

**EXCERPT**  
**General Comments from NRSA 0809 Peer Reviewers**

**From:**

**October 9, 2012**

**Draft Independent External Peer Review (IEPR) Report  
of the  
U.S. EPA National Rivers and Streams Assessment (NRSA) Summary Report**

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## Draft Independent External Peer Review Report for the

### U.S. EPA National Rivers and Streams Assessment (NRSA) Summary Report

#### EXECUTIVE SUMMARY

The primary objective of the National Rivers and Streams Assessment (NRSA) was to characterize the chemical, biological, ecological condition, and recreational suitability of rivers and streams throughout the conterminous United States. In 2009 and 2009, trained field crews took water samples, recorded data, and made physical habitat observations based upon approximately 2,400 sites across the country. EPA has drafted a NRSA Summary Report for the general public and a companion Technical Report for the scientific community. The Summary Report, conveying the findings of the assessment, is scheduled to be released for public comment by the end of this calendar year (2012).

The U.S. Environmental Protection Agency (EPA) is conducting an Independent External Peer Review (IEPR) of the NRSA Summary Report. Under Contract No. EP-W-09-024, EPA engaged Battelle to coordinate the peer review of the technical basis of the hypotheses, design, methods, models, data and analyses, and assumptions supporting the NRSA Summary Report.

Based on the technical content of the NRSA Summary Report and the overall scope of the project, Battelle identified candidates for the peer review who were experienced in the following key areas: water resource monitoring and reporting at a national scale, river/stream condition assessments using biological indicators, water chemistry, and physical habitat indicators, and random forest models. Four reviewers were selected from a candidate pool of seven peer reviewers. EPA was given the list of candidate reviewers, but Battelle made the final selection of the peer review panel.

Battelle provided the reviewers with an electronic version of the NRSA Summary Report, totaling approximately 100 pages, along with supporting documentation and a charge that solicited comments specifically on the technical content, completeness and clarity, and scientific soundness of the Summary Report. EPA and Battelle worked together to prepare the charge according to guidance provided in EPA (2006) and OMB (2004).

The peer review panel reviewed the NRSA documents individually, producing more than 250 individual comments in response to the nine charge questions. The reviewers then met via teleconference with Battelle to review key technical comments, discuss charge questions for which there were conflicting responses, and reach agreement on final comments to be provided to EPA.

## SUMMARY OF PEER REVIEW COMMENTS

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Peer reviewers agreed with each other on their assessment of the technical basis of the hypotheses, design, methods, models, data and analyses, and assumptions supporting the NRSA Summary Report. The peer review panel agreed on the following:

- The design of the study is clearly explained in several places and the goals and purpose are well described for the general public, but the design is unevenly presented in sections of the report.
- The graphical presentation is generally clear, summarizes a wealth of peer-reviewed data, and by and large communicates the main findings quickly and easily to the reader.
- The Summary Report does a good job of clearly describing the major stressors and presenting the assessment results. It also meets the stated goals and objectives of reporting on indicators that reflect the conditions of the nation's river and stream resources and associated stressors; however, the relationship between these stressors and biotic indicators is not fully addressed.
- Overall, the Summary Report presents the results of a national survey of the health of streams and rivers and describes indicators that are relevant for assessing the physical, chemical, and biological condition of our nation's waters.
- The section on probability-based sample design is well described; however, it will be pertinent to mention the reason for picking the probabilistic approach adopted over a sentinel approach for streams and rivers, as flowing waters with localized impacts (e.g., point sources, critical source areas) can affect aquatic conditions far downstream.

Peer reviewers found the report to be acceptable either with minor revisions (two reviewers) or with major revisions (two reviewers) as indicated by the detailed verbatim comments from each peer reviewer in response to the charge questions (presented in Appendix A).

The following statements provide a summary of key comments from each peer reviewer in response to the specific charge questions. These statements, which may include *verbatim* text or questions posed by the reviewers from their original review, include brief recommendations of changes or revisions (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed) that EPA should consider that would improve upon the clarity and scientific accuracy of the document.<sup>1</sup> Previous recommendations and specific examples of how to clarify these issues are further described in Appendix A.

### ***Random Forest Modeling Reviewer***

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<sup>1</sup> These summary statements should supersede the summary of key comments from each peer reviewer supplied to EPA on September 26, 2012.

- The reviewer found the section on thresholds and screening approaches to be the weakest part of both the Summary Report and the supporting documentation. The Summary Report is inadequate in describing how reference sites were selected. The reviewer recommends a clearer description of the process and data used to select the reference sites. In addition, the supplemental material should provide a thorough documentation of the selection of the sites. The reviewer found this to be a critical issue that may be difficult to address. At least one other reviewer voiced similar concerns, specifically questioning whether the accessibility constraint could have skewed the sample towards being dominated by sites on public lands.
- In general, the reviewer believes that the presentation of some of the results could be clarified. For example, the discussion of the limitations of the analysis of change between the two time periods is poorly worded. The reviewer found this to be an important issue, but easily addressed.
- The reviewer recommends that future reports attempt to tie in results to direct effects on humans. Such an effort could greatly increase the impact of future assessment on policy. The reviewer found this to be an important issue, but does not necessarily feel that it needs to be addressed in the Summary Report. However, if it were addressed, it would increase the impact of the report.
- The Summary Report would benefit from having a conclusion section and in general more interpretation of the results (e.g., putting the results in context). The reviewer found this to be an important issue that could be easily addressed.

#### ***Ecological/Environmental Statistics Reviewer***

- The reviewer recommends framing the purpose and goals of the survey more clearly at the beginning of the Summary Report (see strong statements of goals in first sentences on pages 46 and 60). Currently the goals are somewhat scattered throughout the document). The authors need to tell the reader how NRSA specifically and uniquely meets the goals. The question about why we need NRSA is asked (Box p. 10), but not really answered. A better case could be made for the value of the national survey. The purpose of the survey is to make high level assessments of stream condition, track trends, identify important stressors, and prioritize management actions to restore rivers and streams. Possible reasons why we need a national survey include: to find the most degraded areas, to identify the most sensitive biological communities, to identify the most important stressors, and to prioritize funding for restoration based on which stressors have the most impact on biological resources. The NRSA survey and resulting analysis makes it possible to rank and prioritize management actions according to the risk associated with different threats to water resources. This value of NRSA could be emphasized more.
- The authors seem hesitant to believe the results of the data for the comparison with the previous national survey (i.e., WSA). For example, there are frequent caveats regarding statistical vs. ecological significance which have the potential to undermine the reader's confidence in the NRSA methodology. While it is good scientific practice to keep results in context, it is also good to mention that the NRSA approach to statistical sampling represents a big improvement over the type of haphazard sampling it was designed to replace.

- In general, the authors do a good job of balancing the details of the methods and the broad overarching results. Figures are complex, easy to read, and beautiful – all at the same time. More examples are needed of how the results from the survey can be interpreted and applied, perhaps as a conclusion section. The scientific rigor of both the data collection methods and survey methodology would support some broad, interpretive statements (e.g., nutrients are of greater concern than acidification of streams).
- The value of this study and the significance of the results are somewhat understated. The authors provide a good historic background of NRSA, but more context is needed. NRSA represents the culmination of intensive collaboration across multiple disciplines (statistics, chemistry, hydrology, biology of multiple assemblages) to produce an integrated assessment at the national scale. Furthermore, the statistical and data collection methods developed for the NRSA have been adopted by many states. Thus, data collected at different regional scales can be compared and integrated across the U.S. This was not possible before and represents a major advancement in water resource protection.

### ***General Ecology Reviewer 1***

- The Summary Report suffers from a lack of in-depth interpretation of the data. It currently reads as a data report or “data dump.” Data are presented, but little is put in context. There are numerous examples of where interpretation is needed: (a) In the Executive Summary a statement is made that the nation’s rivers are under significant stress yet there is relatively little analysis making that point. What is the basis for this statement? (b) More discussion is needed on what the important stressors are. (c) More discussion is needed as to what the regional differences are and what is driving these differences. (d) It is necessary to place the results of this study in context with other studies. Even if the Summary Report is written for lay or general audiences it would be appropriate to put the results in the context of other studies and citing these studies.
- In line with the above concern—there is no conclusion section. This would be the perfect place to highlight the important findings of the report and make a case as to why the findings are important.
- The relationship between the sampled stressors is not clear to the casual reader. Upon careful reading, it is clear that the biological index is the main index of stream health. In other words, the condition or overall health of the stream is mainly determined by the biological index. The other indices are potential causes or contributors to the stream condition. It would be useful to clearly state that the biological condition is the key index of stream health and the other ones are collected to gain a better understanding of what is determining the condition.
- The Executive Summary could include some rationale on the reasons for the perilous status of streams in the country. A clear statement of goals and objectives would be helpful.
- The section on thresholds and screening approaches could be reworked as it lacks clarity.

- The Summary Report is “unevenly” written. Some sections are quite good and others not so good. In addition, there are obvious differences in writing style suggesting that the report has been written by multiple authors whose sections have been combined. The Summary Report would benefit from a professional technical editor focusing on clarity and organization and consistency of terminology.

### ***General Ecology Reviewer 2***

- The text needs to be tailored to the intended audience; the document will need to be carefully crafted if the intended audience is broad. The document needs to be edited to be consistent in writing style, terminology, and graphics throughout.
- The text that describes the reference site approach used in the study needs to be rewritten; as currently written, it will confuse most audiences.
- Findings concerning differences (NRSA vs. WSA), stressor-biological relationships, and risk must be based on statistics, otherwise they risk being subjective. Also, additional description on what the error bars in the graphs represent (e.g., standard error, standard deviation, confidence interval) needs to be presented.
- Statistical results for the nation are not independent from regional results; this issue can be resolved by rewording a few sentences.
- More clearly distinguish a difference from a trend; this also is an editorial more than a technical issue in this document.
- NRSA findings need to be compared to those of other regional and national studies. This is particularly important because some of the NRSA findings seem to conflict with those of previous studies.
- Are the results (distribution of good-fair-poor sites) consistent among biological indicators? What do the similarities and differences tell us about the condition and causes of impairment across streams and rivers in different regions?
- Are stressors themselves correlated and, if so, how does this affect conclusions concerning cause-effect based on what is essentially a correlation analysis?
- Did accessibility constraints on the probabilistic sampling design and the inability to sample certain metrics (e.g., fish mercury) at a substantial number of sites bias study results?
- It is not clear how some metrics (riparian zones and periphyton in particular) were standardized across stream and river orders. Low-order streams are inherently different from large rivers from both a functional and structural standpoint.

### ***Consensus Observations by the Peer Reviewer Panel***

Many of the same issues were identified by each of the peer reviewers. The following statements provide a summary of the recurring themes or issues from the peer review panel.

#### ***Interpret the results.***

More discussion is needed regarding how to apply the results of the survey. This does not need to be too specific or definitive. The authors provide a good example of how data are being used

(p. 63, sentence beginning “Already the analysts...”); however, a few more examples would help ground the reader and show the value of the NRSA data. The regional summaries (starting on p. 65) are formulaic and provide good data, but offer little interpretation. Text could be added about how results differed across regions, or how observed differences relate to regional land use patterns and were reflected in biological responses. These could be simple statements, not full scientific explanations (e.g., “high nutrients associated with fertilizers used in farming can cause changes to the periphyton index that reflect an increase in tolerant diatoms”). These would just serve as examples of how the data are meant to be used.

***Clarify the relationship between stressors and biotic indicators.***

The Summary Report, notably the Executive Summary, does not offer a clear description of relationships between stressors and biotic indicators. It is therefore unclear to the reader that the biological indices are the key indicator of aquatic health or condition and that the other indices measured as drivers of health or condition. One recommendation is to add a short statement that makes the connection between biological metrics and stressors more explicit and explains the relationship of the different indexes.

With respect to the biological condition, it appears that much more weight was placed on the Multimetric Index (MMI) compared to the other measures of biological condition (see Section 4.3.1). If so, this needs to be clarified and some explanation as to why should be provided.

Stressors that have a relative risk significantly greater than 1 should be distinguished from those that do not. If most relative risks are not significant, then there needs to be some discussion of the lack of concordance between poor conditions for stressors and biological impacts. Another major caveat that needs to be recognized in the Summary Report is that measured stressors themselves may be correlated and apparent responses to measured stressors may be due to associated unmeasured stressors.

***Provide a set of conclusions.***

The report needs a set of conclusions related to the data collection and analysis methods, the regional and national results, the survey design, or policy. A brief overview might help orient the reader and provide context for the conclusions. Suggested examples of conclusions are: some stressors are more important than others; national surveys allow us to compare condition and the impact of stressors in different regions; biological measures of condition respond to independent measures of human disturbance; and ranking stressors proves a means of prioritizing restoration goals.

***Describe the intended audience.***

The reviewers recognize the need for the Summary Report to speak to different audiences; however, it may help to clarify this early in the document so that readers know the intended audience. Additional text to orient various audiences may help elucidate this point. For example, “State water quality managers will find templates for reporting results from random sampling, but not the technical details of methods. Policy makers will find results of stressors summarized at the national and regional scale, but no discussion of specific laws or policies. Citizens and stakeholders will find an overview of a national program designed to address the most important problems affecting our streams.” By having this orientation, a scientist, for

instance, reading the report will recognize that not all of his/her technical questions will be answered in the Summary Report.

***Add a technical report to complement the summary report.***

The peer reviewers suggest that a separate technical document with a more detailed interpretation of the information be written in addition to the Summary Report. It would be useful if there was a technical report that contained a more thorough interpretation of the information. The technical report would complement the Summary Report that contained the higher level summary for general audiences. The peer review panel recognizes that once the Summary Report is made public the supplemental documents will be posted to an EPA website in a single document format. The peer review panel wants to be sure that all the excellent data and information being produced is presented in a cohesive technical document

## Charge Questions and Guidance to the Peer Reviewers for the National Rivers and Streams Assessment: Summary Report

### CHARGE TO PEER REVIEWERS

Prior to its December 2012 release, the NRSA reports are being reviewed in three stages. The first is a review by EPA's state partners that is being conducted simultaneously with second stage. The second stage of the process, in which Peer Reviewers are being invited to participate, is the peer review. This peer review is important to ensure that the information contained in the reports is scientifically credible. The peer review also is important in evaluating whether the Summary Report will be easily understood by people who may have a vested interest in rivers and streams nationally or on a local scale. The third stage is the release of the draft Summary Report to the general public for final comment via the web.

The draft NRSA reports are a culmination of effort from EPA, States and Tribes, and input from rivers and streams experts from various academic and/or scientific institutions. While the subject matter is somewhat technical in nature, the Summary Report itself is intended for the "environmental policy or educated layperson" – the type of person who may work at the policy level in environmental issues, or alternately has a dedicated interest in river/stream water resource quality concerns. EPA is also including a Technical Report intended for those people who would like a more in-depth explanation into the analytical underpinnings of how the assessment was derived. EPA is asking that Peer Reviewers review comments focus specifically on: technical content, completeness and clarity, plus scientific soundness of the Summary Report. EPA is asking that Peer Reviewers limit their review to an assessment of whether the:

- Methodology is acceptable, even if it may not be the "best" of all possible choices;
- Findings are scientifically reasonable and logical outgrowths of the data and methodology; and
- Presentation is consistent with the scientific underpinnings.

EPA is not requesting comments on:

- Formatting unless it is misleading or apt to be confusing to the reader;
- Indicator selection because it resulted from extensive collaboration with many parties;
- Data selection, other than in the context of the particular analysis (i.e., the focus is on the data that has been collected, not alternatives for collecting additional data);
- Reference site selection as described in Chapter X, because many alternatives could be considered reasonable. However, it is appropriate to comment on reference site assumptions and adjustments for a particular analysis; and
- The Technical Report unless it is inconsistent with the Summary Report or presents inappropriate methodologies.

Specific questions for the Peer Reviewers are included in the general charge guidance, which is provided below.

### General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the NRSA Summary Report. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you should not comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note the following guidance.

1. Your response to the charge questions should not be limited to a “yes” or “no.” Please provide complete answers to fully explain your response.
2. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
3. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
4. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable
5. Please focus the review on assumptions, data, methods, and models.
6. This document should be considered confidential and should not be shared with other individuals or groups, as it is likely to change as a result of state and peer review.

Please **do not** comment on or make recommendations on policy issues and decision making. Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, Peer Reviewers can contact one another. However, Peer Reviewers **should not** contact anyone who is or was involved in the project or prepared the subject documents.
2. Please contact the Battelle Peer Review Manager (Rachel Sell, [sellr@battelle.org](mailto:sellr@battelle.org)) or the overall Battelle Project Manager (Bob Lordo, [lordor@battelle.org](mailto:lordor@battelle.org)) for requests or additional information.
3. In case of media contact, notify the Battelle Peer Review Manager (Rachel Sell, [sellr@battelle.org](mailto:sellr@battelle.org)) immediately.
4. Your name will appear as one of the Peer Reviewers in the peer review report.
5. Peer reviewers shall not share findings of the draft Summary Report with any other individuals or groups.

**Please submit your comments in electronic form to Rachel Sell, [sellr@battelle.org](mailto:sellr@battelle.org), no later than September 20, 2012, 12 pm Eastern (9 am Pacific).**

Peer reviewers will be “charged” with responding to specific technical questions. EPA asks that Peer Reviewers address the following questions in their evaluation and critique of the draft Summary Report.

### **Specific Charge Guidance**

**Question 1:** Does the organization and content of the Summary Report seem appropriate and does it present the material in an understandable manner for its target audience (i.e. general public)? For example:

- a. Are the goals, purpose, and design of the study clearly described for the target audience?
- b. An important aspect is that the reader understands that the NRSA is not assessing individual rivers and streams for those rivers/streams attributes, but rather the population of rivers/streams at several geographic scales. Does this point come across clearly?
- c. Is the data presentation sufficiently clear and intuitive? We would like your thoughts on whether these data presentations work, or if other approaches would be more intuitive.

**Question 2:** Are the thresholds and screening approaches for reference scientifically valid for the regional scale? Are the concepts of reference condition and threshold development explained and clear to the reader in the Summary (i.e., general public) Report?

**Question 3:** Is the underlying approach for the analysis of the biological indicators scientifically sound? Is the information presented for each biological indicator presented in a clear and understandable manner in the report? Please answer this question for:

- a. Benthic macroinvertebrates [(Multimetric Index (MMI) and Observed/Expected (O/E)]
- b. Fish Community
- c. Periphyton

**Question 4:** Are the major stressors described in the report explained and clear to the reader? Are there concerns with the analysis used to develop the final results?

**Question 5:** Is the relationship between the stressors and the biological indices adequately explained?

- a. Are the underlying approaches used in assessing the relationship between stressors and biological indices acceptable and based on scientific principles?

**Question 6:** The NRSA presents the difference in Wadeable Systems from a previous study. Is the information on these differences/changes from the previous report explained and clear to the reader?

- a. Is the approach used to assess the change in Wadeable Systems acceptable and based on sound scientific principles?

**Question 7:** Is the approach used for analyzing mercury in fish tissue and assessing the population acceptable and based on sound scientific principles?

- a. Is the information presented clear and understandable?
- b. Are there alternative ways to present this data at a population level?

**Question 8:** Does the Summary Report meet the stated goals and objectives of reporting on indicators that reflect the condition of the nation's river and stream resource and associated stressors?

**Question 9:** What is the most important concern you have with the report that was not covered in your answers to the questions above?

Using the template provided, please answer/comment on these questions in detail. Please also raise any other scientific concerns you may have and feel free to make any other suggestions regarding presentation, findings, graphics, *etc.* that you believe will enhance the documents.

### **PEER REVIEWER RECOMMENDATION**

Finally, please provide a recommendation. Based on your reading and analysis of the information provided, please identify your overall impression of the National Rivers and Streams Assessment Summary Report.

- a) Acceptable as is
- b) Acceptable with minor revisions (as indicated)
- c) Acceptable with major revisions (as indicated)
- d) Not acceptable (with explanation and any corrective actions)