

July, 2002

**Significant Scientific Information Submitted to EPA by the Public on the Estuarine and Coastal Marine Nutrient Technical Guidance Manual and the EPA National Nutrient Criteria Program Responses.**

Comments are compressed and combined by topic where possible for a concise presentation.

This response represents a summary of comments from:

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**1. The manual provides an ambiguous and inadequate level of protection** because it describes the goals of the Clean Water Act as “largely hypothetical”(p 6-2); it discusses reference conditions as “approaching natural conditions” (p 1-10); the reference to “acceptable nutrient loads” (p 9-23) in criteria development as opposed to being based on pristine references or historical observations; and the use of a hypothetical example which accepts a degraded reference condition value of 50um TN as opposed to an historical value of 20um TN (p 7-7).

**EPA Response:**

The intention is not to dismiss the Clean Water Act goal of restoring and protecting the physical, chemical, and biological integrity of our nation’s waters. Rather it is to merely acknowledge that reference conditions are expected to be set to achieve the most natural condition possible, i.e. minimal cultural impact as measured from sites having the least amount of human influence achievable, but acknowledging that pre-Columbian, pristine conditions rarely exist anymore. We strive for reference condition values and criteria representing that level of present, most natural site information *equated* with a knowledge of earlier water quality status and trends. The challenge is to identify the most “pristine” condition possible while recognizing the reality that society has, in fact, influenced these conditions by its very existence. Revisions of the text will more clearly and consistently describe this objective throughout including changing the hypothetical illustration to demonstrate the concept presented on page 6-10, Figure 6-4 where the median between historical and present conditions is the better approach under the circumstances described.

**2. The text suggests that EPA anticipates the development by states of nutrient criteria that are less protective than might be desired. This is indicated particularly by the phrase “once established, nutrient criteria should only be refined in a positive direction in response to improved conditions”.**

**EPA Response:**

The quoted phrase was not intended to promote development of less stringent or less protective criteria, rather it is to ensure that states not sample future degraded sites and inadvertently use these data to establish “impaired” reference conditions. This is a very real concern in light of the reports by many states that their estuarine waters are already so degraded that reference site determination is not possible. Thus, many estuaries will require emphasis on the use of historical information and reference watershed loading estimates to establish nutrient criteria upon which restoration management is expected to be initiated. In this case future, revised reference values should only be used when they reflect improved conditions.

**3. The frequency distribution approach used by EPA is arbitrary and results in inappropriately stringent criteria.**

**EPA Response:**

The frequency distribution approach is not used to establish criteria; rather it is used to determine one of the components of a criterion, the reference condition. This reference condition is one element of a criterion which should be considered along with historical background information, possible model extrapolations of data, and consideration of possible downstream impacts on those waters by a regional panel of experts (Regional Technical Assistance Group or RTAG). These five elements combined in an ecoregional and coastal province classification scheme determine the nutrient criteria for each of at least four variables; total phosphorus, total nitrogen, chlorophyll-a, and clarity (others, such as dissolved oxygen and algal species may also be used).

Further, the scientific community uses frequency distributions as a common basic interpreter of data with the upper and lower quartiles as an admittedly subjective, but traditional approach to viewing the extent of a distribution about a central tendency. It is not mandatory or expected that the reference condition so derived be translated directly into a criterion. The selection of an upper quartile (or lower quartile with mixed water quality samples) is also consistent with the EPA policy to set levels protective of the majority of waters.

The manual presents alternate approaches to use in lieu of frequency distributions to assess reference conditions and determine relationships among causal and response variables.

**4. The potential criteria may be lower than concentrations needed to support a large, healthy fishery.**

**EPA Response:**

The Agency agrees that in some instances, increased ambient enrichment produces a larger fishery than otherwise attainable, i.e. bass production in a warm water lake. But, generally cultural eutrophication has a negative effect. Where enrichment is documented as beneficial by

regional specialists, EPA recommends that nutrient criteria development be developed to promote the removal of that amount of ambient total nitrogen and phosphorus in excess of optimal fish production as determined by consultation of the RTAG with state and federal fisheries biologists and water resource managers.

**5. The criteria established in upstream states, although adequate to protect local waters in those states may not be sufficient to address nutrient impairments in downstream states particularly with respect to estuarine states. Greater emphasis should be placed on understanding these downstream impacts.**

**EPA Response:**

The “downstream effects” element of nutrient criteria development was intended to address this concern among the nutrient program developers. Because lake and reservoir, and stream and river criteria were likely to be developed first due to the more abundant data available, this provision was included particularly to ultimately protect the water quality of those estuarine and coastal waters. The expectation is that there will be a cumulative positive net benefit downstream as state criteria are used to further water protection and restoration and each state develops criteria which include protection of immediate downstream water quality as well. This effect is also expected to be manifested in the coordination of adjacent Regional Technical Assistance Groups to ensure mutual, cumulative downstream water resource protection. Interested estuarine management parties such as the Gulf of Mexico Program, the Chesapeake Bay Program, and any downstream state of concern should establish contact and coordination with upstream RTAGs to achieve the necessary coordination and protection.

Details about such downstream impacts are essential and specifics were not presented in this manual because regional RTAGs are more likely to have the particular geographic and hydrologic information needed to make informed decisions in this regard. Discussion continues over the manifestation of negative downstream (or in coastal waters, down current) effects as being evident in degraded ambient water quality or in impaired designated uses. As more inclusive information is developed, more detailed guidance will be forthcoming.

**6. The nutrient criteria fail to meet the requirements of the Clean Water Act because they are not 304 (a) (1) criteria to support designated uses.**

**EPA Response:**

Ecoregional nutrient and biological criteria are distinct from chemical criteria as originally described in the Clean Water Act. These are not criteria specific to designated use. Rather because they are reference condition-based, they are expected to support the broad array of aquatic life criteria in accordance with the Clean Water Act. These values are intended to be used by the Agency and the States/Tribes as benchmarks for comparison and evaluation when the States/Tribes prepare their own nutrient or biological criteria equated to particular designated uses.

**7. The nutrient criteria should not be reference condition based, rather they should be effects based as indicated by designated uses in Section 304 (a) of the Clean Water Act**

**which requires the protection of aquatic biological communities.**

**EPA Response:**

See EPA response to designated use concerns in number 6 above. The reference condition based approach was selected over an effects based approach because physical conditions of a waterbody may mask or defer the effect of excess nutrients on the biological community. This is particularly evident in cases of high gradient waters in which large amounts of nutrients may be carried past a particular sampling point without evident impact upon the biota, but when that load reaches more quiescent waters downstream the effect can be highly significant. It was to avoid such problems that the reference condition approach and the downstream protection elements were chosen by EPA. A cause and effect approach, when applicable, is useful to site-specific nutrient assessments and may not apply to large geographic areas with various waterbody classes. Cause and effect relationships can be used to develop criteria or to support a reference condition analysis. Cause and effect relationships, if pursued, should be based upon a timely and definitive effect (s). If a cause and effect relationship is not readily evident, the reference condition approach should be used. Where a state can satisfactorily demonstrate no adverse effects upon the receiving waters (and its designated uses), and no adverse effects on water quality downstream due to nutrients, criteria can be established based upon such a cause and effect approach.

**8. Comments on indicator variables, analytical techniques, and sampling designs:** Other variables are already in use or should be considered by states to successfully measure water quality degradation; other analytical techniques can be used to assess the data gathered; groundwater condition should also be included in nutrient assessments; composite sampling is not always a good idea; temporal variability should be included in sampling designs.

**EPA Response:**

The causal and early response variables recommended by EPA of TP, TN, chlorophyll-*a*, for phytoplankton and dry weight or ash free dry weight for macroalgae, and water clarity (e.g., Secchi depth) are key to the nutrient criteria development process and have been endorsed by peer reviewers. In those systems that have hypoxia or anoxia problems, dissolved oxygen should also be added as a primary response variable. Chlorophyll-*a* and other forms of chlorophyll as indicators of enrichment must be distinguished from inorganic suspended material and this point is addressed on pages 4-6 through 4-8 of the manual; more detail on the role of suspended inorganic sediments may be added to future editions (see also number 9 below).

However, the addition of other variable measurements such as macrophytes -including extent of seagrass beds in estuaries, silica, flora and fauna species composition and algal biomass (and dry weight or ash free dry weight for macroalgae), and dissolved oxygen are also identified in the manual. As resource managers incorporate these variables and report on their efficacy, they will be further discussed in the guidance.

The role of groundwater in nutrient loading and cycling to surface waters is evident but varies considerably with season and locale. Therefore, an early decision was made by EPA to leave the

determination of groundwater source extent and measurement methods up to the regional specialists (see also number 13 below).

EPA agrees that composite sampling as a cost effective technique should be employed only after due consideration of the information to be lost by this process (as briefly discussed in the manual). It is appropriate that spatial and temporal trends be determined before making such a decision. Similarly, indexing on a particular season or tide cycle requires consideration of an initially more extensive data base to make that decision. Year round sampling may be particularly important if the nutrient and other data are to be considered for uses supplemental to criteria development such as spill response assessments.

**9. The nutrient criteria as developed by EPA are unnecessary because the states already have criteria for factors affected by eutrophication such as dissolved oxygen, pH, and turbidity, and can use these measures to identify excessive nutrient problems.**

**EPA Response:**

These symptomatic approaches and variables such as dissolved oxygen, pH, and turbidity have been used by states to reveal nutrient problems in their waters, but the root cause of eutrophication as demonstrated by excess primary production is nitrogen and phosphorus. It is necessary to measure the extent of this cause to more effectively address the problem. The manual includes a discussion on the importance, especially for estuaries, of incorporating local hydrodynamics and higher trophic level influences on nutrient susceptibility. The criteria are based directly on these primary causal elements of total nitrogen and phosphorus plus three response variables, algal biomass, and water clarity, and dissolved oxygen which most often indicate the early vegetative response to nutrient enrichment. The other variables cited above are also indicative and can be used by the states as well, especially to better understand water column nutrient dynamics, but the four primary indicators are believed to more often and more reliably reflect enrichment problems and to do so earlier in the eutrophication process. The selection of these primary variables was endorsed by both expert peer reviewers for the initial design of the National Nutrient Criteria Program and by the expert peer reviewers of the technical manuals including this document.

**10. It may not be necessary to limit both nitrogen and phosphorus to attain designated uses on particular waters. Only the reduction of the limiting nutrient is necessary.**

**EPA Response:**

It is generally accepted that in fresh waters, phosphorus is most often the limiting nutrient determining the extent of vegetative growth (although there are nitrogen limited fresh water lakes, reservoirs, rivers and streams), conversely in the lower reaches of estuaries and in coastal marine waters nitrogen is most often the limiting nutrient because of the abundance of phosphorus in those waters. Because the continental waters of most of the U.S. cumulatively drain to the coasts, nitrogen and phosphorus in run off can be expressed in cultural eutrophication problems at a considerable distance from their sources. Nitrogen entering the upper Mississippi River has been traced to the Gulf of Mexico and phosphorus in rapidly flowing streams has been argued to have no ill effects to the stream, but can cause algal booms in the receiving waters of a larger water course or lake or reservoir. Thus, both nutrients are

potential sources of problems in all waters both proximal and distant. A policy of setting criteria for only one or the other in a given region has the potential to displace the responsibility for nutrient abatement from the area of the source to a downstream jurisdiction. This not only places an undue burden on the recipient of this imported material, it increases the costs of abatement because source control is lost as a management option. EPA is, however, willing to consider limiting-nutrient criteria development in localities where it can be conclusively shown that the unrestricted nutrient has no detrimental downstream or down current effects.

**11. The manual lacks clear guidance on how to set nutrient criteria when reference conditions are absent.**

**EPA Response:**

The reported extensive degradation of estuarine systems is the reason this manual describes five options for establishing reference conditions in estuaries summarized in Table 6-1, two of which are variations on the frequency distribution approach described in the freshwater manuals. Coastal marine reference condition determination is described on pages 6-14 and 15 and in detail in Appendix H.

This manual also places greater emphasis on the historical information element of criteria development than the freshwater manuals because the reference condition of estuaries may be degraded, and estuaries, in particular, can seldom be classed where a sample size allows for a frequency distribution. A value between the historical “pristine” condition and the present conditions is a viable criterion for restoration. Two variations on this approach are shown in Figures 6-3 and 6-4 of the manual. The other alternative of watershed areal load estimation could also be used, as well as extrapolating reference condition data from a comparable, higher quality surrogate watershed in the same ecoregion.

All of these multiple options presented embody different approaches to establishing reference condition-based criteria.

**12. The Regional Technical Assistance Group (RTAG) composition should be more inclusive with academics and interest groups engaged in the meetings and public involvement assured.**

**EPA Response:**

This point is addressed in the manual on pages 1-7 through 1-10. The RTAG is an EPA assistance body comprised of specialists in public service agencies, both federal and state. The civil service responsibility of the RTAG can not be abrogated to the private sector, i.e. only federal and state members can make decisions on nutrient criteria and state water quality standards. But provision is made for participation by both university and interest group specialists as well as for open public involvement.

**13. Long-term monitoring should be stressed as part of the criteria development and application process.**

**EPA Response:**

EPA agrees. It is the intention of the Program that reference condition data collection be maintained over an extended time with criteria compliance and reference condition calibration monitoring being a permanent function. The context of this concept and approach to extended monitoring is described in section 8.3 “Comprehensive procedure for nutrient management”.

**14. Trading programs to achieve nutrient water quality criteria should not be included in this manual.**

**EPA Response:**

The discussion was included as an illustration of a management tool for water quality improvements. The intent of this chapter is to show that nutrient criteria have practical application as benchmarks for management decision making from which practical remedies can be devised. This particular subject is better detailed in an implementation document. EPA plans to address implementation issues including this one in individual policy memos such as the 14 November 2001 memorandum from the Director of the Office of Science and Technology and EPA and State Water Quality Directors.

**15. Using year-round values to establish reference conditions creates unduly stringent criteria.**

**EPA Response:**

See above discussion regarding the distinction between reference conditions and criteria. Also, states and tribes are at liberty to index their reference condition values on a given season, usually the spring or summer are selected, and data provided in the ecoregional criteria recommendation documents is presented both by year and by season. States can and are encouraged to select the season most appropriate to their region to minimize nutrient impairments.

**16. Modeling applications to nutrient criteria development...models should not substitute for field sampling and when used should incorporate the benthic flux of nutrients.**

**EPA Response:**

No models should be used in the nutrient criteria development process that have not been validated and calibrated with empirical data appropriate to that waterbody, area and use. Further discussion in that chapter is predicated on this requirement, especially page 9-17ff.

Attention to the benthic flux of nutrients is important to the comprehension of nutrient cycling and management strategy development. It is treated by the program as a groundwater element as described above in number 5. EPA acknowledges the significance of this factor and endorses the inclusion of hydrologists on the RTAGs to address this need.

**17. Assimilative capacity of the receiving waters should be incorporated in nutrient criteria development.**

**EPA Response:**

EPA nutrient criteria have value in their own right for management decision making, but they are

also intended to support development of EPA standards and the maximum daily loads (TMDLs). Assimilative capacity is an aspect of the TMDL process and, in that program assimilative capacity may be used in conjunction with ecoregional nutrient criteria to set appropriate TMDLs for water quality protection. However, nutrient criteria are a separately derived tool of ambient water quality measurement as opposed to load allocation which is appropriate to the TMDL process. As stated in EPA guidance (both manuals and memoranda), States may develop nutrient loads rather than concentrations that are protective of designated uses. In addition, States may develop loads as a quantitative translator for narrative nutrient criteria.

**18. Compliance with and enforcement of the nutrient criteria should not be discretionary because the criteria program allows for considerable state discretion in the developmental stages.**

**EPA Response:**

Ecoregional nutrient criteria are intended to be used as starting points as states develop their own criteria and as a tool to evaluate state developed nutrient criteria associated with various designated uses and standards or permit applications. Criteria are not enforceable, but NPDES permit limits based on these criteria are. While the states and tribes have considerable latitude in developing their criteria and standards, and are also involved through the RTAG in helping EPA establish ecoregional nutrient criteria, once these ecoregional values are developed they will be used by EPA as a consistent and independent benchmark for assessing the sufficiency of these other activities.

Compliance with state water quality standards and NPDES permit limits is critical to the ultimate success of nutrient controls. Once criteria are adopted into state water quality standards and used as the basis for TMDLs and NPDES permit limits, monitoring will occur to evaluate compliance with nutrient controls for both point and nonpoint sources of nutrients, and to determine the success of overall nutrient management efforts. EPA is developing guidance on nutrient monitoring that will assist states in establishing baselines for monitoring frequencies, sampling methods, determining correct sampling indicators.