



UNDERSTANDING PUBLIC VALUES AND ATTITUDES RELATED TO ECOLOGICAL RISK MANAGEMENT: AN SAB WORKSHOP REPORT OF AN EPA/SAB WORKSHOP

**PREPARED BY THE EPA SCIENCE
ADVISORY BOARD**

September 19, 2001

MEMORANDUM:

SUBJECT: *Understanding Public Values and Attitudes Related to Ecological Risk Management: An SAB Workshop Report of an EPA/SAB Workshop* (EPA-SAB-EC-WKSP-01-001)

FROM: Donald G. Barnes, Staff Director / *Signed* /
EPA Science Advisory Board (SAB)

TO: The Honorable Christine Todd Whitman, Administrator
Environmental Protection Agency

I have attached *Understanding Public Values and Attitudes Related to Ecological Risk Management: An SAB Workshop Report of an EPA/SAB Workshop*. The Report documents a public workshop that occurred on May 23-24, 2001 in Washington, DC, and that was supported by SAB and several EPA offices, specifically: the Office of Air and Radiation; the National Center for Environmental Economics in the Office of Policy, Economics and Innovation; the Office of Research and Development; and the Office of Water.

This Workshop Report is the first of “a new product line” of outputs from the EPA Science Advisory Board (SAB). Historically, the SAB has generated Reports, Advisories, Commentaries, and Notifications of Consultations. All but the last constitute formal advice to the Agency which is transmitted after public review by one of the formally chartered Federal Advisory Committees that are a part of the SAB complex; i.e., the Executive Committee of the SAB, the Clean Air Scientific Advisory Committee, and the Advisory Council on Clean Air Compliance Analysis.

By way of contrast, an SAB Workshop Report simply captures the discussion that took place in a workshop setting of experts who were convened to discuss important technical issues associated with a particular problem confronting the Agency and the country. The Workshop Report does not represent an SAB consensus position nor does it convey any formal SAB advice, *per se*. It is simply a record of a high-level encounter of technically qualified people whose comments should inform the Agency as it deals with the issues under discussion. No formal response to the SAB is expected.

The concept of the SAB Workshop emerged from the 1997 Strategic Planning Retreat of the SAB Executive Committee at which the members declared their intention to "[t]ake on a catalytic role in conducting workshops on important scientific issues. In addition to generating advisories, commentaries, consultations, and reviews, the SAB will work with the Agency, professional societies, or others to insure that open workshops are conducted to address important scientific issues. Such workshops may involve outside experts in a rapidly developing field... or bring together various groups inside and outside of EPA around a common issue..."

As detailed in the attached report, the Ecological Risk Management Workshop engaged a broad spectrum of federal, state, and local experts and decision makers on an issue that has proven to be complex for all managers addressing ecological risk issues. In addition to increased understanding and awareness of the issue among the roughly 100 participants, the Workshop has already led to followup interactions between local leaders and researchers, plus resources materials that have contributed to a separate, formal SAB report.

The Science Advisory Board is interested in your reactions to the SAB Workshop concept and to suggestions for topics for future Workshops.

Attachment

NOTICE

This report has been written as part of the activities of the EPA Science Advisory Board, a public advisory group providing extramural scientific information and advice to the Administrator and other officials of the Environmental Protection Agency. The Board is structured to provide balanced, expert assessment of scientific matters related to problems facing the Agency. This report has not been reviewed for approval by the Agency and, hence, the contents of this report do not necessarily represent the views and policies of the Environmental Protection Agency, nor of other agencies in the Executive Branch of the Federal government, nor does mention of trade names or commercial products constitute a recommendation for use.

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Kempton, and Jennifer Harris (Full Text)

A. INTRODUCTION

EPA and the Science Advisory Board co-sponsored an EPA/SAB workshop on May 23-24, 2001 entitled *Understanding Public Values and Attitudes Related to Ecological Risk Management*. The workshop had the goal of bringing ecological risk assessment, economic benefits assessment, and other social science research together to address a real environmental problem, air deposition of nitrogen in Tampa Bay Estuary. The workshop was not an advisory committee meeting, organized with the purpose of providing advice to the Agency. Instead, it was a public workshop designed to highlight and discuss in a public forum approaches that could supplement, complement, or expand current economic methods for characterizing benefits from protecting ecological resources. The workshop was the result of collaborative planning across the Agency. Sponsors included the Office of Air and Radiation; the National Center for Environmental Economics in the Office of Policy, Economics and Innovation; the Office of Research and Development, the Office of Water; and the Office of the Science Advisory Board.

The project was sparked by the work of the SAB's Valuation Subcommittee for the Integrated Risk Project. The workshop implemented a suggestion in the Board's report, *Toward Integrated Environmental Decision Making* (EPA-SAB-EC-00-011), to create a forum for open discussion on the topic of natural resource valuation. The workshop focused on a specific place, with specific ecological risk management problems. It provided an opportunity for in-depth discussion of alternative research strategies for understanding why people value protecting water resources in Tampa Bay against nitrogen deposition, and how much they value them. The conversation that occurred among researchers; state, federal, and local risk managers; and a diverse audience provided a springboard for discussion of how the Agency might generally expand its approaches for eliciting, characterizing and understanding public values.

The workshop focused on practical discussions to transcend "What We Have" currently in EPA's analytical toolbox for understanding "Forming, Eliciting & Considering Public Values." The SAB Report, *Toward Integrated Environmental Decision Making*, noted current problems in the following areas: (1) difficulty translating changes in ecological conditions into monetary units; (2) difficulty measuring values placed on keeping ecosystems viable ("existence values")--public often does not have knowledge about ecological impacts; (3) ecological services not reflected well in markets; and (4) difficulty measuring values such as equity and sustainability. The workshop aimed to shift the discussion to seek "What We Need," namely: (1) better methods to estimate value the public places on protecting ecological conditions; (2) better methods to incorporate values and preferences into decision-making; and (3) more open dialogue among scientists and between scientists and decision makers. The specific contribution of the workshop was to explore how social sciences have been and could be applied to ecological risk management. Dr. Milton Russell provided a historical perspective in his presentation at the workshop. His remarks are included as Section B of this report.

The Tampa Bay Estuary Program was an active partner in the effort, since air deposition of nitrogen is the next frontier for that program, which has a well-articulated assessment of the ecological

damages associated with nitrogen pollution. The Bay is Florida's largest open water estuary and has successfully addressed nitrogen pollution from more traditional sources, such as sewage treatment plants. Benthic organisms, corals, waterfowl, and seagrasses have returned to the Bay. The Tampa Bay Estuary Program has a history of voluntary partnerships to meet environmental goals, demonstrated by its *Tampa Bay Estuary's Comprehensive Conservation and Management Plan; Partnership for Progress, The Tampa Bay Nitrogen Management Consortium Management Plan*, and the partners' agreement on an environmental goal and an indicator of concern--restoring seagrasses to 1950's levels.

The Bay Program offered its experience as a focus for the workshop, since new ecological risk management issues were appearing for the Bay Program and new research tools from the social sciences might be helpful. In the next 15 years, the Bay Program expects population in the Bay area to grow by 600,000. New sources of nitrogen pollution, the Bay's biggest problem, are air pollution from utilities, other industries and automobiles and runoff from lawns, streets and parking lots. These sources of pollution are expected to increase. The Tampa Bay Nitrogen Management Consortium estimated that large reductions in atmospheric deposition of nitrogen will be necessary if the Tampa Bay Estuary Program is to meet its nitrogen reduction goals. The science surrounding atmospheric deposition and its ecological effects is relatively new; there is uncertainty about risk assessment estimates; and less experience among Tampa Bay partners in dealing with controlling air emission than with land-based, stationary sources. Ms. Holly Greening, Senior Scientist from Tampa Bay Estuary Program, provided an introduction to risk assessment and risk management questions for the workshop participants. Her presentation is included as Appendix C of this report.

The Tampa Bay Estuary Program framed specific risk management questions, relevant to decisions to be made by federal, state and local governments concerning air deposition of nitrogen. EPA provided those questions to social science researchers, selected through a competitive process. The challenge to each of the researchers was to develop a proposed research plan that would detail methods for collecting, analyzing and interpreting social science data that would assist managers in addressing risk management questions at Tampa, where the nature, depth and breadth of public support for addressing air deposition issues are an issue. The researchers were asked to describe how they would provide information that would help managers make decisions, communicate decisions, and justify decisions related to protecting ecological resources.

The centerpiece of the Workshop were the presentations from researchers from four different social science traditions. The Science Advisory Board managed a competitive process that awarded contracts to four senior social scientists to prepare the research plans and participate in the workshop. (See Appendix E for a sample Statement of Work for one of the social scientists, describing in detail the tasks required for the research plan, including the specific risk management questions from Tampa Bay to be addressed.) EPA made awards to: Dr. Terry Daniel, Department of Psychology, University of Arizona, Tucson, Arizona; Dr. Robin Gregory, Decision Research, North Vancouver, British Columbia, Canada; Dr. Willett Kempton, College of Marine Studies, University of Delaware, Newark, Delaware; and Dr. James Opaluch, Department of Environmental and Natural Resource Economics,

University of Rhode Island, Kingston, Rhode Island. The full text of the Proposed Research Plans appears as Appendices F through I of this workshop report. The Executive Summaries for the Research Plans appear in Section 4 of the Report.

A panel of risk managers participated in the workshop, representing a diverse group of senior managers from EPA (Office of Air and Radiation, Office of Water, Office of Research and Development, Region 4, Office of Policy Economics and Innovation), the State of Florida, and Pinellas County, one of the partners in the Tampa Bay Estuary Managers. (The list of panel members appears in Appendix B.) The managers discussed how the four proposed research plans, if funded, could potentially help them make decisions, communicate decisions, and justify decisions related to protecting ecological resources in Tampa or in other places where ecological resource protection is an issue. They also were asked to discuss: (1) What opportunities do the approaches offer that current strategies for understanding values and attitudes do not?; (2) What follow-up actions would be desirable – either in the area of risk management or research?; and (3) What other kinds of problems do you think would benefit from the kinds of approaches described? The full text of the questions for panelists appear in Appendix D.

The Chair of the Workshop, Dr. Baruch Fischhoff, prepared a “Sense of the Meeting Summary” (Section A of the report), which captured major points from the panel discussion.

B. WORKSHOP CHAIR'S "SENSE OF THE MEETING" SUMMARY

Prepared by the Workshop Chair, Baruch Fischhoff¹

B.1. Definitions .

The term "value" has multiple interpretations, which were identified, but not resolved, at the workshop. At the one extreme, the term refers to fundamental predispositions, moral precepts, and ethical standards. At the other extreme, it refers to the articulation of such basic values in specific contexts, reflecting preferences among alternative conditions. Moreover, people's "values" might be taken as they are, when valuation questions arise, or "constructed" through a process affording individuals an opportunity to learn about the issues and their feelings toward them. "Attitudes" typically are attached to focal objects, although without explicit consideration of alternatives (and the tradeoffs implied by choices among them).

As noted below, choosing the kind of values pertinent to a specific context is a critical aspect of designing an assessment process. Using common terminology is essential to effective collaboration, across disciplines as well as between professionals and practitioners. Rather than adopting any one discipline's conventions, this summary uses "value" for any evaluation derived by questioning individuals.

B.2. Environmental Science

- a) Well-informed evaluations require accurate summaries of the science about the environmental systems involved, including the surrounding uncertainties and controversies.
- b) The research agenda for that science should be sensitive to policy concerns, so that it focuses on the environmental science needed to inform public choices. Otherwise, research resources may not be efficiently allocated.
- c) The environmental sciences need to include the social sciences. The social sciences are essential for predicting human demands on the environment and responses to interventions, for estimating economic impacts, for clarifying human dependence on environmental services and integrity, for eliciting expert judgment in policy-relevant forms, and for assessing public preferences among alternative policies.
- d) Ensuring public understanding of environmental issues requires properly designed and empirically evaluated communication programs.
- e) That communication should be proactive, so that authoritative information is in citizens hands as issues develop (and before misinformation shapes their beliefs).

¹University Professor, Carnegie Mellon University

B.3. The Science of Assessing Public Values

- a) Research into public values and attitudes should meet the methodological standards of the appropriate social science disciplines (even if its subject matter is too applied to merit publication in theoretically oriented academic journals).
- b) The research should be problem, rather than discipline driven. That will often require employing multiple methods, combining the strengths of different approaches.
- c) When an evaluation question is posed to citizens, it is critical that it be interpreted as intended. Ensuring such comprehension requires proper preparatory work and empirical demonstration of success. Otherwise, citizens' responses may not be interpreted as they intended.
- d) Researchers (here, as elsewhere) should be candid about the limits to their research. Claims of validity should reflect the basic research literature and direct demonstrations (i.e., showing the reliability of measures, their sensitivity to relevant changes in circumstances, and their insensitivity to irrelevant changes).
- e) The resources invested in research should fit its contribution to the policy-making process. It is possible to spend too much and too little, as well as to misallocate resources between understanding environmental issues and evaluating them.

B.4. Policy Makers

- a) Those who commission assessments of values and attitudes need to specify the kind of research that they want, helped by researchers who can clarify the methods that are available. Specification issues include:
 - 1) Who are the relevant stakeholders, whose values or attitudes should be elicited?
 - 2) How well informed should participants be, regarding the environmental science? Is their current level of understanding appropriate (in order to anticipate initial citizen responses to a topic) or should they be informed about the critical issues (in order to represent citizens who have invested in such understanding)?
 - 3) How well informed should participants be, regarding alternative value perspectives? Should they respond with whatever values and attitudes come to mind or should they be presented with different views (as might occur through observing a public debate or reflecting privately over time)?
 - 4) Should participants be encouraged to think of themselves as members of the community or to respond as individual consumers (or left to resolve their roles by themselves)?
 - 5) Is the goal of the assessment procedure to produce estimates, needed as inputs to formal analyses, or to create a process that clarifies values and creates respectful relationships among participants?

b) Persuading citizens (either to change their values or to act on those values) needs to be distinguished from assessing their independently determined values. Both goals can be legitimate, but require different methods and relationships with citizens.

B.5. Stakeholders

- a) Have a role to play in defining the problem being analyzed (lest their concerns be overlooked - leading to an erosion of trust and misallocation of research resources).
- b) Are entitled to effective communication regarding the relevant environmental science and regulatory issues.
- c) May need to be provided with multiple perspectives on the issues, of the sort that would arise with an intensive public debate.
- d) May need multiple channels for receiving information and for providing input, suited to their habits, resources, and sophistication.
- e) Must be seen in the context of their relationship to their community. Participants in a value-assessment process might help to legitimate its results for other citizens; they might also become captive of the process, losing contact with others.

B.6. Research Management

- a) Policy makers need to provide core support for evaluation research, drawing on multiple relevant disciplines, so that appropriate methods are available, when managers need them. These developmental costs could be spread over many applications.
- b) Research planning should create methods that, once developed, can be used efficiently in other contexts. The goal is achieving the maximum legitimate generalizability, at minimum cost. Four (non-exclusive) possibilities for pursuing this strategy:
 - 1) Intensive demonstration projects that can be copied in other contexts, at reduced expense. (Further development of the Tampa Bay Estuary example might merit examination.)
 - 2) Modular method development, creating pieces that can be assembled for new applications (e.g., ways to communicate environmental science, interactive programs for simulating the impacts of interventions, data analysis packages, guidelines and training for moderators).
 - 3) Research into the generalizability of values and attitudes across contexts (recognizing that, when the assessment process itself is paramount, it needs to be repeated in each context, with the relevant individuals).
 - 4) Independent case studies of evaluation processes, in order to show how these experiences could be viewed and improved.

c) Social scientists capable of adapting scientifically accepted methods to environmental settings are relatively scarce. That is especially true when the value-assessment process requires an understanding of environmental science and the difficult evaluation issues that often arise (e.g., changes occurring over long time periods, surrounded by great uncertainty). Three (non-exclusive) possibilities for expanding the ranks of qualified scientists:

- 1) Graduate and post-doctoral training opportunities.
- 2) Summer workshops for faculty from teaching institutions, interested in working on evaluation issues in their local communities.
- 3) Resources for easily adding social scientists to environmental science research groups where they are currently missing.

B.7. Research Needs (partial list)

a) Communicating the environmental science needed to make informed evaluations:

- 1) Uncertainty and controversy (e.g., why scientists seem so disputatious, how to reconcile competing claims in the new media).
- 2) The social processes of research (e.g., why and how scientists choose - and ignore - particular topics; how scientists identify and express disagreements; what peer review means).
- 3) Large-scale changes, especially the possibility of non-marginal (discontinuous) and irreversible changes in environmental systems.
- 4) Prioritizing information needs (so that participants are neither denied relevant facts nor drowned in irrelevant detail).

b) Helping people to think about the difficult values issues and choices posed by many environmental processes:

- 1) How to think about taking gambles with nature.
- 2) How to avoid paralysis through analysis.
- 3) How to anticipate their own future sense of loss or accommodation, with negative environmental changes.
- 4) How to understand the role of nature in their lives and well-being.

c) Developing better "constructive" value assessment processes (in which participants are helped to consider and evaluate alternative perspectives):

- 1) How to provide alternative perspectives in a balanced way.
- 2) How to integrate monetary and non-monetary concerns.
- 3) How to frame ecological valuation questions, including existence value.

d) Combining values derived from expressed preference studies (in which people are asked about them) and revealed preference studies (in which values are inferred from behavior):

- 1) How to infer values from (natural or designed) behavioral experiments (e.g., providing real-time information about energy consumption to drivers or home owners).
- 2) How does misunderstanding of environmental and economic issues affect market behavior?
- 3) How can econometric procedures be used to extrapolate expressed preferences from sampled populations to general ones?

e) Understanding the dynamic properties of values:

- 1) How do they change over time within age cohort, as the result of experience?
- 2) How do they differ across cohorts (e.g., teens versus adults of different ages)?
- 3) How should environmental policies accommodate these changes, especially when considering actions affecting future generations?

C. THE CHALLENGE OF ECOLOGICAL VALUATION

Prepared by Milton Russell,²

Co-Chair of the Science Advisory Board's Valuation Subcommittee
of the Integrated Risk Project

I am pleased to be here to provide some background and introductory remarks for this important workshop on meeting the challenge of ecological valuation.

Unfortunately, Al Maki, who was to join me in providing this background, found late last week that he would not be able to make the journey from Alaska. He has asked that I express his regrets and to offer his best wishes to the workshop.

I will start by recounting a true (if secondhand) anecdote that encapsulates why we are here today and why our efforts are so important.

The time was almost two decades ago.

The place was a decision meeting with the President.

The subject was a proposal from EPA to undertake a fairly aggressive program to combat acid rain.

And the defining moment occurred when David Stockman of OMB framed the issue with the question: "How many fish are your grandmother worth?" after having asserted that the program would cost about \$6,000 per fish saved.

The President faced a real decision. Acid rain had real, negative ecological consequences. The acid rain control program would also use up real national resources that would then not be available to do other things, including achieve health improvements.

To make the decision responsibly in the public interest, it was essential for him to have the answers to a whole series of questions, these among them:

1. What would be the reductions in emissions of the proposed program?
2. What would be the effect of these reductions on the ecological end points of concern?
3. What would be the costs (in terms of other things people want) of making these reductions?

²Senior Fellow, Joint Institute for Energy and Environment, Knoxville, Tennessee; and Professor Emeritus of Economics, The University of Tennessee, Knoxville.

4. And finally, the crux of our workshop today, how much would the American people value the expected improvements in ecological outcomes that would be bought with their money?

Only if that value were greater than the cost would this be a good deal for the American people. Only if they thought it was a good deal would the decision be supported.

To close out the anecdote, the EPA answers to these questions, especially the value one, did not make a persuasive case.

Jumping ahead a half-dozen years, the ensuing one-half billion-dollar National Acid Precipitation Assessment Program (NAPAP) research effort did provide more convincing answers to the first three questions. The political system ultimately decided that the ecological value of taking some control measures would be worth some costs-leaving to later to decide whether still more controls were necessary. And that's where the situation lies today-and the value question regarding the benefits from still tighter controls remains the most troublesome one to answer.

Before the acid rain issue and since, ecological valuation issues have been among the most vexing problems facing environmental policy makers. They are central to such headline issues today as global climate change, drilling in the Arctic National Wildlife Refuge, visibility in the Grand Canyon, air quality in the Great Smoky Mountains National Park, and our case study, nitrogen deposition in Tampa Bay.

Not surprisingly, policy makers have often turned to the economics profession for the guidance they need to make such judgments. Not surprisingly because the question of how to allocate limited resources to maximize something-in this case public welfare-is at the heart of what economists do. Valuation of alternative ecological outcomes is one of the components needed in many environmental decisions.

The economics profession has responded to that challenge by developing a coherent and rigorous framework for attacking the problem. It has created an ingenious but incomplete bag of tools for trying to get the data required to exercise that framework. And it has, for the most part, shown a becoming modesty about its overall success. This leads to the message that strictly economic approaches can now provide useful inputs into the policies regarding ecological protection, but these approaches cannot provide the "answer" by themselves.

That brings us to the origin of this workshop and to where Al Maki and I come in.

In 1996 EPA leadership urged the SAB to address the need for improved methods for measuring ecological benefits. This request was motivated by the widespread view that economic analysis, as then practiced, tended to undervalue ecological resources and was especially inadequate in dealing with long term issues and matters of intergenerational equity. SAB wrapped this request into its ongoing Integrated Risk Project and formed an

interdisciplinary Valuation Subcommittee to pursue the matter. Al Maki and I were co-chairs of this Subcommittee.

In my judgment, the key conclusions that resulted from the intense deliberations of the committee are these, and I quote:

- "1. For decision-making purposes in a governmental context, ecological valuation is an anthropocentric exercise ([that is] people's wishes count; there is no external set of values waiting to be discovered for application to decision making).
2. The value of anything reflects its contribution toward the achievement of some goal. The process of valuation cannot be separated from the need to reach agreement on goals.
3. Environmental valuation requires a diverse and interdisciplinary process involving interaction and deliberation among scientists, decision makers, and other stakeholders to identify goals and to define endpoints to characterize those goals.
4. Existing economic approaches, broadly considered, are consistent and coherent frameworks for valuation because they organize a system of trade-offs. However, they are not mechanisms for producing "the answer" because they may omit trans-economic values that may be important, may include some elements that are difficult or impossible to estimate, and may employ preference elicitation processes that are incomplete. [Therefore,]
5. An expanded, rich, and complex process using multiple approaches is required to fully encompass ecological valuation."⁵

And finally, the Subcommittee ended its report with these words, which are a message to us today:

"Environmental valuation remains a craft embedded in political processes. Much additional research is needed in all areas that are important to estimating the benefits and costs of environmental management action."⁴

Just as important as what the Subcommittee concluded is what it did not find: An alternative to the basic economics paradigm that would yield useful policy guidance without the grungy, difficult, and often contentious process of trying to answer valuation questions such as the one I opened with, "How many fish are your grandmother worth?" And it looked. With the help of SAB staff, the Subcommittee collected and examined a goodly portion of the literature

³"Toward Integrated Environmental Decision-Making (Peer Review Draft, May 3, 1999), Chapter 5, "Assessing the Value of Natural Resources," 5-3.

⁴Ibid., 5-51.

on the issue of ecological valuation. It also heard from a number of persons who provided their views on the issue.

I commend the report of this conscientious, wide-ranging and distinguished Subcommittee to your attention. Not because of the answers it reached, but because of the salience of the issues and concerns that it raised.

This Workshop is the next stage of the SAB's effort to respond to the challenge to improve processes to value ecological outcomes for decision-making purposes. It brings together researchers from different disciplines, risk managers, and stakeholders in the context of a problem that will require action. That action will affect the real people of the Tampa Bay area, who would bear its costs and reap its benefits. And these are the same people who must ultimately agree with any action taken, so their views matter.

This process over the next two days will provide important insights into how valuation can be improved and made more useful in dealing with the many other environmental decisions that will have to be made in the future.

I look forward to these proceedings and to the contributions of the researchers invited to share their views with us.

D. EXECUTIVE SUMMARIES OF FOUR RESEARCH PLANS COMMISSIONED BY EPA FOR THE VALUES WORKSHOP⁵

D.1. Tampa Bay NEP Research Plan: A Decision Science Perspective on Understanding Public Values and Attitudes Related to Ecological Risk Management, Prepared by Robin Gregory⁶

The purpose of this research plan is to outline an approach to understanding public values and attitudes relating to policy initiatives in ecological risk management. Although key elements of the approach are intended to be broadly applicable, the specific case study of nitrogen deposition by air to the Tampa Bay, Florida estuary is used to illustrate and provide supplementary details of the proposed approach. Understanding how the public views the problem of airborne nitrogen deposition, and what considerations it may use when evaluating alternative policy responses, is one of the primary questions now under study by the Tampa Bay National Estuary Program (TBNEP). In particular, the TBNEP seeks answers to questions concerning (a) the reasons why people care about protection of water quality in the Tampa Bay estuary, and (b) ways in which the broad range of stakeholder concerns can be evaluated and measured to facilitate their incorporation into risk-management policies.

This research plan focuses on the contribution of insights from the decision sciences to addressing these important questions. It represents one of four social science perspectives (the others being psychology, anthropology, and innovative economics) to understanding public values, which taken as a whole seek to broaden the range of techniques available to encourage public input and to develop an improved management plan for the estuary. In many respects the four approaches are complementary, so that both general techniques and specific study suggestions are expected to be quite similar. In other respects, however, the four approaches are quite different, with a decision science perspective giving particular attention to the ways in which values and tradeoffs are formed, to the quality and interpretation of expressed judgments and evaluations, and to the use of decision aids in clarifying stakeholder concerns and in developing defensible linkages between the value- and fact-based aspects of a proposed risk-management initiative. In light of the mandate for the research plan, this discussion of a proposed study approach will focus on insights and techniques that are based in the decision sciences and leave issues relating to the complementarity of the different approaches to presentations at the May, 2001 workshop and to subsequent discussions.

A variety of techniques from the decision sciences can assist the Tampa Bay NEP in developing plans for protection of the estuary that incorporate, and are responsive to, both the complexities of the ecological risk-management challenges and the interests and values of the

⁵Full texts of these Research Plans appear as Appendices F through I of the Report. A sample of the “Statement of Work” to which the plans respond appears as Appendix E.

⁶Decision Research, 1201 Oak Street, Eugene, Oregon 97401

diverse set of stakeholders. Although implementation of the selected techniques would provide immediate insights, many of their benefits will become even more apparent over time, as the TBNEP moves on to the consideration of more costly and more controversial protection measures. Five principal types of benefits are foreseen.

A. Nurturing collaborative exchanges. Dialogue, both within and across stakeholder groups, has been and will continue to be an important reason for the success of the TBNEP. At Tampa Bay, open discussions need to occur among many different parties: between technical experts and laypersons, between natural and social scientists, between federal and state and local government employees, and among representatives of varying perspectives and opinions. The value-based approaches described in this research plan both foster and focus dialogue, whereas techniques for decomposing complex problems and addressing uncertainties will help to ensure that open dialogue also occurs among technical experts.

B. Implementing structured decision-making processes. Structured processes are essential for understanding the diversity of values and concerns that characterize different stakeholders and for using this information to create the best possible alternatives (in the form of recommended actions). Because they establish an open and transparent decision process, structured methods for involving stakeholders also provide a highly defensible mechanism for making policy choices, one that is viewed as legitimate because the steps are clearly delineated and because components of recommendations can easily be traced back to stakeholder expressions of value.

C. Clarifying sources of scientific uncertainty. Scientific uncertainty is unavoidable in programs such as the TBNEP, and over the next decade or two it is likely to increase as the Program's focus moves from land-based and point-source to airborne and farfield sources of nitrogen deposition. As a result, it is important to clarify differing perspectives among scientists and to attempt to understand the reasons for these differences, in terms of identifying the best actions for protecting the estuary and in terms of maintaining strong public support.

D. Learning over time. Developing management structures that can incorporate learning over time is fundamental to the long-run success of a program such as the TBNEP. Some of this learning will come in the form of staying in tune with the changing values of the residents of Tampa Bay. In addition, adaptive management processes are likely to form an increasingly important part of the TBNEP, because of the help they provide in establishing flexible management responses to reducing uncertainty that incorporate learning over time and, by carefully monitoring effects, reduce both the probability and expected cost of failures.

E. Improving the quality of communication. Communication up to this point in time has been relatively straightforward because the benefits of actions undertaken by the TBNEP have been widely supported and highly visible whereas the costs have been low. As the costs rise over time and the benefits become less salient, it will be important for the

TBNEP to continue to communicate effectively with its diverse group of stakeholders; this is likely to also become more difficult because the geographic area affected by TBNEP programs will become larger. Different strategies will be called for depending on whether the communication is about values or about facts; either way, an interactive, two-way communication process is recommended.

The past success of the TBNEP program appears to have created excellent conditions and motivation for undertaking a deeper look at both the values of stakeholders and the underlying science. Techniques from the decision sciences can be used proactively to learn more about the relationships among stakeholder concerns, the reasons for conflict among scientists, and the types of decision processes that will be viewed as continuing to create defensible, legitimate recommendations. The visible success of the program to date has created an unusual and welcome window of opportunity, one that should be embraced soon in anticipation of the more difficult tradeoffs, and less visible benefits, that are likely to come in the years ahead.

D.2. Tampa Bay Estuary Program Values Assessment: Charting Publicly Preferred Passages, Prepared by Terry C. Daniel⁷ and Michael J. Meitner⁸.

The goal of the proposed program of research is to identify and assess public environmental values associated with the Tampa Bay Estuary Program (TBEP) effort to restore and protect the ecological health of the bay by reducing (or halting increases in) aquatic nitrogen pollution. Specifically, the assessment will determine public preferences for nitrogen management options and associated ecological conditions to provide insight into the nature of and the bases for current and future public support for the TBEP effort. The study will illustrate the application of computer-based interactive survey methods being developed in the context of other environmental quality and risk assessments.

The TBEP (established in 1991) has set the goal of holding nitrogen loads in the bay to 1992-94 levels and restoring sea grass coverage to 1950 levels (minus permanently altered areas). Bay-wide nitrogen targets are achieved by a voluntary trading scheme in which increased loads from one source are balanced by reductions in another. The program has enjoyed substantial community support and nationally recognized success. Projected increases in population and development in the bay watershed will contribute additional nitrogen to the bay, so continued active management will be required to balance contributions from new sources against reductions in existing sources. As achieving nitrogen-reduction targets becomes more costly, currently agreed upon nitrogen load targets may be challenged, along with the associated ecological/sea grass protection goals. In this context, better understanding of relevant public beliefs and preferences will be important to guide policy-making and to build the public support needed to implement and sustain the TBEP management programs.

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⁸Assistant Professor of Forestry, University of British Columbia.

To establish the relevant temporal and geographic context for the assessment, historic and contemporary environmental and social conditions will be presented to participants through computer graphic and environmental data visualization systems. A converging operations research strategy will separately assess public preferences for alternative nitrogen management/outcome scenarios by verbal-questionnaire, conjoint-rating and scenario-creation procedures. Preferences expressed in each of these contexts will be appropriately scaled and quantitatively related to physical parameters of total nitrogen (with associated sea grass coverage) and to the relative contributions of nitrogen from different sources. Obtained psychophysical relationships between preference indices and nitrogen pollution parameters will be compared across different stakeholder and general public samples to determine points of convergence and divergence in relevant public values, and to test the generalizability of findings. Comparison of findings between elicitation methods will be used to gauge the convergent validity of the assessment.

D.3. Understanding Public Values and Attitudes Related to Ecological Risk Management, Prepared by James J. Opaluch⁹

This proposed research will identify and quantify values for important natural amenities of Tampa Bay. The value measures will provide direct input into decision making regarding the alternative programs to control nutrient inputs into Tampa Bay, and will put this into perspective of other programs to improve the environmental amenities of Tampa Bay. This work is important for achieving continued progress in provision of important environmental amenities. Although recent years have seen much progress in protection and restoration of critical environmental amenities, many significant impacts and threats remain. Limited resources are available to resolve these issues, and competing social needs necessitates that management actions focus on resolving the highest priority issues in a cost effective manner. Simultaneously, communities are becoming increasingly resistant to management solutions imposed from “outside”. Continued progress towards achieving environmental improvement depends on establishing consensus management strategies that focus efforts towards addressing the key objectives at reasonable cost.

It is critically important that public values be represented in environmental decisions process, since public money is to be used to fund resource protection activities, the public will ultimately bear the costs management actions that increase cost to industry, and since under the Public Trust Doctrine, government managers are mandated to act as trustees for the public. This sets forth a challenge to identify the key environmental objectives of the community more clearly, and to focus management on the highest priority goals of the community, which underscores the importance of efforts to elicit priorities and values of the affected communities. Social scientists have much to contribute to these issues, having invested substantial research efforts towards understanding processes to identify and measure public values, and processes to develop consensus agreements among interested parties.

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Measuring community environmental values in a way that can contribute to assessment of specific management actions is an inherently difficult task, and not one that is amenable to routine application of standard techniques. For example, it is a difficult task to determine how much people care about reducing nitrogen deposition in Tampa Bay, and what level of expenditure of public dollars is justified to support specific programs. The complex scientific nature of the problem also contributes to the challenges faced in this task.

A flexible approach is essential in order to focus on the most critical issues and controversies faced by the community, and to design an instrument that respondents can understand and that elicits values for key Tampa Bay amenities. Therefore, it is important not commit prematurely to a specific instrument design. Rather, the research process must first obtain a firm understanding of the key issues and controversies from the perspective of the various communities, and steps must be taken to design an effective survey instrument.

Thus, rather than simply applying a predetermined set of economic tools, we will set forth a research process to identify public values regarding critical natural amenities of Tampa Bay. First, we will obtain and carefully study documents that describe the critical issues faced in Tampa Bay in order to obtain background information on the problems faced. Much of this work has already been completed as part of developing the present proposal. The second stage of the research is to meet with the various interested parties to get a more detailed understanding of the important issues from various perspectives, and particularly to identify the important controversies. The goal of this stage in the process is to expand our knowledge base on critical Tampa Bay issues and, just as importantly, to develop a working relationship with the various parties. The next stage in the research will develop a list and description of important values concerning Tampa Bay amenities, and identify those that can reasonably be addressed within the context of the proposed study. We will then meet with Tampa Bay management teams to describe the values that will be estimated. This will be the final opportunity for input from the management team on the essential elements of the study, and we maintain flexibility up to this stage, so that values measured by the research efforts can be of highest utility to the management team.

Once we have come to agreement with the management council on the final set of values to be estimated, we will organize and implement a set of focus groups and, later, a set of verbal protocols with the goal of developing a survey instrument to measure important public values. Initial focus groups will involve general discussions of the issues of concern, and will be used to understand the perspective of participants, to identify how they think about issues, what language they use, which words are loaded or likely to be misunderstood, what kinds of background information needs to be provided, whether they care about the particular issues, and if so why. As the process moves along, more time will be spent on specific issues identified to be important to the developing survey and pretesting successive draft questions. The focus groups will include considerable discussion of the questions to ensure that participants understand the questions, and that the survey responses convey the information we are attempting to elicit.

These focus groups will provide excellent qualitative information that is useful for understanding values held by focus group participants. More importantly, the focus groups will provide essential insights that help to identify difficulties in survey questions, and suggest approaches that can be used to improve the survey design.

When we feel we have a workable draft survey, we will implement a set of verbal protocols on the draft instrument. Verbal protocols are carried out by having an individual complete the survey, while “talking aloud” to express what the individual is thinking about while answering the questions. This will provide additional insights into the thought process underlying the survey format, and the survey will be revised as appropriate, until investigators are confident that the survey provides the information being sought.

When the survey development process is complete, we will implement the survey using a sample of the public. The precise format of the survey will be determined through the rigorous survey development process described above, and we strongly recommend that we maintain the flexibility to determine the best survey instrument and means of implementation. However, we anticipate that the survey will be administered as an in-person, self-administered survey. We also anticipate that adequate funds will not be available for probability sampling, and we can use standard weighting procedures to correct for non-representative samples, to the extent possible. We will also apply standard rationality tests to confirm that results of the survey indicate valid economic values.

The results of the survey will provide an assessment of public values for important amenities of Tampa Bay and will link with available scientific studies to provide direct input into management options. We will carry out various “rationality tests” to confirm that the survey results are valid measures of values of specific amenities described and not, for example, symbolic expressions of concern for the environment, in general. The results are analogous to public referenda, but are much more informative to policy makers and are more flexible. As such, the results will provide essential public input into the management process and ensure that public values are represented in the public decision process.

D.4. The Effect of Values and Cultural Models on Policy: An Anthropological Approach to Environmental Policy in Tampa Bay, prepared by Douglas W. Christel, Dr. Willett Kempton, and Jennifer Harris¹⁰

Policymakers and administrators in the Tampa Bay region have observed high levels of public support for policies to reduce human impact on the Bay. This support has helped to make possible government actions that restrict water-borne pollution, nutrient loadings, and other anthropogenic impacts on the Bay. Current studies of the Bay's water and ecosystems suggest that further improvements will require action to reduce the impact of the deposition of airborne materials into the bay, which will require different types of policies, affecting different sources. Whether and how public support will extend into these new policy areas is not yet known.

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The proposed research takes the approach, demonstrated in Kempton, Bister, and Hartley (1996), Bunting-Howarth (2001), and Kempton, Rayner, Harris, and Marker (2001) that support or opposition to policies can be understood by eliciting the public's values and cultural models. The goal of this research is to understand the values and cultural models that Tampa Bay residents apply to the Bay and to policies to preserve the Bay. Specifically, we will conduct interviews to elicit the values that lead residents to place priority on protection of the Bay relative to other social or personal priorities. The interviews will also elicit cultural models that people use to explain why various types of human impact cause damage, how different elements of the Bay ecosystem interact, and how protection measures can affect the preceding. Finally, the interviews will explore what is now known about air deposition into the Bay and its impacts.