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 – May 9-10, 2006

Committee Members: (See Roster – Attachment A)

Scheduled Date and Time: From 9:00 a.m. to 5:30 p.m. (Eastern Time) on May 9, 2006; and from 8:30 a.m. to 3:00 p.m. (Eastern Time) on May 10, 2006. (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 meeting had two purposes: 1) the SAB C-VPESS discussed a draft advisory report calling for expanded and integrated approach for valuing the protection of ecological systems and services and 2) the committee discussed initial work on application of methods for valuing the protection of ecological systems and services.

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

Attendees:

Chair:	Dr. Barton H. (Buzz) Thompson, Jr.
Vice-Chair:	Dr. Kathleen Segerson
Committee Members:	Dr. William Louis Ascher
	Dr. Gregory Biddinger
	Dr. Ann Bostrom (by phone)
	Dr. James Boyd
	Dr. Robert Costanza
	Dr. Terry Daniel
	Dr. A. Myrick Freeman
	Dr. Dennis Grossman
	Dr. Geoffrey Heal
	Dr. Robert Huggett
	Dr. Douglas E. MacLean
	Dr. Harold Mooney
	Dr. Stephen Polasky
	Dr. Paul Risser
	Dr. Homes Rolsten
	Dr. Mark Sagoff
	Dr. Kerry Smith

C-VPESS Consultant: Dr. Joseph Arvai

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

EPA Staff: Dr. Julie Hewitt
Mr. James Van der Kloot
Mr. David Nicholas

Meeting Summary

The discussion generally 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. Vu welcomed committee members and acknowledged the progress made by the committee. She commended the members for the successful workshop in December 2005 and noted the progress made on the committee's initial document and source examples. She also welcomed members of the public and Agency staff.

Dr. Buzz Thompson, Chair of the Committee, echoed thanks for committee members' work on the source examples. He stated the goal, shared by the vice-chair to finish work of the committee by the end of calendar year, even though the SAB Staff Office notes that there is no absolute deadline.

Dr. Thompson reminded the committee of the proposed design for the committee's work, presented in April 2005, which involved generally three related reports: an introductory report, informally called "Document Zero" (and more formally titled, as a draft document, *Valuing the Protection of Ecological Systems and Services: An Expanded and Integrated Approach*), a Methods Report; and an Applications Report, which is the focus of the source examples. The goal of the meeting is to develop a plan of action for developing those three elements. He envisioned two meetings in 2006 (a meeting in the early fall and a meeting at the end of the calendar year) to make the substantive progress needed to complete the committee's work.

Discussion of Committee's Review of C-VPESS draft document, *Valuing the Protection of Ecological Systems and Services: An Expanded and Integrated Approach*

Dr. Kathleen Segerson opened the discussion with a summary of the processed used to develop the April draft document provided to committee members for review. She noted receipt of only minor written comments have been received prior to the meeting. She will revise the document to incorporate changes and planned to provide committee members an additional opportunity to see how comments have been integrated into the text. She noted that it was an "open question" as to whether the document would stand alone, or be integrated into a larger committee document.

A committee member noted that it would be important for committee members to read the next draft thoroughly and then proceed to use the language and concepts it contains so that the Methods Report and Applications Report will build on "Document Zero."

Presentation from subcommittee focusing on valuation for national rule making

Drs. Harold Mooney and A. Myrick Freeman provided a brief overview of their subcommittee's work, which focused on EPA's 2004 effluent guideline aquaculture rule as a source example. Dr. Mooney used a PowerPoint presentation (Attachment D) to provide an overview of the aquaculture issue and the science that could be used effectively for valuation. Among other points, Dr Mooney noted that: globally, aquaculture is making a larger and larger percentage of fish consumed; that as a fraction of the global market, the United States is a large consumer but a small producer of aquaculture fish; and that the government would like to encourage this industry in light of balance-of-trade issues (as illustrated by an April 2006 Senate Bill and hearing related to promotion of aquaculture). He noted that most US aquaculture production involves catfish and mollusks, but that the rule does not address those species. Instead, the largest numbers of facilities affected raise salmon (Maine facilities) and trout (Idaho facilities), which are raised in relatively small numbers of tons (compared to catfish and mollusks) but have a high dollar value and are also high on the food chain. He noted that ponds are the most common technology for aquaculture but that but ponds not covered in the rule because they do not involve the type of continuous effluent that triggers effluent guidelines. He also noted that ornamental fish are not covered.

Dr. Mooney also noted that although the rule was national in scope, the aquaculture facilities affected were relatively few and, as a practical matter, were focused in a limited geographic area. He provided maps that illustrated that trout pens were located near Hagerman, Idaho, close to the Magic Valley, noted for the purity of water pumped from artesian wells. He noted that the growth of trout farming raised water rights issues similar to those raised for the Klamath River. Similarly, salmon farms in Maine have local impacts and are associated with regional issues.

Dr. Mooney noted that the National Oceanic and Atmospheric Administration (NOAA) and the World Health Organization (WHO) had recently issued a very complete study of aquaculture, facilitated by an EPA scientist, Dr. Glenn Suter. The study includes a conceptual model for stressors, a detailed list of endpoints that can be quantified, and an analysis of interaction of effects. He noted that only transfer functions are needed to operationalize the study. Another committee member noted that the NOAA/WHO study built on EPA's risk assessment guidelines.

EPA's ecological assessment supporting the aquaculture rule was more limited. EPA looked at water quality impacts on non-pond systems; and primarily focused on the impact on recreational use. The primary strength of the model used, Qual2E, to estimate interactions among nutrients, algal growth, and dissolved oxygen. The Agency did consider an alternative model, Aquatox, which provide a broader range of ecological effects, but was not used because of its novelty, relatively greater (but still relatively low) expense, and the difficulty of choosing "standard water bodies" to model for a national rule.

Another committee member then noted that maybe many national rules actually are regional in orientation. Refineries, for example, are clustered in a limited portion of the country, and air quality rules affecting them might benefit from a regional analysis.

The committee discussed the purpose of the benefit assessment. One committee member suggested that valuation could help the Agency identify different "boundaries" for regulatory options and be used in the development of the rule, and not just for justifying the rule. A member then noted that the Clean Water Act requires that decisions be made on analysis of the "best available technology economically achievable," not on weighing of costs and benefits.

The Chair acknowledged the restrictions of the Clean Water Act and then noted that it would be beneficial for the subcommittee to consider questions separate from the specific example chosen – he may be interesting to consider whether valuation exercises for other kinds of rules can be useful beyond meeting OMB's needs.

Dr. Freeman then provided some brief remarks that completed the summary of the initial findings of the subcommittee he led with Dr. Mooney. Dr. Freeman noted that the aquaculture rule is somewhat problematic as a case example because the rule has little scope over the real ecological impacts of aquaculture and the valuation resulted in very low benefits. He notes, however, that the example illustrates how difficult it can be to quantify ecological impacts. It is difficult to specify baselines and changes in ecological stressors from that baseline that technology options in the rule will bring about. He emphasized that if the Agency cannot quantify ecological "outputs," it will not be able to quantify related values in monetary or other terms.

Dr. Freeman discussed the economic component of the valuation. EPA focused on recreational fishing, conducted in a "primitive way" (EPA used Qual2E to estimate change in water quality parameters) and then linked those parameters to the Mitchell and Carson findings for fishing and boating. The Agency did not look at ecological changes that could have affected fishing (e.g., flow regimes, species and abundance). If that kind of analysis had been done, then the Agency could link results to particular species for recreational fishing, and then conduct a random utility method or conjoint analysis. Such analysis would have involved identifying a few kinds of representative facilities, which could have been based on types of facilities in Idaho and Maine and would have yielded stronger economic valuation measures.

He discussed changes in biodiversity as another kind of service but the subcommittee did not see a way to quantify that effect so that economic valuation could be done. Economic

analysis needs information about the species affected, the changes in population, and changes in ecological communities. With that kind of information, economists could conduct stated preference (economic tool available) surveys.

He noted that approaches for non-economic valuation were summarized in section IV.E. of the draft subcommittee report. These methods were similar to those included in the committee's draft Methods Report.

Dr. Freeman asked the committee to consider carefully developing advice for the Agency regarding "filling in missing pieces in the analytical chain" when there are severe resource-constraints affecting a rule.

Dr. Nugent introduced Dr. Julie Hewitt of EPA's Office of Water, who had agreed to provide some preliminary comment on aspects of the subcommittee draft outline that were particularly useful; areas where she would like some additional information or explanation, and areas that appear problematic and the reasons. Dr. Hewitt began her comment by noting that she will provide additional information for the Committee about how the scope of the aquaculture rule was chosen and that the Agency does not have a mandate under the Clean Water Act to gather data on benefits (as it does for engineering technologies and costs). As a result, the Agency needs help in making a case for the utility of benefit assessment.

Dr. Hewitt commented that the subcommittee's list of potential ecological impacts on page 5 of the draft report was a useful way to format key information from ecological assessments. She also noted that the Agency can consider how it might design its data collection for engineering technologies and costs to garner some data useful for benefit analysis.

She suggested that it would be useful for the C-VPESS to provide more advice as to when the Agency might conduct a regional-level analysis vs. a national analysis and how a regional approach might be used in a national benefit assessment. She suggested that it would be helpful for the committee to be very specific in its recommendations so EPA can understand most fully how particular scientists or economists' work might be affected at different stages by the recommended changes.

She noted that the committee's recommendation to pursue the Aquatox model, rather than Qual2E was problematic, because the Agency had an established link between the Qual2E model and the Mitchell and Carson Model. In contrast, the Agency does not have clear precedent or clear prospects for integrating the output of the Aquatox model with an economic analysis. If success is defined as providing appropriate monetized benefits, then, given today's options, Qual2 E is the model of choice. It is also appealing to use because it maximizes limited resources. She also noted that there were limited funds for benefit analyses and unless the importance of benefits analyses were elevated, it would be difficult for the Agency to justify using two models and developing two versions of an analysis.

A committee member asked whether the valuation exercise felt like "jumping through hoops, "i.e., was it "intellectually relevant or was it just checking the boxes." Dr. Hewitt

responded that it was not a box checking exercise, but if there are competing demand for budget resources; analysts cannot run down all possible intellectual alleys.

Another committee member asked whether EPA typically presented comparisons of monetized costs and benefits in tables and whether that kind of representation and analysis is message EPA wants to send. Dr. Hewitt responded that EPA did present comparisons of monetized costs and benefits in a table in the benefit assessment for the aquaculture rule. She noted that the Agency is taking more care now to label "estimated total benefits" as "estimated total "use benefits" with caveats in the text. The committee member noted that such tables suggest to the reader that the cost and benefit information are comparable and wondered whether the Agency is "losing more than you're gaining by presenting it in this way." Dr. Hewitt noted that senior managers ask for cost/benefit comparisons and are presented with detailed information about the uncertainties of the data. She acknowledged that communication of these issues to the public is important. Another member commented that the NOAA/WHO report identified a distinct "phase" for communication of valuations and suggested that it might be helpful for the C-VPESS to provide guidance so that communication of valuation information will not be misleading. Yet another member spoke about the appeal of a recent presentation, where decision analysts effectively used a software program to communicate the results of an analysis and engage the audience in discussion of uncertainties and how they may be parameterized. Dr. Kerry Smith found this vehicle for engaging the topic valuable and volunteered to give citations that may be useful for the committee

A committee member suggested that the Agency might usefully depart from the current practice where a single model is applied nationally for a national rule. He suggested that EPA might take a few targeted locations and make comparisons with sensitivity analysis to apply two candidate models. This might be useful both for the ecological and economic assessment and could provide a window on future research that might be cost effective. Dr. Hewitt responded that such an approach could help the Agency convey its results by including fuller characterization of its analysis and addressing the contention that EPA sometimes "oversells" its analysis.

Another member expressed concern that ecological, economic, and social sciences will not advance if a single rule is expected to "foot the bill" to advance the science. He expressed the view that the estimate of $66,000 annual benefits associated with the rule was not a meaningful number and was unduly constrained by the economic modeling. He asked whether there was a way to break out of the "single rule" constraint. Dr. Hewitt emphasized that EPA's Office of Water wants to make progress in benefits estimation and is envisioning benefits analysis for all rulemakings, whether they are economically significant or not. Dr. Freeman noted that there is a need for more investment in ecological science in the Agency generally and that the SAB Chair testified on that topic before the Environment, Technology, and Standards Subcommittee of the U.S. House of Representatives' Committee on Science.

Dr. Freeman then remarked that the measure of success for a benefit assessment might be whether it results in a monetary estimate that is sound from empirical perspective and adequately reflects ecology and economics. Dr. Hewitt concurred with this goal.

Dr. Thompson then asked committee members to identify any concerns or problems with the approach taken by the subcommittee and suggestions for developing a written draft from the subcommittee's draft annotated outline.

A committee member suggested that the subcommittee focus more on the valuation component of the analysis and less on the ecological assessment, because although the ecological analysis for the aquaculture rule was minimal, many rich, scientifically credible ecological assessment exist where valuation have not been done and valuation is the focus of the committee.

Another committee member suggested focusing on the linkages between ecological model outputs and services that could be the focus of economic analysis. He asked whether there are sufficient outputs from Qual2E that are relevant as services.

A third committee member suggested that the subcommittee explore the reasons behind the powerful influence of the Carson and Mitchell study to see what the committee might recommend that could be similarly helpful. Another member amplified that comment and asked: What could be done to update that study? And make it applicable to a large range of applications? What are the general characteristics that could be done for other services that EPA use across different programs, different rulemakings?

In response, a member suggested looking at two valuation methodologies [the water quality ladder and the value of statistical life (VSL)] that have served as "central organizing themes" for valuation in the Offices of Water and Office of Air and Radiation. He suggested that these methodologies were easily understood and recognized methods; they involved quantifiable unit values that could be the focus of a state preference study; and involved units that were transferable to different location. A change in water quality to "fishable" or "boatable" status could be understood in different geographic contexts, even if it might not be ecologically credible. Similarly, risk assessors and economists agreed that VSL provided a measure of mortality impacts that allowed for consistency across analyses. He also noted that Carson and Mitchell identified "commodities" that are being valued and that it did not frame the units in terms of ecological services. These quantifiable methods gained "traction" because they allowed for communication about tradeoffs and could suggest what the Agency needs in terms of additional methods for ecological valuation. A committee member acknowledged the power of this point, but noted that although the VSL had big impact on consistency of EPA's analyses, it is now seen as an idea needing more nuance and there is much controversy surrounding it. He suggested that what EPA really needs are unit values that are context dependent. Another committee member added that such unit measures need to be consistently defined and concretely measured and that the C-VPESS needs to develop a consistent meaningful definition of ecological services.

A discussion of the Carson and Mitchell study followed, along with a discussion of what was needed for a scientifically credible approach to replace it as a methodology. A member spoke of the unsuccessful recent research effort by Huber and Viscusi to update the Mitchell and Carson study to include more fully developed benefits of water quality improvements and still have the kind of broad relevance ascribed to the Mitchell and Carson study. Dr. Hewitt

confirmed the difficulties associated with the research, which involved asking individuals to make improvements in water quality. Individuals found difficult respond with discrimination to general questions (without a specific context) involving tradeoffs between costs and a variety of water quality services (e.g., recreation, fishing, something else). Committee members asked the Designated Federal Officer to obtain any published papers or other information related to the Huber and Viscusi research.

A committee member spoke of the need for a "sunset provision" so that twenty-year old data, as contained in Caron and Mitchell's study, are reviewed and reconsidered in the light of new contexts. Another member emphasized that it is important to try out new models and methodologies for every new rulemaking by applying alternative models on a subset of areas relevant to the rule and conducting comparisons. As standard practice, the Agency can build in mechanisms to cross-check models as a robustness analysis; he argued that such practice needs to be part of culture at EPA and part of every Regulatory Impact Analysis (RIA). He suggested that EPA's economic guidelines require that every RIA contain a chapter that tries out new models. He also suggested that there be a comparable message in EPA ecological guidelines. Without such requirements, offices engaged in the rulemaking are never going to choose to spend money on research. Another member added that without the "pressure" of advice from the SAB or changes to EPA guidelines, EPA may continue to use Carson and Mitchell, without fully acknowledging its limitations, as the principle basis for valuations of effluent guidelines.

A committee member then made a different point. He asked to subcommittee to consider the whole range of ecological services that need valuation and identify where services dripped out from the monetary analysis, then examine why those services "fell out," and how they can be factored into the analysis.

The committee then discussed the extent to which the subcommittee should focus on the aquaculture example vs. rulemaking affecting ecological systems and services in general. Members acknowledged that the aquaculture rule, like every individual rule that could be considered, had unusual characteristics and localized impacts. Dr. Hewitt acknowledged that, in general, effluent guidelines have regional impacts. The committee chair then emphasized the importance of not "overparticularlizing" to a given rule. Dr. Nugent suggested that the summaries of interviews conducted by Dr. James Boyd with Agency staff concerning national rulemaking might be useful to the national rulemaking subcommittee in its work. Dr. Thompson asked her to provide that document to the committee.

A committee member suggested that the subcommittee use its draft to discuss the appropriate use of benefit transfer information and the pitfalls associated with benefit transfer. The consultant to the committee noted that he saw a three-tiered approach to benefit transfer. The most desirable approach involved "process transfer" -- where a "sensible process" would be transferred to every valuation context where there would be a decision-analytic approach taken to defining problems, characterizing objectives, and comparing alternatives anew in each context. If such an approach wasn't possible, the Agency could rely on pre-defined sets of ecological services that would identify the attributes and measures to define benefits. Finally, if that option wasn't available, the Agency could turn to benefits transfer, as it is more commonly understood, transferring well-established units from one well-identified study to another.

A committee member suggested that the subcommittee focus on the Aquatox model and evaluate it to determine whether it produces functions whose outputs could be used in economic valuation. He asked whether Aquatox could be parameterized within a week (and explore the cost involved) to address one of the types of facilities affected by the rule. He suggested that the subcommittee evaluate the usefulness of Aquatox very specifically and, if appropriate, recommend that such a model become part of a baseline approach. Another member noted that EPA has models similar to Aquatox (e.g., the Trim model) and suggested that the subcommittee look at those models in general and ask "what would it take for those models to deliver what is needed for ecological analysis" and what are the policy implications (e.g., for double counting). Dr. Mooney responded that the Aquatox model worked well with the concepts of ecological services discussed in the Millennium Ecosystem Assessment report. Aquatox generates numbers, composition, interactions, and spatial distribution important to analysis of biodiversity impacts.

The committee discussed the concept of ecological services within the context of the source example. One member noted that defining ecological services is very different from a VSL, where there is considerable agreement across programs and issues. Ecological services become extremely problematic because they are site-specific and difficult to compare across sites and services. Members acknowledged the need to develop agreement on a "standard' for ecological services, given the diversity of services within different contexts. One member suggested the need for indices of ecological services; another responded that indices are difficult to understand and that the appeal of a VSL or Water Quality Ladder is their rhetorical power and comprehensibility. He asked the committee whether such a comparable single ecological measure, which might be flawed, still might be valuable because "maybe having the wrong measure is better than no measure." The committee members discussed whether the biodiversity and conservation measures developed by NatureServe and other conservation organizations could be useful in this regard but did not agree whether they represented one type of index of ecological service.

The committee chair asked Drs. Mooney and Freeman to work with the subcommittee to develop draft subcommittee text that addressed the full committee discussion. He asked the Designated Federal Officer to circulate the draft, at a time deemed appropriate by Drs. Mooney and Freeman, to EPA's Office of Water, EPA's Office of Air and Radiation (as the two EPA offices most active in rulemakings affecting ecological systems and services), and also to EPA's National Center for Environmental Economics for comment.

The committee then turned to a discussion of the issues raised by the source example that merit incorporation in the C-VPESS Methods Report. The committee chair suggested that the topic of communication of valuation information is important and needs additional discussion in the methods report. He asked Drs. Bostrom and Arvai to develop this section. Dr. Bostrom commented that well-identified, well-understood units become very important in policy processes where so many elements are unknown and poorly understood. She also spoke of the importance of a visual representation of a process model. Dr. Avai commented that he can focus on what valuation information decision makers need to know and understand related to options related to decisions.

The committee discussed the need to clarify the definition of ecological services. A member suggested that the list of ecological services Millennium Ecosystem Assessment contained some items that were functional characteristics of the ecosystems and not ecosystem services. He noted that services are something humans experience and measure. Another member related this issue to the decision scientist's concern to identify the fundamental objectives of a decision and then the elements of the system one chooses to measure. The chair noted that it will be important for the committee to address this definitional issue and the issue of developing a set of metrics useful to measure ecosystem services.

The committee identified other topics appropriate to discuss in the methods report:

- the development of databanks of models and applications;
- using mediated modeling to build the toolbox and knowledge together
- the issue of the value of information analysis in ecological valuation;
- the issue of characterizing a desired future condition documenting what we think we're moving toward (vs. restricting valuation to reactive decision exercises)
- using national rulemaking plus regional studies to develop knowledge/test new knowledge

Presentation from subcommittee focusing on valuation for regional decision making

Drs. Stephen Polasky and Ann Bostrom, co-leads for the subcommittee, provided a brief overview of their subcommittee's work, which addressed valuation within the context of a regional partnership called "Chicago Wilderness." This partnership activity for EPA's Region 5, focused on as a priority. Dr. Polasky used a PowerPoint presentation (Attachment E) to provide an overview of Chicago Wilderness and how valuation information might be developed to address four ecosystem services of concern (species conservation; ecological systems conservation; open space; and water quantity). The subcommittee's draft report was developed after review of materials available on the website of Chicago Wilderness and some of its member organizations and discussion with EPA Staff from Region 5 and members of Chicago Wilderness at a public meeting on April 28, 2006.

Committee members raised several questions and made several comments during Dr. Polasky's presentation. One member suggested that the subcommittee revise its treatment of forests and evapotranspiration. Another member suggested adding travel cost methods to the list of economic tools available to value biodiversity related to wildlife tourism. Another member noted, however, that it may not be appropriate to "break out" recreational bird watching as an independent item because it is part of a larger issue of concern. A subcommittee member then noted that Chicagoans have a sense of their city that is linked to its natural history and that Chicago has a notable tradition of public institutions linked to and scientific study of natural history and ecology. A committee member then spoke about the difficulty of posing "tradeoff questions" about nature or biodiversity to people who are motivated by stewardship concerns. On the topic of open space development, a member noted that he was aware of research documenting open space benefits for realtors on the East Coast. Other committee members discussed the nature of the concept of "wilderness" addressed by Chicago Wilderness. One

noted that there was no pristine wilderness involved; the ecological state desired, in his view, was more an aesthetic "garden" rather than a preservation of wilderness. Another noted that the pictures presented from the Chicago Wilderness website provided some very different pictures of the desired wilderness (e.g., as undeveloped prairie or forested prairie), which show different values and are likely to evoke different responses from the public. Another member responded that ecologists consider a city as another kind of ecosystem and Chicago Wilderness aims to turn that environment from less hardscape to more greenscape. Even when an ecosystem is not pristine or wild, that makes no difference to the organisms living in it

Dr. Polasky noted the variety of audiences that Chicago Wilderness considered for ecological valuation: developers, members of the public facing bond referenda related to biodiversity; political leadership in local governments; the general public it wishes to educate about biodiversity; and, to a somewhat lesser extent, its own membership and staff.

Members asked about the operating budget for Chicago Wilderness. Dr. Bostrom responded that much financial information is available on the Chicago Wilderness website and that the organization is effective in fundraising and supporting its small staff. She noted that the partnership is extremely effective at collaboration and maintains a huge volunteer program. Public education is a priority. A subcommittee member noted that EPA could benefit from tapping into the type of motivation that Chicago Wilderness evokes at the grass roots.

Dr. Nugent then introduced Mr. James Van der Kloot of EPA's Region 5, who had provided initial information to the regional subcommittee and had agreed to provide some preliminary comment on aspects of the subcommittee draft report. Mr. Van Der Kloot expressed appreciation for the subcommittee's understanding of the history, goals and operations of Chicago Wilderness and the issues faced by the partnership. He commented that the subcommittee's "nesting" of economic valuation within a broader context of valuation is helpful. He expressed personal interest in seeing whether Chicago Wilderness can use some of the tools for decision-making. He suggested that a next step might be a discussion of the report with the Steering Committee of Chicago Wilderness.

The C-VPESS chair asked about Mr. Van der Kloot's sense of whether economic tools could actually be used by Chicago Wilderness or whether the complexity and expense would restrict their use. Mr. Van der Kloot responded that the Chicago area is facing complex decisions associated with development. Chicago Wilderness is interested in tools that can influence conservation-style developers to "do the right thing." A committee member suggested that the next step for Chicago Wilderness, now that it has listed all the target species, ecological communities, and aquatic communities of importance, is to set goals across the region and make a plan of action.

Dr. Thompson then asked committee members to identify any concerns or problems with the approach taken by the subcommittee and suggestions for developing a written draft from the subcommittee's draft annotated outline. A committee member asked how a citizen jury approach might work in the context of Chicago Wilderness and when a stakeholder analysis, for valuation of a particular piece of land, for example, might morph into a citizen jury approach. The C-

VPESS chair spoke of interest in this question and the importance of appropriate selection of membership of a citizen jury, depending how the purpose of the valuation effort.

Another C-VPESS member asked whether EPA had any interest in exporting the "lessons" of valuation from the Chicago Wilderness to other regions, other cities. Dr. Nugent responded that she would investigate with the Agency's Innovation Action Council about that question.

Committee members also discussed whether and how Chicago Wilderness was interested in the valuation approaches being developed by the Committee. One member noted that emotions and feelings related to biodiversity, rather than analysis, have guided Chicago Wilderness in the past. Drs. Polasky and Bostrom noted that Chicago Wilderness members spoke of the appeal of valuation information to aid in making decisions and setting priorities, although their past history suggested that they used a less structured process for decision-making. A committee member responded that other regional organizations do use analysis to help make trade-offs. It might be interesting to contrast those organizations and their experience.

A subcommittee member noted that Chicago Wilderness spoke of two different contexts for using valuation involving ecology and economics: 1) to help them make decision and set priorities, and 2) influencing other people's priorities affecting biodiversity.

A C-VPESS member noted that the regional example different from the national example. Chicago Wilderness "started with what they cared about" (i.e., the services) and the regional subcommittee then developed a potential strategy for valuation. In the aquaculture example, the national subcommittee sees potentially useful biophysical information (that could feed into economic valuation) and is "trying to reach the service side."

A committee member asked about the potential impact of valuation. Currently, without valuation, Chicago Wilderness is successful in motivating people on the basis of biodiversity and stewardship, as evidenced by Chicago Wilderness's own surveys. If Chicago Wilderness goes "too far down the road of willingness-to-pay, it will kill the goose that lays the gold egg."

Dr. Polasky responded that he believed Chicago Wilderness is interested in using valuation to persuade "people different from themselves" about the value of biodiversity -- and most likely does not have a strong interest in valuation for internal priority setting. As illustration, he described the green infrastructure calculator developed by the Center for Neighborhood Technology (a member organization of Chicago Wilderness) and designed to influence developers. Another subcommittee member observed that there is a point at which economic valuation is counterproductive in a voluntary partnership. If you prioritize among partnership objectives, no partner wants to work on lower-level priority.

Another member spoke about the importance of the source example. The values described reflect what people care about related to ecological systems and services in many different situations. The very values described in the Chicago Wilderness example have been problematic for social, economic, and ecological valuation tools to capture. Would it be possible

for the subcommittee to explore the kinds of changes in ecosystems and ecological services that will affect those values?

Members of the committee asked how NatureServe helps make choices among different pieces of land where biodiversity is an issue. A committee member responded that the organization sets goals regarding the numbers of acres, different kinds of land, different quality, spatial relationships and connectivity between them and that a similar approach would be useful for Chicago wilderness.

Committee members also briefly discussed how this example raises questions about the choice of spatial and temporal baseline for restoration efforts. One member suggested that the concept of "wilderness" assumes a spatial or temporal baseline as a reference. Another member responded that restoration might alternatively attempt to restore balance in space as part of a larger habitat and also mentioned that historical documents describing habitat can be used for restoration efforts.

Other specific suggestions for revising subcommittee report included:

- specifying how historical information about referenda can be used for and what the limitations of that information would be
- considering how to introduce and frame the non-economic, non-science based description of the urban ethic that motivates many participating in Chicago Wilderness. Suggestions ranged from omitting the text; to attributing it to Chicago Wilderness, not the committee; to including it in a text box insert within the regional source example discussion; to including it in the preamble to the Applications report
- considering valuation approaches used by other regions to identify critical habitat to broaden discussion of regional partnerships beyond Chicago Wilderness
- considering valuation tools from Operations Research for prioritizing.

The committee also discussed the value of maintaining a section on biodiversity and conservation values in the methods report.

The Committee adjourned the public meeting at 5:00 p.m. on May 9, 2006

Presentation from subcommittee focusing on valuation for local decision making

The C-VPESS began its public session at 8:30 a.m. on May 10, 2006.

Dr. Gregory Biddinger, co-lead for the subcommittee, provided a brief overview of the subcommittee's work, which focused on valuation for local decision making and used remediation and redevelopment at contaminated sites as a source example. Dr. Biddinger used a PowerPoint presentation (Attachment F) for his overview. He described four Superfund sites and how valuation might have been used at them for making decisions about remediation and redevelopment.

Committee members asked several clarifying questions during the presentation. Dr. Biddinger noted that the Superfund cleanup process was separate from any Natural Resource Damage (NRD) process conducted at the site. The subcommittee focused on the EPA cleanup process and did not look in depth at the NRD process in which the EPA is not a natural resource trustee, except as it related to ecological risks at the Leviathon Mine site. A member provided additional detail about the Avtex site, which was closed by the State of Virginia, not the federal government. Dr. Biddinger mentioned the work of the Interstate Technology Regulatory Council and the Wildlife Habitat Council, which are both trying to incorporate ecological preservation from the start of cleanup activities and integrate it with cleanups. He described state interest in this initiative, where there are no federal funds for cleaning up a contaminated site. Another subcommittee member noted the potential value of the data collected in the NRD process for EPA's efforts to clean up a site. Yet another member noted that the Superfund process has improved in efficiency and its use of human health information; use of ecological information is less well-developed.

Members asked about risk/risk tradeoffs involved in ecological site planning at the Avtex site. One member asked about planning for removal of contaminated sediment and wondered if the sediment wasn't clean and the waterfront was developed, the ecological restoration might create an attractive nuisance. Mr. David Nicholas from EPA's Office of Solid Waste and Emergency Response volunteered to check to see if the remediation at the Avtex site involved dredging for contaminated sediment or remedial action.

Dr. Biddinger noted that the information available on EPA's website regarding valuation for redevelopment of contaminated sites was quite limited and principally involved qualitative descriptions of habitat and economic estimates limited to job creation and tax revenue related to redevelopment.

A subcommittee member noted that the redevelopment process, as described on EPA's web sites, did not involve the creation of options or offer an opportunity to develop valuation information comparing different options. Instead, the process was collaborative design effort, where EPA was one of several players including the state, the local community, and the responsible party. Dr. Biddinger suggested that, in general, the Remedial Investigation/Feasibility Study phase of the Superfund process, which focuses on risk mitigation and cost effectiveness, provides a logical context for valuation.

In the Leviathon Mine case, Dr. Biddinger noted that the policy frames at different parts of the process determined what kinds of baseline information needed to be identified. The NRD process, for example, required analysis of what it would cost to replace resources. A subcommittee member noted the difficulty of defining the ecological services associated with habitat protection. Committee members suggested that habitat might have an impact on property rights or affect wetlands or listed species. Another committee member noted the example of a site on the Elizabeth River where liver cancer in a small non-food fish that was not threatened or endangered and that was not linked to property rights mobilized a community to clean up the river. A subcommittee member also noted for the Leviathon mine case that ecological services to Native Americans were a significant driver for the site clean up. She noted that the NRD

process included a plan to conduct ethnographic, anthropological studies of Native Americans, because a contingent valuation study would not be likely to be acceptable to the tribe.

Dr. Biddinger concluded his presentation with the comment that the Superfund Process is a long process that will accommodate collection of local ecological data and time to conduct surveys. Investment in such data gathering, in his view, could demonstrate the cost-effectiveness of conducting ecological valuations and result in more successful clean-ups that are closer to communities' goals for contaminated sites.

Dr. Nugent then introduced Mr. David Nicholas of the Policy Analysis and Regulatory Management Staff in the Office of Solid Waste and Emergency Response (OSWER). Mr. Nicholas began his comments by acknowledging the usefulness of past SAB advice on benefit assessments associated with OSWER's Underground Storage Tank Program and noted that his office is conducting qualitative case studies, as recommended by the SAB in an earlier report. He also reiterated the strong interest of the Interstate Technology Regulatory Council and the Wildlife Habitat Council, which are assembling guidelines for valuation. He suggested that the support of those groups can help with implementation of recommendations of the SAB.

He provided brief remarks, supplemented by written comments (see Attachment G) that summarized particularly useful aspects of the preliminary draft subcommittee text; areas needing additional information or explanation; and one or two areas that appear problematic and the reasons why. He then took questions from the committee. In response to one question, he noted that OSWER anticipates adding ten to twelve Superfund sites per year and that in the past, there have been as many as 10,000 sites in the queue for Superfund, plus additional clean ups involving underground sites and state sites. There are, however, currently far fewer sites in the queue as state programs take on site clean-ups. He noted that the approaches described by the committee would be relevant to all those sites, not just to Superfund sites. Another committee member observed that the C-VPESS needs to make the case for value added that valuation can bring and how analyses can improve the outcomes of clean-up. In face of resource restrictions faced by the Agency, such justifications will be helpful. Committee members asked the Designated Federal Officer to obtain and provide for them copies of the draft guidelines and training materials being prepared by the Interstate Technology Regulatory Council and the Wildlife Habitat Council.

Members then discussed comparisons of human health risk and ecological risk in the context of contaminated sites. One member noted that policy issues involving sensitive subpopulations were addressed over time in human health risk assessment, but ecological assessment raises a broader range of issues. He asked whether ecological risk assessment and ecological valuation were an art or science. Mr. Nicholas acknowledged that EPA policy was evolving and that the SAB C-VPESS report will help in this effort. The goal in his mind is to optimize ecological services from a contaminated site and meet program requirements and the letter of the law. A committee member noted that ecological assessment can estimate ecological risks and model ecosystems to a level of certainty comparable to human health risk assessment. He asked about overall context for valuation and posed the question "How accurate do we have to be (in ecological assessment)? If valuation is only good to plus or minus 50%, why should ecological assessment expected to be stricter?" Another committee member asked what level of

uncertainty would be acceptable to the Agency and posited that the answer depends on how interested the Agency is in using ecological assessments. Yet another committee member noted that the American public has different tolerances for error related to human health vs. ecological risk. The American public does not have the same tradition of precautionary principle for ecological risk as for human health risk.

A committee member then commented that Dr. Paul Slovic had noted in earlier committee discussions that there was a similarity between human health risk assessment and ecological valuation. He noted that Dr. Slovic predicted that analysts cannot simply apply willingness-to-pay methods and expect the results will reflect what people care about. He suggested that valuation is, in part, an art. He noted expert practitioners in decision-analytic techniques (Robin Gregory and Ralph Keeney) who follow a process to work with people to determine what matters to them and why. This component of valuation -- and not just discussion of the sophistication and evolution of ecology or economics -- deserves mention in the subcommittee report

The committee then noted that there was no explicit weighting scheme comparing health and ecological risk. Dr. Biddinger noted that the Agency does face trade-offs where there are "bright fuzzy lines" -- where an ecologically valuable forest may be in an area where over-conservative human health assessments, with extra safety factors might be applied, might be interpreted as presented a risk to sensitive subpopulations. Dr. Segerson asked about the significance of such risk/risk tradeoffs for the Agency. Dr. Anthony Maciorowski responded that most of the drivers for decision-making in the Agency are human health and most ecological guidelines are office-specific. Dr. Biddinger suggested that it would be helpful to integrate human health and ecological protection perspectives. Another member spoke of a potential effort by the National Academy of Sciences to update the "Red Book" and create and "Red and Green Book" that would update and combine approaches to human health and ecological risk. Dr. Freeman commented that in national rulemakings, which generally control emissions or exposures, there do not appear to be tradeoffs between health and ecological risks; they instead appear as complements. A committee member noted that in clean up decisions, when a concentration standard is chosen, valuation could identify the point at which some additional clean-up activity beyond the level and type necessary to protect human health could have marked increased vale for a community.

Committee members then talked about the case for ecological valuation. Dr. Biddinger suggested that the "80/20% Rule" applied. The Agency would recognize significant benefits if ecological services are brought into initial scoping for contaminated sites. Introducing valuation at that stage would help decision-makiers choose among alternative options. He suggested that standardization of vocabulary and identification of ecological values at preliminary stages will help assessors collect the right data the first time, prevent "dumb mistakes," and reduce the angst and outrage on the part of people who feel they're not listened to. Investment of a small amount of time and resources at this early stage can make a little impact on a lot of sites and result in a big impact for society.

Discussion of next steps related to Subcommittee work and development of the C-VPESS Applications Report and Methods Report

Dr. Thompson began the discussion with a proposal that the committee consider merging "Document Zero" (which would become the introduction to a new consolidated report), the "Applications Report," and the "Methods Report" into a single document. The committee considered this proposal and a rough outline provided by Dr. Thompson and refined the outline, as included in Attachment H. The vision for the title of the document would include three ideas: an integrated and pro-active approach to valuation for the protection of ecological systems and services and would include a reference to the choice of methods.

Several committee members suggested designing the text not just as a standard SAB report but also as a web-based document that could be distributed on a CD. Dr. Thompson agreed to pursue this idea with the Designated Federal Officer and Dr. Vu.

Committee members noted the importance of the concept of ecosystem services and the need for guidance to operationalize this concept at EPA. Several committee members asked Dr. Nugent to organize a briefing for the committee on and provide materials about EPA's new research effort related to ecosystem services.

Dr. Thompson asked committee members to identify the particular aspects of each of the sections of the applications part of the report that would illuminate different EPA needs for valuation. The committee determined that the section on national rulemaking will focus on rulemaking and meeting the requirements of the Office of Management and Budget. The section on regional valuation will focus on partnership activities, where the Agency can be more experimental in its approach. The section on local decision-making will focus on site-specific valuations. Additional descriptions of the unique aspects of each section are included in the comments indicated on the draft outline in Attachment H.

Discussion of each application context should focus on the valuation needs for the decision context. Write-ups on source examples should include enough technical detail to make examples understandable. These write-ups might be included in text boxes. The committee asked Drs. Freeman and Mooney to consider including details about the Combined Animal Feeding Operation rulemaking in their text on national rulemaking.

The committee agreed that each application discussion should consider the issue of Agency resource constraints. This theme should also be addressed in the introduction and methods section. The committee identified general valuation issues to be discussed and addressed in section 4 of the report. The committee also discussed how to handle responsibilities for developing new sections of the report and refining existing text (indicated in bold face in Attachment H). Tentative assignments of lead roles are identified in the outline.

The committee then discussed its vision for Part 2 of the report, which would focus on methods. The committee agreed that this section should not serve as a textbook on methods. The outline also identifies "open issues" whose placement in the outline could not be resolved.

Dr. Thompson asked the Designed Federal Officer to schedule a planning call for the subcommittee co-leads and agreed to work with her and Dr. Segerson on a schedule and process for working with committee members with lead responsibility for parts of the integrated report.

The committee adjourned at 3:00 p.m.

Action Items

1. Dr. Segerson will revise the draft document, Valuing the Protection of Ecological Systems and Services: An Expanded and Integrated Approach to incorporate changes requested in C-VPESS members' comments and will provide committee members an additional opportunity to see how comments have been integrated into the text.
2. Dr. Smith will provide citations for software used in a recent presentation, where decision analysts effectively used a software program to communicate the results of an analysis and engage the audience in discussion of uncertainties and how they may be parameterized.
3. Dr. Nugent will contact Drs. Smith and Hewitt to obtain any published papers or other information related to the Huber and Viscusi research and will provide this information to the National Rulemaking Subcommittee.
4. Dr. Nugent will provide to the national rulemaking subcommittee the summaries of interviews conducted by Dr. James Boyd with Agency staff concerning national rulemaking might be useful to the national rulemaking subcommittee in its work.
5. Drs. Mooney and Freeman will work with the national rulemaking subcommittee to develop draft subcommittee text that addressed the full committee discussion. Dr. Nugent will circulate the subcommittee draft, at a time deemed appropriate by Drs. Mooney and Freeman, to EPA's Office of Water, Office of Air and Radiation, and National Center for Environmental Economics for comment.
6. Dr. Nugent will investigate with the Agency's Innovation Action Council as to whether EPA had any interest in exporting the "lessons" of valuation from the Chicago Wilderness to other regions, other cities.
7. Drs. Polasky and Bostrom will work with the regional subcommittee to revise the draft subcommittee text that addressed the full committee discussion.
8. Mr. David Nicholas from EPA's Office of Solid Waste and Emergency Response will check to see if the remediation at the Avtex site involved dredging for contaminated sediment or remedial action.
9. Dr. Angela Nugent will obtain and provide for the local subcommittee copies of the draft guidelines and training materials being prepared by the Interstate Technology Regulatory Council and the Wildlife Habitat Council.
10. Drs. Biddinger and Heal will work with the local subcommittee to revise the draft subcommittee text that addressed the full committee discussion.
11. Drs. Freeman and Mooney will consider including details about the Combined Animal Feeding Operation rulemaking as an additional source example in draft text on national rulemaking.

12. Dr. Thompson will discuss with Drs. Nugent and Vu possibilities for designing the C-VPESS report not just as a standard SAB report, but also as a web-based document that could be distributed on a CD.
13. Dr. Nugent will organize a briefing for the committee on and provide materials about EPA's new research effort related to ecosystem services.
14. Dr. Nugent will schedule a planning call for the subcommittee co-leads with Drs. Segerson and Thompson.
15. Dr. Thompson will work with Dr. Segerson and Dr. Nugent to develop a schedule and process for working with committee members with lead responsibility for sections of the consolidated report.

Respectfully Submitted:
/Signed/
Angela Nugent
Designated Federal Officer

Certified as True:
/Signed/
Barton H. (Buzz) Thompson
Chair

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

Attachments

Attachment A	Roster
Attachment B	Federal Register Notice
Attachment C	Meeting Agenda
Attachment D	Presentation by Dr. Harold Mooney, “Introduction to the Aquaculture Rule Source Example”
Attachment E	Presentation by Drs. Stephen Polasky and Ann Bostrom, “Chicago Wilderness Source Example”
Attachment F	Presentation by Dr. Gregory Biddinger, “Use of Valuation for Local Decisions; Source Example Analysis Superfund Decisions”
Attachment G	OSWER Perspectives on Draft Text on Valuation "Source Examples" Prepared by Subcommittees of the SAB Subcommittee on Valuing the Protection of Ecological Systems and Services (C-VPESS), draft May 3, 2006 for SAB C-VPESS Deliberations on May 9-10, 2006
Attachment H:	Draft C-VPESS Report, "Integrated and pro-active approach to valuation for the protection of ecological systems and Services; choice of methods"

Attachment A: Roster

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

ACTING CHAIR

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

ACTING VICE-CHAIR

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

MEMBERS

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

Dr. Gregory Biddinger, Environmental Programs Coordinator, ExxonMobil Biomedical Sciences, Inc, Houston, TX

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

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

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

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

Dr. A. Myrick Freeman, 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, Consultant and Professor Emeritus, College of William and Mary, Williamsburg, VA

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

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

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

Dr. Stephen Polasky, Fesler-Lampert Professor of Ecological/Environmental Economics, Department of Applied Economics, University of Minnesota, St. Paul, MN

Dr. Paul G. Risser, 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. Stewart 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

SCIENCE ADVISORY BOARD STAFF

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

Attachment B: Federal Register Notice

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

[Federal Register: April 11, 2006 (Volume 71, Number 69)]
[Notices]
[Page 18327]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr11ap06-97]

ENVIRONMENTAL PROTECTION AGENCY
[FRL-8157-1]

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

AGENCY: Environmental Protection Agency (EPA).
ACTION: Notice.

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

DATES: A public meeting of the C-VPESS will be held from 9 a.m. to 5:30 p.m (Eastern Time) on May 9, 2006 and from 8:30 a.m. to 3:30 p.m. (Eastern Time) on May 10, 2006.

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

FOR FURTHER INFORMATION CONTACT: Members of the public wishing further information regarding the SAB C-VPESS meeting may contact Dr. Angela Nugent, Designated Federal Officer (DFO), via telephone at: (202) 343-9981 or e-mail at: nugent.angela@epa.gov. The SAB mailing address is: U.S. EPA, Science Advisory Board (1400F), 1200 Pennsylvania Avenue, NW., Washington, DC 20460. General information about the SAB, as well as any updates concerning the meetings announced in this notice, may be found in the SAB Web site at: http://www.epa.gov/sab.

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

Background: Background on the SAB C-VPESS and its charge was provided in 68 FR 11082 (March 7, 2003). The purpose of the meeting is for the SAB C-VPESS to discuss a draft advisory report calling for expanded and integrated approach for valuing the protection of ecological systems and services. The Committee will also discuss initial work on application of methods for valuing the protection of ecological systems and services.

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

Availability of Meeting Materials: Materials in support of this meeting will be placed on the SAB Web site at: http://www.epa.gov/sab/ in advance of this meeting.

Procedures for Providing Public Input: Interested members of the public may submit relevant written or oral information for the SAB to consider during the advisory process. Oral Statements: In general, individuals or groups requesting an oral presentation at a public meeting will be limited to five minutes per speaker, with no more than a total of one hour for all speakers. Interested parties should contact Dr. Nugent, DFO, at the contact information noted above, by April 30, 2006, to be placed on the public speaker list for the May 9-10, 2006 meeting. Written Statements: Written statements should be received in the SAB Staff Office by April 30, 2006, so that the information may be made available to the SAB for their consideration prior to this meeting. Written statements should be supplied to the DFO in the following formats: one hard copy with original signature, and one electronic copy via e-mail (acceptable file format: Adobe Acrobat PDF, WordPerfect, MS Word, MS PowerPoint, or Rich Text files in IBM-PC/ Windows 98/2000/XP format).

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

Dated: April 3, 2006.

Anthony Maciorowski,
Associate Director for Science, EPA Science Advisory Board Staff Office.
[FR Doc. E6-5327 Filed 4-10-06; 8:45 am]
BILLING CODE 6560-50-P

.

Attachment C: Agenda

Meeting of the SAB Committee on Valuing the Protection of Ecological Systems and Services (CVPESS)
Draft Agenda – May 9-10, 2006
Woodies Building, 1025 F Street, N.W., SAB Large Conference Room, Room 3705
Washington, DC 20004

The purpose of the meeting is for the SAB C-VPESS to discuss a draft advisory report calling for expanded and integrated approach for valuing the protection of ecological systems and services. The Committee will also discuss initial work on application of 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.

<u>May 9, 2006</u>

9:00 - 9:10	Welcome	Dr. Angela Nugent, EPA, SABSO Dr. Vanessa Vu, EPA, SABSO
9:10 - 9:15	Introduction of members and review of agenda	Dr. Barton H. (Buzz) Thompson, Jr., Chair Dr. Kathleen Segerson, Vice-Chair
9:15 – 9:30	Public Comment	
9:30 - 9:45	Report on Committee Review of C-VPESS draft document, *Valuing the Protection of Ecological Systems and Services: An Expanded and Integrated Approach*	Dr. Kathleen Segerson
9:45 – 10:15	Presentation from subcommittee focusing on valuation for national rule making	Dr. A. Myrick Freeman Dr. Harold Mooney

10:15 – 10:30	Agency Comment	Dr. Julie Hewitt Office of Water
10:30 – 10:45	Break	
10:45 – 12:00	Committee Discussion	
12:00 – 1:00	Lunch	
1:00 – 2:00	Continued Committee Discussion on valuation for national rulemaking	
2:00 – 2:30	Presentation from subcommittee focusing on valuation for regional decision making	Dr. Stephen Polasky Dr. Ann Bostrom (by phone)
2:30 – 2:45	Agency Comment	TBD
2:45 – 3:30	Committee Discussion	
3:30 - 3:45	Break	
3:45 – 5:00	Continued discussion of valuation for regional decision-making	Committee discussion
5:00 - 5:30	Summary and discussion of agenda for May 10	Dr. Barton H. (Buzz) Thompson, Jr.
5:30	Adjourn	

May 10, 2006

8:30 - 8:35	Opening of Meeting	Dr. Angela Nugent, EPA, SABSO
8:35 - 9:05	Presentation from subcommittee focusing on valuation for local decision making	Dr. Gregory Biddinger Dr. Geoffrey Heal
9:05 – 9:20	Agency Comment	Mr. David S. Nicholas Office of Solid Waste and Emergency Response
9:20 – 10:30	Committee Discussion	
10:15 – 10:30	Break	
10:30 - 11:15	Continued discussion of valuation for local decision making	
11:15 - 12:00	Discussion of next steps related to Subcommittee work and development of the C-VPESS Applications Report	
12:00 - 1:00	Lunch	
1:00 – 2:00	Discussion of development of C-VPESS Methods Report	Dr. Barton H. (Buzz) Thompson, Jr. Committee discussion
2:30 - 3:00	Discussion of next steps related to the Methods Report	Dr. Barton H. (Buzz) Thompson, Jr. Committee discussion
3:00	Adjourn	

Attachment D:
Presentation by Dr. Harold Mooney, "Introduction to the Aquaculture Rule Source Example"

Slide 1

Aquaculture National Rule

I. Introduction
The nature of the industry
What is the rule
What the rule did not cover
II. Environmental stressors potentially controlled by the rule
III. Identify and quantify ecological impacts
Enumerate individual effects and effects metrics
Modeling system effects
IV. What matters to people
V. Estimate values in non-monetary terms
VI. Estimate monetary values
VII. Cross-cutting issues—who assigns ecological values
VIII. Data quality and uncertainty
IX. What are other nations doing in rule making?

Our draft is an annotated outline as requested. We hope that the discussion here will guide us to a final outline and give us guidance on the report.

Slide 2

Global Overview of Aquaculture—Big and Growing

World fisheries production and utilization

	1998	1999	2000	2001	2002	2003[1]
	(million tonnes)					
PRODUCTION						
INLAND						
Capture	8.1	8.5	8.7	8.7	8.7	9.0
Aquaculture	18.5	20.2	21.3	22.5	23.9	25.2
Total inland	**26.6**	**28.7**	**30.0**	**31.2**	**32.6**	**34.2**
MARINE						
Capture	79.6	85.2	86.8	84.2	84.5	81.3
Aquaculture	12.0	13.3	14.2	15.2	15.9	16.7
Total marine	**91.6**	**98.5**	**101.0**	**99.4**	**100.4**	**98.0**
TOTAL CAPTURE	87.7	93.8	95.5	92.9	93.2	90.3
TOTAL AQUACULTURE	30.6	33.4	35.5	37.8	39.8	41.9
TOTAL WORLD FISHERIES	118.2	127.2	131.0	130.7	133.0	132.2

FAO 2002 World Review of Fisheries and Aquaculture

Slide 3

US Aquaculture Trends—A bit player

Total tons US production, 606,549 tons

World tonnage is 419,000,000 tons

Catfish and molluscs are the bulk—neither covered by rule

http://www.fao.org/figis/

Total Metric tons

Species	2000	2001	2002	2003	2004
Crustaceans					
Crabs, sea-spiders	488	501	121	249	46
Freshwater crustaceans	7 713	13 501	27 670	33 547	31 954
Shrimps, prawns	2 163	3 564	4 026	4 577	4 731
Crustaceans	10 364	17 566	32 026	38 373	36 740
Diadromous fishes					
Miscellaneous diadromous fishes	5 062	4 948	4 758	5 192	5 216
Salmons, trouts, smelts					
Arctic char	65	75	44	40	38
Atlantic salmon	22 395	20 759	12 734	16 315	15 127
Rainbow trout	26 837	25 913	24 696	23 005	24 937
Sea trout	0	0	9	0	1
Salmons, trouts, smelts	49 297	46 857	37 477	39 360	40 103
Diadromous fishes	54 349	51 803	42 235	44 552	45 319
Freshwater fishes					
Carps, barbels and other cyprinids					
Bighead carp	2 005	2 005	9	0	0
Common carp	0	0	9	29	29
Cyprinids nei	6 330	6 330	6 329	6 329	6 329
Carps, barbels and other cyprinids	8 335	8 335	8 329	8 358	8 358
Miscellaneous freshwater fishes					
Channel catfish	269 257	270 948	286 039	300 056	285 970
Miscellaneous freshwater fishes	269 257	270 948	286 039	300 056	285 970
Tilapias and other cichlids	8 051	9 951	9 000	9 000	9 972
Freshwater fishes	286 643	287 232	301 368	318 414	301 400
Marine fishes	0	0	9	11	1 373
Molluscs	106 689	122 463	121 717	146 979	221 717
metrica	456 045	479 254	497 346	544 329	606 549

Slide 4

Value gives a different picture for marine aquaculture—salmon the big player

1998 U.S. Aquaculture Production

Value of Prominent Farmed Marine Animals by Key-producing States

Salmon
Maine $64.1 million
Washington State $30 million

Oysters
Washington State $14.1 million
Oregon $1.9 million
California $1.3 million
Massachusetts $1.1 million

Clams
Washington State $12.1 million
Connecticut $12 million[2]
Virginia $11 million
Florida $9.5 million

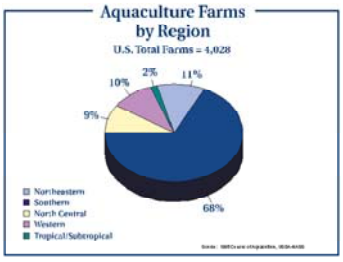
Shrimp
Texas $8.4 million
Hawaii $1.7 million

[2]Estimated; exact figures are not available due to confidential data.

The major marine animals farmed in the United States are salmon, clams, oysters, and shrimp. The 1998 production of these organisms is recorded here as the value of the farmed product in millions of dollars.

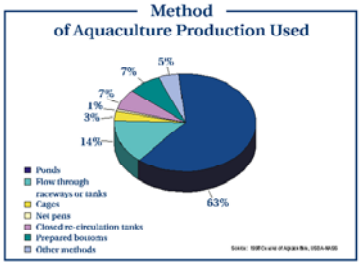
Marine Aquaculture in the United States, Goldburg, et al. Pew Ocean Commission

Slide 5

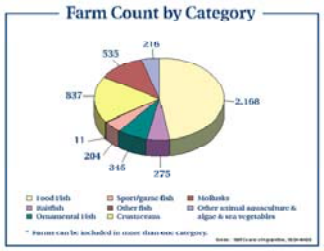


The above was 1998 census, surely larger now. The rule covered 242 facilities only of which 101 are commercial

Slide 6



Slide 7



Slide 8

The Clean Water Act

(33 U.S.C. 1251 et seq.) This law gives EPA the authority to issue National Pollution Discharge Elimination System (NPDES) permits for "point sources" of discharges, including effluent from "concentrated aquatic animal production facilities."

The Clean Water Act also gives the Army Corps of Engineers (ACOE) authority to grant "Section 404" permits to aquaculturists who want to convert areas defined as wetlands to aquaculture ponds or other facilities.

Goldburg et al., 2001 Pew Commission Report, Marine Aquaculture in the United States

Slide 9

Final Rule Fact Sheet

The final rule applies to direct discharges of wastewater from these existing and new facilities:

Facilities that produce at least 100,000 pounds of fish a year in flow-through and recirculating systems that discharge wastewater at least 30 days a year (used primarily to raise trout, salmon, hybrid striped bass and tilapia).

Facilities that produce at least 100,000 pounds a year of fish in net pens or submerged cage systems (used primarily to raise salmon).

http://www.epa.gov/guide/aquaculture/fs-final.htm

Slide 10

The target of the rule thus is particularly relevant to only a few regions of the country

Slide 11

The final rule—It is basically conform to Best Management Principles

The rule requires flow through and recirculating discharge facilities to minimize the discharge of solids such as uneaten feed, settled solids, and animal carcasses.

The rule requires open water system facilities to:

Use active feed monitoring and management strategies to allow only the least possible uneaten feed to accumulate beneath the nets.

Properly dispose of feed bags, packaging materials, waste rope, and netting.

Limit as much as possible wastewater discharges resulting from the transport or harvest of the animals.

Prevent the discharge of dead animals in the wastewater.

http://www.epa.gov/guide/aquaculture/fs-final.htm

Slide 12

The final rule

The rule requires that all applicable facilities:

Prevent discharge of drugs and pesticides that have been spilled and minimize discharges of excess feed.

Regularly maintain production and wastewater treatment systems. Keep records on numbers and weights of animals, amounts of feed, and frequency of cleaning, inspections, maintenance, and repairs.

Train staff to prevent and respond to spills and to properly operate and maintain production and wastewater treatment systems.

Report the use of experimental animal drugs or drugs that are not used in accordance with label requirements.

Report failure of or damage to a containment system.

Develop, maintain, and certify a Best Management Practice plan that describes how the facility will meet the requirements.

http://www.epa.gov/guide/aquaculture/fs-final.htm

Slide 13

Looking at the big areas covered by the rule

Trout Farming in the US

"Idaho ranks first in the nation in production of food-size trout, producing **three-quarters of the nation's supply** at about 30 fish farms along the Snake River near Hagerman. The fish farms receive a continual supply of cold, clean spring water."

They sold 38 million pounds (17,200 mt) of trout worth $30 million in 2002

info.ag.uidaho.edu/.../ fish_research.html

Slide 16

http://www.ieer.org/sdafiles/vol_10/10-1/farmer.html

Slide 15

Why is Hagerman Valley such a good trout site?

Known as 1000 Springs, this area is supplied with artesian water from the Snake River Plain Aquifier, a 10,000-square-mile underground reservoir. The water is filtered as it flows through porous rock and cinders.

http://www.idahomonks.org/ourarea.htm

Slide 16

Idaho trout farm-pumped water goes down into Snake River in a flow-through system

www.visualsunlimited.com/.../ vu212/vu212727.html

Slide 17

Slide 18

Two More Idaho Fish Farms Demand their Full Water Rights
by Associated Press
Capital Press, November 21, 2003

"The trout farms have targeted dairies, irrigators and industries with water rights newer than their rights, which date back to the mid-1960s. The crisis was created by three straight years of drought."

In 2000, Idaho used about 1,970 million gallons of water per day to grow trout

http://ga.water.usgs.gov/edu/qausage.html

Thus aquaculture impacts are more than effluents going into the water—also inputs--regional not national issue

Slide 19

The Klamath all over again

"Idaho Water Resources Director Karl Dreher has told 750 farmers, businesses and cities he will order them to shut down 1,300 wells April 1 if they cannot produce 26,500 acre-feet of water to make up for lost spring water. Up to 111,000 acres of Idaho farms would be dried up, more than 125,000 dairy cattle would lose their water, several food processing plants would be closed, and 14 small cities would be shorted water if he follows through".

Rocky Barker
The Idaho Statesman
March 14, 2004

Slide 20

Even though water purity is not a big issue--

Infectious hematopoietic necrosis virus

Infectious hematopoietic necrosis virus (IHNV) is a rhabdovirus which infects salmon and trout and may cause disease with up to 90 % mortality. In the Hagerman Valley of Idaho, IHNV is endemic or epidemic among numerous fish farms and resource mitigation hatcheries.

It is likely that there were 2 historical events in which Hagerman Valley IHNV types were introduced and became established in the lower Columbia River basin. However, HV is not a continuous source of waterborne virus infecting salmonid stocks downstream.

Garver, K. A., R. M. Troyer, and G. Kurath. 2003. Two distinct phylogenetic clades of infectious hematopoietic necrosis virus overlap within the Columbia River basin. Diseases of Aquatic Organisms **55**:187.
Troyer, R. M., and G. Kurath. 2003. Molecular epidemiology of infectious hematopoietic necrosis virus reveals complex virus traffic and evolution within southern Idaho aquaculture. Diseases of Aquatic Organisms **55**:175.

Slide 21

Salmon farms in limited areas in the US

Again, local impacts at present

Goldburg et al., 2001 Pew Commission Report, Marine Aquaculture in the United States

Slide 22

April, 2006 Senate Bill Hearing

"The hearing was the first look by the committee at the administration's proposal to increase fish farming five-fold over the next decade.
The plan calls for the National Marine Fisheries Service (NOAA Fisheries) to develop a permit system to allow fish farming in the 3.4 million square mile Exclusive Economic Zone (EEZ), which extends from three to 200 miles off the U.S. coast.
Permits for fish farms would be granted with 10-year renewable leases under the plan, which was introduced as legislation by Senators Ted Stevens, an Alaska Republican, and Daniel Inouye, a Hawaii Democrat"

Environment News Service
April 10, 2006

Slide 23

Catfish farm in Mississippi

Aerial view of catfish ponds in Humphreys County, the county with the most water acres in catfish production in Mississippi -- 20,600 water acres in 2005. Photo The Catfish Institute

Slide 24

The Rule had an impact before it was even finalized. Make a threat and they will respond

"The United States Environmental Protection Agency recently announced the decision to develop nationally applicable discharge standards for aquaculture. Mississippi State University scientists at the National Warmwater Aquaculture Center in Stoneville, Mississippi, responded by evaluating a simple environmental management system to reduce the amount of waste produced within catfish ponds and decrease the volume of water discharged from ponds. After 2 years of study, average mass discharge of total nitrogen, phosphorus, suspended solids, and 5-day biochemical oxygen demand has been reduced by over 80% in ponds managed with the system. Catfish farmers can easily adopt these practices, which will allow catfish farms to be operated with little or no impact on the environment. "

http://www.ars.usda.gov/research/programs/programs.htm?np_code=106&docid=1754

Slide 25

Our Outline (continued)

II. Environmental stressors potentially controlled by the rule

III. Identify and quantify ecological impacts
- Enumerate individual effects and effects metrics
- Modeling system effects

Slide 26

Identifying Stressors

- The rule background document does a pretty good job of this
- There are many other attempts to do this by other groups.
- NOAA is intensively studying this issue at present because of various pressures (import/export imbalance, alleged consumer pressure, etc)
- A good example from NOAA follows, but directed at marine aquaculture. We do our own in the outline.

Slide 27

Table 3. Categorization of observed or perceived effects associated with marine fish aquaculture, and the identifiable sources of the stressor.

Effects	Sources
1. Increased organic loading	• Particulate organic loading ◦ Fish fecal material ◦ Uneaten fish feed ◦ Debris from biofouling organisms ◦ Decomposed fish mortalities on the farm • Soluble organic loading ◦ Dissolved components of uneaten feed ◦ Harvest wastes (blood)
2. Increased inorganic loading	• Nitrogen and phosphorus from fish excretory products • Trace elements and micronutrients (e.g., vitamins) in fish fecal matter and uneaten feed
3. Residual heavy metals	• Zinc compounds in fish fecal material • Zinc compounds in uneaten feed • Copper compounds in antifouling treatments
4. The transmission of disease organisms	• Indigenous parasites and pathogens • Exotic parasites and pathogens
5. Residual therapeutants	• Treatment by inoculation • Treatment in feed • Treatment in baths

NOAA Technical Memorandum NMFS-NWFSC-71
Guidelines for Ecological Risk Assessment of Marine Fish Aquaculture December, 2005

Slide 28

6. Biological interaction of escapes with wild populations	• Unplanned release of farmed fish • Unplanned release of gametes and fertile eggs • Cross infection of parasites and pathogens • Planned release of cultured fish for enhancement or ranching
7. Physical interaction with marine wildlife	• Entanglement with lost nets and other jetsam • Entanglement with nets in place, structures, and moorings, etc. • Attraction of wildlife species (fish, birds, marine mammals, reptiles) • Predator control
8. Physical impact on marine habitat	• Buoyant fish containment structures and mooring lines • Anchors and moorings
9. Using wild juveniles for grow-out	• Harvest of target and nontarget species as larvae, juveniles, and subadults
10. Harvesting industrial fisheries for fish feed	• Increased fishing pressure on the shoaling small pelagic fish populations

Slide 29

The outputs of the biophysical analysis, other than water quality and movement, relate to the genetics and population biology of the target and non-target organisms at all trophic levels, including their toxic accumulations

The end points identified in these guidelines for protection from marine fish aquacultu activities may include:

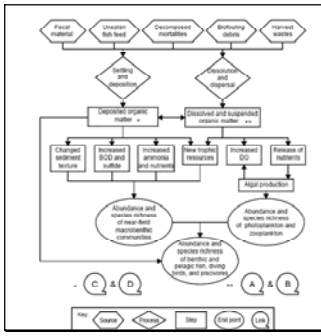
- the species richness and abundance of the seston, nekton, or infauna,
- the abundance of a specific species in the seston, nekton, or infauna,
- the species richness and abundance of the epifauna,
- the abundance of a specific species in the epifauna,
- the abundance of a specific species of marine mammal, reptile, or bird,
- the immune resistance of demersal and pelagic fishes,
- the number and fitness of the natural (conspecific) population,
- the fitness of another fish population, and
- the abundance of the industrial fisheries.

NOAA Technical Memorandum NMFS-NWFSC-71
Guidelines for Ecological Risk Assessment of Marine Fish Aquaculture December, 2005

Slide 30

A couple examples of conceptual models of individual categories of system inputs—these are given as text in our outline

Slide 31



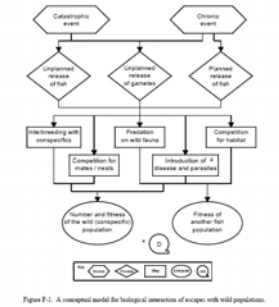
Organic matter inputs

Also diagrams for nutrient and drug flows

Slide 32

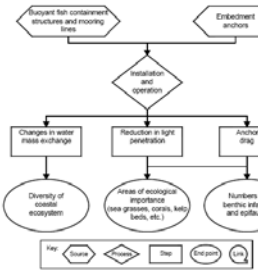
Parasites and Pathogens

Slide 33



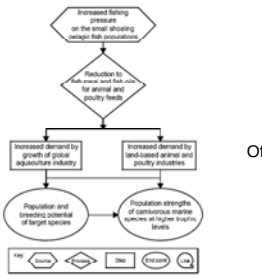
Escapes

Slide 34



Habitat modification

Slide 35



Off-site impacts (feed)

Slide 36

Then quantifying the impacts in terms that can be used for valuation

The rule utilized one impact model that was easiest to parameterize and to use in valuation--QUAL2E

Slide 37

The EPA Analysis

What was monetized

Water quality improvement of non-pen systems
Recreational use

Slide 38

QUAL2E

The model's strength is its ability to estimate the interactions among nutrients, algal growth and dissolved oxygen.

The major drawback of the model is that it is not capable of, for instance, ascertaining the impacts of TSS, metals, organics, etc. on the benthos and the resulting cascading effects on aquatic communities. There does not appear to be imbedded biological linkages and feedback loops that could allow detailed evaluations of the impact of all CAAP contaminants on the structure and function of receiving water's ecosystems

Slide 39

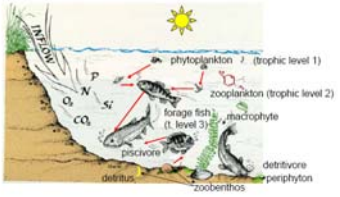
AQUATOX—A more comprehensive integrated model with a long history of application mainly for toxic bioaccumulations

- **Simulation model that links pollutants to aquatic life**
- **Integrates fate & ecological effects**
  - **fate & bioaccumulation of organics**
  - **food web & ecotoxicological effects**
  - **nutrient & eutrophication effects**
- **Predicts effects of multiple stressors**
  - **nutrients, organic toxicants**
  - **temperature, suspended sediment, flow**
- **Can be evaluative (with "canonical" or representative environments) or site-specific**
- **Distributed by US EPA**

AQUATOX Training Workshop Web Edition Release 2.1

Slide 40

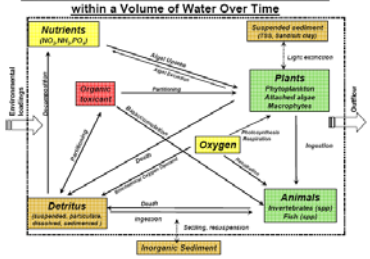
Ecosystem components



AQUATOX Training Workshop Web Edition Release 2.1

Slide 41

AQUATOX Simulates Ecological Processes & Effects within a Volume of Water Over Time



AQUATOX Training Workshop Web Edition Release 2.1

Slide 42

Value added of AQUATOX

- Process-based approach yields better understanding of system, and therefore how to determine management measures
  - Feedback loops, indirect effects
  - Trophic cascade *(e.g..grazers on periphyton)*
  - Multiple factors affecting ecosystem responses *(e.g., nutrients and TSS)*
- Get more bang from monitoring buck
  - Fill in gap between sampling periods
  - Identify most sensitive variables

AQUATOX Training Workshop Web Edition Release 2.1

Slide 43

Challenges

- It's hard!
  - Complexity of model reflects the complexity of the ecosystem
  - Some processes omitted or imperfectly understood
- Calibration & parameterization are probably hardest task
- Data requirements
  - Continue to expand data libraries
  - Use uncertainty analysis to identify sensitive parameters and data needs

Directly from AQUATOX Training Workshop Web Edition Release 2.1

Slide 43

Challenges

- It's hard!
  - Complexity of model reflects the complexity of the ecosystem
  - Some processes omitted or imperfectly understood
- Calibration & parameterization are probably hardest task
- Data requirements
  - Continue to expand data libraries
  - Use uncertainty analysis to identify sensitive parameters and data needs

Directly from AQUATOX Training Workshop Web Edition Release 2.1

Slide 44

Some important responses from EPA

- Used a water quality model for assessment (Qual2E) since the available ecological impact model was too expensive, and time-consuming to run (Aquatox)
- Could not quantify impacts of rule on reductions and consequences of smaller loads of drugs and chemicals discharges, nor impacts of reductions of escapes
- Plea for tools for valuation of non-monetary benefits
- Plea for justification of doing benefits valuation
- Need representative rivers, lakes, etc, just as they have representative facilities to use for analysis

Slide 44

Some important responses from EPA

- Used a water quality model for assessment (Qual2E) since the available ecological impact model was too expensive, and time-consuming to run (Aquatox)
- Could not quantify impacts of rule on reductions and consequences of smaller loads of drugs and chemicals discharges, nor impacts of reductions of escapes
- Plea for tools for valuation of non-monetary benefits
- Plea for justification of doing benefits valuation
- Need representative rivers, lakes, etc, just as they have representative facilities to use for analysis

Slide 45

The other guerillas-NOAA

1. Establish a comprehensive regulatory program for the conduct of marine aquaculture operations;

2. Develop appropriate technologies to support commercial marine aquaculture and enhancement of wild stocks;

3. Establish and implement procedures for the environmental assessment and monitoring of marine aquaculture activities;

4. Conduct education and outreach activities to establish a well informed public on marine aquaculture; and

5. Meet international obligations to promote environmentally sustainable practices for the conduct of marine aquaculture.

Then there is FDA, USFWS, Corps of Engineers

Slide 46

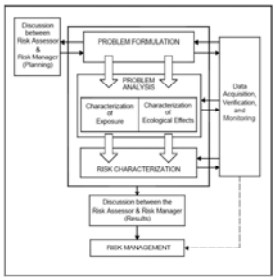


Figure 1. The WHO framework for ecological risk assessment.

Slide 47

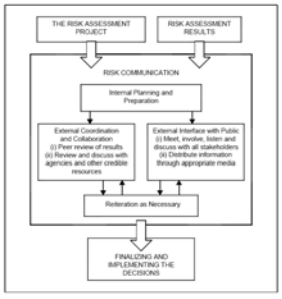


Figure 2. The process of risk communication for the project and the results.

Slide 48

Selected Measures of Biological Impairment*

- **Algae**
  - **high chlorophyll**
  - **lower Secchi depth**
- **Macrophytes**
  - **density**
  - **biomass changes**
- **Invertebrates**
  - **assemblage changes**
- **Fish**
  - **% piscivores**
  - **% omnivores**
  - **tissue contaminants**

***Lake & Reservoir Bioassessment & Biocriteria (EPA 841-B-98-007)**

AQUATOX Training Workshop Web Edition Release 2.1

Attachment E
Presentation by Drs. Stephen Polasky and Ann Bostrom, "Chicago Wilderness Source Example"

Slide 1

Chicago Wilderness Source Example

CHICAGO WILDERNESS

Slide 2

Subcommittee Members

- Ann Bostrom (Co-lead)
- Jim Boyd
- Denny Grossman
- Lou Pitelka
- Steve Polasky (Co-lead)
- Paul Risser
- Holmes Rolston
- Joan Roughgarden
- Buzz Thompson

Slide 3

Introduction to Chicago Wilderness

- The Chicago Wilderness consortium is an alliance of more than 180 public and private organizations that have as their common goal

"…to restore the region's natural communities to long-term viability, enrich local residents' quality of life, and contribute to the preservation of global biodiversity."

Slide 4

Role of EPA

- EPA Region V is one of the member organizations
- Collaborative partnership
- No explicit regulatory or permitting function

Slide 5

Possible Uses of Valuation

- To inform decisions on where to establish green infrastructure and prioritize the acquisition of land
- To assess the value ecosystem services related to clean water
- To assess the relative value of conventional vs alternative development
- To help put a value on green infrastructure, biodiversity and open space that can be communicated to the public

Slide 6

Decision Context: County Open Space Referenda

- Voters in several counties passed referenda authorizing bonds for Forest Preserve Districts to purchase land for the purposes of preserving open space:
  - DuPage County - $70 million (1997)
  - Kane County – $70 million (1999)
  - Will County – $70 million (1999)
  - McHenry County - $50 million

Slide 7

Valuation Exercise

- What lands should be purchased, or what management actions should be undertaken, to maintain or restore natural communities, given a bond issue of $50 or $70 million?
- What actions would generate the greatest value of preserving ecosystems or services?
- Note: this is the type of question that Chicago Wilderness and its members have only begun to think about trying to answer (to the best of our knowledge)

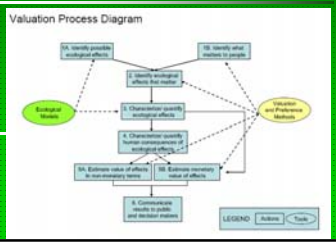
Slide 8

Valuation Exercise

- For purposes of this exercise we decided to concentrate on four issues (services??)
  - Species conservation
  - Ecological systems conservation
  - Water quantity
  - Open space

Slide 9

Issues Raised
(organized by the valuation process diagram)



Slide 10

Identify Ecological Effects that Matter (1 & 2)

- How are important ecological effects determined?
  - Concerns of member organizations
  - Workshops of experts and the interested public
  - Focus (filter?) of biodiversity preservation
- In at least some regards this procedure exemplifies participative valuation approaches described in the methods report
- Would a different scoping procedure be needed to address the question of what actions would generate the greatest value of preserving ecosystems or services?

Slide 11

Characterize/Quantify Ecological Effects (3)

- Extensive data collection – over 190 GIS data layers (p. 27)
- Data alone are not sufficient – also need a spatially explicit modeling approach that can predict ecological effects of possible strategies

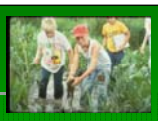
Slide 12

Species and Ecological System Conservation

1. Identify the biological, ecological and ecosystem service targets
2. Define standards that represent a viable occurrence for each target, and for valuing the relative quality of each of these occurrences.
3. Define standards for measuring the range wide conservation status of each target.
4. Create a 'conservation value layer' for each target that represents the conservation status of the element and the viability/service value of each occurrence.
5. Create a 'conservation value summary' that represents the composite values of all conservation targets.
6. Establish the targets, goals and values for one or more stakeholder groups.
7. Map current land uses, policies, threats, economic values, and compatibilities across the project landscape.
8. Analyze and optimize spatial solutions across the project area that address stakeholder goals and provide a clear delineation of priority actions.

Slide 13

Water Quantity



- Minimize flooding
  - Identify areas with flooding potential
  - Quantify reduction in flooding potential with conservation actions
- Maintain or increase groundwater recharge
  - Percolation and runoff rates
  - Quantify changes in these rates with conservation actions
- Maintain or increase wetland communities

Slide 14

Characterize/Quantify Human Consequences of Ecological Effects (4)

- Translation of ecological effects into ecosystem services
- Species and ecological systems conservation:
  - Preserve global gene bank (global rarity)
  - Recreation (bird watching)
  - Moral or religious reasons (stewardship)
- Water quantity
  - Flood control
  - Groundwater availability
  - As a supporting service for species or ecological system conservation
- Open space
  - Recreation
  - Aesthetics
  - As a supporting service for species or ecological system conservation

Slide 15

Estimating Monetary Value of Effects (5b)

- Little attempt to date to estimate the monetary value of effects
- Kosobud (1998): stated preference study on willingness-to-pay for "wilderness recovery and extension activities in the Chicago region"

Slide 16

Species and Ecological System Conservation

- Stated preference choice experiments: contingent valuation or conjoint analysis
- Deliberative valuation and citizen juries
- Question: are stated preference methods sufficient given that stewardship, moral/religious reasons were often the main motivation for species conservation?

Slide 17

Water Quantity

- Flood control: avoided damages approach
- Examples in Illinois:
  - Salt Creek Greenway (Illinois Department of Conservation, 1993; USACE, 1978)
  - Cook County estimated value of regional floodwater storage was $52,340 per acre (Forest Preserve District of Cook County Illinois, 1988)
- Groundwater availability: ex situ value of water

Slide 18

Open Space

- Hedonic property price approach: measure the change in value of nearby residential properties
- Travel cost: measure the value of recreation opportunities
- Stated preference (e.g., Kosobud 1998)
- Voting on open space referenda
  - Trust for Public Land data set on open space referenda across the country

Slide 19

Estimating Non-Monetary Value of Effects (5a)

- Tradeoffs of biophysical measurements/indicators
  - Group processes
    - Expert driven or initiated (NatureServe approach)
    - Expert and non-expert driven (mediated modeling)
    - Non-expert initiated (value-focused thinking and decision support approach)
  - Surveys
- Intensity of attitudes
  - Individual surveys and interviews
  - Group processes

Slide 20

Communicate Results to Public and Decision-makers (6)

- What are the most effective ways to communicate results?
- Is it better to report information in terms of biophysical units
  - Species conserved or amount of open space
- - or biophysical processes
  - Visual or narrative representations of causal processes
- Is it better to report information in terms of a common metric
  - Value of species conserved or value of open space

Slide 21

Cross-cutting Issues

- Uncertainty
  - Focus on specific ecosystem services and evaluate changes in them
  - Maximize learning or maximize expected value?
- Benefits transfer
- Scale and scope

Attachment F:
Presentation by Dr. Gregory Biddinger, "Use of Valuation for Local Decisions; Source Example Analysis Superfund Decisions"

Slide 1

Use of Valuation for Local Decisions

Source Example Analysis
Superfund Decisions

Slide 2

Purpose of Analysis

- Test utility of CVPRESS process model and associated methods (valuation and ecological production models) to support the USEPA in local decision-making
- USEPA Local decisions include:
  - Clean Water and Clean Air act permit decisions
  - RCRA Waste disposal permits
  - TMDL for watersheds (borders on regional)
  - Contaminated property actions (CERCLA , Brownfield initiatives)
- Workgroup decided to focus on contaminated property decisions

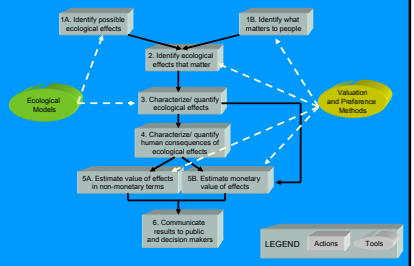
Slide 3

Selection of Source Example

- Evaluated two primary sources of information for contaminated properties
- Matt Wilson White Paper on Ecological Benefits from Superfund redevelopment
- Region V – Sustainable Brownfields Initiative – *Greening Milwaukee*
- Based on level of available information and completeness decided to go with Wilson (2005) study
- Wilson 2005 – reviewed 39 potential cases and selected 3 principally with intent of representing Urban, suburban and exurban cases.
- Three cases
  - Urban: Charles George Landfill – Virginia
  - Suburban: AVTEX Fiber, Port Royal, Virginia
  - Exurbal: Leviathan Mine, California

Slide 4

Valuation Process Diagram



Slide 5

Initial Mapping - Superfund to CVPESS

Initiation (Identification of site)	1A. Identify possible Ecological effects 1B Identify What Matters to people 2. Identify Ecological Effects that matter to people *Captures the value of site to community*
Assessment (s) (PA/SI , HRS, NPL Listing, RI/RS)	3. Characterize the ecological effects that matter 4. Characterize / quantify human consequences 5A. Estimate value of effects in non-monetary terms 5B. Estimate value of effects in monetary terms Aligns risk assessment and benefits assessment
Decision (ROD, RD/RA)	*Allows comparison of alternative remedial designs* 6. Communicate results to public and decision makers
Clean-up	
Closeout	
Post-construction (LTRA)	*Use ecosystem services as a focus of performance*
Restoration/reuse/re-engineering (SRI)	6. Communicate (actual) results to public and decision makers

Slide 6

Revised Mapping - Superfund to CVPESS

Initiation	
Assessment (s) ***CVPESS Process run both as a preliminary screen and refined assessment***	1A. Identify possible Ecological effects 1B Identify What Matters to people 2. Identify Ecological Effects that matter to people ***Captures the value of site to community*** 3. Characterize the ecological effects that matter 4. Characterize / quantify human consequences 5A. Estimate value of effects in non-monetary terms 5B. Estimate value of effects in monetary terms **Aligns risk assessment and benefits assessment**
Decision ***repeating 5A and 5B for each alternative***	***Allows comparison of alternative remedial designs base on relative benefits*** 6. Communicate (expected) results (benefits) …..
Clean-up	6. Communicate (expected) results (actions)…..
Closeout	6. Communicate (completed) results (actions)…..
Post-construction	***Ecosystem services as a focus of performance***
Restoration/reuse/re-engineering	6. Communicate (actual) results (Benefits) …..

Slide 7

Example #1 – Charles George Landfill

- Driver – Urban Landfill near Lowell MA, contaminated community groundwater service
- Early Superfund Model (1988) -
  - Focus on Human Safety and Human Health – Drinking water
  - Ecological concerns triggered by "sensitive habitats" in HRS analysis and superfund process.
  - **Remedial action**: (1) Replace source of drinking water service; (2) 60 acre synthetic cover to control penetration of rainwater
  - Creation of Ecological Service not consider in remedial design
  - Subsequently Restoration Plan developed – CG Natural Resource Trustee Council
- Counter-point Example – Dupage (Illinois, Landfill) – Mount Hoy
- Similar site in Illinois resulted in dramatically different outcome
- Developed redevelopment plan with recreational service in mind
  - Created lakes for boating, trails for hiking and biking, community picnic areas
  - Best spot in Chicago area for watching hawks

Slide 8

Charles George – Methodological Learnings

- HRS listing process doesn't consider non-sensitive Environments
- Agency separates Human Health protection and ecological service; led to missed opportunity in the Charles George example
- Ecological Services need to be considered upfront in light of desired future-use of the site
- Ecological considerations in redevelopment should go beyond concern for sensitive environments
  - Protection of organisms is difference then protection of peoples access to nature
- Site management team should include representation for ecological services
- Structured decision-making processes with ability to address multiple objectives would inform process
  - McDaniels et. al 1999, Gregory et. al. 2000, Arvai and Gregory, 2003
- Open Questions
  - What was the cause of different outcome for Dupage and Charles George sites? Different process? Community values recognized?
  - Would stakeholder group be willing to trade-off marginal risks for ecological service?

Slide 9

Example #2 – AVTEX Fibers

- 400 acre site along Shenandoah River located within municipal boundaries of Front Royal VA,
- Historically used for agriculture(1920's) and Rayon and synthetic fiber manufacturing (1940's – 1989)
- Proximity to residential areas; prep school and major recreational areas (Skyline drive, Appalachian Trail)
- **Ecological Condition** – 1.5 miles of waterfront; upland juniper and floodplain forests present, property used migratory birds and butterflies; notable presence of wildflowers and hummingbirds
- **Contamination**- Chemical Soup – Carbon disulfide, sodium, phenol, Heavy Metals (Pb, As, Cd) and PCB's
- **Redevelopment focus**
  - 240 acre river conservancy – Ecological restoration/Habitat conservation
  - 165 acre Eco-Business Park – includes refurbish AVTEX admin building
  - 25 acre active recreation park – picnic areas, soccer fields and boat landings

Slide 10

AVTEX Fibers – Methodological Learning's

- Followed Superfund Process to analyze example
- Initiation – Not clear how were or could be represented in nomination process
- Assessment – *Preliminary Assessment/ Site Inspection (PA/SI)*
  - Include all components of CVPESS in screening analysis
  - Ecological and social scientists integrate conceptual models and develop preliminary eco production models to link ecological changes with ecological service flows of potential value to community
  - HRS – If wanted to test the risk of listing or not then could include ecological-social value models in HRS analysis
- Assessment – *Remedial Investigation/Feasibility Study (RI/FS)*
  - Include all components of CVPESS in refined analysis
  - Ecological and social scientists develop integrated models to estimate and compare ecological service values associated with clean-up activities and restoration plans
  - Support results and conclusion communications
  - Assess and compare alternatives in a systematic tradeoff analysis
  - Hedonic pricing models to reveal property value models ;
  - Alternative futures- Conjoint Survey multi-dimensional description of houses

Slide 11

AVTEX Fibers – Methodological Learning's

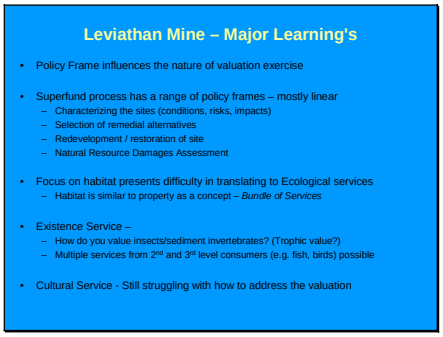
- Decision – ROD and *Remedial Design/Remedial Action* (RD/RA)
  - Comparative runs of ecological production models coupled to ecological services valuation methods could be used to test alternative strategies
  - Inclusion of value estimates would add communication of proposed remedial actions
- Clean-up
  - Measures of change in ecological service benefits associated w/ what matters to community would link risk mitigation to value derived from clean-up actions
- Post-Construction –
  - Use CVPESS system to determine that ecological protection goals and expected ecological service benefits have been achieved.
- Restoration/Reuse/reengineering –
  - If CPESS value process has been integrated in superfund process from the start then redevelopment imitative will result in upgrade in ecological services

Slide 12

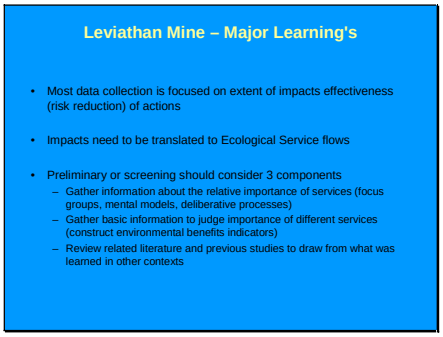
Example #3 – Leviathan Mine

- 235 acres former sulfur mine 23 miles SE of Lake Tahoe, CA
- Surrounded by National Forest; 21 acres of forest impacted
- Contamination – high sulfur acid mine drainage in snowmelt, leaching of heavy metals (As, Cu, Ni, Zi, Cr, Al, FE
- Ecological impacts
  - Degradation of water Quality in Carson River
  - Degradation of ground water
  - Reduction in groundwater discharge
  - Degradation of soils in stream banks and floodplains
  - Reductions in standing stocks of harvestable organisms
- Cultural impacts (Washoe tribe)
  - Reduces harvesting (hunting, pine nuts, fish)
  - Water use (including pine nuts allotment)
  - Ceremonial use of land

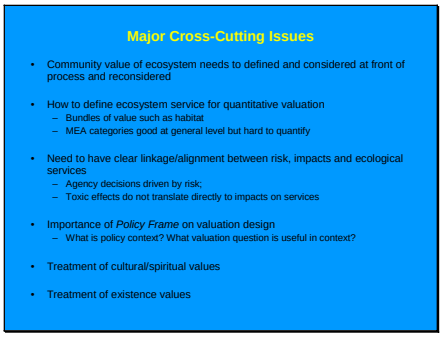
Slide 13



Slide 14



Slide 15



Attachment G:
OSWER Perspectives on Draft Text on Valuation "Source Examples" Prepared by Subcommittees of the SAB Subcommittee on Valuing the Protection of Ecological Systems and Services (C-VPESS), draft May 3, 2006 for SAB C-VPESS Deliberations on May 9-10, 2006

OSWER Perspectives on Draft Text on Valuation "Source Examples" Prepared by Subcommittees of the SAB Committee on Valuing the Protection of Ecological Systems and Services (C-VPESS), Draft May 3, 2006
For SAB C-VPESS Deliberations on May 9-10, 2006

1) Particularly useful aspects of the preliminary draft subcommittee text

- The draft integrates and builds on existing studies to offer a common vocabulary and set of frameworks that anticipate different analytical tasks that EPA will face.
- Growing support for common terms and framework: reinforced at last week's workshop on Ecological Reuse of Contaminated Land by the Wildlife Habitat Council.
- Draft text is also consistent with Interstate Technology and Regulatory Council's draft Guidelines on Ecological Reuse of Remedied Sites
- This draft – and the efforts of this committee – supports the first priority in OSWER's Action Plan: to restore contaminated properties to environmental and economic vitality." The final report will help OSWER's work in revitalizing remediated property and provide analytical tools we can use with state, local and tribal governments where land use decisions are made

2) Areas needing additional information or explanation

- Need to address the issue of double-counting benefits in the context of ecosystem service valuation.
- Early in the draft and in terms clear to non-economists, there should be a clarification of the strengths/weaknesses of the framework.
    - Need to consider Institute of Medicine's report on Valuing Health for Regulatory Cost-Effectiveness Analysis and how analysts can respond
- A focus on groundwater valuation techniques may yield payoffs across several EPA programs (OW, OPPTS, OSWER) and enable EPA to reliably quantify the benefits from protecting this resource.

3) One or two areas that appear problematic and the reasons why

- More consideration of the institutional workings of EPA and stakeholders in decision-making would be useful. Would help set expectations realistically for how far/fast the valuation techniques could be adopted.
- Resources 9time, money, staff) will be limited for the foreseeable future. EPA will need to make strategic investments in this area.

Attachment H:
Draft C-VPESS Report
"Integrated and pro-active approach to V-PESS; choice of methods"

Part One – Valuation of Ecological Systems and Services at EPA

1. Introduction -- "Document Zero" text with expanded discussions of:
    a. Importance of information about values of ecological systems and services (Kathy)
    b. Interrelationship among context, choice of methods, and likely value characterized or assessed (Paul R)
    c. Operationalizing ecosystem services (Jim, Kerry)
    d. People, time, and resource constraints (Kathy) (recognize throughout)

2. A more complete toolbox
    a. Different types of value (Rick, Doug)
    b. Brief characterization of methods (Buzz)
        i. Include discussion of non-monetized methods
    c. Table of methods

3. Applying the approach
    a. Importance of context (Buzz)
        i. Purpose of valuation
        ii. Decision maker
        iii. Role of EPA
        iv. Legal/regulatory/policy framework
    b. Major illustrative EPA valuation settings [include discussion of retrospective assessment and aggregation]
        i. Introduction
        ii. Rulemaking[1] (Rick and Hal)
            1. Aquaculture
            2. CAFO
        iii. Site-specific Decisions[2] (Greg and Geoff)
            1. Superfund Remediation
        iv. Collaborative Decision Making[3] (Steve and Ann)
            1. Partnership with Chicago Wilderness

[1] Comment: What's unique for National rulemaking:
Rulemaking
OMB requirements
Need for aggregation
Importance of non-monetized and non-quantified information
[2] Comment: What's unique for site specific decisions:
Focus on a single site – very specific social and ecological context
Opportunities for applying methods that might not work at national or regional levels
We have to think about benefit transfer—could it offer bottom-up possibilities
[3] What's unique for collaborative Decision Making:
Partnership
No valuation requirements – allows more experimental methods

c. Lessons (Kathy and Buzz)

4. General Valuation Issues and Approaches for Addressing Them
    a. Using valuation for decisions (Steve)
    b. Whose values judged by whom (Terry, Paul)
    c. Data and model bank (Kerry, Bob H)
    d. Uncertainty (Bill and Bob C)
    e. Value Communication (Ann and Joe)

5. Recommendations – to come
    a. Research
    b. Guidance documents
    c. Institutional Recommendation

Part Two - Descriptions of Methods

1. Process diagram with map of methods to different steps
2. Ecological production function models (Greg and Joan)
3. Conservation and Biodiversity methods, HEA (Denny and Greg)
4. Ecosystem benefit indicators (Jim)
5. Socio-Psychological approaches (Terry)
6. Economic methods (Rick, Steve)
7. Survey issues (Terry and Jon)
8. Public and group expressions of social/civic value (Bill and Buzz)
9. Group processes for eliciting value (Bob C and Joe)

Open items

Energy and Material Flow Assessments
Emergy
Net Environmental Benefit Analysis
Survey issues
Issues raised at the workshop