

**SAB Comments on the Draft SAB Report:
*Valuing the Protection of Ecological Systems and Services***

Table of Contents for SAB Comments

Lead Reviewers:

1. Comments from Dr. Baruch Fischhoff
2. Comments from Dr. Catherine Kling
3. Comments from Dr. Judith Meyer

Other SAB Member Comments:

4. Comments from Dr. Otto Doering
 5. Comments from Dr. James Galloway
 6. Comments from Dr. James Hammitt
 7. Comments from Dr. Steven Heeringa
 8. Comments from Dr. Rogene Henderson
 9. Comments from Dr. Bernd Kahn
 10. Comments from Dr. Agnes Kane
 11. Comments from Dr. Meryl Karol
 12. Comments from Dr. L.D. McMullen
 13. Comments from Dr. Granger Morgan
 14. Comments from Dr. Duncan Patton
 15. Comments from Dr. Valerie Thomas
 16. Comments from Dr. Thomas Wallsten
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1. Dr. Baruch Fischhoff

I was very favorably impressed by this report. It has a very distinguished and diverse group of authors, who must have labored mightily to produce a synthesis document that they could all sign. While the report carefully focuses on EPA's mission, I think that it represents an intellectual product that will have echoes beyond the Agency. In fact, I suspect that the commitment to the Agency's mission is what enabled committee members to make the compromises needed to get on one page – whereas, in theory, proponents of different methods and disciplines tend to stand their ground.

Were the Agency to follow the report's recommendations, it could set the pattern for an innovative organizational model, which would make the best use of its limited resources. Notably, it requires the Agency's work to be done by interdisciplinary teams, which work together throughout management processes and begin with a jointly formulated "conceptual model." That model would reflect both the natural science of the ecological systems under consideration and the potentially complex human "values" that it could affect. It would provide a brake on research activities that specialize in producing detailed analyses of

fragments of problems. It would afford the Agency a leadership role in ecological stewardship.

Fundamental to the report is its characterization of the different kinds of tasks that the Agency faces. At one extreme, there are regulatory proceedings, in which formal evaluations are meant to replace judgment. Or, more specifically, issues of judgment are resolved in the course of preparing a formal analysis. At the other extreme, are consultative proceedings, in which evaluations are intended to inform judgment, allowing stakeholders (inside and outside the Agency) to reach common understandings, improve the design of ecological solutions, stimulate create dialog and research, and so on. Although I suspect that the committee had some tense moments, in reaching its own shared understandings, the resulting text is noteworthy in showing the complementarity (rather than rivalry) of the different methods that it endorses.

Another noteworthy feature of the report is the attention paid to achieving economics of scope, in the sense of conducting analyses with an eye to creating an inventory of methods and results that could be reused in subsequent applications. Its innovative development of the concept of value transfers should help the Agency work in a more efficient way, while making its actions more predictable to those who depend on it.

I applaud the reports heavy reliance on peer-reviewed research for its primary sources. In so doing, it makes a stand against the trend toward relying on methods that exist solely in the gray literature of contractor reports. Although basic research (and researchers) can be frustrating in their concern for fundamental issues, the fussiness of peer review is essential to creating sound methods, with well-characterized strengths and limits. I would like to think that the thoughtfulness of the report will help to draw more basic researchers to the fundamental issues associated with ecological valuation.

In that light, let me suggest two publications of my own that would provide access to valuation research that is not covered by the existing references. In particular, each traces valuation methods to their disciplinary roots and assumptions, which can be hard for outsiders to find. I would be happy to send pdfs.

Fischhoff, B. (1991). Value elicitation: Is there anything in there?
American Psychologist, 46, 835-847.

Fischhoff, B. (2005). Cognitive processes in stated preference methods. In K-G. Mäler & J. Vincent (Eds.), *Handbook of Environmental Economics* (pp. 937-968). Amsterdam: Elsevier.

The report is, I believe, wise to characterize its interest as in the values expressed by well-informed individuals. That requirement should help to deflect charges that, by consulting with the public, the Agency will become slave to irrational public opinion. Such low views of the public are often exaggerated (sometimes strategically). However, this requirement creates an obligation to assess public

understanding and fill the critical gaps, a task addressed in Chapter 5. The attendant need for two-way communication in all valuations will enhance the Agency's standing and credibility, even with valuation processes that are not essentially consultative. A more recent reference that the committee might consider (pdf also available):

Fischhoff, B. (in press). Risk perception and communication. In R. Detels, R. Beaglehole, M.A. Lansang, and M. Gulliford (eds), *Oxford Textbook of Public Health, Fifth Edition* (Chapter 8.9). Oxford: Oxford University Press.

The report is candid about the strengths and limits to the methods that it recommends, from which it identifies research needs that the Agency could address, when it decides to re-establish capabilities in the social and behavioral sciences other than economics (which could also be bolstered).

I am, however, not as optimistic as the authors about the adequacy of following guidelines, like those in the Agency's *Risk Characterization Handbook*. Not all those guidelines are grounded in the research literature. (Actually, the *Handbook* says very little about communication. However, EPA has issued publications that have said more, but which are spotty in their scientific foundations.) Even where guidelines are grounded in the science, it is unrealistic to expect individuals without appropriate training to be able to read, then apply them appropriately. Indeed, even individuals with that training cannot be expected to get it right the first time, when they create communications (or valuation procedures) on new topics, for new audiences. As a result, without direct empirical testing, the communication mission cannot be fulfilled.

I realize that the recommendation to follow guidelines is sandwiched between recommendations regarding evaluation (on p. 65). However, it is very easy to imagine people skipping the evaluations because they have unwarranted trust in their own intuitions and won't find the modest resources needed to ensure that they have secured the understanding upon which the entire enterprise is predicated.

[On this topic, in another important EPA activity area, see:

[http://yosemite.epa.gov/sab/sabproduct.nsf/B1BC9941890A5A5C852574F9007627DA/\\$File/EPA-SAB-09-003-unsigned.pdf](http://yosemite.epa.gov/sab/sabproduct.nsf/B1BC9941890A5A5C852574F9007627DA/$File/EPA-SAB-09-003-unsigned.pdf)]

Given the Agency's extremely limited social and behavioral science resources, both in absolute terms and relative to its ecological missions, I suggest that the report recommend that the Agency create a core (in the NIH sense) capable of developing and evaluating valuations and communications for all of its activities. That would be more feasible and cost-effective than asking each program to create, then staff, a position (or fraction thereof). Having core staff with regular liaison staff to different programs would ensure an understanding of their needs, while having a central repository of expertise and inventory of materials that can be used across applications – providing economies of scope here as well. Such an

institutional structure seems essential to fulfilling the commitments of chapters 6 and 7, to the scientific standards enunciated in the earlier chapters.

2. Dr. Cathy Kling

This document represents an enormous amount of work and the authors are to be commended for taking on this challenging task. Many very useful ideas and suggestions are contained in the report that will no doubt help guide both the research community and policy analysts for many years. Chapters 3-6 are excellent. Likewise, a real strength of this report is the discussion and examples it raises with respect to methods for informing decision making when ecosystem services are poorly understood by the general public and/or when significant uncertainty between a policy or a project and the resulting change in ecosystem services exists. These are the central features of ecosystem services that make their valuation even more challenging than any other environmental good.

A few suggestions/concerns follow.

- a) The third major recommendation of the report is that the Agency should “Allow for the use of a wider range of possible valuation methods, either to provide information about multiple types of value or to better capture the full range of contributions stemming from ecosystem protection” (executive summary page 4 and elsewhere).
 - i The terminology is unclear as it suggests with the terminology “allow for” that such valuation methods are somehow now explicitly disallowed. While it is true that alternative CONCEPTS of value would not “be allowed” in a benefit-cost analysis, it would be inappropriate for them to be allowed. On the other hand, alternative methods/concepts can often be useful as precursors in eliciting economic concepts of value and are already often used in that way by researchers (e.g., focus groups, survey methods, preference probes via Likert scales, and even some deliberative processes are often used in stated preference approaches). And, as this document does a great job of arguing, alternative concepts and methods can be very informative even when benefit-cost analysis is the purpose, but monetization is not possible. Are these approaches really disallowed currently? (In the letter to the administrator, the language used is that the “SAB advises EPA to **consider** the use of a broader suite of valuation methods than it has historically employed ...”is that better language?)

Along the same lines, this document makes a strong case for including deliberative processes, decision science approaches, constructed values, in helping EPA learn about ecosystem services, but the mixing of “concepts” with “methods” throughout the

document makes me concerned that this recommendation might be misinterpreted to indicate that EPA should allow alternative concepts of value in benefit-cost analysis.

- ii Recommendations are made that EPA invest in alternative methods (e.g., on page 5, the report suggests that EPA should “Develop criteria to determine the suitability of alternative methods for use in specific decision contexts”). Given the tight budgetary times, I am concerned about the prioritization of EPA research funds that this statement and related statements in the text might generate. Perhaps it is obvious, but some of the concepts described in the document will rarely be of value for decision making and therefore little budget should be expended to sharpen their definition or develop methods to support the concepts. EPA has limited resources and should spend its resources in places that will yield high returns: some of the methods described in this report would fit this category, but some methods and concepts will not. I would hate to see a large research budget expended on exploring the full range of concepts described here.
 - iii All of these concerns relate to the seemingly interchangeable use made of “methods” and “concepts,” in the document. Perhaps this is a source of confusion to others as well?
- b) A final concern r.e. recommendation #3. Multiple valuation methods are intended to provide information about multiple “types of value.” The report discusses difference “concepts of value,” but only with reference to spiritual and moral values do they refer to “types of value. Which of these do they mean? If it is the latter, I don’t believe the report provides an adequate basis for making this recommendation (see my comment on spiritual values below). There is also a section where “sources of value” (page 23) are mentioned, but no details provided. Are “sources” and “types” synonyms?
- c) Generally, the introduction to methods in chapter 4 is excellent. However, there is a premise (stated at the top of page 44) throughout this chapter that there is largely a 1-to-1 correspondence between the concept of value being sought and the method for its measurement. I think this is false and detracts from the usefulness

of this presentation. Some of the methods listed in Table 2 and described briefly in the text can be used to yield much improved economic valuations or to provide useful information when the concept of economic value is the desired endpoint, but inadequate information is available to generate economic value numbers. Further, I suspect that nonmarket valuation methods (such as stated preference surveys) could be used to elicit community-based values. For example reliable economic values generated by stated preference approaches need to be based on survey instruments that have been developed with substantial input via focus groups, individual narratives etc. It is common to use attitude scales (Likert scales), importance rankings, and other methods described in Table 2 to introduce respondents to a valuation scenario in stated preference approaches. These are extremely complimentary and, speaking as an economist who has tried some of these methods, we need to learn to do them better from decision scientists, psychologists, sociologists, etc.. This would be a great place to make this point to urge increased inter-disciplinarity amongst social scientists.

- d) A statement that reappears throughout the document is that EPA is constrained by regulatory requirements to use “economic values” in its national rule making and RIAs. It is not until the excellent discussion in chapter 6 describing valuation for national rule making that the point is made that this requirement is not arbitrary, but rather the concept of economic value is central to determining whether the total well-being of a society is higher or not after a policy change or project. While not explicit, I am concerned that the repeated statements of the sort in the first sentence strongly imply that if such requirements were not in place, it would be appropriate for EPA to use a different concept of value for use in benefit-cost analysis or informing national policy. This is generally not true. I think it is critical to make this clear early on in the document.
- e) Several times throughout, the document states that “moral and/or spiritual” convictions are not captured in economic values. I am not aware of a literature that definitively answers this question; if so, references should be added. While a couple of citations are provided quite late in the document (Sen’s 1970’s book and a reference in a law review), this statement is very strong and

personal introspective suggests to me it is wrong: my spiritual and moral values are central to decisions I make about most things I purchase (or don't purchase), my behavior, and certainly when I consider tradeoffs between ecosystem protection and other uses of funds.

Smaller issues:

- a) On the first page of the executive summary, 6th paragraph under "General findings..," two quite different ideas are contained in the paragraph that begins "To date, EPA has primarily sought to measure economic benefits, as required in many settings by statute or executive order." In addition, the Agency's value assessments have often focused on those ecosystem services ... The third sentence indicates that this focus can diminish the relevance of a value assessment. This statement refers (I assume to the second sentence). Later in the paragraph, other concepts of value are discussed which would seem to refer back to the first sentence.

I suggest moving the three sentences that begin with "In addition, the Agency's..." to their own paragraph, this would leave the first sentence and the remainder of the current paragraph as their own paragraph and avoid confusion about what is being referred to.

- b) On page 7, there are two bullets that seem to say essentially the same thing (right hand column, second and third from bottom).
- c) On page 13, delete "and narrower" in parenthetical, second paragraph from bottom.
- d) Second line on page 18, By "demonstrating" implies that the ecosystem services have value. Use "considering" or "including"
- e) Why aren't "spiritual and moral appreciation" listed under ecological services in figure 3?
- f) Footnote 20 is the same as the text following the footnote.

3. Dr. Judith Meyer

This report is written well and effectively discusses a very important topic.

Are the original charge questions to the SAB Panel adequately addressed in the draft report?

In general, yes. EPA's needs are identified, the state of the art and science are assessed, and key areas for research are identified. I do have some

specific comments:

- a) I am concerned that there is so little mention of ORD's proposed research program on ecosystem services, which is directly relevant to what is being identified as research needs in this report (I realize that it is recognized on p. 38). Recognition of this new research direction seems appropriate in the Executive Summary and perhaps also in the letter to the Administrator, since it is a specific program that the Administrator would know about and bears directly on what is called for in the last paragraph on p. i. Some mention of that research program would make the committee's recommendations seem less vague and general. The Executive Summary recommends that EPA coordinate its research programs on ecosystem services, yet there is no clarification of what those programs are. Furthermore, there is a need to incorporate the results of that research into the Program offices, which the report does not acknowledge.

On p. 7, the third bullet identifies research on ecological production functions as an important research topic, and specifically notes STAR research. I think the contributions of ORD research on those topics should also be included in that recommendation. It is not appropriate to mention STAR without also recognizing the work that is being done in those areas by ORD scientists. I suggest modifying the bullet to read: "Carefully plan and actively pursue research to develop and generate ecological production functions for valuation, include ORD and STAR research on ecological services and support for modeling and methods development. The committee believes that this is a research area of high priority."

- p. 9, right, first paragraph: another place where the ORD ecosystem services research program deserves recognition.
- p. 35, right, first full paragraph: Another place where ORD ecosystem services research should be mentioned. It is not clear why a single grants program is identified here.
- p. 77, right, first sentence and p. 78, right last paragraph: why are only extramural programs emphasized?

- b) Reading the conclusions for Chapter 2, I was surprised that there is no mention of the need for research.

Is the draft report clear and logical?

In general, yes; but there are places where it could be improved.

- a) It is very useful to describe the context of valuation at EPA (Section 2.2). A brief summary of what is required in OMB Circular A4 would help the reader unfamiliar with that (since that is really the purpose of this whole section).
- b) The report is written with EPA staff and contractors as the target audience, which is appropriate. Has the committee considered sending the report to OMB? It seems to me that the decision-makers at OMB need to be aware of these other approaches to valuation. This would be most valuable if it were accompanied by a cover letter that pointed out OMB-relevant sections of the report.
- c) p. 24: Where is the conceptual model in this figure and in Figure 5? The report emphasizes the importance of developing a conceptual model, yet it is not clear where that step is in this figure or in Figure 5.
- d) On p. 25, the report discusses the parallels between risk assessment and valuation. Yet later (p. 88) the report argues that there are fundamental differences between risk assessment and what the committee is proposing. These two statements seem contradictory. On p. 88, the committee appears to be calling for a change in the risk assessment paradigm. If so, this is extremely important and needs greater emphasis (inclusion in Executive Summary and letter).
- e) p. 106: Is this section essentially an appendix (since it comes after Conclusions)? It needs some sort of a label. At the very least it needs to be referenced in Chapter 4. I think it is so relevant to the material in Chapter 4, that it would be much better as a box in that chapter. The various web materials are cited in that chapter, and I think it is important that the disclaimer that these were not approved by the entire committee or reviewed by the SAB belong closer to where they are originally referenced. As I was reading chapter 4, I wondered what sort of review process those web documents had undergone. I did not get an answer to that question until p. 106. It also seems as though the disclaimer paragraph in the left column (“The description of these methods...”) refers to the other web documents cited in this appendix (i.e. survey issues discussion and workshop summary) and not just the methods descriptions as implied by its placement in that section.
- f) There is no reference to the box on p. 56. In fact this is a general problem with ALL of the boxes in the report. Please give boxes numbers (or some other identifier) and then refer to them by that identifier in the text. That would greatly help the reader figure out in what context boxes are supposed to be read. In Chapter 6, it is particularly confusing because the sites are supposedly “described below” when in fact they are described in boxes.

- g) Who are the “stakeholders” who are so often mentioned in this report? I do not think this question is adequately addressed in the report, yet it is crucial given that so much emphasis is placed on stakeholder values (rather than expert opinion). Of all the recommendations in this report, I have the greatest problem with this one, primarily because the committee clearly assumes an INFORMED public, yet that is not always stated. I worry that statements about public values could be taken out of context and the fact that the report is talking about values of an informed public will be ignored. I also think there can be problems with local vs. national stakeholders that I did not see addressed. For example, a local community in the West may value the revenue generated by logging whereas a city dweller in the East values the forest as a vacation spot. Both are clearly stakeholders, but I did not see that issue discussed in the report.
- h) Fig 4: What is Captured Energy Fertilizer? There is no indication of the effects of these losses on water, air, or soil ecosystems. This is not an overview. No ecosystem services are even mentioned.
- i) pp. 79 – 85: This description of the Chicago Wilderness example seems overly long and exuberant, given the amount that has been accomplished. This is particularly striking when compared with the Portland example, which seems to be a more complete example of the process the committee has been discussing. I would have liked to see much less about the Chicago wilderness (and less enthusiasm about it) and much more about the results of the Portland analysis – what were the conclusions from the study? How did the city use the analyses?
- j) What are the pictures at the top of some of the pages supposed to convey? As far as I could tell, they bear little relevance to what is being discussed on the page where they appear.

Are the conclusions drawn, and/or recommendations made, supported by information in the body of the report?

In general, yes; although I think some of the conclusions and recommendations should be more clearly presented in the letter and Executive Summary.

- a) In the letter to the Administrator, point out the specific contexts (national rulemaking, regional partnerships, and local site-specific decisions) considered in the report.
- b) Having read the Letter and the Executive Summary, I still have no idea what the committee means by “other valuation methods.” The Executive Summary and letter end up sounding extremely vague on this point because those alternative approaches are not identified in any way. In fact, they are not

identified until p. 42 of the report. Some clarification of what is meant is needed much earlier! This could be done even in a parenthetical expression that cites Table 2 and lists the main headings from that table (i.e. all methods would not need to be listed). A similar clarification is also needed in Chapter 7, since a reader might only look at the conclusions and have no idea what is meant by alternative methods.

- c) p. 19: The report's endorsement of the oversight committee and ecological valuation forum belongs in the conclusions from this chapter and in the Executive Summary.
- d) p. 53: benefits transfer seems most problematic, even in an economic analysis. I'm not sure the need for research in this area is adequately emphasized in the Executive Summary.
- e) p. 99: I was surprised that there was no reference to Net Environmental Benefits Analysis in the conclusions (6.3.4). It seems that some is warranted.

Additional specific comments:

- a) p.8, on right: I do not think EPA has an obligation to evaluate effects of actions on individual organisms.
- b) In terms of other uses (p. 18), the committee talks about state level water quality regulations, where states do not run their own programs. But EPA writes the guidance documents that states use to derive their regulations, and it would seem that valuation would be useful there. Mitigation (e.g., for wetlands loss) would seem to be another use for this type of analysis.
- c) p. 29: what is missing from Figure 2 is any consideration of other factors (e.g., sediments, habitat availability) that would alter these relationships from one site to the next.
- d) p. 33, first paragraph on right: This paragraph seems out of place, redundant with what is in a later paragraph, and inappropriately identifies one approach reflecting the views of one committee member. The third paragraph in that column provides a much more complete description of how one might select models that is more relevant to EPA's needs. I recommend eliminating the first paragraph.
- e) p. 36: cite the more recent Heinz report. I can provide if needed.
- f) p. 37: use a more recent Karr citation. I can provide if needed.
- g) p. 37: It would seem that a reference to CADDIS, which is an EPA effort, is relevant in this discussion of using weight of evidence.

- h) p. 37: In addition to LTER, NSF's more recent NEON (National Ecological Observatory Network) and USGS's NAWQA program seem particularly relevant to this discussion.
- i) p. 37 (and 39 and Chapter 7, p. 105): NSF is a federal agency, not a scientific organization!
- j) p. 47: Couldn't referenda results be biased as a consequence of extensive and unequal advertising for one side or another during the campaign?
- k) p. 54 on right: Is the comparison supposed to be MN (with many lakes) vs. TX (with few lakes)? If so, those parenthetical phrases would make this comparison clearer.
- l) p. 61, right column: It is not clear to me how the fact that SAB is reviewing a white paper on expert elicitation relates to the rest of the paragraph. Perhaps a sentence clarifying the nature of the review or the conclusions of the white paper would help.
- m) p. 70, right column: when the Carson and Mitchell study was described earlier (p. 54), it stated that it only considered fishing, but here it says fishing, boating and swimming. That is not consistent with the earlier statement.
- n) On pp. 74 (right, line 6) and 78 (third bullet), it is not clear why category 5 is excluded from those lists. Surely those Category 5 benefits also require explanation and clarification.
- o) p. 75: what is *ceteris paribus*? Is that term really needed?
- p) p. 87, first bullet on left: also encourage regions to collaborate with ORD researchers.
- q) p. 87, first sentence on right: seek to understand what an INFORMED public views as valuable
- r) p. 104, right, bullet 3: For what it is worth, the SAB review of Ecological Research Program MYP said the same thing.
- s) It is unclear why Dr. McCarty did not sign letter to the Administrator since it appears that he was also a Chair of the committee. There were two chairs and a vice-chair?

4. Dr. Otto Doering

Coming into this report late in its development, I have provided a limited number of comments.

The draft does respond to the three specific charges in the report

The draft is, at the same time, dense, deep and broad. It is not a compelling document.

While conclusions are based on the evidence in the report, there are moments when multiple discussion in the report may weaken conclusions, and there are conclusions that repeat, overlap or intersect. While this may be an accurate reflection of the landscape covered, the conclusions then seem less strong.

Given the length and dense complexity of the document it is especially important the executive summary be clear, direct, and highlight the most critical points from the report. I believe that the summary could be improved by:

- Being more explicit about the critical nature of the link between the biophysical response and valuation. If we do not have a good knowledge of the biophysical response, the valuation of an unsure response is not very valuable. If biophysical response is not well known, do we want to provide this information to survey respondents who are to provide input for valuation? If the uncertainty about the biophysical response is large and the uncertainty about the valuation method is small, the result will not necessarily be useful. Both uncertainties need to be known.
- Trying to eliminate even the appearance of repetition where closely related items are given separate attention. I.e. merge what can be merged.

For the three key recommendations:

- Number 1., again, if we are to identify the ecological responses that are of greatest importance to people, we have to start with validated ecological responses. I am also not sure whether this process would expand or in fact narrow the range of ecological responses that EPA characterizes or quantifies for which it estimates values.
- Number 2., following on number 1, are we predicting ecological responses in terms that are relevant to valuation or relevant to peoples' concerns? This recommendation seems contradictory at times.
- Number 3., I feel it would be important here when discussing a wider range of possible 'valuations' to mention indicators (which are discussed in several places later in the report – ex. 3.4.1) and also such things as tipping points and irreversibility which may have more meaning to the public than some other metrics.

In the discussion of implementation:

- 2nd bullet under implementing #2 gets to the ability to predict ecological response as being a most important part of the process (and

then there is a statement in the report that ecological models can only reflect history, not look forward).

- 5th bullet under Implementing #3 discusses uncertainty with respect to valuation efforts. I would suggest that uncertainty analysis with respect to the biophysical projections is equally important.

- The last paragraph under implementing # 3 is extremely important and should be stated more strongly

Overall, I believe that the whole notion of validation gets short shrift. This should be an issue raised in the executive summary, not just in the text. The validity issue does get some treatment on page 41. However, one part of the discussion starts with the phrase “ Ideally, a method should measure only what it is supposed to measure.” I would state this more strongly than “ideally”. There is little in the report discussing how our biophysical response information and our valuation results might be better validated. The validation issue should be front and center in 2.3.2, for example, in the transfer issue. There is a mention of validity on page 23 that refers to section 4.1. where again questions are asked, but only modest guidance is given.

Finally, I find this report myopically focused on EPA doing everything by itself. I do not believe that the resources are available or forthcoming for this to occur. The major issues of this report are being struggled with by other agencies who are attempting to accomplish similar or related goals in many cases. While regulatory standards may have to be “invented” by EPA, there is certainly room to learn from what others are doing in biophysical modeling and valuation. I would suggest as examples the Conservation Effects Assessment Program at USDA, the long term work of the forest service on valuation, and some of the ecological studies and modeling of the Fish and Wildlife Service. Even if these do not fit EPA’s needs or are not of sufficient quality for EPA’s responsibilities, they may prevent EPA for expending resources in others blind alleys. It would have been helpful if more information were given about what others are doing. Mentioning the need for partnering with other agencies and state and local governments is less compelling than a brief review of what might be available at other agencies working in this area. Using Portland and Chicago case studies make the case for reaching out at all levels even more compelling.

5. Dr. James Galloway

I have reviewed the draft report in the context of the three items below [SAB quality review charge]. For all three, I find the committee has done an excellent job.

6. Dr. James Hammitt

I’ve read much of this report and think it is excellent. I have no issues to raise.

7. Dr. Steve Heeringa

Just a note to say that I read the draft report, "Valuing the Protection of Ecological Systems and Services" with interest (although minimal expertise). The report is well-written and to my reading very informative. In today's federal research funding environment it will be difficult to support the research requirements for the in-depth, integrated and often iterative valuation approach that the report advocates. Nevertheless, those constraints should not unduly shackle the recommendations for a scientific approach that is optimal for addressing the complex ecological, health, political and social components that factor into a true valuation of ecological systems.

8. Dr. Rogene Henderson:

I reviewed the submittal letter, the charge and the executive summary of this report.

1. Are the original charge questions to the SAB Panel adequately addressed in the draft report?

This report is a little different from most SAB reports I have reviewed, in that the charge questions are from the SAB, not the Agency. The charge questions are rather broad and not as specific as Agency charge questions usually are. But based on the executive summary, I would say they were well addressed.

2. Is the draft report clear and logical?

The part I read was well-organized. There were parts of the executive summary that I misunderstood (see next question).

3. Are the conclusions drawn, and/or recommendations made, supported by information in the body of the report?

The first line of the first key recommendation reads, "Identify early in the valuation process the ecological response that are likely to be of greatest importance to people,....." This type of phrase is repeated throughout the executive summary, even stated in one place as the need to consider the "spiritual and moral values" of the people. So when I came to the implementation section for Recommendation #1, I expected to see a recommendation to use some type of stakeholder input in the valuation process. Instead, it was recommended to use involvement from EPA staff as well as outside experts in the bio-physical and social sciences. This contradiction exists through out the executive report with cautions to include components that the public values, but little indication that the public will be asked what they value.

The only place public input seems to be mentioned is at the top of page 6 left column, when it is stated that "EPA can identify public concerns

through a variety of methods, drawing on either existing knowledge or interactive processes designed to elicit public input." Otherwise the advice seems to be unidirectional from the EPA to the public. See sentence at top of page 6, right column, "Regional-scale analyses hold great potential to inform decision makers and the public about the value of protecting ecosystems and services..."

I looked at Chapter 4 of the report, "Methods for assessing values," and community input is described. Perhaps a bit more of that approach could be mentioned in the executive summary.

9. Dr. Bernd Kahn

The draft report is well done. Addition of a table of acronyms and abbreviations would be helpful to the reader.

10. Dr. Agnes Kane

Thank you for sending the draft report on valuing the Protection of Ecological Systems and Services. This is an excellent document that should serve as a model for clarity and presentation of complex information. The inclusion of case studies is very helpful; this could be improved by actual maps or photographs. This approach would also be very useful for Superfund sites and Brownfields.

11. Dr. Meryl Karol

The report is excellent, clear and logical. Its conclusions and recommendations are supported by information in the body of the report.

The following are suggested revisions:

- a) A list of acronyms would be helpful. For example, RIA is used throughout, and appears to have been defined only once (in the Executive Summary). Also, please consider adding a glossary.
- b) The figures and tables are excellent, but are the photos necessary? I found the latter neither helpful (ie, illustrative) nor interesting.
- c) The first of the 3 key recommendations (p. 4) is somewhat confusing. I had to read it several times to gain understanding. Can it be stated more simply?
- d) There appears to be excessive use of the word "also" in lead paragraphs (ie, p. 102, para 7.5.3, line 1; p. 104 para 7.7, line 1; p.103, para 7.6).

12. Dr. LD McMullen

I have read the report and have found it very interesting. While I agree with the concepts that were contained in the report, it seems like a big hill for EPA to climb. I know how hard it is for the agency to develop regulations just on economic issues and not get sued for their decisions. That is not to say that they should not try additional approaches which is just what the report proposes. As to the charge questions:

Assess EPA's needs for valuation to support decision making. I feel that the report identifies areas that EPA should consider other than just economic. The discussion of value determination was good and provided a broader look at rule making. I liked the CAFO example, which I have personal knowledge of in Iowa. I think they covered this charge question.

Assess the state of the art and science of valuing the protection of ecological systems and services. This section of the report was very valuable. The discussion of the different methods and the additional reading for each was excellent. What it really shows is how many different ways there are to look at a particular problem. This was the real meat of the report. I really like chapter 6 when the ideas were applied to real decision making at EPA. It really pulled the material together.

Identify key areas for improving knowledge, methodologies, practice, and research at the Agency. This was covered through out the report. It was clear to me that the ideas contained in the report are sound; however, the application of the ideas is new and needs some additional research. I feel that spreading the needs for research through out the report was the most appropriate approach.

In conclusion I feel that the report addresses the charge questions and was very well written.

13. Granger Morgan

I have quickly looked over the report "Valuing the Protection of Ecological Systems and Services". While it is well written and Ch 4 describes a reasonable set of strategies, I am troubled that it does not include a strategy that I outlined on several occasions to folks involved in this effort.

While sometimes it is possible to value an ecological system or service, I have argued that there will likely be many cases in which this is not straight forward. In such cases one would be well advised to turn things around, work backwards from the decision at hand, and ask, how large must the valuation be before the decision changes. If that quantity strikes the decision maker (and/or the public(s)) as very modest, then clearly additional thought, assessment, and consideration about the decision is in order. If, on the other hand, that quantity must be indefensibly large before the decision changes, then probably the proposed decision is defensible.

I am also a bit troubled by the discussion of uncertainty. It would be nice to see a much sharper distinction drawn between uncertainty about the value of coefficients and the functional form of models of ecosystem impact (and similar models) VERSUS uncertainty about the value to be placed of a well specified ecological change. It makes sense to put PDFs on the former and do stochastic simulation (as the report suggests). In my view it does NOT make sense to do that with value parameters themselves. If you don't know what your values are,

then they should be treated parametrically so that you can see the consequence of the choice (see Section 4.3.4 in Morgan and Henrion, *Uncertainty*, Cambridge, 1990).

I note on pg vi that I am not listed as a member of the Board.

14. Dr. Duncan Patten

Comments on November 2008 Draft Report on “Valuing the Protection of Ecological Systems and Services” by Duncan Patten.

This is a much improved draft from the 2007 draft. Several issues are bothersome. Some I mentioned in my review of the 2007 draft and one that I did not catch the first time around.

Title: This is not a report just on valuing “protection” of ecological systems, it is one of valuing potential actions of EPA on ecological systems, protection being one. I’m not certain what a better title might be, but perhaps one that recognizes the purpose of the report, that is, to value decision making and actions of EPA.

Another point I made in my review which was mostly accepted but still needs some modification of the text is the use of the word “change” when discussing the result of EPA actions on ecosystems. The report mostly implies that EPA decisions or actions create changes (e.g., improvements) in ecosystems and that these can be valued. If the word in the title “protection” is what is really meant, ecosystem responses to decisions may be one of “no change” and the lack of change, or protection, can be valued. The authors changed the word “change” to “response”, as in Ecosystem Response, in many cases in the text, but many places still need to be considered for changing “change” to “response”. Examples of need to change the word “change” to “response” can be found on pages 45 and 56.

Relative to the three topics to be considered for this report.

- a) The original charge to the committee has been more than adequately addressed. Perhaps the most useful parts of the report are the “conclusions” and perhaps the Executive Summary. There is a lot of supportive material for this in the text but the conclusions do a good job of summing up the main points that address the charge.
- b) The draft report is complex in some portions and more understandable to those who do ecosystem valuation, or other non-market types of valuation, but overall, it is well written, well organized and clear and logical.
- c) As pointed in #1 above, the conclusions are well presented and follow the extensively developed text in the body of the report. The conclusions

are actually a brief set of recommendations which will be useful to EPA and those who do ecosystem valuation.

15. Dr. Valerie Thomas

The report is beautifully put together and the examples and discussions are detailed and well crafted. As discussed below, the scientific status of valuing the protection of ecological systems and services does not come through clearly enough; the report would be stronger if the science, with its strengths and its weaknesses, were more prominently characterized and evaluated.

The charge questions, as summarized in the Executive Summary, are (1) to assess EPA's needs for valuation; (2) to assess the state of the art and science of valuing the protection of ecological systems and services, and (3) the identify key areas for improving knowledge.

Charge question 2, the state of the art and science, is not clearly or explicitly assessed. The state of the art is addressed in terms of EPA's practice, but the state of the art in the scientific community in general is not specifically clarified. The report is written as advice for improving the practice of valuation at EPA. What's missing is a clear discussion, including in the letter to the administrator and in the Executive Summary, about what is and is not established, known, or feasible in valuing the protection of ecological systems and services. In the charge, EPA asked about the science, and art, of valuation, and how knowledge could be improved. The draft report is about what EPA can do to improve its valuations, which is not quite the same.

A clear review and assessment of the state of the science of valuation could significantly strengthen the report and could be important to justify further research in this area. One of the reasons, I think, that EPA's valuation efforts have been limited is uncertainty about the validity of valuation methods. EPA has asked about the science: what can and cannot currently be done, or what is and is not currently known about valuation. Throughout the text there are a number of sentences or passages that address the capabilities and limitations of the science. Bringing together a complete statement of the state of the science would strengthen the report. This would include about half a page in the Executive Summary plus a long section in one of the chapters. Alternatively, each of the "conclusions and recommendations" sections could be revised to address the state of the science and how to improve knowledge. Currently these sections are phrased recommendations for what EPA should do in its valuations, rather than as statements about the state of the science.

Specific examples of "state of the science" points are listed below:

On p. 35, section 3.4 is the statement "development of a broad suite of ecological production functions faces numerous challenges...", yet the Executive Summary, page 5, Implementing Recommendation #2, says

“where possible, use ecological production functions to estimate...” SAB seems to be recommending, then, a process to EPA that will not be feasible in many cases; that should be made explicit.

For the indicator approach, the statement on p. 36 is “There is currently no agreement on a common set of indicators.” This is an important statement about the state of the science and should be one of the points brought out in a state-of-the-science discussion. The discussion of the meta-analysis approach, p. 37, is quite short, and the question of “state-of-the-science” is not directly addressed.

On page 39, the recommendations to EPA have too many “EPA should” statements. The same thing can be said, a little more gently, without repeating “EPA should” eight times.

On page 55-57, value transfer is discussed. Here again, a state of the science statement could be made, along the lines of “value transfer methods need to be developed.” [Also, to improve clarity, a different term than “value transfer” should be used in the table of contents listing and heading of this section, so that a quick reader (e.g. the Administrator) can more easily grasp the meaning. Something like “The challenge of using valuation results from one setting in a different setting.” (When I first read the heading in the table of contents, I thought it meant how financial benefits are transferred from one party to another!)]

On page 74, expansion of valuation beyond monetized benefits is discussed. The discussion indicates that the science is not yet developed to identify scientifically based indicators, and that EPA would be developing the science by pursuing this approach. This exploratory nature of the recommendations should be highlighted explicitly as part of the State of the Science discussion. Also, re-writing this section to discuss how the science and art of valuation can be improved would make it more effective than the “EPA should” formulation of the current draft.

The conclusions, p. 100, include “ information based on some of the other concepts of value may also be a useful input into decisions affecting ecosystems, although members of the committee hold different views regarding the extent...” Here again the text is indicating that some of the approaches suggested in the document may turn out not be useful, and are controversial and uncertain. This should be made explicit in a discussion of the state of the science.

The conclusions, p. 101, also include the statement “EPA’s ability to do this today is limited, presenting a barrier to effective valuation of ecological systems and services.” This conclusion should be brought up to the Executive Summary and Letter to the Administrator, and also would

be better phrased not just in terms of what EPA can do, but more generally as part of the state of the science.

16. Dr. Thomas Wallsten

This draft report is overall an excellent document. It is thoughtful, informative, forward-looking, well organized, and reads well. My comments are divided into two parts, one mentioning features of the report I particularly want to commend and the other mentioning items, aspects, or points with which I take some issue.

There is much to praise in this document. Notable points include:

- The recommendation to use a broader suite of methods than only economic valuation. The authors recommend that EPA also use quantitative, non-economic methods where appropriate and allowable, as well as other more qualitative methods of assessing and expressing valuations. This point is expressed throughout the document and summarized well in Section 7.1, “An expanded, integrated valuation approach.” I do have a concern here, however, which I outline below in the section on criticisms.
- The recommendation to develop conceptual models to guide ecological valuations at the beginning of the valuation process. This point is developed most thoroughly in Section 3.1.
- The related recommendation to work across levels to map ecological responses to ecological services that can be valued, as illustrated in Figure 2 on page 29.
- The recommendation to use regional analyses as testing grounds for new valuation techniques and approaches, as methodology here is less constrained by Federal legislation, rules, and regulations than in the case of national rule making.
- The related recommendation that EPA develop research strategies for improving valuation methods.
- Distinguishing “informed” from “uninformed” valuations with strong recommendations to rely on the former. The authors also include some recommendations for how to inform participants about the complexities of an issue prior to carrying out valuation exercises. This point is particularly important as the process of informing can subtly change to one of influencing opinion. Research could usefully be done here to establish guidelines for this process.
- Distinguishing revealed from constructed values. While I praise the authors for including this distinction, I do not think that they treat it entirely appropriately and will comment further on it below when I take up criticisms.
- The excellent Section 4.3 on value transfer.
- The excellent Chapter 5 on uncertainty and communication. Section 5.2 particularly stands out.

- The recommendation that uncertainty estimates not be hidden in appendices, but be included in the bodies of reports, even given their own chapters.
- The excellent summary of the entire document in Chapter 7.

Points that I take issue with in the report, sometimes in a minor way and sometimes to a larger degree, are as follows:

- As indicated above, I commend the authors for recommending that a suite of valuation techniques be employed. However, assuming that the full array of results is provided to decision makers, as I believe the authors intend, they may need some guidance on how to consider and balance the different types of valuations. The report does not address this point.
- Relatedly, when full discussions of uncertainty are included in the body of valuation reports, the resulting text could be overwhelming and the decision makers at whom the reports are aimed may suffer from information overload, causing them to disregard or misinterpret important portions of the material. The report does not address this point. The authors might consider recommending research on ways to address the problem.
- The discussion of issues of the validity of valuations (e.g., pp. 41-42) can be improved. *Validity* refers to the degree to which a scale properly represents the underlying construct of interest; and it is often very difficult to quantify. *Construct validity*, which is what the authors are concerned with here, is bound up with models of how the latent construct of interest manifests itself in observable behavior. None of that comes through in the current discussion.

The issue is complicated and the authors are not to be faulted for not having solved it here. However, they should give a better flavor of the problem. For example, everyone would agree that the indices listed on pages 41 and 42 are *necessary* for validity, but they certainly are not *sufficient*.

- On page 37 and elsewhere, the authors discuss meta-analysis and data aggregation almost synonymously. (E.g., the second sentence in Section 3.4.2 begins “Meta-analysis, or data aggregation, involves collecting data from multiple sources ...”). This is misleading, as the term *data aggregation* can refer to any method for combining data within or across studies, while *meta-analysis* refers to a very specific (and growing) set of statistical techniques for combining comparable data from multiple studies into unified models that assess overall significance as well as statistical effects due to various factors that may differ across the studies. The authors make this point themselves on pages 53 and 54, but do not maintain it consistently throughout the report.
- The authors refer to *constructed values* (as opposed to *revealed values*) in Table 2 on page 43, but then in Section 4.2.4 (first sentence) state “Decision science valuation methods presume that individuals’ *preferences* need to be *constructed* (emphases added) through a deliberative process that helps individuals understand and assess tradeoffs among multiple attributes.”

Three important points are being somewhat confused here, in my opinion: revealed preferences, constructed preferences, and constructed values.

Behavioral decision scientists do distinguish between *revealed* and *constructed preferences*, but not in the way implied in the report. The term *constructed preference* refers to the fact that people often unconsciously construct their preferences as a function of how the preference is elicited rather than simply reveal pre-existing preferences via the pattern of their choices. (Thus, e.g., it is easy to create situations in which someone will choose A over B, but offer to pay more for B than for A.) The *constructed values* that the authors mention often are elicited in aided decision analyses and they often are very useful, but they do not imply constructed preferences.

- The behavioral decision scientists' distinction between revealed and constructed preferences is especially important when considering *willingness to pay*, *willingness to accept*, and other *contingent valuation techniques* (CVT). The authors refer uncritically to these techniques at various places throughout the report, yet the techniques often are criticized and a useful literature that can guide valuations has developed on this topic. The criticisms have precisely to do with the distinction between revealed and constructed preferences. If preferences simply were *revealed* through CVT, they would be consistent across techniques, but they tend not to be, suggesting that they are *constructed*. The report should make mention of this issues.
- The authors correctly recommend use of Monte Carlo methods for characterizing uncertainty. On page 61, they mention that failure to include covariance among model parameters can lead to unreliable results. This statement should be stronger, as such a failure can lead not to unreliable but to misleading results.

These comments notwithstanding, this is an excellent, thoughtful, and very useful report.