

**Summary Minutes of the
U.S. Environmental Protection Agency (EPA)
Science Advisory Board (SAB)
Committee on Valuing the Protection of Ecological Systems and Services (C-VPES)
Public Meeting – May 1-2, 2007**

Committee Members: (See Roster – Appendix A)

Scheduled Date and Time: From 8:30 a.m. to 5:30 p.m. (Eastern Time) on May 1, 2007; and from 8:30 a.m. to 1:00 p.m. (Eastern Time) on May 2, 2007. (See Federal Register Notice, Appendix B)

Location: Woodies Building, 1025 F Street, N.W., SAB Large Conference Room, Room 3705, Washington, DC 20004

Purpose: The purpose of the meeting was for the SAB C-VPES was to discuss a draft advisory report calling for an expanded and integrated approach for valuing the protection of ecological systems and services. The report relates to the Committee's overall charge: to assess Agency needs and the state of the art and science of valuing protection of ecological systems and services, and then to identify key areas for improving knowledge, methodologies, practice, and research

Attendees: Chair: Dr. Barton H. (Buzz) Thompson, Jr.
Vice-Chair: Dr. Kathleen Segerson

Committee Members: Dr. William Louis Ascher
Dr. Gregory Biddinger
Dr. Ann Bostrom
Dr. James Boyd
Dr. Robert Costanza
Dr. Terry Daniel
Dr. A. Myrick Freeman
Dr. Dennis Grossman
Dr. Robert Huggett
Dr. Douglas E. MacLean
Dr. Harold Mooney
Dr. Louis Pitelka
Dr. Stephen Polasky
Dr. Paul Risser
Dr. Homes Rolsten
Dr. Mark Sagoff

C-VPES Consultant: Dr. Joseph Arvai
Dr. Allyson Holbrook

SAB Staff Office: Dr. Angela Nugent, SAB Staff Office, Designated
Federal Officer (DFO)
Dr. Vanessa Vu, Director of the SAB Staff Office
Dr. Anthony Maciorowski, Associate for Science,
SAB Staff Office

Meeting Summary

The discussion addressed the topics included in the Proposed Meeting Agenda (See Meeting Agenda - Appendix C) and roughly followed the sequence summarized below.

Opening of Public Meeting

Dr. Angela Nugent, Designated Federal Officer (DFO) for the SAB Committee on Valuing the Protection of Ecological Systems and Services, opened the public meeting at 8:35 a.m. on May 1, 2007.

Dr. Vu welcomed committee members and expressed appreciation for their hard work and progress on the draft report. She remarked on the importance of developing and implementing an effective communication strategy that will help the report have a wide impact. She thanked the chair and vice-chair for their leadership and the DFO for her efforts.

Introduction of members and consultants and review of agenda

Dr. Buzz Thompson, chair of the Committee, thanked Dr. Vu for providing the resources to sustain the committee's work. He thanked fellow committee members for the progress made and especially Dr. Segerson for her efforts in developing a coherent document. He thanked the DFO for her support for the committee. Dr. Thompson asked committee members to provide editorial and substantive comments that did not warrant discussion by the full committee to Dr. Nugent by May 11, 2007. He noted that the purpose of the meeting was to hold substantive discussions on issues that need to be resolved before the document is revised and sent to a technical editor. Committee signoff will happen at a future date, after the document has been revised and edited.

Committee members then provided brief comments on the overall report. One member spoke of the importance of revising the report so that it speaks with a single voice and holds, as much as possible, a single viewpoint. Presently, he noted, it reads like a series of essays with different points of view. One important issue is to clarify whether the report throughout should emphasize "ecosystem services" or only those "benefits people recognize they receive from ecosystems." Dr. Thompson spoke of the importance of EPA's educating the public regarding the values received from ecosystems. The Agency's task is greater than simply focusing on--and valuing--services that people recognize. Dr. Segerson noted the importance of maintaining a consistent tone throughout the report and especially in recommendations on this point.

Another member noted that the report often creates a false dichotomy between experts and the lay public. She observed that communications scientists generally understand communication in a more complex way. There are different publics and different kinds of expertise. Disciplinary specialists often value things differently and have a variety of different

kinds of expertise. The member suggested that the report describe a continuum, from people who have little incentive or interest to find out about ecological benefits to scientists who have specialized expertise in a particular area. She spoke of the need throughout the report to refer to a continuum of knowledge and expertise. Another member suggested that definitions of "publics" and "experts" be included in the table of usage of terms.

Dr. Segerson asked for specific replacement language throughout the text on these two points.

Discussion of Part 1, Overview (pp. 6-47): new and significantly revised text, recommendations, and committee-identified issue

Dr. Thompson began the discussion by focusing on written comments received from committee members (Appendix D) prior to the meeting. He noted one comment that called for addition of text introducing Figure 1 by discussing the purpose of valuation in assisting decision-making. Valuation is not to be conducted for its own sake, but instead to enable the Agency to make better decisions.

Another comment called for a brief discussion in Part 1 of different concepts of value and how choice of method relates to the type of value that needs to be understood or assessed to inform a decision. This commenter called for the report to evaluate the theoretical coherence or rationale underlying methods. He viewed it as appropriate for the committee to express differences of views on this point, if necessary. He called for the report to "get under the surface" of methods, so that the reader can make choices among valuation methods.

The same commenter also asked for the report to clarify what was meant by "an integrated approach." The committee then focused on the implications of advising the Agency to use a multi-method report. One member asked about the merits of using one method to "cross-check" another, if methods have different theoretical assumptions. Different methods may be measuring different things. Members noted that it might be valuable to replicate valuation measures, but that replication does not ensure accuracy. Some members spoke of the usefulness of comparing the result of methods with different theoretical bases. The logic of different approaches can differ, but together they may be useful as input for a decision. If methods with completely different starting assumptions are used and the results coincide, then there may be a robust conclusion that may be useful for decision makers. One member noted the importance of this "conciliance." Another member noted the importance of clearly indicating in the report the kinds of expertise needed to use different methods, so EPA can plan for the resources needed for using methods of different kinds. Yet another member noted that cross-validation must be considered from a decision perspective. In the context of this report, cross-validation does not involve validating other methods, because the aim isn't determining "which method is correct." Instead, the goal of cross-validation is to inform and support EPA decisions. A member suggested that the term "conceptual pluralism" might be more acceptable than "validation," which is understood mainly in the context of replicating other methods.

The committee generally agreed that Part 1 of the report should briefly lay out the conceptual foundations of methods, explain that not all methods do the same thing, discuss "conceptual pluralism," and address the need to make choices among methods, based on decision needs. One member expressed concern over the term "conceptual pluralism" and did not want the committee to support a "free-for-all" that was not selective or appropriately critical about methods. Another member suggested the term "critical multiplism." He suggested that by

identifying early in the report the conceptual bases of methods and by stressing the importance of EPA's deciding what it intends to measure, the report will be better able to discuss how individual measures contribute to an overall decision-making process and how the roles of experts and publics relate.

The committee then discussed the need for the report to clarify what is meant by "an integrated approach." They discussed the need for the document to discuss how to choose from the "menu" of methods and use the process to "put together a credible, useful valuation." Dr. Vu cautioned the committee against viewing the report as a guidance document. In her view, the report could just be illustrative of how methods might be used. Developing a guidance document would require more work and more detail and may be a more appropriate role for the Agency. She urged the committee instead to clarify its goals and bottom line recommendations for the Agency. It may be appropriate for those goals to include raising awareness, showcasing how valuation could be done differently, urging EPA to get resources, or urging EPA to develop a guidance document.

Another member spoke of the importance of Part 1 Section 2.4 discussing the importance of "context" in the choice of valuation approach. He suggested developing a protocol or set of questions that the Agency could use to structure its valuation approach and choose questions. The "protocol" would give the Agency a sense of what they need to know and understand before they make choices." The protocol could include questions about:

- the decision context goals and objectives
- state of ecology
- what the public knows about ecological values at stake and where gaps are

The "protocol" would be a set of questions to help the Agency frame the problem in its public policy setting. The report needs to convey that the valuation is not an analysis conducted in a vacuum or in an academic setting.

Another member suggested that a major message of the report is that "there are more valuation approaches than you might think. They reflect different concepts of value and different logics. This report will help you incorporate a broader range of ecological values into analyses, by using methods judiciously." Yet another member suggested that Part 1 offer readers a "compass" for using the toolkit of valuation methods described in the report.

The committee discussed the need for the report to help the Agency use a broader suite of methods, not simply the methods the Agency has used in the past that they perceive as low risk. They discussed the need for the Agency to use newer methods especially in site-specific and regional context where the legal restrictions may be less constraining or in post-hoc valuation, where the Agency can use an enhanced suite of methods for communicating the benefits of ecological protection. The committee then briefly discussed a proposed communication plan (Appendix E) that discusses the intended audiences for the report. Members suggested clarifying the message for each group and emphasized the importance of communicating the message that the Agency should have the confidence to use and test methods so that "they don't just play it safe." They also asked that regional staff be added as a distinct audience for the report.

Dr. Thompson summarized the discussion by noting that the committee had agreed that Part 1 Section 2 of the report will include a discussion of the concepts of value underlying major groups of methods and that the committee would discuss this new text in a telephone conference to be scheduled for June. He noted that the report would also include a discussion of the "compass," i.e., questions or criteria for selecting methods. He also noted it was important to include a recommendation for EPA to use methods not used previously, especially in regional

and local contexts and to build body of data that can demonstrate the effective application of methods.

The committee then turned to section 2.4. Several members noted that the tone of the section did not convey the message that valuation needs to reflect ecological benefits to people. One member noted that the "gold standard is benefits; if people don't perceive that, there's a problem." Another member responded that the report cannot "swing to the other pole and endorse 'experts decide all'." He noted that there needs to be a mix between expert and lay understanding and contended that the report should clearly state that there is no one way to measure value. Another member noted the importance of highlighting methods that bring experts and general publics together. The existing text suggests a polarization and does not provide guidance for next steps for the Agency. Other members noted that it is important to recommend a partnership between experts and the public at large to identify the benefits to the publics at large. One member noted that the public often doesn't understand the linkages between actions and consequences. Experts can help explain those benefits. It is important to distinguish between impacts/consequences and benefits. Benefits are what informed people care about. Other members supported this formulation. One emphasized the importance of integration of different perspectives. The chair and vice-chair noted an agreement among the committee on these points and acknowledged a need to revise the tone of the section.

The committee then discussed comments received from Dr. Paul Slovic, who could not attend the session. Another member supported Dr. Slovic's view that the discussion of response order and constructed preferences could be more carefully discussed. Dr. Allyson Holbrook noted several points where the discussion of constructed preferences could be bolstered with citations and the text clarified. Dr. Joseph Arvai agreed. Both agreed to provide more detail and citations for the revision of the section.

Dr. Thompson then noted that Dr. Slovic had provided written comments suggesting that the report include as a major recommendation that the Agency conduct research on valuation methods because none is ready for use in valuation. He also noted that Dr. Slovic did not believe that there had been demonstrated a clear need for ecological valuation methods. Members of the committee took issue with this view and observed that the example of the Combined Animal Feeding Operation valuation demonstrated the existence of a problem. They also noted that the Agency is required by law and by Executive Order to conduct valuations and is currently conducting them. Members spoke of the need to provide advice to assist the Agency to improve valuations for the future. Dr. Thompson stated that he would talk with Dr. Slovic about his comments and the committee's discussion of them.

The committee also briefly discussed the need for Part 1 of the report to discuss that ecological benefits must also be integrated in Agency decision making with other kinds of benefits (e.g., health benefits, agricultural and crop benefits).

The committee then discussed several issues related to the titles of the report and its sections. They discussed titling the report as a whole "Valuing the Protection of Ecological Systems and Services." They discussed renaming Part 1 as "Conceptual Framework and General Approach." They spoke of renaming Part 1 section 6 as "Recommendations."

The committee discussed the major recommendations of Part 1. They agreed to revise and expand the set of recommendations in the current draft to address the following:

- valuation needs to reflect ecological benefits to people
- different methods measure different aspects of value

- Agency should move beyond its current practice of using methods that have previously passed OMB review; need to test methods and accumulate experience in valuation
- Need for ongoing partnership between public and experts in valuation
- Importance of context for choosing valuation methods.

Dr. Thompson asked a subgroup to undertake the revision of Part 1 Section 2. A subgroup of Dr. Robert Costanza (lead), Dr. A. Myrick Freeman, Dr. Douglas MacLean, and Dr. Stephen Polasky agreed to work to revise Part 1, Section 2 by May 21, 2007. Dr. Allyson Holbrook and Dr. Joseph Arvai agreed to provide text and citations, at Dr. Costanza's request to strengthen the discussion of constructed preferences.

Discussion of Appendix A: Survey Issues for Ecological Valuation: Current Best Practices and Recommendations for Research (pp. 325 - 355)

Dr. Holbrook began the discussion by summarizing the revisions to the Appendix since the C-VPESS teleconference on March 6, 2007. She noted that the Appendix had been shortened, the tone changed, and that the role of the Appendix *vis à vis* other sections other sections of the report had been clarified. She and Dr. Jon Krosnick had tightened the focus to summarize recommendations for conducting high quality surveys.

The committee chair noted that the Appendix was quite valuable and interesting. Members made the following suggestions for revisions:

- expand the section on transfer of survey information on p. 339 or identify it as an area for research
- add discussion of importance of timing of ecological impacts, relative to biological cycles.
- centralize recommendations for a well-conducted survey, possibly pulling out recommendations in a text box
- expand the discussion about conveying large amount of information, providing more specifics.
- address issue of learning -- either provide a more expanded discussion of how much learning changes your values or just identify the issue and reduce discussion to one paragraph.

The committee then discussed the need for a separate section in Part 2 of the report devoted to benefit transfer generally. Members agreed that benefit transfer is a key issue for EPA. Members discussed the desirability of criteria or principles to guide the Agency. They noted that it would be helpful for the Agency to check benefit transfer information to see if it "makes sense" in the target application. One member noted that there was a 2-page discussion of transfer of ecological data in Part 2 Section 2 of the draft report. Dr. William Ascher agreed to develop draft text for the committee's review, with the assistance of Drs. James Boyd, Stephen Polasky, and V. Kerry Smith. The committee noted that EPA had convened a workshop on benefit transfer in 2005 and that a special issue of ecological economics had been devoted to benefit transfer.

The committee chair asked Dr. Holbrook to revise the survey text based on committee discussion and to identify topics for future SAB work related to strengthening the science underlying EPA's use of surveys.

Discussion of Part 2, Applying the Approach (pp. 48 -199): new and significantly revised text and committee-identified issues

The committee began its discussion of Part 2 of the draft report by focusing on Part 2, Section 2, "Implementing the Concept of Ecosystem Services." They noted that the new section included a definition of endpoints and guidance for choosing them. Dr. James Boyd, who drafted the section, stressed the importance of publics working with experts on this issue.

Members discussed the following issues:

- placement of Figure 3 seems out of sequence. Dr. Harold Mooney committed to identifying an alternative location in the report.
- recommendation/statement on page 73, line 13 ("Technical expressions or descriptions meaningful only to experts are not ecological endpoints") seems problematic because it appears to remove experts from a key role in determining endpoints
- Use of term "endpoints," which some member viewed as a "problematic term." because it did not clearly relate to established literature on ecosystem services and drew attention away from ecological processes contributing to the "endpoints" (i.e., clean water is desirable, but what contributes to it).

Committee members discussed the need to identify endpoints for social science analysis. One member spoke of the value of commonly identified endpoints. Members agreed on the importance of enhancing understanding of how factors and production functions relate to endpoints. One member emphasized the importance of defining ecosystem services as benefits to people and then saying that endpoints can be identified. Ecosystem services could be direct in some contexts and indirect benefits in others. He characterized the ecosystem as an input/output model. Endpoints, or direct ecosystem benefits, would be outputs that are benefits to people. He noted that delineating the set of endpoints or direct ecosystem benefits may not be quite so clear as one might think and also noted that it may be useful to refer to the field of ecosystem health.

One member suggested that it may be useful to identify biophysical attributes that are as close to what is valued as possible. Then, the "ecologist would work backwards; the social scientists would work forwards." Other members took issue with this notion and also with the "baton" metaphor, which "ran counter" to the C-VPESS notion of a systems approach and partnership among experts and between experts and publics.

Another member expressed a concern that the discussion of ecosystem services in the draft report does not contain a discussion of system boundaries. In his view, services cannot be discussed without reference to a context. Determining inputs, outputs, endpoints and services are all contextual. He noted that even the concept of "clean water" is contextual. Some notions of "clean water" are so free of chemicals that the water would not sustain life forms. The committee chair agreed that the focus on the conceptual model in figure 4 is critical. How EPA "designs the box" and connects it to the policy goal or environmental issue to be decided is critical. It is important to go to the top of the box "but design it right." Emphasizing this point will help link the choice of ecosystem services to decision-makers' needs.

Members spoke of the importance of Figure 4. Any model of ecosystem services needs to "bring analysis to the top level." EPA's generic ecosystem endpoints stop before they "get to the top" and express services in terms of benefits to people. Such a model of ecosystem services would also need to include the "bottom level" of the diagram and show how ecological processes

relate to the top level. One member suggested organizing the text in Part 2 Sections 2 and 3 in relation to the diagram.

Members discussed the value of including an example. One member suggested that pollination might be an excellent example. A service in the agricultural domain might be pollinators' impact on change in quantity of crops. Another member cautioned against focusing the service discussion too narrowly; agricultural services would be only one type of ecological services benefit. He suggested that the text discuss whether analysis should "work Figure 4 up or down" to capture the appropriate services to value.

A member emphasized the need for greater clarity in the major message of this section of the report. Another member spoke of the usefulness of defining endpoints to help sharpen analysis and research.

Members discussed several other issues related to this section:

- the need to drop the term conservation science, conservation ecology. Several members suggested using the term "ecosystem science"
- the need to refer to a suite of experts and publics in discussions of ecosystem services or endpoints, not just economists and ecologists
- the controversial nature of identifying human health endpoints
- the need to include more discussion of indicators and to cite available literature.

Several members also discussed the need for the section to discuss ecological production functions more clearly and include more discussion of EPA's use of ecological models. A member suggested reviewing the production function diagram developed by a committee subgroup in 2004 and draft text on ecological models during that year.

Dr. Segerson and Dr. Harold Mooney agreed to work and consult with Dr. Risser to integrate Part 2 Sections 2 and 3 in light of the discussion. Dr. Bostrom agreed to provide some discussion of mental models and framing to help link the discussion to policy makers' needs. Dr. Pitelka agreed to provide draft text related to ecological modeling and ecological production functions.

Committee members then turned to a discussion of Table 5 in the draft report. Members generally agreed that a table would be useful. They discussed the value of including tables in several parts of the report and decided on the following:

- Table in Part 1 listing the methods and characterizing their conceptual bases
- Table in Part 2, prior to valuation context discussions, grouped by category, with page numbers
- Modified version of current Table 5 at the conclusion of the Methods section.

Members discussed several issues related to the structure of current Table 5:

- The column "who expresses value" presents a dichotomy that doesn't reflect the approach in rest of report.
- The "status" column should be consistent with description of methods appearing on page 300 of the draft report.

Dr. Thompson committed to additional discussion of the development of these tables on May 2, 2007.

Discussion of Part 3, Methods for Implementing Approach (pp. 200 - 324): new and significantly revised text, recommendations, and committee-identified issues

The committee discussed energy-based methods. A member commented that the write-up for energy-based methods incorrectly states the economic theory of value. Another member suggested that the section could be revised to remove language referring to classical economics and economics in general and that such revisions would make the section more acceptable to economists on the committee. Other economists agreed. Yet another member expressed concern that even if one accepted the premise that available energy or exergy is the only scarce factor of production, the connection to valuation is unclear. He asked about the wetlands example on page 212 and the logic that makes the energy analysis relevant to valuation. Another member seconded this view. A member asked whether the wetland example was generally a replacement cost, and, if so, how the dollar estimate is derived. Dr. Robert Costanza, the author of the section, responded that the dollar estimate is derived from the demand component built into an input-output model designed to reflect energy "going into the economy and energy coming out." He clarified the dollars reflects the production cost in terms of energy to produce land, labor, and capital. A member suggested that Dr. Costanza make more prominent the basic assumption on page 210, line 5 that "Available energy or exergy is the only 'basic' commodity and is ultimately the only 'scarce' factor of production, thereby satisfying the criteria for a production-based theory that can explain exchange values. An energy theory of value thus posits that, at least at the global scale, free or available energy from the sun (plus past solar energy stored as fossil fuels and residual heat from the earth's core) is the only 'primary' input to economic production." He urged the section to state more clearly that energy is primary for production and efficiency or the quality of energy is what we should be measuring.

Another member asked for the section to clarify how energy-based valuation would work. He asked whether more embodied energy is "a good or bad thing?" A eutrophied lake, for example, contains more embodied energy but that is not generally considered desirable. Dr. Costanza responded that it would be necessary in some cases to look at a larger system as the unit for valuation.

A member asked for the section to clarify the conditions under which such a production cost would provide a valid measure of value, consistent with economic replacement cost, and also how the concept is different from economic replacement costs.

Dr. Thompson asked members to provide Dr. Costanza with suggestions for revision of the section.

The committee then turned to a discussion of mediated modeling. One member suggested either that the section should be combined with the deliberative processes method or that it be included in part 2 as part of the discussion of prediction of biophysical effects. Another member responded that mediated modeling, as a process enabling lay people to interact with modelers, is a method that provides a sophisticated mechanism for publics to say "this (impact/resource) is important" and identify it for inclusion in the model. Another member stated that mediated modeling can also help publics, experts, and decision makers examine tradeoffs. The committee agreed that the section should appear in separate a subsection with decision-aiding methods because both methods have the potential for combining multiple steps in the C-VPES valuation process and could be used both for valuation and decision-making. The committee briefly discussed whether this subsection should be titled "Deliberative processes" or "Participatory processes," but came to no conclusion.

The committee adjourned at 5:30 p.m.

Opening of the Second Day of the Public Meeting

The DFO opened the meeting at 8:30 a.m. on May 2, 2007. The Chair suggested that the committee discuss: major issues related to the three valuation decision context write-ups in Part 2 of the report; major recommendations for Part 2 of the report; text that could be developed for the conclusion of Part 3 of the report addressing use of multiple methods; recommendations for Part 3; and other priority tasks for enhancing the usability/readability of Part 3.

Discussion of Valuation in EPA Decision Contexts

Drs. A. Myrick Freeman and Harold Mooney briefly discussed changes made to Part 2 Section 5 (Economic Valuation for National Rulemaking) of the report since the C-VPESSTeleconference on April 10, 2007 and comments received on the latest draft. In response to a written comment received, they agreed to change the title of the section to “Valuation for National Rulemaking.” They also agreed to insert brief text in the introduction clarifying that no Executive Order limits benefit analysis to economic analysis. They also agreed to revise the conclusions section so that it reflects the recommendations in the section.

Dr. Gregory Biddinger summarized the major changes to Part 2 Section 6 (Valuation for Site-Specific Decision Making) since the C-VPESSTeleconference call on April 3, 2007. He noted that he will make changes to the text box on Net Environmental Benefit Assessment in response to written comment received on the April 22, 2007 draft. He asked the DFO to work with the technical editor to find the best placement for the large case study text boxes. The committee then discussed changes made to Figure 7 and its appropriateness for the report. Several members of the Committee expressed concern over the terms in the figure, the logic of the figure, as presented, and the lack of consistency with other figures in the report. In response to Dr. Biddinger's concern that such a figure would be useful to Agency staff, the Chair asked the DFO to get feedback from Agency contacts on the utility and usability of the figure.

Members of the committee also asked Dr. Biddinger to revise recommendation 1 in the section to refer to ecosystem services “as important to key stakeholders” (not services considered important “by key stakeholders”). Dr. Biddinger agreed to make this change.

Dr. Stephen Polasky summarized the major changes to Part 2 Section 7 (Valuation for Regional Partnerships) since the C-VPESSTeleconference call on April 3, 2007. He noted that minor points need to be added to complete the section. Dr. Freeman agreed to assist in providing references to travel cost in urban settings. Dr. Polasky agreed to develop text to flesh out the Portland example. Dr. Polasky also noted the need to clarify the major recommendations of this section. The recommendations include the following: EPA can use the regions as a laboratory for valuation because there is great flexibility in types of valuation possible and Regions can utilize both a bottom-up (e.g., Chicago Wilderness-type) approach and top-down (e.g., South East Ecological Framework-type) approach. Members also noted the importance of emphasizing recommendations for information sharing across regions, the possibility of recommendations related to Long Term Ecological Research Sites, the opportunity for regional work to support national models, and how funding from EPA's Office of Research and Development might be used in the region to promote valuation.

Discussion of Report Recommendations

Dr. Thompson asked committee members to review the list of recommendations in the April 22, 2007 report (Appendix F) and identify the recommendations to highlight in Parts 1, 2, and 3 of the report.

Members identified the following recommendations to highlight in Part 1 (while emphasizing that the report is not a "recipe book" for valuation). They discussed that the high-level and secondary points might be re-organized to enhance communication in Part 1.

1. Think big—try to understand ecological systems and services as completely as possible/useful and what matters to people...analyze changes related to EPA actions
2. Highlight the concept of ecosystem services and provide a mapping from changes in ecological systems to changes in services or ecosystem components that can be directly valued by the public;
 - a. Start out with a conceptual model that captures all ecological services of concern and mapping
 - b. Make sure you have the top and bottom of the diagram and linkages between them (production function linkages) (Part 2)
 - c. Use ecological valuation information to be proactive in environmental protection
3. Expand the range of ecological changes that are valued, focusing on valuing the ecological changes in systems and services that are most important to people and recognizing the many sources of value, including both instrumental and intrinsic values
 - a. Requires input from inter-disciplinary group of scientists and stakeholders (pro-active education)
4. Utilize an expanded set of methods for identifying, characterizing, and measuring the values and services associated with these changes.
 - a. Recognize that value is multi-dimensional; make conscious choice about methods appropriately based on values and context of decision
 - b. Utilize local and regional opportunities to further develop an expanded set of methods that can transfer to the national level
 - c. Communicate clearly what methods measure and do not measure
 - d. Don't limit valuation to what is able to be monetized —implement Circular A-4 in reverse order—analysis resources should be distributed to reflect range of services and communication should reflect full range of services
 - e. Information sharing within EPA and with other Agencies
5. Involve an interdisciplinary collaboration among physical/biological and social scientists and solicit input from the public or representatives of individuals affected by the ecological changes from the outset of valuation effort
6. Conduct valuation looking at multi-media impacts
7. Possibly group recommendations regarding learning within Agency

They also discussed adding the following points

- Different methods measure different things and different types of values

- Use broadened set of methods; accumulate experience and information that can be used in rulemaking by using them in other contexts
- The importance of partnerships between publics and experts
- Communications
- Importance of context

They also discussed the following high-level recommendations related to Part 2 (numbers refer to the list of numbered recommendation in Appendix F).

National Rulemaking—High level recommendations

- Don't let valuation be dictated by models, instead by services (49)
- Bottom up analysis for national rulemaking (55)
- Transparency about process (42)

Regional Recommendations – high level recommendations

- Plan for regional resources for valuation

Uncertainty

- Communicate uncertainty to decision-making (81)

Communication

- Follow best practices (87). Committee discussed need to provide additional detail about these best practices in the report.

Discussion of Conclusion of Part 3 and Overall Structure of the Report

The committee discussed the desirability and feasibility of developing a conclusions section that would discuss how the Agency might select from the menu of valuation methods and use the valuation methods in a process. One member suggested developing a set of criteria or questions that would be used with Figure 2 to help guide the Agency's choice of methods. Another member suggested developing a generic example that could be used.

The Vice-Chair expressed concern for the difficulty of developing such a section. She noted that the valuation context write-ups were designed to illustrate the possible use of methods.

Another member suggested restructuring the report so that it would have the following elements:

- Current Part 1
- New Part 2 that includes cross cutting issues section
- Part 3 - Methods Write-ups
- New Part 4: Applying the Approach (which would include the three valuation context sections)
 - o with summary and conclusions about multi-method, integrated approach
 - o recap of major recommendations
 - o possibly 3 diagrams showing how methods could relate to context and questions to ask at different boxes

- final conclusions: acknowledge importance of context; choosing appropriate value measures; acknowledging limits of any and all valuation methods; importance of transparency in communication of results of analyses; and valuation is separate from decision-making.

The committee discussed enhancements to improve the readability and usefulness of the report. One member suggesting inserting the relevant row of "Table 5" before text describing each method in detail.

Next Steps

The committee discussed receiving a briefing from EPA's National Program Manager for ecological research at one of the teleconferences to be planned for June.

In response to a question from the Chair, members briefly discussed suggestions for future work by the SAB. One member discussed the importance of science advice relating to development of a national data set that would be useful at the regional and national levels that could be used for ecological protection and conservation, somewhat like the Southeast Ecological Framework. The chair asked members to provide additional ideas that he could share with the chartered SAB.

The committee briefly discussed the next steps identified by the Chair and DFO for development of the report (Appendix G). Dr. Vanessa Vu suggested that the committee add the step of asking outside experts to read the report informal at some point after the technical editor has helped revise the report and before the Quality Review of the SAB. Dr. Vu also noted that she would plan for the entire committee to help brief the Agency in early 2008 on the final report.

Action items

1. DFO to schedule two teleconferences for June
 - Tentative list of topics:
 - Part 1 Section 2 (An overview of key concepts);
 - Part 2 - New section combining prediction of ecological effects and implementation of the concept of ecosystem service
 - Briefing on ORD's draft multi-year ecological research plan that emphasizes ecological services;
 - Tables of methods for Parts 1, 2, and last Part (Methods)
 - Conclusion for Methods section
2. C-VPRESS members will provide comment by May 11, 2007 on issues not discussed at May 1-2 meeting, especially
 - a. text where rationales, citations seem missing
 - b. part 1, Section 5.2. (Predicting ecological change in value-relevant terms) p. 39-41
3. Subgroup [Bob Costanza (lead), Rick Freeman, Doug MacLean, Steve Polasky] will revise Part 1, Section 2] by May 21, 2007
4. Buzz Thompson will follow up with Paul Slovic regarding his comments concerning characterization of status of methods for valuation (i.e., as in "research" stage only)

5. Allyson Holbrook will revise Appendix by May 21, 2007
6. Subgroup [Bill Ascher (lead), Jim Boyd, Steve Polasky, Kerry Smith] will provide text on benefit transfer for Part 2 by May 21, 2007. Angela will provide references to EPA NCEE workshop on benefit transfer.
7. Kathy Segerson and Hal Mooney will integrate Part 2, Sections 2 and 3 (Predicting Ecological Effects and Implementation of the Concept of Ecosystem Services). by May 21. Will work with Paul Risser and Ann Bostrom on relating Figure 4 to ecological indicators and the mental models/framing issues association with Figure 4 to clarify how the science relates to decision-making. Will work with Lou Pitelka and Steve Polasky to insert more discussion of how ecological production functions fit in.
8. Gregory Biddinger will revise NEBA text box by May 21, 2007
9. Kathy Segerson, Steve Polasky, and Rick Freeman will send comments on Part 3, Section 2.2 (Rankings Based on Energy and Material Flows) to Bob Costanza by May 11, 2007
10. Bob Costanza will revise Part 3, Section 2.2 (Rankings Based on Energy and Material Flows) by May 21, 2007 based on committee discussion and written comments.
11. Rick Freeman and Hal Mooney will revise Part 3 Section by May 21, 2007 to change title to "Valuation for National Rulemaking;" insert text into introduction discussing that the Executive Orders did not limit benefit analysis to economic analysis and that it allowed other qualitative and quantitative analyses of benefits, and revise the conclusions section to reflect the recommendations.
12. DFO will obtain Agency comment by May 11th on whether Figure 7 can be easily understood. If the Agency feels the figure is understandable and useful, Greg Biddinger will work to revise figure. If the Agency does not find the figure understandable and useful, Greg Biddinger will drop the figure from the text of Part 2 Section 6
13. Greg Biddinger will revise Part 2 Section 6 (changing language for recommendation 1) by May 21, 2007
14. Rick Freeman will provide Steve Polasky with travel cost references for urban setting by May 11, 2007
15. Steve Polasky will revise Part 2 Section 7 to make recommendations for Agency action more clear and to develop the Portland text box by May 21, 2007
16. Denny Grossman will revise Part 3 Section 2.1 (Conservation Value Method) to address Rick Freeman's comments by May 2007
17. Buzz Thompson and Kathleen Segerson will develop format for Table of methods in the last part of the report and develop approach for the Conclusions

Summary

Respectfully Submitted:

/signed/

Angela Nugent
Designated Federal Officer

Certified as True:

/signed/

Barton H. (Buzz) Thompson
Chair

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by committee members during the course of deliberations within the meeting. Such ideas, suggestions, and deliberations do not necessarily reflect definitive consensus advice from the panel members. The reader is cautioned to not rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters, or reports prepared and transmitted to the EPA Administrator following the public meetings.

Appendices

Appendix A	Roster
Appendix B	Federal Register Notice
Appendix C	Meeting Agenda
Appendix D	Committee Members' Pre-meeting Written Comments
Appendix E	Draft Communication Plan
Appendix F	List of Recommendations in April 22, 2007 Draft Report
Appendix G	Next Steps for Development of the C-VPES Report

Appendix A: Roster

U.S. Environmental Protection Agency Science Advisory Board Committee on Valuing the Protection of Ecological Systems and Services

CHAIR

Dr. Barton H. (Buzz) Thompson, Jr., Robert E. Paradise Professor of Natural Resources Law, Stanford Law School, and Director, Woods Institute for the Environment, Stanford University, Stanford, CA

VICE-CHAIR

Dr. Kathleen Segerson, Professor, Department of Economics, University of Connecticut, Storrs, CT

MEMBERS

Dr. William Louis Ascher, Donald C. McKenna Professor of Government and Economics, Claremont McKenna College, Claremont, CA

Dr. Gregory Biddinger, Coordinator, Natural Land Management Programs, Toxicology and Environmental Sciences, ExxonMobil Biomedical Sciences, Inc, Houston, TX

Dr. Ann Bostrom, Associate Professor, School of Public Policy, Georgia Institute of Technology, Atlanta, GA

Dr. James Boyd, Senior Fellow, Director, Energy & Natural Resources Division, Resources for the Future, Washington, DC

Dr. Robert Costanza, Professor/Director, Gund Institute for Ecological Economics, School of Natural Resources, University of Vermont, Burlington, VT

Dr. Terry Daniel, Professor of Psychology and Natural Resources, Department of Psychology, Environmental Perception Laboratory, University of Arizona, Tucson, AZ

Dr. A. Myrick Freeman, William D. Shipman Professor of Economics Emeritus, Department of Economics, Bowdoin College, Brunswick, ME

Dr. Dennis Grossman, Principal Associate - Biodiversity Protection and Conservation Planning, Environmental and Natural Resources Department, Abt Associates Inc., Bethesda, MD

Dr. Geoffrey Heal, Paul Garrett Professor of Public Policy and Business Responsibility, Columbia Business School, Columbia University, New York, NY

Dr. Robert Huggett, Consultant and Professor Emeritus, College of William and Mary, Williamsburg, VA

Dr. Douglas E. MacLean, Professor, Department of Philosophy, University of North Carolina, Chapel Hill, NC

Dr. Harold Mooney, Paul S. Achilles Professor of Environmental Biology, Department of Biological Sciences, Stanford University, Stanford, CA

Dr. Louis F. Pitelka, Professor, Appalachian Laboratory, University of Maryland Center for Environmental Science, Frostburg, MD

Dr. Stephen Polasky, Fesler-Lampert Professor of Ecological/Environmental Economics, Department of Applied

Economics, University of Minnesota, St. Paul, MN

Dr. Paul G. Risser, Acting Director, National Museum of Natural History, Smithsonian Institution, Washington, DC

Dr. Holmes Rolston, University Distinguished Professor, Department of Philosophy, Colorado State University, Fort Collins, CO

Dr. Joan Roughgarden, Professor, Biological Sciences and Evolutionary Biology, Stanford University, Stanford, CA

Dr. Mark Sagoff, Senior Research Scholar, Institute for Philosophy and Public Policy, School of Public Affairs, University of Maryland, College Park, MD

Dr. Paul Slovic, Professor, Department of Psychology, Decision Research, Eugene, OR

Dr. V. Kerry Smith, W.P. Carey Professor of Economics, Department of Economics, W.P. Carey School of Business, Arizona State University, Tempe, AZ

CONSULTANTS TO THE COMMITTEE

Dr. Joseph Arvai, Professor, Environmental Science and Policy Program, and Department of Community, Agriculture, Resource and Recreation Studies (CARRS), Michigan State University, East Lansing, MI

Dr. Allyson Holbrook, Assistant Professor of Public Administration and Psychology, Survey Research Laboratory, University of Illinois at Chicago, Chicago, IL

Dr. Jon Krosnick, Frederic O. Glover Professor in Humanities and Social Sciences, Professor of Communication, Director, Methods of Analysis Program in the Social Sciences, Associate Director, Institute for Research in the Social Sciences, Stanford University, Palo Alto, CA

SCIENCE ADVISORY BOARD STAFF

Dr. Angela Nugent, Designated Federal Officer, 1200 Pennsylvania Avenue, NW
1400F, Washington, DC, Phone: 202-343-9981, Fax: 202-233-0643, (nugent.angela@epa.gov)

Appendix B: Federal Register Notice

Science Advisory Board Staff Office; Notification of a Public Meeting of the Science Advisory Board Committee on Valuing the Protection of Ecological Systems and Services (C-VPES)

[Federal Register: April 10, 2007 (Volume 72, Number 68)]

[Notices]

[Page 17896]

From the Federal Register Online via GPO Access [wais.access.gpo.gov]

[DOCID:fr10ap07-73]

ENVIRONMENTAL PROTECTION AGENCY

[FRL-8297-1]

Science Advisory Board Staff Office; Notification of a Public Meeting of the Science Advisory Board Committee on Valuing the Protection of Ecological Systems and Services (C-VPES)

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: The EPA Science Advisory Board (SAB) Staff Office announces a public meeting of the SAB Committee on Valuing the Protection of Ecological Systems and Services (C-VPES) to discuss a draft committee report related to valuing the protection of ecological systems and services.

DATES: A public meeting of the C-VPES will be held from 8:30 a.m. to 5:30 p.m. (Eastern Time) on May 1, 2007 and from 8:30 a.m. to 2 p.m. (Eastern Time) on May 2, 2007.

ADDRESSES: The meeting will take place at the SAB Conference Center, 1025 F Street, NW., Suite 3700, Washington, DC 20004.

FOR FURTHER INFORMATION CONTACT: Any member of the public wishing to obtain general information concerning this public teleconference may contact Dr. Angela Nugent, Designated Federal Officer (DFO), via telephone at: (202) 343-9981 or e-mail at: nugent.angela@epa.gov. General information concerning the EPA Science Advisory Board can be found on the EPA Web site at: <http://www.epa.gov/sab>.

SUPPLEMENTARY INFORMATION: The SAB was established by 42 U.S.C. 4365 to provide independent scientific and technical advice, consultation, and recommendations to the EPA Administrator on the technical basis for Agency positions and regulations. The SAB is a Federal advisory committee chartered under the Federal Advisory Committee Act (FACA), as amended, 5 U.S.C., App. The SAB will comply with the provisions of FACA and all appropriate SAB Staff Office procedural policies.

Background: Background on the SAB C-VPES and its charge was provided in [68 FR 11082](#) (March 7, 2003). The purpose of the meeting is for the SAB C-VPES to discuss a draft advisory report calling for expanded and integrated approach for valuing the protection of ecological systems and services.

These activities are related to the Committee's overall charge: to assess Agency needs and the state of the art and science of valuing

protection of ecological systems and services and to identify key areas for improving knowledge, methodologies, practice, and research.

Availability of Meeting Materials: Agendas and materials in support of the May 1-2 meeting will be placed on the SAB Web Site at: <http://www.epa.gov/sab/> in advance of the meeting.

Procedures for Providing Public Input: Interested members of the public may submit relevant written or oral information for the SAB to consider during the advisory process.

Oral Statements: In general, individuals or groups requesting an oral presentation at a public meeting will be limited to five minutes per speaker, with no more than a total of one hour for all speakers. Interested parties should contact Dr. Nugent, DFO, at the contact information noted above by April 23, 2007 to be placed on the public speaker list for the May 1-2, 2007 meeting.

Written Statements: Written statements should be received in the SAB Staff Office by April 23, 2007, so that the information may be made available to the SAB for their consideration prior to this meeting. Written statements should be supplied to the DFO in the following formats: one hard copy with original signature, and one electronic copy via e-mail to nugent.angela@epa.gov, .gov (acceptable file format: Adobe Acrobat PDF, WordPerfect, MS Word, MS PowerPoint, or Rich Text files in IBM-PC/Windows 98/2000/XP format).

Meeting Access: For information on access or services for individuals with disabilities, please contact Dr. Angela Nugent at (202) 343-9981 or nugent.angela@epa.gov. To request accommodation of a disability, please contact Dr. Nugent, preferably at least 10 days prior to the meeting to give EPA as much time as possible to process your request.

Dated: April 4, 2007.

Anthony Maciorowski,
Deputy Director, EPA Science Advisory Board Staff Office.
[FR Doc. E7-6713 Filed 4-9-07; 8:45 am]

BILLING CODE 6560-50-P

Appendix C: Agenda

Meeting of the SAB Committee on Valuing the Protection of Ecological Systems and Services (CVPESS)

Draft Agenda – May 1-2, 2007

Woodies Building, 1025 F Street, N.W., SAB Large Conference Room, Room 3705
Washington, DC 20004

The purpose of the meeting is for the SAB C-VPESS to discuss a draft advisory report calling for an expanded and integrated approach for valuing the protection of ecological systems and services. The report relates to the Committee's overall charge: to assess Agency needs and the state of the art and science of valuing protection of ecological systems and services, and then to identify key areas for improving knowledge, methodologies, practice, and research.

May 1, 2007

8:30 – 8:35	Welcome	Dr. Angela Nugent, EPA, SABSO Dr. Vanessa Vu, EPA, SABSO
8:35 – 8:45	Introduction of members and consultants and review of agenda	Dr. Barton H. (Buzz) Thompson, Jr., Chair Dr. Kathleen Segerson, Vice-Chair
8:45 – 10:15	Discussion of Part 1, Overview (pp. 6-47): new and significantly revised text, recommendations, and committee-identified issues <u>New or significantly revised text</u> - Part 1, Section 2.4, “Some Caveats Regarding Valuation,” (pp. 19-21)	Committee Lead Discussant :Dr. Kathleen Segerson
10:15 – 10:30	Break	
10:30 – 12:00	Discussion of Part 2, Applying the Approach (pp. 48 - 199): new and significantly revised text, recommendations, and committee-identified issues <u>New or significantly revised text</u> - Part 2 Section 3, Implementing the Concept of Ecosystem Services (pp. 67 - 82)	Committee <u>Lead Discussants</u> Dr. James Boyd Dr. Barton H. (Buzz) Thompson, Jr.

- Part 2, Section 4.7 and Table 5: Table Summarizing Methods Discussed in the Report (pp. 93-94 plus supplementary draft table)

12:00 – 1:00	Lunch	
1:00 – 1:45	Discussion of Appendix A: Survey Issues for Ecological Valuation: Current Best Practices and Recommendations for Research (pp. 325 - 355)	Lead Discussant :Dr. Allyson Holbrook
1:45 – 3:00	Continued discussion of Part 2	
3:00 – 5:15	Discussion of Part 3, Methods for Implementing Approach (pp. 200 - 324): new and significantly revised text, recommendations, and committee-identified issues	Committee
5:15 – 5:30	Discussion of development of an executive summary and the agenda for May 2	Dr. Barton H. (Buzz) Thompson, Jr.
5:30	Adjourn	

May 2, 2007

8:30 – 8:35	Welcome	Dr. Angela Nugent, EPA, SABSO
8:35 – 10:30	Finalization of report recommendations and discussion of draft executive summary	Committee
10:30 – 10:45	Break	
10:45 – 12:45	Next Steps <ul style="list-style-type: none"> - Process for revising text - Process for drafting report cover letter - Editing process - Staff Office Briefing for Agency leadership prior to SAB Quality Review - SAB Quality Review augmented by additional invited experts - Development of communication plan 	Committee
12:45 – 1:00	Summary	Dr. Barton H. (Buzz) Thompson, Jr.
1:00	Adjourn	

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Appendix D Committee Members' Pre-meeting Written Comments

EPA-SAB
C-VPES
May 1, 2007
Terry Daniel

The draft methods report has come far. There are numerous places where some editing will help—especially to find segments that are repeated verbatim in various places.

We are still in need of a closing section that ties together the multiple methods described in part 3, with special attention to how the output from multiple value measures is to be integrated for final decision making. How will biological indices, social scales, group deliberations and referenda and monetary values come together at the end of the decision making process? The draft table of methods is a good start, but it emphasizes the selection of appropriate methods (one at a time) at different points in the decision making process. Some guidance on how to orchestrate a good suite of methods that can complement and cross check each other would be an important (albeit difficult) section for the report. We have told our audience in several places about the difficulties of combining diverse multiple measures for decision making (we have been less clear about the hazards of prematurely and obscurely aggregating to a single measure), but we do not really offer any clear advice on how to approach this important task. This would make a good ending section of our report. All we need to do is figure out what we as a committee have to say about that.

I understand and am mostly sympathetic with the desire to avoid prescribing how EPA should make policy decisions. However, it is inescapable that valuation is conducted in the service of decision making, as our figure 1 clearly shows. A clear and succinct statement of how the decision making process conditions valuation methods is presented on page 18, but a more general direct statement of the role that valuation plays in policy making would be very useful at the top of page 16, where the model is first introduced.

In the “caveats” section I was surprised to see such a strong unconditional statement that the C-VPES notion of valuation rests on the expressed values of lay individuals (p 19). I might well have uttered something like that myself during this past three years, but it is not my impression that the committee as a whole subscribes to such a strong statement. Even I would be leery of wholly depending on lay opinion, and studies of public opinion in this regard consistently find that while people want a say in environmental management decisions, they do not want policy makers simply to implement majority rule.

At the bottom of page 19 the issue of “constructed preferences” would be better presented if a clearer distinction were made between valuations where the public can be expected to have relevant knowledge and familiarity with both the means and ends at issue and situations where they do not have such knowledge and familiarity. There are probably no cases of even moderate complexity where people know everything and have well-considered, well-formed opinions ready to express. Similarly, there are probably no cases where opinions must be wholly constructed on the spot, without any reference to pre-existing values and experiences. So, we are not seeking to decide in any general sense whether preferences are constructed or are held in advance. Rather, the issue is under what circumstances, and by what means, assessors should help respondents to construct valid preferences for complex policy options and outcomes.

The statement on page 20 regarding “allowing public influence on decisions...would be irresponsible” (when the public is ill-informed and has not considered carefully) seems overly strong. Certainly no one (including the public) would want environmental policy makers to rely solely on public opinion in such cases, but it would seem unreasonable for public agencies to just ignore public opinion even in such a case. The statement on line 19 does not seem to be a quote, so could it not be rephrased as “so relying solely on public opinion to make decisions ... would be irresponsible.” Moreover, even in the worst case of public ignorance, it would seem prudent for a public agency to listen to public concerns and wishes, and indeed the agency may have a responsibility in such cases to engage the public in a dialogue to help them better

understand and to garner their support.

I have previously raised a question about the focus of the national rule making case example (p 95) on monetary evaluation. Using the section to place special emphasis on monetary methods is completely appropriate, so long as the legitimate role of other methods is acknowledged—which is better accomplished in the current revision. Importantly, the section raises the bar for the level of sophistication required for applications of monetary valuation methods, and makes creative and useful suggestions for improving and extending economic methods for cases where they are appropriate or required. However, the title of the section and a few remaining sections of text unnecessarily conflict with the broad view of valuation adopted by C-VPESS and the integrated multiple method approach we are advocating throughout this report. As previously noted, there is still some conflict of this kind even within the section. A title change (Valuation Methods for National Rulemaking) would reduce the appearance of conflict. The acknowledgment of Agency rules and actions that do not require, or that even preclude reliance on monetary valuations is useful, but there needs to be an acknowledgment in the other direction as well. Even when monetary valuations are required (as in mandatory CBA), all orders and guides explicitly encourage a thorough evaluation extending beyond monetary measures. While this section is an excellent place to emphasize economic/monetary valuation, it is important that it be made clear that national rule making is not legally or otherwise restricted to monetary valuations.

April 26, 2007

NOTES ON APRIL 22 DRAFT RECEIVED FROM RICK FREEMAN

SUBSTANTIVE COMMENTS ON PART 1

I. The Title: This is not an Overview of the Report. It should be titled something like “Some Basic Issues Involving Valuation of Ecosystems and Services.”

II. Add a Section on Concepts of Value: As I said in a message on March 12, I would like to see a section added on “Concepts of Value.” I think that it should go right after Part 1, Section 2.2. (Or perhaps it could be part of a revised Section 2.3, since some of the points I make below are mentioned in this section. But if it goes here, the section would have to have a new title, since the points that I think are important are not specific to ecological valuation alone.) This addition would do what I tried to do in a presentation to the Committee in June, 2004. It would provide a classification of what are now called “methods” based on their underlying assumptions and value premises, e.g., based on individual preferences, community preferences, non-anthropocentric perspectives, and so forth.

One of the points to be made in this section is that there is no reason to expect agreement between value estimates provided by the various methods since they all start from different places and try to do different things.

I think that this suggestion is consistent with the suggestion made during the conference call on March 6 that there be a table “... that compared methods and their key attributes ... (p. 5 of the draft minutes).” Perhaps the new Table 5 at p. 94 is intended as a response to my suggestion. But I don’t think that Table 5 meets the need that I see. It focuses on specific methods, while I see the need to discuss general concepts. And I have some other comments on Table 5 that I will send along later.

Why This is Important: This Draft makes much of the importance of an “integrated approach” to valuation. And it does a good job of explaining an integrated framework for the valuation process, except for one important point. The integrated framework discussion makes it sound as if the methods described in Part 3 all fit into this integrated approach in some unspecified way. But they don’t. What is missing as part of the integrated framework a step in which it is decided what to measure with a valuation method, that is, which concept of value is to be measured and why.

In a memo to Dom more than three years ago I made the following three points:

(i) The discussions and correspondence to date have identified several different concepts and definitions of value and valuation as applied to ecosystems and their services. The methods that have been discussed are not different methods for measuring the same thing, but are methods for measuring quite different things.

(ii) These different conceptions of value and valuation involve questions of ethical judgements and issues of public policy rather than questions of science. Or to put it differently, the choice of what to measure is usually not a scientific question. Thus the C-VPESS should not try to resolve these questions or to choose one definition of value and approach to valuation. Rather it should discuss the implications of and the strengths and limitations of each of the major different concepts of value.

(iii) There are questions about the assumptions and methods used to implement each of the valuation concepts. The C-VPESS should explore these assumptions and methods. But it should not do this with the objective of reaching any conclusion about which method is “best,” since that would likely involve considerations that go beyond the available science.

What Should Go Into This Section? I tried several times to write up something for the Committee about this. I am not satisfied with any of these efforts. And apparently others weren't, either, since no one else picked up on this and offered an alternative. On looking over my earlier efforts, I can see that one reason for this might be that for many methods it is not clear what value premises and assumptions lie behind them, so that the taxonomy becomes messy and does not appear to have any clear organizing principles. Not all methods are equally “valid.” Some methods have a coherent conceptual basis. Others do not. If it is the case that some of the methods described in Section 3 do not have a coherent basis in principle, it is important that our report point this out.

In the same memo to Dom (January 24, 2004) and in a memo for the Committee for a June 2004 meeting, I made a start on a taxonomy of value concepts based on a distinction between Utilitarian and Nonutilitarian Value Concepts:

A. Utilitarian Values - based on the contributions that ecological systems and services make to the well-being of individuals.

1. Based on individuals' preferences (or consumer sovereignty - Costanza and Folke, 1997, Costanza, 2000, for example). Can include both use and nonuse values.

- (a) Assuming that individuals know their preferences and that they are fixed. Referred to as “economic values.”
 - Market-based methods
 - revealed reference techniques (hedonics, etc.)
 - stated preference methods

[Economic values are based on the assumptions that people are rational actors, have preferences over alternative outcomes, and that the choice of one outcome over another implies that the chosen outcome results in a higher level of well-being for the individual. Economic values are based on a coherent theory of welfare economics that allows comparison of the values of ecosystem services with the values of other services produced through environmental policy changes (for example effects on human health) and with the costs of those policies.]

(b) Assuming that preferences are constructed during the process of elicitation (e.g. Slovic's 1/15/04 memo).

2. Based on community preferences as revealed by some participatory decision making

- process
- Measures of attitudes and intentions
- Valuation by decision aiding
- Citizen juries,
- etc.

B. Nonutilitarian Values - This term covers a variety of ethical and philosophical perspectives. These include ecological values, which I take to mean evaluating ecological changes in terms of their effects on ecosystems or nonhuman species, and sociocultural, and intrinsic values.

For each of these concepts I would include a paragraph similar to the one in brackets [] above. I just do not have the time today to write these other paragraphs.

If my suggestion is accepted, I think that a small subcommittee should be charged with drafting this new material. There are plenty of unresolved questions about definitions, characteristics of different concepts, etc. that would benefit from some discussion among a small group of committee members.

II. There is an important feature of “and integrated and expanded framework for valuation” that seems to me to be missing from Part 1, that is a recognition that ecological services should not be the sole focus of valuation efforts. Many Agency actions have impacts on both ecological services and human health and other dimensions of human well-being. So, I would like to see this point made at the beginning of the discussion of ecological valuation and more mention of it in places like Sections 4 and 5 of ecological and other values, for example at pp. 38, line 22.

III. The Summary: p. 47, lines 4-6: Simply calling for the use of an expanded set of methods is not enough. Which ones do we think are most useful? And for what purposes? See my first set of comments above.

I suggest adding something like the following to this recommendation:

... while recognizing that different methods based (implicitly or explicitly) on different premises about value will produce different answers.

Something similar would have to be done at p. 33, line 17 and p. 34, lines 20 +.

IV. Ecological Prediction: Section 5.2 is improved over the earlier version.

V. pp. 13-14, lines 26-28: The discussion of “social value” vs. “private value” is at best unclear. An EPA action can yield values that are positive for some entities and negative for others. Aren’t you basically saying that social benefit means adding up all the gains and losses to all affected people to get an aggregate benefit? This should be clarified.

From Rick Freeman, April 29, 2007

SUBSTANTIVE COMMENTS ON PART 2

I. On The New Table 5: This Table does not meet the need I identified above for a systematic discussion and comparison of different valuation concepts. I do think that it is useful in playing a more limited role of comparing the details of different methods. But

to serve this role, it needs more work. I recommend:

- limiting the table to those methods actually described in Part 3.
 - consolidating the Market-based, Revealed Preference, and Stated Preference entries into a single entry for Economic Methods that have as outputs monetary measures of changes in individuals' well-being.
 - rewriting of point 5 in the notes on the last page so that it says that different kinds of decisions might call for different value [emphasis added].
 - revision of point 5 a to make clear that it is not whether ecosystem services are complex or easily understood that determines which methods are appropriate, but rather which value concept one is trying to measure.

II. Add a Conclusions Section: I think that there should be a "Conclusions" section preceding the "Recommendations" section (Sect. 9). Here are some of the most important conclusions that I think should be included:

- The difficulty in predicting changes in ecological endpoints resulting from EPA policies is one important impediment to the valuation of ecosystem services resulting from EPA policies.
- There are a number of different concepts of value based on different premises and assumptions. There is not one "correct" value that EPA should strive to measure. (See the next comment.)
- Estimates of values are uncertain. EPA must use methods that assess and communicate the uncertainty.

Certainly there are other conclusions. These are just three that I am especially concerned to get into the Report.

III. ON RECOMMENDATIONS: Without going through the Table, it strikes me that there are way too many recommendations here (n = 103!). Are we trying to improve the apparent cost-effectiveness of the C-VPSS enterprise by lowering the realized cost per recommendation?

I would like to see from 5 to 10 recommendations along the following lines:

- develop an integrated and expanded approach to ecosystem valuation;
 - improve the capacity of the Agency to make predictions about the biophysical changes, especially concerning changes in the provision of ecosystem services, associated with changes in Agency policy.

Now having looked at the first three pages, I can say:

- a. some are too obvious to be included, e.g., #1, 6, 21;
- b. there is substantial overlap and even duplication, for example:
 - #3 and 5
 - #9 and 22
 - #12, 15, and 16
 - #18 and 19
- c. some are conclusions rather than recommendations, e.g., #16
- d. some are good, e.g., #3, 9, and 12.
- e. regarding #18, see my substantive comment III on the Summary of Part 1, sent to you earlier today.

So, this list needs a lot of work reducing overlap, weeding out the obvious, and selecting and emphasizing the most important.

And having read Section 3.2, I would add to the list of recommendations, something based on p. 73, lines 3-8 on the development of ecological endpoints.

IV. On Section 2.4, pp. 56-57: Earlier, I commented that: “It says, ‘EPA could mandate that models ... should meet the following seven conditions ...’.” The change to “specify as a goal ...” is an improvement. But I still think that this section should close with a paragraph that acknowledges that we are a long way from having a set of models that meet these seven conditions and that calls for a strategy for closing this gap.

V, Section 3.2: This is essentially brand new material. I agree with it. But I have two suggestions for revision:

- Section 3.1 defines ecosystem services in terms of end products while Section 3.2 discusses endpoints. The relationship between these two terms should be clarified. Are they synonyms?
- At p. 77 where it states that endpoints should be purely biophysical, the fishing example could be expanded to clarify this as follows. A travel cost model can determine the value of a recreation site for fishing; but as the

text says, this value results from the combination of the biophysical characteristics of the site (fish population) with time, equipment, etc., provided by the visitor. The value of the change in the stock or availability of fish (endpoint or end product?) is the change in the value of the site, that is, the difference in the value of the site before and after the change in the endpoint.

VII. On Group and Public Expressions of Value: I would rewrite the sentence on p. 89, lines 19-22 as follows:

This premise is in contrast to the premise underlying the economic and social-psychological methods discussed earlier which assume that ... [the rest of the sentence is unchanged].

My reading of section 4.3 is that the social-psychological methods also assume that there are fixed attitudes, preferences, judgments, etc. that can be uncovered by the survey questions. I would like to hear Terry Daniel's thoughts on this.

VIII. On Net Environmental Benefits Assessment (NEBA): On p. 153, it says that NEBA "... shares the same theoretical foundation as BCA." I disagree. BCA is based on neoclassical welfare economics theory. But a quick glance at the Efrogmson, et al. Paper suggests that NEBA is agnostic on what methods can be used to make various ecological changes commensurate. I hope to read Efrogmson, et al. more carefully tomorrow on the way to Washington.

SUBSTANTIVE COMMENTS ON PART 3

I. The Conservation Value Method: This section should start with a definition of conservation value. As I understand it, this definition would be something like: a measure of the contribution as defined or estimated by relevant experts of a landscape unit to the conservation of species diversity.

II. Energy and Materials Flows:

A. On pp. 209-210, an "energy theory of value" is described as a means of explaining exchange values. I know that this has been a subject of debate for a number of years. I have not kept up with this debate and do not have the time before the meeting to try to catch up with the current status of the debate. But my understanding is that the consensus among economists is that the energy theory of value is wrong.

On p. 209, lines 28-30, it says "Classical economists recognized that if they could identify a 'primary' input to the production process, they could then explain exchange

values based on production relationships.” My understanding of neoclassical value theory is that it would be more appropriate to say that “Classical economists thought that if they could identify ...” but that they were wrong. Rather, exchange values are determined by the interaction of cost/supply and demand/preferences and cost is influenced by all of the inputs to production.

Before agreeing to have this text in the report, C-VPSS needs to undertake a thorough review of the “energy theory of value” debate.

B. On pp. 211-212, the questions of uninformed individuals and constructed preferences are raised. But these questions have already been dealt with in Section 2.4 of Part 1. The discussion here should reflect that.

C. On pp. 212-214, there is a comparison of values from energy analysis and economic analysis. I see no reason to expect the values to be similar since they are based on different value premises and assumptions about the economy. See my major comment on Part 1 that I sent to Buzz and Kathy yesterday.

III. Mediated Modeling: I still think that mediated modeling is NOT a valuation method. Therefore, I propose that this material be recast to emphasize its use in scientific modeling and moved to Part 2, Section 3: “Prediction of Ecological Effects.” That is where I think that the real contribution of this material lies. The discussion of valuation here is so cursory that I don’t think it adds anything to what is in the materials in the other parts of the section on Deliberative Processes for Valuation.

More specifically, and as I said in my comments for the March 20 conference call:

1. On the plus side, this write up makes a strong case for the value of mediated modeling: (I) to induce interdisciplinary collaboration among scientists developing models of systems being studied; (ii) for using the technique to involve stakeholders in helping to determine what are the important endpoints to concentrate attention on; and (iii) for gaining agreement on a common understanding of how the system works.

2. But, there is very little on valuation here, at least that way we have characterized the problem of valuation in our deliberations.

- If the same participants who discuss the model structure also discuss and reach agreement on the values to be used in assessing alternative strategies, how does this differ from deliberative valuation more generally?

- In the fynbos case (Higgins, et al., 1997), where did the values listed in Table 1 of that paper come from? Was there a deliberative process? Was this a form of benefits transfer? The unit value of wildlife harvest might have been simply a market price.

- Valuation is a process that is separate from the modeling of the underlying system. And in the context of the Patuxent River (as I recall it) and fynbos cases, the values appear to

have come from outside of the modeling process, not as outputs of this process.

- In the Iron and Steel Industry and Louisiana wetlands cases in Costanza and Ruth (1998), there don't appear to be any values being used at all.

3. Here are some more specific comments:

- pp. 272, line 8: I don't understand what is meant by "consensus ... between science and policy." I understand "consensus on the science" underlying a model; and I understand "consensus about policy" - objectives, means, etc. But I think that there is an important distinction between the realms of science and policy.

- pp. 272, lines 18-19: Similarly, what is the "gulf separating the science and policy communities"? And why do we need to bridge this gulf?

- pp. 272, line 9: There is no explanation of how the aggregation to get a single benefits number is done by mediated modeling.

- pp. 274, lines 23, 25: If the terms "atelier approach," and "open space technique" are retained, I think that they need to be explained.

Paul Slovic <pslovic@uoregon.edu>
04/30/2007 12:21 PM To
Angela Nugent/DC/USEPA/US@EPA
cc

bcc

Subject
Re: List of Recommendations...Public comment for May 1-2, 2007
meeting

Dear Angela,

I regret that I have not had time to read the draft report as thoroughly or as carefully as I had hoped. I have only a few of comments on the early

sections as follows:

P.7 line 21. I suggest it read contributions should be valued rather than

are valued. As I have argued before, EPA's role is normative and prescriptive, not simply descriptive.

P.7 line 25. I know this is a quote from EBASP, but it is unfortunate that

it uses "quantify" rather than "characterize" the benefits. Characterize is a broader and more appropriate term.

P.8 line 3. May help the agency rather than can help. It's not clear to me

that most of the methods in the report can, at present, be used

effectively to improve agency decisions.

P.13 line 18. delete or constructed. Individuals' preferences are constructed too. Maybe constructed should follow individuals' in line 17.

P.19. The discussion of constructive preferences needs fixing. In particular, I disagree with the statement that the effects of construction are small (line 26). The effects are often massive, resulting in complete reversals of preference. This is well documented in Lichtenstein, S. and Slovic, P. The Construction of Preference, New York, Cambridge, 2006. I suggest that line 25 (starting with "most" to line 30 ending with "collected", be deleted).

P.20 lines 5-7. Suggests that carefully conducted techniques could correct misleading representations. Does the agency have the capability or inclination to go to the trouble to do studies this carefully? If not, will the valuation attempts actually degrade decision making?

Final Comments:

I believe that the major recommendation should be that EPA engage in a rigorous program to develop and test the various methods identified in the

report and to conduct demonstration studies with them. I don't believe they are ready to be used in agency decision making or rule making.

<>The

National Academy of Sciences come down hard on OMB's proposed risk assessment guidelines, claiming there was no careful assessment of the cost in time and money of trying to apply them (there were other criticisms as well). Shouldn't the present report have a section on such costs associated with attempting to apply the methods in the C-VPASS report and a discussion of whether such costs outweigh the potential benefits of the methods?

Finally, what is the real problem this report is trying to fix? Has it been shown that EPA decisions have been compromised by the failure to employ valuation methods such as those we present here? Certainly, we need

a better understanding of ecosystems and their services and the ways that

EPA policies will affect such services. But, given such understanding, has

it been demonstrated that the traditional means of applying such knowledge

in decision making, using logic, argument, reason, debate, etc. has been a

cause of poor decisions? To my knowledge this has not been shown. This places this report in perspective, not as something that fills a gap

(p.7

line 29) but as a proposal for further research that might eventually be useful for EPA decisions about ecosystems and their services.

Sincerely,
Paul Slovic

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Appendix F: List of Recommendations in April 22, 2007 Draft Report

**List of Recommendations from April 22, 2007 draft of C-VPES Report “Toward an Integrated and Expanded Approach for Ecological Valuation”
(No recommendations found in April 24, 2007 text for Part 2, Section 7, “Valuation in Regional Partnerships”)**

	Recommendation	Page/Line	Part/ Section	“Type”	Decision Context
1.	Ceteris paribus, policy-makers should put more weight on measures of public preferences that are based on well-informed and thoughtful expressions of value.	p. 21, l. 10-12	P. 1; S. 2.4	General	All contexts
2.	Additionally, EPA should consider taking direct steps to assess the level of understanding brought to issues that have complex policy and scientific implications and the implications for valuation, particularly where there are concerns about the public’s understanding of the issues addressed by the Agency.	p. 21, l. 12-15	P. 1; S. 2.4	General	All contexts
3.	This suggests a possible role for a standing expert body that can bring consistency to the review of analysis, avoid duplication of review, and be sensitive to timing and resource constraints.	p. 27, l. 17-19	P. 1, S. 3-2	Peer review	National rulemaking
4.	It is important that data that are housed within individual program offices be made public and readily shared with other offices.	p. 27, l. 25-26	P. 1, S. 3-2	Data and model sharing	National rulemaking
5.	It (the EBASP) advocates the creation of a high-level Agency oversight committee and a staff-level ecological benefits assessment forum. The committee endorses these efforts.	p. 27, l. 27-30	P. 1, S. 3-2	Institutional changes	
6.	...the Agency will continue to face significant external constraints when conducting ecological valuation. The committee recognizes the practical importance of these constraints and urges the Agency to be as comprehensive as possible in its analyses within the limitations imposed by these constraints.	p. 28, l. 1-5	P. 1, S. 3-2	General	National rulemaking
7.	Early public involvement could play a valuable role in helping the Agency both a) identify all of the systems and services impacted by the proposed regulations and b) determine the regulatory effects that are likely to be of greatest value. This would ensure that the benefits assessment includes the most important impacts.	p. 31, l. 9 - 13	P. 1, S. 3-3	Public input	National rulemaking
8.	However, peer review, especially early in the process, would help EPA staff identify relevant and available data, models, and methods to support its analysis, and provide encouragement, direction, and sanction for more vigorous and effective pursuit of ecological and human wellbeing effects associated with the proposed rule. The general idea is to have individual	p. 31, l. 18-24	P. 1, S. 3-3	Peer Review	National rulemaking

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	Recommendation	Page/Line	Part/ Section	“Type”	Decision Context
	components of the analysis (e.g., watershed modeling, air dispersal, human health, recreation, aesthetics) each reviewed, as well as a more general review of the overall analytic scheme.				
9.	The committee’s analysis points to the need for a comprehensive, integrated approach to valuing the ecological impacts of EPA actions, one that focuses on the impacts of most concern to people and integrates ecological analysis with valuation.... The approach should serve as a guide to EPA staff as they conduct RIAs and seek to implement the provisions of Circular A-4, as well as in decisions regarding regional and local priorities and activities.	p. 33, l. 2-8; l. 12-14	P. 1, S. 4	General	All contexts
10.	...the committee’s view that ecological valuation or benefit assessment should focus on the impacts or benefits that are likely to be most significant or of greatest concern to people, which might or might not be those that are most easily measured and monetized.	p. 33, l. 18-22	P. 1, S. 4	Public input	All contexts
11.	The second key feature of the framework is the integration of ecological analysis with valuation. This implies a focus on predicting ecological impacts in terms that are relevant for valuation. In particular, it requires a translation of bio-physical impacts into changes in ecosystem components and services that can be understood by lay individuals and are closely linked to the values they hold. This translation requires collaboration across various disciplines,	p. 34, l. 4-10	P. 1, S. 4	Disciplinary integration Ecosystem services	All contexts
12.	Ecological models need to be developed, modified, or extended to provide usable inputs for value assessments	p. 34, l. 16 - 17	P. 1, S. 4	Disciplinary integration Modeling	All contexts
13.	Likewise, valuation methods and models need to be developed, modified, or extended to address important ecological/bio-physical effects that are currently underrepresented in value assessments	p. 34, l. 20-24	P. 1, S. 4	Disciplinary integration Methods	All contexts
14.	The valuation problem should be formulated within the specific EPA context.	p. 37, l. 7-8	P. 1, S. 5		All Contexts
15.	The second major component of the C-VPES process is the need to predict ecological changes in terms that are relevant for valuation. This requires both the prediction of bio-physical impacts of EPA actions using ecological models and the mapping of those changes into changes in ecosystem services or features that are of direct concern to people.	p. 39, l. 27 to p. 40, l. 1-2	P. 1, S. 5.2.	Modeling Ecosystem services	All contexts
16.	The valuation framework outlined above requires an estimation of the bio-physical impacts that would stem from a specific EPA action. To be used for this purpose, ecological models must be linked to information about stressors. This link is often not a key feature of ecological models	p. 40, l. 29 – p. 42, l3	P. 1, S. 5.2.	Modeling Ecosystem services	All contexts

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	Recommendation	Page/Line	Part/Section	“Type”	Decision Context
	developed for research purposes.				
17.	To the extent that transferable models and parameter estimates exist, it would be extremely valuable to have a central depository that EPA could draw on for this information.	p. 41, l. 14-16	P. 1 S. 5.2	Data and model sharing	All contexts
18.	There are a variety of methods that can be used to characterize values, and the C-VPES approach envisions drawing on a wider range of methods than EPA has typically utilized in the past.	p. 42, l. 2-5	P. 1, l. 5.3	Methods	All contexts
19.	The valuation approach proposed by this committee calls for a more prominent role to be played by a variety of methods for characterizing values, both as a practical alternative when economic methods cannot fully capture benefits because of data or other knowledge-based limitations and as a means of capturing the components of value that are not fully reflected in value measures based solely on economic measures of willingness to pay or willingness to accept. Of course, this toolbox should include only methods that meet accepted scientific standards of precision and reliability, are appropriately responsive to relevant changes in ecosystems/services, and are properly related conceptually and empirically to things people value. For all methods, appropriate application will depend on the underlying scientific basis as well as the specific policy context.	p. 43. l. 11-43	P. 1, l. 5.3	Methods	All contexts
20.	Information regarding the value of ecological changes stemming from EPA actions will only be useful in improving decision-making if it is communicated effectively to policymakers and integrated with other information used in policy decisions. In addition to policymakers, information about the value of ecological changes is likely to be of interest to community members and scientists alike. Communicating the value of protecting ecological systems and services requires conveying not only value information, but also information about the nature and state of the ecological systems and services to which they apply and the ecological processes involved.	p. 44, l. 25 to p. 45, l.4	P. 1, S. 5.4	Communication	All contexts
21.	It is imperative that EPA improve its ability to value ecosystems and their services to ensure that ecological impacts are adequately considered in the evaluation of EPA actions at the national, regional and local levels.	p. 46, l. 11-13	P. 1, S. 6	General	All contexts
22.	encourages the Agency to move toward covering an expanded range of important ecological effects and human considerations using an integrated approach. Such an approach would: a) Expand the range of ecological changes that are valued, focusing on valuing the ecological changes in systems and services that are most	p. 46, l. 21 to p. 47 l. 9	P. 1, S 8	General Summary	All contexts

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	Recommendation	Page/Line	Part/ Section	“Type”	Decision Context
	<p>important to people and recognizing the many sources of value, including both instrumental and intrinsic values;</p> <p>b) Highlight the concept of ecosystem services and provide a mapping from changes in ecological systems to changes in services or ecosystem components that can be directly valued by the public; and</p> <p>c) Utilize an expanded set of methods for identifying, characterizing, and measuring the values associated with these changes.</p> <p>Such an approach would, from the beginning and throughout, involve an interdisciplinary collaboration among physical/biological and social scientists and solicit input from the public or representatives of individuals affected by the ecological changes.</p>				
23.	Formulation of a conceptual model is a key first step in predicting the ecological effects of EPA actions. This conceptual model should be constructed at a general level to guide the process and to incorporate more detailed analyses that will subsequently be considered in identifying the key interactions, assessing the endpoints and calculating the ecological valuations.	p. 49, l. 18-22	P. 2, S.2	Modeling	All contexts
24.	Development of the conceptual model is a significant task that deserves the attention of all the constituents of the process. These constituents include EPA staff from throughout the agency, experts in the relevant topics of consideration, and the public..	p. 49, l. 24-27	P. 2, S. 3.1 (should be 2.1)	Modeling	All contexts
25.	(After describing several ways to identify relevant assessment endpoints). In identifying and predicting ecological changes, it is important to consider their full range, including both primary and secondary effects, adequately accounting for uncertainty, stability of the system (including the effect of random shocks from external drivers, management errors and the system’s resilience), heterogeneity within a population or ecosystem, heterogeneity across populations or ecosystems, and dynamic changes in the ecosystem over time (see Part 1 of this Report).	p. 53, l. 1-5	P. 2, S. 2.3	Modeling	All contexts
26.	All of this emphasizes the importance of continued research aimed not only at improving understanding of ecological systems, but in particular at identifying the minimum information requirements for adequately describing and modeling the properties of ecological systems that result in important ecological services	p. 57, l. 11-14	P. 2, S. 2.4	Modeling	All contexts
27.	It will be important for EPA to have effective links into the NEON planning process, and to expand its involvement with the NSF LTER program, which is now undergoing a major refreshing of its research and data	p. 57, l. 28-29	P. 2, S. 2.6	Research	

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	Recommendation	Page/Line	Part/Section	“Type”	Decision Context
	sharing protocols.				
28.	In summary, EPA can continue to refine the models it uses, paying particular attention to the seven principles described above as a screen for this model selection process. (principles on p. 56)	p. 65, l. 25-27	P.2, S. 2.6	Models	All Contexts
29.	In addition, EPA can explore the possibility of selecting key variables or indicators that are highly correlated with other ecological services.	p. 65, l. 27-28	P. 2, S. 2.6	Ecosystem services	All Contexts
30.	Finally, EPA can also focus on various levels of data aggregation that enable meta-analyses to identify broad relationships that obviate the need for ever more detailed data collection and model construction.	p. 65, l. 30 to p. 66, l. 2	P. 2, S. 2.6	Models Research	All Contexts
31.	A specific need that deserves much more attention by the Agency is the development of ecological endpoints for social science analysis. ... Further, the committee urges the development of such endpoints as the next logical step for the Agency to take as it pursues “methods for the evaluation and protection of ecosystem services.”	p. 72, l. 3-8	P. 2, S. 3.2	Ecosystem services	All contexts
32.	“Principles” for useful endpoints: “The committee believes several core principles can help refine the search for ecological endpoints. “ <ul style="list-style-type: none"> - The common person standard - Endpoints should be purely biophysical - Endpoints should be place-and time-specific - Endpoints should allow for the analysis of scarcity, substitutability, and complements - Use proxies but relate them to real endpoints 	p. 76, l.5- p. 78 l. 19	P. 2, S 3.2.2	Ecosystem services	All contexts
33.	Endpoints should be developed via collaborative discussions between natural scientists, social scientists, decision-makers, and the public	p. 80, 20-21.	P. 2, S 3.2.4	Ecosystem services	All contexts
34.	Endpoints are a common language used to connect disparate academic disciplines and communicate to decision-makers and the public. How is a common language developed? Only through a process that brings these parties together. As a result of its fact-finding, this committee has concluded that not enough interaction currently exists within the Agency between natural and social scientists. A reinvigorated endpoint initiative is a natural and place for more interaction to occur. The committee urges the Agency to initiate such a process.	p. 82, l. 6-12	P. 2, S. 3.2.5	Ecosystem services	All contexts
35.	NCER also has a grant program (though it is smaller than the ecological program) to look at the valuation of ecosystem services. Our fact-finding suggests that these two programs could and should be more closely linked. A joint research initiative focused on the development of ecological	p. 82, l. 19-23	P. 2, S. 3.2.5	Ecosystem services	All contexts

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	Recommendation	Page/Line	Part/ Section	“Type”	Decision Context
	indicators will not only address a critical policy need, it is also a way for the Agency to concretely integrate its ecological and economic expertise				
36.	Endpoints can easily be viewed by the Agency as something to satisfy its relatively narrow reporting and assessment mandates. The committee advocates a more ambitious agenda: the development of endpoints that speak to public and political concerns and to all levels of government. Endpoints should be developed according to what the public wants, needs, and can understand.	p. 82, l. 24-30	P. 2, S. 3.2.5	Ecosystem services	All contexts
37.	The committee urges great caution in the adoption of methods using cost as a proxy for value. It must be demonstrated that the conditions for valid use are satisfied and results should not be interpreted as the value of ecosystem services themselves but only the value of having one means to provide them.	p. 92, l. 10-13	P.2, S. 4.6	Method	All contexts
38.	Identification of socially important assessment endpoints requires information about both the potential biophysical effects of the Agency’s action and the ecological services that matter to people. Recommendation: To guide the collection of this information, the Agency should develop a conceptual model of the ecological and economic system being analyzed.	P. 97, l 18-22	P. 2, S. 5.2.1	Conceptual model	National rulemaking
39.	It should be standard practice for the Agency to develop such a conceptual model before other analytical work begins on a benefit assessment or RIA. The analytical blueprint required as part of EPA’s process for developing rules should call for development of a conceptual model for ecological valuation and specify the interdisciplinary team to be involved in developing it.	p. 98, l. 2-6	P. 2, S. 5.2.1	Conceptual model	National rulemaking
40.	Recommendation: Draw from research based on a variety of different methods to determine early on in the process which of the possible ecological impacts are likely to be of greatest concern to people.	p. 98, l. 11-13	P. 2, S. 5.2.1	Methods	National rulemaking
41.	Recommendation: Consider use of an open, interactive public forum for identifying issues of concern. The committee suggests that EPA experiment with holding open meetings for the public and Agency staff to aid in the development of the conceptual model for a particular rulemaking. Such an approach would provide an interactive forum for determining the ecological changes that are important both biophysically and socially.	p. 99, l. 24-29	P. 2, S. 5.2.1	Public	National rulemaking
42.	Recommendation: Use a transparent, documented process for identifying the ecological changes that will be the focus of the valuation.	p. 99, l. 30-31	P. 2, S. 5.2.1	Communication	National rulemaking
43.	Recommendation: Utilize, or develop, quantitative ecosystem models to	p. 100,l. 14-15	P. 2, S.	Ecosystem	National

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	Recommendation	Page/Line	Part/Section	“Type”	Decision Context
	identify the consequences of stressors on the production of the services of concern.		5.2.2	services	rulemaking
44.	Rather than choosing stressors based on the ability to readily monetize their impacts, the Agency should use the conceptual model (see discussion above) to guide the selection of stressors, and then seek to use a suite of ecological models that can predict the impacts of changes in these stressors on a broader set of the relevant assessment endpoints.	p. 101, l. 16-20	P. 2, S. 5.2.2.	Ecosystem services	National rulemaking
45.	This model can be used as the basis for a qualitative but detailed description of the ecological impacts of a given change. However, just a listing that summarizes possible impacts is not sufficient. Such a summary should be accompanied by justification based on the conceptual model and the associated theoretical and empirical scientific literature. To the extent possible, the existing literature should be used to draw inferences about the likely magnitude or importance of different effects, even if only qualitatively (e.g., high, medium, low).	p. 103, l. 25-p. 104, l.3	P. 2, S. 5.2.2.	Ecosystem services	National rulemaking
46.	To move from a qualitative to a quantitative prediction of impacts, the conceptual model must be linked with one or more ecological models that capture the essential linkages embodied in the conceptual model and are parameterized to reflect the range of relevant scales and regions. Criteria for choosing among alternative models were discussed in Section 2.	p. 104, l. 4-8	P. 2, S. 5.2.2.	Ecosystem services	National rulemaking
47.	In summary, the initial conceptual model of a system provides the big picture of the possible environmental impacts of the rule. Then, when focusing on just the outputs from specific facilities such as CAFOs or aquaculture facilities that are covered in a rule, there is a large array of potential metrics that would indicate the success of rulemaking in providing better ecosystem services to society. In addition to looking at end point services only, it is important to look at the ecosystem service providers, even though they cannot be directly monetized. The suggestion here is through an analysis of the structures of the systems that are impacted it should be possible to focus on functional types that are most directly involved in providing the services in question. There are ample tools available for making these measurements	p. 104, l. 26 to p. 105, l. 4	P. 2, S. 5.2.2.	Ecosystem services	National rulemaking
48.	Recommendation: Start building toward a more holistic approach to rule making.	p. 105, l 5	P. 2, S. 5.2.2.		National rulemaking
49.	Recommendation: The Agency should make a greater effort to select endpoints for valuation based on its assessment of the social importance of the of the ecosystem service rather than to allow the choice of endpoints to be dictated by the available models and data.	p. 106, l. 6-9	P. 2, S. 5.2.3.	Public concern for ecosystem service	National rulemaking

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	Recommendation	Page/Line	Part/Section	“Type”	Decision Context
50.	Recommendation: To the extent possible, non-monetized ecological effects should be reported in appropriate units in conjunction with monetized benefits. In addition, aggregate monetized benefits should be labeled as “Total Monetized Benefits” rather than “Total Benefits.”	p. 107, l. 17-19	P. 2, S. 5.2.3.	Non-monetized benefits Communication	National rulemaking
51.	Recommendation: EPA should seek to build additional capacity, externally and in-house, specifically designed to facilitate ecological valuation for recurring rulemakings The committee advises the Agency to develop an extramural grant program focused on method development specifically for recurring rulemakings (e.g., for rulemaking associated with programs like EPA’s National Ambient Air Quality Standards or Effluent Guideline programs)..	p. 107, l. 17-22	P. 2, S. 5.2.3.	Institutional Research	National rulemaking
52.	The Committee also advises the Agency to host annual Agency-wide meetings to discuss methods used in regulatory impact analyses and benefits assessments and methods needed for full characterization of the effects addressed by the regulatory actions associated with those efforts. One objective of this effort should be to build an improved data base for benefits transfer for ecosystem service valuation	p. 107, l. 17-22	P. 2, S. 5.2.3.	Data and model sharing	National rulemaking
53.	Recommendation: EPA should include a separate chapter on “Uncertainty Characterization” in each benefit assessment and RIA. The chapter should discuss the scope of the benefit assessment, the different sources of uncertainty [e.g., Biophysical Changes and their Impacts; social information about endpoints, valuation methods (including use of “benefit transfer”)], and report on methods used to evaluate uncertainty. Within the section on “scope,” the Agency should discuss the types of “socially important” values related to the issue that were included in the assessment and those that were excluded because they were not conceptually appropriate for the benefit assessment or RIA. At a minimum, the chapter should report ranges of values and statistical information about the nature of uncertainty for which data exist. For each type of uncertainty, information similar to that reported in the Agency’s prospective analysis of the benefits and costs of the Clean Air Act Amendments (US EPA, 1999) should be reported and a summary of this information should appear in the executive summary of the RIA or Benefit Assessment. Specifically, EPA should report: a) potential source of error; b) the direction of potential bias for overall monetary benefits estimate; and c) the likely significance relative to key uncertainties in the overall monetary benefit estimate. More generally, benefit assessments and RIAs	P. 111, l 5-23	P. 2, S. 5.2.4	Uncertainty communication	National rulemaking

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	Recommendation	Page/Line	Part/Section	“Type”	Decision Context
	should highlight in quantitative and qualitative terms any “socially important assessment endpoints” identified as appropriate for the analysis that were not monetized.				
54.	Recommendation: EPA should supplement RIAs with sensitivity analyses based on alternative models and methods for estimating economic values. To stimulate the exploration and development of methods needed to enhance EPA’s capacity for ecological valuation, EPA should seek, for each rulemaking, to conduct a sensitivity analysis using different methods from the core analysis, and preferably appropriate innovative methods, for one or more components of the core analysis. Such a sensitivity analysis would serve to develop experience with innovative methods and to test the results of findings in the core analysis. The plan for the sensitivity analysis should be discussed in the analytical blueprint for the benefit assessment or RIA or the rationale for not including the sensitivity analysis should be discussed in this document, which would be part of the public record for the rulemaking and available on line.	p. 111, l. 24 to p. 112, l. 4	P. 2, S. 5.2.4	Uncertainty Institutional communication	National rulemaking
55.	The Executive Order that mandates a benefit-cost analysis for major rules adopts a national perspective. Thus analysts undertaking the research needed to prepare benefit-cost analyses have tended to favor models and estimates that also have a national perspective. This so-called "top down approach has caused them to overlook the possibility of adapting a set of regional studies more closely aligned to the changes in the ecological effects so that these studies could meet the goals of a national analysis. This alternative "bottom-up" approach would proceed by establishing separate estimates for each regional grouping or group of similar facilities and then adding them together to obtain the national estimate.	p. 112, 21-29	P. 2., S.3.	Case Studies	National rulemaking
56.	. Therefore a key recommendation is that consideration of ecosystem services and their benefits to human well-being and other forms of value need to be considered from the earliest stages of addressing contaminated properties.	p. 126, l. 5-7	P.2., S.6.3	Ecosystem services	Site-specific decision-making
57.	Data that supports or aids in the design of benefits assessment should be considered in the design of any site characterization plan	p. 126, l. 11-13	P.2., S.6.3	Ecosystem services	Site-specific decision-making
58.	In order to facilitate the charge to expand its focus on values, it is recommended that from the outset that expertise and opinions be brought to the process by integrating technical disciplines and engaging interested and affected stakeholders	p. 128, l. 3-6	P. 2, S.6.3	Disciplinary integration Public involvement	Site-specific decision-making

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	Recommendation	Page/Line	Part/ Section	“Type”	Decision Context
59.	At the beginning of the process, broadly define the range of ecological services and associated value(s) recognized as important by key stakeholders and the community at large as attributable to the site or locale. To achieve this objective: <ul style="list-style-type: none"> • Explore the utility of a variety of group process (e.g. Deliberative facilitated) and survey methods (e.g. Social-Psychological or “attitude”) to engage stakeholders in this process from the outset. • Consider the many sources of ecological value including both instrumental and intrinsic. • Consider not only current or diminished ecological services, but also the potential for developing or enhancing ecological services not presently utilized. 	p. 129	P. 2, S.6.3	Ecological services Public involvement	Site-specific decision-making
60.	Appropriately involve the right mix of interdisciplinary collaboration from physical, chemical, biological (ecology, toxicology etc.) and social scientists (economists, social psychologists, anthropologists, etc.) in line with site-specific considerations and conditions and the specific step in the process	p. 129	P. 2, S.6.3	Disciplinary integration	Site-specific decision-making
61.	Clearly demonstrate the alignment between ecological services the ecological functions that produce those services and potential positive or negative effects from current conditions or proposed agency actions. To achieve this objective: <ul style="list-style-type: none"> • Develop the capacity to utilize an ecological – economic conceptual model to inform the site assessment design. • Develop the “accounting rules” to recognize and avoid double-counting or under-counting the benefits from ecological service flows. A consistent focus on production function will aid this objective. • Develop approaches to sort, weight or otherwise prioritize ecological services for primacy for actions and also to weigh benefits derived. 	p. 129	P. 2, S.6.3	Ecological services	Site-specific decision-making
62.	Expand the variety of methods in the Agency’s arsenal to quantify the ecological service, to describe ecological production functions and to capture in monetary and non-monetary terms the value lost or gained from current conditions or some proposed agency action	p. 129	P. 2, S.6.3	Ecological services Methods	Site-specific decision-making
63.	Develop the capability to utilize valuation techniques to provide a basis to demonstrate Agency performance and communicate the expected or actual outcome from Agency actions.	p. 129	P. 2, S.6.3	Communication Evaluation	Site-specific decision-making
64.	Create formal systems and processes to foster an information sharing environment	p. 129	P. 2, S.6.3	Data and model	Site-specific decision-

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	Recommendation	Page/Line	Part/Section	“Type”	Decision Context
	<ul style="list-style-type: none"> Actively document lessons-learned from applications of valuation methods and share broadly among program and project managers. 			sharing	making
65.	Broadly define ecosystem services early in process.	p. 130, l. 5	P. 2, S.6.4	Ecosystem services	Site-specific decision-making
66.	Engage key stakeholders	p. 130, l. 26	P. 2, S.6.4	Public involvement	Site-specific decision-making
67.	Define the ecosystem services that matter to people	p. 131, l. 14	P. 2, S.6.4	Ecosystem services	Site-specific decision-making
68.	Integrate disciplines	p. 132, l. 16	P. 2, S.6.4	Disciplinary integration	Site-specific decision-making
69.	Utilize an ecological-social value conceptual model	p. 133, l. 11	P. 2, S.6.4	Conceptual model	Site-specific decision-making
70.	(?Fill) Need for “accounting” rules to count benefits	p. 135, l. 26	P. 2, S.6.4	Accounting	Site-specific decision-making
71.	Align ecosystem services with ecological production functions and impacts/risks	p. 138, l. 9	P. 2, S.6.4	Ecosystem Services	Site-specific decision-making
72.	Expand methodological capacity	p. 141, l.20	P. 2, S.6.4	Methods	Site-specific decision-making
73.	Future uses that matter to stakeholders	p. 141, l.29	P. 2, S.6.4	Public involvement	Site-specific decision-making
74.	Aligning ecosystem services with risk assessment	p. 144, l.1	P. 2, S.6.4	Ecosystem services	Site-specific decision-making
75.	Testing remedial and redevelopment alternatives (Use new methods)	p. 144, l.23	P. 2, S.6.4	Methods	Site-specific decision-making
76.	Balancing tradeoffs	p. 146, l.6	P. 2, S.6.4	Methods	Site-specific decision-making

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	Recommendation	Page/Line	Part/Section	“Type”	Decision Context
77.	Additionally, the Agency should advance their capacity to communicate alternative futures and their associated benefits to stakeholders	p. 147, l. 10-12	P. 2, S.6.4	Communication	Site-specific decision-making
78.	Develop the capability to utilize valuation techniques to provide a basis to demonstrate performance and communicate the expected or actual outcome from Agency actions.	p. 147, l. 23-25	P. 2, S.6.4	Communication	Site-specific decision-making
79.	Actively document lessons-learned from applications of valuation methods and share broadly among program and project managers	p. 149, l. 23-25	P. 2, S.6.4	Data and model sharing	Site-specific decision-making
80.					
81.	Because any given policy may result in a range of different outcomes, decision makers must be provided with sufficient information about what is known about the distribution of possible outcomes so that they can take uncertainty into account in their policy choices.	p. 180, 1 st paragraph, 5-7 line	P. 2, S.8.1.	Uncertainty	All contexts
82.	The way in which uncertainties are represented should be consistent with the decision principle being utilized	p. 180, 1 st paragraph, 4th line from bottom	P. 2, S.8.1.	Uncertainty	All contexts
83.	As resources permit, analytic-deliberative process, involving iterative problem definition and description by stakeholders, should be engaged, as it will increase the transparency, credibility and usefulness of valuation exercises.	p. 183, 3rd paragraph	P. 2, S.8.2.	Communication	All contexts
84.	Use GIS and interactive geospatial information systems integrated with other ecological models where feasible, to represent the state of ecological systems and services. Consider best cartographic principles and practices	p. 190, 1 st paragraph	P.2, S.8.2.	Communication	All contexts
85.	EPA should develop an empirical analysis of the users of valuation and adapt valuation communications to their needs.	p. 194, l. 16-17	P.2, S.8.2.	Communication	All contexts
86.	Support interactive exploration tools in valuation representations and communications, where feasible	p. 195, l. 19-20	P.2, S.8.2.	Communication	All contexts
87.	Follow demonstrably effective basic practices for risk and technical communication.	p. 195, l. 26-27	P.2, S.8.2.	Communication	All contexts
88.	If a summary of uncertainty in an estimate is not given prominence relative to the estimate itself, context for interpreting the estimate and opportunities to learn from uncertainty associated with it may be lost.... It's important to communicate uncertainty appropriately in all contexts, regardless of the difficulty of doing so.	p. 197, l. 8-10, 25-26	P.2, S.8.2.	Communication Uncertainty	All contexts
89.	Recommendation: The Committee advocates the Agency more broadly collect and communicate ecosystem benefit indicators (EBIs) to inform the	p. 211, l. 17-20	P.3, S.3.1.	Ecosystem services	All contexts

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	Recommendation	Page/Line	Part/ Section	“Type”	Decision Context
	social weighting and valuation of ecosystem services			Method	
90.	EBIs can and should be used to educate decision-makers and stakeholders about the underlying complexity of ecological and economic relationships.	p.222, l. 13-16	P.3, S.3.1.	Ecosystem services Method	All contexts
91.	Genuine probing interactions with individuals or groups representing key stakeholders and including divergent views and concerns should be a central part of problem definition and identification of significant ecological and associated social effects components of the process.	p.240, l. 11-15	P.3, S.4.2	Method	All contexts
92.	However, as yet, different model structures yield quite different estimates of the shadow price of time, and there is no clear basis for preferring one model and its value over other models. Until these issues can be resolved, estimates of recreation values should be presented as conditional upon a specific value of the shadow price of time or a specific modeling approach regarding the role of time, and the uncertainty in the estimates that this implies should be acknowledged	p.258, l. 1-5	P.3., S.5.3.1	Method	All contexts
93.	Governmental agencies should employ citizen valuation juries as a supplement to and check on traditional economic valuation approaches. Decisions whether to pursue particular regulations or other governmental actions should consider estimates of both private and public value, along with the strengths and weaknesses of each approach..	p.307, l. 5-9	P.3., S.6.5	Method	All contexts
94.	Replacement cost can be a valid measure of value if three conditions are met: 1) the human-engineered system provides services of equivalent quality and magnitude, 2) the human-engineered system is the least costly alternative, and 3) individuals in aggregate would be willing to incur these costs rather than forego the service (Bockstael et al. 2000; Shabman and Batie 1978). If these conditions are not met, then use of replacement cost is invalid. Even when these conditions are met, replacement cost is a value not of ecosystem services themselves, but is the value of having a means to produce the service via an ecosystem rather than via an alternative human-engineered system. All valuation methods can be misconstrued applied incorrectly and misinterpreted, however the replacement cost method require special caution. There is great potential for abuse in using replacement costs to estimate the value of ecosystem services and it should be used with care.	p.313, l. 11-13	P.3., S.7.1.	Method	All contexts
95.	In the case of tradable permits, there are no conditions under which the cost of permits could be used as a proxy for economic value.	p.315, l.21-22.	P.3., S.7.2.	Method	All contexts
96.	Therefore the Agency should explore such proactive applications of HEA and REA in other regulatory contexts and especially in collaborative	p.321,l.27-29	P.3., S.7.3.	Method	All contexts

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	Recommendation	Page/Line	Part/Section	“Type”	Decision Context
	partnerships with conservation as a focus.				
97.	The HEA method is not appropriate for standard benefit-cost analysis, where the goal is to determine optimal (efficient) allocation of scarce resources. The cost of compensatory restoration projects should not be communicated as the benefit of the resources to the public	p.322, l.10-12	P.3., S.7.3.	Method	All contexts
98.	Uncertainty can and should be, directly incorporated into any HEA analysis.	p.322, l.13-14	P.3., S.7.3.	Method	All contexts
99.	<p>There are a number of key areas for research and development that the Agency should explore in connection with HEA.</p> <p>The Agency should look at HEA for its applications in other contexts then Natural resource Damage Assessment. In particular they should consider its utility tandem with Net Environmental Benefit Analysis (Efroymsen et. al. 2004) in the selection of best alternatives for project investment.</p> <p>The Agency should consider research to develop a more complete understanding of the service flows and the associated values of goods and services derived from those flows derived form specific important habitat types (e.g. coastal wetlands, bottomland hardwood forest. etc). Such value definitions for ecosystem service could then be couple to HEA to estimate values associated with a project or restoration action.</p> <p>EPA should consider developing operating principles for considering on-site, in-kind changes in resources and ecological services, as compared with off-site and out-of-kind resources. In support of this objective methods to assess and compare ecological capacity and the opportunity and payoff for restoration in the evaluation and design of restoration projects will also strengthen the method to assess comparability of ecological resources.</p> <p>Finally, this method will be strengthened if the Agency develops guidance on the appropriate aggregation and accounting of services related to biotic resources and their supporting habitats in order to advance the utility of HEA to support local and regional valuation efforts.</p>	p.322, l.20 to p.323, l 9.	P.3., S.7.3.	Method Research	All contexts
100	. Whatever the value measure being sought, the design and conduct of surveys is best done when informed by the literatures on survey methods. Therefore, it is important that EPA surveys be implemented at least partly by individuals who are well-versed and up-to-date in these literatures. This is probably best accomplished by teams of researchers composed partly of EPA employees who specialize in surveys and outside consultants who are experts in survey methods. EPA may therefore want	p.339, last paragraph	Appendix A	Survey	All contexts

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	Recommendation	Page/Line	Part/Section	“Type”	Decision Context
	to assess its current capacity to conduct or oversee contractor design and implementation of high-quality surveys.				
101	OMB clearance is required for all EPA surveys, and achieving this clearance requires that a survey meet high standards of quality. In order to maximize the likelihood of approval, it is important that a proposed survey meet a set of criteria: a) representative sampling of the population of interest with minimal non-coverage error; b) a very high response rate or a plan to assess the presence of non-response bias; c) a measuring instrument that has been developed according to optimal design and pretesting practices; and d) a measurement approach for which a body of empirical evidence documents validity.	p.340, first paragraph	Appendix A	Survey	All contexts
102	It might seem obvious that when EPA conducts surveys, all possible steps should be taken to increase response rates. According to federal convention, that cannot include offering financial incentives to respondents, but EPA can implement other techniques to enhance response rates, including lengthening the field period during which data are collected, and more attempts to contact potential respondents. However, to justify resources to implement such techniques, it is important to have empirical evidence documenting the effectiveness of these techniques for EPA surveys. It is also important to be sure that efforts to increase the response rate of a survey do not inadvertently decrease the representativeness of the sample	p.340, last paragraph	Appendix A	Survey	All contexts
103	Finally, new EPA guidelines on surveys suggest that when a survey is expected to obtain a relatively low response rate, investigators should plan to implement techniques to assess sample representativeness. Rather than outlining what such procedures would look like, OMB has left it to investigators to propose and justify such techniques. EPA could therefore commission work to design procedures for this purpose and conduct studies to validate the effectiveness of the procedures.	p.341, last paragraph	Appendix A	Survey	All contexts

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Appendix G: Proposed Next Steps for Development of the C-VPES Report

	Step	Timeframe
1.	Post May 1-2, 2007 Revisions to DFO	June 1, 2007
2.	SAB Staff Office sends document to editor	June 15, 2007
3.	Editor provides redraft	July 15, 2007
4.	SAB Staff Office sends editing team’s comments to editor	August 10, 2007
5.	Editor provides second redraft	August 31, 2007
6.	SAB Staff Office sends document to C-VPES for final review	September 7, 2007
7.	C-VPES review prior to chartered SAB Quality/Expert Review	September 21, 2007
8.	SAB Staff Office briefing for Senior Agency Officials prior to chartered SAB Quality/Expert Review	October 2007
9.	SAB Quality/Expert Review	October/November2007
10.	Finalization of Report	November/December 2007

The Charge to the Board in reviewing draft SAB Panel reports is to determine whether:

- a) the original charge questions¹ to the SAB Standing or Ad Hoc Committee/Panel were adequately addressed in the draft report;
- b) the draft report is clear and logical;
- c) the conclusions drawn, and/or recommendations made, are supported by information in the body of the draft SAB report; and
- d) the document is free from major technical errors.

Because the C-VPES report is an “original study” (the first implemented since the SAB restructuring and implementation plan of 2003), the *Implementation Plan for the New Structural Organization of the EPA Science Advisory Board (SAB): A Report of the EPA Science Advisory Board Staff Office* (EPA-SAB-04-002) (p; 18) requires that “SAB Quality Review Committees, with the assistance of additional experts, will also be established to conduct a review of original works performed by SAB Committees and to make appropriate recommendations to the Board.” A group of subject matter experts will be added to the chartered SAB to assist with the Quality Review.

¹.The Committee's overall charge: to assess Agency needs and the state of the art and science of valuing protection of ecological systems and services, and then to identify key areas for improving knowledge, methodologies, practice, and research.

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