THE VALUE OF DAY TRIPS TO LAKE ERIE BEACHES

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ABSTRACT

This paper explores the recreational value of single-day trips to Lake Erie beaches. Individuals visiting Maumee Bay and Headlands State Park beaches were surveyed during the summer of 1997, and the results were used to estimate travel cost demand functions for beach visits. The results suggest that single day visitors take an average of 6 trips per year to Maumee Bay State Park beach, and 7 trips per year to Headlands State Park beach. The estimated value of a day at the beach is $25 for Maumee Bay and $15 for Headlands. When aggregated over potential users, these results suggest that beaches are highly valuable public resources along Lake Erie's shoreline.

THE VALUE OF DAY TRIPS TO TWO LAKE ERIE BEACHES

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INTRODUCTION

As a public recreational resource, Great Lakes beaches provide access to coastal amenities, such as swimming, sunbathing, and other water related characteristics and activities. In addition to providing recreational opportunities, beaches attract tourists who help sustain local economies. While it is clear to policy makers, beach managers, local officials, and users that beaches are an important resource, little is known about the economic value these users place on beaches. Knowing the value of beach use could help both state and local officials decide whether or not to open new beaches, how much to spend on beach maintenance each year, or how much capital to invest on beach amenities like restrooms, parking lots, and picnic tables.

Unfortunately for managers, economic information about the value of a day at the beach is not readily available through regular market mechanisms. Instead, because beaches most often are provided as public goods, managers must rely on incomplete measures of consumer satisfaction. Such measures might take the form of surveys that gage individual satisfaction about a particular beach visit or set of visits. While surveys like this can provide important information to beach managers, they fail to provide economic information that can be compared directly to the costs of maintaining beaches. Given that managers must justify resource expenditures, having values that can be compared to the cost of maintenance can be helpful.

This paper provides estimates of the economic value of recreation at two Lake Erie beaches. Using the tools of non-market economic valuation, the value of a day trip to Headlands State Park beach and Maumee Bay State Park beach are estimated. Estimates such as this can be compared to the expenditures for each park, and to similar estimates for other State or local parks, to help determine if additional expenditures are justified. Further, these numbers can be used to estimate the value of an acre of public beach access for single day visits. Dollar measures such as this can be compared to the value of lakefront property in private uses to determine whether public or private ownership enhances overall community value.

The research is unique in that we have found no other studies that have investigated the value of freshwater beaches. While the National Oceanic and Atmospheric Administration (NOAA) and other organizations spend considerable resources surveying saltwater beaches, less emphasis is placed on freshwater beaches. Despite the apparent lack of attention among researchers, a recent study of licensed drivers in Ohio found that more than 40% of all respondents visited beaches during the summer, and 58% of those respondents recreated at Lake Erie beaches (Villaplana and Hushak, 1995). Given increasing population and demand for public access to Great Lakes resources, and limited access in some regions, understanding how the public values freshwater beach recreation can provide critical information for state and local agencies, as well as interested public participants in policy and management decision-making.

This paper uses the travel cost method to determine the value of a day trip to one of two beaches. The travel cost technique was first suggested in the 1930's by Harold Hotelling as a way for the National Park system to determine its admission fees for

National Parks. Over the last 25 years, economists have been applying and refining this technique to assess the economic value of a wide range of public resources, from forests (Englin and Mendelsohn, 1991 and Pendleton et al., 1998) to water quality (Smith et al. 1983; Bockstael, et al. 1987;) to saltwater beaches (McConnell, 1977; Bockstael et al., 1987; and Bell and Leeworthy, 1990).

The travel cost technique relies on data collected from surveys of beach users. By using information provided by users, the travel cost method is known as a "revealed" preference technique. The method links information on the distance people travel to visit a beach to information on how many times they visit the beach each year, and other variables. Data on these variables for a sample of visitors is used to estimate a demand function for the number of trips to a beach. The resulting demand function provides an approximate value of a visit to the beach.

This particular study focuses on the Headlands and Maumee Bay State Park beaches. These beaches were picked for two reasons. First, they are at opposite ends of Lake Erie, and near different cities. Headlands is on the eastern side of Ohio's Lake Erie coastline and nearest to Cleveland, Pittsburgh, and Erie, Pennsylvania. Maumee Bay is on the western side, and closer to Toledo and Detroit. Second, these beaches have dramatically different characteristics. Maumee Bay has many amenities in addition to the beach, such as a resort, a golf course, a natural wetland, and a campground. Headlands, on the other hand, has a one mile long natural sand beach and a natural dune area, but none of the other amenities found at Maumee Bay. These differences are likely to affect the size of the economic value estimates for each beach.

The paper is organized in the following way. The article first discusses the survey and the results of the survey. It then presents background information on the travel cost model, and travel cost models for single day visits to each beach are estimated and compared. The results are presented and placed in context relative to estimates found in the literature for saltwater beaches, and related environmental resources.

DATA

Beach users at Maumee Bay and Headlands beaches were surveyed during the summer of 1997. Collecting the data involved placing someone at each beach, and having them pass out surveys randomly to beach visitors. In addition, the surveyor collected the name and address of each potential respondent. These names and addresses were used to send follow-up letters with an additional copy of the survey. Individuals who did not respond promptly were sent this follow-up questionnaire. Several prizes, provided by local visitor bureaus, were given away to respondents to help increase the response rate. This survey achieved a relatively high response rate of 52% for Headlands and 62% for Maumee Bay.

The full set of results for this survey are found in a companion document "Summary of 1997 Survey of Lake Erie Beach Users," by Sohngen et al. (1998). A sample of these results is presented in Table 1 for single day and multiple day trips. Several interesting results can be seen. First, Maumee Bay attracts individuals from a wider area than Headlands for single day trips; however individuals tend to take fewer trips each year. Visitors to Maumee Bay tend to do more than only visit the beach, as the results indicate

that they spend less of their time on the beach itself. This makes sense since Maumee Bay is more developed than Headlands, and has a variety of alternative activities for visitors.

The results are reversed for multiple day trips, most likely because Maumee Bay serves as an attraction in and of itself. With a campground and resort for individuals to stay the night, visitors can plan to spend more than one day at Maumee Bay itself. Alternatively, Headlands is near Cleveland and other attractions in northeastern Ohio. Multiple day visitors to Headlands come there on a side trip as part of a more extended vacation or visit to northeastern Ohio. Most multiple day visitors to Headlands do not list the beach as their primary reason for visiting the region.

Expenditures for single day trips are relatively modest, with an average of $21 per trip for Headlands and $34 per trip for Maumee Bay. Nevertheless, individuals spend only 26-30% of these dollars on travel expenses, with the rest going to the local economy. In 1996, the Ohio Department of Natural Resources estimates that there were 1.4 million visitors to each State Park. Accounting for the fact that only some of those visitors use the beach (discussed below), direct expenditures in local economies near these beaches could amount to $6.2 million for single day beach users at Maumee Bay, and $3.3 million for single day beach users at Headlands.

Average household income for visitors to the two beaches is relatively high at $47,000 and $53,000 for Maumee Bay and Headlands respectively. Median income for visitors to both beaches is slightly lower at $45,000 per household. Comparatively, Ohio's median household income in 1997 was $35,493 (U.S. Bureau of the Census, 1998). Data obtained from the 1990 US Census suggests that median household income

for the regions with visitors to Headlands was approximately $32,000, and median family income was approximately $38,000. Median household income for the regions with visitors to Maumee Bay in 1989 was approximately $31,000, and median family income was approximately $38,000. Interestingly, the visitors in this survey appear to have higher income in than the general populations from which they were drawn. This may suggest that higher income visitors were more inclined to respond to this survey.

Visitors to beaches tend to spend nearly 10% of their income on recreation in any given year. Of recreational expenditures, 3-5% are budgeted for single day beach visits. This suggests that visitors spend a relatively small proportion of their overall income on beach visits, generally less than 1%. Although the total expenditures of all visitors may be potentially large for the local community, for any individual, the expenditures are a small proportion of their income.

Questions about beach attitudes suggest that beach visitors are most interested in beach cleanliness and maintenance, with water quality appearing to play a relatively strong role as well. Given that beach closings have become more prominent in recent years, particularly near Headlands, it is surprising that water quality does not appear to be a more important factor to visitors.

Individual responses to the questions about Lake Erie water quality suggest that it has a relatively small effect on their decision to go to a beach. A potential explanation for this is that beach visitors are generally satisfied with water quality in Lake Erie, particularly since it has improved dramatically in the last 20 years. Despite this, individuals appear to be concerned about water quality at the particular beach they are visiting.

Table 1: Summary results from survey data collected during the summer of 1997.

	Single Day Trips		Multiple Day Trips	
	Headlands	Maumee	Headlands	Maumee
PANEL A. VISITATION PATTERNS				
Trips[1]	345	230	31	101
Average distance traveled to the beach (miles)	26	35	175	86
Annual trips to this beach (number of trips)	7.9	6.0	3.9	3.7
Percent time on beach	64 %	56 %	33 %	30 %
PANEL B. DEMOGRAPHIC AND ECONOMIC VARIABLES				
Average expenditure per trip	$ 21	$ 34	$ 344	$ 213
Average annual household income	$ 49,544	$ 47,168	$ 53,182	$ 52,750
Average annual recreational expenditures	$ 5,052	$ 4,985	$ 5,282	$ 6,488
PANEL C. GENERAL BEACH ATTITUDES[2]				
Water quality affects my decision to go to the beach	4.14	4.25	4.17	4.38
Beach maintenance affects my decision to go to the beach	4.38	4.50	4.30	4.47
Beach cleanliness affects my decision to go to the beach	4.55	4.59	4.39	4.66
Congestion affects my decision to go to the beach	3.77	3.86	3.87	3.85
Beach facilities affects my decision to go to the beach	4.04	4.26	3.91	4.09
Lake Erie water quality affects my decision to go to the beach	3.47	3.36	4.22	3.40

[1] Of the visitors surveyed, 47% responded at Headlands and 54% responded at Maumee.

[2] The average reported in Panel C are based on the survey respondents. Scales ranged from 1=Strongly disagree to 5 Strongly agree.

TRAVEL COST MODELS

Economists have made significant progress in recent years developing methods to value recreation sites. One of the most widely used and accepted methods, the travel cost model, uses the distance people travel to measure their willingness to pay to gain access to recreational sites. By exploring the relationship between trip frequency, distance, income, and other variables, it is possible to estimate a demand function for visits to specific sites. This demand function can be used to estimate the total value of a recreational site.

The theoretical foundation for the travel cost technique is well established (Freeman, 1993; Bockstael, 1995). As shown by these and other authors, travel cost demand functions can be derived from the utility that individuals obtain by recreating at beaches. Over the years, economists have used this methodology to value a variety of recreational resources. These include water quality (see Russell and Vaughn, 1982; Smith et al., 1983; and Bockstael et al., 1987 for example), saltwater beach recreation (Bell and Leeworthy, 1990), recreational fishing and boating (Hushak et al., 1988; Parsons and Kealy, 1992), hiking (Englin and Mendelsohn, 1991; Pendleton et al., 1998), and rock climbing (Shaw and Jakus, 1996) among other things.

A large number of alternative model specifications have been discussed and used in the literature. Single site travel cost models focus on estimating the value of particular sites. These models typically are constructed by regressing the number of trips individuals take to a site on the price of the visit, the price of substitute sites, income, and

other important variables. Once the demand function for trips is estimated, the value of a visitor-day can be calculated with consumer surplus.

More recently, modelers have used travel cost models to estimate the value of site amenities by comparing travel costs across different sites (see for example Bockstael et al., 1987). Valuing site amenities is important because many environmental decisions involve reducing or increasing amenities rather than eliminating them altogether. Further, even if sites or amenities are eliminated, visitors may simply substitute other sites, so that their consumer surplus is not lost entirely. Thus, when environmental quality at a preferred site is reduced, visitors can be observed to reduce visits, change sites, eliminate visits altogether, or some combination thereof. By capturing these possibilities, recent travel cost models more accurately estimate the net value of changes in site amenities.

Given that this study is focused on recreation at only two beach sites on Lake Erie, the single site travel cost model is used to estimate separate demand functions for the two Lake Erie beaches under consideration. Although the single site model does not completely capture the potential for site substitution, prices of alternative sites are included in the model in order to capture these effects. These estimates, however, may be expected to overestimate economic value, depending on the size of substitution effects.

The travel cost demand function for trips is given as:

$$(1) \qquad \text{Trips} = f(P_q, Y, \mathbf{P_s}, \mathbf{X})$$

where P_q is the full cost of a trip to the beach (including both time and travel costs), Y is household income, $\mathbf{P_s}$ is a vector of prices for substitute sites, and $\mathbf{X}$ is a vector of other

important variables. **X** may include other demographic variables or site quality characteristics.

With the travel cost demand function provided in (1), the value of annual beach visits or consumer surplus, can be calculated. Consumer surplus represents the additional value above travel costs that individuals get by visiting the beach during the beach season. It is a standard economic measure of the satisfaction of visiting the beach. Consumer surplus for a single visit to the beach can be calculated by dividing annual consumer surplus by the average number of trips taken to the beach for the sample.

ESTIMATES OF TRAVEL COST DEMAND FUNCTIONS

The literature on travel cost demand functions provides a wide array of alternative model specifications, including choices over variables to include in the model and different estimation techniques. In most applications, the choice of variables to include often depends on the particular survey, and how significant variables are determined to be through sensitivity analysis. The literature is not clear on the particular choice of estimation techniques to use for travel cost data, although the particular techniques often depend on the type of data available.

Because the data used in this analysis is both truncated and censored, maximum likelihood techniques are used to allow for correction of bias caused by sampling methods. The data is truncated because the survey intercepted individuals at the beach; it did not sample the entire population. Individuals not visiting the beach are therefore truncated from the true population sample. Individuals truncated from this sample may

include those who either did not visit the beach this particular year, or individuals who never visit the beach. In addition to truncation, the survey is censored at 15 beach trips. Individuals who took more than 15 trips were allowed only to respond that they took 15 or more trips during the year. The number of respondents taking more than 15 trips is rather large for this sample, 21 % of the single day respondents for Headlands, and 12% for Maumee Bay.

The likelihood function is constructed in the following fashion. Letting T_i be the annual trips taken by person i, the survey recorded $T_i > 0$. If z_i is a vector of variables used in the regression analysis and β is the vector of coefficients to be determined, then we observe

(2) $T_i = \beta' z_i + \mu_i$ if $T_i < 15$

$T_i = 15$ if $T_i \geq 15$

Where μ_i is an error term that is distributed $\mu_i \sim N(0,\sigma^2)$. Under these conditions, a likelihood function can be constructed with the following functional form:

$$(3) \quad L = \prod_{T_i \geq 15} \Phi\left[\frac{\beta' z_i - 15}{\sigma}\right] \times \prod_{T_i < 15} \frac{1}{\sigma} \varphi\left[\frac{T_i - \beta' z_i}{\sigma}\right] \times \left[1 - \Phi\left(\frac{-\beta' z_i}{\sigma}\right)\right]^{-n}$$

Using Olsen's (1978) reparametrization, where $h = 1/\sigma$ and $B = \beta/\sigma$, the log likelihood function can be written as:

$$(4) \quad \ln L = \sum_{T_i \geq 15} \ln\left(\Phi[B' z_i - 15h]\right) + \sum_{T_i < 15}\left[\ln(h) - \left(\frac{1}{2}\right)(hT_i - B' z_i)^2\right] - n \ln[1 - \Phi(-B' z_i)]$$

The log likelihood function in (4) captures both the censoring above 15 and the truncation that arises from sampling only those who actually took trips. The set of parameters (B,h) that maximizes (4) is found using the LIMDEP econometric software. Please see Greene (1997) and Maddala (1983) for further discussion of these techniques.

Although data is available on multiple day visitors and individuals who live long distances from the beach, this paper uses results only for single day visitors who live within 150 miles of the beach. For the most part, individuals living further than 150 miles appear to be engaged in many activities in addition to beach recreation, or their trips involve more than one stop. As a result, it is difficult to determine how best to allocate total travel and time costs when the trip involves many different segments.

This paper explores two particular regression models, each containing different sets of variables in the vector z (i.e. regressors). $P_{q,i}$ is the price of a trip to the beach in question for person i. Trip prices are calculated as the sum of the travel costs and time costs associated with traveling to the beach. Distances are calculated as the round trip distance from the center of the home zip code to the latitude and longitude coordinates of the beach. The mileage rate is $0.33 per mile, which is consistent with government estimates of the cost of owning and operating an average vehicle.

The proper method to incorporate time costs into the travel cost model is still debated within the travel cost literature (please see a recent review by Feather and Shaw, 1997). A key question in the literature relating to this study is how to value an individual's travel time, given that they are taking time away from work and other leisure activities to visit

the beach. In this study, time costs are evaluated at 30% of the wage rate for individuals, following Cesario's (1976) suggestion.

An individual's hourly wages are determined by dividing household income, Y_i, by 2040 hours per year of work. Unfortunately, this introduces error into the estimates, because some individuals will work more and some individuals will work fewer hours in any given year. Furthermore, there are likely to be many households with more than one wage earner. This would bias our estimate of hourly wages upwards. The survey did not provide adequate information to determine how many wage earners there are in the family. Using Cesario's estimate of 30% of the wage rate may reduce the effect of this bias because this may be a low estimate of the value of leisure time for many people.

By assuming that individuals travel 40 miles per hour to obtain a recreational site, the total travel time can be calculated for each visitor. With total travel time and the wage rate, the time costs of travel are estimated and added to the distance costs above. The sum of these is $P_{q,i}$. $Y10000_i$ is the household income divided by 10,000.

The vector P_s contains the price of substitute sites. Because there are many beaches along Lake Erie's shoreline, visitors have many choices over which particular beach to visit. Capturing the effect of these substitute beaches is likely to be an important component of demand. Although substitutes are important to capture, only a small subset of all potential substitute beaches are considered. One problem with incorporating additional substitutes in this sample is multi-collinearity. This arises because the beaches are all along the Lake Erie shoreline. For any particular individual, the distance to a substitute site towards the east of their choice of beaches will be co-linear with the choice of another substitute site to the east. A similar argument holds for beaches to the west.

For this study, we include an eastern substitute site for Maumee Bay. Maumee Bay is at the western edge of Ohio, and there are few substitutes farther to the west (except along Lake Michigan's southeastern shore). $PS_{CC,i}$ in the Maumee Bay regression is the price of a trip to Crane Creek State Park beach. For Headlands, an eastern and western substitute beach is included. $PS_{CL,i}$ and $PS_{GV,i}$ below are the price for each visitor to obtain a trip to Edgewater State Park (downtown Cleveland) and Geneva State Park beaches respectively. Trip prices to these beaches are calculated as discussed above.

Results from the travel cost demand function estimates begin in Table 2 for Maumee Bay. The log of trips $[\ln(T_i)]$ is used as the dependent variable in the regressions. Model 1 shows the results for the model that contains only a constant, the price of a trip, and income. Model 2 contains the price of substitute sites. Substitutes are seen to have little effect on the other coefficients. Other functional forms were investigated as well, although they make little difference in the results, particularly to the coefficient on the own price term, and the consumer surplus estimates.

The coefficient on the price of a trip is negative as expected in both models. The coefficient on income is positive, although it is not significant in either model. Similarly, in model 2, the price of a substitute trip is positive, but not significantly different from 0. The likelihood ratio test compares the likelihood function calculated in models 1 and 2 versus a restricted likelihood function that assumes the coefficients are all 0. The test is distributed as a chi-square distribution, and can be compared to table values to determine if the likelihood estimated in the models does better than the restricted likelihood. In both cases, it does.

Table 3 presents the results for Headlands. As expected the coefficient on the own price variable is negative, and significant. Interestingly, in the model that contains only own price and income, income is significant and positive. As income increases, the number of trips may be expected to increase. The income variable, however, becomes insignificant in model 2, where the price of substitutes is included. One reason for this is that income enters the model in the price terms as well as independently (because the price of a trip is determined in part by wages, which are a function of annual household income). This can cause multi-collinearity, and the maximum likelihood techniques may have trouble picking up the separate effects of income when additional price terms are included.

Table 2: Results for the Maumee Bay State Park beach

	Model 1	Model 2
Constant	2.094***	2.032***
P_q	-0.038***	-0.041***
Y10000	0.014	0.006
P_{CC}		0.005
LR Test (χ^2)	66.39***	68.50***

*** Indicates the variable is significant at the 0.01 level; ** indicates the variable is significant at the 0.05 level; and * indicates significance at the 0.1 level.

Table 3: Results for the Headlands State Park beach

	Model 1	Model 2
Constant	2.126***	1.854***
P_q	-0.059***	-0.070***
Y10000	0.092***	0.050
P_{CL}		0.024**
P_{GV}		0.008
LR Test (χ^2)	84.03***	88.86***

*** Indicates the variable is significant at the 0.01 level; ** indicates the variable is significant at the 0.05 level; and * indicates significance at the 0.1 level.

The coefficients on the prices of obtaining alternative beaches are positive, indicating that these sites act as substitutes. Only the coefficient on Cleveland Lakefront Park, however, is significantly different from 0 (at α=0.05). When the substitute sites are included in the model, the constant term and the coefficient on price change. The signs on these variables, however, remain the same. The likelihood ratio tests both suggest that these models do better at explaining variation in the number of trips than the restricted model.

ESTIMATES OF THE VALUE OF A DAY TRIP

The value of a single-day trip to each beach is estimated with consumer surplus. Consumer surplus is a traditional economic measure of value. It represents the area underneath the demand curve up to the quantity of trips consumed, less the cost of a trip,

as shown in figure 1. By netting out the cost of a trip, consumer surplus captures only the value above travel costs that consumers obtain by visiting a beach.

Consumer surplus is estimated by integrating the demand function over price. If the individual's demand function for trips is given as $\ln(T_i) = f_i(P_q, Y, P_s)$, consumer surplus is

$$(5) \qquad CS_i = \int_{P^0}^{P^1} f_i(P_{q,i}, Y_i, P_{S,i}) dP_{q,i} .$$

P^0 is the price of the trip taken by individual i, and P^1 is the choke price, or the maximum price at which the person will no longer take trips. The choke price is the point where the demand curve crosses the price axis, as seen in Figure 1.

For the log-linear demand function estimated above this is

$$(6) \qquad CS_i = \frac{\left[f^0(P_q^0, Y, P_s)\right]}{-\beta_1}.$$

where β_1 is the coefficient on the own price term, and $f^0(\cdot)$ is the number of trips taken this year.

Within the economic literature, there is debate over whether f^0 should be the actual trips taken by the individual, or the predicted number of trips (see Bockstael and Strand, 1987). The exact measure for f^0 depends on whether it is assumed that there is omitted variable error or measurement error in the model. For omitted variable error, one uses the

average number of trips from the sample data, $\bar{T}$, to determine consumer surplus. For measurement error, the predicted number of trips based on sample averages for the explanatory variables, $\hat{T}$, is used to estimate consumer surplus. Measurement error leads to lower estimates of consumer surplus than omitted variable error (Bockstael and Strand, 1987).

Estimates of consumer surplus are presented in table 4. The sample average number of trips is 6.0 for Maumee Bay and it is 7.1 for Headlands, while the predicted number of trips depends on whether model 1 or 2 is used. Annual consumer surplus for all trips is calculated using (6) above. As predicted, estimates based on the sample average number of trips are higher than those based on the predicted trips, although the differences are not great. Model 2 predicts lower consumer surplus measures than model 1. This is to be expected because alternative sites incorporate substitution possibilities.

The results in table 4 show that consumer surplus (annual and per trip) for Maumee Bay is larger than for Headlands. This is explained by the survey result that Maumee Bay attracts a large number of single day visitors from longer distances (although both beaches attract a large number of visitors from a relatively short distance who take many trips each year). This increases the height of the demand function at a low number of trips, and subsequently increases the consumer surplus estimates.

Table 4 also presents the price paid by beach visitors for the marginal trip, denoted as average price. This price represents the willingness to pay for the last trip taken by the average visitor during the year. Price elasticity estimates are shown to provide additional information on the relationship between the price of a trip and the number of trips taken. Price elasticity describes the percentage change in the quantity of trips that is likely to

occur if price changes by 1%. For example, the price elasticity of a trip to Maumee Bay lies between -0.37 and -1.03. This means that a 1% increase in the price, would reduce trips by 0.37 % to 1.03 %. Although this study does not control for individuals who may quit taking trips altogether if an entrance fee were charged, elasticity estimates provide some guidance for policy makers on the economic effects of instituting such a policy. If a $5 per trip entrance fee were charged at Maumee Bay State Park, the elasticity estimates suggest that the average number of trips taken each year would decline by approximately 1 trip. Price elasticity is larger for Headlands, in part because this beach has additional substitutes nearby. This means that visitors have more options for substituting other beaches for Headlands if that beach decided to implement entrance fees. If the equivalent entrance fee were levied at Headlands, the average number of trips taken each year would decline by 1 to 2 trips per year.

One issue associated with using a log-linear demand function is that the price of trips approaches infinity near 0 ($P_1 \rightarrow \infty$ as $T \rightarrow 0$). This means that a large proportion of total consumer surplus may be attributed to the first few trips each year, depending on the specific shape of the demand function. To determine if this has a large effect on our estimates of consumer surplus, the demand function is integrated between the P_0 and P_1, where P_1 is set at the maximum trip price observed in the dataset. Estimates of consumer surplus measured this way differ little from those in Table 4. However, if the cut-off price P_1 is chosen as the price where one trip occurs, consumer surplus is approximately $22 per trip for Maumee and $12 per trip for Headlands. This slightly reduces the consumer surplus estimates relative to those shown in table 4, but it does not have a dramatic effect. Although the shape of the demand function at a low number of trips has

an effect on consumer surplus estimates, these effects do not dramatically alter the estimates of consumer surplus.

Figure 1: The travel cost demand function, consumer surplus, and travel costs.

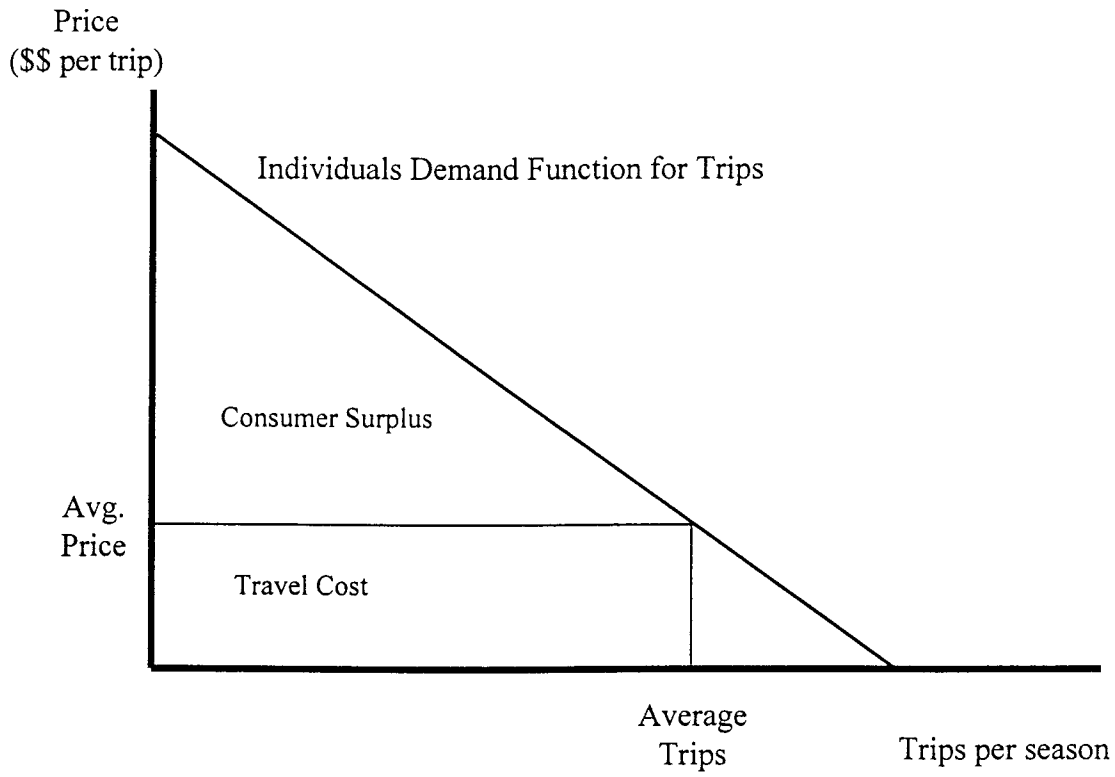

Table 4: Consumer surplus estimates for model 1 and model 2.

	Model 1	Model 2
PANEL A. MAUMEE BAY		
	Sample Average Trips	
Sample Average Trips	5.95	5.95
Annual Consumer Surplus	$158.34	$146.72
Consumer Surplus per Trip	$26.63	$24.67
Average Price	$9.97	$11.24
Price Elasticity	-0.37	-0.46
	Predicted Average Trips	
Predicted Trips	3.33	3.35
Annual Consumer Surplus	$88.74	$82.68
Consumer Surplus per Trip	$26.63	$24.67
Average Price	$25.41	$25.41
Price Elasticity	-0.95	-1.03
PANEL B. HEADLANDS		
	Sample Average Trips	
Sample Average Trips	7.08	7.08
Annual Consumer Surplus	$119.54	$100.55
Consumer Surplus per Trip	$16.88	$14.20
Average Price	$10.61	$12.29
Price Elasticity	-0.63	-0.87
	Predicted Average Trips	
Predicted Trips	4.45	4.59
Annual Consumer Surplus	$75.18	$65.24
Consumer Surplus per Trip	$16.88	$14.20
Average Price	$18.44	$18.44
Price Elasticity	-1.09	-1.30

HOW TO USE THE VALUES

These estimates can provide helpful information to policy makers, beach managers, and other interested individuals. The Ohio Department of Natural Resources, Division of Parks and Recreation estimates that there are approximately 1.4 million visits to each State Park during the year. Of these, approximately 53% are involved in general day use at Maumee Bay, and 17% swim at the beach. At Headlands, approximately 83% of visitors are involved in general day use, and 16% swim at the beach.

Using the visitors who swim at the beach as an estimate of the total number of annual single day visits to the beach itself, we can derive an estimate of the annual value of day trips to each beach. At Maumee Bay there are an estimated 238,000 beach users during summer months, while at Headlands, there are 224,000 beach users. Using an estimate of consumer surplus of $25.60 per trip for Maumee, and $15.50 per trip for Headlands (from table 4), the annual value of single day beach trips to Maumee Bay is $6.1 million, and to Headlands it is $3.5 million.

Maumee Bay is more valuable than Headlands in part because it is a relatively unique resource in the northwestern part of the State of Ohio. There are few close substitutes nearby, and our surveys indicate that visitors perceive that it is well maintained. In addition, the wide variety of alternative recreational opportunities may enhance the attractiveness of this beach for visitors from long distances. While Headlands has one of the longest stretches of natural beach in the state of Ohio, it is not an entirely unique resource in the northeastern part of the state. There are a large number of other beaches

relatively close by that can act as substitutes for Headlands. This potential for substitution reduces the overall value of that particular resource relative to Maumee.

It is important to recognize that these estimates of economic value are considered to be **in addition** to any direct expenditures users undertake during their visits. They are the benefits in excess of the expenditures for transportation and other goods and services, and they are often called "non-market" benefits. Table 1 shows that visitors to Maumee spend approximately $26 (25% of total expenditures per trip are spent on transportation) in the local economy, amounting to nearly $6.2 million each year. While these values accrue to the local economy, the non-market values calculated as consumer surplus above accrue to beach users, who may be local residents, or visitors from distant locations. For Headlands, the comparable direct expenditure calculation is $3.3 million ($21 per trip x 0.70 spent in local economy x 224,000 visitors).

One can use the estimates of consumer surplus above to determine the value of an acre of public beach access. To do this, we begin by assuming that visitation rates remain stable in the future, and that the appropriate interest rate is 7%. Capitalizing the annual value of single day beach visits to determine the net present value of the public asset, we find that the non-market value of Maumee Bay is $87 million, and the non-market value of Headlands is $50 million.

These estimates can be used to determine the value of an acre of lakefront beach access in recreation. Maumee Bay has 15.8 acres of beach along 2,600 linear feet of beach, so that the public value per acre is $5.5 million. Headlands, on the other hand, has 21.5 acres of beach along 4,600 linear feet of lake frontage, so that the public value per acre is $2.3 million. In the city of Mentor near Headlands, recent land sales of property

with lake frontage range from $24,000 to $29,000 per acre. Not surprisingly, the value of land as a public recreational site is much higher than the value of land as a private entity. This likely arises because there are relatively few acres of beach front that are open to the public. Beaches are thus a scarce good, and highly valuable in terms of recreational resources.

It must be recognized that while these values for an acre of public beach are high, they represent non market value accruing to the users of the beach. They are not values that accrue to the local population in general. When considered with the market expenditures discussed above, however, the results of this survey suggest that beaches in Ohio provide substantial value both to residents and businesses near the beaches, and to those who use the beaches.

It is also important to understand that these values do not mean that if a beach was closed, for water quality problems for example, the expenditures and the consumer surplus would be lost entirely. Under a closing, visitors are likely to make substitutions with other beaches, or they would adopt other recreational activities entirely. If visitors shift to another local beach due to the closing, they are likely to continue spending money in the local economy. At least some expenditure value will be preserved. If they shift to another local beach, or even one far away, they will continue to obtain consumer surplus from recreation at beaches, so some consumer surplus will be preserved. Estimating the economic effect of a beach closure involves capturing the change in value net of any substitutions that beach users might undertake. The dataset here does not provide enough information to determine such substitutions, and therefore cannot be used to determine

how much value is lost if beaches are closed or beach days are reduced due to water quality concerns.

The results, however, can be used to make meaningful comparisons with other economic activities in the region to provide some indication about policy. For example, suppose a local community is faced with determining whether or not to develop lake front property as a public beach, or to allow it to be developed privately. The local community can use these numbers to get a sense for how valuable the public beach would be to the local economy and to beach users. Further, the results show that beaches located in regions with fewer substitutes and beaches with additional infrastructure on them provide more value, both to beach visitors and to local communities.

CONCLUSION

This paper values single day visits to Maumee Bay and Headlands State Park beaches along Ohio's Lake Erie coastline. The travel cost model was used to estimate the demand for trips to the beaches, based on the price of obtaining a trip, income, and prices for obtaining substitute sites. Consumer surplus is estimated to determine the value of annual visits to the beaches. These values are in turn used to obtain the average value of one trip, and the value of annual single day visits.

The results suggest that single day visits to Maumee Bay are presently worth $6.1 million, and to Headlands they are worth $3.5 million. The value of an acre of public beach access near Maumee is worth up to $5.5 million per acre and near Headlands it is worth $2.3 million per acre. Although these values are likely over-estimate the true value

of recreation because they do not fully account for the potential set of substitute sites and recreational opportunities available, they do suggest that Lake Erie beaches are highly valuable resources for single day users.

Policy makers should recognize that the values presented in this paper are consumer surplus. While the paper presents estimates of the direct local economic impacts of annual single day visits ($6.2 million for Maumee Bay and $3.3 million for Headlands), consumer surplus is economic value above and beyond the actual dollars spent while recreating. Non market recreational value is an important component of overall economic value because it represents quality of life and leisure considerations rather than expenditures alone. These values, however, are currently not considered within traditional economic markets.

These estimates are lower than the $33 per day estimated by Bell and Leeworthy for Florida beach days. Individuals in our survey, however, do not spend as much time or energy obtaining a visit to the beach. Further, Florida beaches are likely to have fewer substitutes than those along Ohio's Lake Erie coastline. These estimates are similar to those made by Hushak et al. (1998) for angling, however. That study found consumer surplus to range between $8 per trip to nearly $30 per trip for fishing. While anglers come from long distances for fishing, they also tend to spend considerable resources hauling boats and purchasing supplies. Beach visitors, on the other hand, need to make a relatively smaller investment in resources to take part in that activity.

In the future, this research will be extended to additional beaches in Lake Erie. This will allow the researchers to control more specifically for substitute sites, as well as differences in the level of amenities from site to site. Although there are large superficial

differences between Maumee Bay and Headlands State Park beaches, these effects do not appear to have a dramatic influence on our estimates of consumer surplus. This likely results from the fact that the sample used in the travel cost estimates included only the single day visitors from our sample.

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SUMMARY OF 1997 SURVEY OF LAKE ERIE BEACH USERS[1]

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ABSTRACT

During the summer of 1997, visitors to the Headlands State Park and Maumee Bay State Park beaches along Ohio's Lake Erie coastline were surveyed. Surveys were given to 760 visitors to Headlands beach and 607 visitors to Maumee beach. There were 394 responses for Headlands and 376 for Maumee. This paper describes the sampling methods and the preliminary results from the survey. The results suggest that visitors to Headlands are primarily local, and they focus on beach recreation. Visitors to Maumee are involved in many other activities at the State Park or in the area. The beach does serve as an important component of the overall set of activities. Beach visitors have higher incomes than Ohio's general population, but they spend only a small part of it on beach trips (less than 1%). Maintenance, cleanliness, and facilities surface as the two most important amenities for visitors. Water quality is less important than these other factors.

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INTRODUCTION

This paper describes research into the recreational patterns of Lake Erie beach users. During the summer of 1997, visitors to Headlands and Maumee State Park beaches along Ohio's portion of Lake Erie were surveyed. There are several purposes behind this study. One purpose is that there is a paucity of economic information related to freshwater beaches in the recreational and economic literature. Freshwater beaches in Ohio provide recreational opportunities and open access to public resources such as Lake Erie, and they may even stimulate the local economy. Despite their potential importance both to recreationists and local economies, little is known about visitors to Lake Erie beaches, their characteristics, and their beach visitation habits.

Another purpose is to estimate the non market value of beaches. Non market values are important for public goods such as beaches, where prices are not set in the traditional economic sense of the word "price." Typically, we can use the price of a good to determine its value, for example a car is more valuable than a single toothpick. However, for beaches, price information is not available. Economists must therefore use surveys such as this to help determine the value of public resources like beaches.

In this case, we will use the travel cost technique. The travel cost technique is well established within the economics literature. Its roots go back to the 1930's when the technique was first suggested to the National Park Service as a method they could use to estimate the value of National Parks. Through the years, the technique has been refined substantially to improve estimates of non market values. It is important to understand that travel cost studies can only capture the component of non market value related to recreational uses. They do not capture non-use values associated with the existence of public goods or related amenities.

The final purpose of this research is as a stepping stone to a broader assessment of beach resources and their economic value to residents of the State of Ohio. Travel cost studies, such as this, provide useful information on the values placed on beaches by recreationists. These values can be used by beach managers and policy makers as they assess where best to spend scarce government resources in providing public goods.

Maumee Bay State Park and Headlands State Park beaches were strategically chosen for two reasons. First, they are in different regions of Ohio's portion of the lakeshore. Because of this, they are near different population centers. Maumee is near Toledo and Detroit, and Headlands is near Cleveland. Second, environmental quality between the sites differs tremendously. Environmental quality includes both natural components like wetlands and physical components like lodges and golf courses. The State of Ohio has invested heavily in Maumee Bay State Park in particular in the last several years. Understanding the impact of environmental factors like these on beach visitation is an important goal of this survey and analysis project.

This paper describes several important components of this research, although it does not detail estimates of economic value. Non market estimates are reserved for future study. The paper proceeds by first describing the survey mechanism and application. Results from the survey are then presented and discussed. We conclude with a discussion of several interesting implications arising from the results.

SURVEY MECHANISM

The survey focused only on individuals who had already chosen to visit the beaches. Previous studies have examined beach recreation within the context of broader recreational behavior (see for example, Hushak and Villaplana, 1995). Random samples of beach visitors were taken at different points in time during the summer of 1997. The survey was conducted in the following way. First, the surveyor would approach individuals entering or leaving the beach. The surveyor would then describe our work and ask the person if they were willing to participate in a short survey. If the visitor responded positively, the surveyor would write down the individual's name and address, and the surveyor would give that person a survey form and a return envelope.

The surveyor would ask the person to return the survey form as soon as possible. If we did not receive the response from the visitor within 2-3 weeks, we would send a follow-up letter with another survey form. Although we experimented with a second follow-up letter, the response was low and deemed uneconomical.

The survey had four important components. The first component was basic information on what the visitor was doing at the beach, for instance was the visitor there strictly to visit the beach, or to engage in other related activities, such as picnic, visit family, hike, or do something entirely different. The second component was expenditure and general travel information. The survey asked how much the visitor spent on travel for the particular trip in question, how many trips to the beach the person took, the number of people travelling with them, and how far they came.

The third component was demographic information, such as household income, recreational expenditures, and other demographic information. The final component involved beach perceptions. We used a Likurd scale to assess which factors were important to the visitor in determining whether or not to visit the beach. This component provides important information that can be used to gauge which factors are most important for beach visitors in deciding whether or not to visit the beach.

SURVEY RESULTS

Headlands State Park Beach

We sampled 760 individuals visiting Headlands beach during the summer of 1997. Of these, 394 responded, indicating a response rate of nearly 52 %. One of the questions associated with travel cost studies is whether or not individuals are travelling to the site solely for recreation there, or whether or not the trip is part of some other purpose, with the trip to the beach as only a minor (or major) side trip. The survey mechanism was designed to separate these two types of trips, and to allow us to determine the main purpose of each trip.

Tables 1 to 9 present summary statistics for Headlands. Because some of the returned surveys did not contain all of the requested data, these data points were eliminated from the sample. The remaining sample of visitors is 379, 33 of which were multiple day trips (approximately 9%). Figures 1 and 2 present the number of visitors from each county in our sample. Darker areas represent higher visitation. Most of the single day visitors came from local counties, such as Erie, Cuyahoga, and other nearby communities. The multiple day visitors were more widely distributed around Ohio and the Midwest. Of the multiple day visitors, 50% of the visitors stayed with family, 33% stayed in a hotel, and 14% camped.

Table 1 presents the proportion of time visitors spent on different activities while at the beach. As one can see from Table 1, visitors on single day trips were mainly interested in beach related activities, with other responses gaining less attention. Visitors on multiple day trips, however, reported that the beach was only a small part of the reason why they were there. These individuals came from longer distances in general (Table 2), and were in the area to visit family or do other things altogether. They came to the beach as an alternative recreational activity.

Table 2 presents the distances individuals traveled to the beach, as well as the number of individuals travelling on that particular trip. Most of the single day trips were local in nature, while the multiple day trips entailed longer distances. There is little difference between single and multiple day trips in the number of people travelling with the individual who returned the survey, although there is more variation around the mean among the single day trips. This increased variation signifies that there is a larger probability of both large and small groups in the single day trips.

Tables 3 and 4 provide information on the proportion of individuals taking first time trips to Headlands each year, and the proportion of individuals taking a given number of trips to all beaches in a given year. As expected, individuals on single day trips have a lower likelihood of being a first time visitor, while individuals on multiple day trips have a higher likelihood. Most individuals on multiple day trips will travel to Headlands only 1 time, while those on single day trips are much more likely to travel there more times during the year. The average number of trips for each group is 7.9 for the single day trips and 3.8 for the multiple day trips.

One will note from Tables 3 and 4 that the data set is censored, in that individuals who took more than 15 trips only had the option to mark 15+ trips in their survey. Because a substantial number of visitors took more than 15 trips, statistical techniques that account for censoring have been applied. These techniques are used to determine the average number of trips reported in Tables 3 and 4.

Trip expenditures are different for single and multiple day trips (Table 5), ranging from $21 to $344 for the single and multiple day trips respectively. Single day visitors appear to spend approximately 30% of their trip expenses in travel, while multiple day visitors spend a much lower percentage, 15%. It is unclear what other expenditures the visitors are undertaking, as the survey did not ask that question. Our initial hypothesis, however, might have suggested that single day visitors would have spent a greater proportion of their total trip expenditures on travel.

The distribution of income implies an average income of $49,544 for single day visitors and $53,182 for multiple day visitors (Table 6). Table 7 indicates that these

households spend 9-10% of their annual income on any type of recreation. Single day and multiple day trip groups were fairly consistent about the level of income they spend on recreation each year.

The average age of visitors on single day trips is 43, while on multiple day trips it is slightly older, 48 (Table 8). The distribution of ages suggests that the individual filling out the form may have been the head of a household. There were no observations of individuals on multiple day trips younger than 26, and most of the observations were between 26 and 55. Although it is not shown in a table, 55% of the total sample of individuals filling out the survey is male.

Responses to the final 26 questions provide information on what factors are motivating individuals to choose both the Headlands beach and other beaches. All of the answers to these questions could range from 1-5, with 1 being "to strongly disagree" and 5 being "to strongly agree." This survey attempts to determine if individuals had strong feelings one way or another towards indicators of beach quality, such as water quality, beach cleanliness, maintenance, and other factors.

The first 6 questions were general, asking the individual what factors are important in their decision to go to the beach. The results suggest that the most important factors are cleanliness, maintenance, and water quality. The least important factors are congestion and facilities. Question 6 asks "Does Lake Erie water quality affect your decision to go to the beach?" The average response is 3.47, suggesting that visitors are not overly concerned about Lake Erie water quality. Although this contrasts with question 1, visitors appear to be responding in question 6 to the well publicized success of efforts in recent years to clean the Lake in general.

Questions 7 –11 focused directly on the Headlands beach. Cleanliness, maintenance, safety, and facilities appear to be the most important factors affecting individual decisions to go to the beach. Water quality is also important in that individuals are indicating that it is generally good, but potentially not as good as they would like. This conclusion is drawn from the fact that individuals rate water quality higher when they are considering whether or not to visit Lake Erie in general, but lower when they consider visiting Headlands. Congestion, as suggested before, does not appear to be a factor at Headlands.

Question 12 attempts to determine if nearby nature areas are important factors in deciding whether or not to visit a beach. They appear to be neither important nor unimportant. Individuals visiting the beach itself do not have a strong preference one way or the other towards visiting these areas. Rather than suggesting that nature areas are not important, it is likely that there are distinct differences between beach visitors and nature area visitors. These results might differ dramatically if we sampled individuals specifically hiking trails through these natural areas.

Questions 13 – 16 suggest that individuals would not change their visitation habits regardless of changes in the beach or water quality. This suggests general satisfaction with the beach itself, and that individuals in our sample are not likely to change their behavior substantially with marginal changes in beach infrastructure or water quality. One must caution against interpreting these questions in the survey too strictly however, because changes in attributes can also affect the level of visitation among those who do

not presently come to the beach. If changes in beach amenities draw new visitors, this can have an impact on overall visitation, and the non market value of the beach.

On average, individuals in this sample were somewhat familiar with other beaches on Lake Erie and in Ohio (questions 17 and 18). While these results are close to the middle response of "neutral," which is an average response of "3," there is substantial variation around the mean answer. This is noted by the standard deviation column. This suggests that there were a substantial number of individuals suggesting they were familiar with other beaches, and a large number suggesting they were unfamiliar. As expected, single day visitors, who tend to be local are more familiar with beaches in Ohio.

The remaining questions suggest that this beach fares relatively well compared to other beaches the individuals could attend. Furthermore, the individuals would appear to prefer more beaches, and hence access to Lake Erie. Additional information on beaches, which is well distributed, could provide people with the necessary information to determine which beach to visit. These factors appear to be more important to single day visitors than multiple day visitors.

Maumee Bay State Park Beach

The survey at Maumee Bay State Park involved 607 individuals, of which 376 responded, indicating a response rate of 62 %. As with Headlands, some of these points were eliminated when respondents did not complete their entire survey. Of the remaining 331 responses, nearly one-third (101) were from individuals on multiple day trips. Figures 3 and 4 show visitor origins, where darker areas indicate a larger number of visitors from the particular county. Visitors to the Maumee beach tend to be more widely distributed, in terms of origin, than visitors to Headlands.

Single day visitors are more heavily focused on visiting the beach than multiple day visitors, but they spend less time on the beach than their counterparts at Headlands. Visitors also are less prone to link a trip to Maumee with a trip to see family. Perhaps because Maumee Bay State Park has more infrastructure associated with it, such as a lodge for overnight stays, visitors are traveling to the park itself, and using the beach as one of several activities. For the multiple day visitors, 10% stayed in the lodge while 70% camped. This differs dramatically from the proportions reported by Headlands visitors.

Travel distances for single day trips are approximately 35 miles and 86 miles for multiple day trips. The average trip distance for multiple day trips is higher for Maumee than Headlands. Most individuals on single day trips who travel a long distance to Maumee appear to be travelling specifically to visit the park, rather than to visit relatives or some other attraction at the Park or in the region. The size of groups at the beach is lower for the single day trips than the multiple day trips (Table 11).

Approximately 24% of the single day visitors reported this being their first trip to the Maumee beach, while 43% of the multiple day trips reported this being their first trip (Table 12). For both, this is higher than the Headlands. Single day visitors took an average of 6.0 trips to Maumee during the year, and multiple day visitors took 3.7 trips on average. In terms of total trips to all beaches (Table 13), single day visitors took more trips on average than multiple day visitors (7.4 compared to 5.4). These numbers are

consistent with the Headlands, although single day visitors to Maumee appear to take fewer trips on average than single day visitors to Headlands.

Expenditures for trips to Maumee beach are $34 for single day visitors and $213 for multiple day visitors (Table 14). Travel expenditures are approximately 27 % of single day expenses and 14 % of multiple day expenses. Travel expenses are lower for multiple day trips to Maumee than Headlands, suggesting that more people from local areas are traveling to that park, but they are spending the night or a weekend.

The average income is $47,168 for single day visitors and $52,750 for multiple day trips (Table 15). Visitors spend approximately 11 – 12 % of their income on recreation in any given year. The proportion spent on recreation is slightly higher than the Headlands park. The age distribution of visitors to Maumee is broadly consistent with Headlands, although multiple day visitors are slightly younger on average (Table 17).

Visitors to Maumee are most concerned with beach maintenance, cleanliness, and facilities. Facilities appear to be more important to visitors to the Maumee beach than to visitors to the Headlands beach, suggesting some relationship to the large investments that have occurred at Maumee in recent years. Water quality is important, but visitors do not appear to be overly concerned about Lake Erie water quality. Beach congestion does not appear to be a significant concern among beach-goers (Table 18). These numbers are fairly consistent for single and multiple day visitors, as well as for Maumee and Headlands visitors.

Questions related directly to the Maumee beach reveal that visitors agree that the beach is clean and well maintained, and that it has good facilities. However, there is substantial variation around the average on beach cleanliness and maintenance. Many individuals believe that the beach is well maintained while others have the opposite perception.

Concerns about water quality, for example those related to beach warnings and closures, may affect perceptions. These effects may be expected to be particularly strong among local single day visitors since they appear to take advantage of fewer alternative recreational opportunities at the beaches. However, little evidence for this is found in the questions 1 and 6. Interesting, multiple day visitors to Maumee are particularly sensitive to water quality in Lake Erie. This may indicate that the publicized increases in general water quality have enhanced recreation at Maumee Bay State Park.

The existence of nearby natural areas provide some additional reason to visit the beach, although the ranking for natural areas is not substantially different from a neutral ranking. Respondents did not indicate that they would visit more if beach facilities were better, or if the beach was cleaner and better maintained. The questions about water quality at Maumee beach suggest that visitors are neutral about it. Water quality does not appear to have a strong influence on beach visitation.

Comparison of Beaches

These results suggest that there are distinct differences between the Headlands and Maumee beaches. In particular, infrastructural development at the Maumee beach appears to attract individuals from a wider area. Given that 80% of multiple day visitors

stay in the lodge or camp, the Maumee Bay State Park appears to be the primary destination for visitors, with the beach serving as one of many alternative activities in which participate when there. At Headlands on the other hand, 50% of the multiple day visitors report staying with family. Individuals appear who travel to the general area for vacations, business, and family visits do elect to spend some of their time at the Headlands beach.

One of the initial questions that arose in developing this survey was whether beach visitors might also be spending time fishing when they are visiting the Lake Erie shoreline. There is little evidence that this is the case, given that beach visitors in both single and multiple day samples do not spend substantial time fishing (Tables 1 and 10). This supports the hypothesis that beach trips are separate from one of the other major recreational activities at Lake Erie, fishing.

The Maumee Bay State Park beach attracts individuals from a wider area on single day trips, but a smaller area on multiple day trips (Figures 1-4). This results from the reasons why individuals are visiting the beach. At Headlands, they are in the region to do something else (often from a long distance) and they visit the beach as an alternative activity. At Maumee, on the other hand, they are visiting the Park, with many different activities in mind.

This suggests to us that the Headlands beach is a strong local attraction, with the unrealized potential to attract more individuals traveling to the northeastern Ohio region. The Maumee beach is part of a destination package, where individuals are visiting the State Park, and taking advantage of the fact that it has a beach.

IMPLICATIONS

This data set provides a rich source of information for understanding the types of visitors to beaches along Lake Erie's shore in Ohio. These visitors can generally be classified as middle income. They spend approximately 4% of their recreational budgets on beach recreation each year, which amounts to less than 1% of their total income. They appear to be most interested in beach cleanliness, maintenance, and facilities rather than congestion and water quality. Associated natural areas provide some additional reason to visit the beaches, although these benefits are not substantial.

The two beaches surveyed are clearly different. The Headlands beach attracts a large set of local, single day visitors from northeastern Ohio, while Maumee attracts individuals from a wider region. One explanation may be the larger set of attractions that exist within the Maumee Bay State Park. These attractions include a lodge, a golf course, camping, and other amenities. Although the western basin of Lake Erie is known for its fishing, most visitors to beaches do not appear to fish during their trips to the beach.

These results allow us to make the following general conclusions:

1) *Lake Erie beaches have aspects of both local and regional public goods.*

The Headlands beach is a local public good. It attracts mainly individuals from a local area, particularly for single day trips. While multiple day visitors come from more distant locations, they are visiting the region for other reasons (i.e. family, attractions in

Cleveland, or just passing through), and traveling to the beach incidentally. The Headlands beach is an important local destination, but it also captures some incidental recreation from vacationers in the area.

The Maumee beach attracts two distinct sets of visitors: a local group of visitors on single day trips who are interested in the beach (as well as other amenities), and a more distant set of visitors attracted to the Park itself. The State Park itself is a destination, with the beach serving as a potentially important component of the basket of goods provided. This relates to the infrastructure developments that have occurred there in recent years.

2) *There is a committed set of single day beach visitors to each beach.*

While many visitors to these parks participate in a host of different activities, many of them are fairly focused on the beach experience itself. At Headlands, single day visitors spend 64% of their time on the beach, while at Maumee, single day visitors spend 56% of their time on the beach. When linked to visitation patterns, these individuals tend to make several trips to the beach each year, representing a large set of visitors making repeat trips. Visitors to these beaches do appear to take trips to other beaches during the season.

3) *Visitors are generally middle income, although a variety of income levels participate in beach recreation.*

The visitors in this survey were generally middle income, although the average value is weighted heavily by visitors with high incomes. Perhaps a more telling statistic is the median income of visitors to beaches. This value $42,879 for Headlands and $44,432 for Maumee. Median household income for Ohio residents in 1990 was $28,706 according to the US Census Bureau. Visitors to beaches have incomes above the general Ohio population.

4) *Beach users spend approximately 10% of their annual income on recreation in genera, but only a small percent of this on beach visitation directly.*

Beach users spend between 9 and 12% of their annual income on all recreational activities. Single day beach users spend approximately 4% of their total recreational budgets on beach visitation and related activities, but this is less than 1% of annual household income. This is consistent with the earlier results that beaches attract a large set of visitors from local areas, from which it is relatively inexpensive to travel to the beach. One hypothesis derived from this result involves determining how sensitive beach use is to changes in income. For example, will beach users travel to beaches more or less often if incomes are reduced? This question is not directly surveyed, but provides an interesting future research hypothesis.

5) *Environmental factors most important to beach users are cleanliness, maintenance, and facilities. Water quality appears to be important, but less so than the others. Congestion does not appear to be a major factor in beach participation decisions.*

The results on cleanliness, maintenance, and facilities provide an indication as to the amenities that beach users are most interested in obtaining. Congestion at this point does not appear to be a major problem. Interestingly, water quality is not as important as one might expect. These results may be related to recent improvements in the overall quality of water in Lake Erie, despite the fact that these beaches continue to be plagued by local water quality problems. One must be cautious in interpreting these results because the data in this survey does not allow us to account for this possible impact directly. Nevertheless, there is little evidence in this survey to suggest that these incidents are having a major impact on beach use and visitation.

REFERENCES

Villaplana, Jorge V. and Hushak, Leroy J. 1995. Outdoor recreation at Lake Erie. Mimeo. Department of Agricultural Economics. The Ohio State University.

Table 1: Proportion of trip allocation in different activities for Headlands beach, one and two-plus day samples.

	One Day		Two Day	
	Proportion	St. Dev.	Proportion	St. Dev.
Beach	0.64	0.34	0.33	0.25
Fishing	0.02	0.10	0.00	0.01
Hiking	0.07	0.19	0.13	0.15
Picnic	0.09	0.19	0.05	0.13
Shop	0.01	0.07	0.06	0.13
Festival	0.02	0.10	0.02	0.06
Family	0.02	0.08	0.23	0.35
Restaurant	0.05	0.12	0.07	0.09
Other	0.09	0.21	0.13	0.13

Table 2: Distance traveled and number of travelers for Headlands beach, one and two day samples. All distances reported in miles.

	One Day		Two Day	
	Miles or People	St. Dev.	Miles or People	St. Dev.
Distance from Beach to Home	26	24	175	114
Total Trip Distance	55	54	389	246
Persons Travelling	2.9	6.4	3.1	2.3

Table 3: Proportion of first time trips to the particular beach, proportion of sample reporting a given number of trips to Headlands beach, and average number of trips for the sample to Headlands.

	One Day		Two Day	
	Proportion	St. Dev.	Proportion	St. Dev.
First trip to this beach	0.07	0.26	0.32	0.00
Number of trips to this beach				
1-2	0.24	0.43	0.61	0.50
3-4	0.21	0.40	0.04	0.21
5-6	0.13	0.34	0.13	0.34
7-8	0.08	0.28	0.04	0.21
9-10	0.07	0.26	0.13	0.34
11-12	0.04	0.20	0.00	0.00
13-14	0.01	0.12	0.00	0.00
15+	0.21	0.41	0.04	0.21
Average trips to this beach	7.9	8.8	3.9	6.5

Table 4: Proportion reporting a given number of trips to all beaches in a given year and the average number of trips to all beaches reported.

	One Day		Two Day	
	Proportion	St. Dev.	Proportion	St. Dev.
Number of trips to all beaches				
1-2	0.17	0.38	0.24	0.44
3-4	0.19	0.40	0.29	0.46
5-6	0.14	0.35	0.05	0.22
7-8	0.07	0.25	0.19	0.40
9-10	0.08	0.27	0.05	0.22
11-12	0.07	0.26	0.10	0.30
13-14	0.05	0.21	0.00	0.00
15+	0.23	0.42	0.10	0.30
Average trips, all beaches	7.9	8.1	6.0	6.9

Table 5: Trip expenditures for visitors on trips.

	One Day		Two Day	
	Dollars	St. Dev.	Dollars	St. Dev.
Total Expenditures	$ 21.13	$ 39.06	$ 343.57	$ 246.10
Travel expenditures	$ 6.30	$11.67	$ 52.68	$ 50.59

Table 6: Proportion of visitors with Household incomes in a particular level.

	One Day		Two Day	
Income Level	Proportion	St. Dev.	Proportion	St. Dev.
<20,000	0.14	0.35	0.05	0.21
20,000 – 30,000	0.16	0.37	0.09	0.29
30,000 - 40,000	0.18	0.39	0.18	0.39
40,000 - 50,000	0.10	0.31	0.27	0.46
50,000 - 60,000	0.12	0.32	0.09	0.29
60,000 - 70,000	0.08	0.26	0.09	0.29
70,000 - 80,000	0.07	0.25	0.05	0.21
80,000 - 90,000	0.03	0.18	0.14	0.35
90,000 - 100,000	0.03	0.18	0.00	0.00
100,000 - 110,000	0.03	0.18	0.00	0.00
110,000 - 120,000	0.01	0.10	0.00	0.00
120,000 +	0.05	0.21	0.05	0.21
Average annual income	49,544		53,182	

Table 7: Proportion of visitors with particular recreational budgets and average percent and dollars of income spent on recreation.

	One Day		Two Day	
Expenditure Level	Proportion	St. Dev.	Proportion	St. Dev.
<5,000	0.23	0.42	0.14	0.35
5,000 - 10,000	0.41	0.49	0.55	0.51
11,000 - 15,000	0.17	0.38	0.05	0.21
16,000 - 20,000	0.09	0.28	0.27	0.46
21,000 - 25,000	0.06	0.23	0.00	0.00
26,000 - 30,000	0.02	0.14	0.00	0.00
31,000 - 35,000	0.02	0.12	0.00	0.00
35,000 +	0.01	0.09	0.00	0.00
Average Budget (percent)	0.10		0.09	
Average Budget ($$)	5,052		5,282	

Table 8: Age distribution of visitors.

	One Day		Two Day	
Age Class	Proportion	St. Dev.	Proportion	St. Dev.
< 17	0.01	0.08	0.00	0.00
18 - 25	0.10	0.30	0.00	0.00
26 - 35	0.20	0.40	0.09	0.29
36 - 45	0.30	0.46	0.43	0.51
46 – 55	0.21	0.40	0.22	0.42
56 - 64	0.11	0.31	0.13	0.34
65 - 75	0.06	0.25	0.13	0.34
75 +	0.01	0.12	0.00	0.00
Average Age (years)	43		48	

Table 9: Responses to particular questions

Question	One Day		Two Day	
	Prop.	St. Dev.	Prop.	St. Dev.
The following factors play an important role in deciding to go to the beach.				
1) Water Quality	4.14	0.95	4.17	0.94
2) Beach Maintenance	4.38	0.71	4.30	0.97
3) Beach Cleanliness	4.55	0.65	4.39	0.99
4) Congestion	3.77	1.00	3.87	0.87
5) Beach Facilities	4.04	0.80	3.91	1.04
6) Lake Erie Water Quality	3.47	0.95	4.22	0.60
Questions about the particular beach visited				
7) Water quality is good enough for swimming	3.57	0.92	4.22	0.52
8) The beach is clean and well maintained	3.88	0.84	4.48	0.67
9) The beach is safe	3.96	0.70	4.35	0.57
10) The beach is too congested or crowded	2.44	0.86	2.17	1.03
11) The beach has good facilities	3.63	0.93	4.00	0.80
12) I visit due to nearby nature areas	3.05	1.08	3.04	1.19
13) I would visit more if the beach was cleaner	2.90	1.13	2.39	1.03
14) I would visit more if the beach was less congested	2.70	1.02	2.26	0.92
15) I would visit more if the beach had better facilities	2.89	1.10	2.43	0.99
16) Water quality for swimming reduces my annual visit.	2.82	1.12	2.57	1.08
How does this beach compare to others				
17) I am familiar with other Lake Erie beaches	3.50	1.14	3.22	1.24
18) I am familiar with other beaches in Ohio	3.18	1.15	3.17	0.98
19) This beach has better water quality	3.13	0.77	3.19	0.82
20) This beach is better maintained	3.28	0.87	3.74	0.69
21) This beach is less congested	3.24	0.84	3.48	0.73
22) This beach has better facilities	3.26	0.83	3.61	0.72
23) More beaches should be provided	3.96	0.99	3.96	0.71
24) I am well informed about quality of all beaches	2.80	1.03	2.96	1.22
25) More information on beach quality would help me better determine which beach to visit.	3.68	1.07	3.74	0.92

Table 10: Proportion of trip allocation in different activities for Maumee beach, one and two-plus day samples.

	One Day		Two Day	
	Proportion	St. Dev.	Proportion	St. Dev.
Beach	0.56	0.35	0.30	0.20
Fishing	0.03	0.10	0.05	0.10
Hiking	0.09	0.18	0.18	0.15
Picnic	0.09	0.18	0.07	0.11
Shop	0.02	0.06	0.02	0.05
Festival	0.03	0.13	0.04	0.12
Family	0.04	0.17	0.05	0.15
Restaurant	0.04	0.11	0.03	0.06
Other	0.10	0.21	0.24	0.23

Table 11: Distance traveled and number of travelers for Maumee beach, one and two day samples. All distances reported in miles.

	One Day		Two Day	
	Miles or People	St. Dev.	Miles or People	St. Dev.
Distance from Beach to Home	35	41	86	70
Total Trip Distance	74	96	208	166
Persons Travelling	3.8	4.0	4.5	4.4

Table 12: Proportion of first time trips to the particular beach, proportion of sample reporting a given number of trips to Maumee beach, and average number of trips for the sample to Maumee.

	One Day		Two Day	
	Proportion	St. Dev.	Proportion	St. Dev.
First trip to this beach	0.24		0.43	
Number of trips to this beach				
1-2	0.29	0.45	0.47	0.50
3-4	0.23	0.42	0.22	0.42
5-6	0.15	0.35	0.16	0.37
7-8	0.09	0.28	0.07	0.25
9-10	0.09	0.29	0.03	0.18
11-12	0.02	0.13	0.02	0.15
13-14	0.02	0.13	0.00	0.00
15+	0.12	0.33	0.02	0.15
Average trips to this beach	6.0	7.8	3.7	5.6

Table 13: Proportion reporting a given number of trips to all beaches in a given year and the average number of trips to all beaches reported.

	One Day		Two Day	
	Proportion	St. Dev.	Proportion	St. Dev.
Number of trips to all beaches				
1-2	0.17	0.37	0.28	0.45
3-4	0.20	0.40	0.22	0.42
5-6	0.17	0.38	0.22	0.42
7-8	0.11	0.31	0.09	0.28
9-10	0.13	0.33	0.08	0.27
11-12	0.04	0.20	0.01	0.10
13-14	0.03	0.17	0.03	0.18
15+	0.15	0.36	0.08	0.27
Average trips, all beaches	7.4	7.5	5.4	6.7

Table 14: Trip expenditures for visitors on trips.

	One Day		Two Day	
	Dollars	St. Dev.	Dollars	St. Dev.
Total Expenditures	$ 33.74	$ 58.06	$ 212.63	$ 259.04
Travel expenditures	$ 9.06	$ 13.43	$ 30.10	$ 29.72

Table 15: Proportion of visitors with Household incomes in a particular level.

	One Day		Two Day	
Income Level	Proportion	St. Dev.	Proportion	St. Dev.
<20,000	0.15	0.36	0.07	0.26
20,000 – 30,000	0.17	0.37	0.11	0.31
30,000 - 40,000	0.18	0.38	0.13	0.34
40,000 - 50,000	0.13	0.34	0.18	0.39
50,000 - 60,000	0.09	0.28	0.13	0.34
60,000 - 70,000	0.09	0.29	0.17	0.38
70,000 - 80,000	0.06	0.24	0.13	0.34
80,000 - 90,000	0.05	0.23	0.02	0.15
90,000 - 100,000	0.04	0.19	0.01	0.11
100,000 - 110,000	0.01	0.09	0.02	0.15
110,000 - 120,000	0.01	0.12	0.00	0.00
120,000 +	0.03	0.16	0.02	0.15
Average annual income	$ 47,168		$ 52,750	

Table 16: Proportion of visitors with particular recreational budgets and average percent and dollars of income spent on recreation.

	One Day		Two Day	
Expenditure Level	Proportion	St. Dev.	Proportion	St. Dev.
<5,000	0.19	0.39	0.21	0.41
5,000 - 10,000	0.44	0.50	0.30	0.46
11,000 - 15,000	0.17	0.37	0.18	0.38
16,000 - 20,000	0.11	0.31	0.09	0.29
21,000 - 25,000	0.05	0.22	0.12	0.33
26,000 - 30,000	0.03	0.16	0.10	0.30
31,000 - 35,000	0.02	0.13	0.00	0.00
35,000 +	0.00	0.07	0.00	0.00
Average Budget (percent)	0.11		0.12	
Average Budget ($$)	$4,985		$ 6,488	

Table 17: Age distribution of visitors.

	One Day		Two Day	
Age Class	Proportion	St. Dev.	Proportion	St. Dev.
< 17	0.01	0.09	0.00	0.00
18 - 25	0.07	0.26	0.04	0.21
26 - 35	0.23	0.42	0.34	0.48
36 - 45	0.32	0.47	0.30	0.46
46 – 55	0.19	0.39	0.15	0.36
56 - 64	0.08	0.27	0.14	0.35
65 - 75	0.08	0.27	0.02	0.15
75 +	0.02	0.13	0.00	0.00
Average Age (years)	43		41	

Table 18: Responses to particular questions

	One Day		Two Day	
Question	Prop.	St. Dev.	Prop.	St. Dev.
The following factors play an important role in deciding to go to the beach.				
1) Water Quality	4.25	0.93	4.38	0.79
2) Beach Maintenance	4.50	0.63	4.47	0.72
3) Beach Cleanliness	4.59	0.58	4.66	0.60
4) Congestion	3.86	0.91	3.85	0.98
5) Beach Facilities	4.26	0.77	4.09	0.86
6) Lake Erie Water Quality	3.36	1.01	3.40	0.94
Questions about the particular beach visited				
7) Water quality is good enough for swimming	3.32	1.02	3.53	0.85
8) The beach is clean and well maintained	4.51	3.45	4.24	0.73
9) The beach is safe	4.14	0.87	4.13	0.74
10) The beach is too congested or crowded	2.38	0.97	2.43	0.97
11) The beach has good facilities	4.29	0.75	4.26	0.78
12) I visit due to nearby nature areas	3.48	0.99	3.46	1.02
13) I would visit more if the beach was cleaner	2.52	1.13	2.68	1.03
14) I would visit more if the beach was less congested	2.54	1.00	2.45	0.83
15) I would visit more if the beach had better facilities	2.39	0.94	2.26	0.79
16) Water quality for swimming reduces my annual visit.	3.22	1.20	2.74	0.99
How does this beach compare to others				
17) I am familiar with other Lake Erie beaches	3.52	1.11	3.23	1.25
18) I am familiar with other beaches in Ohio	3.26	1.14	3.12	1.25
19) This beach has better water quality	2.99	0.94	3.11	0.80
20) This beach is better maintained	3.74	0.86	3.75	0.83
21) This beach is less congested	3.32	0.89	3.47	0.84
22) This beach has better facilities	3.81	0.84	3.77	0.90
23) More beaches should be provided	3.96	0.94	3.84	0.85
24) I am well informed about quality of all beaches	2.91	0.95	2.68	1.08
25) More information on beach quality would help me better determine which beach to visit.	3.77	0.99	3.66	1.06

Figure 1: Number of visitors from counties for Headlands beach survey, 1 day trips.

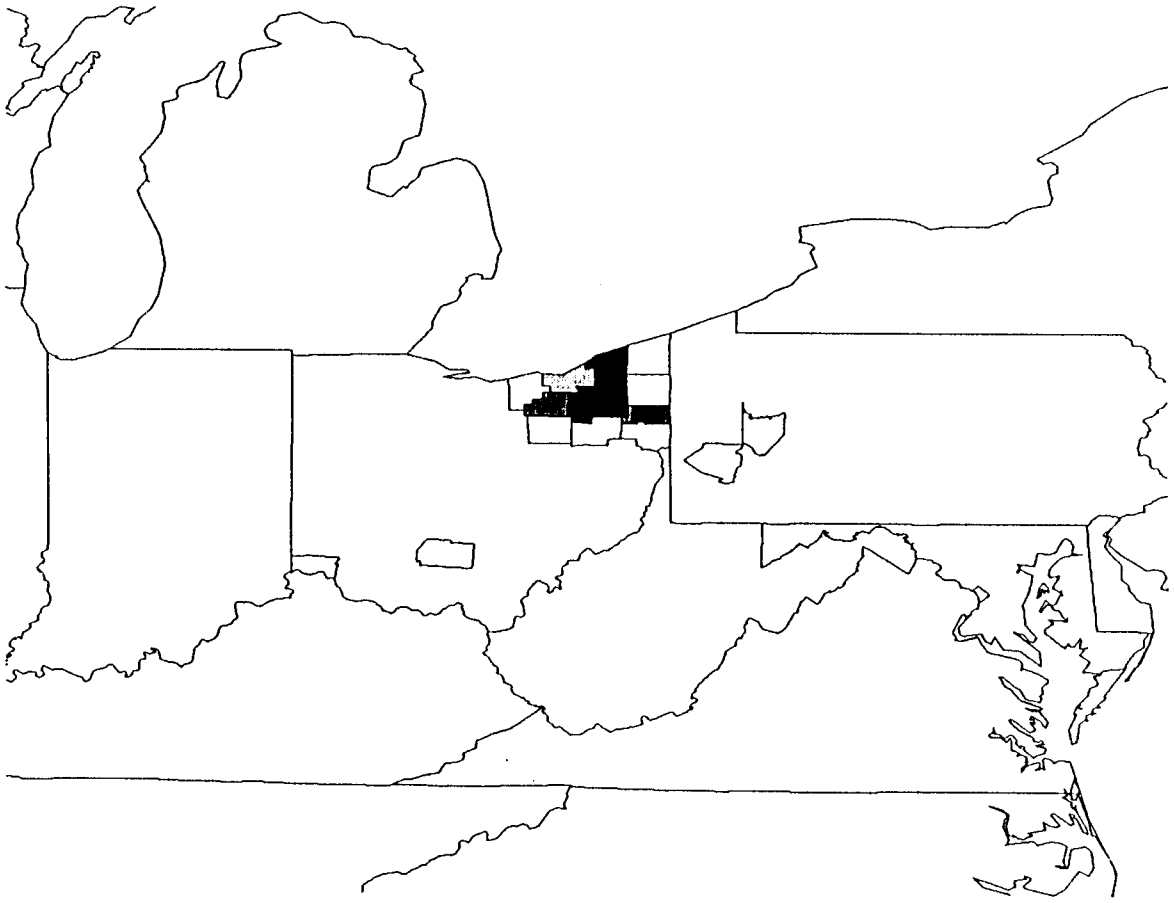

Figure 2: Number of visitors from counties for Headlands beach survey, 2 day trips.

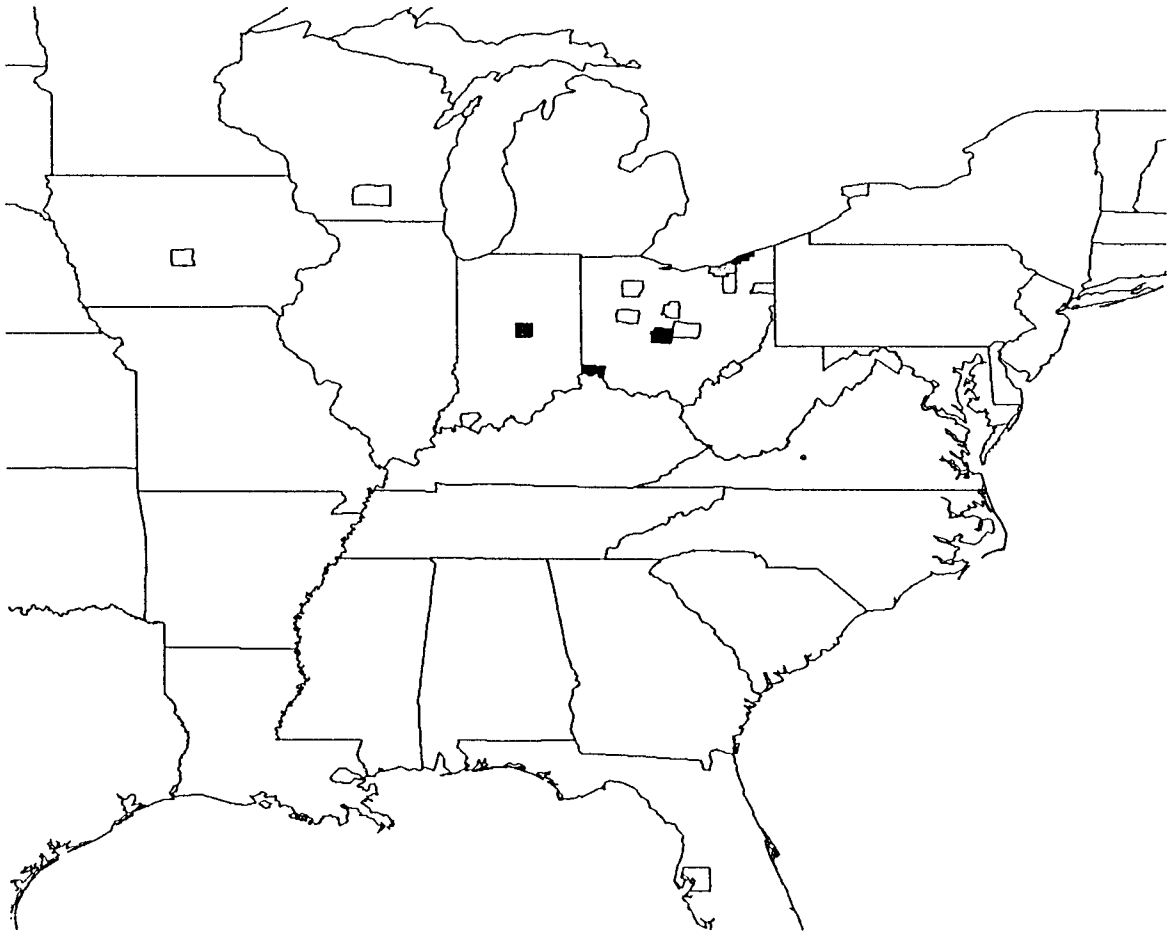

Figure 3: Number of visitors from counties for Maumee beach survey, 1 day trips.

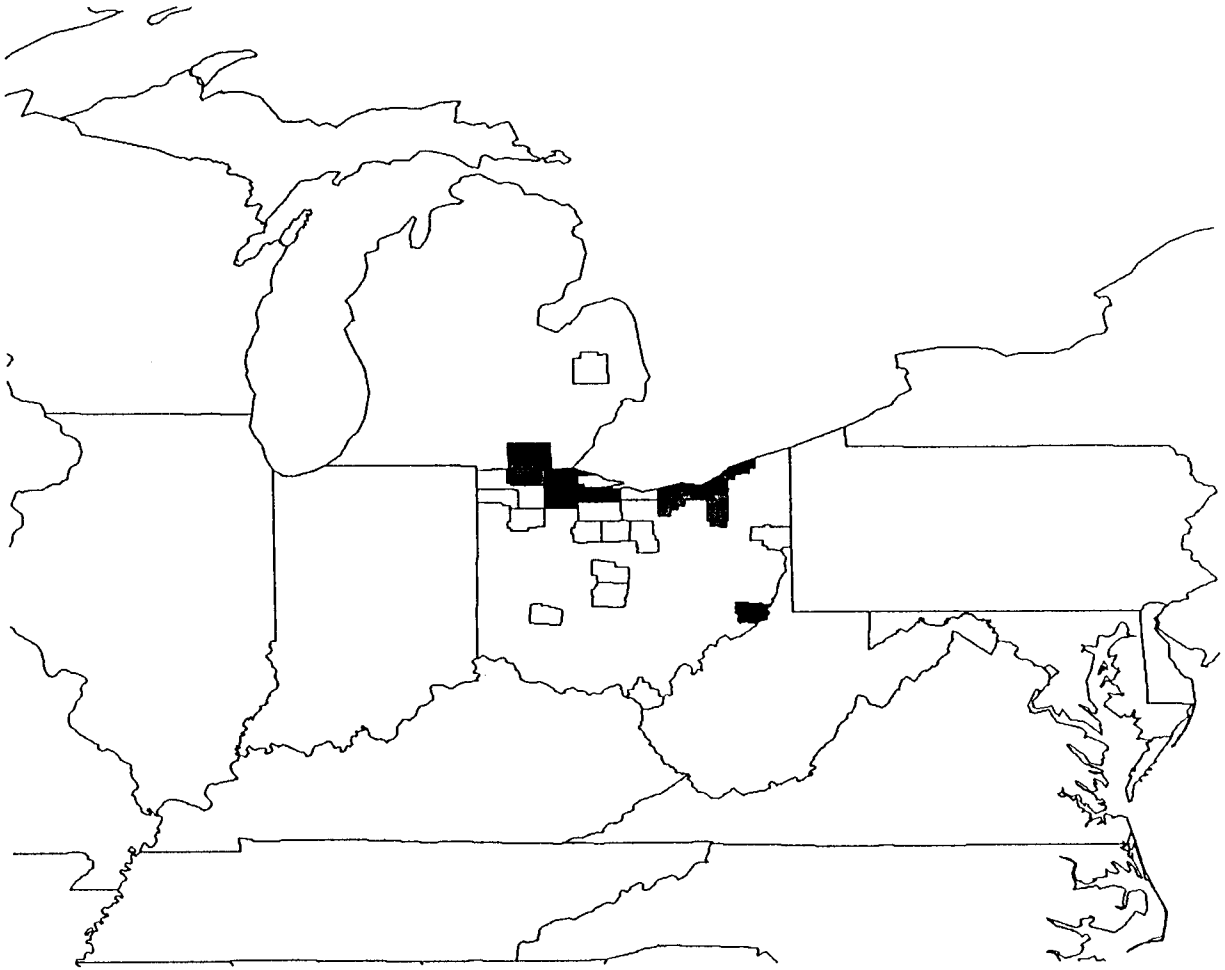

Figure 4: Number of visitors from counties for Maumee beach survey, 2 day trips.