The Economic Impact and Valuation of Florida's Saltwater Beaches - Some Preliminary Findings on Resident and Tourist Beach Users

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November, 1984

Presented at the 28th Annual
Meeting of the Florida Shore and
Beach Preservation Association
Captiva Island, Florida

ABSTRACT

"The Economic Impact and Valuation of Florida's Saltwater Beaches - Some Preliminary Findings on Resident and Tourist Beach Users" presents estimates of resident and tourist beach users' economic impact in terms of sales, employment, wages and state tax revenues generated in Florida. Annual estimates are provided for residents while only one-half a years impact is estimated for tourists. Also included are estimates of the benefits received by residents and tourists visiting Florida's saltwater beaches and these flows are translated into estimates of the present asset value of Florida's saltwater beaches. With the use of a hypothetical beach, it is also shown how estimates of beach values can be utilized in evaluating the economic feasibility of beach renourishment and erosoion control projects.

Introduction

The Florida economy is highly dependent on natural resources. Beaches are just one of Florida's most important natural resources and has made Florida a mecca for outdoor recreation seekers from all over the world. Florida's abundance of natural resources and pleasant climate have resulted not only in its reputation as an international vacation spot but also a preferred spot for establishment of permanent retirement communities. Furthermore, businesses have found that Florida's climate and natural resources make Florida a preferred business location since many employees are willing to substitute lower wages and salaries for a more pleasant environment in which to live and work. As a result of Florida's amiable characteristics, Florida has experienced a tremendous amount of growth in both its resident and tourist populations. Most of this growth has occured in the coastal zone and has placed great pressure on essentially a fixed resource -land in the coastal zone. Although Florida's land in the coastal zone may be essentially a fixed resource, Florida's beaches may not. Due to natural processes, such as storms and littoral drift and man-made structures such as inlets which accelerate the beach erosion process, Florida's beaches may be considered a declining resource. To make matters worse, beaches are also common property. What this means is that all can use the resource at no cost. Thus no single user has to pay for the right to use the resource, nor then does the user have the right to exclude others from exploiting the resource. Therefore, no one has the incentive to invest in beach preservation or restoration since any amount spent cannot be recovered by a private individual due to the fact that everyone owns the resource and has a right to use it without charge. Thus, without the existence of a private market for beaches, private individuals will not have the incentive to invest in preserving or restoring Florida's beaches. This is essentially the reason government intervention is required in order to fund the preservation and restoration of Florida's beaches. Before government can undertake projects requiring the expenditure of tax dollars, the government must have an idea of the economic importance and the economic value of beaches, relative to the costs of preservation and restoration. That is, the government has the responsibility of acting as a prudent investor of society's funds by maximizing the social returns from the investments in beach preservation and restoration. In order to carry out this responsibility, government requires estimates of the costs and benefits of beach preservation and restoration.

Historically, the nominal costs per cubic yard of beach renourishment projects in Florida have increased from $1.65 per

cubic yard during the 1965-70 period to $3.62 per cubic yard during the 1981-83 period [1]. This fact combined with an increasing demand for a larger number and/or size of projects has led some to conclude that beach renourishment may be becoming cost prohibitive. However, there are two problems with this conclusion. First, it is not proper to compare nominal dollars over long periods of time when inflation is a significant factor. If we deflate the Florida Department of Natural Resources cost estimates using the consumer price index (CPI) we arrive at the conclusion that the real cost per cubic yard for beach renourishment has actually declined from $1.65 during the 1965-70 period to $1.30 during the 1981-83 period. However, due to the growth in demand for more and/or larger beach renourishment projects, real total expenditures (i.e., adjusted for inflation) have increased from approximately 2.5 million dollars during the 1965-70 period to over 40 million dollars during the 1981-83 period. This leads us to the second problem with the conclusion that beach renourishment may be becoming cost prohibitive. Is 40 million dollars cost prohibitive? One cannot answer this question until something is known about the extent of benefits associated with this cost. That is, we must know if the benefits from beach renourishment are greater than the costs. Part of the cost of undertaking a beach renourishment project is the estimation of these benefits. One of the main objectives of our present research effort is to quantify these benefits on a statewide basis as well as to provide a general model capable of producing estimates of benefits from beach renourishment projects on any beach in Florida with a minimum of input such as the socioeconomic characteristics of beach users and the physical characteristics of the beach. One benefit of this research is that it may reduce the cost of beach renourishment projects since individualized beach studies of economic benefits will not have to be undertaken at added expense.

Another objective of this study is to detail the baseline valuation of Floirda's beaches and detail the economic importance in terms of sales, employment and wages generated by beach users. An economist distinguishes between "economic impact"and "economic valuation." Economic impact considers how many people participate in beach activities and how much they spend while recreating. These expenditures create jobs and incomes for people who indirectly depend on beaches for their livelihood. Thus, the economic impact attempts to estimate the actual flows of goods and services in dollar terms in the economy. Economic valuation on the other hand is an attempt to estimate the asset value of beaches. As indicated above, beaches are a common property resource so no one pays for the right to use the resource. This

does not mean that beaches have a value of zero. What it does mean is that a private market for beaches has not been established. People really do value beaches, however they are not influenced by market forces to pay a price. Economists through the use of survey techniques attempt to establish the asset value of a common property resource by asking questions about peoples willingness-to-pay for the resource. These questions of course are hypothetical and one might be quick to respond that therefore the answer received will be hypothetical; however, a great deal of research has been done with respect to a variety of common property resources in a variety of uses (e.g. fishing, hunting, beach visitation) and the general conclusion is that survey techniques yield reasonable results.

A natural question at this point is the following: Why are seperate estimates of economic impact and economic valuation necessary? The answer is that economic valuation estimates are the proper measure of benefits received by beach users and therefore the proper measure to compare with the costs of a beach renourishment project. Economic impact however tells us something about the percent of the economy in terms of sales, employment and wages and taxes generated by people recreating and which in turn benefit others that may not be beach users. It gives us some information on which to base the sources of funding for beach restoration. To the extent that beaches generate tax dollars it can be argued that at least some of those dollars could be used for beach preservation and renourishment projects. Here we present some preliminary estimates of the economic impact and valuation of Florida's saltwater beaches. Because the research is still in progress we are forced to limit discussion of the estimates on tourist beach users to the first two quarters of 1984. The estimates for resident beach users are for a full year. The first two sections are devoted to the economic impact of resident and tourist beach users respectively. The third section is devoted to estimation of beach valuation while the fourth section is devoted to explaining how the beach valuation estimates could be used in an evaluation of a beach eroision control project. The fifth and final section is devoted to explaining some of the expected results of our continued research effort.

Economic Impact

Economic Impact of Resident Beach Users

The first step in estimating the economic impact requires an estimate of how many people visit Florida's beaches. The second

step is to find out on average how many days beach users visit beaches annually and on average how much they spend while visiting Florida's beaches. Given these two estimates, it is then easy to determine the total sales impact. The next step is to determine how many people depend on the beaches for their livelihoods and how much income (wages) they receive. Also from the sales information one can derive estimates of some tax revenues received by state government.

To complete step one for the resident population of Florida two telephone surveys were conducted by the Policy Sciences Program at Florida State University under the guidance of the authors. The first survey was a random sample of over 1,000 residents age 18 years of age or older and was part of a regularly implemented state public opinion poll. This survey asked only one question of the respondent about beaches, simply, "Did they visit or use any of Florida's saltwater beaches over the past 12 months?" Sixty-five percent of the sample indicated they visited or used a beach at least once in the past 12 months. Thus, if we take the estimate of Florida's population 18 years of age and older in 1983, published by the Bureau of Economic and Business Research at the University of Florida [2], and multiply this number by our estimate of 65 percent participation in beach use we arrive at a total of 5,217,807 resident beach users 18 years of age and older in Florida in 1983. This is the first item found in Table 1.

In order to complete the second step of estimating economic impact, we designed a more extensive survey of beach users. Again we utilized the Policy Sciences Program at Florida State University and attached a series of questions to their regularly implemented statewide public opinion poll. This second survey was a random sample of 911 residents 18 years of age or older in Florida of which 592 indicated they visited or used a saltwater beach in Florida sometime in the past 12 months. Those that visited one or more of Florida's saltwater beaches were asked additional questions as to what beaches they visited, how many days were spent at each beach, their personal perceptions as to parking conditions, physical appearance, water conditions and crowding conditions. We also asked about their annual expenditures while recreating at Florida's saltwater beaches and as we shall discuss later their willingness-to-pay for an annual beach pass.

Analysis of the data indicated that, on average, residents of Florida spend 38.35 days per year recreating on Florida's beaches. Multiplying this by our previously derived estimate of beach users

Table 1

A Summary of the Economic Impact of Resident Saltwater Beach Use in Florida and the Willingness of Residents to Pay for Saltwater Beach Preservation
(Sample Size: 592)

Number of Beach Users 18 years or Older (65 percent of Florida's Population 18 and over participated in beach use)	5,217,807
Total Days at Florida's Beaches (38.35 average days per person x 5,217,807)	200,102,898
Number of Households Which Visited Florida's Beaches (5,217,807 ÷ 2.09 average number of adults 18 years or older in household)	2,496,558
Total Sales Impact (2,496,558 x $450 or average annual household expenditures while visiting beaches)	$1,123,451,100
Total Sales Impact	36,619
Total Wages Generated	$240,757,124
Total Annual Willingness to Pay for Beach Preservation (5,217,807 x $12.53 average willingness-to-pay per person for annual beach pass)	$65,379,122
Average Willingness to Pay Per Person Per Day At Beach	$1.42

(from step 1 above) yields a total of 200,102,898 resident beach user recreational days. This is item 2 in Table 1.

To estimate annual beach related expenditures we asked for annual household beach-related expenditures. Thus, in order to arrive at an estimate of total expenditures or sales on beach related activities we must divide our estimate of the total number of beach users 18 years of age or older by the average number of adults 18 years of age or older in each household in our sample. This yielded an estimate of 2,496,558 households which visited Florida's beaches (item 3, Table 1). If we multiply this figure by the average annual household expenditure of $450 we obtain an estimate of the total beach related sales impact of over one billion dollars in 1983 (item 4, Table 1).

The final steps to complete our estimates of economic impact utilize the total sales impact figure derived above. Table 2 illustrates how the sales impact can be translated into employment and wage impacts. Column one of Table 2 shows the SIC (Standard Industrial Classification) numbers associated with each expenditure category. Sales to employment ratios and wages to employment ratios are available for Florida by SIC from the U.S. Bureau of Census, The Economic Censuses for Florida 1982 [3]. These ratios are presented in columns 4 and 6 respectively. Referring to Table 2 if we take SIC 7011 or lodging expenditures and divide total lodging sales of $313,617,616 by the sales to employment ratio for SIC 7011 of 27,793 we arrive at an estimate of over eleven thousand people in the hotel, motel industry depend on resident beach users for their livelihoods. These people earned an average of $7,360 (column 6) for a total wages impact of over 83 million dollars in the hotel,motel and lodging industry. Repeating this procedure for each expenditure category yields a total employment impact of over 36 thousand employees earning over 240 million dollars in wages. This is .8% of total employment in Florida. Remember this is just the impact of resident beach users. But before we look at the impact of tourists, one more important impact should be emphasized, which is the amount of tax revenues collected by the State of Florida due to spending by resident beach users while visiting Florida's beaches.

Table 3 shows our estimates of three taxes which we were able to estimate using the sales information given in Table 2. Resident beach users alone generated over 65 million dollars in tax revenues for the State of Florida. Thus, the contention that beach renourishment programs may be too costly for continued State support now can be seen in a different light. During the 1965-83 period the State of Florida spent apporximately 32 million dollars on beach renourishment whereas resident beach users alone

Table 2

Total Sales, Employment and Wages Generated by
Resident Saltwater Beach Users in Florida, 1983-84

SIC	Category	Sales Impact (Dollars)	Sales to Employment Ratio	Employment Impact	Wages to Employment Ratio	Wages Impact (Dollars)
7011	Lodging	313,617,616	27,793	11,284	7,360	83,050,240
5813 & 5813[1]	Food & Drink	449,979,614	21,823	20,619	5,440	112,167,360
5541	Travel	252,152,358	162,444	1,552	8,282	12,853,664
Public Parks[2]	Beach Access Fees	22,144,469	12,126	1,826	12,028	21,963,128
5311	Other	85,557,043	63,936	1,338	8,014	10,722,732
	Total	$1,123,451,100	N/A	36,619	N/A	$240,757,124

[1]Sales to employment and wages to employment ratios are averages for SIC 5812A, 5812B, and 5813.

[2]Sales to employment and wages to employment ratios were derived using receipts, employment and wages for selected state parks which have beaches.

James Cook, Deputy Director, Parks and Recreations, DNR.

Table 3

Estimated State Tax Revenues Generated
By Resident Saltwater Beach Users
In Florida, 1983

Spending Category	Sales Taxes	Gasoline Taxes	Corporate Profit Taxes	Total
Lodging	$ 14,934,172	X	$ 708,332	$ 15,642,504
Food & Drink	21,427,600	X	505,984	21,933,584
Travel	13,872,765	$ 8,770,517	64,860	22,708,142
Beach Access Fees	X	X	X.	X
Other	4,074,145	X	742,756	4,798,901
TOTAL	$ 54,308,682	$ 8,770,517	$ 2,003,932	$ 65,083,131

generated over 65 million dollars in State tax revenues while visiting Florida's beaches in just one year! Of course, most taxes are not levied for such specific purposes but are used for general revenue to support a broad range of programs. The existence of beaches does give rise to a segment of Florida's taxes. If beaches were not available,Floridians might buy recreational services (e.g., beaches) in Georgia or Alabama with a significant loss in state revenue!

Economic Impact of Tourist Beach Users -(Jan. - June 1984)

Estimating the economic impact of tourist beach users is slightly different from the economic impact of their resident counterparts. Because tourists bring in new dollars to the state, economists view tourism as an export industry. We do not actually ship anything out of the state but what we do is provide services in exchange for dollars flowing into the economy. These new dollars have a direct impact identical to that outlined in our analysis of residents. The difference is that tourist dollars have a "multiplier effect" which is limited by the extent to which the money leaves the economy.[1] The multiplier creates what economist call "induced sales, employment and wages" which are added to the direct impact to arrive at the total impact.

In order to estimate the economic impact of tourist saltwater beach users, we designed a survey questionnaire and employed Rife Market Research, Inc. of Miami, Florida to interview tourists as they leave the State of Florida on all major highways and at all the major airports. Rife surveys tourists for the Florida Department of Commerce's Division of Tourism. We piggybacked this process in order to reduce costs. We started the surveying in

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[1]One can think of the case of a tourist who visits Florida and visits a beach. He or she stays at a hotel and spends $500. This $ 500 generates employment and wages at the hotel. The hotel may pay corporate taxes. This is the direct impact. The employees supported by tourists spend their money on food, housing, health care, recreation, cars, T.V.s, etc. The people who sell food, housing, health care, recreation, cars and T.V.S receive income. This process does not go on infinitely because not all the inputs of production of these goods or the goods themselves are produced in Florida and the money used to pay for these goods leaves Florida.

January 1984 and will interview through December 1984. Thus, our work on tourists is still in progress but here we will report some preliminary findings for the first two quarters of 1984 (January - June). Thus all estimates given in this section are only for one half a year.

Direct Impact of Tourist Beach Users (Jan.-June 1984)

As with residents, an estimate of how many tourists participate in beach use in Florida is required. The key is to estimate the participation rate. We designed our questionnaire with a tally sheet on the front so our interiewers, while contacting the general tourist population, could ask if the tourists contacted used or visited a beach in Florida over the last 12 months. If the tourist responded "no," a tick mark was recorded in the appropriate column, and if they responded they "did participate" but for some reason could not be interviewed this was also recorded. Of course, the third response was "yes" and they were interviewed. These tally sheets were used to estimate the percent of all tourists who participate in beach use. For the January - June 1984 period we estimate that 31.28 percent of all tourists visited or used a saltwater beach in Florida. Multiplying this figure by the total number of tourists estimated to have visited Florida by the Department of Commerce (13 million) during the January - June 1984 period yields an estimate of over 4 million tourist beach users during January - June 1984. This calcualtion is presented in Table 4.

As with our resident survey we also asked questions about what beaches were visited, how many days were spent at each beach, tourists perception of the beaches, how much they spent while at the beach and how much they would be willing to pay for an annual beach pass. We found that, on average tourists spent approximately 10 days per year on Florida's beaches. If we multiply this by the over 4 million tourists we arrive at an estimate of over 40 million tourist recreational beach days in Florida for the January - June 1984 period. This is also presented in Table 4.

In order to estimate the direct sales, employment, wages and state tax revenues generated we first must obtain an estimate of the number of households which visited Florida's beaches because our survey asked for household expenditures. We found that on average 1.54 adults from the household accompanied the respondent to the beach. Thus, on average each tourist beach household has 2.54 adults which visit Florida's beaches. Thus, dividing the total number of tourist beach users by 2.54 yields an estimate of

Table 4

A Summary of the Economic Impact of Tourist Saltwater Beach Use in Florida and the Willingness of Tourists to Pay for Saltwater Beach Preservation (January - June 1984)

Number of Beach Users 4,067,000
(31.28% of Tourists 18 years of age and older visited Florida Jan. - June 1984)

Total Days at Florida's Beaches 40,914,020
(10.06 average days per person x 4.067 million)

Number of Households Which Visited Florida's Beaches....1,601,181
(4,067,000 ÷ 2.54 average number of adults in household which visited Florida's beaches)

Direct Sales Impact $707,545,822
(1,601,181 x $441.89 or average annual household expenditures while visiting beaches)

Direct Employment Impact.....29,026

Direct Wages Impact.....$176,406,758

Total Annual Willingness to Pay for Beach Preservation.....$32,129,300
(4.067 Million x $7.90 average willingness-to-pay per person for annual beach pass)

Average Willingness to Pay Per Person Per Day at Beach.....$1.48

Table 5

Total Sales, Employment and Wages Generated by Tourist Saltwater Beach Users in Florida (Jan. - June 1984)

SIC	Category	Sales Impact (Dollars)	Sales to Employment Ratio	Employment Impact	Wages to Employment Ratio	Wage Impact (Dollars)
7011	Lodging	245,347,363	27,793	8,828	7,360	64,974,080
5812 & 5813[1]	Food & Drink	431,435,018	21,823	19,770	5,440	107,548,800
5541	Travel	14,734,068	162,444	91	8,282	753,662
Public Parks[2]	Beach Access Fees	1,292,153	12,126	107	12,028	1,286,996
5311	Other	14,737,270	63,936	230	8,014	1,843,220
	Total	$707,545,872	N/A	29,026	N/A	$176,406,758

[1]Sales to employment and wages to employment ratios are averages for SIC 5812A, 5812B, and 5813.

[2]Sales to employment and wages to employment ratios were derived using receipts, employment and wages for selected state parks which have beaches.

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Table 6

Estimated State Tax Revenues Generated By Tourist Saltwater Beach Users In Florida Jan. - June 1984*

Spending Category	Sales Tax	Gasoline Tax	Corporate Profits Tax	Total
Lodging	$11,683,208	x	$554,125	$12,237,333
Food & Drink	20,544,525	x	485,131	21,029,656
Travel	730,297	512,489	3,790	1,246,576
Beach Access Fees	x	x	x	x
Other	701,775	x	124,840	826,615
Total	$33,659,805	$512,489	$1,167,886	$35,340,180

* Only Sales, Gasoline, and Corporate Profit Taxes could be estimated from survey information.

over 1.6 million households which visit Florida's beaches. The average annual tourist household expenditure while visiting Florida's beaches was $ 441.89. Multiplying this by the number of households yields a direct sales impact of over 707 million dollars. Referring to Table 4 and using the same procedures outlined earlier for residents yields an estimate of over 29 thousand employees directly supported by tourist beach users and a direct wages impact of over 176 million dollars. Furthermore, these direct expenditures generated over 35 million dollars in state tax revenues. This is shown in Table 6. Remember these are only the direct impacts for 6 months.

Induced and Total Sales, Wages and Employment Generated by Tourist Beach Users Jan. - June 1984

Remember that induced sales, employment and wages are a result of the muliplier process. If we utilize a multiplier for Florida of 3.0, this yields an estimate of induced sales of over 1.4 billion dollars; induced employment impact of over 58 thousand employees and an induced wages impact of over 352 million dollars for the January - June 1984 period. If we add this to our direct impact we arrive at a total sales impact of over 2.1 billion dollars, generating a total employment impact of over 87 thousand employees receiving over 529 million dollars in wages.

Beach Valuation

As indicated earlier, the fact that beaches are a common property resource presents a paradox in valuation. Since no one person owns the resource, a charge cannot be levied upon the use of this resource. One might ask why any charge should be levied upon the right to visit a beach? Doesn't everyone have an inalienable right to visit beaches without charge? But, if the right to visit beaches has a zero price, then the value of beaches is apparently zero. An owner of an apartment building who charges no rent will find that his "asset" is worthless. However, many private and government officials point to the immense value of Florida's beaches. But the question is: What is value? Many are quick to say that the expenditures made while visiting Florida's beaches, presented above, in some way measures the value of beaches. However, the logic here is flawed since expenditures are merely the vehicle to enable one to visit the beach. If beaches were to vanish tomorrow, people would simply spend their money on some other form of recreation. The actual value of the beaches may be measured by the charge which might be made for the right to use the beach. We are not concerned here with the policy issue of

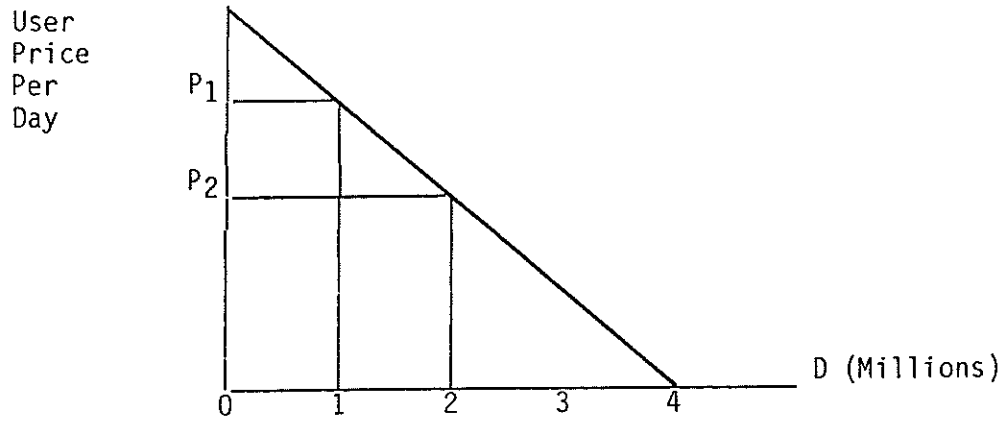
whether to charge or not to charge but how technically to measure the value of the beaches.

First, beaches are an input to producing recreation. The investment in a plant to produce steel is an input called capital. Capital is also an asset which can be rented or sold. Beaches are an asset which could also be rented or sold. The value of any asset (input) is determined by the flow of earnings over a period of time. Capital invested in a steel plant will produce a flow of profits. But, how did we jump from the steel business to beaches? There are ways of simulating the "earnings" produced yearly from the asset called beaches. If beaches were privately owned, one would expect a charge or more specifically a user charge for the right to use the beach. Given the reality that beaches are common property, consider Figure 1.

Figure 1 shows a hypothetical aggregate demand curve for recreational saltwater beach use. If a user charge of P_1 were placed on every recreational day, individuals would choose to "consume" one million recreational saltwater beach days. If the user charge were lowered to P_2, beach users would find Florida beaches a relatively cheaper form of recreation than say golf or tennis. Beach goers would choose to spend more days at the beach at the lower user charge if everything else remained constant. Two million beach days would be demanded.

Figure 1

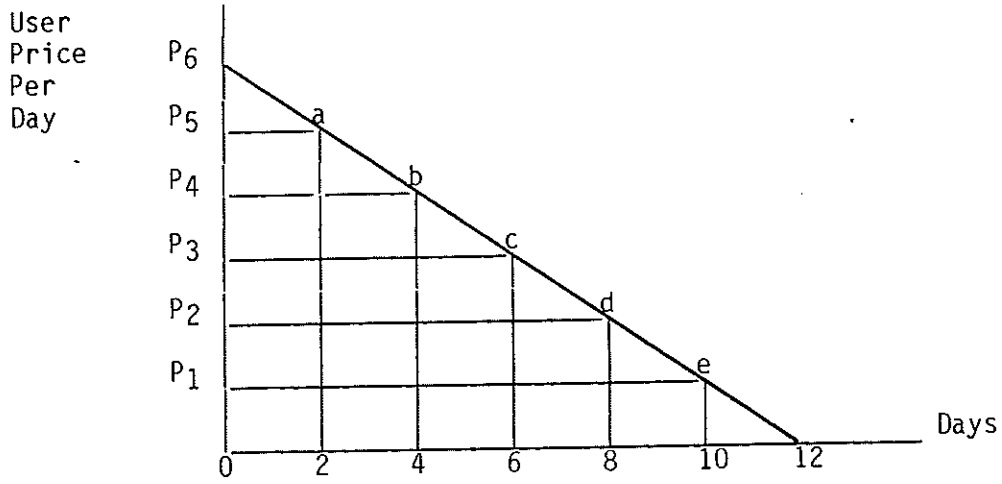
Hypothetical Demand for Saltwater Recreational Beach Use in Florida



Under common property, no charge is made for the use of the resource; therefore, four million saltwater recreational beach days will be spent in Florida.[2] So, are we left with the conclusion that at a zero user price beaches have no value? Beaches will have a value equal to the area under the demand curve, which is called consumer surplus. What is the rationale for this? Consumers could be forced to pay P_1 per beach day, but the price is actually zero. Similarly P_2 could be charged. Consumer's surplus is simply the difference in what could be charged consumers and the actual price. Because beaches are a common property resource and consumers thus face a zero price, consumers gain a surplus. Consider Figure 2.

Figure 2

Individual's Demand for Beach Use



Since the price is zero, 12 days will be consumed by the beach user. At a price of P_5, one surplus will exist (the area of the triangle P_5P_6a). As the price falls, the beach user's surplus increases to P_4P_6b, P_3P_6c, and so on. At a zero price, the surplus reaches a maximum. This surplus is the equivalent of the

[2]A simplification here is that crowding is not a problem. If crowding exists and has a negative impact on demand for beach use, the demand curve would shift back resulting in less total days.

amount of money a beach user would pay for the right to use the beach for 12 days (or the total user charge which might be extracted from him before he would cease visiting beaches entirely). Thus the area under the demand curve measures the economic value to beach users for the right to use beaches at a zero price. Economists call this consumer surplus.

Resident Beach Users Valuation of Florida's Beaches

To estimate the total user value or consumer surplus for resident beach users we asked each beach visitor the following question:

> Because of beach erosion and other beach related problems, suppose it became necessary for beach users to agree to buy an annual pass. The money collected would pay for the preservation of the beach. What is the maximum amount you would pay for the annual beach pass in addition to any present beach fees?

What we are attempting to measure is the dollar value of the consumer surplus from a resource that has a zero user price or a minimal price since some do pay beach access fees (see Table 2). But, how accurate is a hypothetical question such as the one posed above? Perhaps the source of bias in such a question results from "gamesmanship." People who are asked hypothetically what they would be willing to pay for the right to use beaches may recognize two different incentives to distort their responses. Perceiving that they will not actually have to pay and that their responses may favorably influence the supply of beaches, people may overstate their willingness to pay reflecting what they would like to see done rather than how they would behave in an actual market. On the other hand, if people believe that their responses will influence actual fees charged in the future they may be more concerned about keeping their estimates low than revealing their true values. Most evidence to date suggests that responses to willingness to pay questions tend to have a downward bias. In fact we found that thirty-two percent of our sample of resident beach users would not pay anything for a beach pass. The estimates presented here may be taken as lower bound estimates.

Table 1 shows that, on average, resident beach users are willing to pay $12.53 per person for an annual beach pass. Multiplying this figure times the over five million resident beach users 18 years of age an older yields an estimate of over 65 million dollars annually that residents are willing to pay for

beach preservation. This is an estimate of resident beach users consumer surplus for one year. Table 1 also shows that the average willingness-to-pay per person per day is $1.42. More will be said below about how we can use these two estimates. But first lets look at what tourists would be willing to pay for the right to visit Florida's beaches.

Tourist Beach Users Valuation of Florida's Beaches

We asked the same question of tourists that we asked residents (see above). Forty percent of all tourist beach users sampled answered they would pay nothing. On average, however, tourist beach users were willing to pay $7.90 per year. Multiplying this figure times the over four million tourists visiting Florida's beaches during the January - June 1984 period yields an estimate of over thirty-two million dollars that tourists would be willing to pay to have the right to visit Florida's beaches. Remember this value is only for one-half a year!! Tourists were, on average, willing to pay $1.48 per person per day. Table 4 summarizes these results.

Beaches as an Asset

So far we have presented estimates of consumer surplus for resident and tourist beach users. For residents the values represent an estimate of the annual benefits received while for tourists only one-half a year's value was presented. These values are flows of benefits for a particular time period attributable to an asset - Florida's beaches. The value of an asset is defined as follows:

$$(1) \quad V = \frac{R1}{(1+n)^{t0}} + \frac{R2}{(1+n)^{t1}} + \cdots \frac{Rk}{(1+n)^{tk}}$$

where,

V = value of the asset
R = returns to the asset
n = discount rate
t = time
k = number of periods
t = 0,1,....K

If the returns, R, flow for a large number of periods ($k \to \infty$), then equation (1) can be simplified where the returns are constant into the future (R1 = R2 = ...RK).

$$(2) \quad V = \frac{R}{n}$$

Using equation (1) and assuming a discount rate of ten percent the asset value of Florida's beaches was calculated for resident beach users. Equation (3) shows that the value of Florida's beaches as an asset to Florida resident beach users is over 653 million dollars.[3]

$$(3) \quad V = \frac{\$65,379,122}{.10} = \$653,791,220$$

Estimating Benefits from Erosion Control

As stated earlier one of the main objectives of our present research effort is to provide a general model of beach valuation that could be used in evaluating the net economic benefits from beach renourishment and erosion control projects. However, at this time our research effort is not complete. We will therefore try to illustrate how values once obtained could be utilized. We utilize a hypothetical beach for purposes of illustration.

Table 7 gives an illustration of estimating the net benefits from a beach renourishment project. In our hypothetical example, assume a beach is at present severely eroded and is being considered for beach renourishment. It is estimated that 4,000 people visit the beach annually and on average spend 30 days annually at the beach. This yields an estimate of 120,000 total recreational beach days spent on our severely eroded beach. Assuming further that we have an estimate of the average willingness to pay per day of $1.42 yields an estimate of $170,400 in annual benefits received by beach users (consumer surplus) on a severly eroded beach. The next step is to estimate what benefits

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[3]The assumption used here that the annual flow of benefits is constant may not be true. Growth in the number of beach users and the fact that beaches are a normal good may lead to larger annual benefits as population and real income grows.

Table 7

An Example of the Use of Saltwater Beach Willingness To Pay in Estimating Economic Benefits from Erosion Control

Hypothetical Beach

Before Erosion

Beach Users: 10,000
Average Bach Days Per User: 30
Total Days: 300,00
Willingness to Pay Per Day Per Person: $1.42
Total Annual Benefits = $1.42 x 300,000 Days = $426,000

After Erosion Problems

Beach Users: 4,000
Average Beach Days Per User: 30
Total Days: 120,000
Total Annual Benefits = $1.42 x 120,000 Days = $170,400

Net Economic Benefits Via Beach Nourishment Programs

Before $426,000 less After $170,400

$255,600

can be expected from a beach renourishment project. What is needed are estimates of how many beach users attended the beach before the eroision took place and/or an estimate of the total willingness to pay (consumer surplus) in the before erosion or after beach renourishment condition.[4] In our hypothetical example, assume we estimated that 10,000 beach users will visit the beach spending 300,000 total days at the beach with total annual benefits of $426,000 if the beach is renourished. Subtracting the "after Erosion Benefits" of $170,400 from the "Before Erosion Benefits" or "After Renourishment Benefits" of $426,000 yields an annual net benefit of $255,600. This is the added benefits from beach renourishment. In a benefit-cost analysis such as is required by the U. S. Corps of Engineers, these net benefits from beach renourishment would be compared to the cost of renourishment in evaluating the economic feasibility of the project.

Expected Results From Continuing Research

Presently we are merging the data we collected on beach users with the actual physical characteristics of the beaches visited. We hope to be able to design a model that could be used to estimate the consumer value per day of a particular beach with a minimum of input such as the socioeconomic characteristics of the visitors to the beach and the actual physical characterictics of the beach. It is expected that the model will have the following form:

$$CV_{ij} = f(PHYB_{ji}, PB_{ij}, SOCEC_{ij})$$

where,

CV_{ij} = Consumers value per day for the ith beach user at the jth beach.
$PHYB_{ji}$ = Physical characteristics of the jth beach for the ith user
PB_{ij} = Percieved beach characteristics by ith beach user at jth
$SOCEC_{ij}$ = Socioeconomic vector for ith individual (i.e., age, income, tourist, resident) at jth beach.

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[4]The general model we are presently researching is designed to provide such estimates.

This model could prove quite useful for evaluating the benefits from beach nourishment and erosion control measures. The final results of this study will be published by the Florida Sea Grant Program and copies of the report will be made available directly through the Sea Grant Office at the University of Florida in Gainesville.

References

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3. U. S. Department of Commerce, Bureau of the Census, Preliminary Report Industry series. May 1984.

PART 2

Papers Presented at the 30th Annual Meeting of the

Florida Shore & Beach Preservation Association

September 25-27, 1985, Mariott's Harbor Beach Resort, Ft. Lauderdale, FL