The *New Carissa* Shipwreck: Aesthetic Impact on Coastal Recreation

Miranda L. Freeman, Economist
mfreeman@ter.com

Richard W. Dunford, Vice President
rdunford@ter.com

Triangle Economic Research
2775 Meridian Parkway
Durham, NC 27713
Telephone: (919) 544-2244
Fax: (919) 544-3935

Paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Montreal, Canada, July 27-30, 2003

The *New Carissa* Shipwreck: Aesthetic Impact on Coastal Recreation

Stated-preference (SP) surveys and random utility models (RUMs) have been used in several natural resource damage (NRD) applications to determine the impact of an oil spill or hazardous-substance release on recreation (Bishop et al. 2000; Breffle et al. 1999; Texas General Land Office et al. 2001), but rarely to assess a primarily aesthetic recreational impact. In February of 1999, the *New Carissa* freighter ran aground on the North Spit, near Coos Bay, Oregon, during a winter storm. In spite of multiple attempts to remove the shipwreck, part of the stern of the *New Carissa* is still lodged in the surfzone of the North Spit. The objective of our research is to estimate the recreational impact resulting from the presence of the *New Carissa* shipwreck on the Oregon coast.

The ocean along the Oregon coast is usually too cold for swimming, and most ocean-related recreation occurs on the beach or nearby dunes. Thus, most recreation activities are not directly affected by the physical presence of the *New Carissa* shipwreck. However, the shipwreck is visible for approximately two miles on either side of it and may have an aesthetic impact on some recreation activities. Our research uses an SP survey to obtain information on coastal recreation preferences, and then employs the RUM technique to analyze the data and estimate the proportional impact of the *New Carissa* shipwreck on coastal recreation in Oregon. This impact is then combined with the results of an on-site count study and a benefits transfer to estimate the monetary impact of the shipwreck on the welfare of Oregon coastal recreators.

Theory

Our research uses a RUM to determine the effect of the shipwreck on the likelihood that beach recreators will visit a given site. The RUM is based on a standard conditional logit model (McFadden, 1974; McFadden, 1981) and is appropriate for modeling the discrete choices made

in an SP context (Parsons 2001; Bockstael, McConnell, and Strand 1991). The use of RUMs by economists in modeling recreation behavior is well-established (Bockstael, McConnell, and Strand 1989; Parsons and Needelman,1992; Kaoru, Smith, and Liu 1995; Hausman, Leonard, and McFadden 1993). These models measure the probability of a specific outcome (in this case, the selection of an ocean recreation site), conditional on the various characteristics of all relevant site choices. The SP survey included a series of pairwise comparisons by each recreator, i, with two alternative sites, j, in each choice set. In each pairwise comparison, the linear specification of utility for the alternative sites is:

$$U_j^i = X_j\beta + \varepsilon_j^i \quad \textbf{(1)}$$

where

U_j^i = recreator i's utility for site j in each choice set

X_j = a vector of attributes (such as ocean view, beach access, number of people) for site j in each choice set

β = a vector of attribute parameters (i.e., part worths)

ε_j^i = stochastic error for recreator i for site j in each choice set

Assuming ε follows a type-one extreme-value error structure, the probability that recreator i will select site 1 from each choice set (P_1^i) is the standard conditional-logit expression:

$$P_1^i = \frac{\exp(X_1\beta)}{\exp(X_1\beta) + \exp(X_2\beta)} \quad \textbf{(2)}$$

Thus, the probability that individual i will select site 1 is the ratio of the utility that site 1 provides relative to the sum of the utility provided by both sites in the choice set.

Welfare estimates are typically based on compensating variation. Ignoring the superscript for individuals, we define D as the log of the sum of the utility provided by each site in the survey choice set:

$$D = \ln\left[\exp(X_1\beta) + \exp(X_2\beta)\right] \quad \textbf{(3)}$$

We define D' as the same measure across the choice set but with the shipwreck removed from site 1. Specifically,

$$D' = \ln\left[\exp(X_1\beta - \beta_s) + \exp(X_2\beta)\right] \quad \textbf{(4)}$$

where β_S is the coefficient on the shipwreck dummy variable. Assuming a constant marginal utility of income, compensating variation (CV) is:

$$CV = \frac{1}{\beta_{TC}} \bullet (D' - D) \bullet Q \quad \textbf{(5)}$$

where β_{TC} is the parameter on travel cost (marginal utility of income) and Q is the total number of choice occasions (i.e., the total number of trips to ocean recreation sites).

Substituting Equations 3 and 4 into Equation 5 and simplifying yields:

$$CV = \frac{1}{\beta_{TC}} \bullet \ln\left\{P_1\left[\exp(-\beta_S) - 1\right] + 1\right\} \bullet Q \quad \textbf{(6)}$$

where P_1 is the probability of visiting site 1 with the shipwreck at the site. Across all individuals, P_1 simply equals the number of trips to site 1 with the shipwreck (Q_1) divided by the total number of trips to ocean recreation sites (Q). Thus, Equation 6 can be transformed into:

$$CV = \frac{1}{\beta_{TC}} \bullet \left(\frac{\ln\left\{P_1\left[\exp(-\beta_S) - 1\right] + 1\right\}}{P_1}\right) \bullet Q_1 \quad \textbf{(7)}$$

As the total number of ocean recreation trips approaches infinity,[1] Equation 7 simplifies to:

$$CV = \frac{1}{\beta_{TC}} \bullet \left[\exp(-\beta_S) - 1\right] \bullet Q_1 \quad \textbf{(8)}$$

Next, express Equation 8 as:

$$CV = \overline{CS} \bullet S \bullet Q_1 \quad \textbf{(9)}$$

where

$\overline{CS}$ = the inverse of the marginal utility of income, which approximates the average consumer surplus for recreation activities at ocean sites (i.e., $1 / \beta_{TC}$)

S = the proportional impact of the shipwreck on the value of trips to the shipwreck site (i.e., $\exp(-\beta_S) - 1$)

Q_1 = the number of trips to the shipwreck site.

Our paper focuses on estimating the second component of annual damages, S, the proportional impact of the shipwreck. The other two components are obtained from other studies, as discussed later in this paper.

To estimate the proportional impact of the shipwreck, we conducted a paired-comparison SP survey of ocean recreators in Oregon. The SP method is ideal for this research because it allows for and emphasizes the tradeoffs between different attributes of a site, ensuring that we can obtain the impact of the shipwreck alone, holding all other things constant (Louviere 1994; Swait, Louviere, and Williams 1994). In other words, an SP approach enables us to isolate the impact of the shipwreck from the other North Spit features. In addition, the choice technique is more realistic to respondents, because they are more likely to be familiar

[1] Assuming that the total number of ocean recreation trips approaches infinity maximizes the proportional impact of the shipwreck and, consequently, damages.

with choosing between two places based on their characteristics than with estimating how much they are willing to pay/accept for attributes of their ocean recreation experience. Ocean recreators routinely choose where to recreate rather than estimate a value for an attribute of their recreation experience. Choice questions provide respondents with the kinds of choices they are accustomed to making—every time recreators take a trip to the beach, they have to choose which beach to visit, and they make that choice based on the characteristics of the individual beaches. These questions mimic this choice process in a hypothetical context.

The SP technique is also ideal for our research because it allows us to add choice set variation that does not exist in reality. Visible shipwrecks are rare along the coast of Oregon, which limits the opportunity to use revealed preference (RP) data to estimate the recreation impact of the *New Carissa*. Without other trips to places with shipwrecks similar to the *New Carissa*, we cannot distinguish the effect of the other North Spit attributes from the effect of the shipwreck. The SP technique allows us to "add" a shipwreck to other beaches, and thus create the variation necessary to isolate the impact of a single attribute.

Data

The North Spit is a peninsula of sand dunes just north of the entrance to Coos Bay in southern Oregon. The Pacific Ocean is west of the North Spit and Coos Bay is east of it. Most of the North Spit is owned and managed by the Bureau of Land Management. The beach where the *New Carissa* is lodged is accessible only by an unpaved, sand road. The shipwreck is first visible from the sand road from an overlook approximately one mile down the sand road. The shipwreck is actually located about 2.2 miles down the sand road. Most recreators access the beach where the shipwreck is lodged using four-wheel-drive, street-legal vehicles. However, a few recreators enter the area on foot, on horseback, or on ATVs. The North Spit is very windy and the water is cold with high waves and a strong undertow. The area is also

subject to strong storms about seven months of the year (i.e., October through April). There is no boat access on the Pacific Ocean side of the North Spit because of the high waves and strong undertow.

We estimated the number of 2002 recreation visits to the relevant area in the North Spit Recreation Study, a visitor-count study that we conducted in June of 2002.[2] Using the results of our study and monthly visitation data from Horsfall Beach in the Oregon Dunes National Recreation Area (a nearby, coastal, dune-recreation area), we estimated approximately 8,000 visits in 2002 to the beach where the shipwreck is visible. Historical visitation data from Horsfall Beach revealed a declining trend in the number of recreation visits to that area over time. However, we generously assumed that the recreation visits to the North Spit in 2002 would continue at the same level into the future.

The NRD assessment from the oil spill resulting from the *New Carissa* shipwreck used $14.39 in December 1999 dollars ($15.40 in July 2002 dollars) as the average value of a recreation visit to the Oregon Coast (Carlson and Fujimoto 2001). We use the same average value in our research.

Finally, we use a RUM to estimate the proportional impact of the shipwreck on the total value of recreation visits to the relevant area. The RUM analyzes the results of our 2002 Oregon Ocean Recreation Survey, which we conducted from June 20 to August 3, 2002. The survey area included Oregon residents living approximately south of Eugene, west of or near I-5, and north of Grants Pass. The survey used a combination telephone-mail-telephone mode, with a $5 incentive payment for participants in the latter two modes. The initial telephone survey used a random-digit-dial technique to identify and recruit ocean recreators for the remainder of

[2] The 2002 North Spit Recreation Study results have not yet been published. Please contact the authors if you would like more information about that study.

the survey. The mail survey contained 10 paired-comparison questions asking ocean recreators to choose between two ocean places, X and Y. Each place is described using five attributes: ocean view, walk to the beach, people on the beach, presence of sand dunes, and whether vehicles were allowed on the beach.[3] Appendix A shows these attributes and their levels, and Appendix B provides a sample survey question. The attributes are defined to respondents as follows:

- **Ocean View:** What you see when you look at the ocean (such as rocks or a shipwreck).
- **Walk to Beach:** What the walk to the beach is like (short and flat, or long and steep).
- **Sand Dunes:** Whether there are sand dunes at this place (yes or no).
- **People on Beach:** Approximately how many other people you see on the beach (none, some, many).
- **Vehicles:** Whether vehicles, including ATVs, are allowed on the beach and dunes (allowed, not allowed).

The telephone follow-up survey obtained the answers to the questions contained in the mailed booklet.

The survey development included two focus groups with 12 people per group, an in-person pretest with 29 respondents, and a telephone-mail-telephone pretest with 30 respondents. Respondent information for the final survey follows:

- 488 respondents completed the initial telephone survey,
- 390 ocean recreators were asked to take the remainder of the survey,

[3] Commonly, SP questions in a recreational context include an attribute that can be used to measure travel cost, which is then used to monetize the utility provided by the other attributes. In our study, we omitted the travel cost attribute because we obtained the value of a day of beach recreation via benefits transfer, as noted earlier.

- 315 ocean recreators agreed to take the remainder of the survey, and
- 264 ocean recreators completed the remainder of the survey.

In summary, 81% of the ocean recreators who were asked to take the remainder of the survey agreed to do so, and 84% of the ocean recreators who agreed to take the survey completed it. Ultimately, we had usable responses from 259 ocean recreators.[4]

The SP survey consists of 40 questions. To minimize respondent burden while retaining the efficiency of a large design, the survey is divided into four blocks of ten questions each. Each block is designed to meet the criteria for an efficient paired-comparison survey. We removed unrealistic profiles from the design,[5] and minimized overlap. Of the 100 candidate designs created for each survey block, we selected 10 for each block on the basis of d-efficiency, to ensure high orthogonality in all candidate designs. We addressed the remaining design considerations of level balance and utility balance through evaluation of candidate designs. The degree of level balance is relatively constant across candidate designs.[6] The d-efficiency levels have a narrow range from 48 to 52. This efficiency measure varies only slightly across designs because candidate designs were prescreened on the basis of orthogonality. By contrast, utility balance ranges widely across designs, with a low of 25 and a high of 88. According to Huber and Zwerina (1996) selecting questions on the basis of utility balance can improve study efficiency from 30% to 50%. In developing utility balanced blocks, we used preference estimates available from our pretest data.

[4] We determined that five respondents had unreliable responses, so we removed them from the dataset. For the sake of brevity we do not describe the criteria used to evaluate reliability. Please contact the authors for more details on the reliability criteria.

[5] For example, the combination of difficult access and many people was deemed unrealistic during pretesting and was eliminated from the final survey.

[6] Because attributes consist of only two or three levels, eliminating overlap simultaneously leads to good level balance.

One of the challenges of this research was to accurately convey to respondents the aesthetics of the shipwreck without introducing bias into the description. The word "shipwreck" has different connotations for different people, because shipwrecks are by no means a uniform phenomenon. Further, even people who are familiar with the *New Carissa* shipwreck may not be aware of the current condition of the shipwreck. The shipwreck presents a very different view today than it did during the news coverage of the grounding in early 1999. Because the goal of this research is to measure the impact of a specific shipwreck, rather than shipwrecks in general, it is crucial to ensure that all respondents react to the *New Carissa* shipwreck as it exists today.

We chose to use photographs to depict the four levels of the ocean view attribute: open ocean, large offshore rocks, a 1929 shipwreck (located on Horsfall Beach, approximately four miles north of the *New Carissa*), and a 1999 shipwreck (the *New Carissa*). Photographs were selected because they provide the most objective description and convey not only the physical presence of the shipwreck, but also its aesthetics. Respondents are able to react to the same view they would experience if they visited the site. In contrast, if words were used to describe the shipwreck, respondents would need to rely on their imaginations and personal experience to create and interpret the scenes described in the text. Photographs have been used in the contingent valuation (CV) literature to value aesthetic amenities such as visibility and marine debris (Smith et al. 1997, Rowe et al. 1980, Schulze et al. 1983). Thus, it is a natural extension of this approach to use photographs in an SP context. Past research shows that visual images are important to people's perceptions when measuring the importance of aesthetic dimensions of environmental resources (Smith et al. 1997).

However, the use of photographs raises some additional issues. One concern is that respondents may react to differences between the photographs that are not related to the attribute levels that the photographs were intended to convey. To minimize this possibility, we

selected photographs to be as similar as possible in terms of quality, color intensity and tone, distance from the camera, weather, and type of beach. In the survey instructions, respondents were asked to assume that all the beach places had a nice, sandy beach and that it was a typical summer day with good weather. The photographs reflect those conditions as closely as possible. Also, we tested the photographs during the survey development to determine if respondents detected any unintended differences between them.

A second concern is that the use of photographs to describe one attribute and text to describe the other four attributes might cause people to focus primarily on the photographs, ignoring the text. We also explored this issue during pretesting. Respondents were asked which attributes were most important to them when choosing a place to recreate. Although some respondents identified the Ocean View attribute as most important, most of these respondents also identified other attributes as important. In addition, many respondents identified other attributes, such as Walk to Beach, People on Beach, and Vehicles as most important. Further, the photograph positions vary in the different survey versions. Two versions of the survey have photographs at the bottom of the page, and two versions have the photographs at the top of the page. We tested the location of the photographs in the model and found it to be insignificant.

Another potential problem with photographs is ensuring that respondents are able to identify the views and objects depicted in the photographs. For example, in the first pretest, some respondents told us that the *New Carissa* shipwreck looked like a rock at first glance. To ensure that all respondents realized the photo was of a shipwreck, we labeled all the photographs. In the second pretest, respondents received the labeled photographs and although there were specific probes related to the photographs, none of the respondents had any questions about the content of the pictures.

Model and Results

As noted earlier, we used a RUM to determine the proportional effect of the shipwreck on beach recreation value. The conditional logit model specified by Equation 2 is estimated using maximum-likelihood. That is, given the characteristics of the recreation sites in the choice sets available to ocean recreators, the model estimates coefficients that maximize the likelihood that the stated choices in the sample will be observed. Thus, the coefficients show the relationship between the probability of selecting a recreation site and the site attributes of that alternative.

The attributes included in the model are listed in Table 1. Each attribute level from the survey is treated as a dummy variable, and one level is omitted. Thus, the coefficients are interpreted relative to the omitted category. For Ocean View, the omitted category is the open "Ocean" view. For People on Beach, the omitted category is "Many" people. The omitted categories for Vehicles, Sand Dunes, and Walk to Beach are "Allowed," "No," and "Short and Flat," respectively.

Table 1: RUM Variables

Variable	Description
New Carissa	Dummy = 1 if Ocean View is the 1999 shipwreck (*New Carissa*)
Rocks	Dummy = 1 if Ocean View is Rocks
1929 Shipwreck	Dummy = 1 if Ocean View is the 1929 shipwreck
No People	Dummy = 1 if People on Beach is None
Some People	Dummy = 1 if People on Beach is Some
No Vehicles	Dummy = 1 if Vehicles is Not Allowed
Dunes	Dummy = 1 if Sand Dunes is Yes
Long Steep Walk	Dummy = 1 if Walk to Beach is Long and Steep

Table 2 shows the RUM results. Almost all of the site characteristics are highly significant in influencing site choice, with the exception of *1929 Shipwreck* and *Dunes*. Most of

the site attributes, except for *New Carissa* and *Long Steep Walk*, are positive, indicating that the presence of these attributes increases the probability of site selection, other things being equal. The variable of interest, *New Carissa*, is negative and significant, indicating that viewing the *New Carissa* shipwreck negatively affects ocean recreators relative to viewing an open ocean. However, the coefficient on *New Carissa* indicates that the shipwreck has, in absolute value terms, the smallest impact on recreation of all the significant attributes included in the model.

Table 2: RUM Results

Variable	Coefficient	P-Value	90% Confidence Interval	
			Lower Bound	Upper Bound
New Carissa	-0.197	0.010	-0.323	-0.072
Rocks	0.296	0.000	0.173	0.419
1929 Shipwreck	-0.114	0.145	-0.243	0.015
No People	0.551	0.000	0.444	0.659
Some People	0.578	0.000	0.470	0.685
No Vehicles	0.389	0.000	0.306	0.473
Dunes	0.020	0.663	-0.055	0.095
Long Steep Walk	-0.563	0.000	-0.638	-0.488
Pseudo R^2	0.1036			
Percent of Responses Correctly Predicted	65.7%			
Number of Observations.	5154			

The pseudo-R^2 for this model is relatively low. We suspect this may be the result of the utility balanced experimental design. A feature of utility balanced designs is that higher levels of utility balance lead to lower model performance in terms of common efficiency measures such as pseudo R^2 and the percent of responses correctly predicted. This feature implies good foreknowledge of preferences rather than poor model performance (Huber 2002).

One interesting result shown in Table 2 is that respondents have different responses to different shipwrecks. Two of the ocean views included in the survey were shipwrecks; one was the *New Carissa*, and the other was a 1929 shipwreck that had been partially cut up for scrap and eroded by the ocean. Table 2 shows that the 1929 shipwreck has no significant impact on recreation. In other words, the model indicates that ocean recreators are not affected (negatively or positively) by the 1929 wreck, even though it is easily accessible and could interfere with beach activities during low tide. Yet, as we stated earlier, the *New Carissa* shipwreck does negatively affect ocean recreators. One possible interpretation of this result is that as time passes and the *New Carissa* shipwreck deteriorates, its effect on recreation will diminish and ultimately become insignificant.

Additional findings of our research include a positive impact of the *New Carissa* shipwreck for some recreators, although its net impact is negative. Follow-up survey questions revealed that approximately one-quarter of recreators who visit the relevant area increased their visits to the area or enjoyed their visits more with the shipwreck present. This finding is consistent with information received during pretests and with the RUM results. Some pretest respondents indicated that they preferred to visit the beach with a view of the *New Carissa* shipwreck, because they found it to be more interesting than the other views. Some alternative specifications of the RUM using interaction variables between respondent characteristics and the 1999 shipwreck (*New Carissa*) ocean view have a positive and significant coefficient for the interaction variable, providing further evidence that some respondents experience positive utility from the presence of the shipwreck.

Welfare Calculations

We use the *New Carissa* coefficient and 90% confidence interval from the RUM to determine the proportional impact of the shipwreck, which is then used to estimate annual

damages. As discussed above, the proportional impact of the shipwreck on recreation value, S, is calculated with the following equation:

$$S = \exp(-\beta_S) - 1 \quad \textbf{(10)}$$

Based on this equation and the coefficient on *New Carissa* in Table 2, the proportional impact of the shipwreck is 21.8%, with a 90% confidence interval of 7.45% to 38.1%. We estimate annual damages by multiplying the number of current recreation visits (8,000), the average value of a recreation visit ($15.40), and the proportional impact of the shipwreck on the value of recreation visits (21.8%) (Equation 10). Thus, our estimate of the annual damages from the shipwreck is $27,100, with a 90% confidence interval of $8,600 to $46,800 (in July 2002 dollars). To calculate aggregate damages, we apply a 3% discount rate to the annual damages into perpetuity, and assume that the 2002 damage estimate also applies to 2001, 2000, and the last quarter of 1999.[7] Our aggregate estimate of the recreation damages from the continued presence of the *New Carissa* shipwreck is about $1 million. The 90% confidence interval for this estimate ranges from $300,000 to $1.7 million.

Conclusions

To our knowledge our study is the first use of photographs in an SP paired-comparison survey. Furthermore, by combining the results of our SP survey with the number and value of recreation trips to the area from other studies, we were able to estimate recreation losses from the aesthetic disamenity relatively quickly and cost-effectively. The relatively low estimate of aggregate recreation damages (i.e., approximately $1 million) is reasonable given the relatively low use of the area (only 8,000 visits per year) because of its inaccessibility and the perceived attractiveness of the shipwreck to a substantial portion of recreators to the area.

[7] The NRD assessment included recreation damages through the third quarter of 1999. Consequently, we start our recreation damage estimate in the fourth quarter of 1999.

REFERENCES

Bishop, Richard C., William S. Breffle, Jeffrey K. Lazo, Robert D. Rowe, Sonya M. Wytinck. 2000. *Restoration Scaling Based on Total Value Equivalency: Green Bay Natural Resource Damage Assessment Final Report*. Prepared for U.S. Fish and Wildlife Service, U.S. Department of Interior, and U.S. Department of Justice. Boulder, CO: Stratus Consulting, Inc. October 25.

Breffle, William S., Edward R. Morey, Robert D. Rowe, Donald M. Waldman, and Sonya M. Wytinck. 1999. *Recreational Fishing Damages from Fish Consumption Advisories in the Waters of Green Bay*. Prepared for U.S. Fish and Wildlife Service, U.S. Department of Interior, and U.S. Department of Justice. Boulder. CO: Stratus Consulting, Inc. November 1.Bockstael, N.E., K.E. McConnell, and I.E. Strand. 1989. "A Random Utility Model for Sportfishing: Some Preliminary Results for Florida." *Marine Resource Economics* 6(3):245–260.

Bockstael, Nancy E., Kenneth E. McConnell, and Ivar E. Strand. 1991. "Recreation." In *Measuring the Demand for Environmental Quality*, J.B. Braden and C.D. Kolstad, eds. North Holland: Elsevier Science Publishers B.V.

Carlson, Curtis, and Robert W. Fujimoto. 2001. *New Carissa Recreational Loss Pre-Assessment Report*. Damage Assessment Center, National Oceanic and Atmospheric Administration, Silver Spring, MD and Forest Service, U.S. Department of Agriculture, Portland, OR. October.

Hausman, Jerry A., Gregory K. Leonard, and Daniel McFadden. 1993. "Assessing Use Value Losses Caused by Natural Resource Injury." In *Contingent Valuation: A Critical Assessment*, J. Hausman, ed. North-Holland: Elsevier Science Publishers B.V.

Huber, Joel. 2002. Personal Correspondence with Matthew Bingham, TER Senior Economist.

Huber, Joel, and Klaus B. Zwerina. 1996. "The Importance of Utility Balance in Efficient Choice Designs." Fuqua School of Business, Duke University, Durham, NC

Kaoru, Yoshiaki, V. Kerry Smith, and Jin Long Liu. 1995. "Using Random Utility Models to Estimate the Recreational Value of Estuarine Resources." *American Journal of Agricultural Economics* 77(February):141–151.

Louviere, Jordan J. 1994. "Relating Stated Preference Measures and Models to Choices in Real Markets: Calibration of CV Responses." DOE/EPA Workshop on Using Contingent Valuation to Measure Non-Market Values, May 19–20, Herndon, VA.

McFadden, Daniel. 1974. "The Measurement of Urban Travel Demand." *Journal of Public Economics* 3:303–328.

McFadden, Daniel. 1981. "Econometric Models of Probabilistic Choice." In *Structural Analysis of Discrete Data*, C. Manski and D. McFadden, eds., 198–272. Cambridge, MA: The MIT Press.

Parsons, George R. 2001. "The Random Utility Model for Valuing Recreational Uses of the Environment." University of Delaware. March 7.

Parsons, George R., and Michael S. Needelman. 1992. "Site Aggregation in a Random Utility Model of Recreation." *Land Economics* 68(4):418–433.

Rowe, Robert D., R. d'Arge, and David S. Brookshire. 1980. "An Experiment on the Economic Value of Visibility." *Journal of Environmental Economics and Management* 7:1–19.

Schulze, William D., David S. Brookshire, Eric Walther, Karen K. MacFarland, Reagan Whitworth, Mark A. Thayer, Shaul Ben-David, William Malm, and John Molenar. 1983. "The Economic Benefits of Preserving Visibility in the National Parklands of the Southwest." *Natural Resources Journal* 23:149-173.

Smith, V. Kerry, Zhang Xiaolong, and Raymond B. Palmquist. 1997. "Marine Debris, Beach Quality, and Nonmarket Values." *Environmental and Resource Economics* 10(3):223–47.

Swait, Joffre, Jordan J. Louviere, and Michael Williams. 1994. "A Sequential Approach to Exploiting the Combined Strengths of SP and RP Data: Application to Freight Shipper Choice." *Transportation* 21:135–152.

Texas General Land Office, Texas Parks and Wildlife Department, Texas Natural Resource Conservation Commission, National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service, and U.S. Department of the Interior. 2001. "Damage Assessment and Restoration Plan and Environmental Assessment for the Point Comfort/Lavaca Bay NPL Site Recreational Fishing Service Losses." June 21. Austin, TX: Texas General Land Office.

Appendix A: SP Attributes and Levels

Attribute: Ocean View

	
1999 shipwreck	1929 shipwreck
	
Rocks	Ocean

Attribute:	Walk to Beach
Levels:	Short and Flat *or* Long and Steep

Attribute:	Sand Dunes
Levels:	Yes *or* No

Attribute:	People
Levels:	None *or* Some *or* Many

Attribute:	Vehicles on Beach
Levels:	Allowed *or* Not Allowed

Appendix B: Sample SP Survey Question

Question 2

Please consider the following choices for your next visit to the ocean.
Circle the place you would choose to visit.

	Place X	Place Y
Ocean View:	 1999 Shipwreck	 Ocean
Walk to Beach:	Long and Steep	Short and Flat
Sand Dunes:	Yes	No
People on Beach:	None	Some
Vehicles:	Allowed	Not Allowed

Please circle one:	I would visit Place X	I would visit Place Y