

**Summary Minutes of the
U.S. Environmental Protection Agency (EPA)
Science Advisory Board (SAB)
Committee on Valuing the Protection of Ecological Systems and Services (C-VPES)
Public Meeting – April 12-13, 2005**

Committee Members: (See Roster – Attachment A)

Scheduled Date and Time: From 9:00a .m. to 5:30 p.m. (Eastern Time) on April 12, 2005; and from 8:30 a.m. to 2:30 p.m. (Eastern Time) on April 13, 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 SAB C-VPES to discuss issues concerning methods for valuing the protection of ecological systems and services, to continue work on the Committee's advisory on the Agency's draft Ecological Benefit Assessments Strategic Plan, and to plan committee activities. 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. James Boyd
Dr. Robert Costanza
Dr. Terry Daniel
Dr. Dennis Grossman (by phone, April 13, 2005)
Dr. Robert Huggett
Dr. Douglas MacLean (April 12, 2005 only)
Dr. Louis Pitelka
Dr. Stephen Polasky
Dr. Joan Roughgarden
Dr. Mark Sagoff
Dr. Kathleen Segerson
Dr. Paul Slovic
Dr. Robert Stavins (by phone, April 12, 2005)
Dr. Buzz Thompson (by phone, April 12 and 13, 2005)

C-VPES Consultants: Dr. Joseph Arvai
Dr. Robin Gregory

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

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. She noted that public comments had been received from the Agency on the C-VPES Working Group draft Advisory Report on the Agency's draft Ecological Benefits Assessment Strategic Plan and that representatives of the Agency requested a few minutes on April 13, 2005 to speak with the Committee.

Dr. Vu welcomed committee members, communicated the interest of Administrator designate Stephen Johnson in the work of the Committee, and asked the Committee to identify ways in which she could facilitate its work. Dr. Grasso then welcomed members, asked them to introduce themselves, and reviewed the purpose of the meeting and agenda.

Discussion of proposed action plan for C-VPES and initial committee report

Dr. Grasso introduced the draft action plan developed by the Steering Group at a March 24, 2005 meeting at Stanford University. The plan, along with a cover note, (Attachment D) had been sent to the Committee in an email transmitted by the DFO in advance of the meeting. Dr. Grasso noted that Dr. William Ascher has joined the Steering Group but that Dr. Ascher did not participate in the meeting because of previous commitments.

He noted that the plan addresses the committee's charge, builds on all the committee's work to date, and identifies 4 reports that respond to Administrator Designate Johnson's need for advice. The 4 reports initially envisioned were: 1) an introductory report; 2) a report on effective utilization of economic methods at EPA for VPES; 3) a report on expanding the suite of tools for VPES at EPA; and 4) a synthesis report

The Committee then discussed the proposed action plan. Members cautioned against using terms such as "non-economic" or "non-traditional" methods to categorize methods not discussed in the NRC report or not generally used at EPA. Other members spoke of the need for synthesis across methods and approaches. A member asked whether the reports would ultimately be products of the whole committee, not just working group reports. The Chair and

DFO responded that the reports would be reviewed not only by the full C-VPES, but also by the chartered SAB. The Committee discussed possibly reframing the two methods-related reports as appendices to the synthesis report and emphasizing the importance of the initial report and synthesis report. They also discussed reframing the effort proposed to produce the two reports as two parallel tasks that would lead to a single integrated report. Dr. Vu mentioned EPA's need for practical advice about how to capture all relevant benefits related to EPA work. The recent National Research Council (NRC) report spoke in general terms; the Agency could benefit from more specific guidance about how to apply methods described in that report to Agency programs and rulemakings. The Agency could also benefit from specific guidance about other types of approaches. She viewed it as an appropriate task for the committee to address how both these needs could be met in an integrated way. Committee members suggested possible alternative ways to organize the report [e.g., by type of EPA decision (national rulemaking, regional, performance assessment) or by type of ecological system] to encourage discussion across disciplines. The Chair responded that the Steering Group recognized the value of cross-discipline discussions and hoped to encourage such discussion within and across groups.

Some committee members emphasized the need to focus on compelling examples of the use of methods in the EPA context and warned against a process where the committee would merely reiterate the information and conclusions found in other reports. Members spoke of the limits of the NRC report and the need to explore tools and approaches not included in the NRC report, especially those that address a wide range of ecological services and the dynamic nature of ecosystems. A member expressed reservations against the committee's developing a handbook describing methods for valuing the environment.

Another committee member saw merit in C-VPES focusing on methods and approaches that address social and personal value systems and that draw on a variety of non-economic social sciences. Many other approaches to this problem focus more narrowly on economic and ecological methods and approaches.

Committee members in general emphasized the importance of "cross-talk" -- across disciplines, issues, and contexts. One member spoke of taking special note of situations where EPA "runs into problems" in valuing living systems and identifying points of resistance and innovative ways of addressing resulting problems. Dr. Segerson from the Steering Committee emphasized the importance of the synthesis report, which would not simply reiterate findings in the methods report, but attempt to integrate across methods, disciplines, and decision context.

Members spoke of the need for a clear description of decision contexts, and possibly specific examples, that can serve as specific and explicit charges for the groups assigned to Reports 2 and 3 in the proposed action plan to address. They also spoke of the need for continuing interactions between groups working on the two proposed reports, especially exchanges among the chairs and vice-chairs of the two groups.

Dr. Segerson then provided an overview of the proposed outline for the first document envisioned in the action plan (Attachment E). The purpose of this document is to set the tone for the documents to follow and identify the "big picture" issues to be addressed in the reports to follow.

The Committee responded with comments. Members supported the draft outline. One member emphasized the importance of sections 2 and 5 and urged that the initial report provide minimal text on section 4, to be covered by other reports. There were two suggestions concerning Section 5. One member asked that section 5 be expanded to include the need for a process for including expanded information from "alternative methods" in decision support packages. Another member suggested that Section 5 call for methods that capture the dynamic nature of Agency activities that affect ecosystems, and that any valuation effort captures only the start of an effort to describe ecological benefits. Yet another member suggested that the text in section 2.a. provide some specificity on the ecosystems and services of interest. Members discussed the need for section 3.a. to be very clear description of the Agency's decision contexts where information on valuing ecological protection was needed, so that it could be a guide to the two proposed methods groups.

Dr. Segerson described the distinction she saw between the initial report and the synthesis report. The initial report would describe the needs the Committee sees. The final report would describe specific advice to meet those needs or identifies critical research to meet those needs.

The discussion of the initial report concluded with Dr. Segerson agreeing to take the lead in developing the initial report for committee discussion at the next C-VPES meeting.

The Chair asked that the Steering Group meet with the Chairs and Vice-Chairs of proposed reports 2 and 3 after the conclusion of the day's formal agenda to review the suggestions offered by the Committee members regarding the proposed action plan. He committed the group to report to the full Committee on April 13, 2005.

Multi-Attribute Decision Making

Dr. Paul Slovic introduced Dr. Robin Gregory, of Decision Research. Eugene, Oregon. Dr. Slovic spoke of the importance of focusing on the link between valuation and decision making and noted that Dr. Gregory's academic background was in the fields of economics, decision science, and psychology and that he brought both theoretical expertise and practical experience in field work to the presentation of decision-aiding approaches.

Dr. Gregory began his presentation by expressing appreciation for the multi-disciplinary nature of the C-VPES and the value of the discussions in the committee that arise from differences among committee members. His presentation was formally titled "Structured Decision Aiding Methods to Evaluate Environmental Management Options." Dr. Gregory provided detail on the goals and nature of structured decision-aiding methods (e.g., they combine analysis and deliberation, they are meant to help people to understand and evaluate options); how such methods might fit into EPA decision needs; how they relate to the history of decision science; key assumptions; implementation steps; case studies that illustrated different features of the method; how uncertain scientific information could be clarified and incorporated in the decision-making; comparisons between "conventional" and decision-aiding approaches; and lessons for evaluating environmental management options.

Committee members noted that one component of the decision aiding approaches might involve questions to stakeholders that resembled contingent valuation questions. Such questions involve hypothetical questions about willingness to accept an alternative that achieved a certain ranking of an attribute associated with a desired objective. Dr. Gregory acknowledged that such hypothetical questions are often a part of the analysis. He stated, however, that decision-aiding approaches differ from contingent valuation because they were components of a larger process where stakeholders were engaged in identifying multiple objectives, since decision-making in actuality always involves multiple objectives, and where stakeholders and technical experts jointly develop the attributes and attribute scale for discussion..

A committee member asked about how such an approach might be applied to national rulemaking or national policy making. Dr. Gregory responded that Canada is using decision-aiding approaches for National Risk Standards for fisheries and that the approach could be used for national decision making. Special care would need to be given in development of meaningful measures for attributes in different parts of the country but the approach could be made practical for national-scale applications.

Attitude Surveys and "Perceptual" and "Behavioral" Assessments"

Dr. Terry Daniel provided an overview of survey methods for assessing public environmental values. He noted that experimental results consistently invalidate the "traditional" model that held values are stable and can be consistently interpreted through a variety of methods for measuring expressed preferences. Instead, a more "radical" model suggests that in different contexts, perceptions of environmental conditions lead to expressed preferences that help share or define values.

Given that context, he then provided an overview of several assessment tools, including socio-psychological assessments and a variety of survey methods (e.g., multi-item surveys; conjoint; perceptual surveys; behavior observation) and described their scope, variety of technologies involved (e.g., mail, intercept, telephone, internet), and methodological issues. He described several surveys funded by the U.S. Department of Agriculture Forest Service, one including a telephone survey of more than 7,000 people, which included measurements of the value of protecting ecological resources.

Committee discussion followed his presentation. One question concerned the merits of Q methods. Dr. Daniel responded that the Q method makes some *a priori* assumptions (e.g., requirement to distribute a set number of samples in high, medium, and low categories) that are suspect statistically and psychologically. He did not see the special value of the method.

In response to a question about the utility of survey methods for EPA, Dr. Daniel responded that he could envision EPA's conducting a verbal survey to inform the EPA *Ecological Benefits Strategic Plan*. Based on his involvement in 2000 in the SAB's Tampa Bay Estuary Workshop, he could envision conjoint analysis as being useful to Agency geographic programs because it could help the Agency engage stakeholders in a set of complex value-related issues. He saw merit in conducting surveys of public environmental value to improve EPA's

communication efforts. Another committee member noted that open ended attitudinal surveys would be useful at the start of an economic analysis to help identify what people care about related to an environmental issue that needed to be solved. Dr. Daniel noted that surveys can vary greatly in complexity and sophistication and their potential uses could vary greatly.

"Referenda-inference" Method

Dr. William Ascher made a presentation focusing on the merits of analyzing referenda and other public decisions involving protection of ecological resources and using that information to complement revealed preference and stated-preference approaches. He suggested collecting information from such decisions to cross-check or validate other methods. He described advantages (true willingness-to-pay is demonstrated; stakeholders are self identified; "public regardedness" is an assumption; median preference is reflected) and limitations (perceptions of costs and benefits diverge from actual; referenda often include multiple elements and confound valuation of individual components; voters may be motivated by ancillary issues not the focus of the referendum).

Committee members raised questions about the complexity of voting behavior (e.g., some voters care more than others; advertising and moneyed interests affect voting, economic studies suggest that decisions to vote are complicated issues; often referenda do not appropriately tee-up ecological decisions for lay persons). They suggest that this complexity might confound the analysis. Members also asked about the meaning of a 50%/50% vote on a referendum and how that reflected that benefits were generally equal to costs. Dr. Ascher responded that the median vote reveals that as many voters have decided that the public benefits exceed the costs as vice versa. He also responded that the analysis will be less confounded for the many referenda that are focused on a straightforward ecological issue, which are likely to have well-behaved, smooth value distributions. Some members expressed interest in how the referendum addresses aggregation issues and how it reflects the view of the polity. One member noted that the view of individuals' self interest was reflected in economic tools or in certain social surveys, while referenda, multi-attribute decision analysis, and other kinds of social surveys reflected social choice for the polity. A member then raised the question: who has the authority to identify or prescribe values? Should it be scientists, ecologists, Benthamites, the public? How can society identify its ecological values? Should it be done by experts or institutions? Or through some other process? Another member responded that although there is generally merit in "bringing the public in" or "looking to public decisions," there is much known about the kinds of risks or values that are of most concern to people [e.g., 1) effects delayed in time are discounted; 2) the effects of repeated small insults are under-recognized; 3) if adverse effects increase exponentially, the public is slow to react; and 4) if an impact attacks populations and is reported statistically, as opposed to attacking individual organisms of concern, effects are under-recognized.] Dr. Ascher noted that people do react to their perceptions and "people do value things in strange ways." He asked the committee to consider what inferences do we draw from how people actually do value things and how do we deal with that information. Another member emphasized the importance of including in such analysis how public values are shaped by scientific information and gave the example of public attitudes towards the value of stinging nettles changing, once scientific information about the role of stinging nettles in the blue crab food chain was provided. Another member noted that surveys show that the public does not

want to manage the environment by casting votes, but does want their values and concerns to be taken into consideration and wants to know when they are not and why.

The final questions concerned the extent of literature on this topic. Dr. Ascher noted that studies have looked at referenda to validate contingent valuation approaches, but rarely have studies examined the information that referenda could provide to supplement contingent valuation approaches.

Integrated Ecological Economic Modeling

Dr. Robert Costanza gave a presentation on integrated ecological economic modeling. He offered thoughts on how such modeling could be used as a consensus building tool in open, participatory processes; how it could be used at multiple scales; how it acknowledges uncertainty; how it acknowledges values of stakeholders; and how it addresses dynamic aspects of ecological and social systems. He described a three-step modeling process (scoping models; research models; and management models) that involve different levels of complexity, cost, realism, and precision. He described applications where such modeling has been used at different scales and highlighted recent publications. He noted that investment in such models can have multiple benefits. Once built and validated with technical experts and stakeholders, they can be used to evaluate many policy issues. He saw four different opportunities for addressing valuation issues through integrated ecological-economic modeling: 1) to generate values (prices) externally and use them in the model; 2) to generate and display alternatives to value (i.e., via conjoint analysis or multi-criteria decision analysis); 3) to generate alternative non-preference based values (i.e., energy analysis, ecological footprint analysis); or 4) to generate valuation estimates endogenously in the model (i.e., through computable general equilibrium modeling or models like the GUMBO model).

A committee discussion followed Dr. Costanza's presentation. One question concerned the ease of developing models to address ecological problems. Dr. Costanza responded that tools exist to help develop models but that the process for developing models from scratch is itself instructive. Another question concerned expectation of accuracy and validity of models. Dr. Costanza responded that models have been validated "pretty well" by empirical data in predicting bio-physical effects. He spoke about the need to find an ideal "trade-off point" for any given application between model predictability and data predictability. More complex models generally have greater data predictability and lesser model predictability. The goal is to have technical precision and buy-in from the group on modeling assumptions, to make a model as simple as possible, but no simpler. How that balance is achieved will differ across applications. Another question concerned how values would be internalized in the model. Dr. Costanza responded that they would be generated endogenously. A committee member suggested that the committee's initial report include discussion of processes that involve stakeholders in the building of conceptual models for valuation. She also saw merit in using models to develop options for conjoint analysis, and using values generated by ecological-economic models to test valuation estimates generated in different ways. Dr. Costanza noted that ecological economic modeling could be used both to generate and test transfer of benefits from one situation to another. Another committee member supported the use of models like the GUMBO model that recognizes the dynamic and complex nature of society and social capital.

He saw merit in using such modeling iteratively, for example to develop options for conjoint or other analysis, then to use the results of those estimates to enhance generation of internalized valuation estimates.

The committee adjourned at 5:00 pm after discussion of Dr. Costanza's presentation.

Wednesday, April 13, 2005

Discussion of Advisory Review of EPA's draft *Ecological Benefits Assessment Strategic Plan*

Dr. Nugent opened the meeting at 8:40 to begin a discussion of the draft advisory report prepared by the C-VPES writing group. Dr. William Wheeler of EPA's Office of Research and Development (ORD) spoke briefly on behalf of the EPA writing group for the *Ecological Benefits Assessment Strategic Plan*. He thanked the committee for its effort and dedication and informed them that he and several other writing group members would be present throughout the morning to provide any needed clarification of their written comments on the strategic plan review. He also informed the committee that once the Agency receives the final review, the writing team will digest the comments, revise the plan, and submit a revised document, along with the final SAB C-VPES advisory report and a document listing the Agency's responses to the advice in the SAB C-VPES advisory report to several Agency bodies (ORD Science Council, Office of General Counsel, and the Steering Committee for the Ecological Benefits Assessment Strategic Plan).

Dr. Grasso asked the committee for its comments on the draft advisory report, which had been distributed to them in advance of the meeting. He thanked the writing group (Drs. Huggett, Segerson, Smith, and Thompson) for their efforts in developing the report. A short committee discussion then followed. One member asked that the draft report should advise the Agency to explore enhanced processes for eliciting values in local stakeholder interactions. Dr. Daniel suggested the need for language advising that stakeholder interactions and multi-disciplinary involvement in valuation efforts occur early in efforts to value ecological protection. The chair asked Dr. Daniel to provide a paragraph to Dr. Segerson within a month's time on this point. Dr. Daniel agreed to provide the text.

Dr. Grasso asked for the committee to accept the writing group's draft text, subject to revisions that addressed, as appropriate, the written comments received from the Agency and the two changes requested by committee members in discussion. All committee members voted to accept this motion, with the exception of two abstentions (Drs. Roughgarden and Slovic). Dr. Segerson agreed to take the lead in revising the report for chartered SAB review and approval.

Practical institutional needs for benefit assessments for rulemaking

Dr. James Boyd gave a short presentation on his observations and conclusions from the interviews conducted with EPA staff and managers engaged in rule development efforts, with the DFO present to document the interviews. He noted that the full text of the interviews had been distributed to committee members.

A special purpose of the interview effort was to gain insight into how EPA can better meet regulatory development requirements for valuation identified by the Office of Management and Budget (OMB). Unlike EPA programs, OMB did not grant an interview, but did provide a written response to interview questions. The written response drew primarily from Circular A-4 and other published documents, but did not provide the specificity on scientific issues that were sought by the interviews and of concern to EPA. Dr. Boyd and the committee briefly discussed the need to think creatively about how interactions between the Agency and OMB might best facilitate exchange of scientific information but reached no specific recommendations.

Dr. Boyd noted several issues and observations. He observed that it was difficult to interview ecologists who participate in rulemakings that had ecological components. Most of the Agency ecologists are located in ORD, not in program offices where rules are developed. These ORD ecologists are not directly involved in rulemaking efforts even though there is a need to involve ecologists in ecological valuation efforts as rules and their supporting benefit assessments are designed. He then noted that interviewees identified Information Collection Requests and the process for gaining approval of them as the "biggest practical issue" associated with valuation efforts. He suggested that the committee provide some advice on how the Agency might address this issue. He noted that individual program offices had responsibility for developing and financing benefit assessments, that the National Center for Environmental Economics was a centralized reviewer, and that benefit assessments were developed by dedicated economics shops and centralized, such as described in the 2004 Stephen Johnson memo are not fully implemented. He noted that review of benefit assessments takes many forms and that there is no consistency across reviewers and reviews. In general, only "novel elements get reviewed" and there is pressure to restrict analysis to studies that have passed OMB review in the past (such as the Carson and Mitchell study) in benefit assessments. He suggested that the committee consider advice related to the review of benefit assessments. On the topic of methods, he touched on the Agency's need to address skepticism over the use of contingent valuation and benefit transfer methods; Agency interest in expert elicitation; Agency desire for guidance on endpoints to be measured; the inertia that leads to repeated use of methods that have survived challenges from OMB and litigation; and the desire for a "contract with OMB" that would allow for some experimentation. He concluded by underscoring the need to link advice regarding the development of Regulatory Impact Analyses (RIAs) with performance measurement requirements under the Government Performance Results Act; the need for funds to develop more robust tools and data; and a question about whether and how the C-VPESS should make organizational recommendations.

Dr. Boyd recognized Agency staff in the audience and asked for their comments, questions, and engagement in the committee discussion. Dr. Anthony Maciorowski spoke of the need for C-VPESS to limit any "organizational recommendations" it makes to the production and use of science at EPA. An EPA staff ecologist asked whether the Committee could give some general guidance regarding "what endpoints should the Agency measure" or whether that decision needed to be made on a case-by-case basis. Dr. Boyd responded with recognition that there are time pressures associated with developing a rule that make it difficult to identify and gather scientific information. Another member suggested that there might be a longer-term opportunity for planning regulations, building on the overall EPA strategic plan. A committee consultant noted that the decision-aiding approach described by Dr. Robin Gregory could be

used within a short time frame (e.g., 2-3 day workshop) to "turn objectives into endpoints," given involvement of the right experts and stakeholders.

The committee discussed how to improve the scientific interactions between OMB and the Agency on ecological valuation issues. One member commented that OMB can be viewed through several lenses: as an "academic think tank to balance benefits and costs" and as an organization providing centralization within the executive branch to counter the independence of executive agencies. Members suggested that there might be a need for a referee to help OMB grasp the difficulties involved in generating high quality benefit assessments in rulemakings.

An Agency staff person from the National Center for Environmental Economics again raised a question about the measurement of endpoints with special focus on whether the Agency should concentrate on measuring individuals or population effects. He noted that the Agency's 316 (b) Cooling Water Tower rulemaking did not include a discussion of population effects or baseline analysis for many reasons. One reason concerned the difficulties of such modeling. Analysts decided not to pursue this modeling effort because it would introduce too much uncertainty into the analysis. He acknowledged that in this case analysts were faced with a decision: whether to trade off the risk of accuracy in estimating high level effects vs. the importance of those high-level effects for economic analysis. He sought some general advice whether the Agency should generally seek population-level effects, rather than effects at the level of impacts, and "how far up the chain of higher level ecological impacts" should the Agency go in estimating ecological impacts.

One committee member responded that the Agency should seek advice on a case-by-case basis. Before starting the analysis, the Agency should bring together stakeholders and experts to develop a conceptual model that identifies the relevant endpoints. He envisioned the committee providing advice to adopt such a process in its regulatory development. An Agency staff member from the Office of Solid Waste and Emergency Response responded that such a process recommendation for convening experts and stakeholders would be most useful. The committee Chair asked about the importance of the uncertainty issue in ecological valuation, whether there is a special need for advice in valuing ecological effects. Other committee members responded that there was a need for a more sophisticated approach for dealing with uncertainty. The committee asked Agency staff to evaluate OMB's reaction to the Agency's using a stakeholder process for developing a conceptual model of ecological values associated with a particular rule. The NCEE staff person suggested that OMB would be open to such a process if the analysis met the requirements of Circular A-4 and if the stakeholder process supplemented required information or strengthened it. He saw a C-VPESS endorsement of such a process as valuable. Another C-VPESS member provided a different response to the staff member's question. She responded that the Agency would generally need analyses to be taken to the population level. Quantification of the impacts on individuals in a species would respond to the concerns of stakeholders interested in animal rights or nature's rights, but cannot be related to values issues associated with higher-level ecological effects.

A committee member asked how a stakeholder process could accommodate a project of concern to multiple agencies and multiple levels of government. Another responded that well-designed stakeholder processes could address these concerns.

The committee then spoke of the value of ongoing dialogue with Agency staff and senior managers to identify needs and confirm that the committee advice will be useful. Dr. Boyd spoke of the value of insights gained from the interviews. Another committee member spoke of the need for an interactive process with workshops or tutorials that allowed for more dialogue and more constructive engagement.

The Chair asked Dr. Boyd to prepare a section for the initial report on institutional needs. Dr. Boyd agreed to draft this text. The Chair committed to work with the Steering Group and the SAB Staff Office to get comments and engagement on the initial C-VPES draft report and to explore other mechanisms for engaging the committee in active discussions with the Agency about Agency needs for advice.

Discussions of plan for committee's two working groups

Dr. Grasso reported on the previous night's discussion with the DFO, members of the C-VPES Steering Group present at the meeting, and Drs. Biddinger, Daniel, Pitelka, Polasky. After considering multiple options, the consensus was to organize two groups to "break down the effort" involved in producing a single report evaluating methods and providing advice regarding their use. Group 1 (chaired by Dr. Polasky and vice-chaired by Dr. Pitelka) would focus on methods identified in the NRC report, and how those and other economic methods could be utilized by EPA to better capture ecological benefits and issues associated with the use of those methods. Group A (chaired by Dr. Biddinger and vice-chaired by Dr. Daniel) would assess methods not directly discussed in the NRC report and their effective utilization by EPA. Both working groups would be asked to provide an initial report by November for discussion by the full committee.

Committee members discussed the importance of vetting methods within the working group and of having a diversity of expertise within each working group. Accordingly, the committee discussed asking Dr. Roughgarden to serve in Group 1 and Dr. Heal to serve in Group B. Dr. Roughgarden agreed to this reassignment.

There was no objection raised to the plan. A question was asked about the filing of a minority report in the event of disagreement with the committee's report. The chair responded that it was always possible to file a minority report, but such a process was confusing to the Agency and would dilute the impact of the committee's advice. His hope was that the committee would avoid such an outcome. The DFO introduced Dr. Holly Stallworth who will serve as DFO for Group 1.

The committee then discussed several diagrams developed or collected by members of the Steering group for conceptualizing the relationship of models and methods to EPA's needs. The group discussed modifications to one diagram of particular interest. This diagram, as modified, is included as Attachment F.

The working groups then met separately for a planning session and reconvened for reports to the full committee.

On reconvening, the Chairs of the two groups provided brief reports. Dr. Biddinger reported on the discussions of Group A, which discussed methods not directly addressed in the NRC report and their effective utilization by EPA. He reported that the group:

1. agreed to a framework for analyzing individual methods, based in part on the template used to date by the committee for discussing methods;
2. agreed to hold a teleconference prior to the next face-to-face C-VPES meeting to initiate work on assignments to write-up assessments of methods that would be vetted by the full working group;
3. identified a "starter list" of methods to consider;
4. organized this initial list of methods in categories that related to the diagram adopted by the committee, loosely grouped in 3 categories
 - a. public preference methods (that identify what matters to people)
 - b. impact assessment methods (that identify possible ecological impacts)
 - c. deliberative methods (that identify ecological impacts that matter)

Dr. Polasky reported on the discussions of Group 1, which discussed methods identified in the NRC report, and how those and other economic methods would be utilized by EPA to better capture ecological benefits. He summarized several points of general agreement:

1. focus is on the uses and shortcomings of valuation methods: what is needed to make these methods useful, defensible, and complete for EPA
2. recognition of ecosystem services existence and how these might be of greater importance than the particular valuation method
3. valuation is in the context of decision-making – the change in ecosystem services under alternative possible decisions
4. think about the methods within the overall process (Refer to diagram)
5. think about the important questions of the overall committee charge
6. this is not an academic/NRC exercise. Our analyses need to have relevance to the Agency (e.g., CV: Some people think it should not be used, but it is used by the Agency, and we should give them advice)
7. use the Millennium Assessment typology for thinking about ecological services

Dr. Polasky reported that Group 1 set a teleconference call for April 26, 2005. Group 1 also agreed on a "starter-list" of methods and a list of evaluative questions or criteria to assess methods. Group 1 and Group A agreed that group A will take the lead in discussing conjoint analysis. Drs. Polasky and Biddinger will develop a unified list of questions or criteria for assessing methods to share with the Committee.

Based on feedback from the Committee, Dr. Nugent committed to gather information on members availability for alternate dates for the next C-VPES face-to-face meeting.

The committee adjourned at 2:30 p.m.

Decisions

The committee accepted the working group's draft raft advisory report on the Agency's draft Ecological Benefits Assessment Strategic Plan.

Action Items

1. Dr. Segerson will take the lead in developing the initial C-VPASS report for discussion at the next full C-VPASS meeting.
2. Dr. Daniel will draft a paragraph advising that stakeholder interactions and multi-disciplinary involvement in valuation efforts occur early in efforts to value ecological protection to add to the C-VPASS draft advisory report on the Agency's draft *Ecological Benefits Assessment Strategic Plan* within a month's time.
3. Dr. Segerson will revise the draft advisory report on the Agency's draft *Ecological Benefits Assessment Strategic Plan* to address, as appropriate, the written comments received from the Agency and the two changes requested by committee members during the C-VPASS meeting.
4. Dr. Boyd will prepare a section for the C-VPASS initial report on institutional needs.
5. Dr. Grasso will work with the Steering Group and the SAB Staff Office to get comments and engagement on the initial C-VPASS draft report and to explore other mechanisms for engaging the committee in active discussions with the Agency about Agency needs for advice.
6. Dr. Biddinger to work with Dr. Nugent in setting a time for at least one Group A teleconference.
7. Dr. Stallworth will support a Group 1 set a teleconference call for April 26th.
8. Drs. Polasky and Biddinger will develop a unified list of questions or criteria for assessing methods to share with the Committee.
9. Dr. Nugent will gather information on members' availability for alternate dates for the next C-VPASS face-to-face meeting.

The Committee adjourned at 2:30 p.m.

Respectfully Submitted:

/Signed/
Angela Nugent

Designated Federal Officer

Certified as True:

/Signed/
Domenico Grasso

Chair

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by committeemembers 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	April 5, 2005 Note from Dr. Domenico Grasso to Members of the Science Advisory Board (SAB) Committee for Valuing the Protection of Ecological Systems and Services (C-VPES)
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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: March 24, 2005 (Volume 70, Number 56)]
[Notices]
[Page 15085-15086]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr24mr05-46]

ENVIRONMENTAL PROTECTION AGENCY
[FRL-7888-8]

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).

DATES: April 12-13, 2005. A public meeting of the C-VPES will be held
from 9 a.m. to 5:30 p.m (eastern time) on April 12, 2005 and from 9
a.m. to 3:30 p.m. (eastern time) on April 13, 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:
U.S. EPA, Science Advisory Board (1400F), 1200 Pennsylvania Avenue,
NW., Washington, DC 20460. General information about the SAB, as well
as any updates concerning the meetings announced in this notice, may be
found in the SAB Web site at: <http://www.epa.gov/sab>.

SUPPLEMENTARY INFORMATION:

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 discuss issues concerning methods for valuing the protection of ecological systems and services, to continue work on the Committee's advisory on the Agency's draft Ecological Benefit Assessments Strategic Plan, and to plan committee activities. 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 and background documents for this meeting will be posted prior to the meeting on the SAB Staff Office Web site at: <http://www.epa.gov/sab/agendas.htm>. EPA's draft Ecological Benefits Assessment Strategic Plan is available on the EPA's National Center for Environmental Economics Web site at: <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

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DFO at least five business days prior to the meeting so that

appropriate arrangements can be made.

Dated: March 18, 2005.
Richard Albores,
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 -- April 12-13, 2005
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 SAB C-VPES to discuss issues concerning methods for valuing the protection of ecological systems and services, to continue work on the Committee's advisory on the Agency's draft Ecological Benefit Assessments Strategic Plan, and to plan committee activities. 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.

April 12, 2005

9:00 - 9:10	Welcome	Dr. Angela Nugent, EPA, SABSO Dr. Vanessa Vu, EPA, SABSO
9:10 - 9:20	Introduction of members Review of agenda	Dr. Domenico Grasso, Chair
9:20 - 10:10	Discussion of action plan for C-VPES and discussion	Dr. Domenico Grasso and Committee
10:10 - 10:45	Discussion of outline for initial committee report	Dr. Kathleen Segerson and Committee
10:45 - 11:00	Break	
11:00 - 12:15	Multi-Attribute Decision Making Introduction Presentation Committee Discussion	Dr. Paul Slovic Dr. Robin Gregory, Decision Research. Eugene, Oregon
12:15 - 1:30	Lunch	

1:30 - 2:45	Attitude Surveys and "Perceptual" and "Behavioral" Assessments Presentation Committee Discussion	Dr. Terry Daniel
2:45 - 3:15	"Referenda-inference" Method Presentation	Dr. William Ascher
3:15 - 3:30	Break	
3:30 - 4:15	"Referenda-inference" Method Committee Discussion	
4:15 - 5:30	Integrated Ecological Economic Modeling Presentation Committee Discussion	Dr. Robert Costanza
5:30	Adjourn	

April 13, 2005

8:30 - 8:35	Opening of Meeting	Dr. Angela Nugent, EPA, SABSO
8:35 - 9:40	Discussion of Advisory Review of EPA's draft <i>Ecological Benefits Assessment Strategic Plan</i>	Committee
9:40 - 10:00	Break	
10:00 - 11:00	Practical institutional needs for benefit assessments for rulemaking	Dr. James Boyd, Lead Discussant Committee discussion
11:00 - 2:30	Working lunch and discussions for Committee's two working groups: Economic Methods Group Expanding the Suite of Tools Group	Working group discussion
2:30	Adjourn	

Attachment D



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

OFFICE OF THE ADMINISTRATOR
SCIENCE ADVISORY BOARD

April 5, 2005

Note to Members of the Science Advisory Board (SAB) Committee for Valuing the Protection of Ecological Systems and Services (C-VPESS)

FROM: Domenico Grasso, Chair
SAB C-VPESS

I wanted to take this opportunity to update you about two recent meetings that are important to our Committee. In December, Granger Morgan and I had the opportunity of meeting with Steve Johnson, the new EPA Administrator designate. At that meeting, he indicated that improving methods for valuing ecological systems and services was one of his top science priorities for the Agency. Accordingly, we have direct feedback from the Administrator designate regarding the significance of our work. Given this recognition, I thought it important to examine how we might expedite our work of providing advice to the Agency.

On March 24, the C-VPESS Steering Group met with the SAB Staff Office to discuss options for moving our work forward. At that meeting in Stanford, graciously hosted by Buzz Thompson, the Steering Group proposed a strategy that builds on our past discussions, and provides for a series of C-VPESS reports to deliver advice. We believe the proposed strategy offers a clear picture of how we might advance our work. We also need your experience and insights to refine the strategy and its overall implementation.

The strategy proposes producing four separate reports: 1) an initial report; 2) report on effective utilization of economic methods at EPA; 3) report on expanding the suite of VPESS tools at EPA; and 4) a synthesis report. Additional details regarding the reports and a proposed schedule for their development are summarized in Attachment 1. The past work of committee will provide the basis for the above reports. Important foundational work for the reports has been done regarding: the concept of value; national rulemaking needs; regional decision-making needs; communicating ecological values effectively; economic methods; new methods for expanding the suite of tools; and some new fact-finding on EPA's need for indicators for performance measurement).

Operationally, we envision organizing the committee into two subgroups to facilitate debate and deliberation. The first subgroup will consider economic methods (item 2 above). The second subgroup will consider expanding the suite of VPESS tools at EPA (item 3) above. Task and charge definitions, as well as preliminary committee member assignments are summarized in attachment 2. Please contact Angela Nugent if you would like to change assignments to an alternate group.

The subgroups will plan meetings, any additional fact-finding necessary, and a process for developing draft reports. Please note that the Steering Group will develop the scoping document. The synthesis document will be prepared by the Steering Group and volunteers from the committee at large. The subgroup draft reports will be discussed and reviewed by the whole committee. Final committee reports will then be delivered to the chartered SAB, which reviews and approves all reports prior to transmitted to the Agency.

Draft May 10, 2005

I look forward to meeting with you and hearing your input on this new approach to our work. At that time, Kathy Segerson will lead a short discussion about the scope and general outline of the scoping report, which we will discuss in greater detail at our June and fall meetings

**Attachment 1
Plan for Four Major C-VPES Reports**

		Proposed group responsible for first draft	Date provided to Committee for initial discussion	Target date for draft to chartered SAB	To Administrator
1	Scoping/Setting-the Stage Document ~20 page document	Steering Group	Before C-VPES September 2005 meeting		December 2005
2	Effective utilization of economic methods at EPA for VPES	Economic Methods Group Steve Polasky, Chair Lou Pitelka, Vice-Chair	November 2005		
3	Expanding the suite of tools for VPES at EPA	Expanding the Suite of Tools Group Greg Biddinger, Chair Terry Daniel, Vice Chair	November 2005		
4	Synthesis Report	Synthesis Group Group to include Chairs of Reports 2 and 3 and other members to be determined	June 2006		

1. First Report

Possible title: Valuing the Protection of Ecological Systems and Services: Overview of the Problem and Possible Solutions

Would set the stage (rationale, precedent, motivation, contextualization), define terms ("value," ecological services, ecological systems, decision contexts, etc.)

Would include any recommendations the Committee feels the Agency can act on now.

2. Effective utilization of economic methods at EPA for VPES

Charge:

Provide advice on how to use traditional economic methods effectively for different EPA purposes (e.g., for different decision "contexts," for different services, for situations with different time constraints) and how to properly caveat their use.

Suggested outline

Describe the state of art and science in what EPA is doing with economic methods and description of what is being done elsewhere

Suggestions for improved applications of methods to different EPA contexts using illustrative examples (examples that would look at regulatory applications, regional applications, indicators that can be used as performance measures for ecological protection programs); suggestions for how such benefits would be effectively communicated to the general public.

Suggestions for critical research needs for EPA programs

3. Expanding the suite of tools for VPSS at EPA

Charge:

Provide advice on the effective use of methods other than traditional economic methods or different EPA purposes (for different decision "contexts," for different services, for situations with different time constraints, for difference resource constraints) and how to properly caveat their use.

Suggested outline

Describe the state of art and science in what EPA is doing with non-economic methods and description of what is being done elsewhere

Suggestions for improved applications of methods to different EPA contexts using illustrative examples (examples that would look at regulatory applications, regional applications, indicators that can be used as performance measures for ecological protection programs); suggestions for how such benefits would be effectively communicated to the general public.

Suggestions for critical research needs for EPA programs

4. Synthesis Report

Focus: on integration of economic and non-economic methods and results; integrated analysis and its relationship to decision making; possible applications of both in different contexts; discussion of uncertainty analysis and data quality. Illustrate how the Agency could use suite of tools to make the fullest use of available information and where research could be directed to get practical returns.

Draft May 10, 2005

**Attachment 2
Plan for Two Subgroups**

Economic Methods Group

Suggested Group Members

Steve Polasky, Chair
Lou Pitelka, Vice-Chair

Dom Grasso
Geoff Heal
Doug MacLean
Hal Mooney
Paul Risser
Mark Sagoff
Kathy Segerson
Kerry Smith
Rob Stavins

Expanding the Suite of Tools Group

Suggested Group Members

Greg Biddinger, Chair
Terry Daniel, Vice-Chair

Bill Ascher
Ann Bostrom
Jim Boyd
Robert Costanza
Rick Freeman
Dennis Grossman
Bob Huggett
Holmes Rolston
Joan Roughgarden
Paul Slovic
Buzz Thompson

Attachment E

Outline for Initial Report from SAB Committee on Valuing the Protection of Ecological Systems and Services Provided to C-VPESS Members Before the April 12-13, 2005 Meeting

Proposed Title: Valuing the Protection of Ecological Systems and Services: Overview of the Problem and Possible Solutions

(20-25 page document, with cover letter and executive summary)

1. Committee's charge: provide advice for EPA
 - a. Details/history regarding establishment of committee
 - b. Statement of charge/broad scope (what are we trying to do?)
 - c. Audience (who are we trying to do it for?)
 - d. What can committee realistically do, given time and resource constraints?
 - e. Value added, given what's been done already? (How different? How does this go beyond what's been done?)

1. Why is it important for EPA to value the protection of ecological systems and services?
 - a. What is an ecosystem and what services do ecosystems provide? (give definitions and examples (*Shall we adopt the MA "provisioning, regulating, cultural, and supporting" framework?*)
 - b. Concepts of Value – a short summary of the ideas Doug has been working on, emphasizing the means vs. ends, the need to be clear about "reasons" because different reasons lead to different methods, Differences of opinion about appropriate "reasons" (in MacLean's sense). Also differences about the validity of some of the premises (e.g., individualistic) and assumptions (people have stable, well-formed preferences) underlying the economic approach. Concluding that we focus on valuing ecosystems as means for something.
 - c. Why do people value ecosystems and their services? (list different reasons, why are ecosystems and their services important? Put more detailed discussion in appendix?)
 - d. Why is it important to have information about the value of ecosystems and their services? EPA's actions either lead to changes in the conditions of ecosystems, etc., or prevent changes that otherwise would have occurred. Thus the problem is assessing differences in conditions with vs. without the EPA action. (how might information be used? What can happen if we don't have any information about these values)
 - e. Why is it difficult to value changes in ecological systems and services? [identify some of the major challenges: agreement on reasons, predicting outcomes (ecological models – strengths and limitations); finding measures that are commensurable with values of non-ecological changes caused by EPA actions, such as human health]

1. Specific EPA needs?

- a. Within different contexts (e.g., national rule making, regional needs, performance measures)
 - b. Perceptions of EPA staff (from Jim Boyd's interviews; give overview of "lessons", with details in Appendix)
1. Current State-of-the-Art:
 - a. Overview of Different valuation Methods.
 - (i) economic – anthropocentric, utilitarian, individualistic
 - (ii) all the others
 - b. What has been done in past efforts (use summary of CAFO as example?)
(Monetize things that are easily monetized even if they aren't the most important; either ignore benefits that can't be quantified or just list them qualitatively and then ignore or include in +B)
1. Need for a more comprehensive framework for valuation. Need for a framework for valuing the protection of ecological systems and services that integrates ecological analysis with valuation (conceptual diagram)
 - a. Need to expand the range of services that are included in benefits assessment and valuation
 - b. Need to let important impacts drive analysis rather than having analysis driven by available tools and data
 - c. Need to explore additional (non-economic and/or non-monetary) methods for describing value
 - d. Need to formulate valuation problem within specific EPA context, since different contexts have different needs
 - e. Need to appropriately address cross-cutting issues such as uncertainty, scale (temporal, geographic), and heterogeneity (spatial variability, heterogeneity across people)
1. Related Efforts
 - a. Within EPA (related efforts – e.g., EBASP, Risk Assessment)
 - b. Outside EPA (e.g., NRC, MA)
1. Plans for additional C-VPESH reports/report components (*Should this section be included? If so, how?*)

Attachment F

Diagram Conceptualizing the Relationship of Models and Methods to EPA's Needs for Valuing the Protection of Ecological Systems and Services

Diagram Developed at April 13, 2005 SAB C-VPSS Meeting

