Measuring Nonuse Value: A Comparison of Recent Contingent Valuation Studies

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Abstract

Thirty-one contingent valuation studies published since 1980 that have estimated nonuse value were summarized and compared. These studies estimated willingness to pay for many different types of goods, used a variety of methods, and produced a wide range of value estimates. Six different methods were used to isolate nonuse value. Lower estimates of nonuse willingness to pay resulted from mail surveys, in contrast to personal interviews; from using a contribution payment vehicle, in contrast to increases in prices or taxes; and from estimating nonuse value as the total willingness to pay of nonusers, in contrast to other methods of estimating nonuse value. Respondents of most studies indicated that nonuse value exceeds use value. Several studies found that nonuse value was higher for users than for nonusers of the good, suggesting that basing nonuse value solely on the responses of nonusers will underestimate nonuse value.

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Introduction

Using contingent valuation, economists have measured willingness to pay (WTP) for "nonuse" or "passive use" benefits (called "nonuse value" herein) for over 20 years. This paper briefly summarizes and compares 31 such studies published in the United States since 1980. In addition to the text, a lengthy table in the Appendix contains basic information about each study. This paper updates and expands on Fisher and Raucher's (1984) comparison of the first 6 studies (all published in the 1970s) to estimate nonuse value.

Recently, much controversy has surrounded the measurement of nonuse value, centered on the validity of contingent valuation as used to measure the value of public goods, with particular emphasis on the "embedding" effect (Kahneman and Knetsch 1992). It is not the purpose of this paper to address the validity question. This paper's more modest goal is to look across the variety of studies now available in order to (1) summarize the methods used, (2) report on the range of nonuse value estimates that have been obtained, and (3) compare estimates of use and nonuse value.

This paper was motivated largely by two considerations. First, among the post-1980 studies that have measured nonuse value, a wide range of methods has been used. This range of methods occurred partially because of the different types of goods that were studied, but also because of the lack of accepted methodological guidelines in the young field of contingent valuation. The ample recent activity in measuring nonuse value offered the opportunity to investigate the relationship of method to result, to perhaps indicate whether we should be more concerned about our methodological choices. Second, many of the studies measured both use and nonuse value, allowing a comparison of these two parts of total economic value. If studies consistently found similar ratios of use to nonuse value, we might have a basis for obtaining a rough estimate of nonuse value, and therefore total value, for the many studies that measured only use value.

Although an attempt was made to include all recent contingent valuation studies that have estimated nonuse value, some studies have undoubtedly been missed. Apologies are due to the authors of any studies that were inadvertently overlooked. Hopefully those that are included adequately sample the population of such studies.

The basic distinction between use value and nonuse value proposed by Randall and Stoll (1983) has been adopted here, which assigns option value to the use value category and assigns existence or intrinsic value plus bequest value to the nonuse value category. Because the studies summarized here differed in how they defined individual components of use value or of nonuse value, estimates for individual components were added in an

attempt to achieve comparability across studies. Thus, this summary compares aggregate estimates of use value and nonuse value.

General Description of the Studies

About half of the 31 studies were published in the 1980s, with the remainder published in the 1990s. Eleven of the 31 studies focused on wildlife and fish protection. Another third of the studies focused on water quantity or quality, and the remaining third dealt with wilderness preservation, forest quality, air quality, and other types of goods (Table 1).

Mail surveys were used in 18 of the 31 studies, while seven studies used household interviews and four performed phone surveys (Table 2). Four studies distributed questionnaires to respondents onsite, with two of these asking respondents to mail them back and the other two collecting the questionnaires onsite. Among the 19 mail surveys used in the 18 studies, response rates ranged from 21% to 84%, with a median of 39%; this is nearly identical to the median response rate among the 16 contingent valuation studies listed by Mitchell and Carson (1989, Table 12-3). The two highest mail response rates were obtained in surveys that sampled only persons known to be interested in the good: Loomis (1987) obtained a response rate of 84% from users who were given the questionnaire onsite and mailed it back, and Bishop and Boyle (1987) obtained a response rate of 81% from taxpayers who had recently donated to the state's endangered species program. Only one other of the mail surveys (Duffield 1992) sampled only users. The wide range of response rates for the general public samples (21% to 61%) may be due the nature of the good and to methodological choices such as repeat mailing procedure and length of survey. Response rates of the other survey methods were inconsistently reported (see the Appendix).

The two most common elicitation methods were the open-ended response, used in 12 of the 31 studies, and the dichotomous choice response, used in 11 of the studies (Table 3). In addition, four of the dichotomous choice studies followed the yes/no response with an open-ended question. Five studies used payment cards, and only three, performed in the early 1980s, used a bidding game. See Mitchell and Carson (1989) for descriptions of each of the elicitation methods.

About half of the studies used a contribution payment vehicle, whether it was to a "trust fund" or a "special fund" (Table 4). The payment was sometimes called a "contribution" and elsewhere called a

"membership." Six studies used as a vehicle an increase in taxes and/or prices, four used special (ear-marked) taxes, four used increases in utility bills, and one used a "payment" to a "program."

Most of the studies asked for annual bids, but five used monthly payments (this was common for utility bill payment vehicles) (Table 5). Two used one-time payments.

Measuring Nonuse Value

Description of Methods

Six methods were used for isolating nonuse value (Table 6). With *method 1*, used in 12 of the 31 studies, respondents provide estimates of total WTP and then apportion their bids among different valuation motives or value categories. For example, Walsh et al. (1984:17) asked respondents to allocate their bids among (1) actual recreation use, (2) a "payment of an insurance premium to retain the option of *possible* future use," (3) "the satisfaction from knowing that it exists as a natural habitat...," and (4) "the satisfaction from knowing that wilderness will be protected for future generations" (emphasis in the original). Similarly, Loomis (1987a:132) asked respondents to apportion their bids among (1) "value to actually visit Mono Lake this year," (2) "value to maintain the opportunity to visit Mono Lake next year," (3) "the value to you from just knowing that Mono Lake exists as a natural place for birds and other wildlife even if your household could not visit it," and (4) the value to you from knowing that Mono Lake will be preserved for future generations" (emphasis in the original). As demonstrated by these two examples, studies differ in how they describe the components of use value. In some studies, option value is separated from bids for actual future use, but in other studies option price is described. Similarly, in some studies use in the current year is separated from use in future years, while in other studies current and future use are combined. Studies also differed in how they described nonuse motives. As explained above, categories referring to actual or potential use were lumped herein to estimate use value, and categories referring to existence or bequest motives were lumped herein to estimate nonuse value.

With *method 2*, used in 11 of the studies, total WTP is estimated for a subsample of respondents that can in some sense be considered nonusers of the resource. Definitions of nonuse varied among the studies, but conformed to one or both of two basic possibilities: the respondent (1) did not use the resource during some past time period, or (2) does not anticipate using the resource during some

future period. Five studies focused on past use. For example, Boyle and Bishop (1987) asked respondents if they had ever made a trip with the intention to view bald eagles, Whitehead and Blomquist (1991) asked respondents if they had ever visited Clear Creek wetland, and Duffield et al. (1993) asked respondents if they had visited the subject river(s) in the last three years. Four studies focused on future use. Three of these studies did not specify a specific future time period. For example, Stoll and Johnson (1984) asked respondents if they anticipated future visitation to the refuge. Walsh et al. (1985) focused on use "next year." The following two studies used combinations of past and future use: Olsen et al. (1991) distinguished respondents who neither had fished for the subject species in the past five years nor expected to do so in the next five years, and Silberman et al. (1992) distinguished respondents who had not and did not expect to use the beaches of interest.

With *method 3*, used by 5 of the 31 studies, respondents are asked to assume that they would not use the resource. For example, Boyle and Bishop (1987) told respondents that the bald eagle habitat at issue would be in remote parts of the state where viewing was not possible, Duffield (1992) told respondents to "suppose...that you personally would not have an opportunity to see or hear a wolf in Yellowstone...," and Greenley et al. (1981) prefaced the WTP question with "if it were certain you would not use the South Platte River Basin for water-based recreation..."

With *method 4*, all (or nearly all) respondents are assumed to be nonusers. Minimal use is reasonable if the resource is difficult to observe, such as the striped shiner (Boyle and Bishop 1987), or if travel cost is significant and the sample is drawn from a general household population, as with Atlanta residents valuing waterfowl in the Great Plains and Rocky Mountains (Desvousges et al. 1992). The surveys of seven of the studies were considered here to allow for the assumption of nonuse. Note, however, that not all of the seven papers argued that all respondents were nonusers or that the estimated values were totally nonuse values. Nevertheless, their inclusion here allows a comparison of the results of this method with the other methods.

With *method 5*, used only by Duffield et al. (1993), total WTP is partitioned to use and nonuse portions based on statistical associations between WTP and responses to a series of behavior and attitude questions. Duffield et al. queried respondents about their past and expected use of the rivers in question and asked them to

indicate the extent to which they agreed with 23 different statements related to resource use and protection. Factor analysis of the responses allowed isolation of a small set of variables focusing on past and future use, altruism, personal contributions, and environmental protection. Regression of WTP on these variables allowed estimation of the relative share of WTP attributable to use and nonuse motives.

Finally, with *method 6*, used only by Silberman et al. (1992), respondents were asked a nonuse value question without specifically being told to assume zero use. After answering a WTP question about use, respondents were told: "The previous questions were based on your possible use of the new beaches shown in the picture. It may be worth something to you simply knowing that more people will be able to use the beach or because you believe more beaches are good for your community. For example, you might be willing to pay something to maintain a public park even though you won't use it" (p. 227). Each of the six approaches has its advantages and disadvantages. Here are some of them. (1) Asking respondents to apportion their bid among various reasons for valuing the good directly asks for the essential information and is quite easily administered, but it asks respondents to make difficult cognitive distinctions. The distinctions might be confusing or seem arbitrary to respondents, leading to poorly considered or misleading responses. Further, in separating the motive (percentage apportionment) response from the monetary response, this method might allow respondents to switch to a separate mental construct and list proportions that are quite unrelated to actual WTP. (2) Separating users from nonusers so that the bids of the nonusers can be attributed totally to nonuse value works only if nonusers can be reliably separated. For some goods at least, it may be difficult to define nonuse. For example, past nonuse does not preclude future use, so that the bids of past nonusers may include some use value. Even a negative response to the question "Do you expect to visit this area in the future?" does not necessarily preclude the respondent from holding out the possibility of future use and including option value in his or her bid. A further problem with this method, discussed in a subsequent section, is that users and nonusers may assign different values to nonuse motives, leading to inaccuracies when nonuse value is based totally on nonusers' WTP. (3) Asking respondents to assume that they will not use the good in the future is easy to administer, but it makes an already hypothetical scenario even more so. Further, in studies where the conditioned (assumed zero use) WTP question follows an unconditioned WTP question (e.g., as in Duffield

1992 and King et al. 1986), it might be argued that the method almost challenges respondents to demonstrate their environmental awareness by not lowering their previously stated WTP. (4) Assuming that the population of potential respondents contains no persons who consider themselves to be current or potential personal users of the good is perhaps the simplest way to estimate nonuse value, but the assumption may be heroic for all but the most obscure goods. (5) Separating the use from the nonuse portion of the bid based on respondents' answers to a series of related questions avoids asking the respondent to make unrealistic assumptions or difficult cognitive distinctions. However, the method requires a longer questionnaire and is subject to the common specification errors related to selecting the right questions to isolate the key motive variables. (6) Asking direct nonuse value questions, like the apportionment approach, requires the respondent to make potentially difficult cognitive distinctions between use and nonuse value.

Nonuse Value Estimates

Fifty-one estimates of nonuse value, obtained from the 31 studies, are listed in the Appendix (in nominal dollars, along with the year of estimation). Adjusting for inflation (to 1990 dollars), these estimates varied from $1 to $184 per year per household, with a median of $23 (Table 7). A third of the estimates was obtained using method 1, another third using method 2, and most of the remaining third was obtained using methods 3 or 4. The range of estimates for each of these four methods is broad, suggesting that method (of isolating nonuse value) alone does not account for all variation in the estimates.

Among the medians of the estimates obtained using the four more commonly used methods (Table 7), the most notable finding is that the median for method 2 ($12) is considerably smaller than the median for the other three methods. The higher medians with methods 1 and 3, as opposed to method 2, may be attributable to the fact that the former two methods base nonuse value estimates on responses of both users and nonusers (more on this in a later section). The higher median with method 4, as opposed to method 2, may result from the inclusion of some use value in the bids of these "assumed" nonusers (i.e., from the inclusion of users or potential users among the respondents). The assumption of zero use value may not apply to some of the seven method-4 studies, for two reasons. First, two of the studies focused on the northern spotted owl (Hagen et al. 1991 and Rubin et al. 1991). While the respondents most likely realized that their chances of observing the

secretive owl was remote, they may have considered owl preservation a vehicle for preserving old growth ecosystems that they did hope to visit for recreation. Second, three of the studies valued specially designated areas, either wilderness areas (Diamond et al. 1992) or national park lands (Schulze et al. 1983 and Hoehn 1991). While the areas were distant enough from the general population samples that use was unlikely for the large majority of respondents, the areas were special enough that the hope of visitation, and therefore option value, may have been substantial. These results suggest that care should be used in applying method 4.

Comparisons across studies are difficult because of the many methodological differences between surveys. A larger sample of studies would be needed to allow an adequate statistical analysis of the effects of survey characteristics on measured values. However, some interesting patterns appear by examining characteristics of the studies that produced the highest and lowest nonuse value estimates. We will consider five characteristics for the bottom and top quartiles among the 31 studies listed in the Appendix. The 14 estimates and their methodological characteristics are listed in Table 8.

Nature of the good. Both lists include a variety of types of goods covering a range of uniqueness. While there are no obvious differences between the goods in the bottom quartile and those in the top quartile, the top-quartile probably contains more high visibility goods (e.g., Grand Canyon, national parks, spotted owls) than the bottom-quartile. Other evidence suggests that the nature of the good does matter. For example, Bishop and Boyle (1987) found that reported nonuse value was several times higher for bald eagles than for striped shiners.

Survey administration. Six of the seven lowest estimates were obtained in mail surveys, while only two of the seven highest estimates were so obtained. All five of the remaining high estimates were household interviews.

Payment period. Six of the seven lowest estimates used an annual payment period. Among the seven highest estimates, three used monthly payments and four used annual payments.

Payment vehicle. All of the seven lowest estimates used a contribution payment vehicle, while none of the seven highest estimates used a contribution. Among the high estimates, two used utility bill increases (these

were both monthly payments), four used increases in taxes and/or prices, and one used a payment to air quality "program."

Method of isolating nonuse value. Five of the seven lowest estimates were obtained using method 2, while only one of the seven highest estimates was obtained using that method. Note that method 2 is the only method that bases nonuse value solely on the WTP of self-reported nonusers. Three of the high estimates were obtained using method 4 (assuming all respondents are nonusers) and another two were obtained using method 3 (asking respondents to assume zero use).

To summarize, among the 31 studies, higher estimates tended to be obtained (1) in personal interviews, (2) using a monthly payment period, (3) using a vehicle of increases in taxes or prices, and (4) using methods 3 or 4 to estimate nonuse value. And lower estimates were obtained (1) using a mail survey, (2) an annual payment period, (3) a contribution payment vehicle, and (4) method 2 to isolate nonuse value.

Among the studies for which more than one estimate is listed in the Appendix, once one estimate was selected for inclusion here, no other estimates from that study were considered for inclusion.

The reasons for these differences are not entirely clear. However, the differences suggest the following hypotheses: (1) respondents in personal interviews tend to elevate their WTP responses in comparison with mail responses (perhaps respondents seek to please the interviewer); (2) respondents to monthly payment questions indicate a larger annual WTP than respondents to annual payment questions (perhaps respondents to monthly questions fail to compute the annual total); (3) a contribution payment vehicle tends to yield a lower WTP than a tax or price vehicle (perhaps because of an aversion to free riders); and (4) users are willing to pay more for nonuse motives than are nonusers. Each of these hypotheses is testable in a carefully controlled study.

Comparing Use Value and Nonuse Value

Twenty-three of the 31 studies allow a total of 34 comparisons of use value to nonuse value (all are listed in the Appendix). Some studies allow more than one comparison because more than one population was sampled or more than one method was used. For these 34 comparisons (Table 9), nonuse value was isolated using methods 1, 2, 3, or 5, as described above. Corresponding estimates of use value were obtained using the following methods: (1) apportionment by the respondent, (2) total WTP of the sample of users minus total WTP

of the sample of nonusers, (3) total WTP of the sample of actual or potential users minus total WTP of the sample asked to assume zero use, (5) statistical apportionment based on responses to behavior and attitude questions, and (6) asking a separate use value question (see Table 6 for a summary of these methods).

Use and nonuse values were compared by computing the ratio of nonuse value to use value (Table 9). The 34 ratios range from 0.1 to over 10. The median ratio of 1.92 indicates that most studies found nonuse value to exceed use value. However, the results for the specific methods tell an interesting story. Most ratios were estimated using methods 1 (direct apportionment) and 2 (separation of sample into user and nonuser groups based on past or expected behavior), allowing a fairly strong comparison of these two methods. Median ratios for methods 1 and 2 are 2.56 and 0.85. All but one of the 17 method-1 ratios are above 1. Conversely, only five of the 12 method-2 ratios are above 1. One possible explanation for this difference is that respondents using method 1 want to feel or appear magnanimous by indicating that they value existence and bequest more highly than their personal use. The same claim could also be made about nonuse value method 3 (i.e., asking respondents to assume that they would not use the resource). Only the method-5 ratios (where use and nonuse values were apportioned based on behavior and attitude responses) offer a somewhat independent evaluation of this potential explanation. These two ratios, both from Duffield et al. (1993), are similar to the median ratios obtained using methods 1 and 3. Thus, we have some evidence that the high (relative to method 2) ratios obtained with methods 1 and 3 are not simply the result of a feel-good motive.

Another explanation for the difference in ratios between methods 1 and 2 is that method 2 underestimates the true ratio. Recall that with method 2, nonuse value is total value of nonusers and use value is equal to total value of users minus total value of nonusers. Method 2 assumes that nonuse value is the same for users and nonusers. If nonuse value of users exceeds that of nonusers, this method would underestimate the ratio for any good that is subject to "use." The next section examines this critical assumption of method 2.

Comparing Users' and Nonusers' Nonuse Values

Six of the 31 studies allow comparisons of users' and nonusers' nonuse values (Table 10). Three of the studies used method 1 (direct apportionment) with user and nonuser subsamples. Two studies used method 3 (assumed zero use) with user and nonuser subsamples. The other study obtained users' nonuse WTP using method 6 (asking a specific nonuse value question) and nonusers' nonuse WTP using method 2 (total WTP of the nonuser subsample). In three of the studies, users were distinguished from nonusers based on past behavior, while in the other three studies the distinction was made based on expected future behavior. It is not clear to what extent past nonusers might be future users, or to what extent expected future nonusers were past users.

The 7 ratios of users' to nonusers' nonuse values range from 1.4 to 2.6 (Table 10), suggesting that past or expected future use tends to enhance nonuse WTP. Note that the findings of two other studies (Loomis 1987a,b and Stoll and Johnson 1985) tend to substantiate this finding. However, in each study the users' and nonusers' estimates of nonuse value were obtained using different survey administration procedures, so the users' and nonusers' estimates may not be directly comparable.

Whitehead and Blomquist (1991) provide additional evidence of the effect of "use" on nonuse value. Past nonusers of Clear Creek wetland were separated into two subsamples depending on whether they had "information" about wetlands. This "information" was either onsite use of other Kentucky wetlands or offsite sources such as television or conservation literature. The ratio of mean WTP of the informed subsample to WTP of the uninformed subsample is 3.14.

One explanation of the results of the six studies listed in Table 10 is that past or expected future use is associated with information about the good, and that information, as Whitehead and Blomquist (1991) suggest, enhances nonuse value. Obviously, past use provides information about the good. Furthermore, respondents' plans for future use may have resulted from information gathered about the good. If nonuse WTP is sensitive to information about the good, we would expect users' nonuse WTP to exceed nonusers' WTP to the extent that users have more information than nonusers.

Of course, the converse of this explanation is also feasible -- that those whose nonuse value is higher for a given resource tend to accumulate more information about the resource than those with lower nonuse

values. In either case (whether information engenders value or value prompts one to acquire information), the suggestion is that people's nonuse values differ, that the difference is associated with familiarity with the good, and that such differences in value can be measured.

Silberman et al. (1992), however, offer a quite different explanation based on their data about WTP for beach restoration. They concluded that the positive ratios of future users' to future nonusers' nonuse value that they found were attributable to use value being included in users' estimates of nonuse value. Indeed, this possibility is plausible given the methods they used, which required future users, after answering a use value question, to provide a separate estimate of WTP for "simply knowing that more people will be able to use the beach..." (see the earlier discussion of method 6 for more of the statement). Although respondents were told that the payments for "simply knowing" would be added to any entrance pass income to restore the beaches, the respondents were not precluded from or specifically warned against including some use value in their responses. That is, expected future users had the opportunity to double count use value.

Double counting use value could also affect ratios based on method 3 (used by two of the six studies listed in Table 10), where respondents are asked to estimate their WTP under two separate scenarios (zero future use and potential future use). But if responses to the assumed zero future use scenario included some personal use value, the respondents were explicitly ignoring the dictates of the zero use scenario. Double counting use value seems plausible, but it seems less likely than in the Silberman et al. (1992) study, where the nonuse value question did not explicitly state that use value should not be included in the bid.

Unlike in the method-3 studies, the double counting explanation of the higher nonuse bids of users than nonusers could not apply to the ratios based on method 1 (used by three of the six studies listed in Table 10). Method 1 of isolating nonuse value does not allow respondents to double count use value because it requires only one WTP estimate from each respondent.

However, another possible explanation of the positive method-1 ratios reported in Table 10 is that method 1 requires respondents to perform two tasks that may be cognitively unrelated. That is, perhaps respondents, once they have estimated their total WTP, then allocate their WTP to value components based on general affective attitudes that have little to do with actual WTP. If this is the case, then perhaps all

respondents (both users and nonusers) would tend to report the same percentages for allocating their total WTP, and the higher total WTP of users would result in greater nonuser WTP for users than nonusers. However, the evidence does not support this explanation. The three method-1 studies that allowed computation of ratios of nonuse value to use value for both user and nonuser subsamples (Table 11) all found quite different ratios across the two subsamples. [Note that "nonusers" can provide estimates of use value as long as nonuse is not defined as "no future use expected."] Two of the studies (Duffield et al. 1993 and Walsh et al. 1985) found considerably lower ratios for users than for nonusers (i.e., users allocated more of their total WTP to use motives than did nonusers). In spite of the lower ratios for users than nonusers, the users' significantly greater total WTP caused their nonuse value to exceed that of nonusers. The third study (Clonts and Malone 1990) reported a higher ratio of nonuse to use value for users than nonusers (both the use value and nonuse value of users exceeded those of nonusers, but the difference in nonuse values was by far the greatest). Perhaps the difference between Clonts and Malone's finding and that of the other two studies is partially explained by the fact that in the former study a respondent was considered a user if a household member (not necessarily the respondent) had used one of the 15 rivers in the past three years, while in the latter studies use was dependent on the respondents' behavior.

The hypothesis that use is preceded by and enhances information, and that information increases nonuse value, is a parsimonious but tentative explanation of the ratios listed in Table 10. If this hypothesis is accepted, method 2 must be rejected as a way to partition total value. If comparisons based on method 2 are removed from Table 9, all but three of the remaining 22 ratios of nonuse value to use value exceed 1. These 22 ratios range from 0.6 to over 10, with a median of 2.56.

Conclusions

This comparison of 31 studies suggests that basing nonuse value solely on the responses of nonusers or uninformed respondents will underestimate nonuse value. Given the opportunity, respondents almost always report that their nonuse WTP exceeds their WTP for personal use. However, while the consistency of this finding across many studies increases its credibility, circumspection is advisable because nearly all of the estimates are based either on self-reported allocations of total WTP or on respondents' estimates of WTP given

a hypothetical zero-use scenario. Additional studies of the type performed by Duffield et al. (1993), which do not directly rely on respondent breakdowns of total WTP, are needed.

The comparison of studies suggests that lower estimates are obtained (1) using a mail survey in contrast to personal interviews, (2) using an annual instead of a monthly payment period, and (3) using a contribution payment vehicle rather than increases in taxes and/or prices. Tests of these hypotheses are warranted if contingent valuation of nonuse value is to be used for policy decisions.

The hodgepodge of methods used by the contingent valuation studies summarized herein made comparison of the studies difficult. The assortment of methods is reasonable given the immature state of the field of contingent valuation and the lack of generally accepted guidelines. Nonetheless, the field would benefit from a series of systematic studies to test hypotheses such as those listed above, followed by an effort to standardize contingent valuation methodology.

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Table 1. Type of Goods in Nonuse Value Studies of the 1980s and 1990s	
Good Type	Number of Studies
Wildlife and fish protection	11
Water quality	6
Water flow or lake level	4
Air quality	3
Wilderness preservation	3
Forest quality	2
Wetland preservation	1
Beach restoration	1
TOTAL	31

Table 2. Survey Administration Method	
Method	Number of Studies[1]
Mail	18
Household interview	7
Phone	4
Onsite interview	2
Onsite self-administered	2
Onsite distribute, mail back	2
TOTAL	35
[1]Some of the 31 studies used two survey methods.	

Table 3. Elicitation Method	
Method	Number of Studies[1]
Open-ended	12
Dichotomous choice	11[2]
Payment card	5
Bidding game	3
Other	3[3]
TOTAL	34[4]

[1]Studies using the method with a separate sample.
[2]Four of these studies asked an open-ended question after the dichotomous choice question. These studies are not also listed as open-ended in this table.
[3]Hoehn (1991) and Desvousges et al. (1983) used multiple elicitation methods. Clonts and Malone (1990) did not report elicitation method.
[4]Some of the 31 studies used different methods with different samples.

Table 4. Payment Vehicle	
Vehicle	Number of Studies
Contribution to a special fund	15
Increases in taxes and/or prices	6
Special tax	4
Utility bill	4
Payment to a special program	1
Not reported	2
TOTAL	31[1]

[1]In addition to these vehicles, some of the studies also used other vehicles for comparison.

Table 5. Payment Period	
Period	Number of Studies
Annual	22
Monthly	5
Onetime	2
Not reported	2
TOTAL	31

Table 6. Summary of Methods of Isolating Nonuse and Use Values		
Method	Nonuse value	Use value
1	WTP apportioned by respondent	WTP apportioned by respondent
2	WTP of nonuser subsample	WTP of user subsample minus WTP of nonuser subsample
3	WTP when respondents are asked to assume zero use	WTP of actual or potential users minus WTP when respondents are asked to assume zero use
4	WTP of all respondents, who are assumed to be nonusers	na
5	WTP apportioned based on responses to attitude and behavior questions	WTP apportioned based on responses to attitude and behavior questions
6	WTP based on a separate nonuse value question0.00	WTP based on a separate use value question

Table 7. Estimates of Annual Nonuse Value

Method[1]	Number of Studies	Number of Estimates	Nonuse Value[1]		
			Low	High	Median[3]
1	12	17	$5	$184	$31
2	11	16	1	155	12
3	5	7	17	139	59
4	7	7	7	155	63
5	1	2	8	12	10
6	1	2	18	23	21
All	37[4]	51	$1	$184	$23

[1]Willingness to pay per household per year in 1990 dollars. The one-time payments are included here as annual payments. Where a range is listed in the Appendix table, the midpoint is used here.
[2]Method of isolating nonuse value. See Table 6.
[3]Given an even number of estimates, the median is the midpoint of the median pair.
[4]Some of the 31 studies used more than one method.

Table 8. Characteristics of Studies Producing the Highest and Lowest Estimates of Nonuse Value[1]

WTP[2]	Study	Good	Administration	Payment period	Payment vehicle	Method[3]
Bottom quartile						
$1	Stoll & Johnson (1985)	crane habitat at Aransas	mail	annual	contribution	2
4	Duffield et al. (1993)	flow in 1-5 MT rivers	mail	annual	contribution	2
5	Gilbert et al. (1992)	Eastern wilderness	mail	annual	contribution	1
6	Whitehead & Blom.(1991)	wetland protection in KY	mail	annual	contribution	2
7	Boyle & Bishop (1987)	shiner habitat in WI.	mail	annual	contribution	4
10	Brookshire et al. (1983)	sheep habitat in WY	mail	annual	contribution	2
11	Silberman et al. (1992)	beach restoration in NJ	interview	one-time	contribution	2
Top quartile						
86	Hagen et al. (1991)	spotted owl habitat in CA	mail	annual	taxes/prices	4
92	Desvousges et al. (1983)	Monongahela R. quality	interview	annual	taxes/prices	3
127	Hoehn (1991)	Grand Canyon air quality	interview	monthly	program	4
139	Greenley et al. (1981)	Platte Basin water quality	interview	annual	tax	3
155	Schulze et al. (1983)	parklands visibility	interview	monthly	utility bill	4
155	Mitchell & Carson (1981)	river water quality in U.S.	interview	annual	taxes/prices	2
184	Loomis (1987a, b)	Mono Lake level/quality	mail	monthly	utility bill	1

[1]To avoid double-counting, no more than one estimate of nonuse value from a given study was included here. [2]WTP per household per year in 1990 dollars. [3] Method of isolating nonuse value. See Table 6.

Table 9. Ratio of Nonuse Value to Use Value[1]

Method[2] Nonuse/Use	Number of Studies	Number of Estimates	Ratio[3]		
			Low	High	Median[4]
1/1	12	17	0.97	10.74	2.56
2/2	9	12	0.11	3.89	0.85
3/3	3	3	0.60	7.57	3.17
5/5	1	2	3.17	7.32	5.25
3/6	2	3	0.85	2.97	1.46
All	23	34	0.11	10.74	1.92

[1]Where a range of WTP is listed in the Appendix table, the midpoint was used here.
[2]Methods of isolating nonuse and use values; see Table 6.
[3]All ratios are listed in the Appendix.
[4]Given an even number of estimates, the median is the midpoint of the median pair.

Table 10. Comparison of Users' and Nonusers' Nonuse Values					
Study	Method[2]	Definition of User Based on:	Nonuse Value[1]		
			Users	Nonusers	Ratio[3]
Clonts and Malone (1990)	1	past 3 years	$50	$28	1.82
Desvousges et al. (1983)	3	last year[4]	66	42	1.57
Duffield et al. (1993)	1	past 3 years	10	7	1.42
Greenley et al. (1981)	3	future	67	42	1.60
Silberman et al. (1992) past users	6/2	future	15	9	1.63
past nonusers	6/2	future	20	10	2.07
Walsh et al. (1985)	1	next year[5]	56	22	2.55

[1] WTP per household per year in nominal dollars. All value estimates are listed in the Appendix.
[2] Method of isolating nonuse value; see Table 6.
[3] Ratio of nonuse value of users to nonuse value of nonusers.
[4] Also considered users were any respondents who provided a use value.
[5] Users were certain of use next year. Nonusers were certain that they would not use the resource next year.

Table 11. Method 1 Ratios of Nonuse Value to Use Value for Users and Nonusers			
Study	Definition of User Based on:	Ratio[1]	
		Users	Nonusers
Clonts and Malone (1990)	past 3 years	2.56	1.72
Duffield et al. (1993)	past 3 years	1.94	2.72
Walsh et al. 91985)	next year	1.06	3.67

[1]Ratio of nonuse value to use value. All ratios are listed in the appendix.

Appendix. Contingent Valuation Studies Since 1980 Measuring Nonuse Value[a]

Author	Good	Sampled population	Survey administration (response rate)	Payment vehicle	Elicitation method	Mean annual nonuse WTP/hh (year of $), method (m),[b] sample size (n)	Mean annual use WTP/hh, method (m),[c] sample size (n)	Ratio: nonuse WTP to use WTP[d]
Boyle and Bishop (1987)	maintaining and restoring bald eagle habitat in WI (the eagle would become extinct in WI without this effort)	WI taxpayers who recently contributed to the state's Endangered Resources program[1]	mail (81%)	annual membership in private foundation for this purpose[2]	dichotomous choice	$28.38 (na)[3] m=3 n=86	$46.93[4] m=3 n=99	0.60
"	"	"	"	"	"	$18.02 m=2a[5] n=123	$57.29 m=2[4] n=99	0.31
"	same for the striped shiner (a small, endangered fish)[6]	"	"	"	"	$5.55 m=4[7] n=435	na	--
Brookshire et al. (1983)	improvement of grizzly bear habitat within 15 years (decline in habitat expected without action)[1]	WY hunting license holders who will not hunt grizzly bears[2]	mail (~25%)	annual payment for a grizzly "stamp"[3]	open-ended	$15.20 (na) m=2b[4] n=170	$5.80 m=2[5] n=205	2.62
"	same, but for big horn sheep	same, but for big horn sheep[2]	"	same, but for big horn sheep[3]	"	$6.90 m=2b[4] n=108	$11.10 m=2[5] n=265	0.62

Appendix. Contingent Valuation Studies Since 1980 Measuring Nonuse Value[a]

Author	Good	Sampled population	Survey administration (response rate)	Payment vehicle	Elicitation method	Mean annual nonuse WTP/hh (year of $), method (m),[b] sample size (n)	Mean annual use WTP/hh, method (m),[c] sample size (n)	Ratio: nonuse WTP to use WTP[d]
Clonts and Malone (1990)	preserving 15 Alabama rivers in a free-flowing state	nonuser Alabama residents with phone listings[1]	phone (na)	na	na	$27.50 (1987) m=1[2] n=630	$16.00 m=1 n=630	1.72
"	"	user subset from above[3]	"	"	"	$50.00 m=1[2] n=103	$19.50 m=1 n=103	2.56
Cronin (1982)[1]	improvement of water quality in Potomac River from useable for recreation to boatable	Washington, D.C. along Potomac	onsite interview (75%)	na	open-ended	$35.00[2] m=2b n=na	$9.00[3] m=2 n=na	3.89
Desvousges et al. (1983)	keep the water quality in the Monongahela River from slipping back from level D (boatable) to level E (not usable for recreation)	residents of 5 PA counties in Monongahela watershed who used the river last year[1]	household interview (80%)	annual increase in taxes and prices	open-ended[2]	$65.99[3] (1981) m=3 n=66	$45.30[4] m=6 n=17	1.46
"	"	same, but nonusers last year	"	"	"	$42.15[3] m=3 n=139	$14.20[4] m=6 n=34	2.97

Appendix. Contingent Valuation Studies Since 1980 Measuring Nonuse Value[a]

Author	Good	Sampled population	Survey administration (response rate)	Payment vehicle	Elicitation method	Mean annual nonuse WTP/hh (year of $), method (m),[b] sample size (n)	Mean annual use WTP/hh, method (m),[c] sample size (n)	Ratio: nonuse WTP to use WTP[d]
Desvousges et al. (1992)	protecting specified number of waterfowl in the Central Flyway from drowning in waste-oil holding ponds by covering the ponds with wire netting[1]	adult non-student shoppers in Atlanta GA	distribute and complete onsite (na)	annual price increase	open-ended[2]	$59.00 to $71.00[3] (1991) m=4[4] n=398 to 408[5]	na	--
Diamond et al. (1992)	protect specified wilderness areas in CO, MT, ID, or WY from timber harvest, given that 7 of the 57 designated wilderness areas in those states are already proposed for harvest	CO, MT, ID, and WY residents with phone listings	phone (62%)	annual federal income tax surcharge to respondent's household	open-ended	$23.27 to $58.54[1] (1991) m=4[2] n=144 to 151[3]	na	--
Duffield (1992)	support recovery of wolves in Yellowstone National Park (fund essential to recovery)[1]	visitors to the park	distribute onsite, return by mail (31%)	lifetime membership in trust fund	dichotomous choice[2]	$17.39[3] (1990) m=3 n=457	$5.48[4] m=3 n=~450	3.17
Duffield et al. (1993)	buy water to increase summer flows in selected MT rivers, to improve habitat and recreation[1]	residents of 6 urban areas in MT and WA with phone listings	mail (34%)	annual membership in a special trust fund	dichotomous choice[2]	$4.07 (1988) m=2a[3] n=254	$9.97 m=2 n=269	0.41

Appendix. Contingent Valuation Studies Since 1980 Measuring Nonuse Value[a]

Author	Good	Sampled population	Survey administration (response rate)	Payment vehicle	Elicitation method	Mean annual nonuse WTP/hh (year of $), method (m),[b] sample size (n)	Mean annual use WTP/hh, method (m),[c] sample size (n)	Ratio: nonuse WTP to use WTP[d]
"	"	"	"	"	"	$7.14[4] m=5 n=554	$2.26[4] m=5 n=554	3.17
"	"	"	"	"	open-ended[5]	$9.33 m=2a[3] n=103	$6.54 m=2 n=124	1.43
"	"	"	"	"	"	$11.35[6] m=5 n=227	$1.55[6] m=5 n=227	7.32
"	"	same, but only users[7]	"	"	"	$10.47 m=1[8] n=124	$5.40 m=1[8] n=124	1.94
"	"	same, but only nonusers[3]	"	"	"	$7.37 m=1[9] n=103	$2.71 m=1[9] n=103	2.72
Gilbert et al. (1992)	protection and management of Eastern wilderness areas (assuming budget cuts eliminated all public funding and protection)[1]	residents of southern Vermont and parts of surrounding states[2]	mail (~27%)	annual contribution to a special trust fund	dichotomous choice[3]	$6.40 (1990) m=2a[4] n=78	$7.88 m=2 n=108	0.81
"	"	"	"	"	open-ended[5]	$4.78 m=1 n=195	$2.32 m=1 n=195	2.06

Appendix. Contingent Valuation Studies Since 1980 Measuring Nonuse Value[a]

Author	Good	Sampled population	Survey administration (response rate)	Payment vehicle	Elicitation method	Mean annual nonuse WTP/hh (year of $), method (m),[b] sample size (n)	Mean annual use WTP/hh, method (m),[c] sample size (n)	Ratio: nonuse WTP to use WTP[d]
Greenley et al. (1981)[1]	postpone mining that would degrade water quality throughout the South Platte Basin (CO) enough to permanently preclude riparian recreation (3 photos used)	Denver and Fort Collins residents expecting to use sites for recreation in the future	household interview (na)	annual increase in sales tax payments[2]	bidding game	$67.00[3](1976) m=3 n=174	$79.28[4] m=6 n=174	0.85
"	"	same, but future nonusers	"	"	"	$41.95[3] m=3 n=24	na	--
Haefele et al. (1992)	protection programs (against insects and air pollution) for spruce-fir forests along roads and trails in the southern Appalachian Mountains (3 photos used)[1]	residents within 500 miles of Asheville, NC, with phone listings	mail (51%)	annual increase in taxes put into a special conservation fund	dichotomous choice	$50.75 (1991) m=1 n=306	$7.58 m=1 n=306	6.70
"	"	"	mail (53%)	"	payment card	$15.93 (1991) m=1 n=318	$1.48 m=1 n=318	10.74

Appendix. Contingent Valuation Studies Since 1980 Measuring Nonuse Value[a]

Author	Good	Sampled population	Survey administration (response rate)	Payment vehicle	Elicitation method	Mean annual nonuse WTP/hh (year of $), method (m),[b] sample size (n)	Mean annual use WTP/hh, method (m),[c] sample size (n)	Ratio: nonuse WTP to use WTP[d]
Hageman (1985)	avoid reduction in California sea otter population from current level to a level that would eliminate chances of seeing the animal and could endanger the population[1]	California residents with phone listings	mail (21%)	annual flat tax paid by all U.S. households, plus an additional personal contribution[2]	payment card	$13.62 (1984) m=1 n=~173	$7.20 m=1 n=~173	1.89
Hagen et al. (1991)	protect northern spotted owls and their old-growth habitat in the Northwest	U.S. residents	mail (39%)	annual increase in taxes and wood product prices	dichotomous choice	$86.32 (1990) m=4 n=394	na	--
Hoehn (1991)[1]	83% improvement in air quality at the Grand Canyon[2]	Chicago residents	household interview (na)	monthly payment to an air quality program	several[3]	$82.79[4,5] (1980) m=4 n=182	na	--
King et al. (1986)	certain survival of a nearby herd of big horn sheep that would be lost with certainty without action	Tucson, AZ residents with phone listings listings	mail (59%)	annual membership in organization that would protect habitat	open-ended	$15.14 (1985) m=3 n=~500	$2.00 m=3 n=~500	7.57
Loomis (1987a)[1]	certain improvement in water level in Mono Lake, with associated water quality and habitat improvements	CA residents with phone listing[2]	mail (44%)	monthly water bill[3]	dichotomous choice	$80.48[4] (1986) m=1 n=~160	$14.20 m=1 n=~160	5.67

Appendix. Contingent Valuation Studies Since 1980 Measuring Nonuse Value[a]

Author	Good	Sampled population	Survey administration (response rate)	Payment vehicle	Elicitation method	Mean annual nonuse WTP/hh (year of $), method (m),[b] sample size (n)	Mean annual use WTP/hh, method (m),[c] sample size (n)	Ratio: nonuse WTP to use WTP[d]
"	"	Mono Lake visitors contacted onsite	distribute onsite, return by mail (84%)	"[3]	"	$160.19[4] m=1 n=~100	$41.81 m=1 n=~100	3.38
Mitchell and Carson (1981)[1]	improving water quality in all U.S. river and lakes (from a current unspecified level) to fishable level	national household survey	household interview	annual increases in prices and taxes	payment card	$111.00[2] (1981) m=2a n=?[3]	$126.00 m=2 n=?	0.88
Olsen et al. (1991)	guaranteed doubling of Columbia River Basin salmon and steelhead fish runs	Pacific Northwest residents with phones	phone (72%)	monthly increase in electric bill[1]	open-ended	$26.52 (1989) m=2a,b[2] n=~300[4]	$47.64[3] m=2 n=390	0.56
Rahmatian (1987)	avoid a decrease in air quality and visibility at the Grand Canyon[1]	Denver residents	household interview (na)	monthly increase in electricity bill	open-ended	$47.52[3] (1981) m=1 n=75	$13.44 m=1 n=75	3.54
Rubin et al. (1991)	assure continued existence of the northern spotted owl	WA residents with phone listings	mail (23%)	annual payment[1]	payment card	$49.72 (1987) m=4[2] n=216	na	--

Appendix. Contingent Valuation Studies Since 1980 Measuring Nonuse Value[a]

Author	Good	Sampled population	Survey administration (response rate)	Payment vehicle	Elicitation method	Mean annual nonuse WTP/hh (year of $), method (m),[b] sample size (n)	Mean annual use WTP/hh, method (m),[c] sample size (n)	Ratio: nonuse WTP to use WTP[d]
Schulze et al. (1983)	prevent a specified deterioration in visibility from the current average in parklands region (photos used)[1]	residents of Albuquerque, Los Angeles, Denver, and Chicago	household interview (na)	monthly increase in electric utility bill	payment card	$101.40[2] (1980) m=4[3] n=448	na[4]	--
Silberman et al. (1992)	quantified restoration and maintenance of selected northern NJ beaches damaged by recent erosion (photo used)	current users of selected nearby beaches, expected future users	onsite interview (na)	one-time contribution to a non-profit foundation, which would also collect entrance fees[1]	bidding game	$15.21[2](1985) m=6 n=1177	na[3]	--
"	"	same, but future nonusers	"	"	"	$9.34[2,4] m=2b n=754	na	--
"	same, but no photo used[3]	Northern NJ and Staten Is. residents who don't use the selected beaches but will in future	phone (na)	"	open-ended	$19.65[3] m=6 n=83	na[6]	--
"	"	same, but future nonusers	"	"	"	$9.51[4,5] m=2a,b n=138	na	--

Appendix. Contingent Valuation Studies Since 1980 Measuring Nonuse Value[a]

Author	Good	Sampled population	Survey administration (response rate)	Payment vehicle	Elicitation method	Mean annual nonuse WTP/hh (year of $), method (m),[b] sample size (n)	Mean annual use WTP/hh, method (m),[c] sample size (n)	Ratio: nonuse WTP to use WTP[d]
Stevens et al. (1991)	preserve and protect bald eagles in New England (extinction in region is assured without action)[1]	New England residents	mail (30%)	annual payment for the next 5 years to a private trust fund[2]	open-ended[3]	$15.81 (na) m=1 n=~85	$3.47[4] m=1 n=~85	4.56
Stoll and Johnson (1985)	effort to preserve essential whooping crane habitat (extinction certain without this effort) & exclusive entrance to refuge areas	visitors to Aransas National Wildlife Refuge in TX	distribute and complete onsite (67%)	annual membership in foundation that would work for crane preservation	dichotomous choice	$9.33 (1983) m=2b[2] n=30	$7.54 m=2 n=351	1.24
"	"	TX residents	mail[1] (36%)	"	"	$1.03 m=2b n=73	$9.64 m=2 n=176	0.11
Sutherland and Walsh (1985)	maintain water quality in Flathead Lake and River (in Montana) at current (pristine) level	residents of 4 Montana cities with phone listings	mail (61%)	annual payment to special fund for protecting water quality in the area	open-ended	$46.25[1] (1981) m=1 n=171	$18.08 m=1 n=171	2.56
Walsh et al. (1984)	protect 10 million acres of potential CO wilderness from certain development, allowing time for an informed decision about wilderness designation	Denver and Fort Collins residents	mail (41%)	annual payment to a special fund[1]	open-ended	$22.60 (1980) m=1 n=195	$23.23 m=1 n=195	0.97

Appendix. Contingent Valuation Studies Since 1980 Measuring Nonuse Value[a]

Author	Good	Sampled population	Survey administration (response rate)	Payment vehicle	Elicitation method	Mean annual nonuse WTP/hh (year of $), method (m),[b] sample size (n)	Mean annual use WTP/hh, method (m),[c] sample size (n)	Ratio: nonuse WTP to use WTP[d]
Walsh et al. (1985)[1]	guaranteed protection of 11 specified rivers (development will begin without protection)[2]	CO resident nonusers[3]	mail (51%)	annual payment to a special trust fund	open-ended	$22.00 (1983) m=1 n=40	$6.00 m=1 n=40	3.67
"	"	user subset from above[4]	"	"	"	$56.00 m=1 n=59	$53.00 m=1 n=59	1.06
Walsh et al. (1990)	protection of specified level of live trees from insect damage in 11 CO national forests (3 photos used)[1]	Fort Collins residents with phone listings	household interview (~67%)[2]	annual increase in taxes and prices[3]	bidding game	$24.00 (1983) m=1 n=198	$23.00[4] m=1 n=198	1.04
Whitehead and Blomquist (1991)	preserve Clear Creek wetland (a large bottomland hardwood forest wetland in western KY) from potential development for surface coal mining	KY residents with phone listings with prior information about KY wetlands[1]	mail (31%)	annual contribution to the Wetland Preservation Fund for Clear Creek wetland	dichotomous choice	$17.48 (1989) m=2a[2] n=118	na	--
"	"	same, but without prior information	"	"	"	$5.56 m=2a[2] n=96	"	--

Appendix. Contingent Valuation Studies Since 1980 Measuring Nonuse Value[a]

Author	Good	Sampled population	Survey administration (response rate)	Payment vehicle	Elicitation method	Mean annual nonuse WTP/hh (year of $), method (m),[b] sample size (n)	Mean annual use WTP/hh, method (m),[c] sample size (n)	Ratio: nonuse WTP to use WTP[d]
Whitehead and Groothuis (1992)	reduction in nonpoint source pollution in Tar-Pamlico River (NC) allowing anglers to catch twice as many fish per trip	residents of counties in Tar-Pamlico basin	mail (61%)[1]	annual contribution to a preservation fund for compensating farmers who use pollution control practices	open-ended	$21.00 (1991) m=2b[2] n=65	$14.00 m=2 n=26	1.50

"na" indicates not available (not reported); "hh" indicates household

[a] "Nonuse value" refers to WTP for the knowledge that a thing exists (usually called "existence value") and for the desire to make the thing available for others (usually called "bequest value"). "Use value" refers to WTP for current and future use, and for the option of future use (usually called "option value").

[b] Nonuse values were estimated by one of six methods:

1. asking respondents to allocate their total value into categories of value (nonuse value includes existence and bequest value), or asking a separate question about nonuse value;
2. asking total WTP to a sample including only persons who (a) had not used the resource or (b) would not use the resource;
3. asking total WTP to respondents who are asked to assume that they would not use the resource;
4. assuming all respondents are nonusers;
5. statistically separating total value into categories of value based responses about relevant attitudes and behavior;
6. asking separate questions about nonuse value.

[c] Use values were estimated by one of five methods:

1. asking respondents to allocate their total value into categories of value (use value includes option value);
2. the difference: total WTP of the subsample who reported that they had or would use the resource minus total WTP of the subsample who reported they had not or would not use the resource (where the latter is listed in the nonuse column);
3. the difference: total WTP when respondents are assumed to use or have the option to use the resource minus total WTP when respondents are asked to assume that they will not use the resource;
4. there is no value counterpart to nonuse value method 4;
5. statistically separating categories of value based responses about relevant attitudes and behavior;
6. asking separate use value questions.

[d] The components for this ratio are taken from the two columns to the left. Note that the ratios reflect various methods of separating use from nonuse WTP.

Boyle and Bishop (1987)

[1] This subsample is restricted to persons who had made a trip to view bald eagles. Recent noncontributors were also surveyed. Among the past nonviewers who had recently contributed, the mean bid of those who were told they would be able to view in the future was not significantly different from the mean bid of those who were told they would not be able to view the eagles.

[2] Although zero bidders were asked to explain why, all zero bids were included in the analysis.

[3] These respondents were past viewers who were told that the birds' habitat would be in remote parts of the state where viewing was not possible.

[4] These respondents were past viewers who were told that all members would be given information on how to conveniently view bald eagles in WI.

[5] These respondents were past nonviewers (reported they had never made a trip where one of their intentions was to view bald eagles) who were told they would be given information on how to conveniently view bald eagles in WI.

[6] This question followed the bald eagle question.

[7] This small fish is unlikely to be seen or recognized by recreationists.

Brookshire et al. (1983)

[1] The report also contains results for habitat improvements achieved within five years.

[2] The report also contains results for persons who expected to hunt the species.

[3] For future hunters of the species, the report is clear that this stamp was required for hunting. However, for future nonhunters (the results reported here), the report is not clear about what the stamp provided, other than the knowledge that the holder had contributed to a worthy cause. It is assumed herein that purchase of the stamp was similar to a contribution.

[4] Respondents who did not expect to observe the species.

[5] Use in this case was for observation of the species by persons who did not plan to hunt the species. Note that the authors assumed that the bids of users contained no existence value, whereas method 2 herein assumes that users' bids include existence value.

Clonts and Malone (1990)

[1] Subsample who reported that a household member had not used any of the 15 rivers in the last three years.

[2] Each respondent was asked in separate bidding questions to report WTP for use, option value, bequest value, and existence value; then respondents were asked three times to verify the individual and summed values, making this essentially a method 1 study.

[1] Subsample who reported that a household member had used one or more of the 15 rivers in the last three years.

Cronin (1982)

[1] As reported by Fisher and Raucher (1984), who also take some of their summary from another paper by Cronin, a forthcoming (in 1982) paper entitled "Estimating the use, option, and existence values for improved water quality," Pacific Northwest Laboratory, Richland, Washington.

[2] From table 5 of Fisher and Raucher. The nonuse value is for persons who said they would not use the Potomac even if it were as clean as they would like it to be.

[3] Users' total WTP ($44.00) was for persons who are present users or would use a cleaned-up river.

Devousges et al. (1983)

[1] Also included as users are those who provided a use value, even if they did not report using the river in the past year.

[2] For use value, subsamples of approximately equal size responded to (1) bidding game with $25 starting point, (2) bidding game with $125 starting point, (3) open-ended question, and (4) payment card. Responses varied widely depending on vehicle. Only the open-ended responses are reported here because only an open-ended question was used for existence value.

[3] Different categories of value were carefully described to respondents. For existence value, respondents were to assume they "would never use the river."

[4] WTP for future use, described as option price for users and option value for nonusers. The authors caution that some respondents may have failed to distinguish between option value and existence value, including some existence value in the future use value category and/or some future use value in the existence value category. This is in part indicated by the fact that some respondents gave the same estimate for existence value that they had given for option price. See also Fisher and Raucher (1984).

Devousges et al. (1992)

[1] The Central Flyway consists mainly of the Great Plains, from North Dakota and eastern Montana in the north to Texas and eastern New Mexico in the south. Note that this is far from the sampled population in Atlanta. Three subsamples were surveyed about WTP for protecting waterfowl from waste-oil ponds, differing in the number of birds (2,000, 20,000, and 200,000) that died from this in 1989 (and by implication the number of birds that would be saved if the netting were in place). This study also included subsamples that valued reductions in oil spills. Those results are not reported herein.

[2] This study also used a dichotomous choice response format, with the oil spill subsamples.

[3] Mean WTP for the three subsamples were: $59 for 2000 birds protected, $59 for 20,000 birds protected, and $71 for 200,000 birds protected. The differences were found to be not significant.

[4] Because of the long distance from the survey population to the Central Flyway, these responses are assumed here to represent nonuse value.

[5] Sample sizes of the three subsamples were 398, 408, and 399 in order of increasing number of birds protected.

Diamond et al. (1992)

[1] There were five subsamples, differing in the specific wilderness area(s) to be protected. The potentially protected areas and mean WTP follow: Selway Bitterroot ($58.54), Washakie ($23.27), Bob Marshall ($40.69), Selway Bitterroot and Washakie ($44.41), or Selway Bitterroot, Washakie, and Bob Marshall ($46.59). These estimates are with both protest ($0 WTP) and extreme value (>5% of annual income) responses removed. The survey was performed to test for degree of substitutability among goods (i.e., among wilderness areas). Differences in WTP between individual areas or between single areas and groups of areas were not found to be significant.

[2] Although respondents were asked about past use of the wilderness areas, all estimates reported in the paper are for the complete sample. Most respondents of this household survey can be assumed to be nonusers.

[3] The range in size across the five subsamples.

Duffield (1992)

[1] Other trust funds (e.g., the Nature Conservancy, Ducks Unlimited) were mentioned and loss of other animals because of the wolves was mentioned.

[2] Respondents not willing to pay the posited amount were asked if they would pay $1. An open-ended question followed, but only the dichotomous choice results are reported herein.

[3] Respondents were told "Suppose ... that you personally would not have an opportunity to see or hear wolves." Note that median WTP is reported here, not mean WTP.

[4] Respondents were told "Suppose ... that you personally might get to see or hear a wolf in Yellowstone..."

Duffield et al. (1993)

[1] Results presented here are for a combination of three subsamples; one focused on the Bitterroot River, another on the Big Hole River, and the third on a set of five western Montana rivers that included the Bitterroot and Big Hole.

[2] Respondents who were not willing to pay the posited amount were asked if they would pay $1.

[3] Respondents who had not visited the specified river(s) "in the last 3 years."

[4] The entries here assume that 76% of WTP of all respondents (past users and nonusers, and the single and 5-river subsamples combined) was attributable to nonuse interests. The 76% is the midpoint between the high (82.7%) and low (68.1%) estimates among the four equations reported by Duffield et al. (1993) using method 5.

[5] An open-ended question followed the dichotomous choice question.

[6] These entries assume that 88% of WTP was attributable to nonuse interests. This is the average of estimates from three equations using method 5 (86%, 87%, and 91%).

[7] Respondents who had visited the specified river(s) "in the last 3 years."

[8] The users' percentages, not reported in Duffield et al. (1993), are 66% to nonuse and 34% to use.

[9] The users' percentages, not reported in Duffield et al. (1993), are 79% to nonuse and 29% to use.

Gilbert et al. (1992)

[1] A separate sample was asked only about protection and management of Lye Brook Wilderness Area in southern Vermont.

[2] Specifically, the households of this sample were located from 25 to 75 miles from Lye Brook Wilderness Area. The households of the other sample (not reported here), who were asked only about Lye Brook Wilderness Area, were located within 25 miles of Lye Brook.

[3] The dichotomous choice results are medians, not means. Note that the report states that 35% of the responses were "unusable" and that respondents who bid $0 were asked why, but does not indicate what proportion of these were protests.

[4] Respondents who had never visited an Eastern wilderness area.

[5] Respondents were first asked for a dichotomous choice response to a single amount, and then asked the open-ended question.

Greenley et al. (1981)

[1] See also Walsh et al. (1978).

[2] Actual responses were in terms of an increase in sales tax rate, but respondents were told, based on household income and family size, what each 1/4 percent increase in tax rate would likely cost them in dollars per year. A monthly water bill payment vehicle was also used, but is not reported here.

[3] The nonuse value questions were prefaced with "If it were certain you would not use the South Platte River Basin for water-based recreation, would you be willing..." (Walsh et al. 1978:82).

[4] Respondents were asked four separate WTP questions, focusing on current use recreation value, option value, existence value, and bequest value, with the use and option value questions asked first. The report suggests that the four separate responses may have included some overlap. In particular, for users it seems most likely that the earlier responses, dealing with use value, may have included some nonuse value. This is especially likely because the payment vehicle was sales taxes, not recreation use fee.

Haefele et al. (1992)

[1] A second question was asked, about WTP for protection of all remaining spruce-fir forests in the southern Appalachian Mountains.

Hageman (1985)

[1] In addition to sea otters, blue or grey whales, bottlenose dolphins, and northern elephant seals were valued using separate descriptions but identical valuation questions. Results for these other species were similar: total WTP was about $25 for whales and about $18 for the dolphins and seals; percentages allocated to use and nonuse were very similar to those for otters.

[2] Respondents were instructed to "suppose ... the average responses to [the earlier question that determined the nationwide flat tax] did not provide enough funds ... please indicate any additional amount over and above your [earlier] response which your household would be willing to pay ... per year."

Hagen et al. (1991)

[1] Users were not differentiated from nonusers, but most respondents can be assumed to be nonusers.

Hoehn (1991)

[1] See also Randall et al. (1981).

[2] Photos were used to depict differences in air quality. This program was described as the only option for improving air quality.

[3] Randall et al. (1981) state that open-ended questions, payments cards, and bidding games were used. Hoehn does not specify which format was used for the data he presents.

[4] Few of the respondents can be expected to be Grand Canyon visitors, so most of this value can be assumed to be nonuse value.

[5] In 1981, a year after this estimate, 71 Chicago residents were asked to value the same change in Grand Canyon air quality in an "embedded" questioning format (Kahneman and Knetsch 1992). A CVM question about Chicago air quality alone was asked before a question about a combination of Chicago and Grand Canyon air quality. The value of the Grand Canyon air quality improvement is estimated as $11.50, the difference: WTP for the combination of a 100% improvement in Chicago air quality and a 83% improvement in Grand Canyon air quality ($190) minus WTP for a 100% improvement in Chicago air quality ($179). A considerable portion of the total bids is likely to be use value.

Loomis (1987a)

[1] See Loomis (1987b) for the short version.

[2] About one-third of the households had visited Mono Lake sometime, and very few of the respondents were expected to be current or future users.

[3] Two other subsamples used a trust fund payment vehicle or a water bill vehicle with uncertainty about improvement. Twenty percent of the respondents were determined to have protested this form of payment for maintaining lake levels, preferring, for example, that Los Angles residents pay.

[4] WTP for both levels of improvement combined (alternative 3 minus alternative 1).

[5] About 17% protested this payment vehicle.

Mitchell and Carson (1981)

[1] These estimates are reported by Devousges et al. (1983). See Mitchell and Carson (1989) for examples of the payment cards.

[2] Nonusers were those who said they did not participate in in-stream freshwater activities during the past two years (does not preclude future users, and therefore, the bid is likely to include some option price).

[3] Based on a sample of 1,576 respondents, 39% of whom were nonusers; four sets of payment card anchor points were used, and it is unclear whether the results reported here are for all four subsets or only some of the subsets.

Olsen et al. (1991)

[1] About 16% of the nonusers and 19% of the users protested the payment vehicle.

[2] This nonuser subsample reported that they had not fished for these species in the past five years and did not expect to do so in the next five years. A third subsample was also surveyed, consisting of past nonusers who were uncertain about fishing in the next five years. Their mean WTP was $58.56 per year, and was interpreted to contain option price in addition to nonuse value.

[3] The user subsample reported that they had fished for these species in the past two years.

[4] Assumes that roughly 50% of the past nonusers reported in the paper were in the uncertain future user subsample.

Rahmatian (1987)

[1] Photos were used to depict current and the potential lower level of air quality.

Rubin et al. (1991)

[1] A specific payment vehicle was not used. Respondents were asked for the "largest amount that you would be willing to pay per year to be 100% sure that the northern spotted owl will exist in the future."

[2] Users were not differentiated from nonusers, but most respondents can be assumed to be nonusers.

Schulze et al. (1983)

[1] Parklands included the following national parks: Grand Canyon, Zion, Mesa Verde, Bryce Canyon, and Canyonlands. The study also valued increases in Grand Canyon air quality and prevention of plumb blight

seen from Grand Canyon. Several air quality levels were depicted on photos; the results reported here are for avoiding a drop from level C to level B.

[2] A simple average of the WTP of the four sample populations, which ranged from $79 per year for Denver to $116 for Los Angeles. Based on separate questions for the Grand Canyon (simple average of $54 per year) and the other parks ($47).

[3] Some of this bid could be user value. However, use of people living so far from the sites would generally be low. The authors concluded that "visitation plans were not an overwhelming factor in determining bids" and "knowledge acquired through past visits was also of relatively little importance" (p. 168).

[4] The study also estimated a use value using an entrance fee payment vehicle. However, the authors did not report any use rates, so annual WTP could not be computed.

Silberman et al. (1992)

[1] Although 56% of the future nonusers and 36% of the future users bid $0 WTP to the fund, only 7% on average were judged to be protests. However, respondents who bid $0 and indicated "the existence of a new beach would be of value, but it is not fair to ask for contributions to pay for it" were not considered protests.

[2] The nonuse question said in part: "The previous questions were based on your possible use of the new beaches shown in the picture. It may be worth something to you simply knowing that more people will be able to use the beach or because you believe more beaches are good for your community. For example, you might be willing to pay something to maintain a public park even though you won't use it" (p. 227).

[3] Before the existence value question, future users were asked a use value question, but those responses were not reported in the paper.

[4] The authors attribute the difference between future users' and nonusers' bids to improved quality of beach for intended use, and not to differences in personal characteristics of the two subsamples.

[5] Respondents were also told "Remember that there are many worthy causes to contribute to, and that you only have so much money for contributions."

[6] It is not clear from the paper whether these future users were asked about use value as were future users in the onsite survey.

Stevens et al. (1991)

[1] This study also valued wild turkey, salmon, and coyote using a similar approach.

[2] Although 80% reported that bald eagles were "important" to them, 58% reported 0 WTP in protest. Of the protests, 40% were of the payment vehicle (taxes or license fees were preferred, and 25% protested the effort to quantify the economic value.

[3] This open-ended response was preceded by a dichotomous choice response.

[4] The authors report that about 82% of the payment was allocated to existence and bequest value, and that 7% was allocated to use. We assume here that the remaining 11% is option value (to be added to the use category).

Stoll and Johnson (1984)

[1] Results were also reported for a mail survey of non-Texas residents.

[2] Respondents did not anticipate future visitation to Aransas.

Sutherland and Walsh (1985)

[1] This estimate is for users and nonusers combined. The authors report that users' (someone in the household visited the area in the past year) mean WTP exceed nonusers' mean WTP by $8 for option value, $30 for existence value, and $32 for bequest value; actual estimates for these two groups could not be determined.

Whitehead and Blomquist (1991)

[1] Neither this group (with information) or the no-information group had previously visited Clear Creek wetland. "Information" refers to past experience with wetlands by means of onsite use of a KY wetland or offsite use via television, conservation organization literature, and the like. Of course, the survey itself provides some information about wetlands. Note also that lack of prior onsite use of Clear Creek wetland does not preclude future use of the area; the study apparently did not ask for prediction about future use of the site. Also note

that if "information" were considered to be use, then this listing could be changed to show a nonuse value of $5.56 and a use value of $11.92 (using method 2a).

[2] Respondents who had never participated in onsite use of Clear Creek wetland.

Whitehead and Groothuis (1992)

[1] 89% of these answered the contingent valuation question.

[2] Respondents who would not fish the Tar-Pamlico in the future.

Walsh et al. (1984)

[1] About 11% protested.

Walsh et al. (1985)

[1] See also Sanders et al. (1990).

[2] One half the respondents were told to assume that development would begin "next year" without protection, while the other half were told that there was a 50% chance that development would begin next year. Bids of the uncertain subsample were 20% lower than those of the certain subsample. Results reported here are for the combination of the two subsamples.

[3] Subsample who reported 0.0 probability that a member of the household would use of one or more of the 11 rivers "next year".

[4] Subsample who reported 1.0 probability that a member of the household would use of one or more of the 11 rivers "next year". A third subsample, not included herein, reported a probability >0 but <1 of use during the next year.

Walsh et al. (1990)

[1] Six other environmental goods were also valued; WTP responses for these goods were included as independent variables.

[2] Potential respondents were first contacted by mail with a description of the good and the purpose of the study. They were then contacted by phone to arrange a time for the personal interview.

[3] Only 4% protested.

[4] The total value for a specific region of Colorado (northern Front Range) was $61 when only that region was valued and $33 when that region and the rest of Colorado were each independently valued.