

## Existence Values for Maryland Forests

Prepared for

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# 1. Introduction

Even Maryland citizens who do not visit Maryland's State Forests or otherwise use the forest's services may have opinions or feelings for the status of these forests. In economic terms, these feelings form a category of environmental value known variously as passive use value, existence value, or non-use value.<sup>1</sup> This category represents the value placed on an environmental asset by people beyond the products or services it provides; beyond the wood products, outdoor recreational experiences, and ecological services such as watershed protection or carbon sequestration. It represents the value of "just knowing something is there."

Existence value was a large component of the liability damages imposed in the Exxon Valdez oil spill. In that case, most people in the U.S. recognized that they would never visit the degraded area, Prince William Sound, or see the wildlife that lives there, but they were willing to pay something to keep the area pristine and ecologically functional; that is, they valued its existence. The role of existence value was established within neoclassical economics by Krutilla (1967). In the legal arena, U.S. courts have upheld the validity of existence value in the assessment of damages in natural resource cases, although this remains an evolving legal area.

The measurement of existence value is difficult, however. Because this value is, by definition, separate from the number of visits to a forest or the amount of "product" the forest produces, it can be estimated only through subjective surveys (Haab and McConnell, 2002; Smith, 2004). These are called *stated-preference* surveys because they rely on individuals stating their values rather than revealing them (*revealed preference*) through their actions. Travel cost analysis is an example of a revealed preference approach.

Revealed preference is the preferred method for estimating outdoor recreation values and indeed for all "use" values<sup>2</sup>; preferred by economists because it involves analysis of decisions by individuals involving real money and real consequences. Revealed preference techniques cannot be used for non-use values, however, since in these cases there is no "action" that can be counted, by definition. Any observation of non-use value must rely on individual statements about that value. The elicitation of such values is called a *valuation survey*, sometimes referred to as contingent valuation (see Mitchell and Carson, 1989).

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<sup>1</sup>These terms are synonyms. We will use the term existence value.

<sup>2</sup>Recreation is a use value because it entails visiting the site. "Use value" does not mean that the forest or other environmental amenity is used up; it means that individuals come in contact with the resource and that the more they come in contact with the resource the greater satisfaction they derive. Enjoying the scenery at a park counts as a use value; staying at home and picturing a beautiful forest in one's mind is a non-use value. Ecological services count as use values to the extent that individuals see these as market-like products; for example, they save us money on health expenditures. They count as non-use values to the extent that individuals care about ecological stability for the sake of the environment. This distinction is not always unambiguous.

It seems likely that existence value is substantial for Maryland forests, sufficient to warrant such a survey. This chapter reports a study of values expressed by Marylanders over forest management approaches for Maryland State Forests. More than 400 in-person surveys were conducted between February 2006 and March 2007 using two major survey techniques (open-ended and closed-ended).

The science of valuation remains in its early stages, despite roughly 20 years of intensive research. We therefore also used this opportunity to try to advance the science. Our survey addresses both a somewhat narrow design question (the role of real-money transactions in improving hypothetical public goods responses) and a broader question (the nature of existence value).

Because forest managers see themselves, usually rightly so, as good forest stewards, our surveys also addressed the issue of combining individual values and professional judgment for forest management.

We discuss environmental valuation in Section 2. The survey, protocol, and related issues are discussed in Section 3. Results are in Sections 4 and 5.

## **2. Valuation Surveys: History, Literature, Design, and Hypothetical Bias**

Even the best designed valuation surveys can be controversial. The subjective and hypothetical nature of the questions means that individuals are essentially unconstrained in their responses. An individual who says she would be willing to pay \$150 per year for a specified change in a forest, such as to its facilities, its boundaries and area, or its ecological management, cannot be contradicted, even when outside analysts believe that were she actually to face this bill (along with the given change), the individual would believe herself to be worse off. Unlike a market good, we cannot offer this environmental service for \$150 and see if the individual actually takes it. We are forced to rely on the credibility of the survey.<sup>3</sup>

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<sup>3</sup>There are two rather obvious qualifications to this claim. First, the individual cannot credibly offer to pay more than her income. This restriction is rarely enough to ensure credibility, however; consider an individual who claims to be willing to pay \$40,000 per year for this environmental change, an amount that is below her income but still not believable. Statements about the compensation that would be required to accept environmental degradation (called willingness-to-accept; an example is payments to allow households to allow the siting of a nuclear waste repository; see Kunreuther and Easterling, 1992) face no constraint at all.

Second, in some cases individuals will vote on an actual referendum for the proposed change, in which case their responses to a valuation survey should be consistent with their votes. Studies that compare surveys to referenda are discussed below.

Economists have taken several approaches to enhance the general reliability of valuation surveys. Some of these approaches entail simply following standard survey practices. A valid survey should:

- (i) Ensure that survey respondents take full account of their real-world budgets. They should respond as if real dollars were at stake.
- (ii) Provide subjects with a clear understanding of the natural resource decision that is at stake, the “before” and “after” scenarios.
- (iii) Describe a concrete mechanism by which the individual would pay the stated (hypothetical) amount.
- (iv) Describe a concrete decision rule; in other words, inform subjects about how their responses will be used to make the final decision.

Other survey protocols were outlined by the NOAA Blue Ribbon Panel (Arrow, 1993), a panel of experts, including two Nobel laureates, convened to provide guidance to the Federal government on environmental valuation.

Good survey practices may not be enough, however. Researchers have conducted research to improve the aspects of valuation surveys that make them different from and more challenging than other types of surveys. This is generally referred to as research to reduce “hypothetical bias.”

The difference between what an individual says she would pay and what she would actually pay is known as *hypothetical bias*.<sup>4</sup> The NOAA panel suggested that individuals typically say they are willing to pay twice as much as they would actually pay if real money and consequences were involved. List and Gallet (2001), reviewing the literature comparing responses in hypothetical and real valuation exercises, found that individuals’ reported values in the hypothetical instances were roughly 3 times their values when real money was involved. These results must be viewed with caution, as discussed below.

Hypothetical bias is not the only issue that arises in surveying but it has become the key focus. Other prominent issues include sensitivity to scope, decomposition of responses into use and non-use values, open-ended versus closed-ended design, mail versus in-person versus computer surveys, and willingness-to-pay versus willingness-to-accept. Sensitivity to scope means that values are higher when more of the environmental good is at stake. Value decomposition means that it should be possible to break down reported willingness-to-pay into use and non-use values. Since use values are often estimated from revealed preference analysis, they must be extracted from stated willingness-to-pay to avoid double-counting.

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<sup>4</sup>A more precise statement is that hypothetical bias deals with the difference between an individual’s claim that she would vote for a proposal that cost \$x and the vote she would cast if actually voting on this issue. This is a much harder claim to verify.

Of these latter items, lack of scope sensitivity remains perhaps the highest barrier to a wider acceptance of valuation surveys.<sup>5</sup> Many of the other issues, such as open- vs. closed-ended surveys, have largely been resolved. A common view is that if hypothetical bias were minimized, surveys would exhibit the appropriate degree of scope sensitivity. The literature therefore is currently highly focused on hypothetical bias.

## 2.1 *Hypothetical Bias*

There have been three general remedies for hypothetical bias: reminders, cheap talk, and certainty calibration. We propose a fourth in Section 3.2. Evidence about hypothetical bias is discussed at the end of this section.

There is a long-standing tradition of including reminders in the survey about subjects' household budgets, possible substitutes for the environmental good or service, and alternative demands on the household's income. In 1999, Cummings and Taylor suggested a stronger admonition, labeled *cheap talk*. Their hypothetical surveys included a section that contained the reminder:

...in a recent study, several different groups of people voted on a referendum just like the one you are about to vote on. Payment was hypothetical for these groups, as it will be for you. No one had to pay money if the referendum passed. The results of these studies were that on average, across the groups, 38 percent of them voted "yes." With another set of groups with similar people voting on the *same* referendum as you will vote on here but where payment was real and people *really* did have to pay money if the referendum passed, the results on average across the groups were that 25 percent voted yes. That's quite a difference, isn't it?

We call this "hypothetical bias..." (Cummings and Taylor, 1999, p. 651)

Other studies have contained even more blatant reminders, although the above statement is blatant already, by directly appealing to respondents to "avoid this problem" (Champ, Bishop, and Moore, undated). Note that in most cases these cheap talk scripts describe *facts*, though in a leading fashion.

Cummings and Taylor found that such a reminder statistically eliminated hypothetical bias. Haab, Huang, and Whitehead (1999), replying to a cheap talk test in Cummings et al. (1997), argued that the test was incorrect and hypothetical responses were not statistically different from real responses. Nevertheless, cheap talk almost uniformly reduces valuation responses, even if the difference is not statistically significant. Current professional debate focuses on the effects of the length and nature of cheap talk.

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<sup>5</sup>Carson et al. (1996) demonstrate that several well-designed valuation surveys exhibit scope sensitivity, which they implicitly interpret as evidence that hypothetical bias is small; that is, the surveys are likely recording true willingness-to-pay. Smith (1999) examines a well-known demonstration of hypothetical bias and notes that the real-valued survey did not exhibit sensitivity to scope.

A third ex post approach to reducing hypothetical bias is to ask survey subjects how certain they are about their responses, using various measures of certainty. Champ *et al.* (1997), Johanneson *et al.* (1999) and Blumenschein *et al.* (1997), among others, have shown that for individuals who are “sure” about their hypothetical responses, hypothetical and real willingness-to-pay are roughly the same. A few studies (Champ, Bishop, and Moore, undated; Whitehead and Cherry, 2007) have combined cheap talk and ex post certainty assessments.

It is important to note, however, that evidence about hypothetical bias and its remedies is based almost solely on private goods. Studies using public goods have tended to use a voluntary donation or provision-point mechanism. This framework does not readily generalize to the kinds of collective choice that environmental valuation seeks to elucidate.

## **2.2 Alternative Approach to Reducing Hypothetical Bias**

Rather than tell people that their valuation responses might not reflect their true preferences, we introduce a method to *show* individuals their presumed hypothetical bias. In the surveys we conducted, individuals first took part in a real private-goods collective-choice experiment, using either a pen, flashlight, or both. After subjects participated in the real experiment, they answered the environmental valuation question which was, of course, hypothetical. The two parts to the survey used parallel formats as a way of emphasizing to subjects that their task with respect to our harvestable area question was no different from their task in the pen and flashlight questions. This is the essence of our approach. We explain the formats below.

The efficacy of this approach in reducing hypothetical bias has not been proven. We present some preliminary evidence that it was successful. Further research along these lines is surely warranted.

## **2.3 Valuation Reconsidered: Economics, democracy, and valuation as a form of voting**

Valuation surveys are not an easy tool to embrace; they seem too tentative. They cannot be easily dismissed, however. Their justification comes from the close connection between democracy and economics. In western society, these two institutions arise from the same system of beliefs. The strong support we give to democratic ideals leads us to give preliminary strong support to valuation.

In a democracy, the attitudes that citizens have toward their forests should be taken into account; this is the very principle of democracy. The economic view is similar: The values that individuals place on the forest should be counted. Individual values for non-market goods such as nature or, more narrowly, forest attributes, can best be expressed in

terms of voting. Would individuals vote for a proposed change in harvest area, given the effects on forest revenues and household budgets?

Thus, the argument is that environmental valuation is the *right* thing to do. This claim has both a conceptual basis (voting is how individuals in a democracy express their views over public goods) and a practical basis (voting is a task that individuals are familiar with.) Environmental valuation uses these insights in developing its methodology.

### **3. Survey**

We conducted eleven in-person group-format willingness-to-accept surveys with roughly 400 subjects. This section explains the group-format, survey and protocol, and valuation item.

#### **3.1 Group Format Surveys**

We used the group format to administer the surveys. Group format means that a group of individuals sits in a room, hears the survey described, and asks questions publicly. At the end of the session each individual fills out his or her own survey. Group format surveys are like very large focus groups except that the tasks are much more structured than the typical focus group.

The groups are recruited by an organization, usually a non-profit organization such as a Parent-Teacher-Student Association, citizens' association, church, or sports club. The groups were paid \$20 per subject. This amount gives them the incentive to contact their members and encourage them to show up for the survey. The participants need not be official members of the group; they need only to be willing to help out the group. Individual participants were not paid; they were volunteering their time for their group.

##### **3.1.1 Advantages and Disadvantages of the Group Format**

Group formats have several strong advantages and are, in our opinion, under-used in valuation research. They have most of the advantages of in-person surveys but at much lower cost. The most widely used alternative is mail surveys, which are cheaper but have low response rates and, even worse, endogenous responses. Telephone surveys have higher response rates than mail surveys and are more representative than group-format but they cannot provide much background information or any visual material.

Individual in-person surveys can provide the subjects with extensive background information and visual material and can be designed with close to a random sample of the general population but are quite expensive to conduct. In-person intercept surveys (in which individuals are approached at a shopping mall or other public gathering place;

travel cost analyses are an example) can also provide the background information but suffer, like mail surveys, from having endogenous responses.

Group formats have five further benefits over mail, telephone, and intercept surveys:

- (i) Subjects can be led to take them more seriously. The surveys are conducted away from the home and in a time-slot that individuals have set aside. In contrast to an intercept survey, subjects are not rushing to complete the activity that they were intercepted from. Therefore, outside distractions are minimal, a feature that presumably leads subjects to concentrate on the surveys and give them the attention that the surveyor wants the surveys to have.
- (ii) The format mimics how participants interact in real life.
- (iii) This format is enjoyable to subjects. It is a social activity.
- (iv) Subjects' comments about the survey and the environmental issue are highly informative to the researcher.
- (v) Group-format is the only format in which collective choice exercises (exercises that are analogous to environmental policy) can be conducted.

The effect of each of these characteristics has not yet been measured, so at the moment several of these advantages (items i, ii, and iii) are intangible. We presume that items (i) through (iii) are beneficial to the survey. Items (iv) and (v) are clearly valuable. Item (v) cannot be duplicated by any other survey format.

Group-format has two possible disadvantages. First, the surveys are not representative of the general population. There are two types of "representativeness" of interest to surveyors: representativeness in terms of observable geographic and demographic characteristics (income, race, education, location) and unobservable tastes and preferences. The latter dimension is particularly thorny for environmental valuation. Group formats tend to attract more sociable individuals. This sociability *may* be an advantage, since it seems likely that individuals who attend group surveys are more likely to vote.<sup>6</sup> Again, however, the effects of this feature on survey outcomes are not known.

Second, subjects in group formats are subject to being swayed. A crystallizing question or comment by a subject has the potential to sway responses. This feature, like the previous one, may be an advantage since it mimics the dynamics of real-world decisions. On the other hand, it introduces a random element into the surveying process.

Finally, it should be noted that although group format surveys are an inexpensive form of in-person survey and have many other advantages, they are still expensive. Because the

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<sup>6</sup>One idea is that the preferences of voters are what should count in public goods provision; non-voters are implicitly declaring that they do not want their preferences to be counted (in real-world decisions). One weakness of this theory is that voting participation can be influenced by other factors. Voting is not an either-or personal characteristic.

group format makes the responses geographically correlated, these surveys can be expensive when the goal is a fuller geographic coverage.

One important feature for minimizing bias in group format surveys is that subjects are not told ahead of time what the survey is about. This silence minimizes the problem of attracting subjects who are particularly interested in the subject. To encourage subjects to attend, the group organizers were told that the surveys were about “household budgeting,” a generic subject that seemed likely to attract a wide range of participants.

**Table 1** provides summary information about the groups surveyed and the types of instruments used.

<b>Table 1. Survey Groups</b>						
<b>Location</b>	<b>County</b>	<b>Group</b>	<b>Date</b>	<b>#</b>	<b>Open/ closed</b>	<b>Preceding valuation exercise?</b>
Trappe	Talbot	Trappe Little League (parents, etc.)	2/20/06	22	Open	Yes
Waldorf	PG	Boy Scouts (parents, etc.)	4/25/06	37	Open	Yes
Camp Springs	PG	Unitarian Church	4/30/06	50	Open	Yes
Belair	Harford	Singles group	5/2/06	21	Open	Yes
Bivalve	Wicomico	Sustainable ag.group	5/13/06	33	Closed	Yes
La Plata	Charles	Master Gardeners	5/16/06	17	Closed	Yes
Aquino-Baden	PG	Citizens Assoc.	5/17/06	50	Closed	Yes
Hagerstown (Potomac Hts.)	Washington	PTSA	12/4/06	13	Closed	Yes
Hagerstown (Winter St.)	Washington	PTSA	12/11/06	13	Closed	No
Hagerstown (Bester)	Washington	PTSA	12/20/06	123	Closed	Split
Frederick	Frederick	Adult Soccer	3/26/07	21	Closed	Split

### **3.1.2 Group Representativeness**

Group-format surveys must also be concerned about the representativeness of the groups themselves. This representativeness is of less concern when the subject matter is general economic behavior but it is of more concern when the subject matter is a contentious

public issue. Forest management might be reasonably assessed as falling somewhere in the middle of this range.

Note that although group-format surveys are inexpensive on a per-person basis, they are more expensive when viewed on a per-group basis. Adding another group is expensive both in terms of the payments to the group and gifts to the participants and in terms of administrator efforts to find a willing group, organize the session, and conduct the survey.

Our groups were chosen to yield as representative a sample as possible given the budget. Two of the groups seemed clearly focused on environmental-type issues (LaPlata and Bivalve), although in retrospect we found the Bivalve group quite instructive, despite its likely predisposition, because of its rural nature. One group (Camp Springs) that seemed likely to be generally liberal, though not focused on the environment, turned out also to be valuable because it was racially diverse, with roughly half the surveys appearing to come from African-Americans.

Two groups that had a high proportion of low and middle income individuals were Aquino-Baden (“Baden”) and Bester-B. The Baden group, like Bivalve, surprised us. This was a community group. Although this group might normally tackle a range of community issues, it is currently focused on resistance to sprawl and community change. Despite this perhaps one-sided focus, the group was composed of diverse lay-persons. We got some of our best and rawest comments from this group.

Our last group was an adult soccer league in Frederick. This was an important group because it had a significant contingent of young males, which are one of the hardest groups to interview in the group format.

The results appear to show little differences across the groups. When we regressed results against age, income, gender, or education (not shown), we found no substantial demographic effects. A larger budget and more sample groups would allow us to explore possible group or individual effects further.

### **3.2 Survey and Protocol**

A sample survey is included in the Appendix. It consists of four parts: (a) A cover sheet containing a consent form; (b) General demographic questions; (c) Environmental attitudes questions; (d) Private goods valuation questions, framed as collective choice; and (e) Public goods valuation questions.

The essence of the survey was the set of private and public goods questions. Everyone was given a pen and flashlight at the start of the experiment. Individuals first answered questions regarding the value of the pen and flashlight, then a question about forest management. The purpose of the pen and flashlight questions was to introduce the valuation mechanism and to give subjects experience in expressing their values and seeing the outcome of that expression.

By participating in a real-money experiment, subjects are led to think in terms of real-money transactions for the hypothetical forest-choice question. The private goods experiments use a collective-choice framework that parallels the forest choice. The goods themselves, however, are non-environmental goods so that subjects are clear that their pen and flashlight responses are not meant to reflect on their forest values. Collective-choice means that everyone in the group (or within the appropriate sub-group; see Section 3.2.2) experiences the same outcome.

### **3.2.1 Open-ended Questions**

The first four surveys used the open-ended framework. In the open-ended framework, individuals report a dollar amount that represents their willingness-to-accept (WTA), also known as compensation demanded (see Horowitz, McConnell, and Quiggin, 1999). The alternative is a closed-ended framework, which was used for the remaining surveys. In the closed-ended framework, individuals make a yes-no choice about whether they would accept the offered compensation.

Individuals were first asked to “value” their pens. The question asked them to give their minimum willingness-to-accept. This was described as the smallest amount of money at which the respondent would vote “yes” to return his pen or flashlight in return for the proposed payment.

After everyone had filled out their answers, the survey administrator pulled a piece of paper out of an envelope. This piece of paper had a dollar amount written on it. This is the offer. If more than half of the individuals had written down an amount less than or equal to the offer, everyone had to return his or her pen and everyone received the offered amount. This is a collective choice version of the Becker-DeGroot-Marschak mechanism.

In the first few surveys, the pen question was hypothetical; it was used merely to illustrate the mechanism. In the remaining surveys, the pen question was real; if the vote passed, individuals had to return their pens and were paid the offered amount.

We determined whether half of the individuals had written down an amount less than or equal to the announced offer by asking for a show of hands. (We did not worry about individuals changing their answers or reporting their implicit votes incorrectly.)

Individuals were then asked to “value” their flashlights. The procedure was then the same as for the pen. After everyone had filled out their answers, the survey administrator pulled an offer out of an envelope. This is the offer. If more than half of the individuals had written down an amount for their flashlight less than or equal to the offer, everyone had to return his or her flashlight and everyone received the offered amount. The flashlight question was always conducted for real money.

The forest valuation question was then explained. Subjects filled out their surveys and turned them in. The survey was then over.

### **3.2.2. Closed-Ended Questions**

The remaining surveys used a closed-ended format: one requiring a yes or no answer.<sup>7</sup> Each survey had a dollar offer for the pen, flashlight, and forest. Respondents had to vote on whether to accept the offer. The amount offered differed across subjects. For example, in the Bivalve survey, the amount offered for the pen was either \$0.90, \$1.10, \$1.30, or \$1.75, with roughly one-quarter of the surveys having each of these offers.

Individuals were first asked to vote on the pen offer. Recall that multiple offers were being made (on paper). Each individual received one of several possible offers. After participants had voted, I randomly chose one of the offer amounts to be a *real* offer. If more than half of the respondents who had received that offer voted yes, then all of the subjects with that offer had to return their pen and each received the payment. For example, suppose I chose \$1.35 as the real pen offer. Individuals whose surveys offered \$0.75 or \$1.95 were not affected; they merely kept their pens. For those individuals whose surveys offered \$1.35, if more than half voted yes, then all had to return their pens.

Individuals were next asked to vote on their flashlight offer. Again, multiple offers were being made, with each individual receiving one of several possible offers. After participants had voted, one of the offer amounts was chosen as the real-money offer. If more than half of the respondents who had received that offer voted yes, then all of the subjects with that offer had to return their flashlight and each received the payment.

### **3.3 Forest Valuation Question**

The final survey question asked about forest management options. The economic concept of value requires a choice between two specific options. Think of these as “A vs. B” or “Before and After” or “With and Without.” It is not possible to value solely “Maryland forests”; a concrete alternative is needed. In the terms of Section 2.2: if an issue is put to the voters, voters should know what will happen if the referendum passes or fails.

We set up two options for Maryland forests: an “as is” scenario describing current management plans and an alternative with more area available for harvest.

We chose to focus on forest management options for two reasons. First, subjects could easily understand the options. It was possible to demonstrate the options using photos, pie charts, and verbal description. Participants could understand the reason why these two options might be considered and why greater harvest area would yield additional

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<sup>7</sup>Closed-ended questions are also known as discrete choice or dichotomous choice.

revenue. That is, participants could easily understand why a money-environment tradeoff exists and why choosing a point on this tradeoff was necessary.

The second reason is that this is a dimension that Maryland foresters have some leeway over, the balance between “working forest” and “natural forest.”

Despite these advantages, a focus on forest management remains highly emotional. Other researchers have tended to steer away from forest management studies because they quickly turn into debates about clearcutting, about which the public’s views are widely different from professional foresters’ views, based on seemingly unsupportable reasons. One of the researchers involved in one of the rare studies of forest management told us that the valuation exercise could not show pictures of clearcutting because it evoked such a strong reaction.

Our study experienced some of this reaction, although it was not as severe as we were led to expect. In Section 4.3 we describe participants’ comments about the forest management options; these are informative in ways that transcend the elicited survey responses.

### **3.3.1 Willingness-to-Accept**

The private-goods (pen and flashlight) exercises must use a collective choice mechanism in order to mimic the forest valuation question. A collective choice mechanism means that everyone in the group either gets the pen/flashlight or a payment. This approach requires us to use a willingness-to-accept format.

A few researchers have used a willingness-to-pay format for private goods using a collective-choice mechanism, but they have given participants an ex ante payment and have used offer prices that were below this payment. Under such a design, no one is asked to give up any of his “non-experimental” money. This strikes us as unlikely to generate results that are comparable to non-experimental situations.

This format then requires us to use a willingness-to-accept format for the harvest areas question. The willingness-to-accept format is believed to be more susceptible to hypothetical bias and, when employed with a valuable environmental good, yields many more protest responses. We chose the willingness-to-accept format despite these potential drawbacks.

## **4. Results**

### **4.1 *Open-ended valuation***

Horowitz and McConnell (2000) studied open-ended WTA responses for pure private goods (mugs, flashlights, binoculars) and showed that even for these ordinary goods,

responses often violated basic economic principles. For single-item valuations they invoked “intuitive plausibility” and “economic plausibility” and showed that the more restrictive latter criterion led to the elimination of between 7 and 21 percent of responses. For experiments involving WTA for a single flashlight, the experiment closest to the ones we conducted, 12 percent of responses were eliminated as not satisfying economic plausibility. Economic plausibility was defined as twice the purchase price of the item. (For example, if a flashlight cost the experimenter \$8 then any response greater than \$16 was deemed not economically plausible.) Horowitz and McConnell (2000) did not impose any lower limit on economic plausibility, in contrast to our study.

**Table 2** shows mean and median values for the pen, flashlight, and forest area for two samples: the entire sample and the sample restricted to “economically plausible” responses. Data columns three and four of Table 2 show mean and median values for pens among the sample of pen responses between \$0.25 and \$3.00 and for flashlights among the sample of flashlight responses between \$1.00 and \$18.00. These cut-offs, both lower and upper, that we use to define the sample of interest are arbitrary but reasonable. The upper limit is slightly above twice the item’s purchase price.

**Table 2. Values for Pen, Flashlight, and Harvest Area  
Using Open-Ended WTA**

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
	<b>Mean</b>	<b>Median</b>	<b>Trimmed</b>	<b>Trimmed</b>	<b>Right-trimmed</b>
	<b>(# obs.)</b>	<b>(# obs.)</b>	<b>mean</b>	<b>median</b>	<b>mean</b>
			<b>(# obs.)</b>	<b>(# obs.)</b>	<b>(# obs.)</b>
Pen	\$178 (113)	\$1.00 (113)	\$1.19 (66)	\$1.00 (66)	\$0.82 (100)
Flashlight	\$177 (119)	\$10.00 (119)	\$8.51 (93)	\$10.00 (93)	\$8.52 (107)
Harvest area	\$173,500 (107)	\$1000 (107)	\$870 (60)	\$375 (60)	\$225 (68)

The sample of “reasonable” harvest area valuations is harder to define because there is no market value for this item. In column 2 we eliminated \$0 responses since most of these are likely to be protest responses and we chose an upper limit of \$5,000.<sup>8</sup>

The \$0 protest responses are eliminated because these individuals would surely, if asked to vote on the choice, have voted no to increase forest harvest area in return for a rebate of a small positive amount of money. Indeed, these individuals would likely have voted no for a rebate of a *large* amount of money. Therefore it is not possible to adjust their responses to, say, \$1 or \$10.

<sup>8</sup>A protocol exists for selecting the cut-off value for a private good but so far no protocol exists for choosing the cut-off value for a public good.

Not all \$0 responses are necessarily protests. Some individuals may have been willing to follow professional foresters' recommendations, in which case \$0 would have been a true response under the assumption that the proposed change in harvest area would only go forward if professional foresters thought it was desirable. Other individuals may have preferred the increased harvest area because they preferred more cut-over forests (e.g., hunters or birdwatchers) or felt sympathetic to logging communities. These individuals should have reported a *negative* willingness-to-accept (because they would be made better off by the increase in harvest area) but may have felt constrained to give non-negative answers.

We cannot distinguish protest responses from "true zero-or-less" and therefore we drop all \$0 responses. Note that this procedure affects the trimmed median's definition, too. If all of these responses represent high WTA, then the "true" trimmed median is  $n/2$  observations higher than the calculated median where  $n$  is the number of dropped responses. Table 2 is based only on the traditional definition of the trimmed median; i.e., the median of responses after too-low and too-high responses have been dropped.

The percentage of responses dropped for not satisfying economic plausibility (the difference in the number of observations between column 1 and column 3) were 42 percent, 22 percent, and 44 percent for the pen, flashlight, and harvest area, respectively. The percentage of flashlight responses that are not economically plausible is similar to the Horowitz and McConnell results for binoculars and for multiple flashlights.

The percentage of dropped responses for "harvest area" may be as high as 50 percent (60 valid responses out of 119, rather than 60 out of 107), since 12 respondents did not respond to the forest harvest question. However, it is difficult to tell whether a non-response is truly a protest, since some individuals arrived late (hence some missing pen responses) or left early (which may have led to some missing forest responses).

Table 2 also includes trimmed means when only the high responses are dropped (i.e., right-trimmed mean). This correction makes the most sense for pens – many individuals returned the pens to us even when they did not have to, which suggests that for many individuals, willingness-to-accept was \$0.

## 4.2 Closed-ended valuation

In the closed-ended surveys, individuals answered a question like the following:

Suppose the State payment were \$37 per adult resident per year. If more than half of the people vote in favor, then the acreage available for harvesting would increase by 33,000 acres (330 additional acres harvested per year), and every adult would receive the payment.

State payment to you: \$37 (per adult, per year)

Your vote: \_\_\_\_\_ (YES)

\_\_\_\_\_ (NO)

The offered amount differed across participants within the same survey group. For example, in the LaPlata survey, the offered amounts were \$18, \$38, \$78, and \$178, distributed roughly randomly across participants.

We expect that the higher the amount offered, the greater the proportion of people who would vote yes. That is, we might expect 20 percent of the participants who received an \$18 survey would say yes, whereas 60 percent of the participants who received a \$178 survey would say yes. We can use the pattern of responses to estimate the dollar value at which 50 percent of respondents would say yes. This is the estimated median WTA. Since we use a standard assumption that error differences are distributed logistically, a symmetric distribution, the estimated mean WTA is equal to the estimated median. The estimation procedure was developed by Hanemann (1984) and further explained by Cameron and James (1987). Haab and McConnell (2002) have a detailed discussion of estimation and the derivation of median WTA.

Estimation takes the form of a logistic regression where the dependent variable is 0 or 1 (no or yes) and the right-hand-side variables are a constant and the individual offer amount (e.g., \$37 in the above example). Their coefficients can be interpreted as the “disutility” from the increase in harvest area and the (positive) utility from the offered payment. Thus, we expect a negative constant,  $\alpha$ , and a positive coefficient on the offered payment,  $\beta$ . The latter coefficient is positive whenever a higher proportion of individuals say yes to a higher offer, on average.

The coefficients are denoted as  $\alpha$  and  $\beta$ . Median WTA is the ratio  $-\alpha/\beta$ . This is essentially the marginal utility of harvest area normalized by the marginal utility of income; note that utility cannot be scaled, so the individual coefficients cannot be interpreted directly. If  $\alpha$  is positive or  $\beta$  is negative, WTA cannot be calculated.

Results are shown in **Table 3**.

**Table 3. Logit Results from Closed-Ended Surveys**

	<b>Baden</b>	<b>Bester-A</b>	<b>Bivalve</b>	<b>Potomac Hts.</b>
Intercept ( $\alpha$ )	-2.47	-1.14	-3.06	-1.28
Offer ( $\beta$ )	0.018	0.073	0.015	0.0065
Implied median WTA	\$137	\$15	\$204	\$197
<i>n</i>	46	53	29	13

Dependent variable is the 0-1 (no-yes) response.

Table 3 contains results only from groups with negative  $\alpha$  and positive  $\beta$ . In the dropped cases, in which  $\alpha$  and  $\beta$  had the wrong sign, the values for  $\alpha$  and  $\beta$  were also quite small. In other words, in those cases the utility and income effects were small, in which case

small errors in their measurement led to nonsensical WTA results. (Note that the statistical significance of the estimates is not informative since  $\alpha$  and  $\beta$  have no scale.)

### **4.3 Values for Maryland Forest Management Options**

Tables 2 and 3 present our main results. Open-ended experiments have the advantage that participants report individual WTA values. This has the disadvantage, however, of yielding many implausible responses. This problem also occurs for private goods (Horowitz and McConnell, 2000). It remains a perplexing problem for research on willingness-to-accept.

In closed-ended surveys, only the group's median value can be observed. Closed-ended surveys are considered superior to open-ended surveys because of their close connection to the democratic process, as outlined in Section 2.2. Closed-ended surveys do not provide any opportunity for individuals to report implausible responses, however, and the results may be sensitive to the highest offer price that is used in that sample. This latter phenomenon has not been investigated to our knowledge.

Our open-ended surveys yield median WTA estimates of around \$375 per adult per year for an increase in potential harvest area of 30,000 acres. Our closed-ended surveys yield median WTA estimates of around \$200; although the range is from \$15 to \$456 (see **Table 4**). Bester-A had the lowest offer prices (\$6 - \$32), which may account for the very low estimate there. If we remove Bester-A from the A-group in Table 4, the estimated median WTA is \$212.

These numbers are predictions of the price (for example, a rebate to all Marylanders similar to what has been provided by the state of Alaska to residents as payment for natural resources revenue) at which a referendum on increased harvest in Maryland would pass. They are, however, much higher than any revenue that would possibly be gained from increasing harvest. To put this another way, an increase in harvest area would almost surely fail benefit-cost test.

An alternative policy question is whether harvest area should be decreased. In this case, the appropriate measure of value is *willingness-to-pay*. For environmental goods and services, willingness-to-accept has been found to be 10 times higher than willingness-to-pay (Horowitz and McConnell, 2002, Table IIIA).

Our study predicts willingness-to-pay, per adult per year, for a decrease in potential harvest area of 30,000 acres, of between \$20 and \$45. This reflects primarily non-use value but may include some recreation values. This number can be compared to estimates of lost harvest revenues in a benefit-cost analysis of decreases in potential harvest area.

## 4.4 Participant Comments

The group-format that we used allows subjects to make comments. These comments were often quite insightful. Below are some comments and, where appropriate, our responses. In a few cases, the comments were overheard and are our inference about individual sentiments. Comments can also have obvious answers, or they may be “throwaway” comments. These are less useful, although they do pose a larger question about surveying and public choice.

### *Comments on forests and forest values*

1. “Working forests” and the balance between livelihood and nature: Individuals were less sympathetic to the livelihood of local communities than we expected. The Bivalve group took place in a relatively remote area of the Eastern Shore. The feeling among this group seemed to be, “We found ways to make a living; those in logging communities will too.” This was a group focused on sustainable farming, so their views may not be broadly shared. In none of our groups, however, did we hear comments about local community effects. (We did not explicitly ask about livelihood of local communities; local effects were mentioned in the description of possible consequences of changes in harvest area.)
2. Effects on wildlife: The mention of deer evoked powerful responses. The possibility that additional harvest area would increase deer populations appeared to lead individuals to report higher WTA (in the open-ended case) or vote no (in the closed-ended case). Baden participant: “Deer is a dirty word around here.”
3. Forest harvest is analogous to development: For some respondents, images of forest harvest evoked suburban sprawl and development; forest harvest was seen as the first step toward development. Although subjects surely knew that this was not the case for state Forests, the mental image still seemed to affect their responses.

In all of the communities we visited, urban development seemed much on participants’ minds. A great majority of Marylanders live in communities where development and loss of farmland or forests is occurring. A very small number of Marylanders live in communities where logging revenue is important.

### *Questions about forest management*

4. “Shouldn’t foresters decide the right way to manage the forest?” Our response: Maryland citizens should have some input too.
5. “How will the harvest be conducted?” Our response: Forest managers will choose the harvest method that is most appropriate for the forest, just as they do now. This includes a variety of methods, depending on the forest: clearcuts, selective cuts, and thinning. Maryland forests are harvested in ways that minimize effects on water and soil erosion. All Maryland harvests are managed to ensure that forest regrowth occurs, either through planting or through natural reseeding.
6. “Will they be cutting old growth?” Our response: “Sometimes. Trees in state Forests are managed on a sustainable basis, with a roughly one hundred year rotation in western Maryland forests.”
7. “We need to cut those trees, otherwise they’ll form a fire hazard.”

*Comments about the survey*

8. “I just want to say that I find this [survey presentation] highly biased in favor of logging.”
9. “You’ve told us what the value of the logging is. But what about the value of not logging?” In response, I explained that that was what the survey was asking about.
10. “I need more information.” This is heard about once per survey. It is essentially impossible to counter; some subjects will always feel they do not have enough information.
11. “We’ll never see that money.” Subjects did not put much credibility in our discussion of how the extra revenue from additional harvesting might be returned to Maryland citizens. This is a general weakness of valuation studies: Survey scenarios require individuals to envision a specific amount of money but in most environmental decisions, the increase or decrease in people’s material standard of living is quite diffuse. The state of Alaska’s payments to citizens is a concrete example that we hoped respondents would understand, but most of them also appeared to feel that this was unlikely in Maryland.

#### **4.5 Effects of Preliminary Pen/Flashlight Valuation Exercises**

Our survey method used the preliminary pen and flashlight exercises as tools to help individuals start thinking about “personal values” and understand the survey mechanism. This demonstration of valuation and the chance for individuals to see that they might have misperceived and misreported their own values should, we believe, have been more forceful than ex ante cheap talk or ex post measures of certainty.

To test this proposition we conducted forest surveys with 3 groups that did not have preliminary pen or flashlight exercises. (These individuals received pens and flashlights, just like the other participants.) Results for the groups with and without the preliminary exercises are shown in **Table 4**. Because the offer prices in Bester-A were so much smaller than the other groups, Table 4 also contains logit results with Bester-A excluded.

Based on Table 4, the preliminary exercises appear to have been successful. Individuals were sensitive to the offer price (positive  $\beta$ ) in groups that conducted a pen or flashlight valuation exercise, but not sensitive in groups without the valuation exercise. Sensitivity to price is a key condition that a closed-ended survey question must meet to be successful.

This sample size is so far too small to draw broad conclusions from. More surveys would allow us to understand the source of this variability in responses.

**Table 4. Logit results from closed-ended surveys with and without preliminary pen/flashlight valuation**

	Groups with preliminary valuation exercise	Groups with preliminary valuation exercise excluding Bester-A	Groups without preliminary valuation exercise
Intercept ( $\alpha$ )	-0.73	-1.63	0.63
Offer ( $\beta$ )	0.0016	0.0077	-0.006
Implied median WTA	\$456	\$212	--
$n$	168	115	86
	Baden, Bester-A, Bivalve, Frederick-A, LaPlata, and Potomac Hts.	Baden, Bivalve, Frederick-A, LaPlata, and Potomac Hts.	Bester-B, Frederick-B, Winterstreet

## 5. Results, continued: The Role of Scientist vs. Public Opinion in Valuation

Valuation is a tricky business. It asks citizens to make quantitative judgments that appear unlike any other decision they have ever made. Individuals are rarely informed consumers; no analog to *Consumer Reports* exists to help them choose. Using survey answers for policy requires a leap of faith. Yet no systematic, transparent, and rigorous alternative to benefit-cost analysis exists for policy guidance. Given a reliance on benefit-cost analysis and the apparently large role for non-use values, no alternative to stated preference surveys exists. This debate has been summarized as, “Is Some Number Better than No Number?” (Hanemann, 1994; Diamond and Hausmann, 1994).

Alternatives to benefit-cost analysis that can yet provide useful information to policy-makers remain primitive. None has received the volume of research that benefit-cost analysis has. Horowitz and Quiggin (2007) have proposed a ranking-based alternative that would rely on environmental and natural resource professionals to make “quantitative” decisions and public opinion to make “qualitative” or scale decisions. Canham (1990) proposes a decision matrix that uses a weighted summation method of valuation.

### 5.1 Scientist versus Public Opinion for Environmental Decisions

Any alternative procedure must still rely on public acceptance and must still include a role for the public’s preferences. To provide some background research into alternatives

to environmental valuation, our surveys also asked participants about their willingness to cede at least some environmental decisions to resource managers. The questions are shown below.

A. When society is choosing wild areas to protect, should priority be given to:

\_\_\_\_\_ Those areas that scientists say are most important to maintaining the Balance of Nature, *or*

\_\_\_\_\_ Those areas most enjoyed by people?

(This question was asked before the harvest-areas valuation question.)

If citizens are concerned about protecting the balance of nature and the integrity of the natural environment then we would expect them to rely on scientists, not public opinion, to make decisions about environmental protection. On the other hand, if they wanted environmental protection to reflect individual values that would not be available any way other than by canvassing citizens then we would expect them to select the latter option.

Like valuation, even this “who should decide?” question must simplify the situation. The question must be worded in a non-technical way; individuals do not use terms like “existence value.” Environmental protection in (A) is cast in terms of “protecting wild areas,” a simple environmental policy that all participants can understand. We presume that this phrase stands in for general environmental protection.

In the Bester survey we reframed the question as (B). This framework makes more explicit that individual opinion about the scale of environmental protection could be decided publicly and more technical decisions could be delegated to environmental professionals such as scientists and economists. If citizens accepted this division of authority then citizens would need to decide only the scale of environmental protection. This would be an easier public decision than an environmental valuation decision such as willingness-to-accept changes in harvest areas.

B. When society is choosing *which* wild areas to protect, should priority be given to:

\_\_\_\_\_ Areas that scientists and economists say are most important to protect, *or*

\_\_\_\_\_ Areas that the general public most wants to protect?

In either case, the public would still decide *how many* acres would be protected in the chosen areas.

A third approach, which we administered in the last of our surveys, made the division of authority even more explicit. The underlying framework is the same as B. The questions are shown in C.

C. When society is choosing wild areas to protect, policymakers must decide both *which areas to protect* and *how many acres to protect* in those areas.

a) When society is choosing *which* areas to protect, should priority be given to:

\_\_\_\_\_ Areas that scientists say are most important for maintaining the Balance of Nature, *or*

\_\_\_\_\_ Areas most enjoyed by people?

- b) When society is choosing *how much land to protect* in these areas, should priority be given to:
- \_\_\_\_\_ The opinions of scientists and economists, *or*
- \_\_\_\_\_ The public's opinion?

Results are shown in **Table 5**. These show a remarkably widespread willingness to rely on scientific expertise for environmental decisions.

**Table 5. Responses to Questions A, B, and C**

	Rely on scientists	Rely on public	n
A	82%	18%	258
B	70%	30%	67
C-a	80%	20%	20
C-b	70%	30%	20

Table 5's results must be viewed with caution, for two reasons. First, a generic willingness to accept scientific expertise is not the same as willingness to accept scientific conclusions in any specific instance. This line of research is relatively new. In particular, question wording has not been subject to the long academic process that environmental valuation questions have. A substantial literature exists on medical decision-making by experts versus patients. Individuals are not unconditionally willing to rely on experts for medical decision-making, even though the difference between expert and individual knowledge is surely wider and of greater import than environmental decision-making.

Second, our results are at odds with previous findings. Question D was asked as part of the Maryland Poll, a random telephone survey of Maryland adults conducted by the Maryland Survey Research Center from April to June 1995. Like the survey questions used in our research, this question was simplified for general public understanding and to make it suitable for a telephone survey.

- D.** When choosing which undeveloped areas to protect, do you think the highest priority should be given to:
- \_\_\_\_\_ Areas most in danger of disappearing from nature, or
- \_\_\_\_\_ Those areas most enjoyed by people?

Results are shown below in **Table 6**. Although the questions differ slightly, the responses clearly show a completely different picture: Individuals are not willing to make choices based on a scientific criterion ("disappearing from nature") over a public-based criterion ("enjoyed by people").

The reasons for this difference remain unknown. The forest surveys were conducted in-person while the Maryland Poll was conducted by telephone; perhaps individuals are

more willing to trust a “scientist” when he or she is there in person. This is a drawback to the otherwise desirable in-person survey format. The two surveys were conducted roughly 10 years apart. Finally, the forest surveys were conducted with a sample of individuals who may be more socially outgoing or public-spirited than a random sample of individuals.

**Table 6. Responses to Question D (1995, telephone survey)**

<b>County or Region</b>	<b>Disappearing from Nature</b>	<b>Enjoyed by People</b>
AA and Howard	25.9%	69.0%
Baltimore (city)	30.2%	68.6%
Baltimore (county)	25.0%	73.5%
Eastern shore/Southern Md.	22.9%	76.2%
Montgomery	25.9%	73.8%
Prince George’s	28.2%	68.1%
Western Maryland	16.9%	79.4%

Survey responses for Eastern Shore, Southern Maryland, and Western Maryland counties were combined by the Survey Research Center, not by the author. Categories do not sum to 100 percent because of Don’t Know and other non-responses. Number of responses no longer available.

## **5.2 Ecological Services versus Existence Value**

It is not always clear why individuals want to protect the environment. Some individuals justify their desire to preserve the environment on moral or cultural grounds – protecting the environment is the “right” thing to do. This is an existence value. Other individuals justify environmental preservation by the services that the environment provides – it sustains life, through water, air, climate, and biological resources (biodiversity). These are ecological services. Ecological services are *use* values, albeit highly amorphous and indirect. Ecological services are the ways in which the environment adds to our material well-being, including amenities such as comfort.

Many individuals and many justifications are a muddled mix of the two justifications.

In a democracy, individuals do not need to justify their choices. The economic analog to this principle is *de gustibus non disputandum est*; there’s no disputing taste. Still, existence values and ecological services have very different

implications for the proper role of economists and for environmental valuation approaches. If individuals want to preserve the environment based on moral and cultural grounds, then individuals are the “experts” to whom we should appeal in making environmental decisions. Individuals are the ones who should say what the right level of existence value is. This is the principle underlying valuation surveys.

On the other hand, if individuals want to preserve the environment because of the ecological services it provides, then scientists and economists are the experts to whom we should appeal in making environmental decisions. Scientists and economists will have the most reliable information on ecological services. Valuation surveys, which elicit the public’s opinions and values, are a poor stab at an estimate of the value of ecological services.

The surveys above suggest that ecological services, not existence values, are motivating responses in our survey. The implication is that a study of ecological services, not valuation surveys, is the right approach to nonmarket valuation. This issue begs for further research.

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