

**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-VPESS)
Public Meeting – January 25-26, 2005**

Committee Members: (See Roster – Attachment A)

Scheduled Date and Time: From 9:00a .m. to 5:30 p.m. (Eastern Time) on January 25, 2005;
and from 8:30 a.m. to 4:00 p.m. (Eastern Time) on January 26, 2005. (See
Federal Register Notice, Attachment B)

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

Purpose: The purpose of the meeting is for the Committee to conduct an advisory
on the EPA's draft Ecological Benefits Assessment Strategic Plan
(EBASP) and to discuss issues concerning methods for valuing the
protection of ecological systems and services. All of 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 then to identify key areas for improving knowledge,
methodologies, practice, and research.

Attendees: Chair: Dr. Domenico Grasso

Committee Members: Dr. William Ascher
Dr. Gregory Biddinger
Dr. Ann Bostrom
Dr. James Boyd
Dr. Robert Costanza
Dr. Terry Daniel
Dr. A. Myrick Freeman
Dr. Dennis Grossman
Dr. Robert Huggett
Dr. Douglas MacLean
Dr. Louis Pitelka
Dr. Stephen Polasky
Dr. Paul Risser
Dr. Holmes Rolston
Dr. Joan Roughgarden
Dr. Mark Sagoff
Dr. Kathleen Segerson
Dr. Paul Slovic
Dr. V. Kerry Smith
Dr. Robert Stavins

Dr. Buzz Thompson

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

Meeting Summary

The discussion followed the Proposed Meeting Agenda (See Meeting Agenda - Attachment C) except where noted 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. Maciorowski welcomed committee members and underscored the importance of the Committee's advice on EPA's draft *Ecological Benefits Assessment Strategic Plan* (EBASP). Dr. Grasso welcomed members, asked them to introduce themselves, and reviewed the agenda. He noted that Drs. Robert Huggett and V. Kerry Smith had been asked to develop written preliminary comments to help initiate the committee discussion of charge questions and that they would provide some brief oral remarks after a presentation from the Agency on the draft document being reviewed.

Presentation on EBASP Vision and Measuring Success

Dr. Wayne Munns introduced himself as a member of the Agency work group responsible for the draft plan. He also introduced other members of the EPA workgroup in the audience: Drs. Nicole Owens and Steve Newbold from the National Center for Environmental Economics, Dr. Joel Corona from the Office of Water, and other staff from the Office of Research and Development, Drs. Will Wheeler and Randy Bruins. He provided background on the derivation of the plan. Dr. Munns identified the goal: "to advance EPA's ability to identify, measure, value, and communicate the ecological benefits of its actions in order to improve EPA decision-making at the national, regional and local levels." He discussed how issues and actions were derived and grouped in the plan. He noted that the Agency had envisioned the plan being implemented through four principal mechanisms: Program Office action plans, action plans in the Office of Policy Economics and Innovation, ORD multi-year plans, and STAR and other collaborations. Finally, he discussed how the Agency envisions the success of the plan might be measured. He closed by asking the Committee's advice with the opportunities and challenges associated with improving ecological benefits assessment.

Committee members followed his presentation with several questions. One set of questions pertained to Figure E-1 in the draft plan, "Stylized representation of an integrated ecological benefits assessment." Members asked whether analyses of effects of management actions on sources of stressors occurred as part of the risk assessment phase or risk management phase. Agency staff responded that they envisioned it occurring as part of the risk management

phase. In their view the purpose would be to distinguish baseline assessment and assessment of management options and effectiveness. A committee member suggested that integrated assessment needed to occur as part of the baseline assessment happening in problem formulation, and suggested that economic analysis should be better integrated with the Agency's ecological risk assessment guidelines. If the Agency saw integrated ecological benefit analysis as part of the risk management process, that point should be made more clearly. Another committee member expressed concern that if integrated ecological benefits assessment were considered only as part of the risk management process, the needs for economic information would not be factored in the analytical process early enough to provide needed information for benefits assessment. Integrated ecological benefits assessment should start in the problem formulation phase of risk assessment to inform decision making. Yet another committee member asked for confirmation that the component box entitled "assessment of efforts of management actions on sources of stressors" involved an assessment of psychological and economic responses to management options. Dr. Munns responded that it did.

Dr. Munns stated that the work group's major concern was to avoid a paradigm where risk management was informed by ecological risk and economics separately.

A committee member expressed concern that the diagram gave the impression of a unidirectional flow of logic. He suggested that it would be more appropriate to indicate that analysis occurring on the right-hand side of the diagram took place earlier in the process, at the problem formulation stage. He expressed appreciation for the Agency's comprehensive view of the issue. He suggested that there was a need for a new metaphor describing the analysis intended. He viewed figure E-1 as confusing and suggested that it would be useful to dispel the unidirectional logic suggested.

Another member noted that the draft text in the plan emphasizes the importance of a planning dialogue in the problem formulation stage. She wondered why this "planning dialogue" did not show up in figure E-1. Dr. Munns noted that the workgroup intended that dialogue occur throughout process. He responded that the document provide more extended discussion of the ecological risk assessment framework and more discussion of the overall process envisioned for integrated ecological benefits assessment. Committee members agreed that a depiction of a complex, non-linear process would be more appropriate. Adaptive management, for example, shows in the text of the plan, but not the diagram.

A committee member noted a different issue, common to both the diagram and the text of the plan. He observed that the text focused on developing an integrated bi-disciplinary process, not a multi-disciplinary process. He suggested that the diagram "roll the oval boxes together" to call for integrated scientific/analytical approach to knowledge, methods, models, and data. He also suggested that the document integrate the separate discussions of ecological and economic science into sections devoted to integrated science issues

Yet another type of issue pertained to the intended scope of the plan. A member asked for clarification of whether the plan was limited to national benefit assessments or whether it was intended to include benefit assessments supporting decisions of other kinds. Dr. Munns responded that the scope was intended to support decision making at all levels. While the

tendency is to focus on program offices, they are at the "top of the pinnacle" of decisions made by states, tribes, and regions. He saw the plan as including improvements to ecological benefit research that may have impact on local zoning.

Another member asked whether the scope of the plan was intended to focus on research or broader institutional and organizational goals. Dr. Munns responded that the draft plan intended to include advancements and changes to make progress in ecological benefit assessments beyond the research domain.

A committee member asked how Figure E-1 would allow for a "Silent Spring" consideration. Dr. Munns responded that at EPA, the Office of Pesticide Programs assesses ecological risks and benefits for pesticides. A "Silent Spring" scenario could show up in box 3 when an Agency ecologist could identify a pesticide as having "Silent Spring" potential, as part of the assessment of potential ecological responses to use of the pesticide. Agency decision-makers would then make a decision about whether those adverse effects were acceptable or not.

Preliminary Comments from Drs. Huggett and Smith

Dr. Smith began the discussion with brief remarks on the scope and purpose of the written comments circulated as "Preliminary Comments" to the Committee and made available to the public. He noted that these were individual notes, representing personal, initial reactions to the draft. They were provided in response to the Chair's request for initial comments to initiate committee discussion. They were not intended as a draft committee report and as a working document, did not include text expressing appreciation to the Agency for the hard work and ambitious scope of the draft plan.

Dr. Smith noted appreciation for Dr. Munns' presentation and discussion of Figure E-1. The "reductionist approach" suggested by that figure benefited from the additional discussion. He observed that ecological benefits assessment faces a challenge similar to that faced by health scientists and economists after introduction of the "Red Book." There is need for a metaphor to organize available information and to structure research where information is not available. A metaphor is needed to help health scientists, academic scientists in economics and all domains.

He expressed the desire for the strategic plan to include a plan to make some short term progress where there is ability to integrate information on the value of ecosystem services and have that information appear in Regulatory Impact Analyses more quickly. He acknowledged also that the strategic plan should include the planning of a long-term research agenda.

The "Preliminary Comments" were intended to meet three goals: 1) to identify what a strategic plan should include and whether the Agency's draft EBASP included those elements; 2) to identify whether the draft EBASP included strategies for making progress on short term analytical and longer term research issues; and 3) to identify whether the draft plan contained sufficient examples and information required to deal with the charge questions.

Dr. Huggett supported Dr. Smith's remarks. He underscored the importance of improved ability to assess and value ecological benefits as part of the risk paradigm. He saw a pitfall in

defining and describing this activity as a separate entity from the risk management/risk assessment paradigms. He suggested that the Agency would benefit from integrating this activity more fully into the Agency's current *Ecological Risk Assessment Guidelines*, rather than creating a separate document and research agenda.

Dr. Grasso began the committee's discussion of Drs. Huggett's and Smith's preliminary remarks with his view, that the Agency document is an excellent starting point. The Committee's goal is to strengthen it to achieve the desired outcomes.

Committee members discussed briefly the pros and cons of discussing ecological benefits as an activity separate from ecological risk issues. One member noted that it was possible to think about ecological benefits or valuing ecological services outside the risk paradigm, but noted that EPA has a history associated with ecological risk assessment. He asked how much does the committee wish to keep it a separate analytical process. Dr. Huggett responded that many action items are related only ecological risk assessment and that EPA is recognizing that benefit analysis is part of the risk paradigm. He sees the need for a single set of guidelines for both ecological benefit assessments and ecological risk assessments.

Agency staff noted that ecological risk assessments could be conducted for reasons other than generating an ecological benefits assessment. They need not be necessarily linked.

Dr. Grasso noted that Drs. Huggett and Smith saw the need for integration of benefits and risk assessment at the start of the analytical process. Dr. Smith echoed the view that it was very important to involve economists at the problem formulation stage, when ecological services and likely-related human choices to them were being discussed and defined. Dr. Munns commented that an ecological economic modeling workshop conducted by the Agency related to selected Office of Water case examples illustrated the utility of this approach.

Discussion of Charge Question 1: "Given the audience described in Section 1.4., does the Plan adequately address the objectives described in Section 1.1.?"

Dr. Grasso introduced this section of the agenda by referring to footnotes to the Agenda (Attachment C) which cited the definition of the audience and objectives, as identified in the draft EBASP. One of the committee members noted that the summaries of interviews conducted by Dr. James Boyd and provided to committee members in Dr. Boyd's status report included specific technical and institutional issues identified by EPA staff. He asked whether the committee might benefit from consideration of these issues in its review of the draft EBASP. As an example, he highlighted Agency staff emphasis on the difficulties involved in review and approval of Agency Information Collection Requests, necessary for any research involving collection of information from more than nine people. Agency staff noted that there was only a brief mention of this issue in the draft EBASP and that it would be helpful if the committee were to highlight this need in its advisory report on the draft EBASP or its broader report.

Dr. Grasso decided that the full committee should take a half-hour break from the draft agenda to read the interview summaries and return after lunch to a session where Dr. Boyd

would briefly summarize the interviews. He asked the committee to consider how the information might relate to their advice on charge question 1.

After lunch, Dr Boyd provided a brief summary of the highlights of the interviews. He noted that the purpose was to ask potential clients about their real needs for advice related to the committee's work, to explore the relationship between OMB and EPA as regards development of Regulatory Impact Analyses. All interviews were documented and interviewees were informed that comments to be shared with the committee were "on the record." The Designated Official was present at all interviews; and interviewees reviewed and approved the summaries received by committee members. He expressed a desire to interview more ecologists involved in the development of Regulatory Impact Analyses. He also expressed the caveat that the summaries only include information interviewees were willing to report publicly.

He noted the following highlights: 1) EPA's Deputy Administrator, Stephen Johnson recently issued a memo specifying how economists and ecologists would interact in developing Regulatory Impact Analyses; 2) the Nation Center for Environmental Economics is a "big player," but much activity devolves to program offices; 3) the Regulatory Impact Analysis process is "very organic" and doesn't follow the Johnson memo; 4) money for activities originates from program activities; 5) important issues emerging include expert elicitation for depicting uncertainty and range of endpoints for analysis, peer review processes for analysis are uneven; the Data Quality Act and Information Collection Request process are important; and 6) there is a tendency to follow--and not depart from--analytical models that have passed OMB scrutiny. He saw this last "tendency" as a symptom of the Agency's fear of experimentation. There was also a sense that contingent valuation studies and benefit transfer are not on the table because of how they are received by the Agency.

The Committee then turned to a discussion of Charge Question 1.

In terms of the audience for the report, the committee discussed the need to clarify that the audiences should include EPA managers and staff at the EPA regional levels. There is a need to provide more information for the different kinds of ecological decision making considered, including the different kinds of regional decisions. A committee member noted that examples would be helpful. A member noted in response that there is a need to strengthen benefit assessments conducted by regions, and that the EBASP needs to encompass both Headquarters and regional assessments. Another member stated that the plan would benefit from a stronger focus on external academic researchers and a clearer statement of the Agency's overall goals and objectives for them.

Another member suggested that the Agency would benefit from considering the need for benefit assessment outside the regulation development phase. There is the need to consider how benefit assessments might inform decisions at the implementation, enforcement, monitoring and assessment phases, and how they relate to the requirements of the Government Performance and Results Act (GPRA). The Chair also talked of the need to contextualize benefits analysis within the fuller life-cycle analysis of a regulation.

A member then noted that EPA's air and water legislation impose a schedule for revisiting regulations within certain timeframes. This schedule could impose a structure for ongoing planning for integrated ecological benefits assessment at the national and regional scales that would have practical results for improving Regulatory Impact Analyses.

The committee then discussed how the interviews conducted by Dr. Boyd shed light on whether the plan was designed to meet audience needs. A member noted that the interviews identified a range of short-run crises that need to be addressed and that such issues were generally not discussed as issues in the plan.

Another member responded that a comprehensive strategy would include both research to meet the objectives set for long term needs and ways to address the short range problems agency deals with on regular basis. Another member suggested that such issues merited inclusion in an implementation plan.

Dr. Maciorowski spoke of the merits of documents like the *Ecological Risk Framework*, which solved no individual problem, but provided a paradigm that changed thinking in the Agency over time.

The committee then discussed the stated objectives in the draft plan. Members spoke of the need to encourage multi-disciplinary collaboration not just between economists and ecologists, but also between experts trained in other relevant disciplines. Another member linked this call to the broad need to characterize non-use values that is a dominant issue discussed in Dr. Boyd's interviews. If contingent valuation will not work to provide analyses to support decision making, there is a need to turn to other analytical mechanisms or other mechanisms to bring ecological considerations into decision making.

Members spoke of the need for the plan to include a roadmap, which would provide a description of the current context and where the Agency desires to be five or ten years from now. A statement of the need for a model for conducting non-use benefit assessments might be part of that roadmap. Another part might be the need to identify an example ecosystem service that changed because of a regulatory action. Or it might be helpful to identify a target like improving benefit assessments for nitrogen deposition. This would identify a particular issue that could be addressed as a priority across the Agency.

Members spoke of the need for the plan to identify more clearly as objectives the operational hurdles faced by the Agency faces have not been reflected in strategic plan. They noted that it would be helpful for the background section to describe those operational issues. A member emphasized that if the draft EBASP is to meet its goal of advancing Agency ability to identify, measure, value, and communicate ecological benefits to improve decision making, then the plan must include more than research. It must call for an understanding the process of decision making, and the tools, information, and process needed. The interviews conducted by Dr. Boyd illuminated many of these issues for decision making and those issues need to be addressed in the plan.

One committee member spoke of the need for the draft plan to address the mission-oriented agency tasks identified by regulation and the need to fill long-term research gaps. He acknowledged the tension between these two needs, but also noted that long term efforts can be sustained by successes in meeting intermediate needs. In his view, it would sustain the Agency's momentum to pick a few really important near-term goals and meet them.

The committee discussed the merits of advocating an approach of "punctuated evolution," where progress could be marked by cases where improved benefit assessments were demonstrated. In the process of that evolution, one member pointed out that the Agency could then determine the "questions that science can ask, the questions that science can answer, and the questions that cannot be asked by science."

Turning to another issue, the committee agreed with one member's suggestion that the EBASP would be improved by linkages to the EPA strategic plan. The EBASP needs a theoretical and practical rationale for advancing EPA's mission for the plan to have an impact.

Members then discussed the role and significance of benefit analyses for EPA's work. One member reviewed the importance of such analyses in meeting executive orders, legislative mandates such as section 812 of the Clean Air Act Amendments of 1990, and specific legislation that requires benefit-cost analyses. Many economists and others note that decisions should not be based strictly on benefit cost analysis alone and that it is important to provide decision makers with analyses of equity, distribution of income, and other analyses of value. Benefit-cost analysis is a starting point. Another member took a different tack. He viewed many environmental laws as stating environmental goals, while Executive Orders as rationalized Agency actions. EPA staff, in response, spoke of Agency efforts to identify appropriate ecological endpoints and offered to provide the Agency with a recent Risk Assessment Forum document that developed generic ecological assessment endpoints.

Dr. Grasso asked committee members to determine whether the plan met its stated objectives. One member indicated that it did and that identified one specific recommendation that she believed would greatly improve the document. She emphasized that the writing overall needed to be improved so that the Agency's goals and strategy are communicated more clearly, especially to academic researchers. She recommended that language in the executive summary be framed in positive terms and be revised to eliminate jargon and vague language. The biggest single improvement would be to make the document positive and direct. The message should be that the benefits of ecological protection are important to quantify -- life depends on ecological benefits and one of EPA's goals is to protect ecological resources.

Another member framed the purpose of the draft plan as identifying ways to do a better job of evaluating ecological benefits. The first step would be to incorporate ecological impacts into net present value analysis to comply with Executive Orders and Regulations; the next step would be to pursue additional kinds of analysis to supplement net present value approaches. He cautioned the committee that the Agency will find advice useful only if it includes specific recommendations for improvement.

The chair of the committee summarized the discussion as providing a "conditional yes" to

charge question 1. He asked the writing team, composed of Drs. Huggett, Segerson, Smith, and Thompson to work with the DFO on documenting the Committee's support for the Agency's draft, along with the caveats and suggestions mentioned in the discussion.

Discussion of Charge Question 2: "Are the issues described in Section 4 the most important ones that EPA should address to improve its ability to identify, quantify, and value the ecological benefits of its activities? If not, what issues should be added?"

The committee began discussion of this charge question by noting that the presentation by Dr. Munns had indicated that individual program offices and the Office of Research and Development planned to create detailed implementation plans to take action on the issues described in the draft plan.

A committee member noted that the plan did not include sufficient information on inter-agency research and noted a need to increase references to improving inter-agency coordination and accessing other Agency's research. She noted that the EPA-NSF research, for example was not explicitly mentioned. Other members spoke of the potential utility for EPA in coordinating with several programs where monitoring could combine both ecological and economic information with potential for benefits assessments. The projects mentioned included the National Ecological Observatory Networks (NEON), National Science Foundations studies of ecological change, and Long-Term Ecological Research (LTER) efforts.

Committee members spoke of their difficulty evaluating the issues described in Section 4. They called on the Agency to prioritize and group the issues in a more comprehensible way.

Committee members noted a variety of criteria or methods for ranking issues. One method involved the possible approach of evaluating issues by their potential to reduce uncertainty in benefit assessments. Another member noted that the term "ecological benefit assessment" is very broad; it might be appropriate to group issues by different types of ecological benefits for different purposes, defined clearly. Yet another member suggested that the Agency link issues to objectives and pick two per objective and inform the committee of the rationale for those choices. Another member suggested that the Agency sort actions by whether they involved short- or long-activities or whether the issues arise due to lack of data, lack of understanding, or some other reason.

Other members focused on specific parts of the report. One member noted that section 4.5 was very well written and thorough. She noted that the issues selected were the most important and the actions were appropriate, and some quite innovative. She noted one possible addition. Long term ecological monitoring sites don't generally include long-term economic monitoring accruing at those sites. Such information would be a useful addition to the scientific protocol. She also noted that section 4.6.1 was preferable to 4.6.2. Her perspective was that ecological systems are better studied *in situ*. She expressed skepticism about transferability. The only thing missing from section 4.6.1 in her view was an explicit discussion of whether the actions discussed addressed the information gaps of concern to OMB.

Another member noted that the draft plan missed an important opportunity to develop important interdisciplinary work. The organization of the document forces separate discussions of ecological and economic research. What is most needed, integrated research and comparative studies is not included, partly due to the structure of the document.

Other members spoke of the need to identify a few regulatory examples that could demonstrate the utility of benefits analysis. One member emphasized the importance of these examples for sustaining a long-term commitment to research.

Finally, one member suggested that the Agency include an additional issue relating to the need to improve communications with lay audiences.

Discussion of Charge Questions 3: "Are there actions in Section 4 that are the most important for EPA to undertake at this time to improve its ability to conceptualize, identify, quantify, and value the ecological benefits of its activities? Do the actions respond to the identified issues? Are there actions that are missing?" and 4: "Are there other actions you would recommend?"

A committee member suggested that the Agency workgroup develop priorities by asking different parts of the Agency to prioritize actions independently and then look at areas of agreement or difference to identify overall priorities. Another member objected to this suggestion because recommending such a process might undercut the perceived authority of the workgroup that developed the draft plan.

Members then discussed the merits of the Agency's using the criteria on page 61 of the draft plan for ranking actions. One member argued that the "opportunity for collaboration across disciplines," in itself was not an appropriate criterion. It would only identify issues as a priority if such collaboration led to a useful result for the Agency. Another member proposed rewording the criterion as "opportunities for learning across disciplines. The consultant to the committee urged the committee to retain criteria, to discuss the merits of each, and then ask different groups in the Agency to weight actions by the criteria. The Committee discussed asking the Agency to divide the actions into short, medium, and long term and to rank actions within each category.

Another approach to ranking actions was articulated by a member who advocated that EPA allocate specific resources for benefit assessments associated with a target problem and then hold a competition for projects related to improving benefit assessments for that problem. The Agency could build in incentives for collaboration.

Another member emphasized that priority should be given to characterizing the value of non-use values.

On the topic of identifying actions that may have been missing, another member spoke of the need to find ways in the short term to capture value in more than one way to give managers multiple kinds of information on value. He called for an exploration of how to package existing information, whether qualitative, quantitative, or monetized in an understandable package for managers. The goal of such an exercise would be to "get the most out of the information we

have" to assist managers in making good decisions. He envisioned a "weight of evidence approach." Other members endorsed addition this suggestion and also mentioned the merits of comparing the results of the different assessment methods used. A member expressed the hope that in the future individuals could learn to use information and metrics other than monetized information and may come to understand the power of other information. He expressed concern that EPA analysts are "self-editing themselves" and becoming increasingly limited to a restricted set of tools for monetizing the narrow set of values that can be monetized.

Another member identified a potentially missing action as the identification of opportunities to use existing efforts to collect information that could have ancillary data collected to enrich ecological benefits assessment. Existing data collection efforts could be expanded with benefits to the Agency.

The Committee then discussed the issue of expert elicitation, a topic raised by several persons interviewed by Dr. Boyd. Committee members discussed including an action to explore what role expert elicitation might play. Members also discussed different understandings of the term "expert elicitation." One meaning involves asking economists and ecologists to evaluate a set of relationships. The process would engage individuals a sufficient number of times to confirm their sense of values. Results would be analyzed statistically to check for certain consistency parameters. This approach would use experts for a certain limited set of questions (e.g., dose-response relationships) for which their technical knowledge and judgment were sought. Another member thought it valid to use the term expert elicitation to compare the knowledge and value judgments of experts and lay persons. Some committee members expressed concern over how terms were used and the need to find language to distinguish between these different forms of expert elicitations.

Discussion of Charge Question 5: "Are there specific research approaches, or research projects, on which the Agency should focus?"

Members discussed the need for the document to be more consistent in calling for a "pluralistic," multi-method approach to research. This approach would compare deliberative with "one-shot analytic approaches," and compare the merits of different analytic approaches. Members called for this point to be made throughout the document and in the executive summary. They discussed the merit of comparing the results of different methods and learning from that comparison. One member called for more specificity about the methods encompassed in this "pluralistic approach;" he saw more merit in bio-economic modeling approaches than in other approaches specified. One member mentioned the difficulty of talking about appropriate methods apart from the problem to be assessed because each policy application may require its own look and feel.

Discussion of Charge Question 6: "Is the proposed implementation plan adequate?"

The committee agreed that the proposed implementation plan, as described in the document was not adequate. There was a need for identification of more specific timelines and responsible parties for the actions described. They discussed the need to include the information

on implementation mechanisms presented in Dr. Munns' presentation in revisions of the document

Discussion of Next Steps

The chair asked the writing team to develop a draft of the advisory report for review by the whole committee. The writing team agreed to meet and develop a process and schedule for incorporating the points raised in the discussion and in the preliminary written comments provided by Drs. Bostrom, Daniels, Huggett, Pitelka, Risser, and Smith before the meeting.

The committee adjourned at 5:30.

Wednesday, January 26, 2005

Update on C-VPES Workplan

The chair asked the Designated Federal Officer to review the status of activities related to development of the C-VPES major report. Dr. Nugent reviewed the outline (Attachment D) developed by the Steering Group in November 2004 in response to comments received from committee members at their September meeting. Committee members asked whether there was a deadline or forcing function to produce the report by a particular time. The chair, the Designated Federal Officer, and Dr. Maciorowski agreed that the SAB Staff Office Director sees no set deadline for the committee and that Dr. Vu supports the committee's taking whatever time is needed to produce a good report. Dr. Nugent and Dr. Grasso recognized the need to provide opportunities for the committee as a whole to provide comments on and deliberate on the results of work underway by individual committee members or subgroups.

During discussion of this agenda item, a committee member asked the Designated Federal Officer to note for the record that the interview summary of Dr. Boyd's discussion with analysts from EPA's Office of Air Quality Planning and Standards contained correct information about the use of expert elicitation in a study by Carson and Mitchell.

C-VPES Evaluation of Economic Methods and the National Research Council (NRC) Report, Valuing Ecosystem Services; Toward Better Environmental Decision-Making

The chair introduced the discussion of the NRC report. The question before the committee was whether the committee could support the findings of the NRC as they pertain to the use of economic methods for establishing the value of protecting ecological systems and services and whether there were additional points to be included concerning those methods in the C-VPES report, given its broad charge.

Dr. Stephen Polasky presented an overview of the charge, scope, and findings of the NRC report, on which he collaborated with Drs. Segerson and Heal, also members of the C-VPES. He summarized the major findings in a slide presentation. The key points appear immediately below.

During and immediately after his presentation, members asked several clarifying questions. One set of questions pertained to the difference between methods involving willingness-to-pay and willingness-to-accept. Dr. Polasky explained that willingness-to-accept methods framed questions in terms of "how much you're willing to accept for me to take a resource or ecosystem service away." He noted that it doesn't assume income limits. Other members noted a concern among economists over whether willingness-to-accept studies provide reliable results. They noted that economic benefit analyses in other contexts generally use willingness-to-pay methods.

A committee member suggested that the current draft text, "Concepts and Introductions to Methods" developed by Dr. MacLean and provided to members, defines a broad understanding of value doesn't fit the method of willingness-to-pay.

The committee then discussed use of the avoided-cost method. Dr. Polasky noted that use of this method reflects on a subset of ecosystem services. In the Catskills example, only the subset of services sufficient for decision-making was discussed. He acknowledged that such an analysis did not consider the issue of distribution of costs and benefits. Dr. Polasky noted that if distribution issues are important to the decision being made, then the analysis should report on report who wins, who loses, and the nature of gains and losses. A committee member questioned whether the decision to protect the Catskills in practice actually depended on avoided-cost value information. Dr. Sagoff stated that he would provide a publication to the Designated Federal Officer on this topic so that she could distribute it to committee members. Another member noted that Dr. Sagoff had written on this topic in his recent book, *Price, Principle, and the Environment*.

The committee then discussed the production function approach. Members reflected on the example of the production function approach, as applied to wetlands and fisheries. One member noted the complexity in this example. The case involved both issues of opened access and contamination of an ecological resource. One cannot evaluate the gain from improving the fisheries habitat without recognizing how the resource is used. A member of the committee asked whether such production-function approaches assume the system studied is operating in a dynamic or static way. Dr. Polasky responded that generally such studies compare a steady state before and after introduction of the policy being considered. If a dynamic model of the ecosystem were used, there would then be a set of complex issues to address including the issue of discounting, aggregating benefits across time, and weighting present and future benefits. A member asked how such approaches deal with spatial dimensions of change. If a policy option being considered compromises half of a marsh, does that make the other half more valuable? Dr. Polasky responded that such approaches generally consider such spatial changes as equivalent. Dr. Costanza stated that some approaches to spatial modeling of marshes take a different approach and offered to circulate an article of spatial modeling of marshes. Dr. Polasky noted that results from production-function analysis of single ecosystem services should not be compared against costs; they must be put in a broader context that describes the types of ecosystem services not captured in the analysis.

The chair then asked three commenters, identified on the agenda, to initiate broader discussion of the NRC report. Dr. A. Myrick Freeman stated that he thought the report is

excellent. He believed it explains economic concepts of value, why they are important, and what's entailed in deriving them. He stated that the report contains a full and useful discussion of the limitations of available methods. He also stated that the report does a good job of contrasting different kinds of ecosystem services valuation efforts. It also acknowledges other valuation concepts such as non-anthropocentric and anthropocentric rights-based approaches that go beyond the economic approaches that were the focus of the NRC report. Dr. Freeman stated that the C-VPES should include in its own report a prominent discussion of economic approaches, as described in the NRC report, but he did see more to say on that topic beyond what is described in the NRC report. The C-VPES report, in his view, should cite the NRC and Millennium Assessment reports. The C-VPES report might devote additional space to the kinds of data and methods that would be most useful for major environmental protection decisions at EPA, such as impacts on nitrogen deposition on estuaries, other marine resources, and forests or deposition of mercury. He noted one specific recommendation on page 220 that might merit rewording. He noted that the fifth bullet refers to linkages to services "that people value." He suggested that this bullet might be better reworded with as "that enhance human well-being" because of people's lack of knowledge about the ecological services that affect their well being. He saw merit in research recommendations to deal with the gap between preference-based values expressed by people and experts.

The chair then turned to Dr. Robert Costanza, the second commenter. He characterized the report as excellent, given the limits it set for itself, and offered comments related to where the C-VPES report should go, given the NRC report. He agreed that the C-VPES could use the discussion of economic methods as the basis for discussion of that topic in the C-VPES report. He viewed the NRC report as "freeing us up" to pursue where the NRC report did not go.

He made three major points. The first point concerned the distinction between intrinsic and instrumental value. If the committee focused on the goal of enhancing human welfare and well-being as broader than what is revealed through willingness-to-pay, are there other ways to assess those contributions not captured? Within the goal of enhancing human well-being, which includes enhancing economic efficiency (captured at least in part through traditional methods); there are also contributions to fairness and sustainability. Policy options may be valued in respect to how they achieve those goals, e.g., fairness, sustainability. He noted that he remains convinced that the term "intrinsic value" is confusing -- whatever is considered an "intrinsic value" is a goal. One can measure the degree a policy option contributes to attaining those goals. If one is trying to assess a policy option's degree of contribution to fairness or sustainability, preference-based approaches may be difficult to use. People's preferences may not be well-informed, similar to smoking choices made by people who didn't understand the negative health effects of smoking. Similarly, he saw merit in analysis of migration in learning and group evaluation of expert views. He saw merit in seeking understanding of a spectrum of preferences ranging from the preferences of experts fully informed technically about ecological effects to the preferences of people who have connections to impacts but no technical knowledge. He suggested including a table in the C-VPES report that would include the category of non-preference based approaches.

His second point was that benefit analyses had value for multiple purposes, not just for evaluating policy options. An additional purpose for the analysis could be to establish a baseline

that would allow comparison of different systems. He noted that his much-commented-on paper in the journal *Nature* had the latter purpose. He encouraged the committee to think broadly about possible alternative uses and purposes of benefit analysis.

His third point involved the identification and discussion of additional approaches, outside the limits of methods discussed in the NRC report. He called for examination of more integrated, quantitative models at different spatial scales. He noted that such modeling had been conducted in Louisiana, Florida Everglades, and Maryland. He offered to provide the committee with access to the reports on those modeling efforts. He noted that the NRC report might have benefited from a more extended discussion of such integrated models. He viewed such modeling exercises as especially useful because they encourage interaction of different groups within a specified geographic context and because investments in such models, if planned carefully, could be made available for developing Regulatory Impact Analyses and answering policy questions as they arise. Modeling efforts, if planned well, would involve the involvement of stakeholders and potential users. Appropriate stakeholder involvement would enhance, in his view, implementation of environmental protection decisions.

Dr. William Ascher served as the third commenter on the NRC report. He summarized his major points with the aid of slides. Dr. Ascher also affirmed the value and usefulness of the NRC report. He noted ten major premises in the NRC report and focused on two of them in more detail. He noted that one premise defined total economic value as the sum of use values and non-use values. He observed that how values were aggregated were crucial and that the NRC report assumed a Benthamite utilitarian approach. Alternative approaches are possible, such as using mean values that might be obtained through referenda. He also noted that the NRC report focused on the dangers of underestimating benefits, due to omitting factors and methodological limitations. He observed, in addition, that there might be institutional or political factors, which may be influencing EPA analysis to underestimate benefits for regulatory decision making. He then focused on what was not addressed in the report, including non-monetized economic methods; the utility of using multiple methods; the limits of willingness-to-pay assumptions when “estimates exceed the value of alternatives”(i.e.,: willingness-to-pay may not be enough if the estimate is to spur stronger future rules); preferences that may be revealed through official acts, such as referenda; and certain aspects of the uncertainty question, including expressing uncertainty most usefully and providing incentives for experts to express uncertainty most usefully.

At the conclusion of the comments provided by the lead discussants, the chair turned to Drs. Polasky and Segerson for responses. They thanked the discussants for their insightful comments and agreed that the comments point to future directions for the C-VPESS. Dr. Polasky noted that he has studied the relationship between referenda, discussed by Dr. Ascher, and stated preference studies. He noted his appreciation of Dr. Freeman's call for research comparing the values expressed by technical experts with values expressed by those without technical expertise. Dr. Ascher also suggested that the Committee check the work of the World Bank in assessing political preferences, comparing the preferences of the poor and rich. Dr. Costanza noted that it might be useful to group methods into those that evaluate individual preferences and those that evaluate community preferences. Referenda would be included as a community preference method.

Dr. Freeman then suggested that it was a "blurry line" between referenda and revealed preferences. His observation is that results of voting are not far from individual preferences modeled by economists, if both are "done right."

The full committee then discussed the NRC report. One member asked whether defining a "production-function approach" as a valuation method was appropriate. He viewed production functions as the curve to which dollars are fit. Dr. Polasky agreed that the production function approach pertains to the production of ecological services. It is really the first step that precedes valuation.

Another member added that economists assume constrained optimization functions influence choice and those production functions are one of those constraints. Where such functions are observable, they useful checks build into the analysis because they identify intermediate outcomes

Members talked about the value of discussing production functions in efforts to assess the value of protection of ecological systems and services. Because an ecosystem has nearly innumerable production functions, ecologists benefit from consulting with other kinds of scientists about their analytical needs for information about ecological production functions. One member emphasized the importance of dialogue at the conceptual stage. It is important to frame issues at a fundamental level.

As follow up to this discussion, the chair asked the Designated Federal Officer to work with Drs. Polasky, Segerson, Freeman, Costanza, and Ascher to develop draft text for the C-VPESS report that captures the committee's understanding of how the NRC characterizes the use and limitations of economic methods and its support for the points made in the NRC report.

Ecological Benefit Indicators

The chair then introduced Dr. James Boyd to discuss the first method not discussed in the NRC report, *Valuing Ecosystem Services; Toward Better Environmental Decision Making* (2004). Dr. Boyd traced his interest in this topic to the current popularity of indicators and his desire to find a method that applies ecological principals and doesn't involve monetization. He stated that he wanted economics to have more impact on local decisions, regional decisions, and decisions at the national level.

Dr. Boyd provided a slide presentation focused on a personal critique of environmental economics, a definition and description of ecological benefit indicators, and an example of their application for a policy purpose. His major thrust was to use this method as a way to get people thinking about the relationships that lead to benefits, e.g.,: demand, substitutes, comparability.

After his presentation, the committee began a discussion deliberating on the potential application of this method at EPA. One member expressed appreciation for the method as an elegant display of problem formulation. The method could be used at the problem formulation stage to define the scope of the analysis, potential impacts, and variables to quantity.

The committee then turned to the question of who would aggregate the value information derived in using this method: participants in the political process, Agency decision makers, or a technical analyze monetizing benefits. Dr. Boyd responded that all those different strategies could be used to aggregate information, depending on the decision to be made. In his view, it was most important for analysts to acknowledge and embrace the limits of what's known. From his perspective, the current economic approach buries information about the limits of knowledge. No matter what method is used, it is important to acknowledge the limits of what we can aggregate monetarily and the limits of what we can identify as commensurate

One member saw a strong link between Dr. Boyd's approach and more participatory modeling approaches. If the stakeholders were in the room, there would be less concern about arbitrariness in the choice of variables. Stakeholders could discuss relevant trade-offs and that information could be factored into the model. Appropriately designed and implemented stakeholder involvement will allow participants to understand, the indicators, agree on their choices, and "buy into" underlying assumptions. With such involvement, there is a better chance of implementing ecological protection decisions and programs. Another member spoke about the usefulness of such participatory modeling for research; if stakeholders rank amenities, and if one option is monetized, researchers gain information about other options. Yet another member saw this method as an "economics production function exercise" -- as a process for identifying the inputs for a monetized economic analysis.

A member asked about the utility of this approach for evaluating two options for a decision scenario pertaining to a single place. Dr. Boyd responded that it is difficult to use to tool to depict scenarios in a dynamic time path, because it is difficult for ecological science to predict the future or predict a counter-factual.

One member returned to the topic of aggregating or weighing indicators presented in multiple dimensions. Dr. Boyd responded, once again, that he was comfortable with information being used in different ways, depending on the need -- no one way seemed obviously superior, given the current state of knowledge. Information could be given to economists and monetized, or given to stakeholders to evaluate in some process oriented way, or given to experts to evaluate in an effort to elicit their views of comparative value. The member raising the question agreed that the weighting problem was difficult. He thought, however, that it was important and "unavoidable," and Dr. Boyd agreed.

Another member returned to the first point made in the discussion concerning the potential contributions of such an approach for creating an integrated conceptual model in the problem formulation stage. In current practice, ecological assessment sometimes focuses on one assessment endpoint with no connection to benefits. Often the current approach doesn't span the range of ecology effects related to the problem or provide a basis for dialogue between ecologists and economists. He envisioned that ecological benefit indicators, as described by Dr. Boyd might be used at the regional level for deciding on Total Maximum Daily Load (TMDL) and watershed decision making, where decision makers need to look at sediment loads, toxic stressors, nutrients, and other factors and as "what do I work on first?" He saw potential applications with nitrogen trading and the European water framework

Dr. Boyd responded that ecological benefit indicators could be useful where data can be arrayed spatially -- so it can be used to evaluate best management practices or land use changes, which are often options for a TMDL. He questioned whether such a spatial tool would be as useful for toxicity impacts. The committee member agreed that one would need a connection between the chemical stressor and impact on habitat or some other spatial endpoint.

A member noted that he had participated in an ecological modeling exercise that engaged stakeholders in evaluating options for protecting a tributary of the Columbia River. In that case, stakeholders became decision makers and developed "understanding and ownership" of the decision makers. He asked whether it is necessary to model ecological consequences of different decisions. If such modeling questions are posed at large regional areas, national areas modeling are expensive.

Dr. Boyd responded that his approach did not model the hydrological flow pattern, because it was impractical to do such modeling with limited budget. His method was proposed as a simplifying way to think about ecological benefits, assuming analysts are working in a constrained world. The approach creates strawmen. If we are reducing floods, it is necessary to make some assumptions and do sensitivity analysis on those assumptions.

The consultant to the committee suggested that the constructed value approaches might provide a way to assist in weighting different alternatives.

The committee took a break for lunch and resumed discussion of ecological benefit indicators. One member showed several slides that illustrated how misleading representation of indicators can be on a map. He argued that the ecological benefit indicators presented by Dr. Boyd were a model, not just a map, of ecological indicators. He emphasized that how one portrays geographical information can have a major impact. He cited Edward Tuftee's work, which explored how a visual platform can be used to convey importance of particular variables and how it can be misused.

Another member discussed the need to represent, with greater transparency than discussed in the presentation, the characteristics of each of the geographical units represented on the map and the need to see the relationship between equations involving major variables and these variables' representation on the map. He commented that he viewed ecological benefit indicators as providing a platform and a model for participation and enhanced communication. He noted that he was less convinced that the method facilitates decision-making.

Yet another member spoke about the power of maps, which represent factors and relationships difficult to capture in equations -- they capture the "who" and "where" dimensions of a problem and actually add information that helps decisions. Members agreed that using both mathematical models and maps generated from Geographical Information Systems facilitates asking important questions. Using a map, however, is not "neutral to the decision process." One member remarked that it "privileges the 'who' question;" comparing bar graphs and maps of income disparity can result in very different conclusions.

The chair asked Dr. Boyd to draft a description of this method and committee discussion of it for incorporation in the draft of the committee's report. The Designated Federal Officer stated that she would send a template to both Dr. Boyd and Dr. Grossman to follow, so that write-ups of the methods discussed at the meeting would be of comparable length and format.

Spatial Representation of Biodiversity and Conservation Values

Dr. Dennis Grossman began his slide presentation by remarking that there is available much of the data and understanding of biodiversity and conservation values needed to drive decisions. He framed his presentation as a discussion of the methods and information used by conservation organizations to make decisions. He emphasized that such organizations exist to make conservation decisions. There are very few examples of where they pursue analysis without a decision endpoint.

Dr. Grossman provided the committee with a step-by-step description of the process and method used by NatureServe in assisting conservation organizations with science-based information about biodiversity and conservation decisions. He began by defining an "element" as a species or vegetation type, habitat or ecosystem, a unit of biological diversity of interest. An "element occurrence" is a spatial descriptions on the landscape of a particular element. The seven stages detailed in his presentation were:

1. Define the targets
2. Define occurrence standards for each target
3. Define standards for valuing the quality of each occurrence
4. Define standards for measuring range wide status of each target
5. Create a 'conservation value layer' for each target - Modify 'conservation value layer' through application of stakeholder conservation goals
6. Create 'conservation value summary' of all targets - Create 'conservation value summary' through application of specific stakeholder goals for each target
7. Incorporate urgency into the valuation.

As targets, NatureServe defined "elements" at the level of ecological systems, focal communities, and focal species or subspecies. He noted that species had been tracked in a very fine way (30,000 animal taxa had been tracked and 56,000 plant taxa had been tracked). Ecological systems were also well-identified and mapped across the country. Definitions of "elements" required major efforts defining conservation targets, units for reporting, and standardized ways to identify them. He noted that NatureServe coordinated 85 different programs feeding a central database.

He noted that the element occurrence delineation process is an important step. NatureServe has developed a process for standardizing reporting of element occurrences (EO) by ranking occurrences by quality. "EO" rank depends on the condition, size, landscape extent and context within each group. Experts review and evaluate occurrences reports and rank them

NatureServe then aggregates occurrence information. It develops rankings of the range-wide status of each target and global "G ranks." "G-ranked" occurrences help to identify the relative importance of an element.

NatureServe then creates a conservation value layer for each target with the name of each element of interest, its conservation weight, quality score, and confidence score. NatureServe computer tools also allow users to factor their own weights into the analysis. The system can be used to create biodiversity value layers from individual elements or elements of interest or aggregate across the landscape all elements that relate to the most important places relative to a decision-maker.

Dr. Grossman noted that NatureServe has developed this information and that it is available to address quickly urgent decisions. He envisioned that the approach could be used to generate scenarios related to customers' goals. It could be used to evaluate protected areas or assess the biodiversity impacts of a development pattern. He noted that some current analysis is integrating NatureServe information with research on hedonic values in Napa County. He noted that the Napa County example was a case where the NatureServe analysis gave decision-makers new insights into the value of places they thought they knew thoroughly. He also noted that NatureServe is also working with the wetlands program to identify wetland values of particular interest.

Dr. Grossman then provided some suggestions about how the NatureServe data and method could be useful to EPA. He noted that EPA has many programs related to the kinds of information contained in the NatureServe datasets. It has responsibility for some trust species, wetlands authority, needs to set priorities through regional assessments, and interests in preventing or addressing the adverse ecological effects associated with different development patterns. He noted that at the C-VPESH meeting in San Francisco, different regions are developing assessments using different elements, different assumptions, and different standards. Such an approach makes it difficult for range-wide analyses involving several regions to be brought to the table. He also noted that NatureServe is working with the Agency's pesticide program and pesticide registrants on assessment of biodiversity impacts of pesticides.

The Committee began its discussion of Dr. Grossman's questions. One member asked how the system prioritized resources. Dr. Grossman mentioned that the G1 resources were seen as generally most valuable. The ranking of value was set by experts based on rarity and threat.

In response to a question about the relationship between the NatureServe information and method and EPA's Ecological Monitoring and Assessment Program (EMAP) and the NEON program, Dr. Grossman responded that EPA's EMAP program uses some NatureServe data, but that EMAP has different objectives that have evolved over time. He also answered that NEON was a new program and he was just beginning to understand what it entailed.

A member then noted that using the NatureServe method would fit in nicely with the notion of envisioning multiple goals for assessing the value of alternative options, with only one goal being economic efficiency. Biodiversity protection is a goal. What one would evaluate are policy options and their likely results that contribute to such a goal. He saw linkages between the NatureServe biodiversity data and method, sustainability, and human well-being. He saw the method as offering a way to make trade-offs in light of the goals of biodiversity, sustainability, and human well-being.

The same member noted that the NatureServe method is a good example of showing the merits of an expert elicitation process.

A member asked whether the NatureServe database shows total biodiversity issues only for selected species. Dr. Grossman responded that the database is restricted to elements threatened or imperiled.

Another member asked about the limits of the analyses that can be done with the NatureServe database. He asked whether the system exhibits non-linearities and if and how it incorporates the idea of tipping points. Dr. Grossman responded that the definition of tipping point occurred within the occurrence definition, where there is a size condition. Minimum size criteria decrease the quality of occurrences. He was also asked if there was included the concept of a keystone species. Dr. Grossman indicated that the keystone species concept was included.

A member noted that the definition of biodiversity used here involves beginning with an inventory of all species; defining reductions in biodiversity as reductions in that set; and using a ranking scheme to determine the level of reduction. He noted that another definition of biodiversity might be an inventory of genes and degree of overlap of genes. He asked for confirmation that value was derived from scarcity and threat and asked if the rankings were world wide or regional). Dr. Grossman confirmed the definition of value used and noted that the "G rank" value was global. He also noted that most rare and endangered species have a limited range, so they are generally little affected by changes in other countries.

A member then made a general comment about the two methods discussed by Drs. Boyd and Grossman. He did not view them as alternative approaches. Instead, he viewed them as it as complementary efforts to bridge economics and ecology. He saw the NatureServe data and methods as a platform to start when talking about biodiversity and conservation. He also referred to a previous comment that the NatureServe data and goal fit with the goals of biodiversity, sustainability, and human well being, as separate from economic efficiency. He stated that he did not see those goals as so different. He sees the NatureServe data as ideal for cost-effectiveness analysis, if a goal is specified.

Another member linked the value of the NatureServe data and method to Agency activities at the regional level. He advocated that economists, ecologists, and other analysts consider how they can use these data and tools for decisions that might affect biodiversity.

A member asked whether the analysis to be conducted of recent selected benefit assessments could have included information, results, and connections to the NatureServe data. He suggested that it would be valuable to explore whether the adverse ecological effect being addressed "hit some hotspots" and whether threatened and endangered elements would have been affected.

The chair asked Dr. Grossman to draft a description of this method and the committee discussion of it for incorporation in the draft of the committee's report. Dr. Nugent stated that she would provide guidance as to the format needed for the report.

Cross-Cutting Issues:

The chair then introduced discussion of two cross-cutting issues identified for the committee report, data quality and uncertainty, and spatial and temporal scale. He noted that Dr. Paul Slovic had an interest in participating in the discussion of public involvement, and that the other cross-cutting issues would be pursued at a later meeting.

Data Quality and Uncertainty. Dr. William Ascher made a brief slide presentation of a proposed plan he developed with Dr. Robert Costanza, since they had been asked to serve as leads to explore this issue. The slides were based on a draft memo provided to members at the start of the meeting. The two committee members noted three main issues to be addressed: 1) how to conduct valuation, given uncertainty; 2) how to convey uncertainty to policymakers; and 3) how do (and should) policymakers take uncertainty in valuation into account?

After Dr. Ascher's brief presentation, committee members posed questions and comments. The chair asked if the proposed approach subsumed data quality into one form of uncertainty. Dr. Ascher answered that there were different kinds of uncertainty (e.g., stochastic vs. theoretical weakness vs. lack of information) and that data quality issues were a subset of uncertainty related to lack of information. Another member noted the importance of considering how uncertainty is represented, given multiple formats for presenting information (e.g., text, mathematical outputs, maps generated by Geographic Information Systems, computer visualizations of possible futures). Another member asked if there was something fundamentally different to consider associated with uncertainty when decisions might be irreversible. He referred to the work of Arrow and Fisher in this context. The chair noted a hysteresis component as well. Another member noted that there might be a research issue associated with how uncertainty might be communicated to the public. Another member noted that there was much related publication and attention to metadata standards.

Dr. Ascher observed that his review of rulemaking undertaken with Drs. Boyd and Biddinger in June 2004 found that EPA seemed to "self-edit" where there is uncertainty. Such behavior makes it difficult to explore a wide range of options that might include increased environmental protection.

Dr. Ascher and Dr. Costanza proposed developing a draft paper addressing the three issues for discussion by the committee at a future meeting. The committee agreed to move ahead with that plan.

Spatial Scale and Temporal Scale. Dr. Joan Roughgarden had been asked to provide some initial thoughts on this topic to being committee discussion. She made four points.

The first was that "scale" was a hot topic for ecologists and was the theme for the Ecological Society of America meeting in 2005. Ecologists general use the term in four types of ways: 1) spatial scale, which is defined by movement distances; 2) temporal scale; 3) level of organization, which pertains to "nestedness" to increase the predictive power to different levels

of organization; and 4) system definition for a particular spatial scale, that takes a fixed area in space that cuts across all the scales present in natural processes.

The second point addressed the relationship of scale in ecology with the concept of scale in policy and economics. In her view, ecologists work in a spatial scale too fine and a temporal scale too long for policy making. She stated a belief that scientific information must be matched with jurisdictional space. There is a need to adjust scales studied to match policy needs. Dr. Roughgarden noted a recent paper where she wrote about the need to make the spatial scale of analysis coarser to help the science connect with policy. She noted that ecologists tended to distrust policy makers because they "turn over" and noted a concern about how to provide science designed to keep sustainable policy sustainable over the long term.

Dr. Roughgarden's third point concerned the relationship of policy to nature. She took issue with the supposition that one can make policies to manage nature. She noted that "we can screw it up, but we can't manage it." In her view, a more appropriate metaphor is a partnership or a marriage, where there is a sense of interaction. The goal is to take actions affecting ecosystems so they take care of themselves and forgive your mistakes. Such a task requires a relationship with the ecosystem so it can function as a partner rather than as a slave. She expressed the desire to convey the benefit of this relationship.

The fourth point related to how benefit assessments or efforts at valuing ecological protection conceive of human interactions with nature. She saw a problem with an image of nature as an efficient factory and hypothesized about the absurd and dysfunctional results of accepting such an image. She noted that a zoo was an efficient deliverer of biodiversity, but asked whether a zoo provides what humans want in a relationship with nature.

At the close of her remarks the committee began a general discussion. One member noted that it is important for analysis not to be locked into one particular scale. Benefit transfer may be attractive and easy, but it may not provide information at the appropriate scale. Another member noted that economic analysis often refers to the scale considered in regard to substitution. An approach might be to depict all the different layers of scale related to a problem and provide a cautionary note. Other members agreed that research requires looking at system at multiple scales and trying to integrate results. Some members discussed the non-linear dynamics of some scaling involved in analysis. A member asked about the question of assimilative capacity and resilience at a given scale. If one could know something about those characteristics, then ecological risk assessment for toxicants would be made more easily. He noted that ecological risk assessors have some knowledge about the effects of toxicants on specific endpoints, but they don't understand ecosystem effects. He asked if we currently knew the "error bars on what we know about assimilative capacity." Dr. Roughgarden responded that there are good tools for analyzing ecosystems at different scales, but one must retain respect for periodic unpredictable events.

The chair asked the Designated Federal Officer to work with Dr. Roughgarden to develop draft text how the Agency might address the issue of spatial and temporal scale within the section on cross cutting issues. One member suggested that this section include examples that address different spatial and temporal scales.

Discussion of Strategies for Addressing Additional Methods

The chair noted that there was not sufficient time to pursue discussion of identifying additional methods for committee discussion. The Designated Federal Officer noted that Dr. Paul Slovic had provided a nomination sheet for multi-attribute approach to value construction, along with related publications; that Dr. Ascher had nominated referenda and related public decision-making; and that Dr. Daniel had nominated "Attitude Surveys" and "Perceptual" and "Behavioral Assessments."

The chair asked the Designated Federal Officer to issue a last call for additional methods to be discussed at the Committee's upcoming meeting in April.

Action Items

1. Dr. Randy Bruins from EPA's Office of Research and Development will provide the Committee, through the Designated Federal Officer, with Agency documents that have addressed the issue of goals for ecological assessments and ecological decision-making.
2. The writing team for the C-VPES review of the draft EBASP (Drs. Huggett, Segerson, Smith, and Thompson, assisted by the Designated Federal Officer) will develop a draft of the advisory report for review by the whole committee by the end of February.
3. Dr. Sagoff will circulate a publication to the Designated Federal Officer on the Catskills case study for circulating to the broader committee.
4. Dr. Costanza will circulate an article of spatial modeling of marshes.
5. Dr. Costanza will circulate citations for spatially explicit ecological economic modeling in Louisiana, the Florida Everglades, and Maryland
6. The Designated Federal Officer will work with Drs. Polasky, Segerson, Freeman, Costanza, and Ascher to develop draft text for the C-VPES report that captures the committee's understanding of how the NRC characterizes the use and limitations of economic methods and its support for the points made in the NRC report.
7. Dr. Boyd and Dr. Grossman will each draft descriptions of the method each presented to the committee and committee discussion of those methods. The Designated Federal Officer stated that she would send a template to both Dr. Boyd and Dr. Grossman to follow, so that write-ups of the methods discussed at the meeting would be of comparable length and format.
8. Dr. Ascher and Dr. Costanza will develop a draft section of the Committee report addressing uncertainty for discussion by the committee at a future meeting.
9. The Designated Federal Officer will work with Dr. Roughgarden to develop draft text for the committee report addressing the issue of spatial and temporal scale within the section on cross-cutting issues.
10. The Designated Federal Officer will issue a last call for additional methods to be discussed at the Committee's upcoming meeting in April.

The Committee adjourned at 4:00 p.m.

Respectfully Submitted:

/Signed/ Angela Nugent

Angela Nugent
Designated Federal Officer

Certified as True:

/Signed/ Domenico Grasso

Domenico Grasso
Chair

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by the Panel 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.

Attachments

Attachment A	Roster
Attachment B	Federal Register Notice
Attachment C	Meeting Agenda
Attachment D	Draft Outline of C-VPES Major Report and Status of Activities

Attachment A: Roster

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

CHAIR

Dr. Domenico Grasso, Dean, College of Engineering and Mathematics, the University of Vermont, Burlington, VT

SAB MEMBERS

Dr. William Louis Ascher, Dean of the Faculty, Bauer Center, Claremont McKenna College, Claremont, CA

Dr. Gregory Biddinger, Environmental Sciences Advisor, Exxon Mobil Refining and Supply Company, Fairfax, VA

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, Research Professor of Economics, Department of Economics, Bowdoin College, Brunswick, ME

Dr. Dennis Grossman, Vice President for Science, Science Division, NatureServe, Arlington, VA

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

Dr. Robert Huggett, Vice President for Research and Graduate Studies, Office of Vice President for Research and Graduate Studies, Michigan State University, East Lansing, MI

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, Director and 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, Chancellor, Oklahoma State Regents for Higher Education, Oklahoma City, 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. Kathleen Segerson, Professor, Department of Economics, University of Connecticut, Storrs, CT

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

Dr. V. Kerry Smith, University Distinguished Professor, Department of Agricultural and Resource Economics, College of Agriculture and Life Sciences, North Carolina State University, Raleigh, NC

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

Dr. Barton H. (Buzz) Thompson, Jr., Robert E. Paradise Professor of Natural Resources Law and Vice Dean, Stanford Law School, Stanford University, Stanford, CA

Attachment B: Federal Register Notice

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

[Federal Register: January 6, 2005 (Volume 70, Number 4)]

[Notices]

[Page 1244]

ENVIRONMENTAL PROTECTION AGENCY

[FRL-7858-1]

Science Advisory Board Staff Office Notification of Upcoming 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's Committee on Valuing the Protection of Ecological Systems and Services (C-VPES) to conduct an advisory on the EPA's draft Ecological Benefits Assessment Strategic Plan (EBASP) and to discuss issues concerning methods.

DATES: January 25-26, 2005. A public meeting of the C-VPES will be held from 9 a.m. to 5:30 p.m. (Eastern Time) on January 25, 2005 and from 9 a.m. to 3:30 p.m. (Eastern Time) on January 26, 2005.

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: US 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:

Background: Background on the SAB C-VPES and its charge was provided in 68 Fed. Reg. 11082 (March 7, 2003). The purpose of the meeting is for the SAB C-VPES to conduct an advisory on the EPA's draft Ecological Benefits Assessment Strategic Plan and to discuss issues concerning methods for valuing the protection of ecological systems and services. All of 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 then to identify key areas for improving knowledge, methodologies, practice, and research.

Availability of Review Material for the Meetings: The Agenda for this meeting will be available from the SAB Staff Office Web site at: <http://www.epa.gov/sab/agendas.htm>. The review document that will be the focus of the January 25, 2005 meeting, EPA's draft Ecological Benefits Assessment Strategic Plan, will be available on the Web site of EPA's National Center for Environmental Economics: <http://yosemite.epa.gov/ee/epa/eed.nsf/pages/homepage>.

Procedures for Providing Public Comment: It is the policy of the EPA SAB Staff Office to accept written public comments of any length, and to accommodate oral public comments whenever possible. The SAB Staff Office expects that public statements presented at SAB meetings will not be repetitive of previously submitted oral or written statements. Oral Comments: In general, each individual or group requesting an oral presentation at a face-to-face meeting will be limited to a total time of ten minutes (unless otherwise indicated). Interested parties should contact the Designated Federal Official (DFO) in writing via e-mail at least one week prior to the meeting in order to be placed on the public speaker list for the meeting. Speakers should bring at least 35 copies of their comments and presentation slides for distribution to the participants and public at the meeting. Written Comments: Although written comments are accepted until the date of the meeting (unless otherwise stated), written comments should be received in the SAB Staff Office at least one week prior to the meeting date so that the comments may be made available to the committee for their consideration. Comments should be supplied to the appropriate DFO at the address/contact information above in the following formats: one hard copy with original signature, and one electronic copy via e-mail (acceptable file format: Adobe Acrobat, WordPerfect, Word, or Rich Text files (in IBM-PC/Windows 98/2000/XP format). Those providing written comments and who attend the meeting are also asked to bring 35 copies of their comments for public distribution.

Meeting Accommodations: Individuals requiring special accommodation to access these meetings, should contact the relevant DFO at least five business days prior to the meeting so that appropriate arrangements can be made.

Dated: December 22, 2004.

Anthony Maciorowski,

Acting Director, EPA Science Advisory Board Staff Office.

Attachment C: Agenda

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

Draft Agenda -- January 25-26, 2004

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

Purpose: The purpose of the meeting is for the Committee to conduct an advisory on the EPA's draft *Ecological Benefits Assessment Strategic Plan (EBASP)* and to discuss issues concerning methods for valuing the protection of ecological systems and services. All of 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 then to identify key areas for improving knowledge, methodologies, practice, and research.

January 25, 2004

9:00 - 9:10	Welcome	Dr. Angela Nugent, EPA, SABSO Dr. Anthony Maciorowski, EPA, SABSO
9:10 - 9:20	Review of Agenda and Introduction of Members	Dr. Domenico Grasso, Chair
	Introduction to the Charge Questions and to the Review Process and Writing Team	
9:20 - 10:00	Presentation on EBASP Vision and Measuring Success	Dr. Wayne R. Munns, Jr. Associate Director for Science for the Office of Research and Development's Atlantic Ecology Division, EPA
		Committee Questions
10:00 - 10:30	Preliminary Comments	Drs. Robert Huggett , V. Kerry Smith
10:30 - 10:45	Break	
10:30 - 12:00	Discussion of Charge Question 1 ¹	

¹ Charge Question 1: "Given the audience described in Section 1.4., does the Plan adequately address the objectives described in Section 1.1.?"

Agency Statement of Objectives (section 1.1)

- Describe technical and institutional issues that prevent the Agency from conducting accurate and comprehensive ecological benefit assessments.
- Direction for future research, data collection and development of analytical tools.

12:00 - 1:15	Lunch	
1:15-1:30	Public Comment	TBA
1:15 - 2:15	Discussion of Charge Question 2 ²	
2:15 -3:30	Discussion of Charge Questions 3 ³ and 4 ⁴	
3:30 -3:45	Break	
3:45 -4:30	Discussion of Charge Question 5 ⁵	

-
- Propose activities to foster increased collaboration and coordination among Agency's ecologists, economists, and other analysts in ecological benefits assessment.
 - Propose institutional mechanisms to facilitate adaptive implementation of plan and adjustment to reflect scientific progress.

Agency Description of Audience for Strategic Plan (Section 1.4)

- EPA managers and analysts who devote time or other resources toward basic or applied research in areas of ecology, related natural sciences and economics relevant to ecological benefit assessment.
- EPA analysts developing action plans to guide future investments in ecological benefits assessment.
- Researchers in academia, other federal agencies and members of public -- to inform about EPA's need and objectives

² Charge Question 2: "Are the issues described in Section 4 the most important ones that EPA should address to improve its ability to identify, quantify, and value the ecological benefits of its activities? If not, what issues should be added?"

³ Charge Question 3: Are there actions in Section 4 that are the most important for EPA to undertake at this time to improve its ability to conceptualize, identify, quantify, and value the ecological benefits of its activities? Do the actions respond to the identified issues? Are there actions that are missing?

⁴ Charge Question 4: Are there other actions you would recommend?

⁵ Charge Question 5: Are there specific research approaches, or research projects, on which the Agency should focus?

4:30 -5:00 Discussion of Charge Question 6⁶

5:00 - 5:15 Discussion of Next Steps

⁶ Charge Question 6: Is the proposed implementation plan adequate?

January 26, 2004

8:30-8:35	Opening of Meeting	Dr. Angela Nugent, EPA, SABSO
8:35-9:05	Update on C-VPESW Workplan	Dr. Domenico Grasso
9:05-9:15	Review of Agenda and Discussion of C-VPESW Approach to Methods Evaluation ⁷	Dr. Domenico Grasso
9:15-10:30	C-VPESW Evaluation of Economic Methods and the NRC Report, <i>Valuing Ecosystem Services; Toward Better Environmental Decision Making</i>	Dr. Stephen Polasky and Dr. Kathleen Segerson (introduction) Commenters: Dr. A. Myrick Freeman Dr. Robert Costanza Dr. William Ascher
10:30-10:45	Break	Committee Discussion
10:45-12:00	Ecological Benefit Indicators	Dr. James Boyd Committee Discussion
12:00 -1:15	Lunch	
1:15 -2:30	Spatial Representation of Biodiversity and Conservation Values	Dr. Dennis Grossman Committee Discussion
2:30 - 3:00	Discussion of Strategies for Addressing Additional Methods	
3:00 - 4:00	Discussion of Committee Plans for Addressing Cross-Cutting Issues: <ul style="list-style-type: none">• Data Quality and Uncertainty• Substitutability/Transferability• Spatial Scale• Temporal Scale• Public Involvement and "Whose Values Count"	

⁷ C-VPESW Approach to Methods Evaluation: first to consider economic methods discussed in the NRC Report; then to consider Ecological Benefit Indicators and Landscape, Biophysical, and Ecological Function Methods at the January 26, 2005 meeting; to discuss Multi-Attribute Analysis at a future meeting; and to have the Committee discuss on January 26 whether and how to identify and review additional methods.

Draft March 4, 2005

4:00-4:15 Summary of Next Steps

4:15 Adjourn

Attachment D Draft Outline of C-VPSS Major Report and Status of Activities

Component	Lead(s) & Status	Next Steps
Executive Summary		
Introduction		
Policy and process background, history of issue generically and at EPA; Committee process	SAB SO draft text, December 2004	Steering Group/committee review
Charge		
Scope/Intellectual positioning, Audience, Structure of Report		
Identification of decision contexts (national rulemaking, regional decision making, GPRA, communication and information) – boxes with examples		
Concepts and Introduction to Methods	Workgroup formed (Doug MacLean Lead). Text drafted and discussed at 08-25 teleconference	Revised draft to go for committee for comment after December 5
Definitions (value, ecological systems, services)		
Introduction of methods as “ways to bring values, ecological systems and services together”		
Conceptual Framework (like Fig. 4 in EBASP)		
Context, compelling needs, driving forces		
Lessons to be learned from other efforts underway (NRC, Millennium Assessment, European experience)	NRC and Millennium Assessment activities discussed in June 2004 SAB Staff Office drafted text from minutes	Review of draft text
History of E.O. 12291, Data Quality Act, Paperwork Reduction Act and their role in setting stage, GPRA	Jim Boyd Buzz Thompson	February 2005?
Ecological Risk Framework as a current organization principle for Agency	Bob Huggett Kerry Smith Paul Slovic	February 2005?
Agency specific needs for decision contexts (boxes showing an example of Agency needs in following areas: national rulemaking, regional decision making,	Angela Terry Daniel & Buzz Kathy Segerson	February 2005

Component	Lead(s) & Status	Next Steps
GPRA, communication and information)	and Paul Risser	
Methods and Cross-cutting Issues-		
Traditional Economic Valuation Methods	Geoff Heal	January discussion and follow-up
Other Ecosystem benefit indicators Biophysical Measurements To be determined	Jim Boyd Denny Grossman	January discussion and follow-up Spring Meeting
Cross-Cutting Issues Data Quality Uncertainty Substitutability Spatial Scale Temporal Scale Public Involvement and whose values count Aggregation issues		Spring meeting?
Summary of Conclusions from C-VPES Advisory Review of Agency draft <i>Ecological Benefits Strategic Plan</i>	Topic for January meeting; Smith and Huggett Leads	January 2005 Meeting
Implementation recommendations		
Benefit analyses supporting national Agency regulatory actions	Discussed in June 2004 Boyd, Biddinger, Ascher drafted preliminary text and plan for data gathering for 8/23	Data gathering process (interviews/analysis of rules) to happen in Oct-Nov Draft to incorporate data tables
Example Exercise (CAFO)	Discussed in June 2004 Daniel and Thompson developed text for 8/23	Committee members to provide specifics on key points. Daniel and Thompson to revise
Regional needs and analyses	Polasky, Grossman,	Draft by November 12 for group of 3;

Component	Lead(s) & Status	Next Steps
	Bostrom leads for September meeting and follow up	Discussion of draft with Agency to get feedback
Example Exercise (Region 4 Critical Ecosystems)	Leads: Risser and Segerson	December 1, 2004
GPRA Analyses	Proposed as a focus of Spring Meeting Buzz and Angela work up proposal	Spring 2005?
Communication/Information products used to communicate ecological decisions		?Late Spring or Fall 2005?
Key areas for research		
Summary of research needs		Late fall 2005
Recommendations for a research planning and technical transfer mechanism	Meeting to be planned?	Late fall 2005