Chapter 2

Using an Internet-based survey instrument capture hard to reach beach users and develop a travel cost model for surfing at Trestles Beach, California

Introduction

Coastal tourism and recreation is the largest component of California’s coastal economy (Kildow and Colgan 2005). Over the last decade there has been an increased effort to better understand the behavior and economics of beach going (Pendleton and Kildow 2006). A review of the literature on non-market values of coastal recreation in California shows that most studies have focused on beach goers. These studies often group beach users into broad categories that do not account for nuances in behavior or preferences that drive choices about coastal recreation. Understanding how specific groups use the coast and are affected by environmental changes is necessary to protect coastal recreation.

Small or difficult to monitor groups of beach users that have unique interests, such as surfers, divers and kite boarders, represent a unique challenge to survey based research. They are hard to identify in random samples of the population, their use has high spatial and temporal variability, and they may have a low response rate to in-person interviews (Shaw and Jakus 1996; Hanemann, Pendleton et al. 2004). Surfers are representative of a “hard to measure” user group because their numbers are too small to capture by random
samples of the population (except for surveys that have extremely large numbers of responses), they have a low response rate to on-site surveying, and they use the coast at times that are different than other beach goers. As a result surfers are often underrepresented in beach going surveys. Surfers were found to represent up to 20% of beach visits at certain Orange County beaches in early morning intercept surveys (Chapman and Hanneman 2001) but represented only 3% of all beach goers in the Southern California Beach Valuation project survey using a random digit dial (RDD) survey.

Using a conservative approximation, it is estimated that there are 150 million beach visits per year in California resulting in economics impacts that could exceed $3 billion and consumer surplus values that could substantially exceed $2 billion (Pendleton and Kildow 2006). It is often assumed that beach recreation studies include surfers. However, it is likely that surfers are underrepresented in these surveys and that they may represent a significant beach going population that is not included in studies of beach recreation (Chapman and Hanneman 2001). Nelsen, Pendleton et al. (2007) estimated the economic impact of surfers visiting Trestles to the City of San Clemente to be between $8 million and $13 million. This contribution was not captured in the King (2001) report on economic impacts from San Clemente beaches and was likely considered to be zero prior to the study.

It is important to distinguish surfers from beach goers in economic research and in coastal zone management because surfers are substantially
different than the general beach going population. Surfers tend to visit the beach at different times than regular beach goers. Surfers often visit the beach in the early mornings and in the evenings because these are times when the conditions are at their best (Nelsen, Pendleton et al. 2007). In contrast beach goers tend to visit the beach in the middle of the day and this is when most estimates for beach visitation are taken and when most beach use surveys are conducted (Chapman and Hanneman 2001; Hanemann, Pendleton et al. 2004).

Surfers are more avid than typical beach goers. Although surfers are a small percentage of the overall beach going population their avidity may result in a higher number of visits than beach goers. As part of the 2000 National Survey on Recreational and the Environment, Leeworthy and Wiley (2001) found that California beach goers average 12 visits per year and surfers averaged 20 visits per year. They estimated that California surfers make 22.6 million visits per year (more visits than recreational fishing). There is evidence to suggest that 20 visits per year may be conservative for high quality surfing areas. Nelsen, Pendleton et al. (2007) found that 38% of surfers surveyed visited Trestles over 100 times per year. Leeworthy and Wiley (2001) estimate of 22.6 million surfing visits, which represents approximately 15% of the estimated 150 million beach visits per year. Chapman and Hanneman (2001) made a special effort to intercept surfers by surveying 22 Southern California beaches from 6:00 a.m. to 6:00 p.m. and found that the proportion of beach trips accounted for by surfers ranged from 10-18%. This portion of the beach visiting population may be missed in most beach valuation studies.
Surfers make choices about where to go to the beach based on reasons that are different than other beach goers. Beachgoers are influenced by access, amenities and aesthetics and therefore have many choices for their beach destinations in California (Hanemann, Pendleton et al. 2004). This may be especially true in Southern California because of the large number of accessible, high quality beaches with amenities. In contrast, surfers are extremely particular about their beach choice based on numerous oceanographic, meteorological, surf and social conditions. As a result, environmental impacts such as water quality impairment or changes in beach processes from coastal development will likely impact the beach choice, and thus the economic values and contributions, of surfers differently than other beach goers.

Surfing areas are sensitive to environmental changes resulting from natural geomorphologic changes and human interruption of natural coastal systems (Walker 1974; Scarfe, Elwany et al. 2003). Subtle changes in conditions can affect the desirability of a particular surfing area. Surfers are also affected by water quality impairment more severely than beach goers. Many beach goers are not affected by water quality conditions because they do not enter the water. Dwight (2007) found that average bathing rates varied from a minimum of 26% of beachgoers in winter months to a maximum of 54% during the summer. When surfing, all surfers are completely immersed in the ocean so they are fully exposed to all water quality conditions. Stone (2008) found that surfers ingested an average of 170 ml (6 ounces) of seawater per visit. This volume of water intake is markedly high than those for swimmers (16-37 ml) and divers (10 ml).
Ingesting water can impact the health of surfers (Dwight, Backer et al. 2004; Given, Pendleton et al. 2006; Wade, Calderon et al. 2006).

Coastal development that is permitted by the California Coastal Commission is required to be protective of coastal access and coastal recreation. It is important to understand how coastal development may pose threats to surfing that may be different from the general beach going population. Due to the specific conditions required for surfing, there are fewer substitute sites for surfing than beach going. Impacts to surfing areas such as closures due to water pollution may impact surfers more than other beach goers (Chapman and Hanneman 2001).

Despite the popularity and cultural influence of surfing in California, relatively little is known about surfers and the economic values associated with surfing. To date there are only two peer reviewed and published studies that address the non-market value of surfing (Lazarow, Miller et al. 2007). Oram and Valverde (1994) describe the methodology used by the Surfrider Foundation to argue for mitigation of lost surfing due to the construction of a large groin in El Segundo, California. By comparing the entrance fee of a water park, they estimated a value of a surfing visit to El Segundo at $16.95 ($1991) per person per visit. Multiplying this value by the estimated attendance over four years, they estimated that the lost surf resulted in damages worth $244,000 to local surfers (Oram and Valverde 1994).
Chapman and Hanneman (2001) included the non-market value of surfing to estimate the economic value of lost recreational opportunities from the American Trader oil spill off of Huntington Beach, California. Their results were based on a benefits transfer approach. They could find no existing literature on the value of a surfing day because there were no peer-reviewed publications on the non-market consumer surplus of surfing. As a result they were not able to base their valuation of surfing on empirical evidence. Instead, they based their estimated value on expert opinion from the Surfrider Foundation and comparison with other specialized beach uses (Chapman and Hanneman 2001). They first assumed that a surfing day was valued at $16.95 ($1990) per surfing trip, which was about 30% over their estimate for general beach recreation (Chapman and Hanneman 2001). With the addition of new data sources on the value of beach visits but not specifically on surfing, Chapman and Hanemann (2001) refined their estimate value for a surfing day to be 25% higher than the consumers’ surplus for general beach recreation and used a value of $18.75 per trip ($1990) for surfing trips lost.

One reason that so little is known about surfers is that they are difficult to survey. Random phone surveys are impractical because of the relatively small population of surfers and their non-random distribution in the state. Further, surfers often visit beaches at different times than other beach users and have proven difficult to intercept through in-person surveys (Chapman and Hanneman 2001; King 2007). As a result, surfers have been grouped generally with beach goers in beach visitation research (with the exception of Chapman
and Hanemann (2001)) and when considering the impacts that coastal policy will have on recreation. Distinguishing surfers from other beach goers is necessary to estimate the consumer surplus of surfing waves because surfers have highly specific preferences, avidity and visitation patterns. Surfers may respond to impaired water quality similarly to other water users who immerse themselves, but their substitution options are more limited. Compared with general beach goers, only half of which may enter the water (Dwight, Brinks et al. 2007), they are likely to respond to management decisions differently than other beach goers. Surfing also has a higher non-market value per visit than general beach going (Chapman and Hanneman 2001).

To better capture information about surfers, I use an Internet-based approach to collect data on surfers at Trestles Beach, a famous surf break near San Clemente, CA. Using these data, the non-market consumer surplus of surfing at Trestles Beach is estimated. I find that consumer surplus values for a visit to surf at Trestles are within the range of other coastal recreational use values but higher than beach visit values (Leeworthy 1995; Chapman and Hanneman 2001; Pendleton and Kildow 2005) (See Table 2.3). This is expected given high desirability of surfing at Trestles and the large distances that surfers are willing to travel to surf there. Trestles is representative of other high quality surfing areas in California that may generate similar non-market values.
Internet-based survey instrument

This study uses data from surfers who visited Trestles Beach in San Clemente, CA during the summer of 2006. The data were collected using an Internet-based survey instrument. After testing paper surveys on surfers and researchers, an anonymous opt in Internet-based survey was created. The survey responses came primarily through advertisements on surf forecasting websites and via email to local area surfers. The survey was conducted from late June through September 2006. During this period, 1006 surveys were collected and 971 were deemed usable. The survey instrument collected a wide variety of information from the respondents, including information on surfing background, surfing visitation, and travel behavior and demographics.

The survey instrument included over 40 questions; many were multi-part and resulted in 127 data points per respondent. Data collection methods are explained in more detail in Nelsen, Pendleton et al. (2007). This study was able to capture a large number of highly detailed responses from surfers by using an Internet-based survey, but Internet-based surveys have known issues that limit their ability to generalize responses to a larger population (Couper 2000). These limitations include sampling error, coverage error, and non-response errors and limitations to extrapolating internet-based surveys to a larger population. See Chapter 3 for a discussion of these limitations.
Methods

To estimate the non-market consumer surplus of a surfing visit to Trestles, we use the single site travel cost method (TCM). Two common methods for estimating the consumer surplus of non-market goods are stated preference models and revealed preference models. In state preference models users are asked questions about how they value a non-market good. In revealed preference models, values are estimated by observing the behavior of users (Parsons 2003). The TCM is a well-established revealed preference model.

The premise of the TCM is that the distance a visitor must travel determines the number of visits made to a site. Visitors live at different distances from Trestles and therefore face different prices (or travel costs) for visiting the beach. Visitors who live far away and pay higher travel costs visit less often. Visitors who live closer and incur lower travel costs visit more often. Economic theory says that, ceteris paribus, if costs are higher, surfers should take fewer trips. By comparing travel costs and the number of trips, a downward sloping demand function for recreational is revealed (Parsons 2003)(See Figure 1.3).

The dependent variable in our travel cost model is the number of visits that a surfer makes. To generate the demand function, the number of trips an individual surfer takes over a one-year period is modeled as a function of travel cost and other explanatory variables. This approach is called a count data model. A count model requires that the variable for number of trips is always a non-negative integer.
The model used to estimate the relationship between trips taken and cost of a trip depends on the statistical distribution of these trips across different surfers (e.g. normal, log normal, Poisson, negative binomial.) It is commonly assumed that recreation trip counts have a Poisson distribution, and thus a Poisson regression (Parsons 2003) is often used to model recreational trip count models. The Poisson distribution is characterized by its probability density function given by

$$\Pr(X = x) = \frac{e^{-\lambda} \lambda^x}{x!}, \quad x = 0, 1, 2, \ldots$$

Equation 1.1 Poisson distribution

The parameter $\lambda$ is both the mean and the variance of the random variable $X$, trips to the site, and therefore is always a non-negative value. For many surfers in the general population, the number of trips to Trestles will be zero. By design, our survey instrument required at least one visit, so surfers who did not visit the site are missing in our data set. The lack of data on surfers who made no trips to Trestles is known as truncation. The data is truncated because the survey only intercepted individuals who surfed at Trestles and did not sample the entire population of surfers (Parsons 2003).

Because it is necessary that $\lambda > 0$, it is common to model the conditional mean as an exponential function: $\lambda = \exp(z \beta)$ where $z$ is the vector of demand arguments $\beta$ the vector of parameters. The parameters are estimated by
maximum likelihood estimation (Haab and McConnell 2002; Parsons 2003; Bin, Landry et al. 2005).

The Poisson model assumes that the conditional mean and variance are equal, an assumption that often is violated in recreational data (Haab and McConnell 2002). For recreational trip data, the variance is often larger than the conditional mean - a condition called overdispersion. For our data, the mean and variance of the trip data are 109 and 10571, respectively. When overdispersion in the trip count data exists, the negative binomial model is commonly used to estimate count models. To account for overdispersion in the Trestles count model, the negative binomial model is estimated, which also provides a test for overdispersion (Cameron and Trivedi 1998).

The negative binomial model distribution is given by

\[
Pr(x_i) = \frac{\Gamma(x_i + \frac{1}{\alpha})}{\Gamma(x_i + 1)\Gamma(\frac{1}{\alpha})} \left( \frac{\lambda_i}{\lambda_i + \hat{\lambda}_i} \right)^{x_i} \left( \frac{\hat{\lambda}_i}{\lambda_i + \hat{\lambda}_i} \right)^{\frac{1}{\alpha}}
\]

Equation 1.2 Negative binomial model

where \( \lambda = \exp(z\beta) \). The parameter \( \alpha \) can be used as the overdispersion parameter (Haab and McConnell 2002). When \( \alpha \) is zero, the NBM is equivalent to the Poisson model. If \( \alpha \) is greater than zero, then the NBM is more appropriate. For the Trestles visitation data, \( \alpha \) was 0.81 (.04). This suggests that the NBM is
preferable to the Poisson due to overdispersion (Haab and McConnell 2002). Both estimations are show in Table 1.1 for comparison.

I estimated the value of a single trip to surf in terms of the consumer surplus enjoyed by the surfer. Consumer surplus represents the value captured above cost of travel that the surfer attains when surfing at Trestles (See Figure 1.3). Consumer surplus, the measure of the net economic value of beach going to the beachgoer, is a common economic measure of the willingness to pay, beyond any costs incurred, of an individual to participate in a recreational activity. In this case we are estimating the consumer surplus of surfing at Trestles.

Consumer surplus is given by:

$$\hat{S} = -\frac{\hat{\lambda}}{\hat{\beta}}$$

Equation 1.3 Consumer surplus

We calculate consumer surplus using both the Poisson and NBM for comparison. (See Table 2.2).

**Time and travel costs**

There are three possible components to be considered when calculating the cost of visiting a site. The most straightforward cost is the out-of-pocket costs of traveling to and from the site. Out-of-pocket travel costs include the cost of fuel, and automobile maintenance and depreciation. The other two travel costs
are based on the opportunity cost of time spent traveling to and from the site and the opportunity cost of time spent on the site.

Out-of-pocket travel cost ($optc$) is determined by multiplying the fuel costs, and maintenance and depreciation costs by the round trip mileage associated with each individual visit. Mileage costs were determined using the American Automobile Association estimate for the summer of 2006 ($0.445$/mile). For this study, the survey instrument asked for the respondent’s address and for estimated distance traveled and estimated time spent traveling. Google Maps was used to calculate the actual distance traveled and time spent traveling by entering the respondent’s address and the parking lot at Trestles.

The appropriate way to incorporate the opportunity costs of travel time and time on site is still debated in the literature. For a review see Lew and Larson (2005). New mechanisms to more accurately determine these opportunity costs have been developed, but they significantly complicate the model and require data not collected in our survey (Shaw and Feather 1999). It is common in the recreational demand literature to use a fraction of an individual wage as a proxy for the shadow cost of leisure time. Here the opportunity cost of travel time ($tt$) and the opportunity cost of time on site ($tos$) are estimated using one third of the hourly rate for individuals multiplied by their travel time (Shaw and Feather 1999; Hanemann, Pendleton et al. 2004). An individual’s hourly wage is determined by dividing individual annual income by 2080 hours per year of work or using their stated hourly wage (Cesario 1976). Taking a conservative
approach, individuals who did not report income were given an hourly wage of zero.

Total travel cost (tTC) can be estimated by combining the out-of-pocket costs, travel time costs and on-site time costs.

\[ tTC = optc + tt + tos \]

Consumer surplus estimates are presented for TC using three values incrementally, (a) TC\(_1\)=optc only, (b) TC\(_2\)=optc + tt, and (c) TC\(_3\)=optc+tt+tos. Table 3 shows how the inclusion of the opportunity cost of travel time and time on site increases the average consumer surplus of a visit. The TC\(_2\) is used for the final annual estimates because it is the standard approach.

**Challenges and limitations of the single site travel cost method**

A common problem with recreational data when a sample is drawn from an on-site survey is that more frequent users are more likely to be surveyed. This problem is known as endogenous stratification and can create bias and inconsistency with the results of the analysis (Shaw 1988). One of the qualifying questions for this survey instrument required that the respondent had surfed in the last 24 hours. This qualifier selects for people that surfed within 24 hours of viewing the Internet-based-survey instrument and may select for more avid users because the more avid users are more likely to qualify. This could create endogenous stratification. Endogenous stratification is accounted for in the NBM model used for this study.
A limitation of the single site TCM models is accounting for substitution. Substitution is the ability to choose another surfing site, if Trestles is closed or if the wave quality is reduced. Substitution can reduce the consumer surplus of a site and is not captured using a single site TCM model. Chapman and Hanneman (2001) found that substitution for surfing at Huntington Beach was limited for approximately 50% of the surfers because they did not have time in the morning before work to seek an alternative surfing area. In some cases, substitution for a different site incurs the loss of consumer surplus due to increased cost of travel. To reflect this cost, Chapman and Hanemann (2001) used $12 per trip as their estimate of the average loss of consumer surplus for surfing trips that were diverted to substitute sites when Huntington Beach was closed. Trestles is considered one of the best surfing waves in the continental United States and does not have a comparable substitute that is less than 30 miles away.

The NBM has the advantage of being a closed for solution for the average consumer surplus per trip. This means that the CS can be calculated precisely. Other functional forms where the choke point (point at which trips equal zero) is asymptotic cannot be used to calculate the average or total consumer surplus accurately. The NBM has these properties because of assumptions made about the choke point (Englin and Shonkwiler 1995; Hilbe 2005). In practice, TCM models are best used to estimate marginal changes in trip availability. Here we estimate the CS for surfing at Trestles to show the approximate consumer surplus value of trips to Trestles.
Results

We estimate the non-market consumer surplus value of surfing for survey respondents at Trestles Beach near San Clemente, CA. The single site travel cost method was used to estimate the demand for surfing at Trestles. The high quality waves at Trestles attract surfers from all counties in Southern California (See Figure 2.5). Figure 2.6 shows that surfers who live closer to Trestles visit more often. This is a necessary assumption of the TCM and is verified in the model results below.

Both the Poisson and the Negative Binomial Model (NBM) were used to estimate recreational demand. Estimation results of the recreation demand models are listed in Table 2.1. The parameter $\alpha$ in the NBM was greater than 1 ($\alpha=0.81$) suggesting overdispersion, therefore the NBM is preferred to the Poisson model for our data (Haab and McConnell 2002). In both cases, the coefficient for travel cost (travelcost) is negative and significant, indicating that the number of trips is inversely related to travel cost. This implies a downward sloping demand curve, as required by the travel cost model. While all variables except full-time employment status (fulltime) appear significant in the Poisson model, only high income is moderately significant in the more appropriate NBM model. Haab and McConnell (2002) warn that the Poisson model can be deceptive in giving standard errors that are too low.

The estimate for consumer surplus for surfing at Trestles using the NBM is $115 ($2006) per person per visit. Accounting from endogenous stratification
reduces the consumer surplus to $114. Using the Poisson model, the consumer surplus estimate is $94 ($2006) per person per visit (Table 2.2).

Inclusion of the opportunity cost of travel time and time onsite will shift the demand curve and increase the consumer surplus. The addition of these costs is still debated in the literature. Table 2.3 shows the increase in consumer surplus by adding the opportunity costs associated with an individual’s travel time ($t_t$) and time on site ($t_o$s) to the out-of-pocket costs ($o_p t_c$). Including time-on-site results increases the average consumer surplus value by almost $94. Given that most surfers at Trestles surf either before or after work, time on site is not included in our final consumer surplus estimates (Nelsen, Pendleton et al. 2007).

$T C_1$ and $T C_2$ are four to five times higher than the non-empirical value estimated by Chapman and Hanneman (2001) but are within the range of consumer surplus estimates for San Diego beaches (See Table 1.4). Chapman and Hanneman (2001) valued surfing at Huntington Beach at $28.93 ($2006) per person per visit by basing the value on 125% of a beach day. Leeworthy (1995) estimated the value of San Onofre State Beach (a very popular surfing beach) and San Diego beaches generally as having values of $88 and $93 per person per visit, respectively. Pendleton and Kildow (2005) summarized surplus values for beach visits in California from the literature and found a range from $15 - $52.

Based on a conservative value of $138 per visit and a total of 106,000 annual visits in 2006 captured through our Internet-based survey, the annual economic value for the subset of surfers we sampled is estimated to be $14.6
million per year ($2006). The California State Parks lifeguard department records high quality annual attendance data for Trestles (Nelsen, Pendleton et al. 2007). They report that the annual surfer visits to Trestles in 2006 was approximately 330,000. The estimated per visit value ($138) cannot be extrapolated to this entire population of surfer visits because our sample is not random. A benefits transfer approach can be used to estimate a range of values (Pendleton 2008). Using $29 as a conservative value from Chapman and Hanneman (2001) and $138 found in this paper, a range for the annual economic value for surfing at Trestles for the trips not accounted for by our survey respondents (224,000 visits) can be estimated. This results in an additional value that ranges from $6.5 to $30 million per year. Adding this range to the annual consumer surplus for the respondents results in a total consumer surplus value that ranges from $21 to $45 million per year ($2006).

It is important to note that this paper estimates the non-market economic value of surfing at Trestles, which is only a portion of the total economic value of surfing at Trestles. Total economic value is framework to describe the use and non-use values associated with the recreational resource (See figure 1.3). Surfing is a use value. Non-use values include existence and option values. These values represent the willingness to pay of people who will never use the resource but benefit from the knowledge that the resource exists in a healthy state and can be enjoyed by future generations (NRC 2004). The existence and option values of surfing at Trestles may be important because of its iconic status. It may not be as important for other lesser-known surfing areas.
This paper also does not report on economic impacts (expenditures made by surfers). The economic impacts to the City of San Clemente were estimated in Nelsen, Pendleton et al. (2007). They found that the average expenditure was $40.20 per person per visit and estimated a range of economic impacts generated from visitors to Trestles on the City of San Clemente to range from $8 to $12 million per year ($2006).

Conclusions

This paper provides an estimate of the consumer surplus for surfing at Trestles beach near San Clemente, California. A single site travel cost method was used with data collected from an Internet based-survey. The results show that high quality surfing areas attract surfers who are willing to travel large distances or exhibit high avidity if they live close by. As a result, they generate large consumer surplus values per visit ($138/person/trip). The combination of this high consumer surplus value and high use (330,000 visits/year) creates an annual economic value for surfing at Trestles that ranges from $21 million to $45 million per year ($2006).

Internet-based survey instruments can collect data on “difficult to survey” coastal users for use in the economic valuation. In a ten-week period, the Internet-based survey instrument generated 973 valid responses from surfers at one beach and collected data on over 40 questions, resulting in 127 data points per respondent. Using an Internet-based survey provides a low cost mechanism to collect a large number of survey responses but limits extrapolation of the
results because the results are non-random and may be biased (Couper 2000). There is a tradeoff to be considered between having an unbiased survey with small number of responses (and hence large margin of error) and having a potentially biased survey with a large number of responses and thus a small margin of error.

Further research using short, randomized on-site surveys could be used to “ground truth” the Internet surveys and to provide a basis to extrapolate the Internet-based surveys to better characterize surfer demographics, visitation patterns and economic impacts (See Chapter 3).

The single site TCM provides an estimate for the for the non-market use value of the site for surfing. Single site travel cost models are less powerful when trying to measure how environmental change will affect the value of a site. Further research using multiple surfing areas in Southern California or site choice models could provide insight into how environmental change would affect values of surfing. Surfers visiting Trestles have many choices in their surfing destinations and many surfers who live near quality surfing areas are willing to incur additional costs to visit Trestles. Although other substitute sites in the area are inferior, changes in water quality or quality in the surf break at Trestles could lead surfers, most of whom live closer to other high quality surfing areas, to stay closer to home.

We find that surfers are an important and poorly understood segment of the beach going population. Previous studies have shown that surfing is highly
sensitive to environmental conditions and surfers have many choices, so changes in the environmental and surfing quality of a beach site will likely result in reduced visitation.

Coastal management decisions that will impact surfing areas and water quality should explicitly consider the impacts to surfing and recognize that surfing areas attract an important user group that contributes expenditures to the local community and generates relatively large economic values.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Poisson Coefficients (standard error)</th>
<th>Negative Binomial Coefficients (standard error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>travelcost</td>
<td>-.0106143 (0.000)</td>
<td>-.0087561 (0.000)</td>
</tr>
<tr>
<td>age</td>
<td>-.0011612 (0.033)</td>
<td>-.0010711 (0.841)</td>
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<tr>
<td>yearsurfing</td>
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<td>-.0023983 (0.644)</td>
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<td>.1778206 (0.113)</td>
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<tr>
<td>highincome</td>
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<td>.1492715 (0.063)</td>
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<td>-.0825688 (0.298)</td>
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<td>fulltime</td>
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<td>-.0275131 (0.765)</td>
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<tr>
<td>_cons</td>
<td>4.938367 (0.000)</td>
<td>2.753323 (0.000)</td>
</tr>
</tbody>
</table>

a) accounting for endogenous stratification and truncation. 1) travel cost =optc only

Table 2.1 Estimation results for the Poisson and negative binomial demand model.
| Model             | Consumer Surplus Estimate
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value per person per visit ($2006)</td>
</tr>
<tr>
<td>Poisson</td>
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</tr>
<tr>
<td>Negative Binomial</td>
<td>$114</td>
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</table>

1) travel cost = optc only

Table 2.2  Consumer surplus values for the Poisson and NBM models for surfing at Trestles.
Table 2.3 Consumer surplus values for travel cost, travel time cost and time on site.

<table>
<thead>
<tr>
<th>Model</th>
<th>Consumer Surplus Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>$TC_1 = optc$</td>
<td>$114$</td>
</tr>
<tr>
<td>$TC_2 = optc + tt$</td>
<td>$138$</td>
</tr>
<tr>
<td>$TC_3 = optc + tt + tos$</td>
<td>$232$</td>
</tr>
<tr>
<td>Data Source</td>
<td>Consumer Surplus/Visit (Adjusted $2006)</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>CA Beach Goers&lt;sup&gt;1&lt;/sup&gt;</td>
<td>$15.00 - $52.00</td>
</tr>
<tr>
<td>San Onofre State Beach&lt;sup&gt;2&lt;/sup&gt;</td>
<td>$88.14</td>
</tr>
<tr>
<td>San Diego Beaches&lt;sup&gt;2&lt;/sup&gt;</td>
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<tr>
<td>Huntington Beach Surfing&lt;sup&gt;3&lt;/sup&gt;</td>
<td>$28.92</td>
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<tr>
<td>El Segundo Surfing&lt;sup&gt;4&lt;/sup&gt;</td>
<td>$25.09</td>
</tr>
<tr>
<td>Trestles Surfing</td>
<td>$138.00</td>
</tr>
</tbody>
</table>

1) Pendleton & Kildow, 2006  
2) Leeworthy, 1995  
3) Chapman and Hanemann, 2001  
4) Oram and Valverde, 1997

Table 2.4 Comparison of consumer surplus per person per visit.
Figure 2.1 Response to survey instrument by zip code.
Figure 2.2  Average annual visits to Trestles for zip codes with more than 10 respondents.
Figure 2.3 Total economic value framework with examples from surfing.
REFERENCES


