Comments from Members of the Chartered SAB on *Review of Empirical Approaches for Nutrient Criteria Derivation* (1-8-10 Draft)

List of comments received

Comments from Lead Reviewers

Comments from Dr. Claudia Benitez-Nelson

Comments on the SAB Review of Empirical Approaches for Nutrient Criteria Derivation.
The Science Advisory Board had provided a number of detailed and constructive recommendations for improvement of the Guidance Report on Empirical Approaches for Nutrient Criteria Derivation. These comments will greatly increase the effectiveness of the Guide to local state and tribal water quality managers. I am particularly pleased by the suggested addition of information regarding uncertainty, clarity in defining linkages between cause and effect, and additional frameworks for displaying and analyzing data.
In response to specific Quality review questions:

1. Are the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

Yes. The SAB review Committee has provided a number of detailed comments for improving the quality and usefulness of the Guide for local state and tribal water quality managers. These comments are clearly structured and detailed. They include, but are not limited to better descriptions of what is meant by cause and effect, limitations in data, acceptable values of uncertainty, and various alternative models for examining large data sets.

2. Are there are any technical errors or omissions in the report or issues that are inadequately dealt with in the Committee's report.

Yes. I have one major comment in this regard. The SAB Review requests that the following information be added, "The Guidance focuses on total nitrogen and total phosphorus as the primary nutrient stressor 8 variables. Additional consideration should be given to inorganic forms of these nutrients 9 because these forms are the most immediately biologically available." While I agree that knowledge of the various forms of nutrients play an important role in community structure, I disagree that inorganic nutrients are the most "immediately biological available." Over the past decade there have been a number of studies that now show that organic nutrients are both bioavailable and rapidly consumed by a vast number of organisms, even in the presence of high inorganic nutrient levels. Furthermore, there have been links to changes in community structure associated with the various forms, organic versus inorganic, of the nutrients entering the system. As written, managers could easily misconstrue the statement regarding inorganic nutrient bioavailability to mean that organic nutrients are likely unimportant and should not be measured. This would be a great disservice in trying to establish clear guidelines on water quality.
Minor Comments:

The SAB often states that "at the start of the initial problem formulation exercise, a realistic cause and effect conceptual model must be developed." Is there a reason why the SAB avoids the use of the word "hypothesis" throughout the document?

The SAB states at least twice the following, "The initial assessment is the simplest (e.g., minimal ecosystem specific data) and most conservative, and thus will not always provide sufficient certainty for decision-making." I am not sure what is meant by the word "conservative" here. In my mind, the goal of this statement is that

minimal knowledge will result in the establishment of guidelines that have the largest uncertainty. The word "conservative" implies that the answer will be the safest or most traditional choice, whereas there is no such information provided.

3. Is the Committee's report clear and logical?

Yes. I have only one minor suggested change:
The SAB review states that "The Guidance provides inadequate discussion of the temporal/spatial aspects of data needed 19 to develop relevant stressor-response relationships." I agree. I would further add a statement at the very beginning of this review document regarding lead/lag times and differences in nutrient concentration versus nutrient load. This is discussed in much more detail near the end of the SAB review (pages 39-40). However the implications of such a discussion should be stated more explicitly in the Executive Summary.

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report.

Yes. The SAB Committee provides a number of examples and references supporting their suggestions for modification of the report. The criticisms are well reasoned and appropriate.

Comments from Dr. Duncan Patten

Chartered SAB quality review questions

1. Were the original charge questions to SAB Standing or Ad Hoc Committees adequately addressed?

The EPEC more than adequately addressed the charge questions posed by the authors of the "Nutrient Criteria" report. The charge questions posed by the Office of Water often had several parts and dealt with specific components of the report. The charge questions also often went beyond being questions but rather asked for the review committee to suggest what should be written in the particular component of the report (see comments below).

2. Are there any technical errors or omissions in the report or issues that are inadequately dealt within the Committee's report?

The committee appears to have thoroughly covered the necessary the technical aspects of the report to the point of suggesting major revisions. These suggestions often posed improved technical approaches to determining stressor/response relationships, etc.

3. Is the Committee's report clear and logical?

To address each Charge Question, the committee took a three step approach which made their report very clear and logical. This three step approach included first a description of the general weaknesses or problems in the report related to the charge question, second it more fully described what was meant by the more general issue, and third it summed up the response section with a list of key recommendations. The authors of the Nutrient Criteria report will have no problem understanding what they will need to do to improve the report as they rewrite it.

4. Are the conclusions drawn or recommendations provided supported by the body of the Committee's report.

As explained in the prior response, the approach taken by the committee in addressing each section and charge question allowed the committee to build on the problems they found by developing more in depth explanations based on the science of the issue.

Comments on the letter to the Administrator.
The letter clearly lays out the problems with the Nutrient Criteria Report. In the first paragraph the letter lists three requests from OW relative to the Report. The second paragraph identifies a set of problems that need to be addressed in a revision. In the last sentence of the second paragraph, the letter says that "improvements in the Guidance are needed prior to its release". This statement comes after a litany of major problems which seems to beg a more emphatic word than "improvements". Perhaps some statement along the lines of "reorganization and rewriting in

the Guidance is needed…." would better summarize the findings of the committee. For example should statements like the one used on Page 16, line 10 "recommends that EPA restructure and revise the Guidance..." be used in this letter?
The third and fourth paragraphs of the letter should clearly pick up on the three requests from OW. The first request is covered in paragraph three, while the second and third requests are covered in paragraph four. These might be presented as separate paragraphs or bulleted.
Is there some wording from page 3, lines 19-28 that might be also used in letter to administrator?

Other Comments on review of Nutrient Guidance Report
As pointed out in response to SAB quality review question 1 above, the committee was requested to do more than just review and critique the accuracy and science behind the materials presented in the guidance document. In some cases (e.g., Charge Question 5) the committee is asked to suggest materials that should have been developed in the process of preparing and writing the report. For example "*What approaches would you recommend that could effectively address indirect pathways of adverse effects? What recommendations do you have to address the effects of confounding variables and uncertainty in the estimated relationships?"* These questions beg the review committee to rewrite, or at least suggest major revision. This seems to imply the authors realize they did not do a complete job to start with, and in a sense, are passing the buck to the review committee.

This appears to be the case, or close to being the case, with several of the charge questions. Take for example in Charge Question 1. They ask: "What suggestions do you have that will improve the utility of the draft document, *Empirical Approaches for Nutrient Criteria Derivation,"* This question should read, "is this document properly written to be readily utilized by the intended audience, and if not, how can this be improved?"
The committee did treat the question as if improvement was a forgone conclusion. This is true throughout. The committee went one step farther and recommended restructuring and revision.
Some random comments on complexity: The emphasis on identifying uncertainty and use of weight of evidence through much of the document are good and very important points. Also, the emphasis on using a multivariate approach emphasizes the complexity of ecosystems which one feels the authors of the Guidance did not fully appreciate. This is also true where the committee points out such things as temporal/spatial aspects of data.

Some more detailed comments:
Figure 1. Figure 1 should be in the body of the text as well as in the Executive Summary.
The suggested revision of the Framework Recommended by SAB in Figure 1 comes close to being an adaptive management approach to the problem. As such, the first box as a new box should have Problem Formation and Goal Development (now combined under conceptual model), and the second box should be Conceptual Model Development. Step 5 in the present recommended framework should have a feedback loop to "consider other methods" because it is a step that evaluates the criteria which may not be appropriate to the method selected. Also, might there also be a feedback loop from Step 6 to new top box with goal setting. There are some points that relate to Figure 1 which might need to be corrected based on this recommendation. For example, Page 8, lines 11-13. Is the development of a conceptual model really the first step in the process? I suggest that identifying goals or reasons for developing the model comes first and this is pointed out above.

Cross-walking through the document. Is there some way of cross-walking between some of the sections so recommendations that primarily fit one charge question can be shown to be of utility elsewhere in the document. This demonstrates the complexity of the issues and the review. For example: In response to Charge Question 1, Improving Utility of the Guidance the committee appears to slip into recommendations that address analytical weakness rather than utility issues, for example, page 4, lines 36-43. How does this statement relate to improving utility of the Guidance for the various users? The same appears to be true for recommendation on page 5, lines 1-22 and may be true elsewhere in this section and elsewhere. Another example is on Page 10, lines 27-31. This recommendation under selecting stressors and response variables seems somewhat appropriate to improving utility of the document. Actually, many if not most of the recommendations will improve the "utility of the document".

Ensuring corrections are tied to identified problems. For example Page 13, line 34. The committee points out that the conceptual problem associated with selecting nutrient concentrations as stressor variables should be addressed in the Guidance. They point out what the problem is but have they suggested a correction. In this case, the next recommendation (#6) actually may be meant to do that, but if so, it may not be that clear?

The committee should carefully revisit many of the identification of problems to make sure that "corrections" have been suggested. In most cases the summary of findings relative to each Charge Question does this, so I doubt whether there are many situations with this as an issue, but if SAB is going to recommend a "restructure and revision", then the OW will need all the help they can get.

I did not find other issues of import later in the report that haven't been mentioned above.

Comments from Dr. John Giesy

1. Were the original charge questions to SAB Standing or Ad Hoc Committees were adequately addressed?

Yes. The charge questions were addressed specifically in the report.

2. Where there are any technical errors or omissions in the report or issues that are inadequately dealt with in the Committee's report

No. The report was free of technical errors and comprehensive. All issues were dealt with adequately and the report give clear and specific direction for improvement of the utility of the guidance document

3. Was the Committee's report is clear and logical?

Yes. The report is well organized, logical and well written. It is easy to follow and the direction is clearly presented and should help EPA improve the utility of the document.

4. Were the conclusions drawn or recommendations provided [are] supported by the body of the Committee's report?

Yes. The conclusions and suggestions for improvement of the document were supported by the discussion provided in the body of the report.

Specific comments:

The report is very well written with no issues of syntax or grammar and free of typos. Very well done.

Page 12 L 15 Unless this is the terminology used in the Guidance or if the intent is to suggest an actual weighting of the various information and or inputs to the decision process, it is suggested that the committee consider using the term "lines of evidence" which is more consistent with agency terminology in guidance.

Page 12 L 42 I suggest using terms such as great, greater greatest to denote magnitude since it is confusing to use "high" then also use Higher in the context of position in the hierarchy.

Page 12 L 42 Here the term "lines of evidence" is used. I suggest harmonizing the terms throughout the report and being consistent with terms used I the Guidance.

Page 13 L 1 Suggest replacing "reduces" with "decreases"

Page 13 L 4 Now "weight of evidence" is used again

Page 17 L 34 Should "Analysis" be "analyses"?

Page 24 L 13 replace “low” with “small” or “few”

Page 24 L 14 change “also reduces” to “is also less”

Comments from other SAB Members

Comments from Dr. Terry Daniel

SAB Review of Empirical Approaches for Nutrient Criteria Derivation

1. **YES**, the original charge questions to the SAB Ecological Processes and Effects Committee were adequately addressed.

2. **NO,** there do not appear to be any substantive technical errors or omissions or issues that are inadequately dealt with in the Committee's report.

3. **YES**, the Committee's report is clear and logical.

4. **YES,** the conclusions drawn and recommendations provided are supported by the body of the Committee's report.

EPEC is to be commended for a very comprehensive and insightful review and for presenting detailed and useful suggestions for revisions of the subject guidance document. The review document is quite long (40 pages) and in several places redundant, with a number of the same points and even the same phrases repeated in several sections. The repetition is less bothersome in the Executive Summary (albeit 10 pages is rather long for a summary) and the repetition in the main body seems mostly a product of the overlap in the charge questions. The length and complexity of the review (and of the executive summary) suggest that the cover letter may need to play a stronger role in bringing forward the most important findings and recommendations.

The suggested enhancements of the "framework" (Figure 1 in the Executive Summary) seem especially important and useful. The enhanced framework reinforces the recommended "tiered" process, increases attention to uncertainty, and makes the consideration of incorporating methods other than and in addition to the empirical (statistical) stressor-response method in a weight-of-evidence approach more explicit. In this context, the role of uncertainty at the different levels/tiers of analysis is appropriately emphasized throughout the review. However, the role that uncertainty plays at each level of the tiered analysis might be carried somewhat further. For example, at the highest tiers in the analysis the "level" of uncertainty might be rather low, as the Conceptual Model is mostly based on well-established general principles of aquatic systems. The type of uncertainty that is of most concern here is about how well the selected conceptual model fits the specific stressors and ecological systems under consideration. The types of uncertainty that are of most concern at later tiers is different, especially as specific nutrient criteria are being articulated and quantitative precision is rather high, and the levels of uncertainty are likewise quantitative and precise. Uncertainty at higher levels is more difficult to assess, but it is very important as it may cascade down through the analysis, in effect multiplying the uncertainty in the later tiers of the analysis.

Comments from Dr. David Dzombak

1. Comment on whether the original charge questions to SAB Standing or Ad Hoc Committees were adequately addressed.

   The charge questions were adequately, indeed comprehensively addressed.

2. Comment on whether there are any technical errors or omissions in the report or issues that are inadequately dealt with in the Committee's report.

   I found no technical errors or omissions in the report, or issues that were inadequately addressed.

3. Comment on whether the Committee's report is clear and logical.

   The report is very clearly written and is well organized. I commend the committee on a job very well done. I just have a few minor comments for consideration by the committee to improve the clarity of the letter to the Administrator and the Executive Summary.
   (a)Letter to the Administrator, line 35: begin a new paragraph with "EPA's draft …"
   (b) ES, p.xiii, line 29: The committee emphasizes several times in the document that "EPA more clearly articulate how the Guidance fits within the Agency's decision-making and regulatory processes and, specifically, how it relates to and complements EPA's other nutrient criteria technical guidance manuals and documents", as stated on lines 7-9 of p. xiii, for example. I suggest that the committee consider re-stating this important recommendation as the first bullet under the response to Charge Question 1. I note that it is given as the first bullet in the detailed response to Charge Question 1 on page 4 of the report.
   (c)ES, p.xiii, lines 36-38: The statement about Figure 1 should be linked better and perhaps merged with the statement that precedes it.

4. Comment on whether the conclusions drawn or recommendations provided are supported by the body of the Committee's report.

   The conclusions and recommendations are adequately supported by detailed discussion in the body of the report.

Comments from Dr. Rogene Henderson

Review of Empirical Approaches for Nutrient Criteria Derivation
Rogene F. Henderson

1. Whether the original charge questions to SAB Standing or Ad Hoc Committees were adequately addressed.

The report was quite clear in stating each charge question and addressing it with specific comments.

2. Whether there are any technical errors or omissions in the report or issues that are inadequately dealt with in the Committee's report.

I am not an expert in this field but I did not note any technical errors or omissions.

3. Whether the Committee's report is clear and logical.

The report appeared logical to me.

4. Whether the conclusions drawn or recommendations provided are supported by the body of the Committee's report.

The recommendations were supported by the body of the report. The letter reflects the major points made in addressing each charge question as described in the Executive Summary.

Comments from Dr. Bernd Kahn

The review is impressively well written; I found no problems with it.
Bernd Kahn March 2010.

Comments from Dr. Nancy Kim

1. Were the original charge questions to the SAB Committee adequately answered?
   Yes.

2. Were there any technical errors or omissions in the report or issues that are inadequately dealt with in the Committee's report?
   No.

3. Was the Committee's report clear and logical?
   Yes. The responses to the charge questions and subsequent recommendations were well laid out and easy to follow.

4. Were the conclusions drawn or recommendations provided supported by the body of the Committee's report?
   Yes.

Comments from Dr. Cecil Lue-Hing

Review of SAB Ecological Processes and Effects Committee's (Committee) Report on EPAs guidance document, "Empirical Approaches for Nutrient Criteria Derivation (the "Guidance").

In its charge to the SAB, the EPA requested that the Committee: 1) comment on the technical merit of the methods and approaches described in each section of the Guidance; 2) recommend other approaches that might be considered to improve the Guidance; and 3) offer suggestions to improve the quality of the Guidance for state and tribal water quality scientists and resource managers. The Committee was also asked to respond to seven charge questions posed by EPA.

The original SAB Committee consisted of 11 members, and was later augmented by an additional six consulting members to conduct the review.

General Comments
The Committee's report represents a strong critique of the EPAs Guidance document with respect to - its technical content, clarity, limitations in its empirical approach, the high degree of uncertainty inherent in some of the derivations, and some of the statistical approaches used.

Opinion
It is the opinion of this reviewer that the SAB Committee adequately addressed the four quality review questions posed by EPA:

1. That the original charge questions to the SAB Committee were adequately addressed
2. Technical errors/omissions in the report were adequately dealt with in the Committee's report
3. The Committee's report is clear and logical, and
4. The conclusions drawn and recommendations provided are supported by the body of the Committee's report

After a careful review of the document, I fully support the Committee's report, its responses and recommendations.

Specific Comments
The Committee structured its responses around the 7 charge questions posed by the EPA, developed findings for each question and provided recommendations in support of the findings.

The Committee's review resulted in 89 findings, including findings of deficiencies, and 64 recommendations.

Herewith is a listing of the charge questions, and a brief account of some of the resulting findings and selected recommendations.

Charge Question #1. Improving the utility of then Guidance

Here the Committee developed 5 findings and 13 recommendations for charge question #1
Some Findings:

- The scope, limitations, and intended use of the Guidance should be more clearly identified
- Substantial revision of the document is needed to facilitate identification of the most scientifically defensible approaches to deriving numeric nutrient criteria
- The absence of a direct causative relationship between stressor and response is one of the most serious issues raised by the Committee.

Some Select Recommendations:

- EPA should specify how the Guidance is to be used in combination with other EPA nutrient criteria technical guidance manuals
- In the Guidance, EPA should address the importance of: 1) establishing linkages among designated uses, measured responses, stressors, and measures, of stressors; and 2) relating measures of responses directly to deleterious effects on designated uses
- In the Guidance, EPA should emphasize that the document does not address downstream effects of nutrient enrichment, which are intended to be the focus of a separate future document

Charge Question #2 – Selecting stressor and response variables

Here the Committee developed 12 findings and 6 recommendations to charge question # 2

Some Findings:

- In the guidance, further discussion of potential response variables appropriate for nutrient effects on detritus-based systems is warranted (e.g., how macroinvertebrate populations dependent on detritus may respond).
- The Guidance focuses primarily on TN and TP as the primary nutrient stressor variables. Some distinction should be given to inorganic N and P because these forms are the most immediately biologically available.
- In many regions N and P are often co-limiting to plants and microbes and stressor-response relationships based on only one nutrient are weak. Nevertheless, nutrients (N and P) may be the primary factor controlling productivity/biomass.
- The Guidance provides little discussion regarding the temporal/spatial aspects of data needed to develop relevant stressor-response relationships.

Some Select recommendations

- The Guidance should be revised to elaborate upon the coupling of response variables to designated uses and the importance of ecological relevance of the stressor-response relationship
- The Guidance should consider including inorganic N and Inorganic P as nutrient stressor variables because these forms are the most immediately biologically available.
- The basic conceptual problem associated with selecting nutrient concentrations as stressor variables should be addressed in the Guidance (i.e., nutrient concentrations directly control only point-in-time, point-in-space kinetics, not peak or standing stock plant biomass).

Charge Question #3 – Approaches to demonstrate the distribution of and relationships among variables

Here the Committee developed 8 findings and 13 recommendations to charge question #3

Some Findings:

- Additional methods for exploratory data analysis should be described in the Guidance
- The examples provided in the Guidance do not demonstrate a strong nutrient stressor linkage to beneficial use impairment
- The Committee emphasizes the importance of choosing the biological endpoints (i.e., response variables) that respond specifically to nutrients.
- Clear guidance is needed for identifying when and how the statistical methods and visualization techniques should be used. The strengths and limitations of the methods should also be identified

Some Select Recommendations:

- The Guidance should be revised to include additional methods for exploratory data analysis.
- The Committee recommends that the Guidance be revised to clearly indicate the statistical assumptions and uncertainties that should be taken into consideration when using methods described in the document.
- The Guidance should contain a quantitatively based weight-of-evidence framework using multiple methods and then combining them into figures and tables for visualization.

Charge Question #4 – Methods for assessing the strength of the cause-effect relationship

Here the Committee developed 7 findings and 7 recommendations

Some Findings:

- Experimental validation of causal relationships between nutrient and response variables should be approached with caution
- It is not clear why information from mechanistic models was not included in Section 2 of the Guidance.
- Additional discussion of conceptual model selection (with specific examples) would be helpful

Some Select Recommendations:

- Mechanistic models should be discussed in the Guidance as one way of supporting the stressor-response relationship
- Experimental validation of causal relationships between nutrient and response variables should be approached with caution because a number of factors can affect the response of s system to nutrient enrichment
- The discussion of conceptual models should be expanded to addressa various criteria for model

Charge Question #5 – Statistical methods to analyze the data

Here the Committee developed 25 findings and 10 recommendations

Some Findings:

- The statistical methods in the Guidance require careful consideration of confounding variables before being used as predictive tools

- As previously noted, because plant biomass is driven by nutrient supply rates (mass loads), a potential conceptual problem exists with the selection of nutrient concentration (often used in the Guidance) as a stressor variable
- The Guidance lacks sufficient discussion of the importance of variable selection and data characteristics to ensure useful implementation of the statistical procedures
- In the Guidance, more information must be provided regarding regression assumptions, limitations, and diagnostic procedures.
- Statistical rigor is essential to the development of scientifically defensible criteria. Simplistic application of approaches in the Guidance can lead to stressor-response relationships with poor predictive power and result in inappropriate numeric nutrient criteria.

Some Select Recommendations:

- The Guidance should indicate that response variables must in all cases have biological relevance and be associated with designated uses
- The Guidance should contain more information on approaches that address multiple factors, such as a stratified (or hierarchical) approach that considers other attributes known to be important such as canopy, habitat, multiple nutrients, etc.
- The Committee emphasizes that EPA should provide guidance on the degree of relationship (indicated by R^2, residual analysis, and other evidence) needed to establish sufficiently predictive stressor-response relationships for numeric nutrient criteria development

Charge Question #6 – Evaluating the predictive accuracy of stressor-response relationships

Here the Committee developed 21 findings and 5 recommendations

Some Findings:

- The Committee finds that a clear framework and criteria for statistical model selection is needed in the Guidance
- With regard to validation, nutrient criteria should result from weight-of-evidence from the application of multiple empirical approaches considering multiple response variables and other approaches as appropriate
- The concept of "best fit" needs elaboration in the Guidance
- The Guidance should contain additional information to assess the closeness of root-mean-square predictive error (RMSPE).

Some Select Recommendations:

- The Guidance should be revised to provide much more detailed model validation guidance
- Subsection 4.1 of the Guidance should be revised to make it more consistent with other EPA guidance on development, evaluation and application of models
- Subsection 4.2 of the Guidance should be revised to provide an expanded discussion of uncertainty. This section should address both qualitative and quantitative estimates of uncertainty as well as bias
- Subsection 4.3 of the Guidance should be revised to address inaccuracies associated with linear stressor-response functions

Charge Question #7 – Evaluating candidate stressor-response criteria

Here the Committee developed 11 findings and 10 recommendations

Some Findings:

- A major uncertainty inherent in the Guidance is accounting for factors that influence biological responses to nutrient inputs
- Numeric nutrient criteria developed and implemented without consideration of system specific conditions (e.g., from a classification based on site types) can lead to management actions that may have negative social and economic and unintended environmental consequences without additional environmental protection
- EPA should consider addressing the use of probabilistic modeling (using the distribution of data in the model and re-sampling or simulating a new distribution) to better determine significant stressor-response relationships
- The Guidance does not adequately address the important issue of continued monitoring and assessment for adaptive management
- The direct and indirect effects of best management practices should be captured in setting numeric nutrient targets and evaluating responses to target reductions

Some Select Recommendations:

- The Guidance needs to clearly indicate that then empirical stressor-response approach does not result in cause-effect relationships; it only indicates correlations that need to be explored further.
- EPA should avoid using "biased" databases (i.e., that do not contain the range of data necessary to fully characterize a system of interest) to develop stressor-response relationships
- The Guidance should caution users about potential problems associated with using the overall regression to predict conditions that might result after implementing different nutrient criteria
- The Committee recommends that EPA frame uncertainty according to some key issues including: - what are the goals of the decision makers (e.g., what are the designated uses and when are they impaired?), and what amount of uncertainty is required to make that decision?

Comments from Dr. Eileen Murphy

Ecological Process and Effects Committee:

Charge 1: whether the original charge questions to SAB Standing or Ad Hoc Committee was adequately addressed:
A significant comment throughout the review is that the stressor-response approach (and the framework included in the EPA draft document) is only one approach that can be used deriving numeric nutrient criteria. The Committee stresses, in particular, the important of mechanistic models. However, it is stated in the EPA draft document that the stressor-response approach is one of three approaches that states can use for development of numeric nutrient criteria and that this particular document focuses just on stressor-response. The other two approaches are the reference condition approach and mechanistic modeling approach. Therefore, I think that the Committee MAY have gone beyond the charge given to them. It is stated in the introduction that "…the use of nutrient stressor-response relationships to derive nutrient criteria is one of the recommended approaches in USEPA nutrient criteria guidance." I did not get the impression that EPA is suggesting that states consider only stressor-response approach, but that it is one tool available to them and the guidance document will help them with it. Many of the Committee's comments involved development and use of mechanistic models. However, the EPA draft document specifically states that it is guidance only for the stressor-response approach, and that other approaches may be used as well but are not described in this document. Therefore, I wonder if the comments suggesting more details on mechanistic modeling are beyond the purview of the particular charge?

Under the charge requesting suggestions to improve the utility of the draft document for states and other stakeholders: Not sure that the alternate framework presented by the Committee is an improvement over the one provided in the draft USEPA report. For states working on this issue, I think the original framework in USEPA document can remain intact, and the excellent suggestions made by the Committee can be addressed within that framework. Given the complexity of the issue in general, the simpler the framework, the better for stakeholders.

Charge 2: whether there are any technical errors or omissions in the report or issues that are inadequately dealt with in the Committee's report:
I thought the report was exceptionally well-written. The technical information presented was valuable and pertinent.

Charge 3: whether the Committee's report is clear and logical:
Yes. Organization of the report and justification for opinions rendered were clear and logical throughout.

Charge 4: whether the conclusions drawn or recommendations provided are supported by the body of the Committee's report:
The Committee provides ample justification for its recommendations. My only question is whether or not the Committee may have gone beyond the charges provided to them.