State of North Carolina
Department of Environment
and Natural Resources
Division of Water Quality

James B. Hunt, Jr., Governor
Bill Holman, Secretary

Kerr T. Stevens, Director

NC DENR
1999

Mr. Robert E. Cantilli
EPA Nutrient Program Coordinator
Health and Ecological Criteria Division
Mail Code 4304
USEPA Headquarters
401 M Street, S.W.
Washington, DC 20460\

Original Letter was Signed
November 22, 1999

Re: Comments on Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs

Dear Mr. Cantilli,

We appreciate EPA's willingness to respond to the Clean Water Action Plan's aggressive stance on developing nutrient criteria. We support the need for nutrient management and we also recognize that the challenge put to EPA is formidable. North Carolina has been recognized as a national leader in nutrient management for years. We recognize that we need to do even more. Thus, we have very carefully reviewed this document. We believe that the document needs substantial additional work.

We believe that the fundamental approach of using ecoregion based reference conditions is not supported in this document. The document fails to demonstrate an association, cause and effect relationship, or correlation between the ecoregion approach and use support. This demonstration is vital to the defensibility of ecoregion based nutrient criteria. The basis for regulatory control of nutrient over-enrichment must rely on biological responses to nutrient delivery as well as environmental effects. The thrust of the current document is a comparative approach to reference conditions rather then environmental effects. More detailed comments are attached for the benefit of the authors and the public.

In addition to developing this criteria document, EPA should recognize and support additional efforts aimed at eutrophication management. Our challenge in protecting the state's waters from over-enrichment is more frequently associated with limited resources to develop site specific models and evaluations, the lack of comprehensive and effective volunteer management strategies, the lack of broad based public support for mandatory nutrient management initiatives, and local concerns over zoning and land use management governance.

Sincerely,

Coleen H. Sullins, Chief
Water Quality Section

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Attachment: Comments on Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs

Cc w/ attachment

George R. Gibson (EPA)	Jim Harrison (EPA R-IV)
Robert Carlson (KSU)	Mike McGee (EPA R-IV)
Water Environment Federation	ASIWPCA
NC League of Municipalities	AMSA

North Carolina Division of Water Quality
Water Quality Section
Comments on Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs
Draft Version 8/2/99

Use Support

We believe that the fundamental approach (ecoregion based reference condition) that EPA has chosen is not supported within the document. EPA has not demonstrated an association, cause and effect relationship, or correlation between the ecoregion approach and use support. EPA also has not associated the development of nutrient criteria with effects on the health and welfare of biological resources, esthetics, recreation, and other use support issues. Arbitrarily chosen percentages of nutrient concentrations based on reference conditions may be a proactive basis for protecting our nation's waters but there is no demonstrated link to use impairment at the levels associated with ecoregion based criteria. Because the document does not provide any reasonable criteria associated with use support, we believe that additional work should be completed demonstrating these links and that at least one additional draft of the document will be required.

Given the complex ecosystem interactions, it is recommended that EPA redirect their effort away from ecoregion statistics (ignoring chemical speciation, bioavailabiltiy, and hydraulics) to measures of biological response criteria which can be related to use support. This concept is supported by the evaluation of "effects" as specified in the CWA on developing criteria documents. Without this demonstration we do not believe the necessary resources will be made available to meet the intent of the Clean Water Action Plan or the Clean Water Act

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Guidance or Technical Criteria

There is a general mixed-message provided throughout the document. One message is that this is a guidance document that "can be used" suggesting that the information is optional for states to consider. Then in other areas there are statements that suggest certain approaches "must be done". If this document is guidance, there is no need in the veiled threat of promulgation of standards based on the 25^{th} - 75^{th} percentile reference condition as the default condition. Our opinion is that the document is intended to form the basis of regulatory measures that may be adopted by EPA to insure compliance with designated use support. Yet, the strategy fails to demonstrate that the suggested nutrient criteria levels (ecoregion levels) are associated with levels of use support. The document must propose a mechanism for establishing site-specific criteria based on use support rather than chemical concentrations based on a distribution statistic.

Natural Lakes Vs Reservoirs

Natural lakes and reservoirs should not be lumped within the general context of this document. The document must recognize the differentiation between lakes and reservoirs with more vigor. The ecoregion approach is not justifiable for artificial reservoirs. In many cases reservoirs are constructed by need in areas that have already been impacted by development. For reservoirs, North Carolina supports the use of biological response criteria and site-specific management strategies rather than a range of phosphorus concentration values. We do not believe that it is appropriate to establish NPDES permit limits based on an applicant's interpretation of EPA regional concentration ranges for nitrogen and phosphorus. We continue to be of the opinion that protecting designated uses is best evaluated by examining the biological response of a system rather than a phosphorus concentration founded in the reference condition.

Implementation

We recognize that previous drafts have been changed to include some more details on implementation and expectations on the part of States. This change was based on comments from the State of Washington. However, Washington's comments simply highlighted the importance of implementation issues. We do not believe implementation guidance belongs in the technical criteria document given the ambiguous nature of the technical guidance and the uncertainty of individual state strategies. We do believe that implementation issues have to be considered when developing criteria as we have pointed out regarding the differences between natural lakes and reservoirs. EPA, and the States will be challenged with incorporating criteria, standards, effluent guidelines, permits, monitoring TMDL's, near field and far field issues.

This document should not be used as a vehicle for mandating implementation strategies on how states should use the criteria in adopting standards. It will be difficult enough to accomplish the task of developing scientifically based criteria related to use support - implementation issues do not need to be included within this document. Page two of the Executive Summary indicates an example of this implementation guidance issue.

> "The States are allowed flexibility in their approaches so long as their initiatives are scientifically defensible, and a threshold for positive action is imposed through the ecoregional criteria which EPA can promulgate if no State or Tribal action is taken".

If included, we suggest the following alternative language based on the consideration that ecoregion approaches may not be applicable to use support especially in artificial reservoirs that were not designed to mimic natural systems:
"The States are allowed flexibility in their approaches so long as their initiatives are scientifically defensible, and a threshold for positive action is imposed."

Default Criteria

The current draft promotes a "default criteria" based on the use of numerical nitrogen and phosphorus concentrations (causative criteria) rather than a focus on actual biological response or use support. Using the same conceptual approach, one might suggest setting a BOD5 criteria as opposed to protecting for dissolved oxygen. This approach may lead to vast expenditures of public funds for management of nutrients in areas that are not likely to experience use impairment due to short hydraulic detention times or other site specific factors. It is further anticipated that the range of phosphorus values that will be adopted may actually provide for degradation of existing conditions. States and RTAG's will likely include higher values on the upper end of the scale that will become, in actuality, the definitive measure of criteria compliance.

The document is "all over the place" with default criteria. The Executive Summary, paragraph two, suggests that both biological responses and nitrogen and phosphorus concentration variables are deemed necessary. Yet, on page 99, section E, the document clearly states that "failure to meet either of the causal criteria (N & P) should be sufficient to require remediation. The document also states that if the causal criteria are met and the response criteria (chlorophyll and Secchi) are not met then there should be some kind of decision protocol equating all of the criteria.

We completely disagree with this approach for use in reservoir management. Biological response criteria should have precedence over the use of causal concentration criteria. In no circumstances should there be a protocol rule equating the causal criteria and the biological response criteria. These individual criteria are not equal in evaluating use-support and they are not independent variables.

We are also opposed to the use of an enrichment index for establishing nutrient standards. Scientifically, the purpose of an enrichment index is to evaluate dependent and independent variables for a relative comparison of information between different water bodies. It is our opinion that the use of an enrichment index weighted on nutrient concentrations rather than biological response is not an appropriate mechanism for establishing standards for use-impairment. We further believe that an index balancing biological response variables with nutrient concentration variables is also inappropriate for establishing use support criteria for reservoir systems. We will continue to promote the use of biological response variables for establishing use support enrichment criteria in reservoirs. Where

nuisance conditions exist, or where we can reasonably anticipate impacts to use support, actions to ratchet down nutrient loads to levels that will support uses should be considered.

RTAG's

The document provides a great deal of information that may be valuable to the EPA regions and to the states for their consideration. There does indeed seem to be "something for everyone". Yet the document fails to provide specific guidance – instead defaulting to the RTAG's. The RTAG's have been given the responsibility for developing default regional criteria ranges. The RTAG's are a good idea for the purposes of a regional peer-review team, however, the document suggests that the RTAG's will be the governing Board who will determine whether or not criteria are acceptable to EPA. This delegation of EPA authority is not a good idea. While the RTAG's may make recommendations, the authority for EPA approval should reside with the appropriate official rather than a peer group.

Good Examples or Bad Examples

The guidance manual concludes with examples describing data models, case histories, and even a very brief summary of North Carolina's standards and management options. Yet, the manual does not indicate whether or not EPA will approve these examples as meeting the intent of the current mandate for adopting nutrient criteria. Our current opinion is that the State of North Carolina has already adopted suitable water quality standards including a numeric chlorophyll standard, pH, dissolved oxygen, Nutrient Sensitive Waters, and Outstanding Resource Waters classifications, Water Supply Protection standards, and other narrative language capable of supporting nutrient management efforts.

Executive Summary

The Executive Summary is an incredibly important part of the document. We suggest that a few additional issues be covered in this summary.

In developing nutrient criteria EPA should be very mindful that the best strategy is the development of site specific management plans.

EPA's proposed strategy using "a minimally impacted by human developmental activities" approach is an option for states to consider for natural lakes but it must be tied to use support.

EPA should clearly state, within the executive summary, that reservoirs must be evaluated differently than natural lakes. Reservoir criteria must promote development of site specific criteria and/or the use of biological response criteria.

There is no mention in the Executive Summary, or in any significant portion of the document, that there is a need for additional financial support in order to develop or implement use support criteria and standards. There is also no mention as to the potential costs of infrastructure in order to meet any new criteria or standards. While these issues may not be appropriate to include in the technical guidance manual, implementation issues must be considered before standards are adopted by states. A brief discussion of the implementation complexities should be a caveat within this document.

The executive summary suggests that consideration to coastal areas be included. It is our opinion that the executive summary discussion should be rewritten to be consistent with the discussion on page 84, that downstream effects are to be considered immediately below the lake or reservoir. Downstream effects in this context do not refer to areas substantially downstream within the basin or within the estuarine receiving waters.

Specific Comments

Throughout the document the term "The Agency" should be replaced. This is a term that is frequently used by EPA employees as a colloquialism for "EPA". It is suggested that a generic replacement be used throughout the document. When the document wishes to refer to EPA it should say "EPA" not "The Agency". Use of the term "The Agency" does not promote the acceptance of a consensus built document.

NALMS should be explicitly mentioned as a resource for information.

Page 1, ¶ 1, Suggest using 1998 305(b) information rather than the 1996 report. Suggest adding language that will include the recommendation to separate natural lakes from reservoirs in construction of criteria.

Page 1, ¶ 3, As defined in this paragraph over-enrichment means the addition of nutrients that causes adverse effects or impairment to designated uses. We concur with this definition. However, elsewhere in the document there is a decision to recommend remedial action based solely on a concentration of a nutrient even if there is no exceedance of a response variable (i.e. there is no use impairment or adverse effect). We do not support this position.

Page 2, ¶ 3, Sentence 2. Suggest adding the word quantitative prior to values. Narrative criteria if well constructed can adequately describe a value judgement situation. And we support the use of narrative criteria. Along this same context, we support the notion that it is possible to have effective management strategies without numeric criteria. There may be many situations where a regional numeric criteria is not scientifically defensible for a particularly waterbody.

Page 3, ¶ 1, These issues are so very important that they are recommended for inclusion in the executive summary. 1. Above all do no harm. 2. Management, and application of the criteria, must be economically feasible. 3. Must be scientifically defensible.

Page 3, *Regulatory Assessments* It is in this arena that we encourage EPA to re-consider their approach to the utilization of a nutrient concentration trigger for remedial or enforcement action. It is our belief that we will spend an inappropriate amount of time and resources prosecuting and defending concentration limits without a predicted or actual unacceptable level of biological response (i.e. chlorophyll).

Page 4, ¶ 4, Line 2, change States and the Agency to States and the EPA

Page 4, *The Strategy for Reducing Cultural Eutrophication.* EPA should include a differentiation between natural lakes and reservoirs in this paragraph as an example of establishing nutrient criteria appropriate to each water body type.

Page 5, ¶ 2, *To help achieve this, the Agency*...It is suggested to change *Agency* to the EPA. This comment is suggested for consideration throughout the entire document. Therefore it will not be mentioned again in this review. We appreciate EPA setting up the RTAG's. They can effectively serve as peer review groups. However, we anticipate that they will be placed in the situation of having to work with EPA default criteria that was developed on an ecoregional basis. Thus, it is likely, the RTAG will spend a good bit of time evaluating reasons as to why the nationally developed ecoregion criteria do not fit their particular regional concerns. The RTAG's may be more efficiently used to initiate their own criteria, without the shadow of nationally derived ecoregion criteria looming over. However the RTAG's must be appropriately funded and staffed to scientifically develop

this information. Currently this is not the case in Region IV.

Page 6, ¶ 4, The RTAG in Region IV has not met monthly or quarterly. We are concerned with EPA future mandates for implementation of this strategy. We currently believe that NC has water quality standards to address the nutrient criteria concerns.

Page 7 *Physical Classification*. Any classification scheme should begin by separating reservoirs from natural lakes. If the identification of nutrient over-enrichment is the objective of nutrient criteria development then a measure of biological response should be the tool not a concentration of a particular nutrient. If trophic classification should be avoided then it should not be used as an index for decision making as suggested on page 99 of the document. Finally, we find within this section the suggestion that lakes and reservoirs should be separated and identified as different classes. This suggestion is far too important to be presented with such obscurity. This notion needs to be woven throughout the entire document. We support the thrust of the ecoregional approach as applied to natural lakes.

Page 10, We support the use of response variables in conjunction with narrative criteria. We do not agree with the use of causal concentration criteria alone as a trigger for remedial action. Remedial action is far too expensive and intrusive without site specific predictive modeling or definitive evidence of biological impacts. While the document indicates *...To use only causal or only response variables in the criteria leaves the State or Tribe in jeopardy of not protecting the waters from over-enrichment.* The document also states that *...failure to meet either of the causal criteria should be sufficient to require remediation and usually the biological response, as measured by chlorophyll and Secchi depth, will follow the nutrient trend.* We do not concur with this statement particularly in the case of non-algal turbidity, short retention times, or where other growth limiting factors are important.

Page 11, (c) *Nutrient Criteria Components*. We do not support the notion of a reference condition as being the best quality remaining as applied to artificially constructed reservoirs. Nor do we support the notion of selecting a percentile for use in establishing a cut-off concentration for causal parameters. We do support a biological response criterion that has been approved through the public participation and regulatory requirement process.

Page 13 The document presents an ideal situation where causal concentration factors yield in unacceptable biological responses. While we support a clear weight of evidence approach, using multiple parameters we do not support the notion suggested here on this page of independent applicability. That is to say we do not agree with the following notion as presented on page 13, 99 and other locations. Failure to meet either of the causal criteria should be sufficient to require remediation. However if the causal criteria are met but some response criteria are not met then a decision rule or index should be developed. There are many examples of situations where the biological response has altered the ability to properly evaluate nutrient concentration criteria. We thus support the weight of evidence approach in establishing remedial action plans, BMP's, and NPDES permits.

Chapter Two Chapter Two is quite lengthy and should be reduced as it detracts from the presentation of criteria development. Providing references to the EPA-LRGM, or other lymnological references would be sufficient. However, it is alternatively suggested to focus on the difference between natural lakes and man-made reservoirs because the basic principles presented within Chapter Two do not necessarily hold true for reservoirs.

Page 17, final ¶. Suggest changes in the first sentence. From: *The causal variables such as phosphorus*

and nitrogen are essential criteria because they will be the limits necessary to establish management objectives and are usually directly related to discharge runoff abatement efforts. To the following language: *The causal variables such as phosphorus and nitrogen are important concerns, however, the hydrology and the biological response criteria (chlorophyll, phytoplankton, fish kills etc.) are essential criteria because they will be the limits most directly related to potential use impairment.*

Page 21, Biomanipulation is a management strategy that can successfully alleviate the biological response of nutrient over-enrichment without a change in nutrient load. This statement provides additional support for establishing biological response variables as the primary criteria.

Page 27,29,30,31 Table 2.2, Figure 2.4, and Carlson 1977, Because lakes with the same concentration of nutrients demonstrate differing responses in their plant biomass, it would appear obvious that the Science clearly demonstrates the preference of using a biological response indicator over a more convenient and politically expedient default nutrient concentration criteria. Naumann's and Carlson's idea of classification (and therefore evaluation) of trophic conditions based on biomass should be upheld by the EPA as a preferred, or at least an alternative to ecoregion based nutrient concentration criteria.

Page 34 For the purpose of this document, lakes and reservoirs should be defined separately. There is far too much science available to unnecessarily lump these different systems into the same definition. It is further suggest that old language in Draft version 7 June 1999 be used which indicates that waterbodies with residence times less than 14 days could use river nutrient criteria.

Page 36 thru 39 These pages present significant reasons why reservoirs should not be treated as lakes in setting nutrient criteria. Throughout these pages it is scientifically presented that reservoirs do not necessarily respond to nutrient concentrations as a natural lake (ecoregion concept) may indicate. Yet, for no obvious reasons, EPA seems to be continuing to propose the ecoregion nutrient concentration criteria approach. It would be far more appropriate for EPA to differ to response criteria in this situation. We believe that the case study presented at the bottom of page 41 from Minnesota was conducted on natural lakes and that reservoirs were excluded from this study. Why then is this example presented with the discussion on reservoir systems?

Page 61, 62 The discussion presented in Chapter 4 on sampling, data evaluation and other concerns is interesting and informative for the typical user of water quality criteria. Interestingly, and once again, there are mixed messages to be found within this chapter. For example the discussion on chlorophyll suggest that it is a preferred variable because there are lakes where TP is not the sole or primary limiter of algal production or biomass. Within this chapter there are several examples of states and EPA that have used this variable for criteria. Yet, it is unclear from the overall impressions of this guidance document if chlorophyll or other biological response criteria alone will be acceptable to EPA programs.

Page 84, ¶ 4 Section B on this page indicates *Downstream receiving waters are considered to be those immediately below the lake or reservoir or within a few miles of it.* Yet, in other portions of the document, downstream waters can be considered "all the way to the estuary". In providing guidance as to what areas shall be protected with this criteria EPA should strive for better clarity.

Page 84, ¶ 5 This paragraph suggest that the regional RTAG's will operate as surrogate approvers of EPA's approval of state water quality standards. EPA should re-consider the implications

of this paragraph.

Page 87 — We believe that this Minnesota case study did not include reservoirs. This should be explicitly reported within the text as a natural lakes evaluation and within the "box".

Page 88 Item D — Some states already have over-enrichment standards as discussed within the document. Some of these standards are qualitative and narrative while others are quantitative and parameter specific. Does this paragraph suggest that states will have to submit a site-specific criteria modification request for standards that have already been adopted by the state using appropriate public review and regulatory procedures?

Page 88 Item D1 — We encourage EPA to provide additional information within this document linking values for specific water quality parameters with levels of use impairment. Afterall, the purpose of water quality criteria is to protect designated uses. No where in this document does EPA clearly describe use impairment conditions as measured by the variables being considered for causal factors or response parameters. What corresponding chlorophyll values lead to advisories for swimmers, notices of taste and odor problems, or alterations of biological integrity? At what levels of phosphorus are uses impaired? Trophic classification and relative productivity is not a measure of use impairment.

Page 90 top — "No designated use may be assumed to be in compliance if it fails to meet or exceed the regional criteria." This is a mighty strong statement, not supported in science and likely will not be adhered to. We strongly advise EPA to reconsider this wording. Regardless of the ecoregion based regional nutrient criteria values, if designated uses are being met, then the designated uses are being met and perhaps the criteria were constructed in error. Science frequently makes errors, it is the goal of science to improve on those errors with better science.

Page 99 E — We respectfully disagree as previously presented.

Page 99 E 2 — We respectfully disagree as previously presented. The state of South Carolina is presently being sued for this.

Chapter 8 — This chapter supports the use of management strategies and narrative criteria rather then fixed regional concentration ranges, a position that is contrary to the rest of the document. Although we support these management strategies these issues presented within this chapter seem contrary to the intent of this document. Once again the document is presenting mixed messages. We recommend modifying the rest of the document to remove the mixed messages and support the use of management strategies and narrative criteria.

Page 104 — Calling regional state and federal agency reports grey literature while saving the title of professional literature for journals and peer reviewed proceedings is just a bit too insulting to all of the well qualified and highly respected government scientists. We suggest that alternative adjectives be used. (the word grey also appears to be spelled incorrectly, as the preferred version is gray)

Appendix — Many Case studies, models and other information are presented within the document. Yet no opinion is rendered on the examples. EPA should indicate in the executive summary as to the purpose of this "tacked on" information. Are these case studies examples of what EPA is willing to approve? Or is this information just food for thought? This is a technical guidance document for criteria –the guidance must be clearly defined. The case study on Phosphorus standards in the Everglades raises an interesting query. If states adopt EPA ecoregion based nutrient criteria as a default, will

EPA provide legal assistance and resources as these challenged cases come to the courtroom?