitled to protection to reduce or prevent further impairment from heavy metals, turbidity, chlorophyll *a*, fecal coliform, inadequate amounts of dissolved oxygen, and pH imbalances. Several waters removed from the list remain impaired by these pollutants.

Federal regulations require that North Carolina "assemble and evaluate all existing and readily available water quality-related data and information" to develop the 303(d) list.[48] At a minimum that includes data and information about "[w]aters for which water quality problems have been reported by … members of the public."[49] The federal regulation goes on to provide that "organizations and groups should be actively solicited for "water quality data," and that "university researchers … are good sources of field data."[50] Public input, in addition to previously conducted testing of water impaired for turbidity, excessive heavy metals, chlorophyll *a*, fecal coliform, pH imbalances, and inadequate amounts of dissolved oxygen, supports the return of several delisted waters to the 2014 303(d) list.

Turbidity

Of the delistings due to a change in the assessment methodology, over 50 pertain to turbidity impairment. These assessment units were removed from the list despite conditions that continue to indicate that excessive suspended solids are a problem.

Excessive turbidity, or cloudiness, in drinking water is not only aesthetically unappealing, it also represents a health concern. Studies suggest that routine variations in public drinking water turbidity may be associated with endemic gastrointestinal illness,[51] and although turbidity is not a direct indicator of health risk, numerous studies show a strong relationship between removal of turbidity and removal of protozoa.[52] Turbidity can provide food and shelter for pathogens, and if not removed, can promote regrowth of pathogens in distribution systems, leading to waterborne disease outbreaks, which have caused significant cases of gastroenteritis throughout the United States and the world.

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[48] 40 C.F.R. § 130.7(b)(5).
[49] *Id.*
[50] *Id.*
[51] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2174477/
[52] http://water.epa.gov/drink/contaminants/

In the Catawba River Basin, Dutchmans Creek,[53] Johnson Creek,[54] Clark Creek,[55] Long Creek,[56] and several sections of the South Fork of the Catawba River[57] all have been delisted despite continued evidence of turbidity impairment. One of these segments is upstream of the drinking water intake for High Shoals,[58] and the other is upstream of drinking water intakes for the towns of Dallas, Gastonia and Ranlo.[59]

Similar turbidity pollution exists in the Neuse River Basin.[60] Falls Lake continues to be impaired due to turbidity[61] and it releases downstream to the Neuse, causing additional need for protection in the river.[62]

Several sections of the French Broad River have been delisted despite continued evidence of turbidity impairment. A large number of sections of the main stem of the Haw River[63] have been delisted as well. Parts of Northeast Creek[64] are still listed for copper and zinc, but not for turbidity, despite the fact that turbidity has been observed as a continuing problem and is visible where Northeast creek enters Jordan Lake.

Due to concerns for both human health and aquatic life, all waters delisted for turbidity from the 2012 303(d) list due only to the change in assessment methods should be included in the 2014 North Carolina 303(d) list.

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[53] AU §11-119-(0.5), Dutchmans Creek from source to a point .8 miles downstream of Taylors Creek
[54] AU §11-113-(2), Johnson Creek, from a point .6 miles upstream of mouth to Mountain Island Lake, Catawba River.
[55] AU §11-129-5-(9.5), Clark Creek from a point .9 miles upstream of Walker Creek to South Fork Catawba River.
[56] AU §11-129-16-(4), Long Creek from Mountain Creek to South Fork Catawba River.
[57] AU §§11-129-(10.5), South Fork Catawba River from Town of High Shoals water supply intake to a point .6 miles upstream of N.C. Hwy. 275, 11-129-(14.5) South Fork Catawba River from a point .6 miles upstream of N.C. Hwy. 275 to a point .4 miles upstream of Long Creek (Towns of Dallas, Gastonia & Ranlo water supply intakes), 11-129-(15.5), South Fork Catawba River from a point .4 miles upstream of Long Creek to Cramerton Dam and Lake Wylie at Upper Armstrong Bridge.
[58] AU §11-129-(10.5), South Fork Catawba River from Town of High Shoals water supply intake to a point .6 miles upstream of N.C. Hgwy. 275
[59] AU §§11-129-(14.5), South Fork Catawba River from a point .6 miles upstream of N.C. Hwy 275 to a point .4 miles upstream of Long Creek (Towns of Dallas, Gastonia & Ranlo water supply intakes).
[60] AU §§ 27-43-15-(1)b2, Middle Creek, 27-(50.375)a, Neuse River from Richardson Bridge/SR 1201 to a point .75 miles upstream of Moccasin Creek, and 27-(49.75), Neuse River from a point .5 miles upstream of Richardson Bridge Road/SR 1201 to Johnston County's intake a Richardson Bridge Road/SR 1201 and 27-43-15-(1)but3, UT to Middle Creek, source to Middle Creek.
[61] 2014 303(d) list, p.68.
[62] Upper Neuse River Basin Watershed Protection Revenueshed Analysis at 4. http://www.efc.unc.edu/publications/2012/UNRB_Watershed_Protection_Revenue_Analysis.pdf
[63] AU §§ 16-(6.5), 16-(10.5)a, 16-(1)c2, and 16-(10).
[64] AU §16-41-1-17-(0.7)b2, from Kit Creek to a point .5 mile downstream of Panther Creek.

Dissolved Oxygen

Aquatic animals need dissolved oxygen ("DO") to survive and thrive.[65] Water bodies delisted from the 2012 303(d) list, despite continued evidence of DO impairment, include Loves Creek[66] and Rocky River[67] in the Cape Fear River Basin, and South Crowders Creek[68] and Stanley Creek[69] in the Catawba River Basin.

In the Neuse River basin, assessment units delisted despite continued evidence of DO impairment include Moccasin Creek[70] (Bunn Lake), as well as two segments of Black Creek[71] that have been listed as impaired due to low DO since 2008.[72] In the Tar-Pamlico River Basin, waters delisted despite persistent DO impairment include two segments of Fishing Creek.[73] Finally, in the Chowan River basin, the Meherrin River[74] was delisted despite DO impairment as well.

These water bodies are not healthier. For example, while many streams and swamp waters in the coastal plain naturally have low DO, [75] Fishing Creek Subbasin is consistently stressed by fecal coliform bacteria and incidences of low dissolved oxygen unrelated to natural conditions.[76] Because the 10 water bodies above have been delisted despite continued DO impairment, and only due to a change in assessment methodology, they should be relisted for the 2014 303(d) list.

Fecal Coliform

Two water bodies have been delisted due to application of the new assessment methodology[77] despite persistent pollution from fecal coliform. Both are located on Calico

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[65] http://www.eenorthcarolina.org/images/River%20Basin%20Images/final_web_neuse.pdf
[66] AU §17-43-10b2, Loves Creek from Chatham Avenue to US 421.
[67] AU §17-43-(5.5)a, Rocky River, Siler City upper reservoir from .3 miles upstream of dam to the dam (Turner Reservoir Critical Area.
[68] AU §11-135-10-1, South Crowders Creek from source to South Fork Crowders Creek.
[69] AU § 11-119-3-(2), Stanley Creek from a point 1.0 miles upstream of Gaston County SR 1918 to Dutchmans Creek.
[70] AU § 27-86-2, Moccasin Creek, (Bunn Lake) from Source to Contentnea Creek.
[71] AU §§ 27-45-(2)b, Black Creek from 1 mile upstream of Reedy Creek to mouth of Sassarixa Creek, and 27-45-(2)a, Black Creek from dam at Panther Lake to 1 mile upstream of Reedy Creek.
[72] 2012 303(d) list.
[73] AU §§ 28-79-(1)a2, Fishing Creek from Horse Creek to Possumquarter Creek and 28-79-(1)b, Fishing Creek from Wolfpit Branch Shocco Creek.
[74] AU §25-4-(5), Meherrin River from a point 1 mile upstream from U.S. Highway 258 to the Chowan River.
[75] Tar-Pamlico River Basinwide Water Quality Management Plan, 201 Summary at 4. http://www.ptrf.org/documents/TarSummary.pdf
[76] Tar-Pamlico River Basinwide Water Quality Management Plan, 201 Summary at 6. http://www.ptrf.org/documents/TarSummary.pdf.
[77] Rather than stating that the two assessment units delisted despite fecal coliform impairment were removed from the 303(d) list based on a "[c]hange in Assessment Methods per NC Environmental Management Commission in

Creek in the White Oak River Basin. Because of fecal coliform, Calico Creek has been listed since 2008[78] and should be relisted to the 2014 303(d) list since no new data support its delisting.

pH

Five water bodies were delisted under the new assessment method, despite continued impairment from pH. Those segments include a portion of Morgan Creek, including part of Jordan Lake,[79] in the Cape Fear River Basin; Lake Junaluska[80] in the French Broad River Basin; and two sections of Hunting Creek[81] and Lake Lee[82] in the Yadkin-Pee Dee River Basin. Lake Junaluska has been listed due to pH impairment since 2006, Lake Lee and Morgan Creek since 2008, and Hunting Creek since 2010.[83] Because no new data support their delisting, each assessment unit should be relisted for 2014.

Other than Hunting Creek, which was listed due to low pH, the other water bodies above were listed for high pH. High pH is often correlated with high chlorophyll *a* concentrations, indicating excessive nutrients in a water body. Water bodies like Jordan Lake, including the sections listed above should not be delisted without solid data and a scientific method that show they are truly improving. Such evidence is necessary to prevent further challenges to decades-long efforts to implement the Jordan Lake rules, reduce nutrient over enrichment and related impairments, and ultimately return the Lake to health. Accordingly, all waters delisted despite pH impairment should be relisted in 2014.

Chlorophyll *a*

Excessive nutrients in a water body, and algal blooms driven by agricultural runoff and point sources, are usually associated with heightened levels of chlorophyll *a*.[84] Several water bodies that should be on the 2014 303(d) list have been delisted under the new methodology despite persistent chlorophyll *a* impairment. Those include Burgaw Creek[85] in the Cape Fear River Basin, Slocum Creek[86] in the Neuse River Basin,[87] and Belews Creek[88] (Kernersville

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2013," the justification was that the "[p]revious listing in Category 5 was inconsistent with the assessment methodology" and that now, the "[a]vailable data [is] insufficient to determine attainment status." The result is still the same, these two assessment units were delisted only based on application of the flawed assessment methodology.

[78] 2012 North Carolina 303(d) list.

[79] AU § 16-41-2-(9.5) Morgan Creek, from Chatham County SR 1726 (Durham County SR 1109) to New Hope Creek Arm of New Hope River Arm of B. Everett Jordan Lake.

[80] AU § 5-16-(11.5)d, Richland Creek (Lake Junaluska).

[81] AU §§ 12-108-16-(0.5)b1 Hunting Creek, from Little Hunting Creek to North Little Hunting Creek and 12-108-16-(0.5)b2 Hunting Creek from North Little Hunting Creek to a point 1.1 miles upstream of Davie County SR 1147.

[82] AU §13-17-36-(3.5)b, Richardson Creek (Lake Lee), entire reservoir.

[83] 2012 North Carolina 303d list.

[84] http://water.epa.gov/polwaste/nps/success319/nc_tar.cfm

[85] AU §18-74-39a, Burgaw Creek from source to Osgood Branch.

[86] AU §27-112, Slocum Creek from source to Neuse River.

Lake) in the Roanoke River Basin. Assessment units have also been delisted despite chlorophyll *a* impairment at Blount's Bay[89] in the Tar-Pamlico River Basin, as well as three water bodies[90] in the Yadkin-Pee Dee River Basin, including Back Creek (Back Creek Lake). Two of those streams in the Yadkin-Pee Dee River Basin are upstream from the Asheboro water-supply intake.[91] All of the above-listed water bodies should be relisted because they are still impaired.

For example, Blount's Bay should be relisted. In the 1980's, the Pamlico River estuary, where Blount's Bay is located, saw an increase in problems that indicated excessive levels of nutrients in the water, including algal blooms, low oxygen levels and fish kills.[92] These factors eventually placed the Pamlico River estuary on the 303(d) list for chlorophyll *a*.[93] The Blount's Bay portion of the estuary has been listed due to chlorophyll *a* impairment since at least 2008[94] and should be relisted because it continues to show signs of impairment, particularly during the summer and early fall months. During summer, there are numerous fish kills and algal blooms, and in fall, the fish kills persist.

Additional considerations that warrant relisting Blount's Bay include the fact that the Pamlico River at Blount's Bay is impaired for chlorophyll *a,* as is Chocowinity Bay just to the west. This further demonstrates that it is only the assessment methodology that has resulted in removing Blount's Bay from the 303(d) list.

Like Blount's Bay, all seven waters identified above were delisted solely because of the change in methodology. Since chlorophyll *a* impairment persists and no new data support delisting, they should be on the 2014 list as impaired for chlorophyll *a*.

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[87] In addition to waters delisted solely due to the change in assessment methods, despite chlorophyll a impairment in the Neuse River Basin, several assessment units in the Neuse River Estuary have been moved from category 4t to category 1t, despite chlorophyll a impairment. The implication of this move is that the TMDL has been successful for those AUs, which is contrary to credible public information that demonstrates that the estuary is still impaired, and not meeting nutrient loading limits required by the TMDL.

[88] AU § 22-27-(1.5), Belews Creek (Kernersville Lake) from a point .5 miles upstream of backwaters of Kernersville Lake to Town of Kernersville Water Supply Dam.

[89] AU § 29-9 Blount's Bay (inside a line from Hill Point to Mauls) from source to Pamlico River.

[90] AU §§ 12-(124.5)b, Yadkin River (including the upper portion of Tuckter) from High Rock Dam to mouth of Cabin Creek, 13-2-3-3-2-2-(2), Unnamed Tributary to Cedar Fork Creek, from a point 1.1 miles upstream of mouth to Cedar Fork Creek (City of Asheboro Water Supply Intake), and 13-2-3-3-(0.7), Back Creek (Back Creek Lake) from a point 1 mile downstream of Randolph County SR 1504 to dam at Back Creek Lake (City of Asheboro water supply intake).

[91] AU §§ 13-2-3-3-2-2-(2), Unnamed Tributary to Cedar Fork Creek, from a point 1.1 miles upstream of mouth to Cedar Fork Creek (City of Asheboro Water Supply Intake), and 13-2-3-3-(0.7), Back Creek (Back Creek Lake) from a point 1 mile downstream of Randolph County SR 1504 to dam at Back Creek Lake (City of Asheboro water supply intake).

[92] http://water.epa.gov/polwaste/nps/success319/nc_tar.cfm.

[93] http://water.epa.gov/polwaste/nps/success319/nc_tar.cfm.

[94] North Carolina 2012 303(d) list.

Arsenic

Three sections[95] of the Cape Fear River were delisted from the 2012 draft 303d list for Arsenic. Two sections have been listed since 2008 and one since 2010,[96] and have only been delisted due to change in assessment methods. Because no new data have demonstrated that these segments of the Cape Fear River should be delisted, they should be relisted for 2014.

Lead

Irwin Creek[97] in the Catawba River Basin, has been delisted, despite continued lead impairment, solely because of the change in assessment methods. It has been listed since 2008,[98] and no new data support its delisting. Accordingly, it should be relisted.

Nickel

One substantial area[99] of the Cape Fear River, 7,856.7 square acres, has been delisted, despite continued nickel impairment, solely because of the change in assessment methods. This section of the Cape Fear River has been listed since 2008, [100]and no new data support its delisting. Accordingly, it should be relisted.

Cadmium

The Chowan River[101] is the only water body delisted from the 2014 303(d) list despite continued cadmium impairment, solely because of the change in assessment methods. It has been listed since 2002,[102] and no new data support its delisting. Accordingly it should be relisted.

Zinc

Eight water bodies on the 2012 303(d) list for zinc impairment were delisted under the new methodology, with no demonstrated improvement in zinc levels. These include two

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[95] AU §§ 18-(87.5)a, Cape Fear River prohibited area north of Southport Restricted Area and west of ICWW in Cape Fear River and 18-(71)b, Cape Fear River from a line across the river between Lilliput Creek and Snows Cut to a line across the river from Walden Creek to the Basin, and 18-28ut3, Ut to Locks Creek, from source to Locks Creek .

[96] 2012 North Carolina 303(d) list.

[97] AU § 11-137-1, Irwin Creek from source to Sugar Creek.

[98] 2012 North Carolina 303(d) list.

[99] AU § 18-(71)b, Cape Fear River from a line across the river between Lilliput Creek and Snows Cut to a line across the river from Walden Creek to the Basin

[100] 2012 North Carolina 303(d) list.

[101] AU § 25a2a, Chowan River from near Riddicksville to Deep Creek.

[102] 2012 North Carolina 303(d) list.

streams[103] in the Cape Fear River Basin; Irwin Creek[104] in the Catawba River Basin; a 4.3-mile stretch of the Neuse River[105] and Ellerbe Creek[106] in the Neuse River Basin; and two segments of the Rocky River[107] and a segment of Salem Creek[108] in the Yadkin-Pee Dee River Basin. The majority[109] of these water bodies have been listed for zinc impairment since 2008. Because they were delisted only because of the change in assessment methodology, they should all be relisted in 2014.

Copper

Copper is a naturally occurring element that can cause toxic effects at higher levels.[110] Soluble copper compounds that are commonly used in agriculture are more likely to threaten health.[111] Exceedances of water quality standards for copper raise concerns for wildlife and humans. Copper can harm fish and sensitive plants,[112] while long-term exposure to copper in drinking water can cause liver and kidney damage, and even death, in humans.[113]

Almost 40 water bodies have been delisted from the 2012 303(d) list for copper impairment, solely because of the change in assessment methods by the EMC. All of these segments should be relisted, as no new data have shown that water quality has improved.

The Catawba,[114] French Broad,[115] Neuse,[116] Roanoke,[117] Tar-Pamlico,[118] and White Oak[119] River Basins all have at least two segments on the 2012 impaired waters list due to

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[103] AU §§ 16-11-(9)b, Reedy Fork (Hardys Mill Pond) from Buffalo Creek to Haw River and 18-28ut3, Ut to Locks Creek, from source to Locks Creek.
[104] AU § 11-137-1, Irwin Creek from source to Sugar Creek.
[105] AU § 27-(36), Neuse River from mouth of Beddingfield Creek to a point .2 miles downstream of Johnston County SR 1700.
[106] AU § 27-5-(2), Ellerbe Creek from a point .2 miles upstream of Durham County SR 1636 to Falls Lake, Neuse River.
[107] AU § 13-17c3, Rocky River from Anderson Creek to Lanes Creek and 13-17c2, Rocky River from Hamby Branch to Anderson Creek.
[108] AU § 12-94-12-(4)b, Salem Creek (Middle Fork Muddy Creek) from Burke Creek to SR 1120.
[109] AU §§ 18-28ut3, Ut to Locks Creek, from source to Locks Creek and 11-137-1, Irwin Creek from source to Sugar Creek were listed since 2010, 2012 303(d)list.
[110] Copper Toxicological Profile, Agency for Toxic Substances and Disease Registry. http://www.atsdr.cdc.gov/toxprofiles/tp132-c1.pdf.
[111] *Id.*
[112] *Id.*
[113] *Id.*
[114] AU §§ 11-138, Twelvemile Creek from source to North Carolina-South Carolina State Line, 11-129-5-(9.5) Clark Creek from a point .9 miles upstream of Walker Creek to South Fork Catawba.
[115] 7, Nolichucky River from source to North Carolina-Tennessee State Line, 7-2-(21.5) North Toe River from a point .2 miles upstream of Pyatt Creek to a point .5 miles upstream of US. Hwy. 19E.
[116] AU §§ 27-(96)b2, Neuse River Estuary from Trent River to a line across Neuse River from Johnson Point to McCotter Point (part of upper model segment), 27-(36), Neuse River from mouth of Beddingfield Creek to a point .2 miles downstream of Johnston County SR 1700, 27-(22.5)c, Neuse River from Crabtree Creek to Auburn Knightdale Road, 27-34-(4)b, Walnut Creek from UT .6 miles west of I-440 to Neuse River.

copper but have been delisted for 2014. Significantly, the Cape Fear River Basin[120] and Yadkin-Pee Dee River Basin[121] had eight and at least 13 segments, respectively, impaired due to copper that have been removed under the new methodology. Almost all of the segments in the Cape Fear and Yadkin-Pee Dee River Basins that were listed as impaired for copper have been listed since 2008 and should continue to be listed in 2014. The Haw River of the Cape Fear River Basin had five segments delisted despite discharges into segments of North and South Buffalo Creek below Greensboro that historically constitute some of the worst water-quality problems in North Carolina.[122] That area has, since 1999, shown chronically high levels of dissolved copper.[123] The Rocky River Subbasin of the Yadkin-Pee Dee has the largest number of segments that were delisted despite continued copper impairment, and faces particular development pressures that may add copper to the naturally occurring copper in the region.[124] Potential additional sources include nonpoint runoff from urban areas as well as waste land-application sites.[125]

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[117] AU §§ 22-58-12-6b, Marlowe Creek from Mitchell Creek to Storys Creek, 22-40-(3) Smith River from Fieldcrest Mills Water Supply Intake to Dan River, 22-40-(2.5) Smith River from a point .8 miles downstream of Rockingham County SR 1714 (Aiken Road) to Fieldcrest Mills Water Supply Intake, 22-40-(1) Smith River from North Carolina-Virginia State Line to a point .8 miles downstream of Rockingham County SR 1714 (Aiken Road).

[118] AU §§ 29-6-(5) Chocowinity Bay from a line across the Bay from the upstream mouth of Cedar Creek to the upstream mouth of Silas Creek to Pamlico River and 29-(27) Pamlico River from a line across Pamlico River from Cousin Point to Hickory Point to a line across Pamlico River from Roos Point to Persimmon Tree Point.

[119] AU §§ 19-14 Wilson Bay Entire Bay, 21-35-7-10-4 Broad Creek (Nelson Bay) from source to Nelson Bay, and 21-32b Calico Creek from source to Ut on south side of creek .35 miles west of SR1176 bridge.

[120] AU §§ 17-(10.5)d2, Deep River from Gabriels Creek to Brush Creek, 16-(1)c1, Haw River from SR 2426 to Troublesome Creek at US 29, 16-41-1-17-(0.7)b2 Northeast Creek from Kit Creek to a point .5 miles downstream of Panther Creek, 16-11-14-2c, South Buffalo Creek from US 70 to Buffalo Creek, 16-41-1-12-(1), Third Fork Creek from source to a point 2.0 miles upstream of NC Highway 54, 16-41-1-12-(2), Third Fork Creek from a point 2.0 miles upstream of NC Highway 54 to New Hope Creek, 18-(16.7), Cape Fear River from Lillington water-supply intake to Upper Little River, 18-74-(61), Northeast Cape Fear River from mouth of Ness Creek to Cape Fear River.

[121] AU §§ 13-17-40-11 Beaverdam Creek from source to Lanes Creek, 13-17-9-(2) Irish Buffalo Creek from Kannapolis Water Supply Dam to Rocky River, 13-17-36-(5)a2 Richardson Creek from Watson Creek to Salem Creek, 13-17-36-(5)a1b Richardson Creek from Stewarts Creek to Watson Creek, 13-17c3 Rocky River from Anderson Creek to Lanes Creek, 13-17c2 Rocky River from Hamby Branch to Anderson Creek, 13-17d Rocky River from the Lanes Creek to the Pee Dee River, 12-108-18-(3) Bear Creek from a point .2 miles downstream of U.S. Highway 64 to South Yadkin River, 12-(108.5)b1 Yadkin River (including upper portion of High River) from mouth of Grants Creek to Buck Steam Station, 12-94-(0.5)b2b Muddy Creek from Silas Creek to SR 2995, 12-94-12-(4)c, Salem Creek (Middle Fork Muddy Creek) from SR1120 to Muddy Creek, 12-94-12(4)b, Salem Creek (Middle Fork Muddy Creek) from Burke Creek to SR 1120, 12-(38)b Yadkin River from Reddies River to Mulberry Creek.

[122] Environmental Sciences Branch Report, Basinwide Assessment Report, Cape Fear River Basin (1999) p. 42. http://portal.ncdenr.org/c/document_library/get_file?uuid=5ac4f8d4-c435-4f29-836b-b8ea86f8f70f&groupId=38364

[123] *Id.*

[124] Rocky River Watershed 2008 Water Quality Overview. http://portal.ncdenr.org/c/document_library/get_file?uuid=dfa0a669-23d2-4ee8-a548-4327e5bcfcac&groupId=38364

[125] *Id.*

VII. Conclusion and Recommendations for Improvement

As detailed above, the new methodology used by North Carolina to create the draft 303(d) list is deeply flawed and has resulted in numerous unjustified delistings. To prevent such harmful decisions in the future, the EMC should formally delegate to DWR the responsibility for developing the listing methodology. This will increase the likelihood that scientific expertise, rather than statistical manipulation, informs the identification of waters in need of additional pollution protection.

Regardless of who develops the methodology, it should be substantially revised. When assessing compliance with numeric water quality criteria expressed as maximum levels, the preferred methodology, according to the EPA, is the 1-in-3 frequency method, under which one exceedance in a three-year window results in inclusion on the 303(d) list.[126] If, instead, the State wishes to continue use of the 10% exceedance allowance, it should follow EPA guidance, which cautions that this allowance should not be applied to toxics and other non-conventional pollutants.[127]

If the State insists on retaining its current methodology, it must, at a minimum, explain the policy decisions that form the basis of its decision and clearly define the statistical jargon it employed. Specifically, the State should explain to EPA and the public why it believes the application of the methodology constitutes good cause for making listing decisions that define the level of protection afforded to our State's waters. Unless EPA approves of this methodology, the State should not make delisting decisions on the basis thereof. And because EPA has not approved the 2014 methodology, all waters removed from the list for no other reason than the application of the new methodology should be returned to the 303(d) list and afforded the protection contemplated for such impaired waters under the Clean Water Act.

We appreciated the opportunity to submit these comments.

Respectfully,

Chandra T. Taylor
Will Hendrick
Julia F. Youngman

cc: Andrea Zimmer, EPA Region 4 (via email)
Marion Hopkins, EPA Region 4 (via email)
Environmental Management Commission (via email)

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[126] 2004 Guidance, *supra* note 15, at 26-27 (explaining EPA's preference for the 1-in-3 frequency methodology).
[127] 2006 Guidance, *supra* note 6, at 39; 2004 Guidance, *supra* note 15, at 30.

APPENDIX A

The following water body assessment units (AUs) were reclassified for at least one parameter from category 5 to category 3, the majority from 5 to 3a1. The reason listed for these revisions is "Change in Assessement [sic] Methods per NC Environmental Management Commission in 2013."[128]

- 17-43-10b2
- 18-(71)b
- 18-(87.5)a
- 18-(71)a2
- 18-(71)a1
- 17-(4)b
- 17-(10.5)d2
- 17-43-(5.5)a
- 17-3-(0.3)
- 17-3-(0.7)a
- 16-(6.5)
- 16-(10.5)a
- 16-(1)c1
- 16-(1)c2
- 16-(10)
- 16-41-2-(9.5)
- 16-41-1-17-(0.7)
- 16-11-(9)b
- 16-11-14-2c
- 16-41-1-12-(2)
- 16-41-1-12-(1)
- 18-(16.7)
- 18-28ut3
- 18-74-39a
- 18-74-(61)
- 11-137-1
- 11-138
- 11-119-(0.5)
- 11-113-(2)
- 11-119-3-(2)
- 11-129-5-(9.5)
- 11-129-16-(4)
- 11-129-(14.5)
- 11-129-(10.5)
- 11-129-(15.5)
- 11-135-10-1
- 25-4-(5)
- 25a2a
- 6-(54.75)c
- 6-(1)
- 6-(54.75)f
- 6-(54.75)d
- 7
- 7-2-(21.5)[129]
- 5-16-(11.5)d
- 1-52c
- 27-86-2
- 27-(96)b2
- 27-112
- 27-45-(2)b
- 27-45-(2)a
- 27-5-(2)
- 27-43-15-(1)b2
- 27-(49.75)
- 27-(50.375)a
- 27-(22.5)c
- 27-(49.5)
- 27-(36)
- 27-43-15-(1)but3
- 27-34-(4)b
- 22-(55.75)
- 22-(55.5)
- 22-58-12-6b
- 22-27-(1.5)
- 22-(38.5)
- 22-(1)b
- 22-(39)a
- 22-40-(3)
- 22-40-(1)
- 22-40-(2.5)
- 23-10c
- 28-79-(1)a2
- 28-79-(1)b
- 29-9
- 29-6-(5)
- 29-(27)
- 28-11e
- 21-32a[130]
- 21-32b
- 19-14
- 21-35-7-10-4
- 13-17-40-11
- 13-17-17
- 13-17-20
- 13-17-9-(2)
- 13-17-20-1
- 13-17-36-(5)a1b
- 13-17-36-(5)a2
- 13-17-36-(3.5)b
- 13-17d
- 13-17c1
- 13-17c3
- 13-17c2
- 13-17a
- 12-108-18-(3)
- 12-108-16-(0.5)b1
- 12-108-16-(0.5)b2
- 12-108-21a
- 12-108-21c
- 12-108-20-4a2
- 12-108-20-4a1
- 13-2-3-3-(0.7)
- 12-119-7a
- 13-2-3-3-2-2-(2)
- 12-(108.5)b1
- 12-(108.5)b4
- 12-(124.5)b
- 12-63-(9)b
- 12-63-(9)a
- 12-94-(0.5)b2b
- 12-94-12-(4)c
- 12-94-12-(4)b
- 12-(53)
- 12-(38)b

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[128] *See* NC DENR, Individual Assessment Changes from 2012 (2014), *available at* http://portal.ncdenr.org/c/document_library/get_file?uuid=c36b70c1-de5f-495c-9e99-f024e822580e&groupId=38364.

[129] This segment went from Category 5e to 3a1. Category 5e means EPA listed it for them the last time. *See* NC DENR, 2014 WATER QUALITY ASSESSMENT PROCESS 10 (2014).

[130] This segment went from Category 5 to 3z1. The justification is that the previous listing was inconsistent with assessment methodology and that available data is not sufficient to determine attainment status. *See* NC DENR, Individual Assessment Changes from 2012 (2014).

APPENDIX B

Minimum number of exceedances required to maintain a >90% confidence that a designated use is impaired (10% exceedance).					
Sample Size (n)	Number of observations exceeding required to define an impaired use	Confidence Level	Sample Size (n)	Number of observations exceeding required to define an impaired use	Confidence Level
10	3	0.930	56	10	0.951
11	3	0.910	57	10	0.945
12	4	0.974	58	10	0.940
13	4	0.966	59	10	0.933
14	4	0.956	60	10	0.927
15	4	0.944	61	10	0.920
16	4	0.932	62	10	0.913
17	4	0.917	63	10	0.905
18	4	0.911	64	11	0.948
19	5	0.965	65	11	0.943
20	5	0.957	66	11	0.938
21	5	0.948	67	11	0.932
22	5	0.938	68	11	0.926
23	5	0.927	69	11	0.920
24	5	0.915	70	11	0.913
25	5	0.902	71	11	0.906
26	6	0.960	72	12	0.947
27	6	0.953	73	12	0.942
28	6	0.945	74	12	0.937
29	6	0.936	75	12	0.931
30	6	0.927	76	12	0.926
31	6	0.917	77	12	0.920
32	6	0.906	78	12	0.913
33	7	0.958	79	12	0.907
34	7	0.952	80	13	0.946
35	7	0.945	81	13	0.942
36	7	0.937	82	13	0.937
37	7	0.929	83	13	0.931
38	7	0.920	84	13	0.926
39	7	0.911	85	13	0.920
40	7	0.900	86	13	0.914
41	8	0.952	87	13	0.908
42	8	0.946	88	13	0.901
43	8	0.939	89	14	0.941
44	8	0.932	90	14	0.937
45	8	0.924	91	14	0.932
46	8	0.916	92	14	0.927
47	8	0.907	93	14	0.921
48	9	0.954	94	14	0.915
49	9	0.948	95	14	0.910
50	9	0.942	96	14	0.903
51	9	0.936	97	15	0.941
52	9	0.929	98	15	0.937
53	9	0.922	99	15	0.932
54	9	0.914	100	15	0.927
55	9	0.906			

March 14, 2014

By First Class Mail & Email
Mr. Andy Painter
N.C. Department of Environment and Natural Resources
Division of Water Resources, Planning Section
1617 Mail Service Center
Raleigh, NC 27699-1167
andy.painter@NCDENR.gov

Re: Request to list Stocking Head Creek on North Carolina's Draft 2014 §303(d) List

Dear Mr. Painter:

Cape Fear River Watch was founded twenty years ago to protect and improve the water quality of the Cape Fear River Basin. We have nearly a thousand active members across the watershed. On behalf of our Board of Directors, Waterkeeper Alliance and our membership, we urge you to classify Stocking Head Creek as impaired for nutrients and fecal coliform on the 2014 303(d) list. Our organizations collectively represent thousands of North Carolinians who drink, fish, swim, paddle, and earn a living on our state's rivers, lakes, reservoirs, and estuaries and whose use of these waters have been adversely impacted by bacteria and nutrient pollution that is being inadequately addressed.

Every two years, each state is required by Section 303(d) of the Act to identify waters within its jurisdiction for which required effluent limitations are not stringent enough to implement applicable water quality standards or for which other pollution control requirements (e.g., best management practices) required by local, State, or Federal authority are not stringent enough to implement any water quality standards (WQS) applicable to such waters.[1] Federal regulations require that North Carolina "assemble and evaluate all existing and readily available water quality-related data and information" to develop the 303(d) list.[2] EPA regulations further provide that, in compiling the 303(d) list, the state must consider "[w]aters for which water quality problems have been reported by local, state, or federal agencies; members of the public; or academic institutions."[3] Under EPA regulations, "[f]or the purposes of listing waters under § 130.7(b), the term "water quality standard applicable to such waters" and "applicable water quality standards" refer to those water quality standards established under section 303 of the Act, including numeric criteria, narrative criteria, waterbody uses, and antidegradation requirements. Once waters are identified as impaired on the 303(d) List, the Clean Water Act

[1] 33 U.S.C. § 1313(d)(1)(A); 40 C.F.R. § 130.7(b)(1).
[2] 40 C.F.R. § 130.7(b)(5).
[3] 40 C.F.R. § 130.7(b)(5)(iii).

requires the State to establish a total maximum daily load ("TMDL") to further limit the presence of the pollutant or pollutants that cause the impairment.[4]

In 2013, Cape Fear Riverkeeper and Waterkeeper Alliance asked Michael A. Mallin, Ph.D., Matthew R. McIver, Anna R. Robuck and Amanda Kahn Dickens, Ph.D. at Center for Marine Sciences University of North Carolina - Wilmington to evaluate water quality conditions in the Stocking Head Creek subwatershed of the Cape Fear River. Their analysis of water quality data demonstrates that Stocking Head Creek is impaired by nutrients and bacteria.

Stocking Head Creek is a 2nd order stream located in the Northeast Cape Fear River basin on the Coastal Plain of North Carolina. It lies within 8-digit Hydrologic Unit Code 003030007, and is classified as C Sw waters by North Carolina Division of Water Resources. Catchment area is 4,893 acres (1,980 ha) and stream length to the Northeast Cape Fear River is 13.7 mi (22.1 km). The Northeast Cape Fear River is a 5th order tributary of the 6th order Cape Fear River, the watershed of which contains approximately half of the 9,000,000-plus swine produced in North Carolina. It is estimated that the Cape Fear River basin produced (in 1995) 82,700 metric tons of nitrogen and 26,000 metric tons of phosphorus as waste in this watershed.

Recent monitoring of Stocking Head Creek by Michael A. Mallin, Ph.D., Matthew R. McIver, Anna R. Robuck and Amanda Kahn Dickens, Ph.D., Center for Marine Sciences University of North Carolina Wilmington supports our request to have Stocking Head Creek added to the 2014 303d list of impaired waterways. In March of 2014, Mallin reported that nutrient and biologic parameters consistently far exceed generally accepted water quality standards and other measures of water quality and use support for C Sw waterways.

These parameters include:

- Ammonium: Ammonium is a form of chemically reduced inorganic nitrogen that is often associated with fresh human sewage or animal manure. It is readily taken up by visible plants, algae and bacteria for growth. When exposed to dissolved oxygen in the presence of nitrifying bacteria it is converted to nitrate by the process of nitrification. There is no ambient ammonium standard for North Carolina waters. However, academic research has indicated that ammonium concentrations of 0.5 mg/L (ppm) and greater stimulate algae blooms in blackwater streams (Mallin et al. 2001; 2002; 2004). Additionally, since ammonium is a chemically reduced form of nitrogen, during the nitrification process it can exert a chemical oxygen demand on waters receiving sewage or animal waste inputs, thus contributing to lowered dissolved oxygen. Thus it's concentration in sewage outfalls is regulated by NPDES permits for point-source discharges.

  Ammonium in Stocking Head Creek during the 10 sample trips ranged from the detection limit (0.05 mg/L) to 37.8 mg/L (Table 1). Highest ammonium concentrations

[4] 33 U.S.C. § 1313(d)(1)(C).

were found at Station TR-SDCR, followed by Station SHC-SHCR. The ammonium concentrations found at those sites were well in excess of ammonium concentrations found in many other creeks in the Northeast Cape Fear and Black River watersheds (Mallin et al. 2004; 2006). Only during swine lagoon breaches have such concentrations been found in blackwater streams (Burkholder et al. 1997; Mallin 2000). The presence of elevated ammonium indicates periodic loading to the stream of fresh inputs.

- Nitrate: Nitrate is a chemically oxidized form of inorganic nitrogen, and is used by visible plants and algae for growth. It is very mobile in soils and readily moves through the water table to enter streams. Sources are sewage, animal wastes, and fertilizers, as well as atmospheric deposition generated (even far away) from power plants and internal combustion engines. There are no ambient nitrate standards in North Carolina. However, academic research has indicated that nitrate concentrations of 0.5 mg/L (ppm) and greater can stimulate algae blooms in blackwater streams (Mallin et al. 2001; 2002; 2004). There is a US EPA well water standard for drinking of 10 mg/L to prevent blue-baby syndrome (also called methemoglobinema).

  Nitrate concentrations in Stocking Head Creek were very high (Table 2). Whereas the highest ammonium concentrations were found at two sites, several sites showed high nitrate. Concentrations ranged from 0.08-13.60 mg-N/L, with station means ranging from 0.30-7.94 mg-N/L (Table 2). Particularly high nitrate concentrations were seen at these four sites: SHC-GDR, SHC-CSR, SHC-SDCR and SHC-SHCR; lowest concentrations were at SHC-50. Average concentrations at all stations except SHC-50 were at levels known to lead to elevated BOD in blackwater streams (Mallin et al. 2004). The concentrations seen in this creek were well in excess of numerous creeks this laboratory has studied in the Cape Fear River basin, except for a couple that were impacted by faulty point-source sewage effluent discharges (Mallin et al. 2004; 2006). It is notable that on two occasions even the 10 mg/L standard for drinking well water was exceeded (Table 2).

- Total Nitrogen (TN): TN is the total combined organic and inorganic nitrogen in the water. There are no ambient standards for TN in North Carolina waterways. For the combined sampling periods TN concentrations ranged from 0.11-46.70 mg-N/L, while station averages ranged from 0.54 mg-N/L at SHC-50 to 15.71 mg-N/L at TR-SDCR. The TN values were dominated by inorganic nitrogen (i.e. nitrate and ammonium) rather than organic nitrogen, as is frequently the case in blackwater streams in North Carolina (Mallin et al. 2004; 2006). The TN concentrations in Stocking Head Creek are very high compared to a wide range of blackwater Coastal Plain streams as sampled by the Lower Cape Fear River Program (http://www.uncw.edu/cms/aelab/LCFRP/index.htm) as well as values reported in the literature. To provide a wider perspective, using a large data set of 1,070 streams Dodds et al. (1998) determined that TN concentrations > 1.5 mg/L were characteristic of eutrophic conditions.

- Orthphosphate: Orthophosphate is the most common form of inorganic phosphorus. Sources are fertilizers, human sewage and animal manures. There are no ambient orthophosphate standards for North Carolina waterways. Orthophosphate concentrations in Stocking Head Creek in July and August ranged from 0.07 – 2.02 mg-P/L, with station means ranging from 0.13 – 0.63 mg-P/L. The station means generally ranged from 2-10X the average levels found in a selection of blackwater coastal plain streams (Mallin et al. 2006). As a comparison with another CAFO-rich watershed, in the Herrings Marsh Run study (Stone et al. 1995) average orthophosphate concentrations in a stream section draining intensive swine and poultry operations were 0.68 mg-P/L, and average orthophosphate of 0.78 mg-P/L were in the stream station exiting the watershed. It is notable that orthophosphate is not very mobile in soils, as it has a strong affinity for soil particles, especially clays.

- Total Phosphorus (TP): TP is the total of inorganic plus organic phosphorus in the water column. There are no ambient standards for North Carolina waterways. However, bacteria require P both structurally and energetically (Kirchman 1994), and fecal bacteria in stream sediments can be stimulated by inputs of phosphate (Toothman et al. 2004; Cahoon et al. 2007). Also, fecal coliform bacteria in the water column are stimulated by organic and inorganic inputs, increasing survival and reproduction (Chudoba et al. 2013). Concentrations of TP of 0.50 mg-P/L or greater can increase biochemical oxygen demand (BOD) in blackwater streams by serving as a substrate assimilated by ambient bacteria in the stream (Mallin et al. 2001; 2002; 2004). TP ranged from 0.050 – 10.70 mg-P/L, and station means ranged from 0.15 at SHC-GDR to 2.83 mg-P/L at TR-SDCR. Station TR-SDCR had the highest concentrations, followed by SHC-SHCR (Table 5). On 11 of the 70 samples, TP was higher than 0.50 mg-P/L, above which BOD was found to increase significantly over control in nutrient addition experiments for several blackwater streams (Mallin et al. 2004). With the exception of TR-SDCR, TP at the other stations were in the range of subsurface drainage plots to which swine waste lagoon liquid were applied, which averaged TP ranging from 0.20 to 0.50 mg-P/L, depending upon application rate (Evans et al. 1984). Again looking a broader perspective, using data from 1,366 streams Dodds et al. (1998) concluded that TP concentrations > 0.075 mg/L were characteristic of eutrophic stream.

- Chlorophyll a: Chlorophyll *a* represents the amount of suspended micro-algal material found in a sample of water. North Carolina has a chlorophyll *a* standard of 40 µg/L (ppb) above which waters are considered eutrophic, or impaired by excessive algal blooms. All summer samples were below the standard, except one sample at TR-SDCR on July 29 which was 40 µg/L. In fall a bloom of 44 µg /L occurred at TR-SDCR on September 18, and smaller blooms of 25 µg/L occurred at SHC-50 on September 18 and 28 µg/L at SHC-GDR on September 24. Thus, algal blooms occurred within Stocking Head Creek, but were inconsistent in time and among sampling sites.

- Biochemical Oxygen Demand (BOD): Biochemical oxygen demand (BOD) is a measure of the organic matter available for consumption by the bacteria in a body of water during respiration. As the bacteria consume organic material that has entered the water (via the process of respiration) they use up dissolved oxygen in the water; in extreme cases lowering DO to levels dangerous to fish and invertebrates. One cause of BOD are algal blooms, which eventually die, and this creates a mass of labile (easily-digested) organic matter for the bacteria to consume, and dissolved oxygen in doing so. Another common cause of BOD is the introduction of labile organic materials such as human sewage or animal waste into the water. There are no ambient standards for BOD in North Carolina stream waters; however, comparison of BOD from many streams, creeks and rivers in North Carolina indicate that concentrations of 1 to 2 mg/L can be considered normal (Mallin et al. 2006).

  Five-day BOD (BOD5) ranged widely (Table 7), from background concentrations of 1.0 mg/L all the way up to a maximum of 88 mg/L at Station TR-SDCR on September 16. That station maintained the highest overall concentrations (Table 7), reaching or exceeding 10 mg/L on six of 10 occasions. Station SHC-SHCR exceeded 10 mg/L on three occasions, with a peak of 25 mg/L on August 18. Other stations (SHC-PBR, SHC-CSR) did not show unusually high concentrations. The stream stations with the highest BOD concentrations were those in closest proximity to swine waste sprayfields (Plates 4A and 4B; 9A and 9B).

Based on these results, we request that you list Stocking Head Creek as a Category 5 water to the North Carolina 2014 303(d) List based on these indicators of water quality degradation, use impairment, and nutrient pollution in violation of state water quality standards, and that a TMDL be developed for this waterbody.

Additionally, an extensive analysis of the fecal coliform levels in Stocking Head Creek in relation to water quality criteria was prepared by Michael A. Mallin, Ph.D., Center for Marine Sciences University of North Carolina Wilmington, on January 28, 2014 and is attached hereto. The analysis presented demonstrates that:

> Seven stations in Stocking Head Creek, Duplin County, North Carolina, were sampled on five occasions within 30 days in both summer and fall 2013. The data indicates that Stocking Head Creek is highly polluted by fecal bacteria, by both measures of the NC criteria. The upper five stations exceeded 400 CFU/100 ml 96-100% of the time sampled, and six of seven stations exceeded a geometric mean of 200 CFU/10 mL for five samples in both 30 day periods. Elevated fecal coliform counts occurred during both wet and dry periods; this creek is chronically polluted by fecal bacteria.

Accordingly, we request that you add Stocking Head Creek as a Category 5 water to the North Carolina 2014 303(d) List for fecal coliform violations, and that a TMDL be developed for this waterbody.

Consistent with NCDENR's guidelines for submission of data for regulatory use, all of the data collected by Dr. Mallin meet the same data quality requirements as for internal NCDENR activities.[5] Additional information to support this request for listing Stocking Head Creek is available in any format requested by the NCDENR and the data is of acceptable quality. In the event, the NCDENR decides not to list Stocking Head Creek on the 2014 303(d) List, it is required under 40 C.F.R. § 130.7(b)(6) to provide documentation to the Regional Administrator to support the State's determination, including "[a] rationale for any decision to not use any existing and readily available data and information for any one of the categories of waters as described in" section 130.5(b)(5). The methodology is described in detail in the attached document.

We request the opportunity to review this data and analysis with you prior to your making a listing decision to answer any questions or concerns that arise. We believe that the data analysis demonstrate that Stocking Head Creek is impaired by nutrients and fecal coliform in violation of North Carolina's water quality standards, and as a result, must be listed on the North Carolina 2014 303(d) List. Stocking Head Creek must be placed in Category 5 because "[a]vailable data and/or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed."[6] In the event you disagree, we would welcome the opportunity to further discuss your concerns prior to your making a final listing decision.

Thank you for your consideration of this request. If you have any questions, please contact Kemp Burdette at 910-762-5606 or kemp@cfrw.us.

Sincerely,

Kemp Burdette, Riverkeeper
Cape Fear River Watch
617 Surry Street
Wilmington, North Carolina 28401

Gray Jernigan, Staff Attorney
Waterkeeper Alliance
19 West Hargett Street, Suite 602B
Raleigh, North Carolina 27601

[5] http://portal.ncdenr.org/c/document_library/get_file?p_l_id=1169848&folderId=689969&name=DLFE-72004.pdf

[6] U.S. EPA, Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act.

Stocking Head Creek Fecal Coliform Bacteria Investigation

Submitted to Waterkeeper Alliance

January 28, 2014

Michael A. Mallin, Ph.D.
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Introduction

Stocking Head Creek is a 2nd order stream located in Duplin County, in the Northeast Cape Fear River basin on the Coastal Plain of North Carolina. It lies within subbasin 03-06-22, and is classified as C Sw waters by North Carolina Division of Water Resources. This stream receives potentially polluted inputs from multiple swine and poultry CAFOs in the basin, as well as from grazing cattle. Thus, its potential for degraded water quality is high. As this stream consists of public waters, it was of interest to investigate whether or not these waters are impaired based on North Carolina Department of Environment and Natural Resources (NCDENR) fecal coliform bacteria standards.

Methodology

To obtain a full perspective of the stream's physical and chemical qualities a suite of parameters was sampled. The University of North Carolina Wilmington Center for Marine Science Aquatic Ecology Laboratory is State-certified for field measurements, and the following measurements were made on-site using YSI field meters calibrated and checked according to standard procedures: water temperature, pH, dissolved oxygen, turbidity and specific conductance. Also on-site, samples were collected according to standard procedures for nutrients (ammonium, nitrate, total nitrogen, orthophosphate, total phosphorus), chlorophyll *a*, biochemical oxygen demand (BOD5), fecal coliform bacteria and total suspended solids. The University of North Carolina Wilmington Center for Marine Science Aquatic Ecology Laboratory is State-certified for chlorophyll *a* analysis. Samples (except for chlorophyll *a*) were kept on-ice and returned to a state-certified laboratory for subsequent analysis, within proper holding times. Chain of custody records were maintained. We note that NCDENR has freshwater numeric standards for dissolved oxygen, turbidity, fecal coliform bacteria, and chlorophyll *a*.

Sample Frequency

The overall approach was to conduct intense sampling (five sample trips) during two different 30-day periods, one in mid-summer and one in fall. This was planned to abide by NCDNER's protocol for fecal coliform sampling.
The North Carolina protocol states that fecal coliform counts shall not exceed a geometric mean of 200 CFU/100 mL based on at least five consecutive samples during any 30 day period, nor exceed 400 CFU/100 mL in more than 20% of the samples examined during such period.

Sampling of Stocking Head Creek occurred during both dry and wet periods. Following cessation of all sampling, rainfall data were obtained from the NC CRONOS data set, using station #319026 Wallace, Latitude 34.72, Longitude 77.97778, in Duplin County. Rainfall amount was computed for the day of sampling, the day of sampling plus the previous 24-hr period, and the day of sampling plus the previous 48-hr period.

Sample Sites (see site map)

There were seven stations sampled during both 30-day periods (see map – Fig. 1).

Figure 1. Map of Stocking Head Creek showing sampling locations.

All sites were sampled from bridges on public right-of-ways. Appendix A shows photographs of the sampling sites from different perspectives.

Data Analyses

Sample data were entered into Excel spreadsheets and summary statistics were performed for each period (means, standard deviations, medians, minimum, maximum, and geometric means (for fecal coliform analysis). This report presents only fecal coliform bacteria data; the other parameters will be presented in a subsequent more comprehensive report.

Results and Discussion of 2013 Fecal Coliform Bacteria Sampling

Fecal coliform bacteria: The State of North Carolina uses fecal coliform bacteria counts as a proxy for potentially-pathogenic bacteria in fresh water bodies. Potential sources include human sewage, wildlife, and livestock including cattle, swine and poultry. The NC protocol for sampling and means for determining fecal impairment of a water body are explained above under "sampling frequency".

Table 1. Fecal coliform bacterial counts for Stocking Head Creek, summer and fall 2013, data are as colony-forming units (CFU)/100 mL.

Stocking Head Creek fecal coliform bacteria sampling stations 2013.

	1	2	3	4	5	6	7	geomean
Date	TR-SDCR	SHC-GDR	SHC-CSR	SHC-SDCR	SHC-SHCR	SHC-50	SHC-PBR	
7/29/2013	1,091	728	819	1,637	2,400	91	55	536
8/1/2013	455	2,400	546	910	12,000	109	172	740
8/13/2013	6,000	1,000	1,728	728	1,182	91	364	840
8/20/2013	819	1,460	2,400	1,000	1,460	1,360	637	1,202
8/27/2013	44,000	546	3,300	3,800	26,000	370	4,000	3,807
9/16/2013	60,000	330	819	8,000	23,000	109	270	1,895
9/18/2013	16,000	910	2,700	819	3,700	109	819	1,402
9/24/2013	12,000	3,000	5,000	2,700	60,000	172	430	2,994
10/8/2013	60,000	2,500	1,090	2,700	2,600	748	586	2,432
10/10/2013	54,000	1,730	640	1,550	2,800	380	172	1,498
geomean	9,126	1,184	1,470	1,772	5,863	220	391	

Fecal coliform counts for Stocking Head Creek in July and August 2013 were in general very high and place this creek clearly as one impaired per the State of NC definition. For the summer 2013 sampling period, the upper five stations exceeded 400 CFU/100 ml 100% of the time sampled (Table 1; Fig. 2), and the geometric means for all seven

stations exceeded 200 CFU/10 mL for five samples in 30 days.

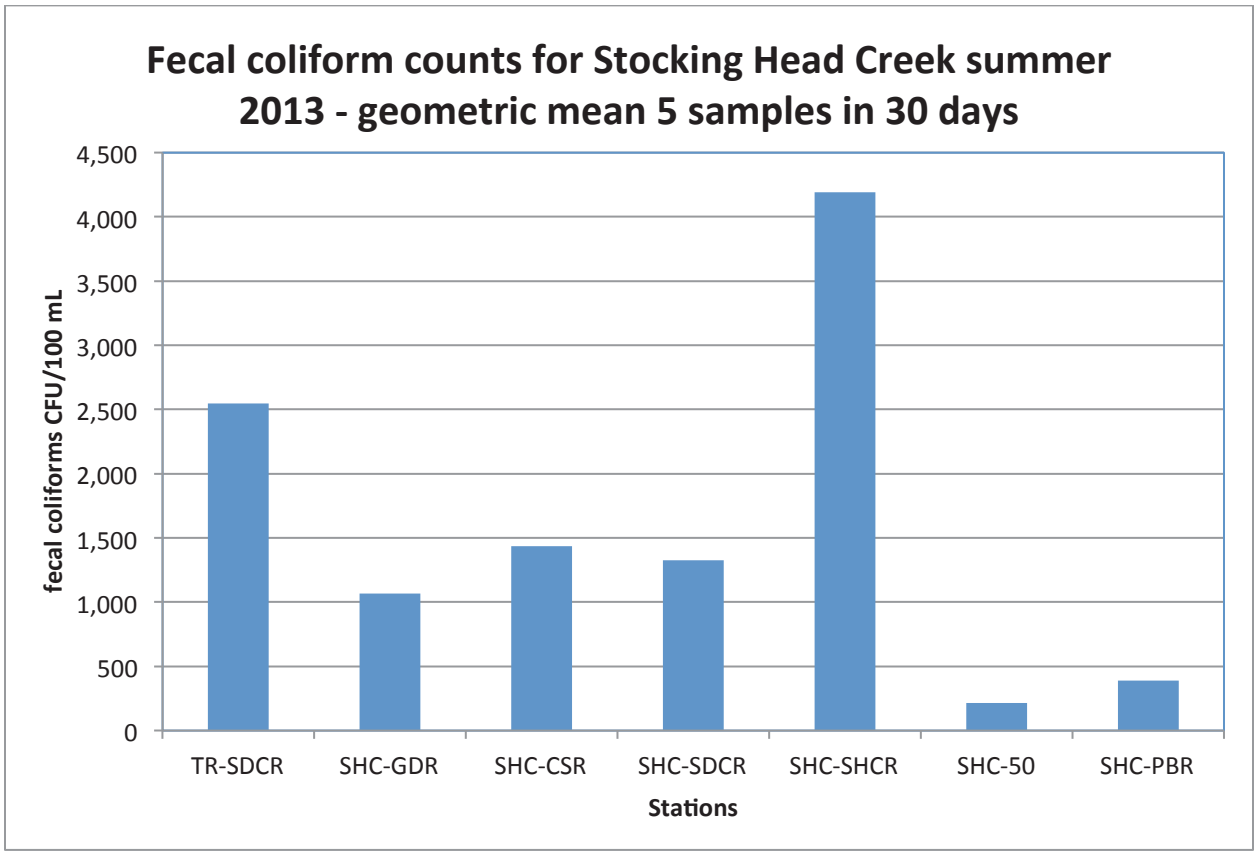

Figure 2. Fecal coliform counts as geometric mean for Stocking Head Creek July and August 2013; compare with NC standard of 200 CFU/100 mL.

Fecal coliform counts for Stocking Head Creek in September and October 2013 were in general very high, in some cases even higher than in summer, and place this creek clearly as one impaired per the State of NC definition. For the fall 2013 sampling period, the upper five stations exceeded 400 CFU/100 ml 96% of the time sampled (Table 1; Fig. 3), and the geometric means for six of the seven stations exceeded 200 CFU/10 mL for five samples in 30 days.

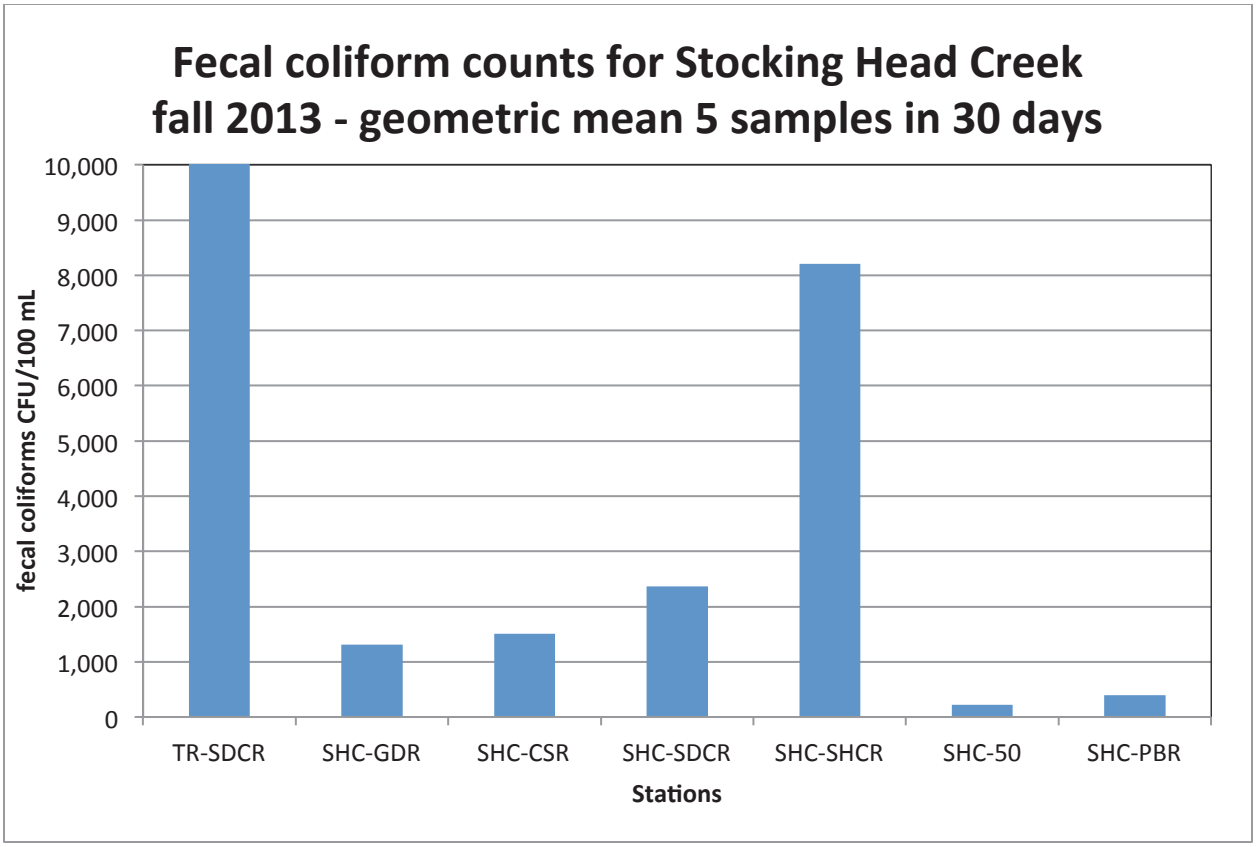

Figure 3. Fecal coliform counts as geometric mean for Stocking Head Creek September and October 2013; compare with NC standard of 200 CFU/100 mL. Note the actual geometric mean for TR-SDCR is 32,689 CFU/100 mL (way off page).

Lack of Rainfall Influence: Measurable rainfall occurred either on the day of sampling or within the 48 hr preceding the sample day on five sampling occasions. They were August 1 and 13, September 24, and October 8 and 10. For all non-rain sample dates and stations the fecal coliform geometric mean was 1,455 CFU/100 mL, and counts exceeded 200 CFU/100 mL 31 of 35 samples for a rate of 89% standard exceedence. For all rain periods and stations combined the fecal coliform geometric mean was 1,467 CFU/100 mL, and counts exceeded 200 CFU/10 mL on 30 of 35 samples for a rate of 86% exceedence of standard. Thus, fecal coliform pollution of Stocking Head Creek is not rain dependent; rather it is a chronic condition.

Conclusions: Fecal Coliform Bacteria

Seven stations in Stocking Head Creek, Duplin County, North Carolina, were sampled on five occasions within 30 days in both summer and fall 2013. The data indicates that Stocking Head Creek is highly polluted by fecal bacteria, by both measures of the NC criteria. The upper five stations exceeded 400 CFU/100 ml 96-100% of the time sampled, and six of seven stations exceeded a geometric mean of 200 CFU/10 mL for five samples in both 30 day periods. Elevated fecal coliform counts occurred during both wet and dry periods; this creek is chronically polluted by fecal bacteria.

Appendix A. Photographs of the sampled sites (in rough descending order from headwaters to lower creek):

SHC-GDR (Stocking Head Creek at Graham Dobson Road): N 34.91197 W 77.94507; Collects the uppermost branch of Stocking Head Creek (Plates 1A, 1B), upstream CAFOs and sprayfields present.

Plates 1A (left) – Uppermost station on Graham Dobson Rd., 1B (right) SHC-GDR is located at the first dip along Graham Dobson Road.

SHC-CSR (Stocking Head Creek and Cool Springs Road): N34.90279, W 77.94440; Collects one upper branch of Stocking Head Creek (Plates 2A, 2B), no immediately adjoining CAFOs or sprayfields, but there are CAFOs nearer the creek upstream (see Fig. 1).

Plates 2A (left) – Cool Springs Road site from air, 2B (right) Creek at SHC-CSR.

TR-SDCR (un-named tributary entering Stocking Head Creek at South Dobson Chapel Road): N 34.88878 W 77.94453; Site was originally hoped to serve as a field control as influence of CAFOs appeared to be low in this upper area of the tributary on first visit; however on subsequent visits evidence of lagoon spraying was present as were cattle (Plates 3A, 3B).

Plates 3A (left) – Tributary off South Dobson Chapel Rd., Station TR-SDCR; 3B (right) bend on South Dobson Chapel Rd. where TR-SDCR is located.

SHC-SDCR (Stocking Head Creek and South Dobson Chapel Rd. – Plates 4A and 4B): N 34.89796 W 77.93628; Numerous CAFO, sprayfields, and grazing cattle near creek

Plates 4A (left) and 4B (right) Station SHC-SDCR, downstream and upstream.

SHC-SHCR (Stocking Head Creek at Stocking Head Road - Plates 5A, 5B): N 34.88710 W 77.91124; CAFO sprayfields immediately adjoining creek.

Plates 5A (left) Sampling site from bridge on Stocking Head Rd., with nearby CAFO shown; 5B (right) Station SHC-SHCR.

SHC-50 (Stocking Head Creek at SR 50 – Plates 6A, 6B): N 34.87950 W 77.89438; Site adjoins a large wetland area which is hydrologically connected to creek.

Plates 6A (left) Sampling site off bridge on Highway 50, 6B (right) Station SHC-50.

SHC-PBR (Stocking Head Creek at Pasture Branch Road – Plates 7A, 7B): 34.87043 W 77.86539; This is a downstream reach with no evident CAFOs immediately nearby. There is an adjoining forested wetland that supplies flow to the stream here.

Plates 7A (left) Sampling site off bridge on Pasture Branch Rd., 7B (right) Station SHC-PBR.

March 14, 2014

Via First Class Mail & Electronic Mail

Mr. Andy Painter
N.C. Department of Environment and Natural Resources
Division of Water Resources, Planning Section
1617 Mail Service Center
Raleigh, NC 27699-1167
andy.painter@ncdenr.gov

Re: North Carolina's Draft 2014 §303(d) List

Dear Mr. Painter:

These comments on the Draft 2014 §303(d) List are being submitted on behalf of the Neuse Riverkeeper Foundation and Waterkeeper Alliance. Our organizations collectively represent thousands of North Carolinians who drink, fish, swim, paddle, and earn a living on our state's rivers, lakes, reservoirs, and estuaries and whose use of these waters have been adversely impacted by nutrient pollution that is being inadequately addressed.

Every two years, each state is required by Section 303(d) of the Clean Water Act to identify waters within its jurisdiction for which required effluent limitations are not stringent enough to implement applicable water quality standards.[1] EPA regulations provide that states need not list waters where the following controls are adequate to implement the applicable water quality standards: (1) technology-based effluent limitations required by the CWA; (2) more stringent effluent limitations required by federal, state, or local authority; and (3) other pollution control requirements required by federal, state, or local authority. *See* 40 C.F.R. § 130.7(b)(1). This list is known as the CWA Section 303(d) list. The state is required to establish Total Maximum Daily Loads (TMDLs) for all waters identified as impaired on the 303(d) list to limit the presence of the pollutant or pollutants that cause the impairment.[2]

[1] 33 U.S.C. § 1313(d)(1)(A).
[2] 33 U.S.C. § 1313(d)(1)(C).

NCDENR is proposing to move six segments of the Neuse River Estuary to Category 1t from Category 4t based on the new assessment methodology and a data set that only considers chlorophyll-a data from 2008-2012. Federal regulations require that North Carolina "assemble and evaluate all existing and readily available water quality-related data and information" to develop the 303(d) list.[3] Based on the fact sheet supporting this action, NCDENR inappropriately limited its analysis to evaluation of chlorophyll-a data to a five year period (2008-2012), and did not included the most recent data from 2013. Further, it is not possible to determine from the publicly available information whether NCDENR considered all available data from this limited time period. Federal regulations require consideration of all existing and available data and data may not be excluded solely based on data age.[4] This is especially important for the Neuse River Estuary as researchers have concluded that, because of the changing conditions in the estuary over time, "[a]ccurate assessment of TMDL management action effectiveness requires a comprehensive analysis over several years to a decade or more."[5] Additionally, existing data demonstrates that chlorophyll-a levels in the Neuse River Estuary have actually increased in recent years, and total observations for chlorophyll-a in the Neuse River Estuary exceed the criteria, even when the new assessment methodology is applied.[6] Segmenting the Neuse River Estuary may be appropriate for some purposes, however, because NCDENR must consider all existing and available data in making its listing decisions, it should not use segmenting to conclude that a waterbody is not impaired when other reliable, representative data clearly conclude that the Neuse is impaired by excess nutrients.

Under EPA requirements for Integrated Reports, Category 1 is supposed to represent that the designated use and all water quality standards (narrative, numeric and antidegradation) are met for that segment based on all existing and available data and information.[7] According to 2004 EPA Listing Guidance, "[w]aters belong in Category 1 if they are attaining all designated uses and no use is threatened. Segments should be listed in this category if there are data and information that are consistent with the State's methodology and this guidance, and support a determination that all WQSs are

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[3] 40 C.F.R. § 130.7(b)(5).

[4] See *Sierra Club, Inc. v. Leavitt,* 488 F.3d 904,913-14 (11th Cir. 2007) (state cannot avoid obligation to assemble and evaluate all existing and readily available data through state law limiting age of data that can be considered).

[5] Lebo et al. 2012; *Environ mental Management* (2012) 49:253–266.

[6] See e.g.; Burkholder, J., R. Reed, C. Kinder, J. James, L. Mackenzie, and E. Allen (2014) Long-term data show continued water quality degradation in the Neuse Estuary, and inadequate production by the total nitrogen TMDL. UNC WRRI, Raleigh, NC.

[7] U.S. EPA, Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act; TMDL-01-03.

attained and no designated use is threatened."[8] In making an evaluation of which Category applies to a segment or waterbody, NCDENR is required evaluate all narrative, numeric, uses and antidegradation requirements.[9] For nutrients, EPA guidance articulates specific types of data and information that should be evaluated when conducting an assessment.[10] The types of data that must be evaluated go far beyond comparing a segment of recent data to a single numeric criterion - all information and data must be considered.[11]

Contrary to this approach, NCDENR places waterbodies in Category 1t as long as a single "[p]arameter assessed was meeting criteria and there is an approved TMDL in place for the assessed parameter."[12] The result of this approach is that these six Neuse River segments have been placed in Category 1t solely on the basis of a time-limited evaluation of one parameter, chlorophyll-a data. This inaccurately and inappropriately leads to the conclusion that the Neuse River TMDL has been successful in achieving its goals and that these segments are no longer impaired by nutrients. This conclusion is contrary to all publically available information. The Neuse River Estuary should only be placed in Category 1 if an evaluation of all narrative, numeric, uses and antidegradation requirements based on all existing and available data and information demonstrates that the designated use and all water quality standards are being achieved. Additionally, where a TMDL is in place as in the Neuse River Estuary, the evaluation should consider whether nitrogen load reductions required under the TMDL have been achieved. All available information demonstrates that the nitrogen loading reductions required by the Neuse River TMDL have not been achieved and the estuary remains impaired.

The Neuse River Estuary was originally listed on North Carolina's 303(d) List in 1994, a 30% nitrogen loading reduction goal was adopted by the Legislature in 1996, and EPA approved a TMDL requiring those reductions in 2002.[13] Substantial information, monitoring data and published research demonstrate that the Neuse River Estuary remains impaired by excessive nutrients and that the TMDL requirements of the

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[8] Id.
[9] 40 CFR 130.7(b)(3); U.S. EPA,Information Concerning 2012 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions.
[10] U.S. EPA, Information Concerning 2014 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions.
[11] Id.
[12] NCDENR, Draft NC Statewide Water Quality Assessment (2014) http://portal.ncdenr.org/c/document_library/get_file?uuid=570da5ea-ac71-4b5f-963c-086a725c0f2f&groupId=38364
[13] NCDENR, *North Carolina Nonpoint Source Program*, 2012 Annual Progress Report (Sept. 2012).

reduction of nitrogen loading have not been achieved some 12 years later. In fact, nitrogen loading has remained constant or even increased since the adoption of the TMDL. For example, in 2012 NCDENR reported that:

> The Neuse River Basin Nutrient Management Strategy has been fully implemented since 2003. While there have been a number of implementation successes the goal of a 30% reduction in nitrogen loading to the Neuse Estuary has not yet been achieved . . . staff believe it will likely be a number of years before a definitive assessment of the effect of the reduction strategy on the estuary can be made. Since the in stream loading data to date do not show distinct improvement, and given the estuary's continued impairment, DWQ has begun to evaluate the limitations of the current strategy and identify additional research needs that may reveal additional opportunities for improvement . . . Given the estuary's continued impairment, this information will help inform DWQ of the limitations of the current strategy and identify opportunities to improve it.[14]

Additionally, North Carolina State University Center for Applied Aquatic Ecology is preparing to present the results of it monitoring of the Neuse River Estuary at the Water Resources Research Institute's Annual Conference scheduled to begin on March 19, 2014. Researchers will report on the condition of the Neuse River Estuary and the TMDL as follows:

> A total maximum daily load (TMDL) developed for the Neuse Estuary in 1998-2002 targeted a 30% reduction in annual total nitrogen (TN) loads to the Neuse Estuary, toward the goal of decreasing noxious algal blooms. The public was informed that the 30% reduction target had been achieved within the five-year period. However, weather patterns of high volume tropical storms in 1998-1999 followed by a 100-year record drought over the remaining three years had strongly influenced that apparent outcome. The NCSU CAAE has tracked water quality conditions in the mesohaline Neuse Estuary for 20 years, including biweekly to monthly data for April-October and monthly data for November-March. In-progress analysis of this long-term dataset has revealed that since the TN TMDL was imposed, **there has been no further progress in controlling**

[14] NCDENR, *North Carolina Nonpoint Source Program*, 2012 Annual Progress Report, p. 100 (Sept. 2012).

> **TN; algal biomass as chlorophyll *a* has significantly increased; high pollutant concentrations have been measured especially in recent years; violations of the fecal enterococci bacteria standard have been common; and hypoxia has significantly worsened in the lower water column**. **Massive fish kills have continued to occur as well.** Coupled land use/water quality analyses thus far indicate that urbanization and industrialized swine production are the major sources of water quality degradation in the upper and lower Neuse basin, respectively. **These findings demonstrate the importance of long-term data for evaluating water quality changes in response to management actions.** The analysis also indicates that a redesigned, strengthened TMDL is needed to protect water quality and beneficial aquatic life in this major North Carolina estuary.[15]

Further, published research by Martin Lebo of the Weyerhauser Company and Hans Paerl and Benjamin L. Peierls of the University of North Carolina – Chapel Hill Institute of Marine Sciences reported that there was some progress made on reducing NO3-N inputs but not for TKN, and concludes, among other things, that "it appears that elevated total nitrogen loading, largely as organic nitrogen, resulted in higher nitrogen availability during 2000–2009 and higher annual average chlorophyll a values" and that "[t]he general pattern of constant or increased TKN concentration at all watershed locations evaluated, particularly under high flows, indicates actions to date may not have collectively addressed Org-N inputs."[16]

It is inappropriate to move any Neuse River Estuary segments into Category 1 because this category represents, at least impliedly, a finding that the TMDL has been successful. Even if it were appropriate for NCDENR to conclude that segments of the Neuse River Estuary belong in Category 1t based solely on this analysis of the time-limited chlorophyll-a data, all of the segments of the Neuse River Estuary must be listed in either Category 4t or Category 5 because substantial, long-term evaluations of the estuary demonstrate that the uses are impaired by excess nutrients; water quality is continuing to degrade based on nitrogen loading increases, fish kill data, chlorophyll-a data, and dissolved oxygen; and the nitrogen loading reductions limits required by the TMDL have not been achieved. This information is existing and available, and must be utilized by NCDENR to continue listing the Neuse River Estuary as an impaired

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[15] Burkholder, J., R. Reed, C. Kinder, J. James, L. Mackenzie, and E. Allen (2014) Long-term data show continued water quality degradation in the Neuse Estuary, and inadequate production by the total nitrogen TMDL. UNC WRRI, Raleigh, NC [Emphasis added].

[16] Lebo et al. 2012; *Environ mental Management* (2012) 49:253–266.

waterbody. The water quality concerns intended to be addressed by 2003 persist to this day, and, in fact, are worsening despite implementation of the TMDL and associated management strategies.

Where, as in the Neuse River Estuary, the TMDL requires compliance with nutrient loading reductions that have not been achieved and the estuary remains impaired, all segments of the Neuse River Estuary should remain in Category 4t or, since the load reductions have not been achieved for so long, the segments should be placed in Category 5 so that changes necessary to achieve the TMDL required can be made. The need to make such changes has been noted by many sources, including NCDENR. For segments that are not meeting TMDL nitrogen load reductions after a long period of time, the segments should be moved back to Category 5 and changes to the TMDL should be implemented.

Thank you for the opportunity to comment on the Draft 2014 303(d) List. If you have any questions about these comments, please contact Jim Kellenberger, Neuse River Foundation President at (919) 621-0362.

Sincerely,

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Haw River Assembly
Defending the river since 1982.
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March 14, 2014

Mr. Andy Painter
N.C. Department of Environment and Natural Resources
Division of Water Resources, Planning Section
1617 Mail Service Center
Raleigh, NC 27699-1167

The Haw River Assembly, a non-profit organization working to protect the waters of the Haw River and Jordan Lake since 1982, offers the following comments on the North Carolina Draft 2014 §303(d) List.

Comments on specific Haw River watershed listings:

1. A large number of sections of the Haw River (main stem) have been removed from category 5 listings because of "change in assessment methods". This includes 16-(6.5), 16-(10.5)a, 16-(1)c2, 16-(10). These had been listed for turbidity, plus 16-(1)c1 for copper.
Only one 7 mile section of the Haw is now listed on the 2014 draft (for Benthos Fair), 16-(1)a.
If the de-listings are a result of the new methodology using the 90% confidence requirement, this seems like a bad outcome.

2. Similar results are seen for Jordan Lake with many sections that had parameters such as pH, turbidity and chl-a numeric standards now removed due to "change in assessment methods", including the Morgan Creek arm and the New Hope Arm. The above average rainfalls and less sediment pollution from development construction in recent years may have improved pH and turbidity in those shallow parts of the lake, but this seems like a temporary condition, not a problem solved. Unless there is solid data and a scientific method that shows these parts of the lake truly are improving, the de-listing could add to the continued delay of clean-up rules.

3. We do not understand why Booker Creek is being de-listed for dissolved oxygen, yet stays on the 2014 list for poor Benthos health. Removing a parameter that has a numeric standard is not helpful unless there is certainty it is not the cause of the biological impairment.

4. Parts of Northeast Creek remain on the 2014 draft list for copper and zinc, but not for turbidity, which the Haw River Assembly has observed to be a continuing problem. Turbidity is visible where the creek enters Jordan Lake. These listings changed due to "change in assessment methods".

5. I have questions about South and North Buffalo Creeks and Reedy Fork (which they flow into) in Greensboro, where metals from identified impairments upstream become non-numeric fish community and Benthos impairments downstream, based on "change in assessment methods".

6. The Haw River at Pittsboro's water supply intake (behind the Bynum dam) is taken off of category 5 for turbidity because of "meeting criteria". The water looks like milk chocolate today coming over the dam in exactly that spot. To move it from a 5 to a 1 seems unlikely from what we witness on a regular basis.

7. The Haw River where Service Creek comes in (Burlington) 16(10.5)d is being moved from a 4t to 1t for Fecal Coliform due to "meeting criteria" . It might be a 5 if there was monitoring during the time periods where 211,988 of raw sewage spilled in to Service Creek in 2013 or the 50,400 spill in January 2014 .

Comments on new methodology:
We believe that NC's new listing methodology will lead to an increase in impaired waters being de-listed and not getting additional protection, for the following reasons.

1. The EMC greatly increased their role in the process, relying much less on science from DENR staff.
2. EPA has consistently warned against using the 10% rule (allowing an exceedance of the water quality standard violation by 10%) to assess attainment of numeric water quality standards for toxic substances.
3.Use of the binomial distribution and the 90% confidence requirement puts burden of proof on those harmed by pollution, not the polluters
4. A large number of waters are being de-listed and the State has not shown "good cause" for removing these waters. EPA has said that waters should generally remain in Category 5 until a TMDL is established unless there is reason to believe that conditions that led to the initial listing have changed. The 2014 list does not show "good cause".
5. 130 waters have been removed due to a change in the assessment methodology. These waters had been on the 303(d) list for impairments such as heavy metals, turbidity, chlorophyll *a*, fecal coliform, inadequate adequate amounts of dissolved oxygen, and pH imbalances. There needs to be much better evidence that these waters should no longer be listed.

In summary we believe that the current draft is insufficient for protecting our waters. EPA should not approve the 2014 NC 303(d) list and accept the delisting using the current NC methodology.

Elaine Chiosso
Haw Riverkeeper

CC:
Andrea Zimmer, EPA Region 4
Marion Hopkins, EPA Region 4

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March 14, 2014

Mr. Andy Painter
N.C. Department of Environment and Natural Resources
Division of Water Resources, Planning Section
1617 Mail Service Center
Raleigh, NC 27699-1167

Re: North Carolina Draft 2014 §303(d) List

Dear Mr. Painter:

Thank you for the opportunity to comment on North Carolina's draft 2014 303(d) list. The Catawba Riverkeeper Foundation (CRF) is a 501(c)(3) nonprofit and is the only organization completely dedicated to education and advocacy for the protection of the Catawba River, its lakes and its waterways for everyone who depends on and uses them. We were founded in 1997 and currently have more than 700 members throughout the basin.

CRF works with many other organizations, including the Southern Environmental Law Center (SELC), and we concur with their comments on this issue, including on the new methodology utilized for the 2014 list. We have many concerns with regard to the methodology used to classify impaired waters for the list of waterways in the Catawba River basin. Of particular concern is the lack of scientific data used to justify the removal of many waterways from the 303(d) list of 2012.

The draft 2014 list has removed multiple Catawba River basin waterways that were deemed impaired and in need of Total Maximum Daily Loadings (TMDLs) for various contaminants. Those waterway segments and reason(s) for impairment in 2012 are listed here:

- 11-119-(0.5) Dutchmans Creek from source to a point .8 miles downstream of Taylors Creek
    - Turbidity

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www.catawbariverkeeper.org

- 11-113-(2) Johnson Creek, from a point .6 miles upstream of mouth to Mountain Island Lake, Catawba River.
    - Turbidity

- 11-119-3-(2) Stanley Creek from a point 1.0 miles upstream of Gaston County SR 1918 to Dutchmans Creek
    - Dissolved oxygen

- 11-129-5-(9.5) Clark Creek from a point .9 miles upstream of Walker Creek to South Fork Catawba River.
    - Turbidity
    - Copper
- 11-129-16-(4) Long Creek from Mountain Creek to South Fork Catawba River.
    - Turbidity

- 11-129-(10.5) South Fork Catawba River from Town of High Shoals water supply intake to a point .6 miles upstream of N.C. Hwy. 275
    - Turbidity

- 11-129-(14.5) South Fork Catawba River from a point .6 miles upstream of N.C. Hwy. 275 to a point .4 miles upstream of Long Creek (Towns of Dallas, Gastonia & Ranlo water supply intakes),
    - Turbidity

- 11-129-(15.5) South Fork Catawba River from a point .4 miles upstream of Long Creek to Cramerton Dam and Lake Wylie at Upper Armstrong Bridge.
    - Turbidity

- 11-129-(10.5), South Fork Catawba River from Town of High Shoals water supply intake to a point .6 miles upstream of N.C. Hwy. 275
    - Turbidity

- 11-129-(14.5) South Fork Catawba River from a point .6 miles upstream of N.C. Hwy 275 to a point .4 miles upstream of Long Creek (Towns of Dallas, Gastonia & Ranlo water supply intakes).
    - Turbidity

- 11-135-10-1 South Crowders Creek from source to South Fork Crowders Creek
    - Dissolved oxygen

- 11-137-1 Irwin Creek from source to Sugar Creek.
    - Lead

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- Zinc

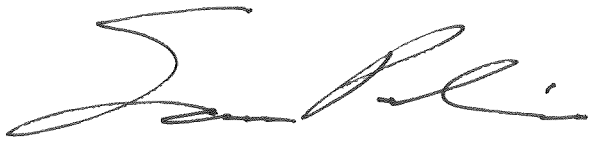
- 11-138 Twelvemile Creek from source to North Carolina-South Carolina State Line
  - Copper

These sites and their sources of impairment seem to have been removed from the 303(d) list with absolutely no justification or reason. I have reviewed the locations (notably within EPA's STORET) where NC DENR has said data are available. Yet, there have not been any new sampling data at all, nonetheless to suggest that these waterways are no longer impaired.

Previous sampling identified these waterways as impaired and in need of a TMDL. If for no other reason, citizens of North Carolina can intuitively tell you that these waterways (as well as many others) are impaired and cannot begin to be rehabilitated without the development of TMDLs. NC DENR has taken a blissfully ignorant approach to waterway impairment that will inhibit its ability to truly clean up our waterways. Impaired waterways are detrimental to local economies, home values, recreation, the environment and the water that ultimately becomes drinking water for millions of people downstream. Many of the sites had been listed for turbidity, the sediment of which is the most pervasive pollutant in our waterways. Sediment buries plant life and inhibits photosynthesis, but it also leaves waterways much shallower, which presents multiple recreational safety issues, especially when turbidity visually inhibits dangers under the water surface.

Without even collecting data, NC DENR cannot purport to be diligently protecting the waterways of the State and the people and environment that depend on them. Individual counties have their own monitoring and testing programs through certified labs, and I hope the state will look to expand its database by actively seeking data from counties. We implore NC DENR to not remove any waterways from the 2012 303(d) list unless there is both scientific data and sound methodology to do so. We appreciate the opportunity to submit these comments.

Sincerely,



Sam Perkins, Catawba RIVERKEEPER®