

**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 – October 5-6, 2006**

Committee Members: (See Roster – Appendix A)

Scheduled Date and Time: From 9:00 a.m. to 5:30 p.m. (Eastern Time) on October 5, 2006; and from 9:30 a.m. to 1:00 p.m. (Eastern Time) on October 6, 2006. (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 to further discuss topics relating to a draft advisory report calling for an expanded and integrated approach for valuing the protection of ecological systems and services. This activity responds 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 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. Terry Daniel
Dr. A. Myrick Freeman
Dr. Dennis Grossman
Dr. Douglas E. MacLean
Dr. Harold Mooney
Dr. Louis Pitelka
Dr. Stephen Polasky
Dr. Paul Risser
Dr. Homes Rolsten
Dr. Mark Sagoff
Dr. Paul Slovic
Dr. Kerry Smith

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

Dr. Jon Krosnick

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
Ms. Kathleen White, SAB Staff Office, Designated
Federal Officer (DFO)

EPA Staff: Dr. Wayne Munns
Ms. Iris Goodman
Dr. William Wheeler

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 9:00 a.m.

Dr. Vu welcomed committee members and acknowledged the progress made by the committee. She welcomed members of the public and Agency staff and recognized Drs. Jon Krosnick and Allyson Holbrook as new consultants to the committee.

Discussion of committee's approach to completing its report and overview and discussion of major report recommendations ("themes") and report outline

Dr. Buzz Thompson, Chair of the Committee, echoed thanks for committee members' work. He noted plans to hold one more face-to-face meeting and asked the DFO to confirm that May 1-2, 2007 were the dates for committee's final face-to-face substantive discussion of the C-VPESS draft report. He described the goal of the meeting as committee discussion of several portions of the report that the Committee has not yet specifically addressed (i.e., Chapters 3 and 4) and planning the process for refining and reviewing Part 2 of the report devoted to methods (See Appendix D, which includes a detailed draft outline of the report). He discussed the draft outline of the report, which is listed immediately below:

Draft Outline of C-VPES Report

PART 1: OVERVIEW AND APPLICATION OF THE APPROACH

1. THE APPROACH
2. A MORE COMPLETE TOOLBOX
3. APPLYING THE APPROACH
4. GENERAL VALUATION ISSUES AND APPROACHES
5. DETAILED RECOMMENDATIONS

PART 2: METHODS

1. INTRODUCTION
2. PREDICTION OF ECOLOGICAL IMPACTS
3. BIO-PHYSICAL RANKING METHODS
4. SOCIO-PSYCHOLOGICAL APPROACHES
5. ECONOMIC METHODS
6. PUBLIC AND GROUP EXPRESSIONS OF VALUE
7. DELIBERATIVE PROCESSES FOR ELICITING VALUES
8. METHODS USING COST AS A PROXY FOR VALUE

APPENDIX A: SURVEY ISSUES: CURRENT BEST PRACTICES AND RECOMMENDATIONS FOR RESEARCH

Dr. Thompson noted that Appendix A was designed to address survey-related issues that touch on many methods. He introduced Drs. Krosnick and Holbrook, invited to serve as consultants to the committee. Their task is to work with members of C-VPES to identify survey-related issues of concern to EPA related to ecological valuation and to provide a review of the related academic literature. Dr. Thompson envisioned that the C-VPES might consider including the draft text they would develop by December 1, 2006 in Appendix A. He noted that they might also suggest some ideas or text that might fit in Chapter 4 of the report.

He also noted that Dr. James Boyd had been asked to lead a discussion about the most appropriate approach for "grouping" or assessing ecosystem services at EPA.

The discussion then turned to the structure of Part 2 of the draft report. Drs. Thompson and Segerson noted that there were no new methods added to the envisioned outline of the report, but that methods had been grouped in some new ways. Dr. Segerson reviewed the rationale for grouping methods in the draft outline. Another member noted the need to have the report edited to eliminate redundancy and to make the document coherent and consistent. Dr. Thompson noted that the SAB Staff Office has committed to securing a technical editor to assist with the final production of the document, and that the chair and co-chair would work with the Staff Office to provide oversight of the editor's work.

Members discussed that Part 2 was envisioned as an assessment of methods for EPA's use. Such an assessment would include consensus where possible and competing views where necessary.

Several members questioned whether the section on “prediction of ecological changes” belonged in Part 2. Members agreed that this section would not be an overview of ecological modeling. Instead it would focus on value-driven ecological models that can provide input for valuation methods.

Dr. Vu commented that it will be important for the committee to roll out the committee report and spoke of the need for committee involvement in planning communications related to the final stages of the report. Dr. Thompson welcomed this suggestion and responded that he and Dr. Segerson can develop a proposal working with Drs. Vu and Nugent and then plan a committee discussion at a future meeting or teleconference.

Dr. Thompson then reminded committee members of the major consensus recommendations reached for "Document Zero." He suggested that those recommendations provide unifying themes for the report. The recommendations, which were also included in the September 27, 2006 note set to committee members (Appendix D), are included below:

- Recognize the many sources of value derived from ecosystems, including both instrumental and intrinsic values
- Highlight the concept of ecosystem services and provide a mapping from changes in ecological systems to changes in services using the concept of an ecological production function as the term is used by C-VPES
- Expand the range of ecological changes that are valued, focusing on those changes in ecosystems and their services that are likely to be of greatest concern to people
- Explore and expand the use of methods that can appropriately characterize or measure the value associated with these changes
- Involve from the beginning an interdisciplinary collaboration among physical/biological and social scientists; and ecologists
- Solicit from the beginning input from the public or representatives of individuals affected by the ecological changes
- Foster information sharing across valuation efforts and “active learning” from efforts to develop and use new methods.

He asked committee members to provide any comments on the recommendations to Dr. Segerson during the agenda break.

Introduction to survey issues in ecological valuation; plans for Appendix A

Dr. Jon Krosnick introduced the presentation that he and Dr. Holbrook had prepared by noting that the survey process was a social and psychological process and that psychological research can help address issues related to collecting survey data. He noted that these issues can often be quite complex. His perspective drew not only on his academic research but also on his experience with contingent valuation studies (e.g., Exxon, Cal Oil, Montrose) and observation of differences between EPA and OMB in their ideas about how to balance costs and benefits of conducting surveys. He and Dr. Holbrook structured their presentation to review the basics of

survey methodology, because these basics usually merit careful attention in EPA surveys. Appendix E provides the slides used in their presentation.

During the presentation and the discussion that followed, the following major points were made of special interest to C-VPES:

- Face-to-face surveys are considered the “gold standard” – they achieve the highest response rates and acquire the most accurate reports from respondents.
- Telephone surveys are preferred by some respondents as more affordable than face-to-face surveys, but several potential problems are associated with telephone interviewing
- OMB guidance in the past used to view the anticipated response rate as a key determinant of whether the study would be approved.
- OMB recently issued new formal guidelines for evaluating surveys that are more flexible and sensible. The new guidelines state that if analysts anticipate a response rate below 70 or 80, they should plan to evaluate the respondent pool for representativeness. The guidelines provide no guidance about how to do so.
- Dr. Krosnick suggested that EPA consider buying questions on large, high-quality surveys to validate a smaller survey’s respondent pool for representativeness.
- A C-VPES member noted that under the new guidelines, any design work requires approval for surveys judged to be influential. Such design work includes focus groups and multiple reviews for enhancements to the design developed iteratively with several focus groups.
- Research shows that a survey respondent pool’s representativeness is correlated with response rate, but only very weakly.
- Internet surveys may offer an opportunity to collect valuable data. The National Science Foundation will spend \$2 million to recruit a nationally representative sample through face-to-face contact at their homes to join an internet survey panel, to provide data monthly. This method will be compared to other modes of sampling/data collection.
- The huge literature on optimal questionnaire design offers great potential for strengthening EPA survey work. Basic findings (e.g., that suggest avoiding agree/disagree questions) and new tools to compare data quality and survey designs can help the Agency. Tools are available to compare methods for presenting complex information.
- Several areas of current survey research are of potential interest to C-VPES, e.g., research to identify when nonresponse bias exists; conditions when nonresponse

rates are related to non-response bias • Federal agencies would benefit from coordinating with each other and taking advantage of research on technical issues and expertise in graduate programs.

Dr. Thompson noted that the purpose of the discussion was for Drs. Krosnick and Holbrook to receive guidance from the committee about the appropriate content of Appendix A.

He noted that Drs. Paul Slovic, Terry Daniel, and Kerry Smith had assisted in coordinating initially with Dr. Krosnick and that they and Dr. Ann Bostrom would serve as a subcommittee to assist Drs. Krosnick and Holbrook in developing draft text for Appendix A. He asked the subcommittee to provide some initial thoughts about important topics to be addressed. Members of the subcommittee identified several ideas. One member emphasized the importance of focusing on the specific scope of the C-VPES: the complex attitudes and values related to protecting ecosystems and ecosystem services. One topic would be the adequacy of surveys for “getting at something that’s this complex, not well to people, where results really will matter.” A related issue was the impact of elicitation method on values and how values, especially expressed through trade-offs, are shaped by elicitation methods.

Another subcommittee member noted that a related issue involved “whether elicitation moves responses around or whether it moves latent values around.” He noted that this issue was not limited to surveys; market choices were also influenced by contextual stimuli. He suggested that the appendix consider the relative merits of conjoint approaches vs. use of “analytical questions” and whether conjoint approaches can be used to help people address values or tradeoffs that are difficult to articulate.

A third subcommittee member stated that the Appendix should describe the attributes of a good survey and discuss the importance of mode. It should also include: 1) some discussion of difficulties doing well-designed surveys of representative population; 2) a general section on surveys that extends to any survey (e.g., multi-attribute, contingent valuation, attitude surveys); 3) a discussion of the complexity of object of choice given to respondents (i.e., is there anything “we can pull from literature” that can help EPA gauge when respondents are informed about complex objects or when there is an interaction between extent of complexity and visual cues.

He noted that concerns exist regarding many methods (e.g., narratives, multi-attribute) that are similar in nature to concerns raised over contingent valuation surveys. He proposed that Drs. Krosnick and Holbrook address the issue of how to separate signal from respondent in surveys and also noted that these insights would be useful for text earlier in the body of the report. Dr. Krosnick noted that survey responses are indirect measures of values we measure. A key question is “can we as researchers improve methods to get closer to people's hearts and minds?” Another subcommittee member commented that these issues resemble issues raised concerning risk assessment. There is a need for transparency in the use of methods. It is important to have methods open to critique, argument, and debate.

A fourth committee member asked that Appendix A contain text that can help the Agency focus on the design phase and also specific recommendations to assist EPA with postsurvey data quality assessment.

Dr. Thompson then invited other committee members for their comment. One member asked about geographic scale and questioned “to what degree does scale influence surveys? If you are operating at level of national rules, do you ask same questions about what matters as you do at local scales?” Another member asked about transfer of survey findings from one location to another – are survey findings in one location transferable to another. Yet another member built on the preceding question to ask “if you have a national program not uniform in its impact geographically, how does that influence the framing of information, the kinds of specificity one presents, particularly because one does not want to ask different questions about programs to people in different locations.” Yet another question pertained to ways EPA can address budget constraints by using a general-purpose survey in different ways.

Another committee member asked if Appendix A could address the relationship between weak preferences on the malleability of preferences and the appropriate ways survey researchers can gather data if preferences are malleable.

Dr. Thompson concluded the discussion by noting that the purpose of the Appendix was to document challenges for EPA for doing survey research and possible approaches to take in light of those challenges. He asked members of the subcommittee to work with the DFO to provide guidance to Drs. Krosnick and Holbrook. Some material developed may be appropriate for the envisioned Appendix. Other material may relate to the “transfer” of social information; other material may go elsewhere in the report.

EPA’s release of a revised Ecological Benefits Assessments Strategic Plan, Update and Committee Discussion

Dr. Wayne Munns of EPA’s Office of Research and Development provided a briefing by telephone on EPA’s revisions to the draft Ecological Benefits Strategic Plan (EBASP), reviewed by C-VPSS in 2005. The briefing summarized the goals of the plan, the Agency’s response to C-VPSS advice, implementation plans, and the plans to release the document to the public in November. (See Appendix G for a copy of the slide presentation used). Dr. Munns also noted that members of EPA’s coordination committee for the EBASP were available to help address committee questions.

In response to question from a committee member, Dr. Munns noted that the revised plan proposes an oversight committee at the senior level, similar to the Agency’s Science Policy Council. He noted that the plan anticipates that the Administrator would appoint members to this group.

Dr. Munns addressed several other questions raised by committee members. In response to a question about regional impact, Dr. Munns observed that the EBASP coordinating committee hoped that the plan would serve as a model for regions and noted that a member of the oversight group planned to brief the Agency’s Regional Science Council, which coordinates planning for regional science with the Office of Research and Development.

A committee member noted that the National Science Foundation's Long-term Ecological Research (LTER) Program was currently examining how to incorporate the social sciences in LTER sites. He suggested that it would be useful and important for EPA to communicate about the release of EBASP to this group. Dr. Munns noted this suggestion and agreed to include a special outreach to the NSF LTER program as part of the communication efforts surrounding the plan.

A committee member asked about the role of quantified values that were not monetized in EPA Agency decision-making. A member of the EBASP coordinating committee noted that a desk officer at OMB who reviews EPA documents observed that OMB valued quantified information that is not monetized. The EPA EBASP committee member had, however, no absolute measure of the importance of that information and observed that dollars appear to have more weight.

In terms of EPA's resources and ability to meet the goals of the EBASP, Dr. Munns noted that EPA has the "right people" who have the "ability" to conduct the science necessary for valuation. In his view, the issue is the availability of methods, information, and knowledge. Institutional barriers do exist. The Agency finds it difficult to assess social values that are key to ecological valuation. Bureaucracy slows our ability to collect needed information. As a result, the Agency often uses benefits transfer and this factor affects the quality of information,

Dr. Munns noted that the Agency recognizes the important step of determining "what matters to people." This information would affect what policy options will be considered and the assessment endpoints used for ecological risk assessment. Dr. Munns noted that the ecological benefits strategic plan suggests that the EPA Risk Assessment Forum's document on *Generic Ecological Assessment Endpoints* would be starting point for consideration of the types of endpoints for ecological risk assessment and ecological valuation. A committee member also noted that the analytical process envisioned for valuation was iterative although this concept is not clearly communicated in the central graphic used in the EBASP. Dr. Thompson asked the Designated Federal Officer to provide the committee with the EPA Risk Assessment Forum's document on *Generic Ecological Assessment Endpoints*.

A committee member asked whether the Agency had considered the possibility that there may be cases where the deficiencies in the knowledge base of linkages among ecological endpoints and social welfare are so great that the Agency should stop the valuation exercise and acknowledge that it cannot be done. He asked about whether the Agency had considered that a premature attempt to apply a monetized framework for such efforts may do more harm than good. Dr. Munns responded that stopping an assessment is not an option for EPA. There are legal and administrative requirements to conduct assessment the best we can. EPA has the duty to make choices about which analytical approach to apply, which endpoints to choose, and how to describe changes. The Agency recognizes the role qualitative descriptions can play and seeks to find some way to put more weight on factors that can't be quantified. The plan may be to raise a high-level science policy issue to increase sensitivity to these issues, to allow greater experimentation, and to alter current understandings of what constitutes a rigorous standard.

Briefing and discussion of STAR grant programs involving ecological valuation and

conserving ecosystem services

Dr. William Wheeler of EPA's ORD National Center for Environmental Research provided a brief slide presentation about EPA's STAR Grant Program on Ecological Valuation (Appendix H) and responded to committee questions.

In response to questions, Dr. Wheeler noted that the STAR grant program was the smallest extramural program in ORD and constitutes virtually all the economic valuation sponsored through ORD. He acknowledged that some of the larger ecological grants from other centers in ORD have some non-economic social science components as part of their multi-disciplinary efforts. He noted that it was important but difficult to coordinate with all other parts of EPA, especially those undertaking site-specific research. A committee member emphasized the need for integration across EPA's research needs and for a forum to identify larger needs. Dr. Wheeler noted that senior managers at EPA review research strategies and plans and identify opportunities to address larger needs.

Another question related to how ORD identified the type of person identifying ecological services or ecological values, i.e., whether those persons are ecological scientists, "lay persons," or others. Dr. Wheeler responded that ORD relied on applicants for grants to work out that issue within their own context. His program was interested in "what people care about for benefit transfer." Several projects compare lay and expert views. Dr. Wheeler distributed a list of valuation related extramural grants funded since 2004 (Appendix I).

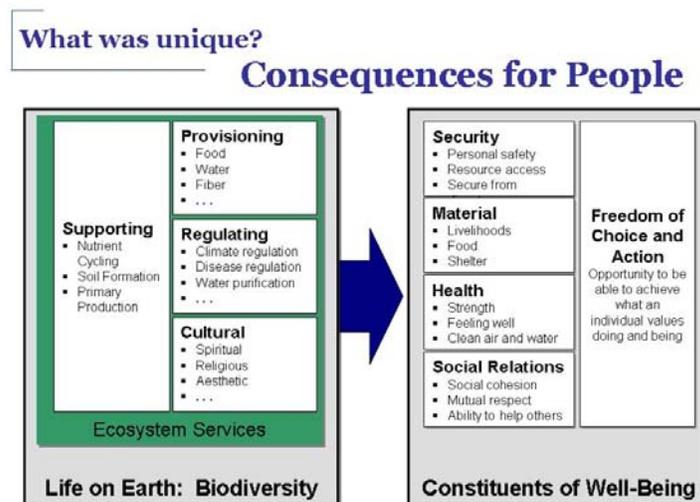
Ms. Iris Goodman, also of EPA's ORD National Center for Environmental Research, spoke of the recent history of EPA's ecological research program and her experience managing a new approach to NCER's extramural ecological research program. She noted that ORD revised the program in light of receiving a "failing score" on its 2003 Program Assessment Rating Tool review from the Office of Management and Budget. She provided a slide presentation with background on the goals of EPA's ecological research program and the planned NCER STAR grant solicitation (Appendix J), building on past STAR grant experiments with the joint EPA/NSF inter-disciplinary "Water and Watersheds" program. EPA has redesigned the ecological research program to have output to support decision-making. Research at the local level was envisioned as offering "lessons learned" for decisions at the national level. She noted in her presentation that the planned extramural ecological research program has received favorable review by ORD's Board of Scientific Counselors and that interest in ecological services is shared by other federal agencies and by the White House Committee on Environment and Natural Resources.

After Ms. Goodman's presentation, she took questions from the committee. She noted that two of the three landscape level research efforts featured in her slide presentation have been documented and a third will be documented soon. They offer examples of how landscape-level effects of government can translate into changes on the landscape over time.

She noted that she has personally kept informed about the NCER ecological valuation research and the Agency's progress on the EBASP and that her principal focus has been on ecological sciences.

Practical aspects of implementing the concept of ecosystem services in valuation at EPA, proposal and discussion

Dr. Harold Mooney provided brief comments that preceded Dr. James Boyd’s presentation of a proposal for implementing the concept of ecosystem services for valuation at EPA. He showed a slide that provided background on the Millennium Ecosystem Assessment categorization of ecosystem services and its conceptualization of the impact of those services on people (slide immediately below).



Dr. Mooney noted that double counting of ecosystem services occurred when analysts count ecological services in multiple categories (e.g., as both supporting and provisioning services).

Dr. James Boyd then provided a proposal for analyzing ecosystem services for EPA’s needs. He proposed that the Committee recommend that the Agency focus its data collection and analysis on “the quantities and qualities of things in nature that folks care about.” He emphasized five principles for determining what would be counted and analyzed. The “qualities and quantities” should be: 1) end products; 2) benefit-dependent; 3) ecological “things” and qualities; 4) measurable in practice; and 5) location- and time-specific. He advocated that counting such things would help analysts measure ecosystem services as "intrinsic values" (i.e., “if you care about beauty, if you care about animals, these are the quantities you care about). His argument was presented in several slides that are included as Appendix F. He argued that the Agency should focus on the “big Q’s” (final quantities of services) and not the “little q’s” (intermediate quantities of services).

One member asked how such an approach would deal with concerns that might be narrow, uninformed, or unformed. The member also expressed concern that there would be a technologically mediated bias in what people care about. Dr. Boyd responded that ecosystem services that are experienced indirectly, i.e., that contribute to a quantity or quality directly experienced would be counted as part of a production function (e.g., mosquitoes counted as part of the production function of pollinating orchids) for a "big Q."

Another member expressed concern that ecosystem services involve interactions between things where complementary is an issue. He noted that ecosystem services were different from the “income and product account,” which Dr. Boyd invoked as a model for conceptualizing ecosystem services. The member noted that much of what is appreciated is “concerned with bundling” (e.g., “is a browser part of your software?”) and wondered how much we know nature and to what extent can nature tolerate constancy in values. Yet another member remarked that ecosystems are valued because of their contribution to well-being and people’s relationships to nature. The “quantities” to be valued are a complex “bundle” of values.

Yet another issue concerned how quantities can be aggregated across places and even compared across places. Dr. Boyd suggested that decisions about the quantities to be valued should be determined locally. In his view “everyone has standing.” Several committee members then asked “if the quantities valued are determined locally, is it clear how they can be combined for a national analysis?” A consultant to the committee noted that “what gets counted” probably differs “across place” because of different decision-analytic processes in different places. Several members suggested that Dr. Boyd compare his approach with the Agency’s interest in incorporating its ecological risk assessment work on “Generic Ecological Assessment Endpoints” into its approach to ecological benefits assessment. Members discussed the comparability of counting “little q’s” and “big Q’s” in different policy contexts. Dr. Boyd noted that “the only thing that matters is tangibility to any person you can think of. If you count something, you count it the same way.” Another member then asked “what makes things the “same?” and noted that the last butterfly in one county is not considered the “same” as that butterfly in place where it’s abundant. Dr. Thompson asked Dr. Boyd to think of a concrete example to tease out that issue in his proposal.

Members then remarked that the term “ecosystem services” is confusing. Dr. Boyd noted that some ecologists use the term to refer to ecological processes; some ecologists use the term in a narrow sense to refer only to market services. He was searching for a way to provide a strong analytical basis for the Agency to monetize what can be monetized legitimately and quantify other services that have a basis in ecological theory and economic principles. His approach helps determine what should be quantified and provides some rationale for quantifying consistently. He proposed that the report include some language describing how to approach ecosystem service quantification consistently and why it is misleading if the Agency focuses on the “little q’s” and miss the “big Q’s.”

One member then noted that the process of “counting” the quantities was very important. He noted the importance of choosing the weights and scales to use. He compared the importance of the choice of metric for ecological benefits assessment to the importance of the choice of metrics for human health risk assessment, where very different outcomes could be obtained by choosing a metric to reflect risk of coal mining based on the death rate per 1,000 tons mined vs. the death rate per 1,000 miners. He emphasized that the choice of metric was value-laden and that value-scaling issues permeates science at all levels. Dr. Boyd noted that similar issues arise in economic analysis (e.g., the scale at which you bundle wetlands). In his view, the ability to talk about a problem improves communication and increases transparency. Another member

supported Dr. Boyd's approach and emphasized the importance of being "phenomenally rigorous" about metrics, choice of quantities, and communicating the analytical process.

Other members expressed concerns about focusing narrowly on the "big Q's" (final quantities of services) without linking that information very specifically to the "pedigree for endpoint information" and the causal functionality related to the "big Q's." She expressed concern over losing information and ability to access information about upstream services that are "supporting ecological services." Another member noted that the solution of "counting everything" was impractical. Dr. Boyd noted a parallel to national income accounting, where conventions about what to count and how to aggregate information have developed over time.

Dr. Thompson asked Dr. Boyd to develop 4 -to-5 pages of draft text on the proposed approach. He asked that the text address the issues raised by committee members, detail the practical approach that EPA might take, and incorporate several examples showing distinctions between direct and indirect effects. Dr. Segerson suggested focusing the discussion on end products and avoiding discussion of GDP analysis as a precedent, because of the complexity that discussion would interject into the text. Drs. Polasky and Grossman offered to assist Dr. Boyd with this effort.

The committee adjourned at 5:45 p.m. on October 5, 2006 and reconvened on October 6, 2006 at 9 a.m.

Process for development/refinement of method write-ups and internal review of methods

Dr. Buzz Thompson introduced the proposal for the committee's development of Part 2 of the C-VPES report, which will focus on methods (see Appendix B, section 3 of the September 27, 2006 memo from Drs. Thompson and Segerson to the C-VPES committee). He noted that different methods were in different stages of development. Dr. Segerson provided additional detail about the proposed structure of Part 2 of the report. She noted that the methods included were not "alternative methods doing the same thing" but methods that could play some part in the valuation effort. She acknowledged the need for an introduction to Part 2 to clarify scope and purpose.

Drs. Segerson and Thompson then discussed the proposed strategy for refining method write-ups and conducting an internal committee review. They proposed that individual members volunteer or take on assignments to revise specific descriptions and assessments of methods, using a common template as a guide, and that other members volunteer or take on assignments to provide initial comments on the documents before committee-wide review of methods began.

After Drs. Thompson and Segerson discussed their proposal, committee members discussed several related topics. Some members suggested changes to the structure of the Part 2. Several suggested that the chapter on "Prediction of ecological impacts" should be integrated into a chapter on ecological science that would include the text on ecosystem services that Dr. Boyd will develop, information on prediction of ecological effects, and information on ecological science from "Document Zero" (i.e., Part 1, Chapter 1). Another member disagreed and expressed the view that the ecosystem service discussion should be separate because it

involved the integration of ecological science with social science. Members also expressed concerns about overlap and duplicative text in “Document Zero” and Part 2. Dr. Thompson responded that Part 2 was intended for readers who wish to learn more detail about the application of specific methods. Members also discussed the merits of including discussions of energy-related methods (including energy) in the report. One member stated that energy-related methods don’t fit the committee’s definition of valuation in Document Zero. This issue was not resolved.

Members then discussed the goal of method write-ups in Part 2. One member welcomed the approach that methods would be critically assessed in Part 2, that committee consensus would be noted where it existed, and divergence of views recognized. Other members voiced concern that expression of reservations about methods or committee disagreements would have a chilling effect on Agency use of methods. Other members believed that the Agency will be able to deal with critical assessment of methods and differences among committee members. Dr. Thompson acknowledged this issue and committed to working with Dr. Segerson and the SAB Staff Office on a process for addressing this issue in the final report. For the interim, he asked committee members to identify disagreements, work to resolve them to the extent possible, and describe the range of views held by members of the committee. The committee will then have an opportunity to review, comment, and discuss the assessment of methods.

Members then discussed the proposed template for individual method “write-ups” (See Appendix E B). Dr. Segerson noted that it would be appropriate to consolidate conclusions common to groups of methods where appropriate to streamline the document and reduce redundancy. Members made the following additional suggestions regarding the template:

- Method write ups might note how they relate to/make use of survey information
- Method write-ups should make context prominent and especially clarify where methods are consistent with benefit-cost analysis.
- Write-ups should include an example scenario of how method has or could be used
- Write-ups should include key references and citations for examples where used
- Travel costs, hedonics, revealed preferences should be put under one category
- The uncertainty section within method write-ups should focus on information unique to specific methods and not duplicate the report section on uncertainty.

Dr. Segerson agreed to revise the method template in light of committee discussion to focus on questions of most relevance to EPA and information not easily obtainable elsewhere.

C-VPESS members provided Dr. Nugent with their preferences for revising method write-ups and preferences for providing initial comments on the documents before committee-wide review. Committee members agreed to complete the process of method write-ups and initial reviews by January 2, 2006.

Discussion of general valuation issues discussed in draft chapter 4

Dr. Thompson opened the discussion by asking members for specific comments for editing the draft text intended for Chapter 4 of the report, which would focus on “General

Valuation Issues and Approaches for Addressing Them.” He asked members to focus their remarks on three questions: 1) whether the draft text makes sense as section as report; 2) whether it provides practical advice; and 3) other substantive critiques.

“Single and Multiple Metrics of Value”

Dr. Joseph Arvai, consultant to the Committee, had been asked to integrated existing draft text into a section on “Single and Multiple Metrics of Value.” He briefly described the scope and purpose of the section: to address how valuation results using multiple metrics or derived through different methods could be used by decision makers. In response, one committee member noted the importance of making an important distinction between EPA’s specific needs for benefit-cost analysis (i.e., for rulemaking under Executive Order 12291 and for section 812 of the Clean Air Act Amendments of 1990) and other contexts where decision-aiding approaches are appropriate (e.g., setting research priorities, general policy decisions). He also expressed concern with the use of conversion factors for non-economically-derived measurements as an approach for dealing with metrics derived from methods based in different traditions and theories.

Another member expressed concern over sections of the text that focus on decision-making and merge discussions of decision-making with discussions of multiple metrics. He also expressed concern that terms (especially the use of term benefits) were used in this section in ways inconsistent with Document Zero and that single-metric approaches were characterized inaccurately or inappropriately in this draft section. Another member seconded the view that the section should be revised to focus on metrification. Yet another member asked that the section focus on the quantification of biophysical parameters. Yet another member expressed the view that the committee should be cautious about the “ease of valuation” and emphasized that it is a “highly uncertain art with a chain of assumptions.” He also suggested that there is a need to address the importance of characterizing the baseline in this section.

One member spoke of the importance of this section because it raises a central issue in the report. He suggested that revisions be tied to EPA’s needs more directly.

Dr. Thompson agreed to assist Dr. Arvai with suggestions for revising the section on “Single and Multiple Metrics of Value” in light of the committee discussion.

/ by noting that she had worked with the SAB Staff Office to develop some ideas initially proposed by Dr. Smith at the SAB’s December 2005, “Science for Valuation of EPA’s Ecological Protection Decisions and Programs” Workshop. The bullets provided were intended to stimulate committee discussion of whether the committee should encourage EPA to create a data or model bank on ecological valuation.

One member noted that there is some interest within the Agency in sharing models. EPA’s NCEE is supporting a small pilot project on sharing ecological valuation data that will help researchers overcome some of the barriers presented by inability to access certain kinds of data because they are proprietary. He suggested that it could be very valuable to provide internet

sites that share data. These sites then can become mechanism for sharing ideas and influencing research agenda. He noted that other organizations and disciplines use such a mechanism.

One committee member noted the need for information-sharing for site-specific decision-making. Another member suggested that such a data or model bank might be more appropriate for an inter-agency effort with coordination from the Council on Economic Quality. Dr. Boyd noted that his proposed approach to analyzing ecosystem services could benefit from better access to information on the "big Q's" of interest. Another member stated that this topic was incredibly difficult and important. Cross-agency coordination is difficult and such a project would be a "huge money sink if not done right." He also noted that at the December workshop a speaker from OMB, Mr. James Laity, had called for a federal Bureau of Environmental Statistics. Providing recommendations for such an effort would be a huge task for the committee. Another member suggested that the Committee provide some text to support the Document Zero recommendation that EPA "foster information sharing across valuation efforts and 'active learning' from efforts to develop and use new methods." In his view, hallmarks of an effective effort would be a useful, flexible database that had "some framing for quality review." He also suggested that any proposal build in a discussion of key EPA ecological databases, AQUIRE and ECOTOX.

SAB Staff Office personnel noted two related activities. Dr. Angela Nugent noted that the SAB is planning to review a related activity, EPA's new draft *Report on the Environment*, which draws on inter-agency data. Dr. Vanessa Vu noted that EPA's ORD National Center for Environmental Research has asked the SAB to provide advice on "Unique Data Sets-Preservation and Distribution" and that the SAB's Environmental Economic Advisory Committee is planning an advisory activity to address this concern for extra-mural research grants.

Dr. Smith agreed to draft a short section about the value and importance of such a database for ecological data and how EPA might examine other database management platforms that offer the ability to merge data in ways that may provide useful models for the Agency's developing a valuation database.

Transfer of Valuation Information

Dr. Segerson noted that this section was designed to consolidate a variety of information about transfer of information about valuation in one place. She noted that the information about transfer of ecological valuation was "straw text" developed by Dr. Paul Risser, who was unable to attend the meeting.

Committee members briefly discussed the possibility and validity of transferring ecological information. Dr. Thompson asked the ecologists on the committee for their views. One ecologist noted that Dr. Roughgarden strongly had advocated for the validity of EPA's recalibrating many existing models to support valuation for Agency decision-making. Another ecologist on the committee advocated encouraging the Agency to explore the validity of data transfer. He stated that many different kinds of information can be transferred that the Farber et al. information in the "straw text" was useful. A third ecologist commented that some ecosystem values and community information can be transferred, but not information at the species level.

Yet another ecologist commented that the committee can direct the Agency to models that are appropriate at different scales and provide advice on transferring model-building methodologies.

The committee discussed this issue more generally. One member expressed concern that ecological information needs to be spatially explicit. Transfer of this information would remove or weaken the connection between location and ecological information. Another member emphasized the importance of focusing on the "usefulness" of ecological modeling information and the importance of challenging the Agency to clearly define the purpose of any transferred information before the choice is made to use a particular model or set of transferred information. Another committee member suggested that this section draw on recent research and thinking addressing the "theory of similarity."

Dr. Segerson suggested that the information in this section be restructured in the following ways: that information in the transfer-of-ecological information be incorporated in the Part 2 Chapter 2 on "Prediction of Ecological Impacts;" that benefit transfer be returned to Part 2, Chapter 5; and that a section be added to Part 2 Chapter 4 on transfer of social-psychological information (in anticipation of text to be developed by Drs. Krosnick and Holbrook based on committee discussion October 5, 2006). Several members suggested, however, retaining some discussion of "transfer" issues in Part 1. Dr. Thompson committed to considering this suggestion in planning revisions of the report.

Dr. Pitelka agreed to work with Drs. Segerson and Risser in revising the section on "Prediction of Ecological Impacts" to incorporate the committee's discussion of the transfer of ecological information.

Uncertainty

Dr. William Ascher introduced the section on uncertainty and described how he had developed the text to integrate materials developed with Drs. Robert Costanza and Robert Stavins on uncertainty and material that Dr. Stephen Polasky had developed on uncertainty.

Committee members made the following suggestions in the course of committee discussion:

- Highlight the sections on reliability and distinguish them from the discussion of validity. Retain the sections on page 20 concerning the uncertainty of valuation methods and benefit transfer
- Include a listing and discussion of the types of uncertainty and include model uncertainty
- Move the section on communicating uncertainty into the communications section later in Chapter 4
- Make the major recommendations clearer
- Remove most of the text on decision-making, but retain discussion of maximizing net benefits
- Shorten the section and remove the discussion of the pros and cons of the precautionary approach.

- Build in a small discussion of dynamics, i.e., how do we link dynamics of ecosystems and the dynamics of the social system with the generally static approach used in economics (more extended discussion of ecological dynamics to be covered in text on the production function approach).

Dr. Freeman agreed to revise the section on uncertainty in light of the committee discussion.

Communication and valuation

Dr. Bostrom introduced the topic, noting that she had developed a straw outline after consultation with Drs. Thompson, Segerson, and Arvai.

After her introduction, one committee member noted the importance of this section and asked whether the committee report should include a high-level recommendation related to value communication. Another member cautioned that the committee's own carefully-crafted definitions related to value will be difficult to communicate. He predicted that the public will be uneasy with terms used differently for analysis than in common parlance. He noted the challenge for the committee and for the Agency in communicating the very specific ways that different methods and different analyses "look at" value.

One committee member stated that the section should focus on communication to decision-makers, not the public, and should not encompass communication of the Agency's decisions, only communication of the valuation exercise. He remarked on the potential of non-traditional approaches, such as slider scales and other visual methods that communicate scenario assumptions and variability of key elements.

The committee expressed general support for Dr. Bostrom's straw outline. Dr. Bostrom agreed to develop text aligned with the outline and committee discussions.

Summary of plenary discussion and plans for the Committee's next steps

Dr. Thompson stated that he would work with Dr. Segerson and Dr. Nugent to develop a schedule for completing components of the committee's work discussed during the meeting so that members can review new draft text and participate in public teleconference calls early in 2007 to discuss those components of the draft report. He expressed the desire that the committee receive a draft with edited text that integrates all components in a readable fashion to review by the committee's meeting on May 1-2, 2006.

Committee members expressed several concerns. One noted the need for some discussion of the cross-cutting issues discussed with Drs. Krosnick and Holbrook in Chapter 4 (e.g., the difference between values vs. preferences and their malleability, balanced discussion of different perspectives on how possible it is to measure values). One member noted that subgroups had developed draft text early in the committee process about the nature of values that drew distinctions that might be useful to incorporate in the report. Yet another member voiced

concern that the committee still faces many unresolved issues and a complex set of tasks for writing and deliberation and wondered whether the goal set for May is realistic. Another member asked for the May meeting to be structured so there will be sufficient time to engage and resolve important differences in the committee.

Dr. Thompson acknowledged the complexity of the task. He asked committee members responsible for drafting text to write "as a representative of the committee" and not from their own perspective. He asked them to surface and try to resolve issues as they work. He believed such an approach will help make the May meeting successful.

The committee then adjourned into three breakout groups (Valuation for Rulemaking, Site-specific Decisions, and Collaborative Decision Making) to plan revisions for revising their text addressing "Major illustrative EPA valuation settings." Dr. Thompson noted that the subgroups had agreed to revise these write-ups by December 1, 2006.

Breakout group: Valuation for Rulemaking

Leads: Dr. A. Myrick Freeman, Dr. Harold Mooney

Members: Drs. William Ascher, Douglas MacLean, Paul Risser, V. Kerry Smith

DFO: Dr. Angela Nugent

Dr. Mooney and Freeman began the session by summarizing the feedback provided by Drs. Thompson and Segerson and other valuation subgroup co-leads. They noted the suggestions that revised text

- Map to the themes and recommendations in Document Zero
- Address how to scale – from the bottom up or top down
- Making clearer the need to address OMB oversight relationships and directives.
- Address the use of non-monetized biophysical data
- Explore how ecosystem benefit indicators might be used
- Discuss how benefit assessments relate to public input and might be more transparent in how values are chosen for analysis and how they relate to public input

Dr. Kerry Smith discussed written comments provided to the co-leads immediately before the meeting. He discussed possible use of Random Utility Models and approaches based on a North Carolina Study.

Members discussed the need to address how to structure analyses for national rule based on ecosystem effects occurring locally.

Dr. Smith agreed to revise the draft subcommittee text related to Valuation for National Rulemaking in light of his comments and related comments from Drs. Thompson and Segerson.

Committee members agreed to review the C-VPES themes in light of the national rulemaking context and provide bullets for incorporation in the draft text.

Dr. Mooney will provide draft text on possible use of non-monetary bio-physical indicators to address non-monetizable effects within the scope of the OMB circular for the next draft subcommittee text related to Valuation for National Rulemaking.

Breakout group: Valuation for Site Specific Decision-Making

Co-Lead: Dr. Gregory Biddinger

Members: Drs. Joseph Arvai, Terry Daniel, Mary Sagoff, Kathleen Segerson,

DFO: Dr. Anthony Maciorowski

EPA Staff providing comment: Mr. David Nicholas, EPA Office of Solid Waste and Emergency Response

Dr. Biddinger summarized feedback received from Dr. Thompson and other subgroup co-leads. He noted the progress on the write-up; the successful effort made to organize text around "Document Zero" recommendations; the need to reduce text to 10-15 single-spaced pages (e.g., by highlighting one example per recommendation rather than multiple examples); the need to address site-specific modeling themes; and to check "tone" regarding benefit analyses.

Mr. Nicholas provided several comments. He commended the subgroup for accurately capturing the current "state of affairs;" welcomed the recommendations; and mentioned that planning for remediation needs to happen early in the process. He noted that the SAB's report on Superfund benefits noted a range of case studies, attributes, and results that could be useful for benefit assessment. Mr. Nicholas committed to providing language to Dr. Biddinger.

The subgroup noted that it will be useful to provide advice on how to characterize ecological services for site-specific decisions. It would be helpful to provide a useful structure that is clear for managers and avoids the problem of double counting.

The subgroup identified the following ways to reduce text:

- Insert methodological discussions under each recommendation
- Don't raise method issues in sections 4, 5, and 6
- For each recommendation, pick the best source example
- Reorganize text to eliminate redundancy

Dr. Biddinger and the subgroup committed to the follow next steps: 1) conference call before November 4, 2006; 2) Dr. Biddinger will revise the text and circulate by email; 3) members to provide any additional comments to Dr. Biddinger.

Breakout group: Valuation for Collaborative Decision-Making

Co-Leads: Drs. Ann Bostrom and Stephen Polasky

Members: Drs. James Boyd, Dennis Grossman, Louis Pitelka, Buzz Thompson

DFO: Ms. Kathleen White

Drs. Bostrom and Polasky summarized the changes needed to the draft. The examples should illuminate themes identified by Dr. Kathy Segerson in “Document Zero.” The Portland and South East Region examples will be used, as well as Chicago Wilderness. When complete, the draft should be 10-15 pages in length.

To support this, Dr. Nugent will:

- Send the previous and current draft to all Regional subgroup members
- Send the Portland study to Dr. Boyd
- Send the South East Study to Dr. Grossman.

The following assignments were made:

- Dr. Polasky will develop and distribute a revised outline by October 9.
- Dr. Grossman will develop a “box” on the South East study by November 1
- Dr. Boyd will develop a “box” on the Portland study by November 1
- Dr. Bostrom will write on the partnership aspects of the Chicago Wilderness example by November 1.
- Dr. Risser will write on those aspects of the Chicago Wilderness example that relate to the biophysical side of landscape analysis by November 1.
- Drs. Bostrom and Polasky will integrate the materials into a draft and provide to Thompson by a date to be determined.
- Dr. Thompson will review the draft in light of the themes from “Document Zero” by a date to be determined and will send text to Drs. Bostrom, Polasky and Pitelka by November 10
- Dr. Pitelka edits the document for readability before November 15
- The Subgroup receives the edited draft by November 15
- The Subgroup provides their comments to Drs. Bostrom and Polasky by November 22
- Bostrom and Polasky revise and provide to Drs. Nugent, Segerson and Thompson by December 1.

Although the “boxes” will be written up as though they will be free-standing, Drs. Bostrom and Polasky may reorganize the material by theme later. After reading their case studies, Drs. Boyd and Grossman should identify 5-10 major points relating to the themes in “Document Zero” and put them in the box. Bullet format is OK. One page would be ideal, two is acceptable.

The committee adjourned at 1:00 p.m.

Action Items

1. Next C-VPASS face-to-face meeting is planned for May 1-2, 2007.
2. Drs. Bostrom, Daniel, Slovic, and Smith will work with the DFO to provide guidance to Drs. Krosnick and Holbrook for developing draft text for Appendix A and other text related to topics discussed during the October 5, 2006 C-VPASS meeting.
3. Dr. Boyd will develop 4 to-5 pages of draft text summarizing the proposed approach to ecological services discussed at the October 5, 2006 C-VPASS meeting. The draft text will address the issues raised by committee members, details the practical approach that EPA might take, and incorporates several examples showing distinctions between direct and indirect effects. Drs. Polasky and Grossman offered to assist Dr. Boyd with this effort.
4. Dr. Nugent will provide the committee with the EPA Risk Assessment Forum’s document on *Generic Ecological Assessment Endpoints*.
5. Dr. Thompson and Dr. Segerson will work with the SAB Staff Office on an approach for addressing the general issues of criticism of methods and divergence of committee views about methods in the final report.
6. Dr. Segerson will revise the method template in light of committee discussion to focus on questions of most relevance to EPA and information not easily obtainable elsewhere. Dr. Nugent will circulate the revised template.
7. Committee members who will be assigned to revise method write-ups or conduct initial reviews agreed to complete the process of revisions and initial comment by January 2, 2006.
8. Dr. Thompson agreed to assist Dr. Arvai with suggestions for revising the section on “Single and Multiple Metrics of Value” in light of the committee discussion.
9. Dr. Smith will draft a short section about the value and importance of a model and database platform to assist researchers with ecological valuation and how EPA might examine other database management platforms that offer the ability to merge data in ways that may provide useful models for such a database.
10. Dr. Freeman will revise the section on uncertainty in light of the committee discussion.
11. Dr. Pitelka agreed to work with Drs. Segerson and Risser in revising the section on "Prediction of Ecological Impacts" to incorporate the committee's discussion of the transfer of ecological information.

12. Dr. Thompson will considering this suggestion of several members that Part 1 of the document retaining some discussion of "transfer" issues
13. Dr. Bostrom will develop draft text on "Communication and Valuation" aligned with the outline discussed by the committee and committee discussions.
14. Drs. Freeman and Mooney, Biddinger and Heal, Bostrom and Polasky will work with subgroups to revise text for valuation for "major illustrative EPA valuation settings" by December 1, 2006.
15. Dr. Smith agreed to revise the draft subcommittee text related to Valuation for National Rulemaking in light of his comments and related comments from Drs. Thompson and Segerson.
16. Committee members agreed to review the C-VPES themes in light of the national rulemaking context and provide bullets for incorporation in the draft text.
17. Dr. Mooney will provide draft text on possible use of non-monetary bio-physical indicators to address non-monetizable effects within the scope of the OMB circular for the next draft subcommittee text related to Valuation for National Rulemaking.
18. Dr. Biddinger and the "Valuation for Site-Specific Decision Making" subgroup will participate in a conference call to be planned before November 4, 2006. Dr. Biddinger will revise the text and circulate by email. Members will provide any additional comments to Dr. Biddinger.
19. Dr. Polasky will develop and distribute a revised outline for the "Valuation for Collaborative Decision-Making" text by October 9.
20. Dr. Grossman will develop a "box" on the South East study by November 1
21. Dr. Boyd will develop a "box" on the Portland study by November 1
22. Dr. Bostrom will write on the partnership aspects of the Chicago Wilderness example by November 1.
23. Dr. Risser will write on those aspects of the Chicago Wilderness example that relate to the biophysical side of landscape analysis by November 1.
24. Drs. Bostrom and Polasky will integrate the materials into a draft and provide to Thompson by a date to be determined.
25. Dr. Thompson will review the draft in light of the themes from "Document Zero" by a date to be determined and will send text to Drs. Bostrom, Polasky and Pitelka by November 10
26. Dr. Pitelka edits the document for readability before November 15. The Work Group receives the edited draft by November 15
27. The Work Group provides their comments to Bostrom and Polasky by November 22
28. Bostrom and Polasky revise and provide to Nugent, Segerson and Thompson by December 1.

Respectfully Submitted:

/s/
Angela Nugent
Designated Federal Officer

Certified as True:

/s/
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	Appendix D, Chair and Vice-Chair Note to Committee Members, September 26, 2006
Appendix E	Survey Presentation Provided to C-VPES, October 5, 2006 By Drs. Jon Krosnick and Allyson Holbrook
Appendix F	Dr. James Boyd's Presentation – Ecosystem Services
Appendix G	Update on EPA's Revision of the Ecological Benefits Strategic Plan, Briefing provided by Dr. Wayne Munns
Appendix H	Briefing on Star Grants on Ecological Valuation, Ecosystem Services, Briefing provided by Dr. William Wheeler
Appendix I	EPA Ecological Valuation STAR Grants 2002-2004
Appendix J	Conserving Ecosystem Services through Protective Decision-making; NCER Contributions to ORD's Ecological Research Long-term Goal 3

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, Environmental Programs Coordinator, 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, Independent Consultant, ,

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, Chair, University Research Cabinet, University of Oklahoma, Norman, OK

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 Slavic, 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

Dr. Robert Stavins, Albert Pratt Professor of Business and Government, Environment and Natural Resources Program, John F. Kennedy School of Government, Harvard University, Cambridge, MA

CONSULTANT 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)

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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: August 9, 2006 (Volume 71, Number 153)]

[Notices]

[Page 45544-45545]

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

[DOCID:fr09au06-75]

ENVIRONMENTAL PROTECTION AGENCY

[FRL-8207-5]

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 components of 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 9 a.m. to 5:30 p.m. (Eastern Time) on October 5, 2006 and from 8 a.m. to 3 p.m. (Eastern Time) on October 6, 2006.

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

FOR FURTHER INFORMATION CONTACT: Members of the public wishing further information regarding the SAB C-VPES meeting may contact Dr. Angela Nugent, Designated Federal Officer (DFO), via telephone at: (202) 343-9981 or e-mail at: nugent.angela@epa.gov. The SAB mailing address is: U.S. EPA, Science Advisory Board (1400F), 1200 Pennsylvania Avenue, NW., Washington, DC 20460. General information about the SAB, as well as any updates concerning the meetings announced in this notice, may be found in the SAB 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 components of a draft advisory report calling for expanded and integrated approach for valuing the protection of ecological systems and services. The Committee will discuss: Application of methods for valuing the protection of ecological systems and services; general ecological valuation methods (e.g., the need for a data and model bank for Agency information about ecological valuation, how to implement the concept of ecological services, how to address uncertainties in ecological services) and how to address them; and next steps for characterizing methods and approaches involved in ecological valuation.

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: Materials in support of this meeting will be placed on the SAB Web site at: <http://www.epa.gov/sab/> in advance of this 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 September 25, 2006, to be placed on the public speaker list for the October 5-6, 2006 meeting. **Written Statements:** Written statements should be received in the SAB Staff Office by September 24, 2006, 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 (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

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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: August 3, 2006.
Anthony Maciorowski,
Associate Director for Science, EPA Science Advisory Board Staff Office.
[FR Doc. E6-12956 Filed 8-8-06; 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 – October 5-6, 2006

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 further discuss topics relating to a draft advisory report calling for expanded and integrated approach for valuing the protection of ecological systems and services. This activity responds 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.

October 5, 2006

9:00 – 9:05	Welcome	Dr. Angela Nugent, EPA, SAB Staff Office Dr. Vanessa Vu, EPA, SAB Staff Office
9:05 – 9:15	Introduction of members, review of agenda, and discussion of committee's approach to completing its report	Dr. Barton H. (Buzz) Thompson, Jr., Chair Dr. Kathleen Segerson, Vice-Chair
9:15 – 9:45	Overview and discussion of major report recommendations ("themes") and report outline	Drs. Barton H. (Buzz) Thompson, Jr. and Kathleen Segerson and Committee Discussion
9:45 – 10:30	Introduction to survey issues in ecological valuation; plans for Appendix A	Dr. Jon Krosnick, Stanford University Dr. Allyson Holbrook, University of Illinois at Chicago
10:30 – 10:45	Break	
10:45 – 11:30	Committee discussion	
11:30 – 12:30	Practical aspects of implementing the concept of ecosystem services in valuation at EPA, proposal and discussion	Dr. James Boyd (Lead Discussant) and Committee Discussion
12:30 – 1:30	Lunch	

1:30 – 2:15	EPA’s release of a revised <i>Ecological Benefits Assessments Strategic Plan</i> , update and Committee Discussion	Dr. Wayne Munns, EPA Office of Research and Development (Presenter, by phone) and Committee Discussion
2:15 – 3:15	Briefing and discussion of STAR grant programs involving ecological valuation and conserving ecosystem services	Mr. William Wheeler and Ms. Iris Goodman, EPA Office of Research and Development (Presenters) and Committee Discussion
3:15 – 5:00	Discussion of general valuation issues discussed in draft chapter 4 (Break as needed): <ul style="list-style-type: none"> • Using valuation for decisions – multiple metrics in valuation • Data and model bank • Transfer of valuation-related information • Uncertainty • Communication and valuation 	Committee Discussion
5:00 – 5:45	Process for development/refinement of method write-ups and internal review of methods	Drs. Barton H. (Buzz) Thompson, Jr. and Kathleen Segerson and Committee Discussion
5:45 – 6:00	Summary and plans for Committee breakout sessions on October 6	Dr. Barton H. (Buzz) Thompson, Jr.
6:00	Adjourn	

October 6, 2006

9:30 – 1:00	Breakout sessions for valuation setting Subgroups <ul style="list-style-type: none"> • Valuation for National Rulemaking <i>SAB Large Conference Room, Room 3705</i> • Valuation for Site-Specific Decision-Making <i>SAB Small Conference Room, Room 3704</i> • Valuation for Collaborative Decision-Making <i>NCER Conference Room 3306 East</i> 	<p><i>Subgroup Co-Leads:</i> Drs. A. Myrick Freeman and Dr. Harold Mooney</p> <p><i>Subgroup Co-Lead:</i> Dr. Gregory Biddinger</p> <p><i>Subgroup Co-Leads:</i> Drs. Stephen Polasky and Dr. Ann Bostrom</p>
1:00	Adjourn breakout sessions of subgroups	



Appendix D
Chair and Vice-Chair Note to Committee Members, September 26, 2006



**UNITED STATES ENVIRONMENTAL PROTECTION
AGENCY
WASHINGTON D.C. 20460**

OFFICE OF THE ADMINISTRATOR
SCIENCE ADVISORY
BOARD

September 26, 2006

Note to Members of the SAB Committee on Valuing the Protection of Ecological Systems and Services (C-VPES)

SUBJECT: October 5-6, 2006 C-VPES Meeting

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

The purpose of this note is to give you a brief introduction to our upcoming meeting and provide some background information for our discussions. Your engagement on the issues we will discuss at the meeting and, even more importantly, your follow-through on writing and review assignments are critical to complete the draft report that will fulfill our committee charge. Section 1 below provides an update on the process and schedule for completing the report.

The October 5-6, 2006 meeting will build on the Committee’s decision last May to develop a single, integrated C-VPES report. The draft agenda (Attachment A) is designed to focus full committee discussion on several significant issues to be addressed in the report where there is need to reach resolution. We plan to keep the meeting focused on specific ways the report can help the Agency implement the major recommendations (Attachment B) articulated in our discussions of “Document Zero.” As we discussed in May, “Document Zero” will now be edited to serve as the introduction to the integrated C-VPES report. It will be important for the recommendations in “Document Zero” to serve as the unifying themes for the entire report.

We plan to discuss a new section on survey-related issues the report (See section 2 of this note); a proposed process for refinement and internal review of the draft text on “Methods” (See section 3 of this note); and to provide time on October 6, 2006 for the Valuation Setting Subgroups to further develop the draft text on the three illustrative EPA valuation settings (national rulemaking, site-specific decision-making, and collaborative decision-making) selected by the Committee. Angela will work with the Valuation Setting Subgroup leads to send out separate emails related to the break-out sessions planned for subgroup members.

1. Process and schedule for completing the report

The table below identifies the major steps and schedule we anticipate for developing the C-VPES report. The table references components of the draft outline (See Attachment C) discussed generally by the committee in May and the minimum steps needed to complete the report.

Proposed Process and Schedule for Completing C-VPES Report

	Timing	Activity
1	October 9-10, 2006	Full Committee discussion of the following topics

		<ul style="list-style-type: none"> - Draft proposal for implementing the concept of ecosystem services. - Draft text and bullets for Part 1, Section 4, General valuation issues and approaches for addressing them - Committee’s approach for developing Appendix A (Survey Issues) of the C-VPES Report - Proposed approach for refining and internal review of method write-ups for Part 2 of the Report <p>Breakout Sessions for Valuation Context Subgroups developing text for Part 1 Chapter 3</p>
	November 2006 – April 2007	Public teleconferences for full committee as needed to reach consensus on components of draft document
2	April 2007 (Time TBA)	April 2007: Face-to-face meeting to discuss complete draft document
3	June-July 2007	Outside technical review
4	October 2007	October 2007: Either a public face-to-face meeting or public conference call for full Committee discussion of revisions before document goes to the SAB for quality review
5	December 2007	SAB Quality Review

2. Addressing Survey-Related Issues in the Report

The draft outline in Attachment C of this note shows an appendix devoted to “Survey Issues: Current Best Practices and Recommendations for Research.” We are including this new appendix after conversations with many of you regarding the strong EPA interest in ecological valuation surveys and how they can be implemented with the most validity and credibility, interest articulated at the December 2005 Workshop on “Science for Valuation of EPA’s Ecological Protection Decisions and Programs.” The Appendix will address survey issues that do not fit neatly into the existing organization of the report because they relate to multiple categories of methods.

The SAB Staff Office has asked Drs. Jon Krosnick and Allyson Holbrook to serve as consultants to the committee to support C-VPES work (See Attachment D for brief biosketches). They have agreed to assist the committee in: 1) further identifying survey implementation issues¹ related to ecological valuation that have been developed by the committee; 2) identifying literature related to current best practices on these topics; and 3) identifying areas for a possible future SAB advisory activity related to EPA best practices and future research investments related to survey issues for ecological valuation.

Jon and Allyson are planning to join us at the October meeting to discuss this work. We are

¹ Initial list of survey implementation issues related to ecological valuation that have been identified by C-VPES members: survey reliability, representative sampling, importance (or lack thereof) of response rates; use of knowledge networks or other internet approaches; survey design (control for recall errors, comprehension errors, reporting errors, intentional omission/addition, and nonresponse), representing targeted changes in ecosystems and services, and uncertainty in ecological predictions and difficulties for surveys

hoping they will work with the SAB Staff Office and with interested C-VPES members in developing a draft paper (~10-15 pages, double spaced) by December 2006 for committee deliberation and discussion. We would look to them to assist with revisions to this paper for our spring 2007 C-VPES Meeting.

3. Proposed strategy for refining method write-ups and conducting an internal committee review

The draft report outline in Attachment C indicates a two-part report. Part 2 will be devoted to a description and evaluation of methods relevant to valuation that Committee members have indicated in past discussions and email exchanges that they view as having merit for EPA's use or that merit research or further exploration.

We have developed a template (Attachment E) to standardize draft text being developed pertaining to each method. The template prompts committee members to address the recommendations in "Document Zero" and to address concerns about implementation articulated by the Agency at the December workshop.

All method drafts have been reformatted by the SAB Staff Office, and several have been reviewed by the original authors. The proposed next steps are the: a) completion of review of method drafts by authors; b) revision of method drafts through an "internal review process" where pairs of C-VPES members (authors and members from a different discipline or point of view) revise the document. The goal of this internal review is to reflect the full committee's views on each method. If there is a consensus position, for example, that consensus position should be reflected. If there is a range of views on the committee, the author and reviewer will be asked to work together to develop text that represents the range of views. The full committee will then address any remaining issues pertaining to the method drafts in public teleconferences or during the face-to-face C-VPES meeting being planned for spring 2007.

Attachment A – Agenda

**Meeting of the SAB Committee on Valuing the Protection of Ecological Systems and Services (CVPESS)
Draft Agenda – October 5-6, 2006
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 further discuss topics relating to a draft advisory report calling for expanded and integrated approach for valuing the protection of ecological systems and services. This activity responds 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.

October 5, 2006

9:00 – 9:05	Welcome	Dr. Angela Nugent, EPA, SABSO Dr. Vanessa Vu, EPA, SABSO
9:05 – 9:15	Introduction of members, review of agenda, and discussion of committee’s approach to completing its report	Dr. Barton H. (Buzz) Thompson, Jr., Chair Dr. Kathleen Segerson, Vice-Chair
9:05 – 9:45	Overview and discussion of major report recommendations (“themes”) and report outline	Drs. Barton H. (Buzz) Thompson, Jr. and Kathleen Segerson and Committee Discussion
9:45 – 10:30	Introduction to survey issues in ecological valuation; plans for Appendix A	Dr. Jon Krosnick, Stanford University Dr. Allyson Holbrook, University of Illinois at Chicago
10:30 – 10:45	Break	
10:45 – 11:30	Committee discussion	
11:30 – 12:30	Practical aspects of implementing the concept of ecosystem services in valuation at EPA, proposal and discussion	Dr. James Boyd (Lead Discussant) and Committee Discussion
12:30 – 1:30	Lunch	
1:30 – 2:30	Briefing and discussion of STAR grant programs involving ecological valuation and conserving ecosystem services	Mr. William Wheeler and Ms. Iris Goodman, EPA Office of Research and Development and Committee Discussion
2:30 – 2:45	Public Comment	As Needed

2:45 – 4:45	Discussion of general valuation issues discussed in draft chapter 4 (Break as needed): <ul style="list-style-type: none"> • Using valuation for decisions – multiple metrics in valuation • Data and model bank • Transfer of valuation-related information • Uncertainty • Communication and valuation 	Committee Discussion
4:45 – 5:45	Process for development/refinement of method write-ups and internal review of methods	Drs. Barton H. (Buzz) Thompson, Jr. and Kathleen Segerson and Committee Discussion
5:45 – 6:00	Summary and plans for Committee breakout sessions on October 6	Dr. Barton H. (Buzz) Thompson, Jr.
6:00	Adjourn	

October 6, 2006

9:30 – 1:00	Breakout sessions for valuation setting Subgroups <ul style="list-style-type: none"> • Valuation for National Rulemaking <i>SAB Large Conference Room, Room 3705</i> • Valuation for Site-Specific Decision-Making <i>SAB Small Conference Room, Room 3704</i> • Valuation for Collaborative Decision-Making <i>NCER Conference Room 3306 East</i> 	<p><i>Subgroup Co-Leads:</i> Drs. A. Myrick Freeman and Dr. Harold Mooney</p> <p><i>Subgroup Co-Lead:</i> Dr. Gregory Biddinger</p> <p><i>Subgroup Co-Leads:</i> Drs. Stephen Polasky and Dr. Ann Bostrom</p>
1:00	Adjourn breakout sessions of subgroups	

Attachment B – Major Recommendations in “Document Zero”

Approach used to develop draft text for discussion at the October 2006 meeting.

- Involve from the beginning an interdisciplinary collaboration among physical/biological and social scientists; and ecologists
- Solicit from the beginning input from the public or representatives of individuals affected by the ecological changes
- Recognize the many sources of value derived from ecosystems, including both instrumental and intrinsic values
- Expand the range of ecological changes that are valued, focusing on those changes in ecosystems and their services that are likely to be of greatest concern to people
- Highlight the concept of ecosystem services and provide a mapping from changes in ecological systems to changes in services using the concept of an ecological production function as the term is used by C-VPES
- Explore and expand the use of methods that can appropriately characterize or measure the value associated with these changes
- Foster information sharing across valuation efforts and “active learning” from efforts to develop and use new methods.

Attachment C – Draft Table of Contents

Proposed Table of Contents for Integrated C-VPES Report

PART 1: OVERVIEW AND APPLICATION OF THE APPROACH

1. THE APPROACH

- 1.1. Introduction
 - 1.1.1 EPA’s Mission Regarding Ecosystem Protection
 - 1.1.2 Scope of this Report and its Intended Audience
- 1.2. An Overview of Key Concepts
 - 1.2.1 The Concept of Ecosystem Services
 - 1.2.2 The Concept of Value
 - 1.2.3 The Concept of Ecological Valuation
 - 1.2.4 Limitations of Current Valuation Methods
- 1.3. Ecological Valuation at EPA
 - 1.3.1 Policy Contexts at EPA Where Ecological Valuation Can be Important
 - 1.3.2 Institutional and Other Issues Affecting Benefits Assessment at EPA
 - 1.3.3 An Illustrative Example of Ecosystem Benefit Assessment at EPA
- 1.4. An Integrated and Expanded Approach to Ecosystem Valuation
- 1.5. Considerations for Implementing an Integrated and Expanded Approach
 - 1.5.1 Policy Context and Problem Formulation
 - 1.5.2 Identifying and Predicting Ecological Changes
 - 1.5.3 Identifying Changes that are Socially Important
 - 1.5.4 Characterizing Values
 - 1.5.5 Communicating Results
- 1.6. Summary and Recommendations

2. A MORE COMPLETE TOOLBOX

- 2.1. Brief Characterization of Methods
 - 2.1.1 Conceptual foundations for economic methods
 - 2.1.2 Non-monetized method
 - 2.1.3 Deliberative methods
 - 2.1.4. Energy and Material Flow Analysis
- 2.2. Table of Methods

3. APPLYING THE APPROACH

- 3.1. Importance of context
 - 3.1.1 Purpose of valuation
 - 3.1.2 Decision maker
 - 3.1.3 Role of EPA
 - 3.1.4 Legal/regulatory/policy framework
- 3.2. Major illustrative EPA valuation settings
 - 3.2.1 Rulemaking
 - 3.2.2 Site-specific Decisions
 - 3.2.3 Collaborative Decision Making
 - 3.2.4 Lessons

4. GENERAL VALUATION ISSUES AND APPROACHES FOR ADDRESSING THEM

- 4.1. Single vs. Multiple Metrics of Values
- 4.2. Data and model bank
- 4.3. Transfer of valuation-related information
 - 4.3.1 Transfer of ecological information
 - 4.3.2 Transfer of socio-psychological information
 - 4.3.3 Benefit transfer
- 4.4. Uncertainty
 - 4.4.1 Introduction
 - 4.4.2 Sources of Uncertainty in Ecological Valuations
 - 4.4.3 Approaches to Assessing Uncertainty
 - 4.4.4 Communicating Uncertainty in Ecological Valuations
 - 4.4.5 Decision-Making with Uncertainty
 - 4.4.6 Contributions of Uncertainty Assessment in Guiding Research Initiatives
- 4.5. Communication and valuation

5. DETAILED RECOMMENDATIONS

- 5.1. Research
- 5.2. Guidance documents
- 5.3. Institutional Recommendation

PART 2: METHODS

1. INTRODUCTION

2. PREDICTION OF ECOLOGICAL IMPACTS

3. BIO-PHYSICAL RANKING METHODS

- 3.1. Ranking based on Conservation Values
- 3.2. Rankings based on Energy Flows
 - 3.3.1 Embodied Energy and Value
 - 3.3.2 Emergy
 - 3.3.3 Ecological Footprint Analysis

4. SOCIO-PSYCHOLOGICAL APPROACHES

- 4.1. Attitude Surveys
- 4.2. Focus Groups
- 4.5. Narratives
- 4.6. Behavioral observation/behavior trace
- 4.7. Interactive games

5. ECONOMIC METHODS

- 5.1. Market-based valuation
- 5.2. Non-market methods: revealed preference
 - 5.2.1 Travel cost
 - 5.2.2 Hedonics.
 - 5.2.3 Averting behavior models.
- 5.3. Non-market methods: Stated preference
 - 5.3.1 Contingent valuation.
 - 5.3.2 Conjoint analysis.
 - 5.3.3 Combining Revealed and Stated Preference Methods.

5.4 Indicators

- 5.4.1 Ecosystem Benefit Indicators
 - 6. PUBLIC AND GROUP EXPRESSIONS OF VALUE
 - 6.1. Referenda and Initiatives
 - 6.2. Jury Awards
 - 7. DELIBERATIVE PROCESSES FOR ELICITING VALUES
 - 7.1. Deliberative approaches
 - 7.2. Mediated Modeling
 - 7.3. Citizen Juries
 - 8. METHODS USING COST AS A PROXY FOR VALUE
 - 9.1. Replacement Costs
 - 9.2. Tradeable Permit Prices
 - 9.3. Habitat Equivalency Analysis
- APPENDIX A: SURVEY ISSUES: CURRENT BEST PRACTICES AND RECOMMENDATIONS FOR RESEARCH

Attachment D
Biosketches for Drs. Jon Krosnick and Allyson Holbrook

Dr. Jon Krosnick

Dr. Jon Krosnick is the author of four books and more than 100 articles and chapters. Dr. Krosnick conducts research in three primary areas: (1) attitude formation, change, and effects, (2) the psychology of political behavior, and (3) the optimal design of questionnaires used for laboratory experiments and surveys, and survey research methodology more generally. His attitude research has focused primarily on the notion of attitude strength, seeking to differentiate attitudes that are firmly crystallized and powerfully influential of thinking and action from attitudes that are flexible and inconsequential. Many of his studies in this area have focused on the amount of personal importance that an individual chooses to attach to an attitude. Dr. Krosnick's studies have illuminated the origins of attitude importance (e.g., material self-interest and values) and the cognitive and behavioral consequences of importance in regulating attitude impact and attitude change processes. Among the topics explored by Dr. Krosnick's political psychology research are: how policy debates affect voters' candidate preferences, how the news media shape which national problems citizens think are most important for the nation and shape how citizens evaluate the President's job performance, how becoming very knowledgeable about and emotionally invested in a government policy issue (such as abortion or gun control) affects people's political thinking and participation, how people's political views change as they move through the life-cycle from early adulthood to old age, and how the order of candidates' names on the ballot affect voting behavior. His questionnaire design work has illuminated the cognitive and social processes that unfold between researcher and respondent when the latter are asked to answer questions, and his on-going review of 100 years worth of scholarly research on the topic has yielded a set of guidelines for the optimal design of questionnaires to maximize reliability and validity. His recent work in survey methodology has explored the impact of mode of data collection (e.g., face-to-face, telephone, Internet) on response accuracy and the impact of survey response rates on substantive results. Dr. Krosnick received a B.A. degree in psychology from Harvard University and M.A. and Ph.D. degrees in social psychology from the University of Michigan.

Dr. Allyson Holbrook

Dr. Allyson Holbrook is an Assistant Professor at the University of Illinois at Chicago in public administration, the Survey Research Laboratory, and the psychology department. She earned her B.A. in psychology and political science from Dickinson College in 1995, graduating summa cum laude. She earned her M.A. and Ph.D. from the department of psychology at the Ohio State University in 1997 and 2002, respectively, with a focus in social psychology, political psychology, and statistics. Dr. Holbrook conducts research in two areas: 1) survey methodology, particularly the role that social and psychological processes play in the task of answering survey questions, and 2) attitudes and persuasion, and the role attitude strength plays in moderating the impact of attitudes on thoughts and behaviors. Much of her work has dealt with improving the design of social science surveys, including issues involved in writing survey questions, survey mode, and survey nonresponse.

Attachment E
Template for Method Write-Ups

Method Name

Brief description of the method

One paragraph description of the method understandable to educated layperson

Key inputs

Outputs of the method; in what units are the results expressed?

Highlights of method relative to major C-VPES recommendations

Is value monetized or not?

Does method help to identify ecosystem service impacts of EPA action or uses ecosystem service information?

Does the method identify changes in ecosystems and their services that are likely to be of greatest concern to people?

Does method address ecological impacts that wouldn't normally be included by EPA or are not easily addressed by monetized approaches?

If method does not present values that in monetizable economic units; does it present some basis or rationale for judging or characterizing the importance of alternative expressions of value?

Does the method involve interdisciplinary collaboration among physical/biological and social scientists; and ecologist at an early stage?

Does the method involve the public in identifying values at an early stage and have recurring involvement through the process?

Are there types of data and information that could be generated through use of the method that might be useful to have in a data/model bank so that valuation can be done more easily by EPA in the future?

Status as a method

Is method relatively scientifically acceptable?

What is its past with the EPA?

What is the experience with the method outside EPA, has it been applied and to what effect? What is the existing literature with regards to the method?

Is the output understandable and communicable to the interested audience?

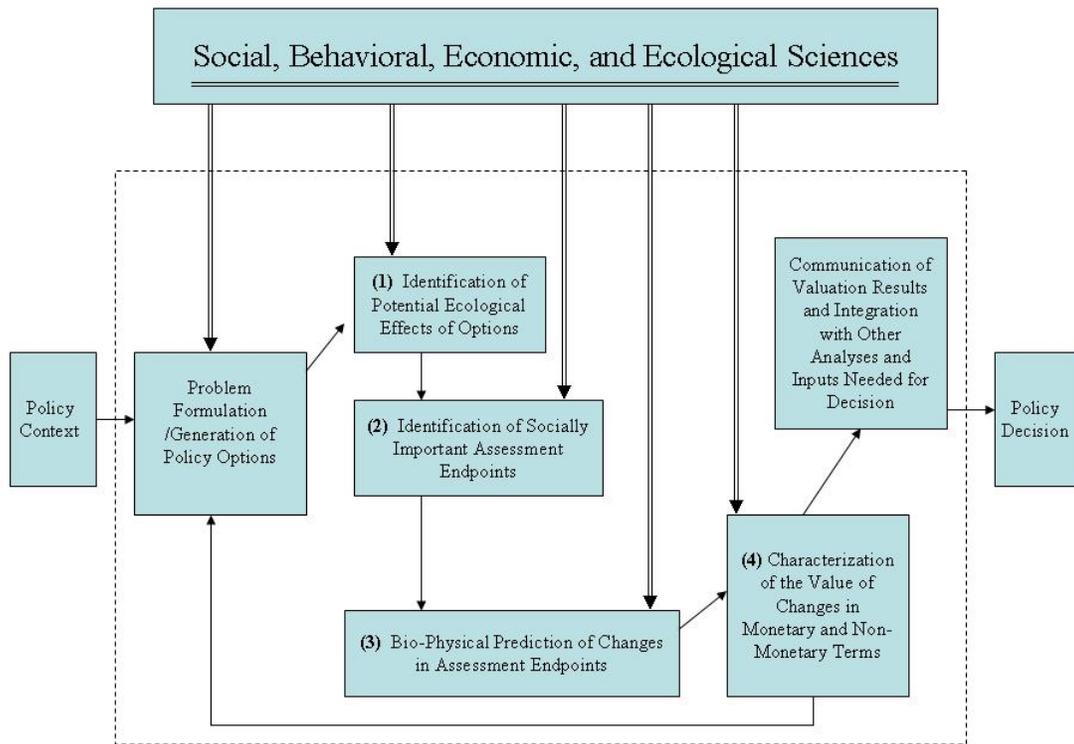
Research needs

What type of research needs to be addressed?

Where and when use of the method is most appropriate

What are the decision-making contexts to which this method can or should be applied? (e.g., rulemaking, site-specific decisions, collaborative decision-making, other)

Where does the method fit in the overall valuation process (relative to the C-VPES valuation process figure below)?



Resources needed

What kinds of resources are needed to implement the method: data, amount of FTE, level of expertise, cost, time?

Strengths/Limitations

What are the advantages and disadvantages of the use of the method for EPA purposes?
 Are there conditions under which the method works well and works poorly?
 What obstacles are there to the effective use of the method: institutional, scientific, lack of data, moral, legal, psychological?
 What other significant questions may be associated with this method and how would these be addressed?

Treatment of Uncertainty

Does this method incorporate any specific ways of treating uncertainty? Is there any approach unique to this method?

Key References

Additional boxed information

In addition, sidebar boxes can be used for information about the method that does not fit into this format or that deserves to be highlighted or special aspects of the method. Boxes may not be required for every method discussed, but can be a valuable asset to fully describe others

Appendix E
Survey Presentation Provided to C-VPES, October 5, 2006
By Drs. Jon Krosnick and Allyson Holbrook

Survey Methods

Allyson L. Holbrook
University of Illinois at Chicago

Jon A. Krosnick
Stanford University

Key Decisions by Survey Researchers

Who to survey?	Sampling
How to survey?	Survey mode
What to ask?	Measurement
Effects of nonresponse?	

Recommendations for EPA

Who to survey?

- **Population:** “the entire set of individuals to which findings of the survey are to be extrapolated”
- **Unit or element:** “the individual members of the population to be measured”
- **Sample:** the subset of the population to be surveyed

Levy, Paul and Lemeshow 1999. *Sampling of Populations: Methods and Applications*. New York: Wiley.

- **Probability sampling:**
 - “every element in the population has a known, nonzero probability of being included in the sample”
- **Nonprobability sampling:**
 - the chance of selection is zero or unknown for at least some elements in the population

Levy, Paul and Lemeshow 1999. *Sampling of Populations. Methods and Applications*. New York: Wiley.

- **Probability sampling methods**
 - Simple random sample
 - Systematic sampling
 - Stratified random sampling
 - Cluster sampling
- **Nonprobability sampling methods**
 - Convenience sampling
 - Snowball sampling
 - Quota sampling

- **Probability sampling strongly preferred over nonprobability**
 - Unbiased estimates of population parameters
 - Standard errors of population parameters
 - Generalized to the population

Mode and Probability Sampling

- RDD telephone and KN Internet
 - Coverage error: zero probability of selection
 - households without telephones
 - CPO households
 - homeless people
 - Residential arrangements considered ineligible
 - Unknown probability of selection:
 - People living in multiple households
- Face-to-face surveys using area probability sampling
 - Minimizes coverage error

Conclusions

- Strong preference for probability sampling over nonprobability
- Probability sampling is possible in all modes
- FTF still advantages over other modes in coverage bias

How to Survey?

- Mail (paper-and-pencil)
- Face-to-Face (in person)
- Telephone
- Internet surveys

- Use of multi-mode or mixed mode designs to increase survey participation

Mode Differences

- Methods for implementing probability sampling
 - Coverage error

- Contacting and gaining cooperation from respondents
 - Response rates
 - Ease of providing incentives
 - Ease of multiple contact attempts

- Interviewers
 - Presence or absence
 - Effect of interviewer characteristics
 - Ability to communicate credibility and develop rapport
 - Ability to monitor and detect falsification

- Questionnaire design and presentation of materials
 - Complex skip patterns, randomizations, and experiments
 - Oral versus visual presentation
 - Complex information (e.g., text, pictures)
 - Measuring responses anonymously

- Respondent experiences and behavior
 - Demand on respondents
 - Respondent effort
 - Respondent enjoyment
 - Respondent distraction
 - Respondent trust

- **Implications for data quality**

- Reliability
- Validity
 - Memory errors
 - Thoughtful responding
 - Socially desirable responding
 - Interviewer falsification
 - Process errors
- Completeness
 - Unit nonresponse - bias
 - Item nonresponse - bias

- **Most mode comparisons have focused on particular pairs of methodologies:**

- FTF v. telephone
- Telephone v. Mail
- Telephone v. Internet

FTF v. Telephone

- Coverage error, response rates
- Sample representativeness
- Measurement
- Respondent experiences
- Presentation of complex materials
- Obtain answers anonymously (CASI, ACASI)

Telephone v. Mail (Paper and pencil)

- Response rates
- Interviewers better able to address respondent confusion or questions
- Easier to implement complex skip patterns, randomizations, and experiments
- Respondent pacing and effort
- Less missing data in telephone surveys

Telephone v. Internet

- Representativeness
- Data quality
- Relationship with respondents - Panel
- Privacy
- Respondent pacing
- Convenience of completing survey
- Presentation of complex information

Conclusions

- FTF better than Telephone
better than Mail
- Internet better than Telephone
 - Viable alternative to FTF?
 - Minimizing coverage bias

What to Ask?

- **Goals**
 - Reliability
 - Validity
- **Questionnaire Design Research**
 - Question Wording
 - Question Order
 - Questionnaire Length

General Principles

- Standardized interviewing
- Unbiased question wording
- Clear and simple question wording
 - Shorter questions
 - Slang, lingo, acronyms
- Opportunity and motivation to be thoughtful in answering.
- Voluminous research
 - Examples

Standardized Interviewing

- Give the same stimulus to all people
 - Read same question
 - Respondent interpretation
- Consistency of meaning
 - Conversational interviewing
 - Translation and cross-cultural issues

Agree-Disagree Questions

- Commonly used wording format (GSS item):

“Do you agree or disagree with the following statement: Almost everything we do in modern life harms the environment.”
- Sources of error:
 - Acquiescence response bias
 - Interpretation of disagree response

- Multiple questions with oppositely phrased statements
 - Requires many questions
 - Negatively worded items – double negative (language issue)
 - Places respondents who say agree to all statements at midpoint
- Similar problems for true/false and yes/no questions

Response option order

– Response order effect

E.g., “Which of the following do you think currently poses the greatest threat to the environment in the U.S.? Water pollution, the use of pesticides, or nuclear power plants?”

- Recency
- Primacy
- Categorical v. Scale
- Visual v. Oral Presentation

– Recommendation to rotate order to estimate and control

– Natural order

- E.g., vote for or against
- Effects of violation

Other questionnaire design issues

– Open versus Closed questions

– No Opinion Response Options

– Rating versus ranking

– Social desirability

– Number of scale points and labeling of scale points

– Question order

Tools to study unanswered questions

– Experiments

– Assessing data quality

- Administration Difficulty

- Completion time

- Completion errors

- Rated difficulty

- Rated enjoyment

- Reliability

- Test-retest

- Cross-sectional

- Validity

- Comparison to an external standard

- Correlations with other constructs

- Discrimination between constructs

- Interviewer effects

- Question order effects

Conclusions

- Research available on many aspects of measurement

- Tools to assess measurement developed

What are the effects of nonresponse?

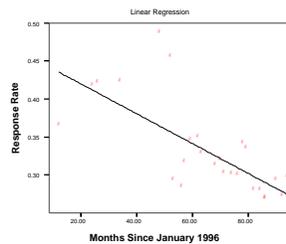
- **Response rate: the proportion of eligible sampled units for which a completed survey or interview was obtained**
- **Ideally response rate of 100% - no nonresponse bias.**
- **Indicator of data quality**
 - lower response rate indicates greater nonresponse bias
- **Response rates over time**

Example

- **26 telephone surveys conducted between 1996 and 2003**
- **Same company**
- **Same topic (health-related)**
- **Same procedures for administering survey**
- **Changes over time in response rate**

Response Rate: 1996-2003

$r = .70, p < .001$



- **Two other examples:**
 - General Social Survey
 - Monthly Survey of Consumer Attitudes
- **Smaller observed decreases in response rates**
- **Strategies to increase response rates known (examples)**
- **Costs to obtain high response rates are increasing faster than budgets for most surveys.**
- **Result: reduced response rates observed over time**

- **Assumption about reduction in response rates:**
 - On October 13, 1998, columnist Arianna Huffington wrote: "It's no wonder that the mushrooming number of opinion polls, coupled with the outrageous growth of telemarketing calls, have led to a soaring refuse-to-answer rate among people polled. This is not good news for pollsters. The key to polling's accuracy is the principle of equal probability of selection. *But if larger and larger numbers among those randomly selected refuse to participate, this principle no longer applies.*" emphasis added (The New York Post, p. 27)."
- **Lower response rates necessarily lead to greater nonresponse bias**

Nonresponse bias =
(response rate) x (difference between
mean of respondents and mean of
nonrespondents)

- Two necessary conditions for nonresponse bias:
 - nonresponse
 - difference between respondents and nonrespondents
- Association between response rates and nonresponse bias
- Nonresponse bias question specific

Key Questions

- To what extent does nonresponse bias exist?
- What is the association between nonresponse (i.e., response rates) and nonresponse bias?

Does nonresponse exist?

–Demographic representativeness of general population surveys reasonably good

Groves (forthcoming) meta-analysis

- Wider range of studies (mode, topic, population)
- Substantial nonresponse bias exists in many studies

Nonresponse Bias and Valuation

- 2 studies
- Pre-surveys (95%)
- Respondents and nonrespondents to follow-up surveys
- Significant nonresponse bias, but...
 - examined limited variables
 - direction not consistent
 - effect of increasing response rates?

Nonresponse and Nonresponse Bias

- Demographic representativeness
- Substantive measures
 - E.g., Groves (Forthcoming) meta-analysis: correlation of $r=.29$

Conclusions

- Existence of nonresponse bias
 - Conditions?
- Association between response rates and nonresponse
 - Conditions?

Recommendations

• Modes and valuation research

- Coverage error
- Nonresponse bias
- Data quality
- Particular focus on Internet v. FTF
 - Coverage bias
 - Method for drawing Internet sample

• More extensive use of existing questionnaire design research

- Improve measurement
 - Methods of non-market valuation
 - Methods for presenting complex information
 - Methods for conveying uncertainty to survey respondents

• Standardized methods for estimating:

- nonresponse
- nonresponse bias:
 - Comparison to known standard
 - Follow-up surveys
 - Easy-to-reach v. hard-to-reach
 - Records match analysis
 - Panel surveys (or pre-survey)
 - Research comparing these methods

• Nonresponse and nonresponse bias:

- Comparing nonresponse bias across surveys with different response rates
- Examining survey results with and without efforts

- **Goals:**

- **Conditions under which nonresponse bias occurs**

- **Conditions under which nonresponse leads to nonresponse bias**

Appendix F

Dr. James Boyd's Presentation – Ecosystem Services

An Architecture for Ecosystem
Services Analysis:
A Proposal for Debate

Jim Boyd
CVPESS, October 2006



The Key to the Argument

- The cornerstone for ecosystem valuation analysis should be

The quantities and qualities of things in nature that folks care about



“Things” - Examples

- An undeveloped mountainside
- Available water
- Air and water of particular quality
- A species population you want to exist
- A species population you want to hunt

The direct experience of nature =
countable, map-able “things”



Fitting the Pieces Together

	Intermediate Quantities	Final Quantities	Weights
Ecological processes →	q_1	Q_1	p_1
→	q_2	Q_2	p_2
→	q_3	Q_3	p_3

More ecological processes → *Weighting techniques*



The direct experience of nature

	Intermediate Quantities	Final Quantities	Weights
Ecological processes →	q_1	Q_1	p_1
→	q_2	Q_2	p_2
→	q_3	Q_3	p_3

More ecological processes → *Weighting techniques*

← Biophysical sciences → ← Social sciences →



How to Derive These
“Final Quantities”?

- A mixture of
 - Economic “utility theory” & Pragmatism
- In plain English
 - Anything in nature that
 - Matters *directly* to real people



Key Metaphor

- Welfare Accounting – e.g. GNP
- 100 years of debate about what to count
- What is counted?
 - Q 's derived from
 - Utility theory
 - Pragmatism

The Power of Consistently Defined *Quantity Units Q*

- Clear “endpoints” for ecology
 - Ecology focused on public decision problems
- Consistency across balkanized programs
 - The left hand can talk to the right hand
- Facilitates comparability across economic valuation studies
 - A way to address the benefit transfer problem

The Definition of Valuation- Relevant Ecosystem Quantities

- Five principles
 - End products
 - Benefit-dependent
 - Ecological “things” and qualities
 - Measurable in practice
 - Location- and time-specific

Weighting

- Weighting approaches
 - Revealed & stated preference (economics)
 - Group deliberation (politics)
 - Value discovery (social psychology)
 - WTP indicators (stuff I've presented before)
 - Others

Arguments in social science are about these

Can't We Agree on the Q 's?

- The definition of valuation-relevant quantities Q
 - *Can be independent of methods used to weight them*
- Proposal – All can use the same Q 's
 - All care about “things that matter to real folks”

The Final Report

- A Unified View of Valuation-Relevant Ecosystem Outputs – the Q 's
 - Q 's are the point of contact between ecology & economics
 - Social science debates about weighting are separable from counting question

By Anchoring Around the Q 's

- Generates a clear agenda for ecology
 - Measurement and prediction of changes in Q 's
- Generates a clear agenda for economics
 - Consistent Q units foster benefit transfer
 - Enable welfare accounting
- Focuses EPA on something they can do *immediately*
 - Count and map the Q 's over time
 - Relate changes in Q 's to agency actions

Appendix G
Update on EPA's Revision of the Ecological Benefits Strategic Plan,
Briefing provided by Dr. Wayne Munns

Ecological Benefits Assessments Strategic Plan

Briefing to the
SAB C-VPSS

October 2006



Briefing Outline

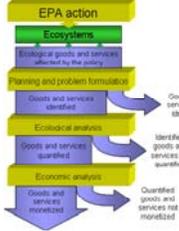
- Motivation, Vision and Goal
- Scope and Audience
- Developing the Plan
- Responses to C-VPSS Input
- Priority Actions
- Implementing Actions
- Recognizing Success
- Roll-out



Motivation

- Increasing need to understand impacts (both positive & negative) of Agency actions
- Increasing need to communicate impacts & tradeoffs to the public
- Current states of the science & practice limit Agency's ability to quantify impacts & tradeoffs comprehensively

Nature of Challenge



Goal of This Effort

To help improve Agency decision-making by enhancing EPA's ability to identify, quantify, and estimate the value of the ecological benefits of existing and proposed policies.



Vision

- Natural and social sciences provide models, methods and information needed to support economic valuation & benefits assessment
- Ecological benefits assessments are multidisciplinary and based on good science
- Agency decisions are transparent and sound



Developing the Plan

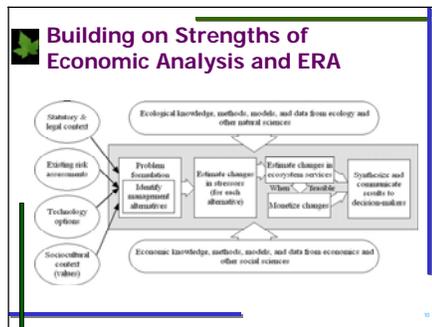
- Broad Agency participation involving: OPEI, ORD, OW, OPPTS, OSWER, OAR
- Information gathering meetings with EPA and other federal agency ecologists & economists
- Informal electronic questionnaire to Agency staff
- Broad issues analysis & action identification
- Workshop focusing on Office of Water programs
- Sponsorship of SETAC workshop on valuation & decision-making
- Broad Agency review
- Consultation with SAB C-VPRESS

Response to C-VPRESS Input

- "Clarify role of EBA & scope of plan"
- "Communicate & implement a more integrated framework"
- "Communicate a roadmap; develop a process & criteria for prioritization"
- "Address institutional issues"
- "Promote short-run results & long-run research in parallel"
- "Identify implementation mechanisms"

Scope & Audience

- Focuses on institutional & technical considerations arising most often in national-level ecological benefits assessments and where statutory requirements for conducting benefit-cost analyses exist
- Primary audiences:
 - Program Offices of EPA
 - EPA's natural and social scientists
 - Other Federal agencies
 - External partners of EPA's research
- Applicable to regional, state & local issues and in many contexts



Considering Priorities

- Fills a critical knowledge gap
- Has cross-program significance
- Is likely to succeed
- Enhances opportunity for cross-discipline participation and external partnership

Priority Actions to Improve Benefits Assessment

- Institutional arrangements
 - Promoting interdisciplinary assessments
 - cross-discipline communication & training
 - encourage interdisciplinary participation
 - expand use of ecological information
 - conduct problem formulation workshops
 - Promoting rigorous & comprehensive assessments
 - develop assessment guidelines
 - update Analytic Blueprints guidelines
 - develop generic ecological benefits assessment endpoints

Priority Actions to Improve Benefits Assessment

- ♦ Interdisciplinary research
 - Addressing overarching issues
 - designs & relevant indicators in environmental monitoring programs
 - inherent variability & uncertainty
 - Understanding policy impacts on stressors
 - behavioral responses to environmental policy
 - capacity for relative risk assessment
 - effectiveness of ecologically-based pollution controls
 - attention to *ex-post* analysis

Priority Actions to Improve Benefits Assessment

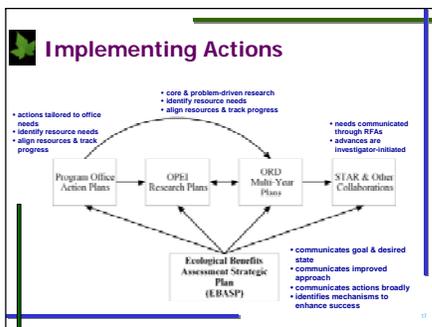
- ♦ Interdisciplinary research
 - Understanding stressor effects on ecological endpoints
 - capacity for population & community modeling
 - modeling changes across spatial scales
 - capacity for bioeconomic modeling
 - Understanding linkages among ecological endpoints & social welfare
 - valuation methods
 - survey methods validity testing
 - capacity for benefit transfer
 - capacity for supplemental methods

Priority Actions to Improve Benefits Assessment

- ♦ Fostering partnerships
 - Supporting studies relevant to Agency policies
 - Communicating Agency research needs
 - Coordinating data collection & research
 - Expediting collection of information about public values

Facilitating Implementation

- ♦ Oversight Committee
 - Ultimate implementation responsible
 - Identifying cross-Agency priorities
 - Leveraging resources to support priorities
 - Developing performance measures & tracking the success
 - Technical & management representation from across the Agency
- ♦ Ecological Benefits Assessment Forum
 - Promoting good practices across the Agency
 - Providing expertise advice & assistance
 - Facilitating information exchange
 - Developing guidelines & special projects
 - Open staff-level forum



Recognizing Success

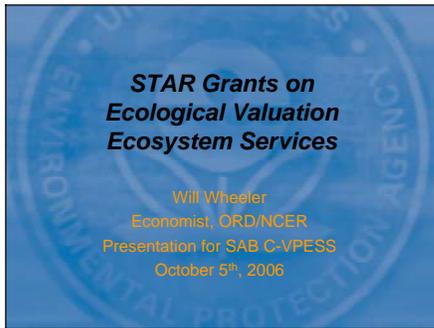
- ♦ In a GPRA sense:
 - Development & implementation of Office-specific Action Plans
 - Incorporation and attainment of relevant performance measures in OPEI's plans & ORD's multi-year plans
- ♦ In an operational sense:
 - Agency's benefits assessments become increasingly quantitative & comprehensive of valued ecological services
 - Agency decisions become more transparent and supportable



Communicating Release

- EBASP posted on NCEE site (<http://www.epa.gov/economics>)
- Office briefings
- Notice of Recent Additions
- Distribution of fact sheet/desk statement
- Target release – 13 October 2006

Appendix H
 Briefing on Star Grants on Ecological Valuation, Ecosystem Services
 Briefing provided by William Wheeler



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Requested Scope

- Focus on eco-valuation and cover
 - the goals, scope, and brief history of the program
 - the list of project currently funded that relate to ecological valuation and the scope of those different projects
 - the list of projects funded in the past
- whether you received all the types of proposals you hoped to get when you issued the RFP or whether there were some types of projects you hoped for that were not proposed

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Economics Research in NCER

- Three recurring RFAs
 - Valuation for Environmental Policy (includes health and ecological valuation, currently alternating); formerly Decision-Making and Valuation
 - Environmental Behavior and Decisionmaking (new title)
 - Market Mechanisms and Incentives
- Current budget is \$2 million/year; two RFAs/year
- Eco Valuation will be every other year, \$1 million
- Research priorities based on Environmental Economics Research Strategy
 - Development began in 2002, published in 2005

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Ecological Valuation in Research Strategy

- Ecological valuation a high priority in research strategy
 - More emphasis on long-term needs than short-term
 - Requests came from ORD, OAR, OW, OSWER, and OPPTS
- Wide variety of specific needs; unable to focus priorities, thus an emphasis on transfer and widely applicable values (such as use of indexes and indicators)
- Economists do not fully understand how people value ecological services—emphasis on interdisciplinary research

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Relationship to EBASP

- The Action Plan process resulting from *Ecological Benefits Strategic Plan* will provide greater detail for RFAs
- Interdisciplinary research (Priority Actions)
 - Understanding linkages among ecological endpoints & social welfare
 - valuation methods
 - survey methods validity testing
 - capacity for benefit transfer
 - capacity for supplemental methods

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Ecological Valuation Research in NCER

- Since 1995 STAR has awarded at least 30 grants dealing specifically with ecological valuation
 - This number excludes dozens of grants dealing with methods such as risk assessment and modeling
- I will highlight ecological valuation grants since 2002 DMVEP RFA

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2002 DMVEP RFA

- Very broad RFA: “research on ecosystems valuation” was one of three areas of research
- Five funded grants, four directly relate to ecological valuation (approximately \$1.2 million)

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2003/2004 Valuation for Environmental Policy RFAs

- We emphasized (based on EERS and EBASP):
 - Widely applicable or transferable values
 - Use of indicators
 - Improving accuracy of benefit transfer
 - Interdisciplinary research
- 2003: Human health and eco
- 2004: Aquatic resources only
- Three parts:
 - New values, transfer, methods

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2003/2004 VEP RFA

- 2003: Seven funded grants, three directly relate to ecological valuation (approximately \$900,000)
- 2004: Three funded grants, all directly relate to ecological valuation (approximately \$1.5 million)

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Do We Always Get What We Want

- No
- Not as much benefit transfer research as we would like—2006 RFA
- Not as much indicator research as we would like—likely 2007 RFA topic
 - Also use of statistical monitoring data in valuation

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Finding info

- Previous RFAs
 - http://es.epa.gov/ncer/rfa/2004/2004_valuation.html
 - http://es.epa.gov/ncer/rfa/2003/2003_valuation.html
 - <http://es.epa.gov/ncer/rfa/archive/grants/02/02dmvep.html>
- Existing grants
 - <http://es.epa.gov/ncer/grants/>

Appendix I
EPA Ecological Valuation STAR Grants 2002-2004

2002 DMVEP

EPA ID	TITLE	PRINCIPAL INVESTIGATOR	INSTITUTION	GRANT AMOUNT
R830821	Contingent Valuation for Ecological and Noncancer Effects within an Integrated Human Health and Ecological Risk Framework	James K. Hammitt, Katherine von Stackelberg	Harvard School of Public Health	\$266,632
R830819	Predicting and Valuing Species Populations in an Integrated Economic/Ecosystem Model	John Tschirhart, David Finnoff	University of Wyoming, University of Central Florida	\$203,176
R830923	Structural Benefits Transfer: Tying Ecosystem Valuation to Utility Theory	Subhrendu Pattanayak, V. Kerry Smith, George L. Van Houtven	Research Triangle Institute, North Carolina State University	\$260,000
R830818	Valuing Water Quality in Midwestern Lake Ecosystems: Temporal Stability and the Role of Information in Value Formation	Joseph A. Herriges, John Downing, Catherine L. Kling, Jinhua Zhao	Iowa State University	\$444,782
				<u>\$1,174,590</u>

2003 VEP

EPA ID	TITLE	PRINCIPAL INVESTIGATOR	INSTITUTION	GRANT AMOUNT
R831596	Integrated Modeling and Ecological Valuation	David S. Brookshire, Arriana Brand, Janie Chermak, Bonnie G. Colby, David Goodrich, John Loomis, Thomas Maddock III, Holly Richter, Steven	University of New Mexico, Arizona State University - Main Campus, University of Arizona, Colorado State University, The Nature Conservancy	\$386,213

Stewart,Julie Stromberg

R831597	The Stability of Values for Ecosystem Services: Tools for Evaluating the Potential for Benefits Transfers	John P. Hoehn,Michael D. Kaplowitz, Frank Lupi	Michigan State University	\$235,772
R831598	A Consistent Framework for Valuation of Wetland Ecosystem Services Using Discrete Choice Methods	J. Walter Milon,David Scrogin,John F. Weishampel	University of Central Florida	\$313,797
				<u>\$935,782</u>

2004 VEP

EPA ID	TITLE	PRINCIPAL INVESTIGATOR	INSTITUTION	GRANT AMOUNT
R832422	Valuation of Regional Ecological Response to Acidification and Techniques for Transferring Estimates	Alan J. Krupnick, Spencer Banzhaf, Dallas Burtraw, Bernard Cosby, Charles T. Driscoll, David Evans, Juha Siikamaki	Resources for the Future, Syracuse University, University of Virginia	\$717,929
R832420	Improved Valuation of Ecological Benefits Associated with Aquatic Living Resources: Development and Testing of Indicator-Based Stated Preference Valuation and Transfer	Robert J. Johnston, Elena Besedin, Eric Schultz, Kathleen Segerson	University of Connecticut, Abt Associates	\$405,154
R832421	Meta-Regression Analysis of Recreation Valuation and Demand Elasticities: Identifying and Correcting Publication Selection Bias to Improve Benefit	Randall S. Rosenberger, Tom D. Stanley	Oregon State University	\$409,947

Transfer

\$1,533,030

Appendix J

Conserving Ecosystem Services through Protective Decision-making; NCER Contributions to ORD's Ecological Research Long-term Goal 3

Conserving Ecosystem Services through Proactive Decision-making

NCER Contributions to ORD's Ecological Research Long-term Goal 3:

Briefing to SAB Committee on
Valuing the Protection of Ecological Systems and Services
October 5, 2006
Iris Goodman, NCER, ORD

Eco LTG 3: *By 2012, decision-makers apply tools that enable them to make informed, proactive management decisions that consider a range of choices and alternative outcomes, including effects on ecosystem services.*

Premises:

- Ecosystem condition is the collective result of numerous decisions and actions at all levels of society and governance
- Ecosystems provide us important services, yet these services are generally poorly understood
- Resource management decisions require trade-offs; such trade-offs are often made unknowingly and can result in unintended consequences

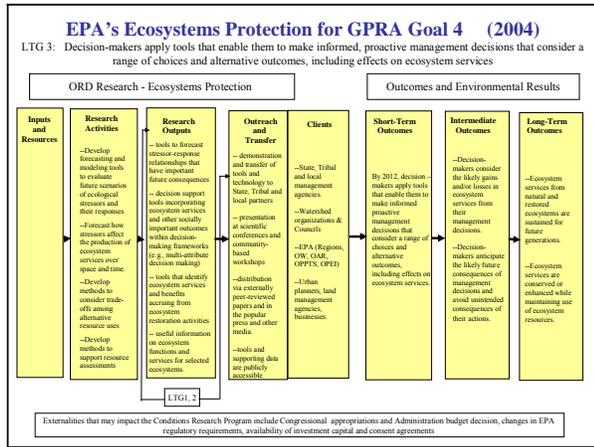
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Categories of Ecosystem Services

Ecosystem Services	Examples
Provisioning services	Fresh water, fiber, food, fuel, genetic resources
Regulating services	Regulate floods, droughts, land degradation, maintenance of air quality, climate regulation
Supporting services	Soil formation, nutrient cycling, primary production
Cultural services	Recreational, educational, and spiritual non-material benefits

Adapted from Millennium Ecosystem Assessment, 2003

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Relationship Among Research Questions for LTG 3

Q1: Scenario Development

What forecasting tools can be developed to evaluate scenarios of future stressors and their associated *ecological and social outcomes*?

Q2: Ecosystem Services

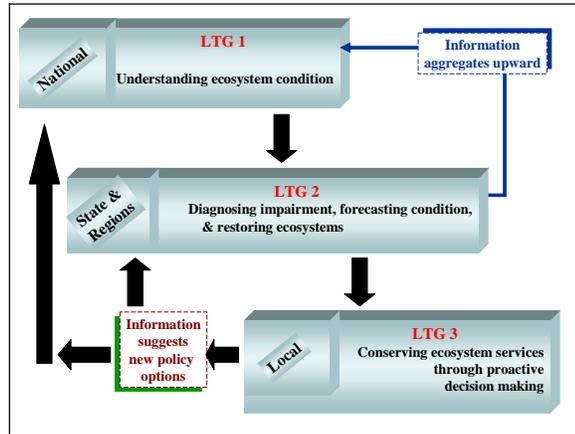
How can forecasting tools incorporate information about the *production of ecosystem services*?

Q3: Decision Tools

What tools can be developed to enable decision-makers to *evaluate trade-offs* among alternative management strategies and to better *manage for sustained ecosystem services*?

Progress in methods is cumulative

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Key points for NCER's Ecosystem Services Program (drawn from draft ORD Eco MYP, LTG 3 and follow-up Eco Services workgroup discussions)

- Functioning ecosystems provide services on which life depends.
- Most ecosystems are highly modified by human stressors, as are their services
- Many important ecosystem services can be quantified and mapped (e.g., rainwater infiltrated, flood peaks reduced, denitrification rates, carbon sequestered)
- We need to re-think "ecosystem service production functions"
- We can use ecological sciences to shape the ecosystem services we receive

Goals and scope of NCER's proposed Eco Services program

- to advance a more comprehensive theory and practice for quantifying ecosystem services and their relationship to human well being
- to achieve this by incorporating the best available ecological science:
 - "space, place, time, scale"
 - (builds on NCER's previous ecological research and results)

Goals and scope of NCER's proposed Eco Services program

- to enrich valuation techniques being developed in the economic sciences (e.g., via scientific contributions to estimatis of cumulative effects, tipping points, discontinuities)
- to foster integration of ecological, economic, and decision-making theories and practice
- to catalyze innovations in governance policies and in the private sector by providing new information on ecosystem services in ways useful to decision-making

How can ecology help?

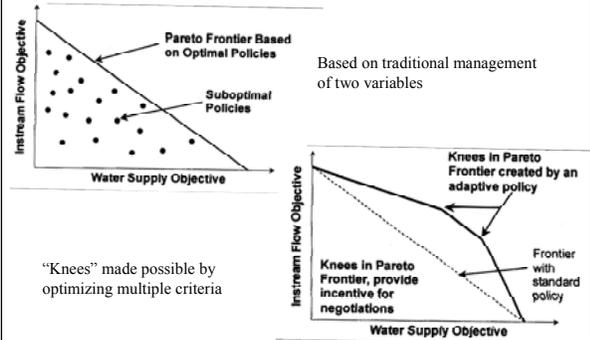
- Create geo-spatial products that describe ecosystem services and potential new ecosystem service production functions
- Develop ways to envision alternative combinations of services and to assess trade-offs.
- Develop methods to restore ecosystem services through restoring ecological structures and / or functions.
- Identify, quantify, and predict ecological "tipping points" that threaten loss of services.
- Provide information to catalyze innovations in policies and the private sector.

NCER Eco research: vignettes on the “art of the possible”

- Restoring water infiltration in urbanizing watersheds in Madison, Wisconsin
- Restoring multiple ecosystem functions for the Willamette River, Oregon
- Decision support tools so that rivers can meet both human and ecological needs in New England
- Enhancing multiple services from agricultural lands – conceptual possibilities in the upper Midwest

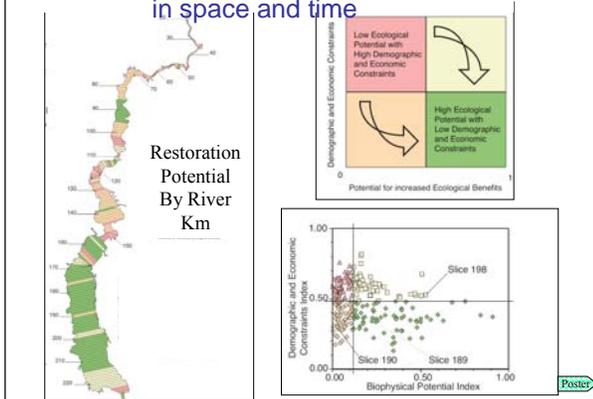
Envisioning new ecosystem service “production functions”

STAR Decision Tools

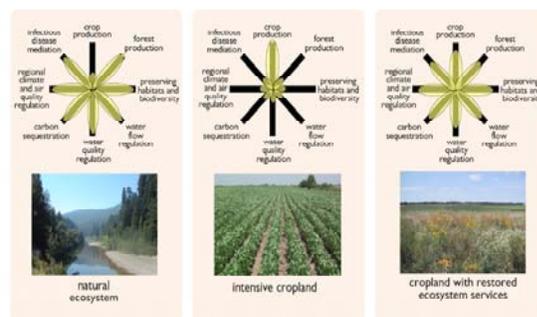


Identifying potential ecosystem services in space and time

STAR Decision Tools



Conceptual basis for new STAR RFA



Hypothetical landscapes and their “production functions:”
Foley, et al. 2005. Global consequences of land use. Science. 309: 570-574

Scope of NCER's proposed program:
(based on draft research prospectus, March 2005)

“We propose to conduct studies at the local and regional scale. . . .”

“Our first priorities are to develop methods for conserving and restoring ecosystem services within agricultural systems, urban and suburban areas, and coastal areas.”

Progress to date:

- 2004: ORD revised Ecological Research Program in response to 2003 PART evaluation
- March, 2005: EPA's BOSC reviewed the proposed new Ecological Research Program, which had two major new elements:
 - (a) Accountability and (b) Ecosystem Services
- BOSC gave high marks to new Eco LTG 3: *Conserving Ecosystem Services through Proactive Decision-making*, and noted NCER's important role in developing the science and transferring it to users

Progress to date:

- FY 2006. Eco LTG 3 formally initiated with \$2 million for ORD Eco, of which \$1.5 million allocated to NCER
- July 2005 – January 2006: convened EPA-wide workgroup to lay out research strategy for FY 2007- 2012
- Hiatus on ORD-wide activities for Eco LTG 3
- Summer 2006: NCER developed new solicitation Enhancing Ecosystem Services from Agricultural Lands

BOSC comments: relevance of Eco LTG 3:

“The research, tools, and analytical technologies . . . represent the most comprehensive federal government research program examining the provision of ecosystem services and the communication of these to decision-makers.

LTG 3 is a highly relevant activity that is central to EPA’s mandate of improving environmental quality and protecting and restoring the health of the nation’s ecosystems. ORD and particularly the ERP are uniquely suited and positioned to address these issues.”

**BOSC comments:
scientific quality and leadership**

- . . . though ambitious. . . the goals are clearly stated and achievable.
- ORD scientists and collaborators working on LTG 3 are among the leaders in this research in the United States. No other federal research agency has as extensive or advanced program in transferring tools to assess the provision of ecosystem services.

BOSC comments regarding Performance

- Very good progress in this area has occurred during the past 5 years and it is expected that this progress will continue in the future with adequate funding and scientific resources.
- The research currently being conducted and that which is proposed to be conducted under LTG 3 represents state-of-the-science in assessing complex systems and developing tools to understand and enhance ecosystem services

Tables created for ORD ERP Draft Ecosystem Services Workgroup Prospectus, March, 2006.

1. Provisioning services:

- a. Provision of freshwater.
- b. Maintenance of ecological integrity, water quality& quantity by headwaters and isolated wetlands.
- c. Enhanced productivity of freshwater and coastal fisheries.

2. Regulating services:

- a. Improving air quality via forests and urban vegetation.
- b. Mitigation of flood damage.

Eco Service tables prepared for :

3. Supporting services:

- a. Denitrification to reduce N loadings to aquatic ecosystems.
- b. Nutrient retention and cycling from wetlands.
- c. Carbon recycling and storage.
- d. Enhancing biodiversity and ancillary benefits.

Each draft Ecosystem Service table:

- defines the eco service
- gives examples of research questions and products for each of the four sub-goals.
- describes objectives for local-scale prototype demonstrations
- describes objectives for regional-scale demonstrations
- identifies the “triple bottom-line” for ecological, economic, and social analyses.
- gives preliminary timelines for analyses: 2008 – 2015.

NCER grants related to Ecosystem Services

- Understanding ecological thresholds in aquatic systems through retrospective analysis (Exploratory Research; RFA in 2004; \$3 M; 11 grants funded)
- Ecosystem Services from Freshwater Systems (RFA in 2004; Eco funded 3 CNS grants, at \$3 M)
- Effects of global change on ecosystem services from tidal marshes and coral reefs (Global-Ecosystems RFA in 2005; \$5 grants, ~ \$4.5 M)
- Non-linear responses linked terrestrial-aquatic systems to global change (Global-Ecosystems RFA in 2006; 6 awards in process, ~5.6 M)
- Enhancing ecosystem services from agricultural lands: developing tools for quantification and decision support (Eco RFA in 2006; anticipate ~ \$1.5 M)
- Biodiversity and human health: An interdisciplinary approach to examining the links (Exploratory research in 2006, pending resources)
- FY 2008 RFA: in planning, pending resources