

Contingent Valuation and the Legal Arena

Richard T. Carson and Robert Cameron
Mitchell

1. INTRODUCTION

Is the contingent valuation (CV) method sufficiently mature and reliable to be used in natural resource damage litigation? That question fundamentally differs from the question: Does contingent valuation, in principle, work? The latter question must be answered in the affirmative. In chapter 10 of this volume William D. Schulze addresses the current state of the art of contingent valuation. Cummings, Brookshire, and Schulze (1986) and Mitchell and Carson (1989) discuss at some length how and why the CV method works. Since the *Ohio v. The United States Department of the Interior* decision in 1989,¹ the method's detractors have been in a much weaker position than they were during the initial formulation by the Department of the Interior (DOI) of rules for natural resource damage assessment under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).² Hundreds of contingent valuation studies have now been completed, and the number of studies using contingent valuation is increasing at a more rapid rate than valuation studies using other nonmarket techniques.³ If asked by a judge, an economist as an expert witness for either plaintiff or defendant would have to say that contingent valuation is now clearly a method that many experts routinely rely upon as a base for their judgments.

¹880 F.2d 432 (D.C. Cir. 1989). The *Ohio* ruling by the D.C. Circuit Court is fairly unusual among federal circuit rulings in the depth of its consideration of an economic valuation technique.

²42 U.S.C. 9601-9675.

³Appendix A of Mitchell and Carson (1989) provides short summaries of more than one hundred of these studies.

The question of whether the CV method should be used in natural resource damage litigation is somewhat more difficult to answer. While successful CV studies are easy to find, the results of other contingent valuation studies seem implausible. This is to be expected. Any nascent methodology requires a certain amount of time to develop its basic operational principles. That period has passed for contingent valuation and a sizable corpus of information is available on contingent valuation techniques. However, the information is neither widely known nor widely disseminated among economists, for whom survey research is in general an unfamiliar or uncongenial way to gather data. Furthermore, these techniques are not yet routinely taught at the graduate level and contingent valuation, unlike many techniques of economic analysis, requires extensive practice. Contingent valuation is also susceptible to failure because of the great expense of conducting a CV study properly. Contingent valuation's apparent simplicity may lull the inexperienced into the belief that a study may be conducted cheaply with little development effort. An underfunded study is likely to be a poorly developed and poorly executed survey whose results lack reliability and validity.⁴

In any event, reliability and validity are relative concepts at best. A fair assessment of all nonmarket valuation techniques used during the last decade is that none of them automatically produce reliable and valid answers.⁵ A certain amount of art is required to assess the value of a natural resource. For hedonic pricing and travel cost analysis, this art is shown primarily in econometric specification; for contingent valuation, it is shown largely in the form of wording of questions. In both cases the problem is that natural resources do not and cannot have a true value that is context-independent.⁶ Unfortunately, this dependence is not comforting to those lawyers who expect economists to come up with *the* answer rather than *an* answer or, even worse, a range of answers. What the analyst can

⁴In the worse cases, failure is willfully counted by ignoring principles well established in the field. This failure is often used by the responsible party to claim that the method is fatally flawed.

⁵Opponents of nonmarket valuation and contingent valuation, in particular, use this assessment to argue that no attempt should be made by economists to value natural resource damages. Indeed, it is suggested in some quarters that nonmarket valuation should be left entirely to judge and jury, that values given to natural resources by resource economists are worse than useless—they are misleading. This suggestion—that a state-of-the-art nonmarket valuation study is not relevant—runs counter to common sense. Without such a study the fact-finder is left with only his own experience to help him determine the value of the resource.

⁶Economics as a profession is to a large degree based on the concepts of substitution effects and income effects that make all economic valuations context-specific. See Hoehn and Randall (1989) for a discussion of this issue as it applies to benefit-cost analysis.

do is eliminate or reduce many of the sources of uncertainty and, more important, explain to a lay audience the determinants of the range of estimates.

Preparing a contingent valuation study for a legal proceeding is a challenging task, in part because of the high standards of evidence that are likely to prevail in such a proceeding, in part because a judge or jury is more likely to understand the criticisms leveled against a contingent valuation study than the highly technical economic criticisms likely to be raised against a travel cost or hedonic pricing analysis. However, the conceptual simplicity of contingent valuation is also an advantage, as its method of obtaining the valuation estimate may be much more intuitive to a judge or jury than are the other nonmarket techniques.

The issue remains whether the method can be applied to particular natural damage cases in such a way that its findings stand up in court. We agree with Schulze that the method can be so used provided suitable attention is devoted to the methodological challenges. Our disagreements with Schulze involve, for the most part, matters of emphasis.⁷ For example, while we agree that the existence of crystallized opinions about the resource may facilitate the valuation effort, we add a couple of caveats. First, having direct experience with the amenity being valued does not necessarily imply that a respondent has a preexisting value for the amenity. Since the amenity is not bought or sold, the act of placing a dollar value on the resource may be unfamiliar, regardless of any extensive personal experience with the resource. Even if personal experience with the amenity aids the valuation process, it may also distort it. For example, personal experience may increase the likelihood of strategic behavior on the part of local residents who imagine that the survey will be used to impose costs on the corporate malefactor that they believe is responsible for the damage. We believe that the whole notion of reference operating conditions has clouded the key issues in contingent valuation without providing any useful guideposts for those evaluating a contingent valuation study.⁸

⁷One technical point over which we disagree with Schulze is on the case of correcting for starting-point bias (see Carson, Casterline, and Mitchell [1985]). We also disagree with Schulze's view that in-person contingent valuation interviews are often strongly influenced by interviewer bias. We have seen no evidence of this phenomena with well-trained interviewers of the major survey organizations, nor does the survey literature suggest that we should. That we have so few disagreements of this sort with Schulze is one indication of how much the method has matured over the last ten years.

⁸The reference operating conditions arrived at by Cummings, Brookshire, and Schulze (1986) are as follows: (1) subjects must understand (be familiar with) the commodity to be valued; (2) subjects must have previously had (or be allowed to obtain) valuation and choice experience with respect to consumption levels of the commodity; (3) there must be little

In section 2 of this chapter we consider some aspects of natural resource damage cases that can make the design and implementation of a natural resource damages contingent valuation survey an exceptionally formidable task. We take as a given that the defense will attack the contingent valuation scenario in the plaintiff's survey as vague, will attack the depiction of the physical injury as more serious, permanent, or far-ranging than it is in actuality, or will suggest that the injury is due to a pollution source other than that for which the defendant is responsible.⁹

2. IMPLICATIONS OF NATURAL RESOURCE DAMAGE CASES FOR CONTINGENT VALUATION STUDIES

A contingent valuation scenario is of necessity an abstraction and a simplification of a very complicated situation. Most CV surveys to date have been restricted to a single environmental medium, either air, surface water, groundwater, or land, and often to a single pollutant. This restriction allows the researcher the maximum opportunity to inform the respondent about the situation without creating information overload. Natural resource damage cases, such as the Eagle River case discussed by Raymond J. Kopp and V. Kerry Smith in chapter 7 of this volume, often involve multiple dimensions (such as the discoloration of a river and loss of a trout fishery), thereby complicating the task of communicating the nature of the good to the respondent. However, if the CV survey is to value only one of the several dimensions, the survey instrument must be designed to ensure that the respondents do not include some of the other dimensions in their willingness-to-pay (WTP) amounts. Getting a respondent to value only a single dimension is often a difficult task, in some cases perhaps an impossible task.

Another characteristic that makes damage estimates difficult is the site-specific nature of the physical injury. To place a dollar value on the injury, one must conceive of the natural environment in its pre-injury, or baseline, state and reconstruct the services it might have provided. The

uncertainty; and (4) willingness to pay measures, not willingness to accept measures, must be elicited. Schultz correctly notes that reference operating conditions 3 and 4 deal with issues not specific to contingent valuation. We would prefer to restate the first two reference operating conditions as saying that respondents should clearly understand what they are being asked to purchase, and should find the institutional/market structure in which that good will be provided to be plausible. Both of these notions make common sense.

⁹There are contingent valuation surveys against which the defense would be correct in making such attacks. It is incumbent upon the plaintiff's scientific experts to establish that the physical injury described in the plaintiff's contingent valuation scenario is not exaggerated.

CV scenario attempts to convey this information, but reading certain words to respondents does not necessarily mean that they will understand the words as intended. For example, if respondents lack personal experience with the site, the effort required to conceive how much and what quality of swimming experience the site would provide may tempt them to express a dollar value for a generalized site for a generalized cleanup. If the site is associated with such symbolically charged attributes as fishing, nature, toxic chemicals, wildlife, and the like, the image that people conceive may well have a higher value to them than the actual site-specific amenity they are intended to value (see Fischhoff and Furby [1988]).

Another frequent difficulty in damage assessment is the requirement that the valuation is of an injury to a natural environment that does not have implications for human health. Here the potential problem is that when respondents are told to value damages caused by toxic chemicals to aquatic species or groundwater resources, they may find it difficult to put aside health concerns. Even aesthetic impacts such as the discoloration of a river may evoke a feeling in some respondents that the situation must pose a health threat to humans. To the extent that respondents include health benefits in their value estimates, an upward bias will result. This problem is not limited to contingent valuation; travel cost analysis and hedonic pricing will suffer the same upward bias if people behave as if health effects are present. Contingent valuation raises the possibility that the dollar values that respondents give can be assigned to different motives in some unique and defensible way. Unfortunately, while economics has much to say about how people are willing to trade off dollars as a function of their preferences, the discipline has long disavowed any ability to answer questions as to why people have the preferences they do. Contingent valuation potentially has the ability to blur this distinction, but the legal arena is not the place to test the ability.

The original DOI rule effectively forced researchers into the business of determining motives by its dictum that, in most instances, only use values could be considered. This dictum put those engaging in contingent valuation in the position of either asking respondents to give only use values or asking for total value (the sum of use and nonuse values), and then separating out use values. Both approaches are usually doomed to failure. Respondents may not be capable of giving an amount that only includes use value, and any decomposition of total values must have a large degree of arbitrariness to it.¹⁰ The problem is not with contingent valuation but rather with trying to measure only use value. Such a measurement is largely meaningless from the point of view of a natural re-

¹⁰Decomposing total value is difficult, like asking a person how much their car would be worth without a transmission, or their bread without a crust.

source damage assessment since total value, not use value, is the economic measure of the injury. The D.C. Circuit Court in *Ohio* ruled that the estimate of damages should include both use and nonuse values. This ruling eliminated one of the major impediments to the application of contingent valuation to natural resource damage assessment.

The defense is likely to argue that respondents to a CV survey engaged in strategic behavior. While strategic behavior is not likely to be a problem in a typical CV study (see Mitchell and Carson [1989]), it may be a problem in a study done for litigation. Here, familiarity with the site may create its own problem. The potential difficulty is that those who are familiar with the site, usually local residents, are also likely to be aware of who caused the damage and, possibly, that the government is pressing that party to pay for a cleanup. This knowledge sets the stage for possible strategic behavior. In some instances a closely related amenity for which strategic considerations do not loom as large should be valued instead.

Often no unambiguously correct solution is available for many of the design choices the CV researcher faces. Therefore, we advocate the use of an explicit design rule for making choices of questionnaire design such as the choice of the payment vehicle or the description of the damage. A conservative rule for the plaintiffs would be to make these decisions in such a way that if one reasonable choice about a scenario element would potentially increase the WTP amount and the other reasonable choice would potentially reduce it, the latter is chosen. For example, given a choice between asking for the WTP amount in the form of either a monthly or an annual payment, the annual payment would be preferred on the grounds that it maximizes the respondent's awareness of the financial implications of his dollar amounts and therefore, if anything, is likely to lower the amount.¹¹ The consistent application of this rule would result in an aggregate benefit estimate that can serve as a lower bound. Trustees for the resource would be well advised to adopt such a rule to enhance credibility of their CV estimates. Defendants may well be advised to follow the opposite tack in studies they commission.

3. DESIGN AND IMPLEMENTATION OF A VALID RESEARCH INSTRUMENT

The most important aspect of designing a valid and reliable contingent valuation study is to understand how and why the survey instrument works. Such an understanding generally cannot be acquired in a short

period of time without great expense. Because of the difficulties of designing a valid research instrument, extensive preliminary research is necessary. This research will require some sort of qualitative field work, most likely using focus groups, to understand how people think about the resource and how they respond to scenario elements. Once a draft instrument is prepared, it must be tested until respondents find it understandable, plausible, and meaningful.

Increasingly, contingent valuation researchers are turning to discrete choice questions that ask for a yes or no answer to a specified dollar amount in order to simplify the respondent's cognitive task. When the amenity to be valued is close to a pure public good, this discrete choice question is often explicitly cast in a referendum context. These two features result in an incentive-compatible question. For this reason they simultaneously reduce the likelihood of strategic behavior and the impact of such behavior by any agent. Unfortunately, instead of eliciting actual valuation responses, such questions elicit only a discrete indicator of the agent's valuation. As long as the purpose is to estimate the distribution of economic valuation in the population of interest, this causes no problems because both the continuous and discrete valuation responses measure the same thing. Of course, discrete choice responses contain less information than the actual values elicited from the same sample of agents.¹² As a result, to achieve the same level of efficiency in estimating a summary statistic for the distribution, such as mean or median willingness to pay, this elicitation format requires either larger samples or much stronger statistical assumptions on the shape of the underlying distribution of values.¹³

In some circles, contingent valuation results have been characterized as vulnerable and as hearsay evidence because they are based on a survey of the public.¹⁴ Contingent valuation surveys, however, are not different from non-CV surveys in this regard. Survey findings have long been accepted as evidence in courts provided they "meet the tests of necessity

¹²Carson and Huppert (1989) show that the payment card, a method that appears to elicit an agent's actual willingness to pay, may be best thought of as eliciting willingness to pay lying in an interval between two amounts marked on the payment card. By analogy, their argument applies to the bidding game, and the direct question is undoubtedly subject to rounding behavior. (On the payment card and bidding game methods, see Mitchell and Carson [1989]). Thus, the difference between a discrete choice response and a so-called continuous response should be seen as a matter of degree—that is, the size of the interval in which the agent's willingness to pay lies.

¹³See Alberini and Carson (1990) for a discussion of optimal designs for discrete choice contingent valuation questions.

¹⁴Hearsay evidence in its simplest form is the recitation in court by one individual of statements made by another individual out of court. Such evidence is not admissible unless it qualifies as one of a number of exceptions.

¹¹In many instances it is both possible and desirable to make the respondent aware of his payment obligation on both a monthly and an annual basis.

and trustworthiness" (Federal Judicial Center, Board of Editors (1978), Section 2.712). Survey findings are frequently admitted into evidence in discrimination, antitrust, and product safety cases. The standard of evidence for surveys required in these cases is very strict, and few contingent valuation surveys to date have met them. The adversarial nature of litigation makes it imperative that the party conducting a CV survey for use in a natural resource damage case exercise extreme care in the design and execution of the survey.

The execution of a CV survey for use in a court case must meet the highest standards of survey research in order to withstand the attacks by the opposing side's experts. The sampling frame chosen, the training of the interviewers, the response rate, and the coding and data entry of the questionnaires will be attacked. As Zeisel (1978) has commented on presenting survey results as evidence: "The discovery of but one serious flaw may endanger the entire piece of evidence; the doctrine of *falsus in uno, falsus in omnibus* is sometimes the ground for not believing a witness's entire testimony if it is found to be untrue in a single instance, and such a flaw may also hurt the expert witness who presents the survey evidence" (p. 1119). Such a contingent valuation study would be costly to conduct: the sample would have to be carefully selected using a probability-based sample design; the sample size would have to be quite large; and each step of the research process would have to be meticulously documented. A widely respected survey firm should be retained to draw the sample and administer the survey. Devoting a great deal of resources to executing the survey does not usually result in estimates greatly different from those obtained in the much less expensive survey execution typical of policy studies, but the risk of obtaining a grossly aberrant estimate is much less and the courts appear to place great weight on minimizing such a possibility. Contingent valuation researchers are well advised to refuse to conduct a survey "on the cheap" if they are expected to defend the results in court.

In particular, we believe that mail surveys of the general public, while the least expensive method of survey administration, may be particularly difficult to defend in a natural resource damage case.¹⁵ Besides having greater vulnerability to strategic behavior, mail surveys have two

¹⁵This statement should not be taken to apply to an ex ante contingent valuation mail survey conducted for a government agency and extensively used for policy purposes by the agency before the natural resource damage occurs. In such a case it can be argued that the agency was explicitly making decisions about the resource on the basis of the valuation indicated by the contingent valuation study. The ideal situation would be for a trustee agency to have established the value of the resources entrusted to it in advance of any possible damage, using the highest-quality contingent valuation techniques.

additional problems. First, those who return the survey are self-selected from those who receive it. Because those who receive the survey can read the instrument before they decide whether to fill it out, those who decide not to return it may be disproportionately uninterested in the topic and thus likely to hold lower values for the damage than others with the same socioeconomic characteristics. Therefore, those who return the survey may not represent the true distribution of values in the sample frame. In-person and telephone surveys do not suffer from this problem because the decision whether to participate is usually made before the potential respondent becomes aware of the survey's subject matter.

The second problem is that mail surveys rely on the ability of the respondents to read and understand the description given in the scenario. This ability is questionable for a significant portion of the general public, as shown by the findings of the National Assessment of Educational Progress, which conducted a study of literacy among a national sample of 3,600 young adults between the ages of 21 and 25. Among other findings, the study found that 6 percent were unable to read a short sports story in a newspaper, 20 percent could not read as well as the average eighth grader, and 37 percent could not present the main argument in a newspaper column (Kirsch and Jungblut [1986]). These criticisms of mail surveys may not apply to mail surveys of specialized populations who enjoy higher than average levels of education and interest in the good being valued.

4. CONCLUSION

The conceptual strategy of developing an appropriate CV survey involves the decisions made by the researcher about such matters as the resource to be valued, the magnitude of the physical injuries involved, the choice of property right structure, and the sampling frame. These decisions must be justified in terms of the facts of the situation, economic theory, and methodological appropriateness. In this light we wish to make three concluding comments on natural resource damage assessment in a legal setting. The first concerns the choice of the nonmarket valuation technique to be used. The second concerns the choice of the sampling frame—a problem that has received far too little attention. The third concerns the choice of willingness to pay versus willingness to accept as the measure of damages.

The concept of a hierarchy of methods for valuing a natural resource injury as embodied in the original Department of the Interior rules was fatally flawed. A technique preferred under the DOI hierarchy may be totally inappropriate for the situation at hand although it may have been

feasible to implement. In other cases, more than one technique may be possible and estimates using more than one technique may be desirable. The court in *Ohio* rejected the DOI hierarchy and directed the agency to revise its rules accordingly. The new DOI rules should provide guidelines as to which techniques are appropriate in which situations rather than mandate a hierarchy of techniques to be used irrespective of the situation. The court's emphasis on total value and its explicit rejection of the proposition that only use values should be measured suggests that contingent valuation will be the technique of choice where nonuse values are important. In situations in which nonuse values predominate, contingent valuation may be the only appropriate valuation technique.

The issue of the sampling frame is important because the greater the population to which the survey estimates are extrapolated, the larger the benefit estimate is likely to be. Should only those who are familiar with the resource be enfranchised? Or should the franchise be extended to include those who lack familiarity with the resource but who have a stake in the damages because their state is the trustee? Because legitimate economic grounds support both approaches, policy guidance from the federal government would be most useful on this issue. The question of the appropriate market arises not only in natural resource cases but in other areas in which law and economics interface—in antitrust cases, for example.

The enabling legislation for the DOI natural resource damage rules clearly suggests a willingness-to-accept (WTA) valuation criterion, while the DOI rules call for the use of a willingness-to-pay criterion. The court addressed the issue of WTP versus WTA and upheld that part of the DOI rule that stated that WTP and not WTA should be measured. DOI's argument in favor of WTP was twofold: that theoretically little difference exists between WTP and WTA and that economists did not have techniques to accurately measure WTA. While the former argument has been shown to be false for the types of situations likely to characterize natural resource damage cases, the latter argument still holds true. In both contingent valuation surveys and experiments with actual money, WTP and WTA often differ radically; and none of the nonmarket valuation techniques at this point in time are capable of directly measuring WTA.

The use of WTP rather than WTA was previously justified by an appeal to Willig's (1976) results, which suggested that theoretically the difference between the two criteria should be small. Cognitive psychologists (Kahneman and Tversky [1979]) have presented theories explaining the large observed differences; and an economist (W. Michael Hanemann [1991]) has shown theoretically that for imposed quantity changes, such as natural resources injuries, the difference

between WTP and WTA can be arbitrarily large. This is so because the difference depends on the ratio of income and substitution elasticities rather than on income elasticity alone, as under Willig's analysis of the difference between WTP and WTA measures for a price change.¹⁶

Whether the courts will uphold the use of WTP in a revised DOI rule in the face of substantial theoretical differences between WTP and WTA amounts remains to be seen. As a practical matter, WTP may be the only reliable measure achievable; and the courts may be willing to sustain the use of WTP merely on the grounds that is a reasonable implementation of congressional intent. Nevertheless, WTP is less than WTA. While this discrepancy will not disturb potentially responsible parties, neither will WTP fully compensate the public as Congress intended.

The power to remedy the situation lies in the hands of DOI in redrafting the natural resource assessment rules and ultimately in the hands of Congress. Economists cannot directly provide an estimate of the quantity desired by Congress. Economists can provide a lower-bound estimate of the desired quantity; the less unique the resource, the closer the WTP estimate will be to the desired WTA estimate. In some instances Hanemann's results may be used to estimate an agent's WTA amount from his WTP response to a contingent valuation survey. This would be the best solution from an economist's perspective. Another solution is allow courts the option of assessing punitive damages, a traditional remedy for an intentional breach of a property right.¹⁷ However, punitive damages are normally reserved for intentionally unlawful behavior. Although one tends to think of the allocation of these costs to the potentially responsible parties as punishment, that allocation is instead merely a decision as to who should be the direct bearer of the burden. CERCLA is remedial by design, forcing those who profited from activities leading to the release of hazardous substances to bear the resultant costs to society. While DOI may seek to polish its justifications, it is left with only one solution—the current one, which does not strictly fulfill the statutory mandate for WTA. Unless Congress acts to correct this disparity, the issue will be handled by the courts in the current crop of post-*Ohio* cases.

¹⁶In most instances, the theories of the cognitive psychologists and Hanemann are observationally equivalent, with the psychologists theories providing an explanation for the magnitude of an agent's perceived substitution elasticity, which drives Hanemann's results.

¹⁷The difference between WTP and WTA is one of property rights. In the case of injury to public resources, the difference is between whether the public should pay the firm not to pollute the public resource (WTP) or whether the firm should pay the public to be allowed to pollute the public resource (WTA).

REFERENCES

- Alberini, Anna, and Richard T. Carson. 1990. "Choice of Thresholds for Efficient Binary Discrete Choice Estimation." Discussion Paper 90-34, Department of Economics, University of California, San Diego, Calif.
- Cameron, Trudy A., and Daniel Huppert. 1989. "OLS vs. ML Estimation of Nonmarket Resource Values with Payment Card Interval Data," *Journal of Environmental Economics and Management* 17, pp. 230-246.
- Carson, Richard T., Gary Casterline, and Robert Cameron Mitchell. 1985. "A Note on Testing and Correcting for Starting Point Bias in Contingent Valuation Surveys," Discussion Paper QES-11, Quality of the Environment Division. Washington, D.C.: Resources for the Future.
- Cummings, Ronald G., David S. Brookshire, and William G. Schulze. 1986. *Valuing Environmental Goods: An Assessment of the Contingent Valuation Method*. Towona, N.J.: Rowman and Allenheld.
- Federal Judicial Center, Board of Editors. 1978. *Manual for Complex Litigation*. Chicago, Ill.: Commerce Clearing House.
- Fischhoff, B., and L. Furty. 1988. "Measuring Values: A Conceptual Framework for Interpreting Transactions with Special Reference to Contingent Valuation of Visibility," *Journal of Risk and Uncertainty* 1, pp. 147-184.
- Hanemann, W. Michael. 1991. "WTP and WTA: How Much Can They Differ?" *American Economic Review* 81, pp. 635-647.
- Hoehn, John, and Alan Randall. 1989. "Too Many Proposals Pass the Benefit Cost Test," *American Economic Review* 79, pp. 544-551.
- Kahneman, D., and A. Tversky. 1979. "Prospect Theory: An Analysis of Decision Under Risk," *Econometrica* 47, pp. 263-291.
- Kirsch, Irwin S., and Ann Jungelblut. 1986. "Literacy: Profiles of America's Young Adults," National Assessment of Educational Progress Report No. 16-P1-02. Princeton, N.J.: Educational Testing Service.
- Mitchell, Robert Cameron, and Richard T. Carson. 1989. *Using Surveys to Value Public Goods: The Contingent Valuation Method*. Washington, D.C.: Resources for the Future.
- Willing, R. D. 1976. "Consumers' Surplus Without Apology," *American Economic Review* 66, pp. 589-597.
- Zeisel, H. 1978. "Statistics as Legal Evidence," in *The International Encyclopedia of Statistics*, edited by W. H. Kruskal and J. M. Tanur. New York: Free Press.

Valuing Natural Assets

The
Economics
of
Natural
Resource
Damage
Assessment

Raymond J. Kopp and
V. Kerry Smith, editors

Resources for the Future
Washington, D. C.