

EVALUATION & DECISION MAKING IN THE CONTEXT OF ENVIRONMENTAL RESTORATION

An Overview Paper for a Collection of Disciplinary Perspectives

Clifford S. Russell
Vanderbilt University

INTRODUCTION

Broadly speaking, the purpose of the set of papers at the appendices is to provide the Corps' leadership and field personnel with the perspectives of four different, disciplines--ecology, economics, engineering and social psychology--on the question: of how judgments should be made among alternative environmental restoration projects. Such projects may be large, as in the unstraightening of the Kissimee River, or small, as when some minor change is made to a culvert or road in order to correct the flow regime in a locally important wetland. Generically, environmental restoration projects modify or even destroy features of earlier structures--or possibly change operating regimes--so that elements of the natural world are returned to a condition more closely approximating the pre-intervention situation. Removal of a dam or a levee are simple examples, at least in the sense that the restoration actions are easy to understand. A change in reservoir operating rules to restore pre-dam flow patterns may be more complicated. The restoration of pre-channelization meanders might involve miles carefully planned and executed dyking and cutting. All involve attempts to recapture at least some features of the past.¹

In sum, while the outputs from restoration projects are hard to predict and value--at least they are far harder to deal with than such traditional outputs as navigation, flood control, and hydroelectric power--the pressures on Corps budgets from both Congress and the executive branch is greater now than in the past. These pressures imply that in this area of construction and operation, as in every other, the Corps must seek a method of building its budget that is externally defensible; internally reproducible as project proposals pass up the line from field offices, through districts and divisions, to headquarters; and that allows comparison across projects of different types from different places.²

CHARACTERISTICS OF METHODS

It will be significant later on in this effort at interpretation and integration stage to recognize that internal reproducibility and external defensibility are, to a significant extent, independent characteristics of a decision method. That is, some set of arbitrary rules might be highly reproducible up the chain of command but indefensible in other settings (for example, some of the old "stemming" benefits). On the other hand, a process of negotiated agreement at the local level might be defensible (Shabman and Schkade both sketch the elements of such a

defense) but essentially irreproducible. As for the comparability requirement, reproducibility seems to be a necessary but by no means sufficient precondition. For example, if every district or division used a different, but reproducible, decision process, comparisons would only be possible within each local system.

These characteristics are demanded of the ranking or decision method because of the organizational structure of the Corps and its place in the national political scene. The following elements of that place seem especially important:

- The Corps remains a decentralized organization, with significant initiative residing in the field.
- There exists, however, a multi-layered process of review and approval that puts at least the power to stop or modify projects in the hands of levels above the field.
- Overall the Corps is increasingly subject to OMB budget review and needs to be seen as a team player within the administration.
- Capital projects require, with few exceptions, the financial support of local sponsors, who must therefore literally buy into whatever is to be done.

The above constitutes the constraints or limits on Corps action in general. However, environmental restoration has considerable *priori* appeal as an activity area for the 1990s and beyond. The very fact that the Corps has lost the power to impose water "control" projects on regions, with the enthusiastic backing of Congress reflects in part the growing power of environmentally concerned groups at the local, regional and national levels. Restoration plays to these groups' concerns and has the potential to earn the Corps favor if it enters the field with the right tools and attitudes.

As an example,, consider the West Tennessee Tributaries project. This attempt to control flooding along tributaries of the Mississippi in west central Tennessee was authorized in 1948. Channelization began in 1961, but by 1970, the project was in trouble with environmentalists who by then had the power to litigate. A series of court actions followed, and slowed progress on this line of work so that by 1994 only 41 percent of the authorized channelization was complete.

In 1992, the Governor of Tennessee began a local negotiation process with the committee chair coming from a state planning office. Represented were local communities, local and state environmental organizations, farm and forestry trade associations, interested state and federal agencies, including the

Corps and EPA, and plaintiffs from the lawsuits. This "steering committee", as it was called, produced a consensus report calling for a redesigned project, one "designed to return more natural functions to significant reaches of the river flood plains.

In these restoration reaches, a naturally meandering river channel capable of carrying normal flows would be restored..." and would "also include protected and restored wetland areas whose natural functions attenuate flood stages". Further, to demonstrate the feasibility of the recommendations, two small scale projects were suggested for immediate implementation. (State of Tennessee, 1994)

This agreement has been hailed by the environmental community as a huge victory, and they have heaped praise on the Governor for his major part in bringing it about. But it is also interesting to note that the steering committee and the Governor's office are concerned that the proposed redesign will not meet of the Corps' traditional approach to benefit-cost estimation. By this they appear to indicate that the restoration benefits of the project will be ignored or undercounted. It is uncertain whether and to what degree they are worried about losing in any cross-Corps comparison against other restoration projects.

Thus, we see here a pattern of early enthusiasm for traditional engineering approaches to hydrologic control; disenchantment as environmental costs become more obvious; and lawsuits that slow and, for periods, stop progress on the works. It seems highly unlikely that this pattern is confined to one small part of one mid-South state.

Such impasses represent political opportunity, and one would expect to see efforts at resolution. The Tennessee example may be unusual in that the Governor put his prestige and power behind the negotiations. But it may nonetheless suggest a model to be explored--a model that is very similar to that espoused by Shabman and Schkade except for the locus of the initiative. Finally, the concerns of the steering committee about how the Corps will deal with the proposed resolution suggests just how urgent is the need for well thought out and well articulated guidance to the field.

So--if this is an opportunity for the Corps in the coming decades, and if the limits on action are as summarized above, what guidance do the papers collected in this report offer?

PATTERNS FROM THE INVITED PAPERS

It should not be surprising, though it may be just a bit disappointing, that the four papers present something very far from a unified front. Indeed, one might say there are four quite very different approaches here--or perhaps three and one-half, since there is some agreement between Schkade and Shabman on:

- the fragility and general unreliability of the contingent valuation method of attempting to get benefit estimates for restoration projects, and
- the desirability of developing systemizing, and using negotiation processes to define values and reach conclusions on project desirability.

Despite the lack of agreement, however, there does appear to be a pattern in the approaches and recommendations. I visualize this pattern in the shape and terms presented in **Figure 1**.

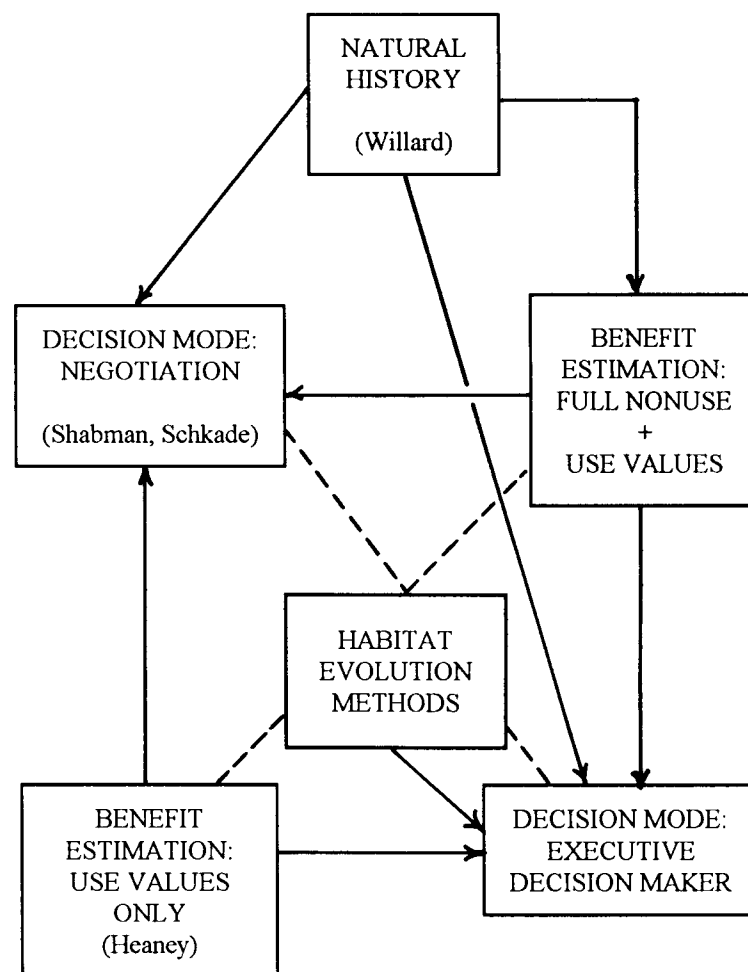


FIGURE 1.

A Schematic of the Positions and Relations of the Panelists Regarding Environmental Restoration Projects

Here, the basic shape is a rectangle, with the SW/NE diagonal representing the continuum between a concentration entirely on use-based benefits (commodities, recreation, irrigation, flood control, even aesthetics) and an all inclusive benefit notion that includes the so-called nonuse values (option and bequest and, intrinsic or knowledge, for example). Heaney places himself close to the southwest end of this range, while Willard, without discussing benefit estimation per se, is clearly close to the northeast end in terms of his view of what is to be valued in an ecological system. The other two authors appear to believe that

the values that are "constructed" (Schkade's term) via negotiation will include nonuse categories. But they are not concerned to dwell on the distinction explicitly.

The other diagonal of the basic box represents a continuum of decision making modes--between "constructed" valuation via negotiation at one extreme and a classic, executive agency model depending heavily on cost-benefit analysis at the other. Two of the authors, as has already been said, are very much at the negotiation end, though not against informing this process in technical ways. Heaney is definitely at the classic end, with a very positive view of what can be accomplished with sufficient data and ingenuity. Just as clearly, Willard has problems with cost-benefit analysis, but it is not so clear how he would suggest the Corps organize data (or people, for that matter) in the interests of reaching a decision. For this reason, outside the "boundary" of the rectangle, another approach has been added that may feed information in a couple of directions. I call it "natural history", the phrase that I believe Willard would likely apply to the extended data gathering and interpretation activity he describes. Finally, by way of tying in another approach with which the Corps is familiar, this author has added within the rectangle, cost-effectiveness analysis based on one or another habitat estimation or measurement system as the source of "effectiveness". It is shown as close to the use-based valuation and the classic decision modes corner points.

If the diagonals of this schematic represent continua, the explicit lines connecting the approaches are meant to show potential information feeds. Thus, either version of benefits definition can feed into either a cost-benefit or a negotiated value construction and decision mode. For that matter, habitat evaluation/cost effectiveness and even cost-benefit itself can be used as information sources for negotiation; though some might object that such feeds would be more distorting than helpful because of the (misleading) implication they carry of a "right" answer. The natural history approach to information organization can also feed information into several of the other processes, though I emphasize here only the potential links to full use/nonuse benefit estimation, and the negotiation decision mode is emphasized here.

INFORMATION AND ORGANIZATION ALTERNATIVES

With this schematic notion of relationships in mind, some comments on each of the "boxes" individually should be discussed. For the information generation and organization activities (benefits estimation, habitat evaluation, natural history), this discussion will first center on sources of data, units of observation and aggregation, and positive features and problems of concern, then turn to matters of reproducibility, and so forth. For the decision modes (benefit cost and negotiation, with a word about cost effectiveness), a comparison will be made of the decision modes and the Corps' requirements as outlined above.

Benefit Estimation-Use Only

The advantages of adopting a use-only definition of the benefits to be counted are two-fold. First, it is important to explore, the controversy about nonuse values, what they mean, and whether they can actually be discovered and secondly (See Cummings and Harrison, 1994, for a recent example.) to maintain the possibility of using only the so-called indirect or revealed preference methods of actual estimation. Thus, property value hedonics, recreation travel costing, defensive expenditures, and weakly complementary expenditures, are all in the available tool kit. And all depend on the use of data in markets that reflect environmental quality; not on stated preferences or intentions. Thus, the weaknesses of the contingent valuation method are of no concern.

Heaney sketches a method that he and his colleagues applied to a wetland restoration project in central Florida. The benefit categories for which dollar values were reported include flood control, storm water runoff retention, wastewater treatment, and recreation. The unit of aggregation in this work was the acre. That is the total benefit from a project restoring A acres of wetland would be, in simplest terms, $A \cdot b$, where b is the estimated total use value per acre. (In the Florida study there were several separate wetlands that would be restored and each apparently had different per acre benefits, but the principle remains the same.) The per acre numbers themselves come from more or less complicated calculations, some of which are of the alternative cost form (the water quality related benefits), and others of which involve original surveys (recreation).³ While it is not at all easy to follow the summary of the manipulations that lead to the values attributable to wetlands, the principle being illustrated is clear.

Before the Corps decides that this general approach solves its problems--at least on the information generation side--it should, however, consider that while indirect methods do not suffer from the same recognized infirmities as contingent valuation method, they are rife with their own varieties. First, consider recreation benefits as an example.⁴

1. Recreation surveys can be done at the site or at homes. The former is easier; the latter may be better at avoiding bias.
2. In any case, recreation benefits that depend on changing availability in non-marginal ways around an entire region should flow from quite a complex system of interconnected demand equations. These are further complicated if new access points to entirely new (not currently observable) opportunities are contemplated.
3. The correct values to use for recreation travel time and, ultimately for recreation days spent at various activities are not questions susceptible to "scientific" answer.
4. Even the functional form for a recreation visitation equation is an essentially arbitrary choice, but one with potential large effects on the estimated benefits.

In addition, hedonics has its own difficulties, including, again, functional form, but involving more fundamental problems of identification. (e.g., Bartik, 1987; Cropper, et al, 1988).

But going beyond any single category or technique are two overarching difficulties. Most important, the issue of non-use benefits is by no means a settled issue, but it can be said that the weight of environmental economics thinking would now agree with the proposition that such benefits are real and should in principle be "counted". (As pointed out below, there seems to be further agreement that there is no good way to estimate nonuse benefits separately from use-inspired benefits.) Setting out to ignore them may satisfy the letter of the Principles and Guidelines, but it biases the results down. This can be called "conservative" but it is conservatism of the special kind that protects the status quo when the question at issue is environmental restoration.

Second, even within the category of use-inspired benefits, there are potential over and under laps that make it difficult to be confident we are counting all and only all of what is our aim. For example, boating and fishing are complements. It is very difficult to find data that allow one to get at a "pure" boating benefit. The same can be said when considering property value changes and recreation. One would like to make sure that only non-resident (non-owner) benefits showed up in recreation numbers attached to a specific site or project if one is also taking credit for shoreline property value changes. This may or may not be possible.

In short, the use-benefit-only position has some serious appeal because the resulting estimates need never involve stated preferences, only revealed ones. Its appeal is tempered by recognition of the several essentially arbitrary choices one must make in applying any one of these methods, and by the under and overlap problems that arise when total benefits are obtained as the sum of separately estimated benefit categories, some of which are defined by use and some by implicit aggregation processes, as in property value hedonics. Further, it seems too early in the continuing debate to abandon the notion of bringing in non-use benefits.

Including Nonuse Benefits

Not surprisingly, the good and bad news sides of this choice are just about mirror images of the use-only approach. Most important, there is as yet no accepted way of getting at non-use benefits other than via the contingent value (direct questioning) method. As Shabman and Schkade point out forcefully, this leaves the resulting numbers open to methodological objections of a quite fundamental nature. For example, there is strong evidence that respondents to such surveys, while not purposefully misrepresenting their willingness to pay, arrive at numbers to give the interviewer by wildly irrelevant and irreproducible methods ("heuristics").

Perhaps, unfortunately, there does not appear to be any way, either, to obtain use-inspired benefits separately from non-use. In particular, it cannot be hoped to combine the strength of the

revealed preference methods with contingent valuation aimed only at nonuse.⁵

Further, the restoration project decision is one of those in which the willingness-to-pay/willingness-to-accept disjunction may be significant. This is because it will be possible to make a case that the original project deprived the affected population of a status quo situation and reduced the natural world service flow. Given this "reference point," the correct question related to restoration benefits should be how much those originally deprived would have been willing to accept as compensation for the damage; not how much they would now be willing to pay to get back to the status quo ante. But it is unfortunately widely accepted that we do not yet know how to obtain serious responses to WTA questions.⁶ (See Knetsch, 1994)

The unit of investigation and of aggregation using the CVM is the individual. But this also raises the questions: Which individuals will have relevant preferences and which should be "counted"? The first question is often referred to as the extent-of-the-market issue. Taking, for example, the Central Florida lakes and wetlands evaluated by Heaney and his colleagues, the first question asks, in effect, how far away one can go before no one is concerned about the proposed restoration.? Observe that a similar question should be asked for a recreation benefit estimation but is often not given any thought because participant sampling happens at the site of interest. Further observe that if we are interested in use plus nonuse benefits we would expect the extent of the market to be expanded over that for use-only benefits. Finding the extent of the market is not easy, though at least it is in principle technically possible. The second question of who should count, on the other hand, is normative and maybe seen as political or ethical, depending on taste. (See Whittington & MacRae, 1986, for some considerations.)

A final, very large obstacle in the way of full benefit estimation for ecological restoration is the difficulty of choosing and conveying relevant (to benefit estimation) information about ecological systems to lay respondents. (This is, in fact, the subject of a multi-year research program just getting underway at Vanderbilt and Oak Ridge National Laboratories.) Thus, even if one were willing to gather data with CVM, one would be ill-equipped to do so because of the inability to convey to respondents a multidimensional characterization of the difference between the before and after restoration states of the system to be affected. And our lack of knowledge here is quite complete. No one is certain of how many dimensions lay people can handle; nor which indicators of system condition are meaningful to lay people and provide a technically accurate notion of system condition. Finally, what is the best approach to convey any chosen information to respondents--what mix of words, numbers, charts, still pictures and even video images produces high response rates and internally consistent answers at least.

Thus, in summary, there is a case for attempting to include nonuse values in benefit estimates where ecological system restoration is at stake. But there is still considerable controversy

about whether and how well CVM, the one method capable of producing estimates reflecting nonuse motivation, taps into internal data and thought processes that deserve to be taken seriously.

Habitat evaluation

A method of dealing with restoration that seems to be widely used in and familiar to the Corps is to concentrate on habitat effects--either habitat for a single species or for a wider community of species⁷ Methods such as the Habitat Evaluation Procedure (HEP), the Habitat Evaluation System (HES) and the Wetlands Evaluation Technique (WET) combine many individual measurements from the natural world, by way of more or less common sense translation formulae, into indices of suitability. (For an overview see Greeley-Polhemus, 1991. On the details of WET see Adamsus, et al, 1987. For a bottomland hardwood forest community habitat model see O'Neil, et al, 1991.) These usually are not intended to be valued in dollar terms, but instead are treated as "effectiveness" measures.

It is likely that many participants in, and observers of, restoration planning consider the major strengths of the habitat methods to be that neither people nor money are involved. The values thus have the appearance of "hard" science and do not suffer the moral taint that goes with translation into dollars.

Taken on their own terms--as science--the methods give the impression of being good guides to what might usefully be measured in order to characterize an ecological system's condition. But the formulae used to combine those measurements look quite *ad hoc* and arbitrary, even if based on such familiar notions as logistic functions and symmetric effects around an optimum level. (See Russell, 1992, for a few examples from the bottomland hardwood forest model referred to above.)

Viewed as a substitute for an effort to estimate benefits, they suffer both because they implicitly ignore routes to benefit accrual and because they ignore functions of ecological systems that might equally well be taken into account. Because we are not talking dollars here, it is not meaningful to say that undercounting is going on. But we can not expect that any broader optimality results would hold for habitat cost-effectiveness choices. That is, there will not be a perfect correlation (perhaps not even a very high one) between any habitat suitability measure and either benefit measure: use, or use plus nonuse.⁸

Notes on Reproducibility, Comparability and Defensibility in the Information Context

All the methods described above have the quality of reproducibility in some measure. For example, the indirect estimation methods behind use-only benefit numbers can be carefully described so that, given the original data sets, the benefit estimates themselves can be reproduced by reviewers. This is not the same thing, of course, as starting with the raw data and producing benefit numbers by using some other equally

defensible function forms, values for recreationists' time, assumptions about competing opportunities, etc. In general, one would not expect the results of the second experiment to match the results under review.

When nonuse values are brought in and the CVM needed to get at those, the reproducibility is of a different quality. Here, given the survey results; the statistical methods used to produce, for example, willingness to pay equations; the characteristics of the sample of respondents; and the population; it should be possible for reviewers to reproduce population benefit totals. But again, this is certainly not the same things as starting with the problem definition, designing another survey instrument, and so forth. It may not even be possible to reproduce the numbers starting with the same survey instrument but a new respondent sample. That, in effect, is what some of the most damaging criticisms of CVM are saying: responses are not just randomly distributed around a mean that we can "discover". The individuals' means or true values do not even exist in any useful sense.

Considering the two non-monetary methods of organizing information, what is being referred to here as the natural history method seems less likely to be reproducible. That is not because any one piece of data is ill-defined or not itself reproducible but because no protocol seems to exist to guide exactly which pieces will be sought. In addition, the interpretation of any given set of pieces appears to involve rather a big dose of art or at least craftsmanship--a personal model applied to an idiosyncratic data set may overstate the problem but perhaps not by much. On the other hand, if habitat evaluation is to live up to its objective, scientific billing it must be possible to have two independent "surveyors" arrive at the same index value for the same system.

Comparability refers to the possibility of using results from the method of information organization to compare the desirability of two proposed restoration projects, perhaps involving different systems in different regions. The benefit estimation methods are designed to do exactly this, so no problem on this score should be anticipated (thought as pointed out, some will not believe either number). Natural history, in contrast, could not be expected to allow such comparisons in general. Perhaps if only one observer/rater were involved in each place (or perhaps one team), he/she/they could produce comparisons by some internal decision process. Habitat evaluations will be comparable as long as the same systems (measurements, formulae, etc.) are used everywhere. It seems more likely, however, based on a close reading of these methods, that there will be different index approaches appropriate to different project systems--wet vs. dry; fresh vs. brackish; high altitude vs. low; high rainfall vs. low; and so on. It may be that a truly generalized system is even now being developed for exactly the purpose of maintaining comparability. In its absence there will be gaps. Cost-effectiveness comparisons will only be meaningful where there is a common effectiveness metric.

External defensibility may be thought of as a test of a method's ability to appeal to observers and would-be critics outside the

professional domain that produced it. But there are several dimensions on which the appeal may be made and more than one audience to be appealed to. For example, economists would be inclined to argue that benefit estimation methods consistent with the fundamental tenets of microtheory are defensible. But external audiences as disparate as hard core environmentalists and professionals in risk analysis may not agree. The former may well object to the notion of holding nature against the yardstick of money; the latter may point out the accumulating evidence that the assumptions at the root of microeconomics do not appear to relate very well to the real human condition. Habitat evaluation, on the other hand, may be more defensible in the abstract than in practice. The notion of an objective, scalar, measure of restoration output--one that does not involve dollars--may have great appeal to both the environmental community and to decision makers. But closer examination of the measurements made, their conversion into normalized arguments, and their final combination into an index, may lead to perplexity. "Why that step function? What if this was used this instead of that averaging approach?", are the sorts of questions that may arise and signal problems for defensibility.

Analogous questions, though perhaps not so narrowly focused, may be expected when the natural history approach is exposed to outside review.

DECISION PROCESSES

There are two major contending decision processes reflected in this collection of papers. One might be called a classic executive agency model, in which cost-benefit analysis counts for a great deal, though not for everything. The concession to political realities takes the form of a concern with predicting the distribution of costs and benefits as a way of anticipating, and perhaps developing project modifications to address sources of opposition to contemplated projects. But there is at the heart of this vision a "decision maker", who has the power to choose among alternatives and whose objective function is a somewhat modified version of economic efficiency. The second process is usually referred to in the papers as "negotiation", and the vision implicitly or explicitly sketched involves gathering the local (and perhaps not so local) "stakeholders" or their representatives, providing the resulting group with information as requested and perhaps with mediation help, and waiting for a consensus project to emerge.⁹

A few general observations may be useful to provide a bit of perspective before going into the matters of reproducibility and so forth. Consider first the executive-agency/decision-maker model. Depending on whether one sees the glass as half empty or as half full, one might say either that this version of public decision making was always the unrealistic (even dangerous) model of what traditional economists wanted to see happening; or that this is the essence of our regulatory system, though the role of benefit-cost analysis was always overstated. Certainly efficiency, in the economists' sense, never drove the system, though it was often necessary to bow in that direction as part of the process. Witness the claims of "cooked" cost-benefit

analysis analyses for water projects and, much more recently, the executive orders of Presidents as dissimilar as Reagan and Clinton requiring CBA in various decision settings. Equally certainly, no single executive agency decision maker could, outside of national emergencies, make decisions that affect members of the public without conducting some sort of political base-touching exercise. This seems to be true even for the independent "commissions" for which terms are meant to run across presidential elections. It is obviously true for the EPA Administrator and is becoming more obviously the case for the Corps itself.

Thus, seen in one light, the recent increase in popularity of the negotiation mode of public decision making looks to be simply a formalization and extension of what was happening informally and unevenly. One way of explaining the perceived need for formalization and extension is to observe the growing power of affected parties--even indirectly affected parties--to throw the proverbial spanner in the works after the agency decision process had ostensibly concluded. Put almost crudely, an appealing notion would be: If they can stop us from doing what we decide is best after we have decided, why not try to get them to buy in to the process before hand and possibly obtain a decision to do something, at least; and something that will not be challenged. A related observation is that no organ of "normal" government is structured to provide the special sorts of coverage and representation that seems to be needed in special decision situations such as those that arise in the restoration context. Advocates of this approach can point to some successes: examples include negotiated EPA regulations ("Reg Neg") (Lyons, 1991) and the so-called Keystone Group consensus document on management of DOE's environmental restoration program (Federal Facilities Environmental Restoration Dialog Committee, 1993).

Seen in another light, that of traditional procedural legitimacy, however, the negotiation model, as it seems to play out in practice, represents quite a break with the past on at least two dimensions: representation and the ultimate decision rule. Representation is ad hoc. there are no geographic districts sharply drawn, but rather the intention is to have categories of interest represented. the choice of actual representatives is not by vote of the putative interest groups but something closer to the way a National Academy committee is put together--through networking, persuasion, and balancing efforts conducted by the agency or a contractor. Decisions by the new collective of "representatives" are clearly most useful if made by consensus (unanimity). Otherwise, the purpose of avoiding ex post challenges may not even be served. This sort of decision rule effectively formalizes the veto of every person (interest) in the group. It favors the status quo over changes; and it appears to lead to sharing rules that on the surface at least, treat every interest equally.¹⁰ These are attributes one might expect to see, given the origin of the underlying challenges to agency decisions in mistrust of agency motives and methods.

The dimensions of reproducibility, comparability, and defensibility apply somewhat differently to decision processes

than to information organization. First, reproducibility is the essence of the classic cost benefit basis for a decision. Only if the accounting stance (for cost and benefit definition) is allowed to differ at different levels in the organization, or if the political base-reaching extends down to lower levels, will it be a problem for higher levels to reproduce decisions. One might even speculate that it is exactly this quality that appeals so much to an agency in which initiatives tend to arise from the field rather than from legislative mandate or Presidential campaign promises. Decisions of a local or regional negotiating process are not reproducible in any sense except that by reading the documentation a reviewer might be brought to agree with them.

Similar statements apply to comparability. Unless there has been an error in guidance, a cost-benefit analysis from California will be comparable to one from Florida, even if totally different projects are involved. This is a strong advantage for budgetmaking, whatever its drawbacks. But there is no way to compare (judge between) decisions from different local consensus groups in building a budget.

Finally, defensibility is even more obviously here a matter of audience. If the above sketch of the background for negotiation is at all accurate it suggests that the popularity of that method arises because the executive agency model, at least in some settings, proved indefensible. That is, attacks by interested parties became more often and more permanently successful. On the other hand, in the context of tight national budget constraints, it may be hard to convince national agency executives and national legislators that a process explicitly ignoring information that helps in priority setting is really helpful. This does raise an interesting question: Might it be possible to have a national consensus group analogous to the DOD Base-Closing Commission that would operate in the environmental restoration area? Input to the group could include both the results of local negotiations and analyses with an explicitly national stance, including benefits and costs as well as budget implications.¹¹

CONCLUSION

It seems tenable that the several different points of view and approaches evident in this collection of papers do not survive simply because single disciplines cannot themselves develop a lock on the truth (though that is true), nor because any of the disciplines is committed to something clearly inappropriate. Rather, the disagreements reflect an inconvenient but unavoidable element of reality: There is no clearly dominant approach. In organizing information about results we may only buy reproducibility, via narrow result definitions, at a cost in defensibility and comparability; or comparability, through fullscale benefit estimation, at a cost in reproducibility and defensibility. Similarly, in choosing an approach to decision making, the executive agency model guarantees reproducibility and comparability as decisions are reviewed at higher levels. But that model has become increasingly difficult to defend. On the other hand, local consensus negotiations may be defensible--especially as politically necessary in the new world of public

decision. But they are not in general reproducible in any meaningful sense, nor do they allow for comparing one local decision with another from another region or another involving a different type of investment. In short, the Corps has some freedom to maneuver but no solution will solve all its problems.

¹As Shabman points out in his paper, it makes a considerable difference to the analytic and decision problem just what objective is chosen for the restoration project. Using an example from the Everglades, he contrasts several alternative possibilities: restore a water flow regime; restore patches of a particular habitat type; or restore populations of particular bird species. This subject will be explored in greater detail.

²It has been pointed out that currently there are insufficient projects submitted to exhaust the annual funding available for restoration projects under the "1135" program, making the need for comparability at least less crucial.

³One of Heaney's strongest recommendation is that the acquisition of relevant data be made a higher priority by social scientists generally and by those with responsibilities that require benefit estimation specifically. It is also worth observing that since some of the data Heaney reports in the central Florida study comes from other parts of the state (e.g.: land values from Lake Okeechobee) he is in effect engaging in "benefits transfer" work. Since this general approach is espoused by Shabmen, this makes one more instance of agreement across papers--an area exactly on target with respect to data availability problems.

⁴See Vaughan & Russell, 1982, for sensitivity analysis on several of these points.

⁵For an ultimately unconvincing attempt to add separately estimated non-use to use values, see the study of the value of the undammed Tuolumne River by Rob Stavins for the Environmental Defense Fund, EDF, 1984; for the argument against separable estimation, see Cummings & Harrison, 1994.

⁶Again, WTP, which would be presumed as lower than WTA, could be called "conservative." But the same objection would apply here as to the argument for the conservatism of use-only benefits.

⁷None of the authors of the other four papers pushed any habitat method. This author includes the notion exactly because it is important within the Corps currently.

⁸It has been noted by a reviewer of a draft of this paper that none of the habitat models is meant to be an absolute measure of ecological condition. Rather all are seen as generating "output" change predictions for contemplated actions. Their use in decision making is confined to guidance, with actual decisions explicitly recognized to depend on other factors such as watershed context and system rarity.

⁹As already noted, the results of cost-benefit analyses might be part of the information provided to the group seeking consensus.

¹⁰Thus, the Keystone Group called on DOE to share budget changes equally across the sites requiring restoration--in proportion to the base-year budget share of each site so that budget shares would not change over time. This was an explicit rejection of priority setting on the basis of assessed health risk differences across the sites.

¹¹Another function of such a group could be the establishment of resource priorities for the guidance of Corps field personnel.

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