



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
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Note to Members of the SAC Committee on Valuing the Protection of Ecological Systems and Services

From: Angela Nugent, Designated Federal Officer

Please find attached three sets of “informal review comments” requested by the SAB Staff Office, in consultation with the C-VPES Chair and Vice-Chair, to aid the committee in determining revisions to be made to the September 18, 2007 C-VPES report. I requested review comments from three experts who either have served or are currently serving with SAB committees or panels: Dr. Roger Kasperson (Clark University), Dr. Duncan Patten (Montana State University), and Dr. James Opaluch (University of Rhode Island).

The SAB Staff Office requested that they focus their comments on: 1) the reasonableness of the advice and general approach recommended in the report; 2) whether descriptions of valuation methods and their applications contain any technical errors; and 3) whether descriptions of ecological science and its use in valuation contain any technical errors.

There will be a more formal technical review when the chartered SAB conducts a Quality Review of the C-VPES draft, but I hope these comments will provide the committee now with fresh perspectives and insights on the current draft. I am grateful to the reviewers for their willingness to review the draft within the tight time constraints necessitated by the upcoming teleconference and I hope their comments will be useful to you.

Attachments (3)

"Roger Kasperson" <rkasperson@clarku.edu>  
10/10/2007 02:03 PM To  
Angela Nugent/DC/USEPA/US@EPA  
cc

bcc

Subject  
C=VRESS Report

Angela, I have done a fast review of this very substantial report which merits a closer review than I have been able to do in the limited time. But here are some big picture comments to begin.

Some Major Positives.

1. Overall. This is a very high quality study which should be very valuable to the Agency. In particular, I appreciate very much

a. the broad scope of treatment. The narrow scope given in the past to the very range of issues has been perhaps the major deficiency

b. the call for a well-developed conceptual model to ground the Agency's work. It is hard for me to see significant high-quality work on the valuation issues without such a conceptual model. That said, it would be helpful if the Committee could provide more guidance on how such a model could be designed.

c. the discussion of uncertainty is very important and thoughtful. But is also seems somewhat buried in this report. Should it be a separate chapter, or, shortof that, given more visibility? You cannot find it in the Table of Contents, for example.

d. the discussion of methods, supported by the lengthy Appendix, is probably the best treatment currently available anywhere.

e. I also appreciate the Committee's structuring around 3 major domains of EPA work.

2. It may seem strange coming from me, an academic, but I worry a bit about the abstract nature of the report. Despite the Committee's good intentions, I do think the report comes across as quite abstract, and not as pragmatic or applied as it might be. So I wonder how much it will be used. More examples throughout would be helpful and in particular one well worked-out example of a case with the implementation steps recommended on page 39 would be very helpful. A model case showing how the Committee's recommended procedure could be done in one separate chapter would be invaluable. This should include a conceptual model.

3. The big problem in the report, in my view, is Chapter 7, Recommendations and Conclusions. It does not do justice to a fine report. I see it as currently a mish-mash of findings, conclusions, observations, and recommendations. I count 24 bolded items in this chapter and I have no idea whether they are findings, conclusions, or recommendations, or Committee

perceptions. Suggest a substantial rewrite and tightening of this chapter, with clear linkages between any conclusions or recommendations and where the supporting evidence can be found in the preceding chapters. I like a format sometimes used in NAS reports where a numbered conclusion is set forth, a paragraph of justification follows, and then a numbered, related recommendation is stated. Ideally, the numbers of such principal conclusions and recommendations should be perhaps 8-10, not 24. Statements that the Committee "believes" this or that are ambiguous. This chapter needs a major reworking so that it is worthy of a very good report.

Roger



society (e.g., changes in catch and perhaps lifestyle), where the values are defined as in Appendix A of the report.

It might then be useful to use this in organizing and clarifying the potential contribution of various methods discussed in the report. For example, pure bio-physical methods might quantify ecosystem effects and the resultant changes in ecosystem functions, but are unlikely to quantify fully the losses in services to society, and almost certainly are not capable of providing comprehensive measures of losses in social values. Thus, bio-physical methods are essential contributors to analyses of changes in ecosystem values that are the subject of EPA analyses, but are not themselves valuation methods. Thus, bio-physical methods focus on stages (2), (3), and possibly part of stage (4) of the problem as laid out above.

Conversely, social valuation methods are unlikely to be able to resolve complex ecosystem effects, or the resultant changes in biological functions. Rather, these methods focus on stages (4) and (5). Thus, valuation studies clearly require supporting analyses from natural scientists. As is pointed out in the report, the general public often has a poor understanding of the natural systems, and their judgment of the functioning of these systems should not serve as the basis for EPA decisions. I liken this to air travel. I would never fly on a plane that is designed according to a survey of the general public. Rather, I hold greater trust in the expertise of trained engineers.

As an aside, I applaud the statement to that effect on page 19, line 22. It is very important for the Agency to keep mind that, while natural scientists have much to contribute to helping us understand the functioning of ecological systems, the preferences of natural scientists should not dictate social values.

Within this framework, I would argue that public opinions and attitudes elicited from approaches like focus groups are most useful in scoping studies that might identify service flows that are socially important, but are probably less useful quantifying values. For example, Table 7 on page 230 shows a series of questions and importance ratings. While this provides some generic information on public issues of concern, it is unclear how this information could be used to support a specific decision. Should total expenditure of the US Forest Service budget be proportional to these importance ratings? Should the importance rating be used to determine whether or not to develop a particular road? If so, this means that no new roads would be developed in forest and grasslands, since it only has an importance rating of 2.62, while conserving forests and grasslands have an importance rating of 4.73. Thus, while this kind of attitude survey might provide some useful information about general public concerns, the results are not specific enough to answer particular policy questions. So I would argue that the approach might help identify important service flows, but not for quantifying values in a manner appropriate to answer particular policy questions.

I would argue that “values” cannot be expressed on biophysical units, rather ecosystem functions or perhaps service flows might be expressed in bio-physical units (e.g., Page 20, line 8 and lines 11-12). This means that the “valuation” and the ecology must be carried out separately, and both are needed to value ecosystem changes.

A framework of this sort might also allow the committee to place a strengthen the foundation for their recommendation that multiple techniques are complementary, not only because some techniques are more useful than others in identifying particular values, but also because multiple techniques are required to fully quantify many of the individual values.

## (2) Explicit Recognition of Decisions Faced by EPA

I think the report might also have benefited by a more explicit recognition that ecosystem valuation analyses are targeted to answer specific questions faced by EPA. This implies that, at least in some cases, analyses don't necessarily have to be complete to provide the information needed to answer a particular question. To continue the example of Table 7 in the Report, if a policy question is faced on whether to allow logging, and one could show that the lost recreational values alone exceed the net value of logging, one could conclude that logging is not justified without determining all the remaining ecosystem effects. It is important to note, of course, that the converse is not true. But at least in some cases, incomplete information is sufficient to resolve a policy question faced by EPA. It would be inappropriate to expend a large effort to analyze the full suite of values, when the correct decision becomes clear with only a subset of values.

## (3) Report Does Not Give Balanced Criticisms of Methods

The committee has, in some places, taken a very narrow view of the contributions of economics to valuation, and indeed in some cases the report reads like some panel members have a chip on their shoulder regarding economic methods. I believe that the report could be more balanced in its discussion of the strengths and weaknesses of different methods. The report discusses at some length, and in many different places, the perceived shortcomings of economic methods, while by-and-large providing a much less critical eye towards other methods that are presented. For example, throughout the report, it indicates that economic analysis assumes perfect rationality (P16 L27), well-formed preferences (P17 L1), is based solely on anthropocentric values (P79 L13), ignores civic values (P16 L2), reflect only self-interest (P16, L25), values are expressed in monetary terms (P15 L33), require individuals to express values in monetary terms that might be considered offensive (P22 L16), are restricted to monetary values to individuals in their roles as consumers (P194, L21), etc.

Yet, other methods are presented almost uncritically, or at least any criticisms are much more muted and far more difficult to find. This makes the report appear unbalanced—aside from the fact that I don't agree with some of these points (I include more discussion on this later). Although the report mentions some shortcomings of these approaches, it does so in far less obvious and critical terms than it does economic methods. For example, the report discusses methods like citizen juries. Citizen juries have the advantage that participants spend a considerable amount of time studying an issue, thereby potentially educating participants regarding some of the complexities being faced. However, juries have the well-known limitation of being subject to manipulation by eloquent and skillful participants. We are all aware of horror stories of outlandish jury awards. I don't mean to imply that the citizen jury approach should be rejected. Simply that the report does not have a balanced discussion of the strengths and weaknesses of the approach.

Another example is the energy-based methods of valuation, which are presented far more uncritically. The report could have observed that energy analysis is based on the assumption that all forms of (excess) energy are equally valued, independent of their form. So, for example, per unit values of energy used to support microbes or the smallpox virus are same as per unit value of energy that supports humans, blue whales and tigers. Emergy analysis would imply, for example, that there is great value to be obtained by dumping untreated sewage into Lake Tahoe, thereby greatly increase emergy content of that highly oligatrophic lake. Yet, the town of South Lake Tahoe was required by EPA to install very expensive secondary and tertiary treatment methods specifically to avoid increasing biological productivity of Lake Tahoe. Emergy analysis would seem to imply that rapid global warming is of great benefit to the earth, since it will increase the energy content of the global system from which organisms can draw. Thus, global warming could potentially greatly increase emergy content of the global system. Yet, even if this were true, one would not argue EPA policy should encourage increased emissions of greenhouse gases in order to increase global emergy. It would be a great error for EPA policy to be based on emergy analysis. Indeed, emergy analysis would seem to violate everyone one of the Report's key recommendations for valuation, as expressed on pages 57-58. Nevertheless, there have been advocates for emergy analysis within EPA.

Yet criticism of Emergy analysis is difficult to find within the report, and rather muted (albeit fairly damning). Indeed, to the contrary, the report states on Page 18, line 20 that valuation based on energy flows are based indirectly on public preferences. I don't understand the reasoning behind this claim, unless the committee sees energy flows as contributing one part of the problem, such as stage (2) in the framework above.

Although I believe that the analysis of flows of energy and materials through a system can provide useful information, these approaches cannot be viewed as measuring values, as values are defined by the report in Appendix A. A framework such as that discussed in my item (1) above would provide a basis for inclusion of these types of values. Although an accounting of energy and materials flows through ecosystems might provide some useful information about ecosystem functioning, it does not provide a measure of values.

Judgment and attitude based methods are similarly based on assumptions of perfect knowledge, otherwise judgment and attitudes could be equally misleading as economic methods. Although social deliberative process are the basis of democratic society, they are subject to manipulation by a vocal and highly motivated minority, who seek their own personal benefit.

All methods have shortcomings, but the discussion in the first Chapter only points out shortcomings of economic techniques, and not other methods. This does not indicate a balanced review of valuation methods. Citizen-juries have potential, but judgments of juries have well known problems.

#### (4) The Report Adopts a Very Narrow View of Economic Methods

Throughout the report, a very narrow view of economic methods is adopted, assuming economic approaches only use monetary valuation methods. In fact, the foundation of economic approaches to valuation is *preference oriented*, not money, and there is a considerable and rapidly growing body of economic studies that focus on non-monetary means of valuation.

Admittedly, EPA may not have widely adopted the techniques to date, but the report criticizes not EPA's choice of methods (often driven by regulations), but economic methods.

For example, conjoint analysis and other choice-based approaches have been employed by economists for over two decades, and is a rapidly growing area of research. Indeed, choice-based approaches to economic valuation has arguably been the most heavily researched area of economic valuation over the past decade. Choice-based methods are based on the same concept of relative preference over alternative commodities described for attitude and judgment based approaches indicated on Page 17 Line 26. But choice-based economic methods are also consistent with, but do not require, valuation in monetary terms. Similarly, habitat equivalency analysis can also be formulated in a manner that is entirely consistent with economic theory, and use of HEA methods was first suggested by economists, and have been embodied into regulations under the service-to-service equivalency. See, for example, Mazzotta, Opaluch, and Grigalunas, 1993; 1994, Unsworth and Bishop 1994; Matthews et al, 1995.

#### (5) Benefit Transfer

The committee correctly places great attention to benefit transfer methods, given that most valuation analyses carried out by EPA are not based on new primary studies. Given its importance, should the report place greater emphasis on the need for EPA to improve benefit transfer methods. Given that most valuation studies are based on benefit transfer due to limitations in time and cost, how can EPA employ the far more extensive method suggested by the panel? Either we need to think about how non-economic methods can be transferred, or the panel should say strongly that more resources should be allocated to valuation, or most likely, both.

Given its practical importance, I would amply the recommendation that EPA should support research to improve benefit transfer. Should EPA be advised to fund a research program to test transferability of values (economic or otherwise), to design values estimates that are specifically designed to be more reliably transferred, and to estimate values systematically to cover the range of services that EPA must regularly value. This would provide a "catalog" of values that could be transferred. It is also important that these values be regularly updated to stay current and to insure that studies are based on state-of-the-art methods.

Page 91, line 6. I'm not sure I would agree that little attention had been paid to the challenges and limitations of benefits transfer prior to 2000. For example, in 1992 there were three key events focused on benefits transfer. First, NOAA hosted a workshop directed towards developing databases to support benefits transfer, and EPA compiled a bibliography of the NOAA environmental benefits studies. Water Resources Research published a special section that was dedicated to papers addressing key issues related to benefits transfer, and AERE held a workshop entitled "Benefits Transfer: Procedures Problems and Research Needs" funded by US EPA, NOAA and USDA.

#### (6) Defining Non-Anthropocentric Values

I fear it is misguided to base the definition of anthropocentric values on whether something effects human well-being, if "well-being" is broadly defined to include such thing as economic

nonuse values (Page 13, Line 1-2). I fear that this definition makes the distinction between anthropocentric and non-anthropocentric values purely semantic. For example, suppose I hold value for endangered species, and I believe that they should be protected for their own sake. Is my psychic “well-being” affected if a new law is passed which strengthens protection provided to endangered species? According to the report, this is an anthropocentric value if it based on the economic concept of nonuse values since it affects my well-being, but is otherwise nonanthropocentric. In economic theory, if I think something is important, and I am willing to sacrifice for it, then it is modeled as affecting my well-being (utility). It is not possible to determine whether something effects “well-being”, unless well being is defined narrowly to include only direct effects, such as recreation or health effects. If I voluntarily give money to the poor or if I vote for a provision to increase my taxes to support the homeless, am I making myself “worse off”, or am I doing it to improve my psychic well-being because I care about the poor and homeless? I would argue the distinction is purely semantic.

I believe that one could equally well define these actions as increasing one’s own well-being, simply by saying that my well-being includes concern for others. In this case, the distinction between whether or not a voluntary action increases one’s own well being is purely semantic. So the concept of nonuse value could equally well be defined as “anthropocentric” or “non-anthropocentric” depending on whether one accounts for an individual’s concern for other species.

An alternative way of thinking about anthropocentric values is to distinguish between “weakly” non-anthropocentric and “strongly” non-anthropocentric. A weakly non-anthropocentric value is a value that is ascribed to an entity by humans, but that does not relate directly to human use of a natural entity. For example, many people feel strongly that conservation of blue whales, endangered species, unique natural features (e.g., Grand Canyon), free flowing rivers, healthy ecosystems and pristine wilderness, above and beyond any present or future use by the individual or by people in general. This value is non-anthropocentric, in that it does not depend upon the effect of the resource on people, but is weakly non-anthropocentric since the value is ascribed by humans. Thus, the value exists because and only because it is held by people.

A strongly non-anthropocentric value is a value that exists as a Universal Truth, and is beyond determination by people, but rather is imposed on people by some greater Truth. This is underlies the notion of true “intrinsic” values, which are values that an entity holds irrespective of how it related to others, or what is believed by others.

People cannot gain insights into strongly non-anthropocentric values except by seeing “into the mind of the Creator”. This is a form of religion. Of course, it is always possible that individuals believe that non-human species have value endowed by a Creator, which serves as their basis for ascribing value. But the value lies in the beliefs by the members of society, and is not imposed on a society that does not share that belief. Many animal rights extremists would conform to this latter view, that the intrinsic value of all species is a right that should be imposed on society irrespective of the beliefs of the members of society. I would argue that “strongly” non-anthropocentric values are based on religious faith, and should not guide EPA policy.

I think this distinction is important, because I believe that many with a biocentric viewpoint hold to the strong non-anthropocentric value that is a form of religion. Furthermore, this distinction helps to separate out “values” that are based on expert judgment (including preferences of

scientists), rather than social values. Furthermore, with this distinction, nonuse values as defined by economists are weakly non-anthropocentric, and specifically not anthropocentric. I firmly believe that the notion of whether nonuse values contribute to human well-being is not a meaningful one.

Many of the approaches described are just as “anthropocentric” as are economic methods, but this is only pointed out when discussing economic methods. For example, Section 4.1.3 describes “Methods of Attitudes Preferences and Intentions” which are anthropocentric.

I think the term “intrinsic values” is misplaced. An intrinsic value is a value of something in and of itself, without consideration of how others are affected. Humans can hold values for existence of something, but this is not “intrinsic”, but rather the value ascribed to an held by another. In my view, insights into intrinsic values are either purely speculative or obtained by seeing into the mind of a Supreme Being, which is a religious value. EPA should not be driven by religious values. (Top of page 13). (Bottom of page 13). (Bottom of page 14).

## **Review of Draft SAB C-VPES Report “Valuing the Protection of Ecological Systems and Services” Provided by Duncan Patten, Montana State University**

General Comments: This is a comprehensive report that obviously has been written by a team. This results in some wordy sections but perhaps wordiness is appropriate for a difficult topic. The approach taken by the committee seems appropriate, that is, an overview, a general approach with a more specific expansion of steps, overview of existing methods, addressing uncertainties, case studies, and general recommendations. This reviewer could not find what one might consider any fatal flaws in the report, although there are many smaller issues that might be addressed in revision.

The more specific review comments below expand on many marginal notes made during reading of the report. Some of the review comments may seem repetitive but if so, then concern for that particular issue may be greater than others. The comments are based on Chapters and Sections of the Report.

### Chapter 1. Introduction.

Brief and to the point and leads the reader into the body of the report.

### Chapter 2. Conceptual Framework.

A good but somewhat tedious background to ecosystem services and valuation with some good examples and suggestions as to application to EPA.

Some text has suggestions as to valuation of “benefits” but not much mention of costs (e.g., page 7, lines 15-22).

Recognition of boarder aspects of ecosystem services is good as many people only think of direct benefits to humans, not indirect benefits such as ecosystem processes that may result in human benefits. It is also good to bring into the valuation picture intrinsic values versus instrumental values. It is also important to recognize that different individuals and disciplines think of the concept of value differently. Throughout the text, this idea is developed but perhaps might be more emphasized earlier in the text.

Constraints on EPA are recognized (page 25, lines 16-26) but how important are these to overall valuation guidelines if EPA constraints change?

In the Integrated and Expanded Approach, the report focused on EPA where there is an environmental protection decision to be made. Like many other places in this report where decisions are addressed, the process often emphasizes protection but this implies the system is “not broken”. Many other comments on using valuation in the text talk about ecosystem “change”. The committee needs to address the use of the word “change” because in many places (to be pointed out later), what is really being addressed is ecosystem “response” to some action. The response may be “no change”.

Figure 1 (page 32) shows a model that directly ties values to decision making and problem formulation. There should be an additional circle in the model between “values” and “decision making” which would be “analysis of values”. This then leads to final decision making or side tracks to more “problem formulation”.

The “Approach” presented in pages 32-33 does not obviously fit with the conceptual model in Figure 1. The committee should consider another more detailed diagram that depicts the steps used in the “approach”. These are not obvious in Model Figure 1 unless they somehow are combined in “problem formulation”.... This needs to be made clear.

Page 35 the report mentions that ecological models have been developed for purposes other than EPA policy and regulation, usually research. It would be useful here to mention the need to adapt these models or create appropriate models. This is mentioned and recommended later in the chapter.

Page 37 line 10 is a good example of the use of value of “ecological change”. If one uses EISs as examples, there is a “no action” component. This might create no change, or the action itself might create no change, thus using the concept of “ecological response” or “ecosystem response” might be more accurate. In some places the use of “change” is appropriate but the use of this term must be used cautiously.

Figure 2, page 40 shows just one feedback to problem formulation. The committee should consider other feedback loops such as from (4) Projection of Changes in Ecosystem Services to (1) Problem formulation or at any step that might generate new information or concepts. The feedback from (5) Measurement of changes to Problem Formulation is appropriate.

In summary, the approach is designed for integration but the models and discussion appears more linear than it might be.

### Chapter 3: Building a Foundation for Ecological Valuation

This chapter discusses use of conceptual models, operationalizing the models and development of ecological production functions, this latter considered the “best” approach to valuation of ecosystem services. One note prior to reading this was that the reviewer was to look for addressing actions that had positive, negative and no-changes. This was to address the reviewers concern that all EPA action leads to “change” which is not necessarily true.

Page 47, line 28. The point made here for “iteration and possible model changes and refinement over time” is major and needs to be reemphasized whenever appropriate.

The discussion of model development and selection is well done but more examples might help the user of this report. Many people have no idea what really constitutes a “conceptual model” whether it is a diagram, complex set of interactive thoughts, etc.

Page 53, line 16. What does “that model will need to be parameterized for the specific valuation context of interest” mean? Perhaps for the non-bureaucrat a definition of “parameterization” needs to be given with examples.

Two important recommendations are hidden in the text. Page 53, line 31 use of models, and Page 54, line 13, selection of model criteria. These are repeated in summary but it seems they need to be highlighted in the text as they are important.

This chapter uses change over and over. The implication to the reader is that valuation requires some change, that one can only put values on things or processes that change. Is this true???? This is implied in lines 9-16 page 55 in the discussion of identifying relevant outputs.

Page 56, line 4. Who or what are stakeholders? They may be public, decision makers, land owners, etc. For the good of this report, they “players” might be better defined.

Page 58-59. A good discussion of possible differences between indicators, endpoints and ecosystem services. Might this be more emphasized?

Page 60, line 20. 3.3.3. The reviewer suggests a change in heading based on concern for use of “change”.... Mapping Changes in Ecological Inputs to Sustainability of Ecological Services..... this recognizes the concept of ecological integrity.

Page 61, line 22. This definition of indicator is a very limited definition. It could also be “a state that tells something about a process” and there are more definitions of indicators. This should be recognized here.

Page 62, line 17. An indicator is not a metric. A metric is what is measured to quantify an indicator.

Page 64, line 16. The report needs to recognize the potential subjectivity of “report cards”.

Page 65, line 19. Meta-analysis discussion implies index or indices (e.g., IBI...Karr is referenced). Should this be recognized?

Page 67. The reviewer seriously questions the applicability of NEON to EPA valuation procedures for ecosystem services. Does the committee really believe this?

Chapter conclusions and recommendations are good, but here again, the committee should consider not using “change” as the only outcome of some action.

## Chapter 4. Methods for Assessing Value

The reviewer is not familiar with all the methods presented and discussed and assumes several committee members are well versed in these methods thus the reviewer will make few comments here.

One is that the discussion of “benefits transfer” is well done and addresses many concerns about the method. The committee in its recommendations also appropriately cautions EPA in the use of this method.

## Chapter 5. Cross-Cutting Issues

This chapter addresses “uncertainty” and “communication”. These two points are probably two of the most important components of this report.

The discussion of uncertainties in ecological valuation is probably so important that this concept should be addressed at several earlier steps in this report. Even development of conceptual models in Chapter 2 is laced with uncertainties and steps in the integrated approach also.

Many points made in discussing uncertainties at times need to be emphasized. One that comes to mind is one dealing with use of experts and that they all might agree but all be wrong. This is important because use of “expert opinion” is such a useful tool when other quantitative data are not readily available.

Section 5.2.3 seems repetitive but perhaps that is useful as a way of emphasizing both communication and uncertainty.

The recommendations at the end of this chapter should have some statements about “uncertainties” not just “communicating ecological valuation information”.

## Chapter 6. Applying the Approach in Three EPA Decision Contexts.

This chapter elaborates on three key features of the approach applied to three different “cases”. The features are (1) early identification of impacts important to people, (2) predicting ecological change (should this be “ecological response”?), and (3) use of multiple methods. The three cases are national, local and regional.

One general issue with the recommendations is that only for the regional approach does the committee recommend in detail what EPA needs to do about staffing, etc. On a national basis shouldn't there also be some expansion of an office that would be able to follow through on the approach to valuation, while on the local level, EPA needs to better be able to aid the community or local constituents which means having some kind of

SWAT team available for such actions. If these are addressed in the text, it is not obvious.

National Valuation...The CAFO case. The reviewer found himself constantly circling the word “change” in this section where “response” or “output”, or “consequences” might be better words.

Page 120, lines 11 and 12. How is use of experts and the public different from “mediated modeling”?

Page 121, line 25. Good point about links between stressors and ecosystem services not being fully understood.

Page 124, lines 4-9. How does EPA select a model that applies nationally and yet has sufficient detail to help the process? It can be done but might be explained. As pointed out in line 26, the site specific nature of many ecological impacts makes a national assessment difficult.

Page 125, line 8. Is the conceptual model of a system as Figure 6 useful or is the problem too general for a national model?

This case study of CAFO discusses water quality but should also address air quality and perhaps quality of localities near cattle feed lots. This is brought into the conceptual model discussion on page 133, lines 6-11 but should be mentioned earlier such as at page 129, line 9.

#### Site-Specific Valuation (Superfund sites, Mines, etc.)

This section presents a model of approach but does not mention or present a model of the system (or typical system). Both models are necessary for adequate understanding. Another place a model would be useful is to “align risk endpoints with ecosystem services” (page 147 line 21.)

Finally in section 6.2.3.3 there is a recommendation to construct models. The points made here need to be made in steps 6.2.1 and Figure 7.

The use of the bulleted list of recommendations on page 166 is a good list and this approach might be used throughout and perhaps in an Executive Summary, remembering that there is a discussion of recommendations at the end of the report.

#### Valuation in Regional Partnerships

There may be a need to have a better distinction between local or site specific examples that might have broader impacts, for example on water quality, and regional examples

such as a watershed which also relates to water. Can this be explained at the beginning of this section or beginning of chapter?

How representative is the Chicago Wilderness study of regional problems throughout the country or was it one that EPA worked with? Explain.

How representative is the SE Ecological Framework Project if it does not attempt to combine economic and ecologic analyses (page 186, line 6)? This project has a deep scientific foundation in conservation but did not do valuation. One is not certain of its applicability here unless this is better explained.

The primary recommendations for the regional case studies is for more staffing and funds for EPA regions. Is this appropriate guidance as to how EPS should organize itself? This seems out of balance for recommendations offered in the national and site specific studies.

Chapter 7. Summary of Major Recommendations and Conclusions.

This is well done.

One more time I need to point out the use of “changes”... page 191, line 6 for example. There are not always changes but there are always “ecological process responses”.

Most of the recommendations stand by themselves but some may be more important than others (one person’s perspective). One such recommendation (page 196, line 15) points out issues in transferability of ecological information. This is a critical recommendation as it is simple to transfer information in making conceptual models or identifying ecosystem components for valuation.