

Outdoor Recreation at Lake Erie

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Introduction

Lake Erie's U.S. Shore supports many recreational outlets and activities, such as state parks and amusement parks, lake cruises, and widespread fishing and boating. Because of the importance of these activities to regional and local development, the economic impact and the demographic characteristics and preferences of visitors to Lake Erie have been studied for some time. There is an increasing participation rate in most recreational activities and most visitors to Lake Erie live within one hundred miles of the Lake.

While Lake Erie's environment has become more amiable and the region seems to be enjoying a sustained increase in the number of visitors with its corresponding economic repercussions, some recreational activities are currently affected by the introduction of non-native species. Among these species, the zebra mussel, which arrived in the Great Lakes in the mid-eighties, is of great importance.

Without many natural predators in the Lake's ecosystem, the zebra mussel has reproduced rapidly, invading the habitats of other species and strongly attaching itself to boats and marine structures. The potential for heavy cleaning, maintenance and prevention expenses for boat owners, marinas, municipalities, and utility companies suggest that the economic impact of the zebra mussel should be further studied.

With the objectives of a) studying the characteristics and preferences of visitors to Lake Erie, and b) assessing the recreational economic impact of the zebra mussel and other environmental changes, a survey of Ohio and Michigan licensed drivers was conducted from November 1992 throughout February 1993. The size of the sample was 3072 drivers: 1571 from Ohio and 1501 from Michigan. Names and addresses were randomly selected by the respective state's Bureau of Motor Vehicles.

The area of the study includes all of those counties in Ohio and Michigan with 50 percent or more of their land area within 150 miles of the Lake Erie U.S. shoreline. Since parts of Indiana, Pennsylvania, and New York are within the boundaries defined above, we attempted to include parts of these states that met the criteria; however, we were unable to obtain samples of licensed drivers from any of these states. Three mailings were sent. The first and the third included a questionnaire; the second was a reminder letter. A total of 828 questionnaires were returned for a response rate of 27 percent. Of these, 408 identified Ohio and 398 identified Michigan as the state of residence.

Characteristics of the Sample

Respondents to the survey were classified according to their county of origin and their proximity to Lake Erie's shore. Nearly fifty percent of the respondents reported living in counties on the lake shore or adjacent to a county on the lake shore. The metropolitan areas of Akron, Cleveland, Detroit, Toledo, and Youngstown are mainly responsible for this result, which is consistent with the population density of the area under study. Thirty one percent of the respondents (253 of 820) reported visiting Lake Erie in 1992. Thirty-three percent of the respondents reported visiting Lake Erie in 1991 (267 out of 811).

The average age of the respondents was 44.1 years, and 55.6 percent of the respondents were males. The average family size and income per household was 2.41 and \$43,600/year, respectively. Respondents averaged 13.6 years of schooling and nearly 60 percent of them were fully employed. Figures 1 through 5 illustrate these demographic characteristics.

Age Distribution of the Respondents In Years

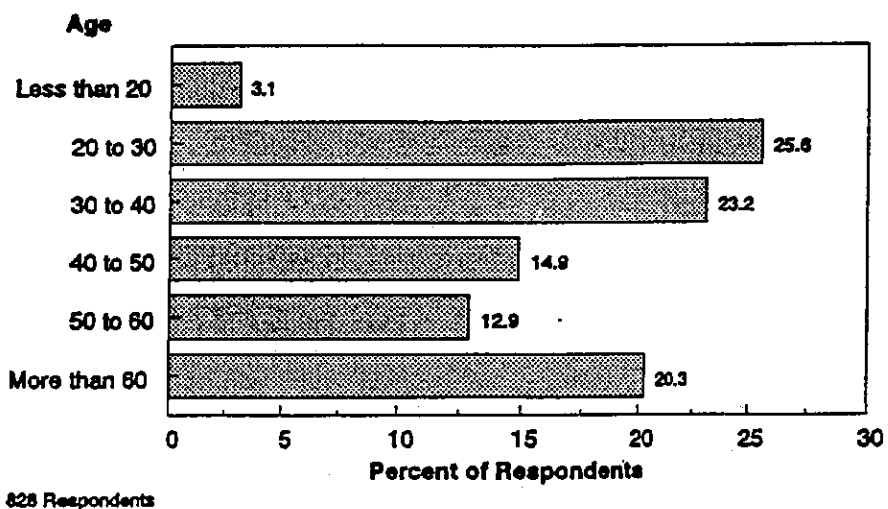


Figure 1

Recreational Participation, All Sites

Respondents indicated shopping as the most popular activity; nearly 62 percent of them had a recreational shopping outing at least one time during 1992. Table 1 shows some of the most frequent activities.

Table 1. Frequency of Participation in Selected Recreational Activities, All Sites, 1992

Activity (N)	Frequency of Visits (Percent)		
	None	1 to 10	More than 10
Shopping (781)	38.7	29.3	32.0
Sight-seeing (792)	41.8	43.3	14.9
Picnicking (797)	45.8	42.5	11.7
Swimming (800)	53.9	33.5	12.6
Trail Activities (786)	57.0	31.9	11.1
Sunbathing (792)	59.7	27.0	13.3
Amusement Park (792)	61.2	36.9	1.9
Fishing (803)	62.6	25.5	11.8

Sight-seeing (461 of 792) and picnicking (433 of 797) are the activities with the largest number of participants after shopping. Among water related activities swimming and fishing are the most important. A third of the respondents reported going swimming 1 to 10 times during 1992. Similarly, a quarter of the respondents fished 1 to 10 times in 1992.

Respondents were asked about the sites they visited when participating in outdoor recreation during 1990, 1991, and 1992 and were asked to indicate the number of visits to each site. The sites more frequently visited were parks. Local, metropolitan, state, and national parks were visited by more than sixty percent of the respondents. These results are presented in Table 2.

Table 2. Frequency of Visits to Recreational Sites, by Type of Site, 1992

Recreational Site (N)	Frequency of Visits (Percent)		
	None	1 to 15 times	More than 15 times
National and State Parks (797)	36.8	56.3	6.9
Metro and Other Local Parks (793)	37.3	51.3	11.3
Inland Lakes and Rivers (794)	40.4	42.9	16.6
Amusement Parks (787)	51.3	47.3	1.4
Private Ponds and Campgrounds (777)	56.2	35.8	8.0
Other Great Lakes (789)	56.9	35.2	7.9
Lake Erie U.S. Sites (804)	57.8	36.2	6.0

Recreational Participation, Lake Erie

Grouping visitors to Lake Erie by state showed that most visitors came from Ohio in contrast to Michigan. The results are reversed when we look at trips to other Great Lakes. Michigan residents showed a stronger preference for these sites over Lake Erie, probably induced by their easier access from Michigan.

Typical visitors made 5.7 trips and travelled 77 miles to their favorite site on Lake Erie during 1992. Michigan visitors travelled 107 miles, stayed for 1.8 days, and made 4.3 trips. Ohio visitors travelled 66 miles, stayed for 2 days, and made 6.3 trips. The average length of stay was 1.89 days for the typical group of 3.6 persons visiting Lake Erie, compared to 1.97 days in 1991. Expenses were about \$170 per trip, resulting in an average expenditure of \$25 per person per day. Figure 6 shows the distances travelled by visitors to their favorite sites in 1992.

Respondents were classified according to their final destination on Lake Erie. Sixty percent of the visitors (148 of 247) visited Ohio's Ottawa, Lake, and Sandusky counties. The amenities in this region include Sandusky Bay, the islands, Cedar Point, and the center of the fishing region. The inclusion of Lucas County and the Michigan shoreline completes the Western Basin area, which accounts for 205 visitors; Figure 7 shows the percent of respondents by distance travelled.

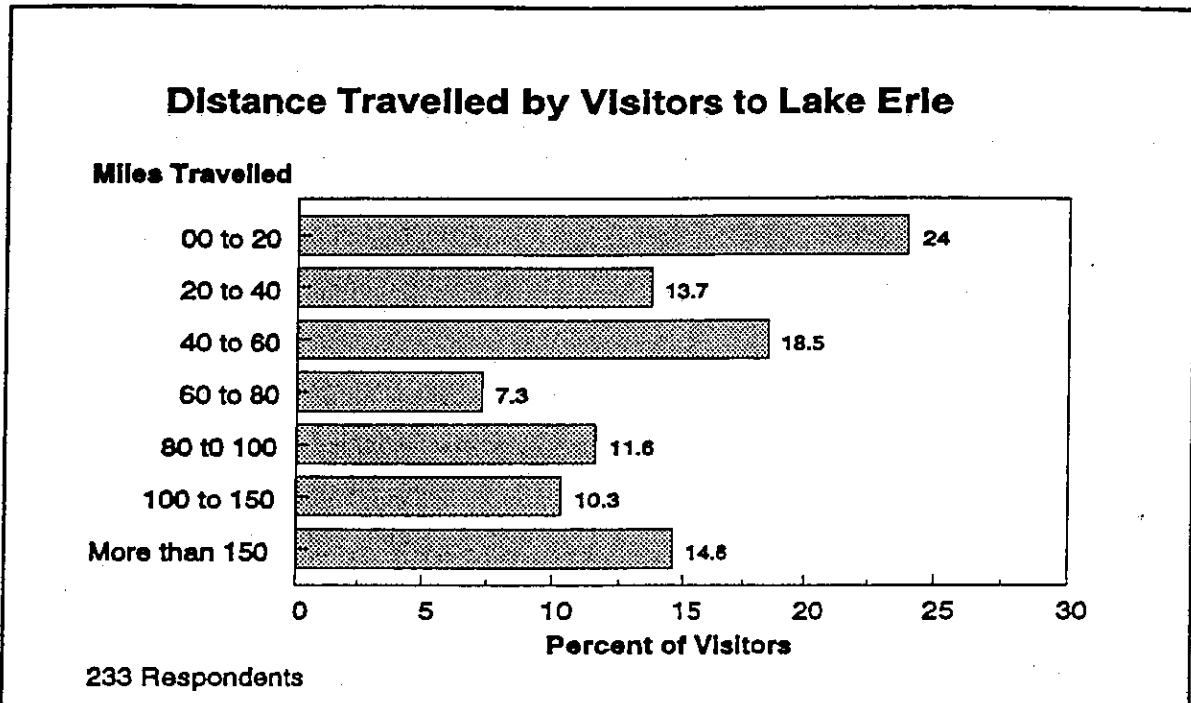


Figure 6

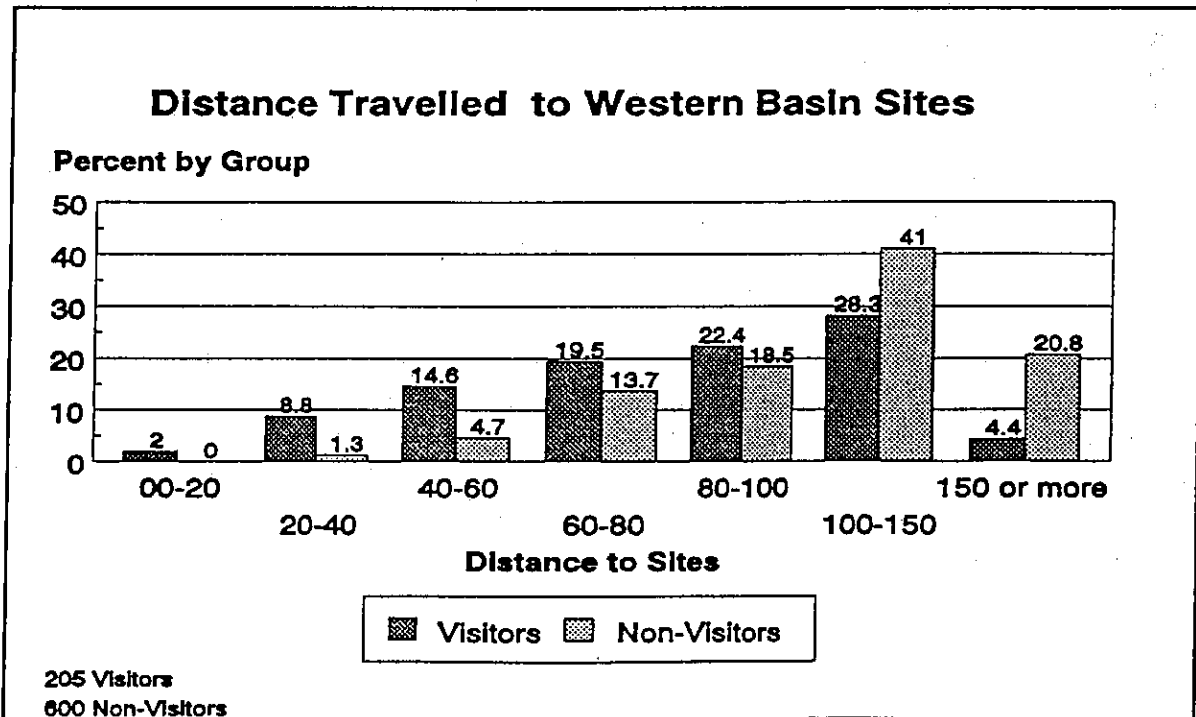


Figure 7

Environmental Changes

The introduction of new recreational alternatives, changes in characteristics of the existing amenities, and the introduction of non-native species can affect the perceived quality of recreational activities and may influence the choice among sites. Tables 3, 4, and 5 illustrate some of the results.

Recreational Activity (N)	Satisfaction Level Change (Percent)		
	Decrease	Same	Increase
Jet Express (207)	2.9	85.5	11.6
Dinner Cruises (210)	1.0	88.1	11.0
Lake Cruises (205)	2.0	86.8	11.2
Ship Museums (206)	1.9	85.0	13.1
Improved Amusement Parks (222)	3.6	68.5	27.9
Maumee Bay State Park (213)	0.9	83.6	15.5
More Shopping Outlets (213)	4.7	76.1	19.2
The Flats (218)	5.0	72.9	22.0

Respondents indicated that all new recreational alternatives increased satisfaction for at least 11 percent of the visitors and decreased it for 5 percent or less. Table 3 illustrates how improved amusement parks, the Flats, more shopping outlets, and Maumee Bay State Park are definitively winners with joint rates (same and increase in satisfaction level) of ninety-five percent or more.

In Table 4, water clarity and beach pollution generated opposite responses suggesting that visitors have widely different perceptions about how these changes affect their recreation quality. Contaminants and pollutants and beach pollution are perceived by nearly 40 percent of the respondents as factors decreasing satisfaction. A large number of respondents reported no change in the satisfaction level regarding the introduction of artificial reefs. This could result from the respondents' lack of knowledge about the Ohio reefs' existence or locations.

Table 4. Change in Satisfaction Levels from Changes in Environmental Characteristics and Amenities, by Type, 1992

Environmental Characteristics and Amenities (N)	Satisfaction Level Change (Percent)		
	Decrease	Same	Increase
Water Clarity (236)	20.8	44.9	34.3
Beach Pollution (239)	39.7	41.8	18.4
Beach Congestion (233)	30.9	63.1	6.0
Artificial Reefs (227)	5.3	87.7	7.0
Water Level Changes (231)	16.5	77.1	6.5
Fish Contaminant Advisory (231)	29.0	60.2	10.8
Contaminants and Pollutants (230)	44.8	44.8	10.4

Respondents were asked whether the presence of the zebra mussel had influenced the time they spend at Lake Erie. Nearly 90 percent of the respondents (238 of 266) answered no. Of the remaining 10 percent, 22 individuals said that time spent at the lake had decreased, and 5 said it had increased. These results along with those of Table 5 suggest that while the zebra mussel has had a negative impact on the visitor's satisfaction level, the time they spend at the lake has not decreased. Other non-indigenous species have had a much smaller impact on visitor satisfaction levels.

Table 5. Change in Satisfaction Levels from Non-Indigenous Species Introductions, by Species, 1992

Non-Indigenous Species (N)	Satisfaction Level Change (Percent)		
	Decrease	Same	Increase
Spiny Water Flea (202)	6.9	93.1	0.0
Zebra Mussel (213)	33.8	60.6	5.6
White Perch (208)	11.1	81.2	7.7
Fresh Water Ruffe (203)	2.0	95.1	3.0
Tube-nose Goby (200)	3.0	96.5	0.5

Respondents were asked to assess whether new recreation activities, environmental changes and non-indigenous species had affected the attractiveness of several recreational

activities. Fishing, swimming, and sunbathing show relatively large decreases in attractiveness, while sight-seeing, amusement parks, and shopping show relatively large increases in attractiveness. Table 6 shows these results.

Table 6. Change in Attractiveness of Recreational Activities due to New Recreational Activities, Environmental Changes, and Non-Indigeneous Species, by Activity, 1992

Activity (N)	Change in Attractiveness (Percent)		
	Decrease	Same	Increase
Fishing (226)	20.8	62.4	16.8
Camping (217)	9.2	78.3	12.4
Swimming (221)	25.8	56.6	17.6
Sunbathing (218)	16.1	73.4	10.6
Picnicking (220)	8.6	73.6	17.7
Pleasure Boating (217)	4.6	77.9	17.5
Trail Activities (217)	5.1	80.6	14.3
Sightseeing (221)	7.2	69.2	23.5
Amusement Parks (220)	4.5	72.7	22.7
Shopping (206)	4.4	73.8	21.8

Interaction of Environmental Factors

The interaction between some of the environmental variables is better visualized by cross-tabulating some of the responses. Tables 7, 8 and 9 show the interactions between the zebra mussel and water clarity, beach pollution, and beach congestion, respectively. The responses for each of the zebra mussel alternatives (*decrease, same, and increase*) are split among the same alternatives for water clarity, beach pollution, and beach congestion. In Table 7, for example, of the 68 respondents who reported that the zebra mussel had decreased their satisfaction level, 19 said that water clarity had also decreased their satisfaction level, while 25 said their satisfaction level was the same, and 24 said their satisfaction level had increased.

Most of the responses fall under the *same or no [satisfaction] change* category (which includes the *don't know* choice). However, respondents appear to be unaware of a relationship between increased water clarity and the zebra mussel although this relationship appears to be very strong. Or, the lack of relationship may result from differing goals of visitors; anglers who believe that increased water clarity has decreased fishing quality vs. swimmers and beach users who like increased water clarity.

Tables 8 and 9 show a stronger linkage between the zebra mussel and decreased satisfaction from beach pollution and beach congestion. In Table 8, for example, of the 68 who said the zebra mussel had decreased their satisfaction level, 34 said that beach pollution had decreased their satisfaction level, 21 said their satisfaction level had remained the same, and 13 said their satisfaction level had increased.

Table 7. Cross-tabulation of Changes in Satisfaction from the Zebra Mussel and Changes in Water Clarity

Zebra Mussel (N)	Water Clarity (N)		
	Decrease (40)	Same (91)	Increase (73)
Decrease (68)	19	25	24
Same (126)	20	64	42
Increase (12)	1	2	9

Table 8. Cross-tabulation of Changes in Satisfaction from the Zebra Mussel and Changes in Beach Pollution

Zebra Mussel (N)	Beach Pollution (N)		
	Decrease (79)	Same (88)	Increase (40)
Decrease (68)	34	21	13
Same (126)	38	64	25
Increase (12)	7	3	2

Table 9. Cross-tabulation of Changes in Satisfaction from the Zebra Mussel and Changes in Beach Congestion

Zebra Mussel (N)	Beach Congestion (N)		
	Decrease (59)	Same (132)	Increase (13)
Decrease (68)	23	40	3
Same (126)	33	85	8
Increase (12)	3	7	2

Table 6 presented fishing, swimming, and sunbathing as negatively affected by environmental changes. Part of a cross-tabulation of selected environmental changes with these activities is given in Table 10. In each cell of Table 10 is listed the number of respondents who said that the environmental changed decreased satisfaction and the reported activity became less attractive. For example, of those who reported fishing as less attractive (47), 26 also reported a decrease in satisfaction due to the zebra mussel (total of 72). This result seems to be consistent with the current belief that the zebra mussel has negatively impacted fishing activities. Of the 57 who reported swimming as less attractive, 42 of 95 also reported a decrease in satisfaction due to beach pollution.

Table 10. Respondents Who Jointly Said Fishing, Swimming or Sunbathing were Less Attractive and Satisfaction Decreased Because of the Zebra Mussel, Water Clarity or Beach Pollution.

Activities Reported as less Attractive	Visitors Reporting Satisfaction Decrease		
	Zebra Mussel (72)	Water Clarity (49)	Beach Pollution (95)
Fishing (47)	26	13	22
Swimming (57)	27	27	42
Sunbathing (35)	14	20	26

Probit Model

Visits to Lake Erie can be interpreted as the result of a binary choice, whether to visit Lake Erie or not. A probability model was constructed to determine the impact of demographic, environmental, and geographical variables on this decision. The results of the model indicated that proximity to the Lake and previous visits increase the probability of making a trip. Increases in the respondents' family size, years of schooling, and age had a negative effect. Neither the zebra mussel nor water clarity had a significant effect, positive or negative, on the decision to visit Lake Erie.

Comparison to 1990 survey

By exclusively looking at the responses given by Ohio residents it is possible to compare the results of the 1992 survey with those of the 1990 survey (reported in OHSU-TS-023). The results are presented in Table 11.

Table 11. Comparison of Mean Responses Between 1990 and 1992 Surveys of Ohio Licensed Drivers Visiting Ohio's Lake Erie Coast.

Characteristic	1990	1992
Male/Female Visitor Percentage	55/45	58/42
Years of Schooling	14	13.6
Age in Years	41	43.7
Average Income in Dollars	41300	40776
Boat Ownership Percentage	60	57
Year of First Visit to Lake Erie	1969	1971
Mean Distance Travelled in Miles	79	66.5
Average Number of Trips per Year	11.16	6.31
Length of the Stay in Days	2.35	1.97

The results show very small differences for the demographic characteristics. However, the core variables of interest-- distance traveled, the number of trips and the length of stay-- show substantial decreases from 1990 to 1992 (the years evaluated in the surveys). While the distance traveled and the length of stay can be explained by the 150 mile restriction imposed on the 1992 sample, the number of trips decreased significantly while it was expected to increase. Those who live closer to the lake are expected to make more, but shorter trips.

In the 1990 survey, 51 percent (of 185) reported a worsening of the quality of the fishing experience due to the zebra mussel. In 1992, only 21 percent (of 226) indicated fishing was less attractive due to the zebra mussel. Unfortunately, in neither the 1990 nor 1992 surveys did we ask those who did not visit Lake Erie about their perception of quality changes and whether those changes caused them to stop visiting the lake.

Data regarding outdoor activities were not available for comparison because the surveys were structured in different formats.

Summary and Conclusions

The results of the survey suggest that visitors to Lake Erie perceive it as an important source for recreation, particularly for Ohio residents. The number of visitors from Michigan reflects their access to alternative outdoor recreational opportunities, particularly closer access to other Great Lakes. The average distance travelled by Ohio visitors to Lake Erie remained roughly the same (if we consider that only part of the state was included in this study), yet the length of stay decrease from 2.35 days in 1990 to 1.97 in 1992, and the number of trips per year decreased from 11.2 to 6.3. While it is not clear what is behind these changes, it may just be the case that preferences have changed and recreators would rather visit other places.

The impact of new amenities such as the Flats or Maumee Bay State Park seems to be positive as suggested by the increase in the satisfaction level reported by the respondents. On the other hand, environmental characteristics like water clarity or beach pollution show mixed satisfaction changes. It is not clear whether the responses are based on prejudice, on an uneven improvement of these characteristics throughout the lake, or just simply on different perceptions of the respondents. Future research may provide some answers in this regard.

The impact of non-native species appears to be minimum. While the zebra mussel seems to be the most widely known of them, its impact on water related activities is less than expected and probably is not affecting the number of trips taken to the lake as the results of the probit model suggest. However, it is possible to argue that all those visitors who were negatively affected by the mussel have already stopped visiting the lake, suggesting a dynamic process that weeds out unhappy visitors that was not captured by our data.

Only 26 visitors showed a decrease in their satisfaction level and reported fishing as less attractive. This seems to suggest that while they still consider the mussel to be a nuisance, fishing participants may be adapting to inconveniences brought about by the zebra mussel.