Economic Values of Walton County Beaches: A Benefit Transfer Analysis

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Introduction

The purpose of this report is to identify the relative economic values held for Walton County beaches with values separated by various beach uses including recreation, tourism and commerce, conservation and wildlife habitat, and more. A method known as "benefits transfer" is used. This approach adapts economic values produced for other beach locations to help gain a better idea of the possible values held for Walton County beaches. Benefit transfer requires identifying and reviewing available scientific studies on values for public beaches and their related uses from other locations in the country. A number of studies have been identified including economic values for beaches in South Florida (including sea turtle issues). Existing studies were not identified for beaches closer to Walton County. The use of economic values developed for non-Gulf beaches and for beaches outside of Florida are required; however, all efforts are made to base results on Florida and Gulf-specific studies when possible. Appropriate economic procedures will be used to adjust these results to best reflect potential values held in Walton County for its public beaches.

The site under study is the Walton County coastal beaches (all of them except those portions within state parks). The current and future uses are primarily for tourism & recreation. The beaches also have wildlife and natural existence values. The physical change that could be expected after this process is over would be the construction of additional temporary or permanent seawalls and other erosion-control or shoreline protection devices after future hurricanes.

Following the passage of Hurricane Dennis in 2005, Walton County issued over 250 permits to coastal property owners to allow installation of temporary emergency armoring structures to protect their structures from shoreline erosion. This event resulted in the installation of several miles of new seawalls along the County's Gulf coast beaches. In many instances the emergency measures undertaken did not conform to State law, and the resulting structures posed a risk to threatened and endangered species without the proper authorizations required under the U.S. Endangered Species Act (ESA). The county did not get an 'incidental take' permit from the federal government for the seawall's impact on wildlife. Time did not allow for the permitting process given the massive erosion and emergency nature of the situation. This elicited consternation from State and Federal regulatory agencies, environmental groups, beachgoers, and many affected beachfront property owners and managers. It also placed the County at risk of a public lawsuit.

The public dialogue that has since ensued culminated in an Intergovernmental Agreement between Walton County, the Florida Department of Environmental Protection, the Florida Fish and Wildlife Conservation Commission, and the U.S. Fish and Wildlife Service. A key tenet of that Agreement was the County's application for Federal funds to develop a Habitat Conservation Plan (HCP) and to apply for an Incidental Take Permit (ITP). The ITP would authorize unintentional harm ("take") to protected species resulting from future emergency shoreline protection measures permitted by the County after the next hurricane. A companion "umbrella" effort is being developed concurrently by the U.S. Fish and Wildlife Service to provide authorization for take resulting from existing structures installed after the 2005's Hurricane Dennis.

Economic Theory

Whenever a government project or policy is implemented there are economic winners and losers. Economic efficiency is one of several criteria (others include equity and risk) used to assess the desirability of government projects, such as coastal management projects. Benefit-cost analysis is a method used to calculate and compare monetary gains and losses for the purpose of assessing efficiency (Boardman et al. 2001). When government pursues a coastal management policy, gains and losses are distributed to consumers and firms.

The concept of consumer surplus is the basis for measuring net economic benefits. Considering a market good, for example a car, the consumer surplus is the difference between what the consumer is willing (and able) to pay and the market price (amount actually spent) for the car. Consumer surplus is also called net willingness to pay (net WTP) since it is willingness to pay net of the costs.

Non-market goods such as beach recreation also provide consumer surplus. In the context of recreation valuation, suppose a beachgoer is willing and able to pay up to $25 for a day at the beach. If the cost of the day trip is $12, then consumer surplus is $25 - $12 = $13. Now suppose that a beach erosion management policy leads to a degradation of the beach that, in turn, decreases the beachgoer's enjoyment. The beachgoer's willingness to pay might decrease to $20 and consumer surplus per trip is $20 - $12 = $8. The beachgoer's economic loss from the erosion management policy is the change in consumer surplus, or $13 - $8 = $5. The empirical challenge is to determine willingness to pay (i.e., consumer surplus) before and after the environmental change.

A number of non-market valuation methodologies have been developed to estimate consumer surplus. Consumer surplus for non-market goods such as beach quality can arise from two sources: use value and non-use value. Use values arise from on-site beach recreation. Non-use values can arise when non-visitors value aspects of beach quality such as wildlife habitat. Both use and non-use values can be estimated using revealed and stated preference methods.

Revealed Preference Methods

The travel cost method (Phaneuf and Smith 2005) is a revealed preference method that is most often used to estimate the benefits of outdoor recreation. The travel cost method a based on the relationship between recreation trips and travel and time costs incurred. Since individuals reside at varying distances from recreation sites, the variation in distance and the number of trips taken are used to trace out a demand curve. The demand curve is then used to derive the consumer surplus associated with using the site. With data on appropriate demand curve shift variables (i.e., independent variables such as measures of beach quality), the consumer surplus associated with changes in the shift variables are estimated.

A variation of the travel cost method is the random utility model (RUM). Unlike the traditional travel cost model which focuses on one recreation site, a RUM model uses information from multiple recreation sites. Individuals choose a recreation site based on differences in trip costs and site characteristics (e.g., beach quality) between the alternative sites. Statistical analysis of the relationship between site characteristics and recreationists' site choices enables estimation of any consumer surplus changes arising from any changes in site characteristics.

The hedonic price method (Palmquist 2005) exploits the relationship between characteristics of land markets, including beach quality, and housing prices. For example, land parcels in close proximity to the beach command higher prices than parcels further from the beach. Housing market differences can be used to trace out the demand for beach quality and used to measure economic values.

The travel cost and hedonic price methods are considered indirect valuation methods because they estimate economic values through an examination of demands for related goods such as recreation trips and housing. The major strength of revealed preference approaches is that they are based on data reflecting actual market choices, where individuals bear the actual costs and benefits of their actions. However, revealed preference methods are generally only suitable for the estimation of use value, as non-use value may not be reflected in market choices and behavior.

The major weakness of revealed preference methods is their reliance on historical data. Policies often are beyond the range of historical experience. For example, few beach visitors may have experienced a degraded beach. Without variation in the historical beach quality data, it may be difficult to predict how a degradation in beach quality would affect visitation and change consumer surplus.

Stated Preference Methods

The contingent valuation method (Carson and Hanemann 2005) is a stated preference approach that directly elicits willingness (and ability) to pay statements from survey respondents. In other words, respondents are directly asked about their willingness to pay (i.e., change in consumer surplus) for environmental improvement, or willingness to accept (i.e., amount of monetary compensation required to allow) environmental degradation.

The method involves the development of a hypothetical market via in-person, telephone, mail, or other types of surveys. In the hypothetical market, respondents are informed about the current problem and the policy designed to mitigate the problem. The state of the environment before and after the policy is described. Other contextual details about the policy are provided such as the policy implementation rule (e.g., majority voting) and the payment vehicle (e.g., increased taxes or utility bills). Finally, a hypothetical question is presented that asks respondents to choose between the environmental improvement with increased costs, or the status quo. The choice is often framed as a referendum vote in order to make the situation more realistic. Respondents can be presented with multiple scenarios and make multiple choices. Statistical analysis of these data leads to the development of willingness to pay and consumer surplus estimates.

The contingent behavior approach is similar to the contingent valuation method in that it involves hypothetical questions. In contrast, the questions involve changes in hypothetical behavior instead of hypothetical changes in willingness to pay. For example, respondents can be asked about hypothetical recreation trips with and without beach quality change. Choice experiments are a type of contingent behavior approach that asks, typically via surveys, about hypothetical recreation site choice and other discrete choices. Again, respondents can be presented with multiple scenarios and make multiple choices. Contingent behavior and choice experiment responses are treated as behavioral data and are analyzed using the same statistical methods as are used in revealed behavior approaches.

A strength of stated preference methods is their flexibility. Coastal management is often without historical precedent and therefore does not have the data needed for revealed preference studies. Stated preference approaches can be used to construct realistic policy scenarios for any new policy. Oftentimes, hypothetical choices are the only way to gain policy relevant non-market benefit information. Another strength of the stated preference approaches, especially contingent valuation, is the ability to measure non-use values, such as the value of wildlife habitat to those who do not view or photograph wildlife. The major weakness of the stated preference methods is their hypothetical nature. Respondents are placed in unfamiliar situations in which complete information may not be available. Their responses about how they may react, or be willing to pay, may differ from what they would do in a real situation.

Benefit Transfer

The benefit transfer approach to environmental valuation was developed for situations in which the time and/or money costs of primary data collection for original direct and indirect studies are prohibitive (Desvousges, Johnson and Banzhaf 1998). With benefit transfer, environmental benefit estimates from existing case studies (i.e., the study sites) are spatially and/or temporally transferred to a new case study (i.e., the beach site). The more common type of benefit transfer is the spatial transfer, where consumer surplus from the study site is transferred to the new site at the same point in time. Less common is the temporal transfer in which consumer surplus from one time period is transferred to another time period.

Four benefit transfer methodologies have emerged: benefit estimate transfer, benefit function transfer, meta-analysis transfer and meta-analytic method. Each of these transfer methodologies can be used to transfer benefit estimates obtained from a variety of benefit estimation methodologies, such as travel cost, contingent valuation, and hedonic valuation.

Benefit estimate transfer uses environmental benefit estimates developed for a study site. Researchers simply obtain a benefit estimate from a similar study conducted elsewhere and use it for the current policy analysis case study. In contrast, benefit function transfer uses a statistical model of benefits developed at the study site to estimate benefits at the policy site. Characteristics from the policy site are substituted into the model from the study site to tailor benefit estimates for the policy site.

Meta-analysis is a general term for any methodology that summarizes results from several studies. In the case of environmental benefit transfer, benefit estimates gathered from several studies serve as the dependent variable in regression analysis, and characteristics of the individual studies (e.g., quality, survey methodology) serve as the independent variables. Benefit transfer using meta-analysis has three advantages over benefit function transfer. First, by employing a large number of studies, benefit estimates will be more rigorous. Second, meta-analysis may be used to control for differences in functional form and other methodological differences across studies. Third, differences between the study site and the policy site can be better controlled. The meta-analytic method is beyond the scope of this project.

Beach Valuation Studies

In this section we review the beach valuation literature to facilitate development of beach impact values. Literature was gathered from existing literature reviews and a search over recent issues of environmental and resource economics and other scholarly journals. The literature review is not exhaustive, since an exhaustive search is beyond the scope of this project, but the most relevant studies are included. All values are in 2008 dollars, adjusted by the consumer price index.

Deacon and Kolstad (2000) review the pre-1995 beach valuation literature. They consider four high quality contingent valuation method and four high quality travel cost method studies. Two of the CVM studies are focused on Florida (Bell and Leeworthy, 1986; Leeworthy et al., 1989-94) and one of the TCM studies is focused on Florida (Bell and Leeworthy, 1986). Converting the mean values from Deacon and Kolstad’s Table 2 into 2008 dollars using the consumer price index, the consumer surplus per beach day for Florida beaches is estimated to be $2.69, $3.61 and $2.26. The average consumer surplus across 13 estimates from eight studies is $5.09.

The National Ocean Economics Program (http://noep.mbari.org) provides a database of nonmarket valuation studies and summarizes 12 studies of beach use in Florida (see Pendleton 2008). Across three studies the value of beach nourishment is $5.61 per recreation trip using the contingent valuation method. The value of a beach visit averages $2.84 per recreation trip from three contingent valuation method studies. Three travel cost method estimates average $66.80 per tourist trip.

More recently, several studies have assessed various aspects of beach recreation values in the mid-Atlantic and South Atlantic states. We consider these in chronological order. Parsons, Massey and Tomasi (2000) use site selection data and the travel cost method to estimate a random utility model of Delaware and New Jersey beaches. Using their "basic model" they find that lost beach width is worth $9.72 per trip per person for 14 beaches in Delaware. The lost beach width is described as being consistent with discontinuing beach nourishment so that all Delaware beaches decline in width to less than 75 feet. The values of beach access per trip per person range from less than $1 for New Jersey beaches to $3.42 for Ocean City, Maryland to $10.68 for Rehoboth Beach, Delaware.

Landry, Keeler and Kriesel (2003) use stated preference data to estimate the value of alternative erosion management policies for Tybee Island, Georgia beaches. They find that household willingness-to-pay for a day trip to Tybee Island with current levels of beach armoring and beach width is $12.64. Household willingness-to-pay for a day trip is $7.43 with wider beaches and current levels of beach armoring. Household willingness-to-pay for wider beaches with reduced armoring is $9.56. Household willingness-to-pay for wider beaches with beach nourishment is $11.39. Household willingness-to-pay for wider beaches with shoreline retreat (moving structures back away from the shore as the beach erodes) is $10.35. Most relevant to this study, willingness-to-pay for a day trip with wider beaches is 29% higher with reduced armoring.

Shivlani, Letson and Theis (2003) use the contingent valuation method to estimate the value of increased beach width at three Key Biscayne/Virginia Key beach sites. Respondents are asked for their willingness-to-pay for beach nourishment per beach trip with and without improvements to sea turtle nesting habitat. Willingness-to-pay per trip is $2.19 per household without habitat benefits and $2.74 with habitat improvements. The sea turtle habitat feature increases the value of beach nourishment by 25% per trip.

Kriesel, Keeler and Landry (2004) use the contingent valuation method to estimate the value of alternative erosion control measures at Jekyll Island, Ga. Respondents are asked for their willingness-to-pay higher parking fees to fund beach nourishment or retreat as alternatives to beach hardening (e.g., rip-rap and seawalls). They find the willingness-to-pay is $8.06 per beach day.

Bin et al. (2005) use the single site travel cost method to estimate the value of a trip to seven North Carolina beaches. The recreation value per visitor day ranges from $13 to $93 for day trips and $13 to $48 for overnight trips. The single site travel cost method is limited in terms of incorporating substitution possibilities. This leads to higher estimates of consumer surplus per day values relative to random utility models such as Parsons, Massey and Tomasi (2000). While Bin et al. relate their values to congestion, and implicitly to beach width, no explicit beach width valuation is made.

Whitehead et al. (2008) use the single site travel cost method with revealed and stated preference data to estimate the consumer surplus per trip per household of beach trips and increased beach width for 17 beaches in North Carolina. Consumer surplus per trip is $110.24 and consumer surplus per trip for increased beach width is $8.01.

Results

A summary of the most relevant studies for the current task are presented in Table 1. Willingness-to-pay per day per household for beach width (avoiding lost width and increasing width) ranges from $2.19 to $23.33 (obtained by scaling the Parsons et al. value up to the household level assuming 2.4 people per household). This, in essence, refers to users' values for avoiding additional beach losses. These differences are exacerbated when scaled down by miles of beach. The range is from $0.08 per household per day per mile to $3.19 to avoid further losses.

Table 1. Summary of recent studies that value beach width

Authors	Site (Miles of Beaches)	Method	Scenario	WTP per household day per mile
Parsons, Massey and Tomasi (2000)	Delaware (25)	TCM (RUM)	Avoiding Lost Beach Width	$0.93
Landry, Keeler and Kriesel (2003)	Tybee Island (3)	CVM	Beach width with current levels of beach armoring	$2.47
"	Tybee Island (3)	CVM	Beach width with reduced levels of beach armoring	$3.19
Shivlani, Letson and Theis (2003)	South Florida (29)	CVM	Beach width with habitat benefits	$0.09
"	South Florida (29)	CVM	Beach width without habitat benefits	$0.08
Kriesel, Keeler and Landry (2004)	Jekyll Island (10)	CVM	Beach nourishment instead of hardening	$0.81
Whitehead et al., (2008)	North Carolina (83)	TCM (Single Site)	Increase in Beach Width	$0.10

If the Landry, Keeler and Kriesel study is considered an outlier due to the armoring of the Tybee Island coast, the range of values is from $0.08 to $0.93 per mile. The average value from four studies is $0.48 per mile. If we assume that the value of a beach recreation day is reduced by the midpoint of the Tybee Island study and the South Florida study, then the value of beach width per mile falls by $0.13 to $0.35. In other words, the household value of beach width per mile per trip is estimated to be $0.48 without hardening and $0.35 with hardening.

The Economic Value of No Beach Armoring

The available data made it possible to estimate the value of avoiding beach hardening per mile in Walton County (Table 2). Walton County officials reported an estimated 2.9 million beach visitors annually. Assuming 2.4 visitors per household, 1.2 million households visit the beaches each year. An estimate of the number of days spent at the beach is 4.5 per trip. Applying the willingness-to-pay per household per day values from the benefit transfer analysis to the number of days visited yields the aggregate recreation value of $2.6 million without hardening and $1.9 million with hardening.

The difference between the two aggregate values in Table 2 can be considered the annual value of avoiding beach hardening which provides wildlife habitat with a maintained beach width. The value is $710,454 per mile. Since there are 5,280 feet per mile, an estimate of the annual value of avoiding beach hardening and providing wildlife habitat with maintenance of beach width is $134.56 per foot. This is the annual value held by visitors to the beach.

Table 2. Calculation of value of avoiding beach hardening per mile		
	Without hardening	With hardening
a. Household value of beach width per mile	$0.48	$0.35
b. Visitors	2,914,684	2,914,684
c. Households (b ÷ 2.4)	1,214,452	1,214,452
d. Days per visit	4.5	4.5
e. Aggregate value per mile (a × c × d)	$2,623,216	$1,912,761

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