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BENEFITS TO BEACH USERS FROM WATER QUALITY IMPROVEMENTS

R. A. C. PROJECT NO. 374C

Environment Ontario

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ABSTRACT

This report documents an empirical study of the value of water quality improvements at beaches in Ontario. A user survey was undertaken to develop basic descriptive information on beach use behaviour and water quality perceptions in Ontario. Beach users are shown to develop accurate perceptions of water quality conditions. The posting of beaches is a key determinant of this perception and is also a significant factor affecting decisions to use beaches. The estimated annual benefit associated with improved water quality at beaches ranges from $60 to $70 per household. The estimated annual loss caused by a deterioration of water quality ranges from $10 to $50 per household.

A new approach to the valuation of environmental amenities based on "contingent use" data is successfully applied and compared to standard approaches. The research also explores key methodological issues. For instance, the treatment of extreme values held by some survey respondents is identified as a potentially significant source of bias in the analysis. An aversion to paying more taxes is estimated to depress the stated willingness to pay for improvements by $30.The opportunity cost of travel time for recreation was estimated to be 12% of the wage rate rather than 25% to 50% as is usually assumed in this type of research.

Opportunities for additional analysis based on the survey data are described and a hypothetical case is used to demonstrate how the results of the analysis in this report can be applied in the evaluation of investments to improve water quality at beaches.

EXECUTIVE SUMMARY

Beach users will remember the summer of 1983 as an unseasonably hot and dry summer when an unusually high number of their favourite beaches were posted due to bacterial contamination. The resulting public and media outcry led to the formation of the Beach Management Program by the Ontario Ministry of the Environment. Under this program, research into causes of the bacterial contamination identified sources such as combined sewer overflows, illegal sanitary connections to storm-sewers and the mismanagement of livestock manure. Remedial measures for these problems often have a high price tag but there is generally little information describing the magnitude of benefits that such measures would generate; without such information, it is difficult to justify high investment costs for remedial measures. Assessments of the demand for beach recreation can provide the information on user benefits that allow an evaluation and prioritization of beach clean up investments.

A ground breaking study was completed in 1987 that provided the basic structure of a planning tool to evaluate and prioritize site-specific remedial measures for Ontario beaches (Usher, Ellis and Michalski, 1987). However, in the absence of a body of existing research findings, the authors of this model were forced to make ad hoc assumptions to describe how beach users would respond to changes in water quality. Moreover, they were not able to derive monetary estimates of the benefits associated with water quality improvements.

This report describes a subsequent study, sponsored by the Ministry of the Environment, that undertook to fill some of the gaps in our understanding of beach user behaviour. Objectives of the study were:

- to monitor beach use and beach attributes, including water quality, over a recreation season at several Ontario beaches;
- to interview beach users concerning beach use behaviour and water quality perceptions;
- to develop and compare alternative measures of the value of water quality to beach users.

The principal findings of this research can be summarized as follows:

1. OVERVIEW OF BEACH USE

Descriptions of the attributes of beach users and of beach visits is basic information that can be used in planning investments for water quality improvements at beaches as well as other types of investments in beach facilities. From this study, some of the main attributes were:

- Thirty to 60 percent of all respondents at each of the surveyed beaches originated from a single large community near the beach. Their average one way travel time was 23 minutes and the average travel distance, 22 kilometres.
- Average party size was 4.1 persons and 53 percent of all groups included children under the age of 12.
- The mean length of stay at the beach was four hours with 91 percent of all visits lasting less than six hours.
- The average out-of-pocket trip cost for parties of beach visitors was $22.

2. WATER QUALITY PERCEPTIONS

Water quality perceptions will govern how beach users respond to changes in water quality conditions. In this study, it was found that:

- The most frequent type of comment on water quality was a general expression of concern over poor quality conditions (31 percent of all comments). Other frequent comments dealt with algae, water clarity and bacterial contamination. Non of the respondents raised the issue of toxic substances.
- Perceptions of water quality attributes such as clarity and odour were consistent with corresponding field measurements of those attributes.
- A strong correlation existed between perceptions of posting frequency and the actual incidence of posting.
- Beach closures have a predominant impact on user perceptions of beach water quality.

3. WILLINGNESS TO PAY FOR WATER QUALITY

Respondents were asked how much they would be willing to pay over the period of a year to assure very good water quality at Ontario beaches that they use:

- Twenty-eight percent of respondents were unwilling or reluctant to pay anything.
- The majority of respondents were willing to pay less than $100 per year and the mean and median payments were respectively $62 and $30 per year.
- If concern was expressed by a respondent over paying more taxes, then the stated willingness to pay was $30 less on average.
- The payment amount increased by $8 for every $10,000 in gross household income.
- Willingness to pay increased with the total number of beach trips made by the respondent.

4. FACTORS AFFECTING HOUSEHOLD BEACH USE

Beach use activity can be described using a travel cost model. This is a statistical model that shows how the frequency of beach use by a household is affected by the travel costs incurred to get to the beach as well as by other factors. A travel cost model was developed in this study. Factors that were used to describe beach visitation frequency in this model were:

- unavoidable out-of-pocket trip costs,
- the opportunity cost of travel time for employed household members,
- overall water quality ratings by respondents,
- beach crowding, and
- gross household income.

5. HOUSEHOLD BENEFITS FROM BEACH VISITS

Consumer surplus is an indirect measure of the benefit that a household derives from beach visits. It is a measure of intrinsic value to the beach user rather than a measure of spin-off benefits to the local economy arising from recreation expenditures by beach users. Estimates of the magnitude of consumer surplus can be derived using a travel cost model. Where the level of beach use increases with improved water quality, then corresponding increases in consumer surplus measure the value to the user of the water quality improvement:

- Beach visits under existing water quality conditions at the survey beaches were estimated to have an annual consumer surplus value per household ranging between $24 and $111,
- If water quality conditions at the survey beaches were improved from existing conditions to very good conditions entailing virtually no postings, this improvement would have an average value among beach using households of $60 to $70 per annum.

CONCLUSIONS

An number of conclusions follow directly from this research:

- Beach users develop reasonably accurate perceptions of water quality conditions, such as odour or clarity, that can be detected by casual observation.

- Posting of beaches is a key factor affecting the perception of water quality by beach users.

- Perceived water quality at beaches is a significant factor affecting decisions to use beaches.

- Beach users will incur higher costs in order to get to a beach with better water quality and are willing to pay for water quality improvements at beaches.

- The benefit to users arising form improved water quality at beaches can be measured and decisions to allocate scarce funds for remedial measures at beaches will yield greater returns if user benefits are estimated and considered in making such decisions.

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This research was funded by the Research Advisory Committee of the Ontario Ministry of the Environment (Project No. 374C). The project study team comprised the following individuals:

M. Fortin	- project manager and principal investigator
J. Leslie	- principal investigator
B. Forster	- advisor
P. Graham	- research assistant
D. Brubacher	- research assistant and interviewer
L. Burr	- interviewer
E. Rogas	- secretarial support

In addition to these individuals, C. Southey graciously volunteered his time to assist J. Leslie in the analysis. L. Coplan with the Ministry of the Environment has been a most patient liaison officer. He and J. Donnan reviewed draft reports.

1.0 INTRODUCTION

1.1 Background

Beach goers will remember the summer of 1983 as an unseasonably hot and dry summer when many of their favourite beaches were posted. Twice as many beaches as normal were posted that summer with major urban beaches being especially hard hit (Usher *et al*, 1987). The placards at closed beaches cautioned prospective swimmers of the health risk associated with bacterial contamination.

The Beach Management Program was launched as a result of the events of 1983. Studies under these programs traced bacterial contamination back to sources such as urban storm runoff, direct sanitary sewage discharges to storm sewers, rural livestock operations and even natural populations of waterfowl at certain beaches. Often, the remedial measures required for clean up entailed large capital investments that could constitute a significant cost burden for public agencies.

Set against the prospect of high clean-up cost was the public and media indignation over degraded water quality conditions and a pressure to do something. But the need to do something was hampered by a limited understanding of beach recreation in the province. Without a basic knowledge of the demand for beach recreation, the response of that demand to water quality conditions, and the character and location of beaches relative to demand centres, user benefits could not be evaluated and cost-effective decisions regarding remedial measures for beaches could not be made.

In 1987, the Policy and Planning Branch of the Ministry of the Environment released the final report of a ground breaking study to assist in beach remediation planning efforts (Usher *et al*, 1987). In this study, Usher, Ellis and Michalski compiled an extensive inventory describing beach sites in the province. This inventory was the foundation of a beach recreation allocation model that incorporated state of the art information on factors affecting the demand for beach recreation opportunities. What was missing from the model, however, was empirical information describing how beach users respond to water quality conditions and how they value improvements to water quality. In the absence of such information, the authors used their best judgement to formulate relationships linking water quality and beach use behaviour. They assumed that virtually no swimming would occur at a beach during periods of posting and that other water quality conditions such as water clarity and algal density would interact with a host of other aesthetic factors in influencing household decisions to visit one beach over another.

The relationships that Usher *et al* built into their model to describe the influence of water quality was necessarily *ad hoc* due to a lack of appropriate research. Research on recreation and water quality has not clearly linked user perceptions of water quality to objective water quality indicators and has had difficulty relating recreation behaviour to water quality (Freeman III, 1979, Turner, 1977). Blomquist and Fishelson (1980), using annual average dissolved oxygen and fecal coliform count data in a recreation site demand model, found a weak response of demand to water quality and identified a need for better water quality data measuring actual on-site conditions during the recreation season. In another study of beach recreation, Feenberg and Mills (1980, ch.7) had access to seasonal on-site data describing thirteen water quality attributes. In developing their model, they obtained consistent results for only three of these attributes, these being attributes that were either directly evident to a swimmer (oil accumulation and colour) or were detectable due to health effects (total bacteria). Ribaudo, Young and Shortle (1986) employed questionnaire data on the water quality perceptions of beach users in a demand model (rather than using objective measures of water quality conditions) and found that user perception was the most important factor determining visitation rates. They did not, however, link perceptions back to objective measures of water quality.

The research documented in this report was an attempt to fill some of the gaps in our understanding of beach user responses to water quality conditions. Specifically, the research objectives were:

- to monitor beach use and beach attributes (including water quality) over a recreation season at several beach sites;
- to survey beach users regarding beach use behaviour and water quality perceptions; and
- to develop and compare alternative measures of the value of water quality to beach users.

In this report, summary statistics from the surveys are provided and discussed in Chapter 2. Interview data are used to develop willingness-to-pay measures of water quality benefit in Chapter 3 and to develop estimates of water quality benefit based on travel cost, in Chapter 4. Chapter 5 provides a discussion of findings. Appendices provide background technical documentation. An interim report under separate cover (Forster, 1988) provides a review of salient literature.

1.2 Data Collection and Preparation

Primary data were collected by means of personal interviews with beach users at five Ontario beaches:

Kelso Conservation Area, Halton Region,
Rockwood Conservation Area, Wellington County,
Fifty Point Conservation Area, Hamilton Wentworth Region,
Guelph Lake Conservation Area, Wellington County,
Sunnyside Beach, Metropolitan Toronto.

(See Appendix A for a discussion of how these beaches were selected.)

Interviews were completed with respondents on several days in the summer of 1988 at each of the five beaches (see Table 1). Respondents were Ontario residents, over the age of 18, making a private visit to the beach. The survey resulted in 489 interviews with respondents who satisfied these criteria.

A copy of the survey questionnaire is provided in Appendix 1. It covered a wide variety of topics relating to beach use and approximately 180 data items were generated from each questionnaire. Spreadsheet software was used to encode and check the data and to prepare summary statistics. Variables which were needed for regression analysis were imported into files for use with statistical software.

TABLE 1.1. Sampling dates.

Beach	Day Of The Week	Date	No. Of Respondents
KELSO	Friday	July 8	20
	Saturday	July 16	19
	Wednesday	July 20	16
	Sunday	July 24	15
	Friday	July 29	19
	Tuesday	August 14	14
			107
ROCKWOOD	Wednesday	July 6	19
	Monday	July 11	6
	Sunday	July 17	20
	Thursday	July 21	12
	Wednesday	August 3	20
	Saturday	August 13	20
			97
50 POINT	Saturday	July 2	11
	Sunday	July 10	20
	Tuesday	July 19	10
	Thursday	July 28	15
	Sunday	July 31	20
	Friday	August 5	4
	Monday	August 15	4
			84
GUELPH	Monday	June 27	5
	Monday	July 4	16
	Saturday	July 9	19
	Friday	July 15	19
	Monday	August 1	17
	Sunday	August 7	20
	Tuesday	August 16	11
			107
SUNNYSIDE	Friday	July 1	11
	Thursday	July 7	12
	Monday	July 18	9
	Monday	July 25	7
	Saturday	July 30	2
	Tuesday	August 2	20
	Monday	August 8	20
	Sunday	August 14	17
			98

Summary statistics were prepared for all 489 respondents grouped together; this includes local day users, campers and respondents who were at one of the beaches as a stopover on a longer trip. For certain variables, separate statistics are also provided for the day-user group. There were, in the data set, 442 day users (see Table 1.2); indicating that the one-day visit was the norm for visits to the five beaches studied.

Additional information was compiled after the questionnaire data were encoded and checked. This included the populations of home origins identified by respondents and the travel distances from these origins to beaches that respondents reported using in 1987. Population data are from the 1986 Census as reported in the 1988 Municipal Directory (Ministry of Municipal Affairs, 1988). Travel distances were measured from the 1988 Official Road Map for Ontario and were estimated as the length of the most direct highway route linking each beach to the centre of each origin municipality. The distance figures are approximate since it was not known where parties came from within each municipality. This approximation can be misleading for some of the short travel distances from large municipalities, since many visitors may have homes that are nearer to or more distant from the beach than the estimated figures would indicate.

TABLE 1.2. Sample Size.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
All respondents	103	97	84	107	98	489
Campers and stopovers omitted	103	71	78	94	96	442

At the outset of the field season, survey staff visited each beach to measure beach dimensions and document other beach and park features. During the course of the interviewing, they measured the following environmental conditions on each interview day at each of the beaches {field work protocols are provided in Appendix B):

- air temperature
- wind speed
- cloud cover
- precipitation
- water temperature
- water clarity
- odour
- debris on beach and in water
- algae in water

They also noted whether the beach was posted at the time of the interviewing.

2.0 PRELIMINARY DATA ANALYSES

2.1 Beach Characteristics

Observations and measurements taken by field staff at each beach covered fixed attributes such as beach dimensions and attributes that varied from one day to the next such as temperature and beach use level. A summary of beach characteristics is provided in Table 2.1.

Certain key features distinguish the selected beaches:

- Kelso and Rockwood are located in parks that feature dramatic escarpment topography;
- Fifty Point and Sunnyside, as Great Lake beaches, are both large, have cooler water, and feature a marina;
- Sunnyside is an urban beach, with no entry fee but with a bacterial contamination problem that results in frequent postings;
- Camping facilities are provided at Guelph and Rockwood.

These distinguishing features appear to coincide well with the variations in average beach user counts reported in Table 2.1. Sunnyside has the lowest counts in keeping with its frequent postings and cooler water. It was in fact the only beach where there were sufficient numbers of beach users on posted days to enable interviewing. Elsewhere, posting resulted in virtual abandonment of beaches (Kelso was posted for a period early in the season with this result). Low user counts occurred at Fifty Point which also has cooler water. Both Sunnyside and Fifty Point occur within a geographic zone of poor to fair water temperatures for swimming (based on Figure 3.1 in Usher *et al*, 1980). The highest user counts were observed at Kelso and Rockwood, which are located in a geographic zone with an excellent rating for water temperature. Both of these beaches also feature a scenic setting.

TABLE 2.1. Beach Characteristics.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside
PHYSICAL ATTRIBUTES					
Beach Length (m)	250	120	475	170	320
Beach Width (m)	15	16	34	31	24
Beach Surface Texture	Coarse sand	Fine sand	Coarse sand	Coarse sand	Coarse sand
Lake Type	Reservoir	Reservoir	Great Lake	Reservoir	Great Lake
OPERATIONS					
Admission Fee	yes	yes	yes	yes	no
Beach Patrol	yes	yes	no	yes	yes
Facilities:					
Picnic	yes	yes	yes	yes	yes
Camping	no	yes	no	yes	no
Rentals	yes	yes	no	yes	no
Concession	yes	yes	yes	yes	yes
Trails	foot	foot	no	no	bike
Sport Fields	yes	yes	yes	yes	yes
Other	escarpment	escarpment	marina		pool, marina
TYPE OF INTERVIEW DAY					
No. of Days:					
During week	4	4	4	5	6
Weekend	2	2	3	2	2
Total	6	6	7	7	8
Avg. weather conditions:					
Air Temp. (°C)	29	30	28	27	25
Wind Speed (mph)	3.7	6.9	9.4	8.1	6.1
Avg. water conditions:					
Water Temp. (°C)	26	26	20	25	21
Water Clarity (secchi disk depth, m)	2.6	1.9	3.1	1.6	2.4
Debris on Beach *	0.5	0.6	1.5	0.9	1.6
Debris in Water *	0.2	0.0	0.3	0.1	0.8
Algae in Water *	0.1	0.3	0.2	0.6	2.9
% of Interview Days when Beach was Posted	0	0	0	0	77
BEACH USER COUNTS AT MID-DAY					
Avg. No. On Beach	213	161	40	57	29
Avg. No. In Water	108	101	14	23	<1
Total No.	321	262	54	80	30

* Visual rating by interviewer based on 0 = "none observed" to 4 = "abundant"

2.2 Description of Beach Visitors

Table 2.2 provides family descriptors for survey respondents. Total before tax family income was obtained from Question 33 which asked respondents to indicate their family income on a scale from 1 to 8 (each unit equivalent to a $10,000 range; code 8 represented an income of $70,000 or more). The midpoint of each range was used to estimate an approximate mean for family income of $41,650. This is very close to the average 1989 household income for Ontario of $43,014 (1986 Census, updated from $38,022 in 1985 dollars).

Question 39 asked "about how much would you normally spend in a month on outdoor recreation?". The average annual expenditure for our sample is $1,560 or 3.7% of reported income. This is virtually the same as the expenditure on all recreation reported in the 1984 Family Expenditure Survey which was $1,543 (Statistics Canada, 1986); suggesting that responses may be biased upward and represent total recreational budgets rather than just outdoor recreation budgets.

Education levels for household adults (Question 35), shown in Table 2.2, indicate that our sample is significantly better educated than the general Ontario population according to the 1986 Census which indicates the following proportions:

Grade 1 - 8	14.6%
High school	
Some	28.5%
Certificate	16.1%
Post Secondary	
Some	15.4%
Diploma	14.1%
Degree	10.8%

Table 2.3 (from Question 30) shows the home localities of visitors to the different beaches. Most of the visitors come from just a few places close to the destination beaches.

TABLE 2.2. Characteristics Of Respondent Families.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
No. of obs.	103	97	84	107	98	489
Family income	$45,300	$42,870	$44,880	$39,040	$36,790	$41,650
Education of household adults (%):						
Grade 1-8	4.4	1.5	4.1	1.5	7.0	3.6
High School:						
-some	12.9	20.6	19.4	9.1	15.8	15.4
-certificate	27.7	23.7	35.3	25.3	21.5	26.7
Post-Secondary:						
-some	13.9	13.9	10.6	15.1	12.0	13.2
-diploma	16.8	18.0	19.4	18.9	17.1	18.0
-degree	24.3	22.2	11.2	30.3	26.6	23.1
Occupation of household adults (%):						
Retired	2.9	5.2	I.8	3.0	2.5	3.1
Student	8.3	6.2	8.8	14.1	11.2	9.7
Trades	10.7	9.3	14.7	8.5	12.4	11.0
Home maker	18.0	16.0	10.0	9.0	3.7	11.7
Professional	26.8	30.9	23.5	33.2	26.1	28.3
Services	22.4	14.9	21.2	16.6	24.2	19.7
Technical	6.8	12.9	12.9	7.0	8.1	9.5
Seeking work	0.5	5.2	1.2	1.0	5.6	1.6
Other	3.4	4.1	5.9	7.5	6.2	5.4
Recreation Activity:						
Spending/month on outdoor recreation	$110	$128	$151	$113	$151	$130
Days off each week	2.1	2.1	2.0	2.1	2.2	2.1
Vacation days each year	27.1	27.4	21.1	30.1	34.5	28.3
No. of beach trips last year (1987)	7.8	10.8	13.3	15.6	22.0	17.3

TABLE 2.3. Origins Of Respondents.

		ALL USERS	DAY USERS
		- - - - - - % - - - - -	
KELSO	Mississauga	29.1	29.1
	Oakville	9.7	9.7
	Milton	8.7	8.7
	Burlington	7.8	7.8
	Etobicoke	6.8	6.8
	City of Toronto	5.8	5.8
	Brampton	5.8	5.8
	19 Others	26.2	26.2
ROCKWOOD	Guelph	26.8	29.6
	Rockwood	6.2	8.5
	Acton	5.2	5.6
	Mississauga	6.2	5.6
	Burlington	3.1	4.2
	Kitchener	4.1	4.2
	Milton	5.2	4.2
	Oakville	5.2	4.2
	Georgetown	2.8	3.1
	21 Others	34.9	33.8
50 POINT	Grimsby	31.0	32.1
	Hamilton	22.6	24.4
	Winona	10.7	11.5
	Stoney Creek	9.5	10.3
	Burlington	3.6	3.9
	St. Catharines	4.8	3.9
	10 Others	17.8	14.0
GUELPH	Guelph	57.9	63.2
	Kitchener	12.1	12.6
	Waterloo	2.8	3.2
	16 Others	27.2	21.1
SUNNYSIDE	City of Toronto	63.3	64.6
	Etobicoke	9.2	9.4
	North York	8.2	8.3
	Mississauga	7.1	7.3
	9 Others	12.2	10.4

2.3 Description of Beach Visits

A variety of factors will characterize a beach visit. In this survey, groups at Kelso and Guelph were found to be larger on average than at other beaches and to have the highest proportion of children (Table 2.4, from Question 31). From the comments on some of the surveys, Kelso seems to be popular for extended family picnics and similar events. Sunnyside groups are smallest, averaging only 2.1 members.

As would be expected, the average duration of stay (Table 2.5, from Question 7) is longest at Guelph and Rockwood which feature camping facilities. When only day users are considered, the longest average stays occur at Kelso and Rockwood (both 4.5 hours); the same beaches which have the larger party sizes. Sunnyside users stay at the beach for the shortest period of time (3.2 hours) reflecting perhaps a more spontaneous or casual type of beach use involving less planning and a lower level of commitment to a day of activity at the beach.

A trip to the beach is not a single homogeneous event; beach visits can take in a number of related activities and can involve varying qualities of aesthetic and social experience. Table 2.6 shows the percentage of visiting parties participating in different beach activities (from Question 5). Relaxing and sunbathing are popular at all beaches. Swimming is also a central activity except at Sunnyside where the beach was posted as unsafe for swimming for most of the summer. However other activities vary widely in popularity among beaches, with users at each beach seeming to "specialize" in a particular activity (windsurfing at Guelph Lake, hiking at Rockwood, cycling at Sunnyside). The beaches are not therefore exact substitutes for each other. The large category of "other" activities at Sunnyside represents people swimming in the pool. Kelso appears to attract large parties for group picnics.

Question 12 asked about the kinds of equipment people take with them to the beach (Table 2.7); beach toys and a cooler are the most common items at all beaches except Sunnyside where a radio is popular. There are more items shown at Rockwood and Guelph because of campers at those beaches. Among day users, Kelso and Guelph parties carry the most equipment on their trips. This is consistent with the larger party size and longer duration stay at these beaches.

TABLE 2.4. Average Composition Of Beach Parties.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
No. of obs.	103	97	84	107	98	489
Average no. of people:						
under 12	2.3	1.7	1.2	1.1	0.4	1.4
12-18	0.6	0.4	0.4	0.3	0.1	0.3
19-40	2.2	2.4	1.9	2.0	1.4	2.0
41-65	0.8	0.4	0.4	0.2	0.2	0.4
65+	0.1	-	0.1	-	-	-
Group size	5.9	4.9	4.0	3.6	2.1	4.1
Avg. no. of family members in group	3.4	3.0	2.7	2.4	1.5	2.6
Percent of groups with children <12	81%	68%	57%	49%	17%	53%
Percent of groups with 12 - 18 year-olds	33%	20%	22%	16%	6%	20%

TABLE 2.5. Duration Of Beach Visits.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
ALL USERS:						
No. of obs.	103	96	84	107	98	489
Avg stay(hour)	4.5	56.9	5.4	25.1	3.2	28.0
% Staying for:						
< 3 hours	26	21	43	36	60	37
4 - 6 hours	60	46	46	45	34	46
> 6 hours	14	31	11	19	6	17
DAY USERS:						
No. of obs.	103	71	78	94	96	442
Avg stay (hour)	4.5	4.5	3.7	4.1	3.2	4.0
% Staying for:						
< 3 hours	26	28	44	40	60	40
4 - 6 hours	60	63	48	51	34	51
> 6 hours	14	9	8	9	6	9

TABLE 2.6. Percentage Of Respondents Participating In Various Beach Activities.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
No. of obs.	103	97	84	107	98	489
Swimming/wading	100	99	95	91	11	79
Motor boating	-	-	6	1	2	2
Windsurfing	1	2	2	18	-	5
Hiking/walking	20	45	19	16	20	24
Cycling	-	6	7	7	26	9
Relaxing/sunbathing	93	95	98	94	99	96
Scuba/snorkel	5	2	4	2	1	3
Picnicking	79	68	58	57	37	60
Canoeing	4	43	-	11	-	12
Sailing	3	-	4	2	2	2
Water skiing	-	-	4	-	-	1
Ball games/frisbee	41	35	21	31	17	29
People watching	69	72	50	56	57	61
Other	10	-	8	9	31	12

TABLE 2.7. Percentage Of Respondents With Various Items Of Beach Equipment**.**

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
No. of obs.	103	97	84	107	98	489
Lawn chairs	41	45	29	38	6	32
Beach toys	71	66	42	50	7	48
Canoe	1	8	-	3	-	3
Radio	15	26	18	22	28	22
Camping gear	-	25	4	10	1	8
Cooler	68	69	56	58	21	55
Fishing gear	7	16	13	8	-	9
Sailboard	-	-	1	16	-	4
Tent	-	23	-	9	-	7
Barbecue	11	23	6	10	-	10
Air mattress	18	16	13	16	1	13
Sail boat	-	1	2	-	-	1
Cook stove	3	24	4	8	-	8
Other	3	12	12	7	5	8
Avg. no. of items of equip.:						
All users (489 obs.)	2.4	3.5	2.0	2.6	0.7	2.2
Day users (442 obs.)	2.4	2.2	1.9	2.0	0.7	l.8

The average journey is less than half an hour or under 30 kilometres (Table 2.8, from Questions 8 and 9).The shortest average journey was estimated for Sunnyside which is in close proximity to a large urban population and which has the lowest water quality rating (see Section 2.5).The longest average journey occurred at Kelso and Rockwood, both beaches with higher water quality ratings as well as unique scenic features due to their escarpment locations.

The journey to the beach will also vary in quality. Some people enjoy travelling by car and consider the journey the most important part of the trip. For others the journey is a necessary evil to be endured in order to enjoy the beach. In their responses to the question: "how would you rate the trip to get here?"(from Question 11), Fifty Point visitors report the least pleasant journeys with several respondents remarking on traffic lineups in the area (see average ratings on Table 2.8).

Length of the journey to the beach and length of time spent on the beach appear to be positively correlated, despite the time constraint of the day-trip. This is apparent in the following regression (t-score in brackets, both variables measured in hours):

$$\text{ONE WAY TRAVEL TIME} = \underset{(5.18)}{0.126} + \underset{(7.43)}{0.044}\ \text{LENGTH OF STAY}$$

R^2 (adj.) = 0.12, F-score = 55.2, no. obs. = 399

This may indicate that a beach-trip involving a long journey will only be made if one also can stay a longer time on the beach, although the longer travel time and the longer stay may both be attributed to a third factor such as beach or park attractiveness.

TABLE 2.8. Characteristics Of The Journey To The Beach.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
No. of obs	103	97	84	107	98	489
Percentage of Respondents Arriving by:						
Car	99	97	92	95	55	88
Camper	-	1	-	1	-	-
Motorbike	-	1	-	1	2	1
Bicycle	-	-	5	3	14	4
Walking	1	1	-	-	17	4
Bus	-		-	-	11	2
Cab	-	-	-	-	1	-
Motorboat	-	-	4	-	-	1
Average One-Way Travel Time (min.) [1]:						
All users	30	36	20	23	19	25
Day users	30	27	18	21	18	23
Average reported Travel distance(km) [1]:						
All users	35	34	20	23	10	25
Day users	35	28	17	19	8	22
Rating of the Journey by all users [2]	2.2	2.1	2.5	2.3	2.3	2.3

NOTES:
1. All users = 489 observations; day users = 442 observations.
2. Journey rated from 1 = "very enjoyable" to 5 = "very unenjoyable"

2.4 Perception of Beach Characteristics

Respondents were asked to rate several beach attributes on a scale of one, "very poor", to five, "very good" (from Question 1). The first part of Table 2.9 shows visitors' opinions regarding beach size, water temperature, facilities, upkeep and scenery at each of the beaches. Kelso rates highest for three characteristics and Sunnyside is lowest for two. Respondents were also invited to comment on what they liked and disliked about each beach (Questions 2 and 4). The most frequent favourable comments related to the proximity of the beach followed by comments on facilities and natural attributes (Table 2.9, second section). The most common dislikes related to the quality of the sand or the swim area, or the debris and garbage on the beach (Table 2.9, third section). Crowding was frequently mentioned at Rockwood which has the smallest beach and at Kelso which had the highest user counts.

2.5 Perception of Water Quality

Data describing respondent perceptions of water quality are summarized in Table 2.10. The first part of this table provides average ratings of specific attributes (from Question 14). All of the beaches are seen to have calm water that is odour free. The Great Lake beaches - Fifty Point and Sunnyside - are considered to have colder water, while Fifty Point water is rated as the clearest, and posting at Sunnyside is considered the most frequent. In their overall ratings of water quality conditions, respondents gave similar ratings to all of the beaches except Sunnyside which was rated "very poor" by 60% of respondents.

In responses to an open ended question on water quality (from Question 3), Rockwood received the largest proportion of comments about weeds and algae, people at Guelph, Kelso and Rockwood had concerns about water being murky or cloudy, and Fifty Point visitors were troubled about bacteria. While there were general comments about pollution hazards and risk, no comments were volunteered that related specifically to hazardous contaminants.

TABLE 2.9. Perception Of Beach Attributes.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
No. of obs	103	97	84	107	98	489
AVERAGE RATING OF ATTRIBUTES [1]:						
Accessibility	3.8	4.2	4.0	3.8	4.2	4.0
Beach size	3.9	3.4	3.8	3.8	3.9	3.8
Water temperature	4.2	4.0	3.3	4.1	2.8	3.8
Facilities	4.0	3.7	4.2	3.7	3.6	3.8
Grounds upkeep	4.0	4.2	3.9	3.6	3.8	3.9
Scenery	4.5	4.8	4.3	3.9	4.0	4.3
DISTRIBUTION OF COMMENTS ON ATTRACTIVE FEATURES (%):						
Beach proximity	36.7	31.8	31.5	45.3	27.0	34.4
Good facilities	9.5	11.2	13.9	15.7	28.1	15.9
Natural features	11.4	22.9	4.6	7.6	21.3	14.2
Good for family or social gatherings	12.7	6.5	5.4	4.4	9.2	7.7
Good water/water quality	7.0	7.7	6.1	5.0	0.0	5.1
Good beach/sand	8.9	2.4	4.6	4.4	4.6	4.9
Cleanliness	1.9	1.2	3.9	1.3	0.6	1.6
Reasonable cost	1.3	2.4	2.3	0.6	0.0	1.3
Other	5.7	10.6	3.9	5.7	0.6	5.3
Average No. of Comments Per Respondent	1.5	1.8	1.6	1.5	1.8	1.6
DISTRIBUTION OF COMMENTS REGARDING DISLIKES (%):						
Poor sand	31.8	15.5	55.3	42.9	18.0	36.5
Swim area too rocky, mucky, deep	12.1	6.9	7.5	31.4	1.6	15.3
Debris, garbage, weeds on beach	12.1	5.2	25.5	1.4	24.6	12.4
Poor facilities	7.6	13.8	4.3	6.4	24.6	9.8
Crowding	13.6	37.9	2.1	0.7	4.9	8.8
Animal droppings	3.0	6.9	2.1	9.3	18.0	7.6
Poor supervision	3.0	3.5	2.1	4.3	1.6	3.1
Poor access/signs	7.6	3.5	1.1	0.7	0.0	2.2
Excess supervision	3.0	5.2	0.0	2.1	0.0	1.9
Other	6.1	1.7	0.0	0.7	6.6	2.4
Average No. of Comments Per Respondent	0.6	0.6	1.1	1.3	0.6	0.9

NOTE: [1]. Each attribute rated from 1 = "very poor" to 5 = "very good"

TABLE 2.10. Perception Of Water Quality.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
No. of obs	103	97	84	107	98	489
AVERAGE RATING OF WATER QUALITY ATTRIBUTES [1]:						
Temperature	3.7	3.2	2.4	3.7	2.3	3.2
Waves	0.5	0.5	0.9	0.8	0.9	0.7
Water clarity	1.6	1.3	2.2	1.5	1.4	1.6
Odour	4.7	4.4	4.5	4.2	4.0	4.4
Algae, weeds	4.2	3.8	4.1	3.5	3.0	3.7
Posting frequency	4.5	4.8	4.5	4.3	2.4	4.1
OVERALL RATING OF GENERAL WATER QUALITY:						
Average rating	3.4	3.3	3.4	3.2	1.5	2.9
Standard Deviation	0.9	1.0	0.9	0.9	0.8	0.9
FREQUENCY RESPONDING THAT WATER QUALITY IS (%):						
- very poor (=1)	2	7	5	3	60	15
- poor (=2)	13	8	10	2	9	17
- fair (=3)	36	40	37	34	8	31
- good (=4)	41	40	44	36	3	32
- very good (=5)	8	5	5	6	0	5
DISTRIBUTION OF COMMENTS ON WATER QUALITY (%):						
Poor quality generally	25.8	18.8	19.4	19.5	50.6	31.1
Excess algae, weeds	19.7	32.5	16.7	23.4	7.6	17.9
Low clarity, poor colour	28.8	27.5	8.3	32.5	2.5	16.8
Bacterial contamination	18.2	3.8	23.6	15.6	17.7	15.9
Odour or taste	3.0	11.3	5.6	7.8	10.8	8.4
Debris in water	4.6	6.3	11.1	1.3	7.0	6.2
Too warm or cold	0.0	0.0	15.3	0.0	3.8	3.8
Average No. of Comments Per Respondent	0.6	0.8	0.9	0.7	1.6	0.9

NOTE: [1] Individual attributes rated as follows:

Temp.	1 = "very cold"	to 5 = "very warm"
Waves	1 = "very calm"	to 5 = "very rough"
Clarity	1 = "very murky"	to 5 = "very clear"
Odour	1 = "very strong"	to 5 = "none"
Algae, ...	1 = "very heavy"	to 5 = "none"
Post'g	1 = "all the time"	to 5 = "never"

Question 40, a totally open-ended question, highlights the importance that respondents place on clean water and a clean environment: 12% of the comments concerned these issues directly and many others were related in various ways to a perceived need for various improvements at beaches (Table 2.11). The survey was welcomed as an indication of possible future action in 10% of the comments.

Certain hypothetical or "contingent" questions regarding beach use behaviour were tied into the questions concerning beach water quality. Respondents were asked to indicate the maximum time they would be willing to travel to the given beach if water quality were (1) the same, (2) very good, or (3) very poor (Question 27). They were also asked to indicate how often they would visit the beach if water quality were (1) very good, or (2) very poor (Question 19). Responses, summarized in Table 2.12, suggest that travel times would be doubled for very good water quality conditions and that use rates would almost triple. Sunnyside users stand out as being less sensitive to poor water quality, with other users indicating minimum use levels for poor water quality conditions. This difference reflects the tendency of Sunnyside respondents to use the beach for activities other than swimming (see Table 2.6) and accordingly, to be less sensitive to water quality. Swimmers presumably go elsewhere as suggested by the low user counts at Sunnyside (see Table 2.1) and might return if Sunnyside were to become a swimmable beach.

2.6 Linking Perceptions to Measurements of Water Quality

An analysis of respondent ratings of water quality conditions and objective measurements of these same conditions was undertaken to develop an understanding of how water quality perceptions are formed. This analysis is a first step in filling gaps in our understanding of beach use behaviour {see Section 1.1). It is necessary to verify that beach users have a reasonably accurate perception of water quality conditions upon which they base their beach use decisions, in order to be able to link water quality improvements back to changes in the demand for beach recreation. Responses to these contingent questions are summarized in Table 2.12.

TABLE 2.11. Summary Of Respondents' General Comments About The Survey.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
No. of obs.	103	97	84	107	98	489
DISTRIBUTION OF COMMENTS (%):						
Need to improve facilities	36.1	28.8	16.4	19.7	9.6	21.4
Spend more taxes on clean up	9.7	8.8	16.4	8.2	28.9	15.6
Need to improve environment water quality	13.9	7.5	6.6	13.1	15.4	11.6
Happy to see survey being done	11.1	12.5	9.8	9.8	7.7	10.1
Favourable comment on beach/park	2.8	7.5	8.2	8.2	3.9	5.8
Need more good beaches	4.2	5.0	13.1	4.9	1.9	5.3
Gov't/industry responsible for clean up	5.6	3.8	1.6	6.6	6.7	5.0
Promote beach use, educate public	0.0	3.8	3.3	6.6	3.9	3.4
Clean up specific beach/lake	2.8	0.0	4.9	1.6	6.7	3.4
Anger expressed re- poor water quality	1.4	0.0	3.3	1.6	3.9	2.1
Beach fees too high	1.4	2.5	3.3	4.9	0.0	2.1
Users need more info. on quality	4.2	2.5	3.3	1.6	0.0	2.1
Advocate certain clean up measures	1.4	2.5	0.0	1.6	2.9	1.9
Complaints re high taxes	1.4	0.0	0.0	6.6	1.0	1.6
Favourable comment re- water quality	1.4	1.3	1.6	3.3	1.0	1.6
Prefer natural swimming area	0.0	2.5	0.0	0.0	2.9	1.3
Concerned about drinking water	0.0	0.0	1.6	1.6	1.9	1.1
Expression of hopelessness, distrust	1.4	1.3	0.0	0.0	1.0	0.8
Concern re-cost of survey	0.0	1.3	3.3	0.0	0.0	0.8
User responsible for clean up	0.0	2.5	0.0	0.0	0.9	0.8
Other	1.4	6.3	3.3	0.0	0.0	2.1
Average No. of Comments Per Respondent	1.5	1.8	1.6	1.5	1.8	1.6

TABLE 2.12. Contingent Beach Use Data Summary.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
No. of obs.	103	97	84	107	98	489
MAXIMUM CONTINGENT TRAVEL TIME [1]:						
If quality remains the same	57	62	49	54	37	40
If quality were very good	68	88	66	83	88	79
If quality were very poor	3	6	4	4	26	9
NO. OF VISITS TO THIS BEACH [2]:						
Actual trips made last year	3.7	4.3	5.8	6.9	15.2	7.2
Trips if quality were very good	8.4	12.2	14.0	16.0	30.8	19.1
Trips if quality were very poor	0.4	1.2	2.4	1.6	15.1	9.4
NO. OF VISITS TO ALL BEACHES LAST YEAR	7.8	10.8	13.3	15.6	22.0	17.3

NOTES:

1. The "Maximum travel time" data summarizes responses to Question 27 which reads:

   "You indicated you travelled _____ minutes to get there. If this particular beach wasn't available, what's the longest time you would have travelled by car to reach a beach like this one with: (1) the same water quality; (2) very good water quality; and (3) very poor water quality?"

2. The "no. of visits" data summary derives from Question 19:

   "How much would you use this beach each year if it had: (a) very good water quality; and (b) very poor water quality?"

The following variables were used in the analysis of water quality perceptions:

1) Subjective respondent ratings (from Questions l, 14 and 16):

QUAL1 - overall water quality rating (Question 1)
1 = "very poor" to 5 = "very good"

TEMP14 - water temperature rating (Question 14)
1 = "very cold" to 5 "very warm"

WAVES14 - water roughness rating (Question 14)
1 = "very calm" to 5 = "very rough"

CLAR14 - water clarity (Question 14)
1 = "very murky" to 5 = "very clear"

ODOUR14 - water odour (Question 14)
1 = "very strong" to 5 = "none"

ALGAE14 - algae density (Question 14)
1 = "very heavy" to 5 = "none"

POSTED16 - posting frequency (Question 16)
1 = "all the time" to 5 = "never"

2) Objective measures of environmental conditions made by interviewers (field measurement methodologies documented in Appendix B):

TEMP - water temperature in wading zone (°C)

WAVES - wave height rating
0 = calm to 3 = "over 25 cm"

COLOUR - apparent colour in ALPHA plutonium cobalt colour units (0 to 100)

ODOUR - rating of odour strength by interviewer
1 = "strong" to 3 = "none"

ALGAE - rating of algae density by interviewer
1 = "very abundant" to 5 = "none"

One observation of each objective measure was available for each interview day (34 days) whereas respondent ratings were available for most interviews (375 in total). Average respondent ratings for each interview day were therefore used in comparisons with objective measures. An additional variable, POST was developed to describe the proportion (from 0 to 1.0) of days over the swimming season that were posted at each beach (data provided by D. Henry, personnel communication, Ministry of the Environment).

The following regressions for each water quality attribute suggest that respondent ratings were based in a consistent manner on physical attributes (t-scores in brackets):

$$\ln(\text{TEMP14/5}) = -4.2885 + 1.1901 \ln(\text{TEMP}),$$
(- 8.283) (7.219)

R^2 (adj.) = 0.615, F = 52.1, n = 33

$$\text{WAVES14} = 1.4463 + 0.4416\,(\text{WAVES}),$$
(50.948) (4.793)

R^2 (adj.) = 0.400, F = 22.9, n = 33

$$\text{CLAR14} = 1.1039 - 0.0135\,(\text{COLOUR}) + 0.2049\,(\text{ALGAE})$$
(18.976) (- 2.879) (3.129)

R^2 (adj.) = 0.263, F = 6.89, n = 34

$$\ln(\text{ODOUR14/5}) = -0.3548 + 0.2360 \ln(\text{ODOUR})$$
(- 6.827) (4.207)

R^2 (adj.) = 0.336, F = 17.70, n = 34

$$\ln(\text{ALGAE14/5}) = -0.2181 + 0.3227 \ln(\text{ALGAE/5})$$
(- 6.460) (- 4.862)

R^2 (adj.) = 0.407, F = 23.6, n = 34

$$\ln(\text{POSTED16/5}) = -0.0239 + 0.2874 \ln(1.0 - \text{POST})$$
(- 0.937) (12.825)

R^2 (adj.) = 0.832, F = 164.5, n = 34

In all of these regression results, coefficients have the expected signs and are statistically significant (P = 0.01).

Subsequent regressions to determine how respondents arrived at an overall rating of water quality are shown in Table 2.13. These regressions employ an exponential model of the form:

$$QUAL1 = a\, x_1^{b}\, x_2^{c}\, x_3^{d} \ldots\ldots.$$

In this model the x's are ratings of water quality characteristics. All of the rating data are re-scaled from a (1,5) interval to a (0,1) interval and the regression analysis is performed on the log transformation of the model:

$$\ln (QUAL1) = \ln a + b \ln x_1 + c \ln x_2 + d \ln x_3 + \ldots\ldots$$

Given the model and data, it is expected that ln(a) will be zero (i.e. a = 1.0) and that the power coefficients (b, c, d, ...) will lie between zero and one, with a higher value indicating that greater weight is placed on the corresponding water quality attribute.

The first two columns in Table 2.13 show ordinary and two stage least squares regression results using the small data set (average daily observations) while the third gives results based on individual respondent data. As expected, the constant terms are not significantly different from zero. Only the WAVES14 variable has a regression coefficient lying outside the expected zero-one interval in two of the regressions and this variable is not significant. All three regressions indicate that postings are the most significant factor affecting the perception of water quality.

TABLE 2.13. Regression Results Explaining Water Quality Ratings. [1]

	Average Daily Data (OLS)[2]		Average Daily Data (TSLS)[2]		Individual Respondent Data (OLS)[2]	
DEPENDENT VARIABLE = ln(QUAL1/5)						
Constant	-0.031	(-0.150)	0.172	(0.482)	-0.101	(-1.459)
ln(TEMP14/5)	0.112	(1.122)	0.310	(1.552)	0.142	(2.831)*
ln(WAVES14/5)	-0.063	(-0.595)	0.050	(0.324)	-0.029	(-0.659)
ln(CLAR14/5)	0.364	(1.668)	0.272	(0.645)	0.338	(7.043)*
ln(ODOUR14/5)	0.359	(1.251)	0.332	(0.528)	0.209	(2.653)*
ln(ALGAE14/5)	0.207	(0.989)	0.514	(1.444)	0.164	(2.917)*
ln(POSTED16/5)	0.896	(8.105)*	0.663	(3.259)	*0.418	(7.955)*
R^2 (adj.)	0.864		0.779		0.400	
F-score	34.8072*		20.341*		42.280*	
no. obs.	33		34		373	

NOTES:

1 The dependent variable in these regressions is ln(QUAL1/5) and the independent variables are listed in the left column. T-scores are provided in brackets after each estimated coefficient and an asterisk (*) denotes that these are significant at P = 0.01.

2 OLS - ordinary least squares regression
TSLS - two stage least squares regression

Independent variables are respondent ratings of individual water quality attributes. In TSLS results, the independent variable data are estimated by OLS regressions using all of the objective measures of water quality.

3.0 WILLINGNESS TO PAY FOR WATER QUALITY

The most direct way to determine what value people place on clean water is simply to ask them. This approach, referred to as the contingent value method, relies on the reaction of survey respondents to hypothesized situations such as an improvement or degradation of existing environmental conditions. Respondents are asked to indicate how much they would be willing to pay to assure an improvement or to prevent a loss, or how much they would require in compensation for an hypothesized loss. Respondents may respond strategically if they feel that their response may affect their future interests but such strategic behaviour has proven not to be a problem in past studies (Hoehn and Swanson, 1989). There is also a concern with the hypothetical nature of the exercise particularly when the postulated changes are remote or lie outside the experience of respondents. This is less likely to be the case with recreationists interviewed on-site as in this study. Moreover, other measures of benefit developed in Chapter 4 are available to verify the contingent value results.

In this survey, respondents were asked the question: "What is the most that you would be willing to pay, say as taxes, over the period of a year to assure very good water quality at any Ontario beach you might want to use?" and the similar question "What is the most that you would be willing to pay, say as taxes, over the period of a year to prevent very poor water quality" (Question 28). Out of 318 respondents who answered the question concerning payment for very good water quality, 92 (29%) indicated that they would be unwilling or reluctant to pay anything (Table 3.1). When payment was to prevent degradation, the proportion in this category rose to 34 percent (52 out of 151 respondents). Among those willing to pay for water quality, a proportion did not know how much they would be willing to pay (6 percent for very good quality, 14 percent to prevent degradation).

The average willingness to pay for very good water quality was $62/respondent and $52 to prevent degradation (Table 3.2).The difference in average payment levels observed here is small relative to the variation among individual responses. This variation is evident in Table 3.3 showing the distribution of responses. While most responses fell below $100/year, there are values ranging up to $1000/year.

TABLE 3.1. Distribution Of Responses To Willingness-To-Pay Questions.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
WILLINGNESS TO PAY FOR VERY GOOD WATER QUALITY						
Distribution of Responses (no.'s):						
Not willing to pay	15	16	22	24	15	92
Willing to pay:						
Stated an amount	45	38	33	49	48	213
Don't know how much	4	2	3	0	4	13
Total No.	64	56	58	73	67	318
WILLINGNESS TO PAY TO PREVENT DECLINING WATER QUALITY						
Distribution of Responses (no.'s):						
Not willing to pay	7	17	8	9	11	52
Willing to pay:						
Stated an amount	23	20	10	24	8	85
Don't know how much	6	0	3	3	2	14
Total No.	36	37	21	36	21	151

TABLE 3.2. Willingness To Pay For Water Quality At Ontario Beaches.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
WILLINGNESS TO PAY FOR VERY GOOD WATER QUALITY						
No. of Obs.	62	53	55	73	63	306
Mean Annual Payment [1]	$48	$66	$50	$56	$91	$62
Standard Deviation	$49	$132	$61	$93	$185	$117
WILLINGNESS TO PAY TO PREVENT DECLINING WATER QUALITY						
No. of Obs.	35	37	18	33	20	143
Mean Annual Payment [1]	$44	$ 80	$34	$60	$14	$ 52
Standard Deviation	$51	$223	$39	$66	$23	$123

NOTE: 1. Payment amounts are annual household values that would be paid to assure a given water quality condition at beaches that the household might use.

TABLE 3.3. Distribution Of Voluntary Payment Amounts.

CLASS INTERVAL	Pay To Assure Very Good Water Quality	Pay To Prevent Degradation
Would Pay Nothing	93	58
$1 to $ 42	72	28
$ 42 to $ 84	58	27
$ 85 to $126	55	20
$127 to $169	4	3
$170 to $211	14	5
$212 to $253	1	-
$254 to $296	-	-
$297 to $338	3	-
$338 to $465	-	-
$466 to $507	2	-
$508 to $550	1	-
Pay $900	1	-
Pay $1000	2	2
Total No. of Responses	306	143
Mean Payment	$62	$52
Median Payment	$30	$20

Following the willingness-to-pay questions respondents were asked: "Why did you choose these amounts?" (Question 29). Responses to this open-ended question, summarized in Table 3.4 are sub-divided into two categories according to whether or not the respondent was willing to pay. There were, on average, 1.3 comments from each respondent who was willing to pay and 1.6 comments from those who were not. One fifth of the comments indicated either that money should be transferred from existing programs or that respondents already paid enough tax; 9% that industry should pay for pollution cleanup or that beach users should pay, rather than all tax payers. Such comments suggest that there may be some downward bias to the willingness-to-pay figures due to the mention of "Taxes". The strong concern about clean water and the environment that showed up in the open ended comments (Question 40 summarized in Table 2.11), appeared again here with

23% of the comments addressing the importance of water quality or a clean environment. The comments show that some people, who were not willing to pay for cleanup, nevertheless thought clean water was very important. Also some of those who objected to paying more tax were still willing to pay for cleanup.

TABLE 3.4. Comments On The Willingness-to-pay Question.

	Willing To Pay	Not Willing To Pay	Total
DISTRIBUTION OF COMMENTS (%):			
Important to clean up water, environment	26.7	10.8	22.6
Favourable to paying more, pay for good program	25.8	5.4	20.6
Shouldn't pay more taxes, change gov't priorities	10.5	47.9	20.1
Gave rationale for the indicated amount of payment	13.0	1.2	10.0
Willing to pay if everyone pays	9.5	0.1	7.1
Prefer user-pay method of payment	3.7	7.2	4.6
Don't use beaches much, can go elsewhere	2.3	10.2	4.3
Industry should pay	2.5	9.6	4.3
Haven't thought about problem, arbitrary amount	1.7	1.8	1.7
Prefer payment by taxes	1.0	1.2	1.1
Clean-up would generate tourism revenues	0.8	0.6	0.8
Other	2.5	4.2	2.9
Average no. of comments per respondent	1.26	1.61	1.33

Regression analysis was used to identify factors affecting willingness-to-pay responses. Based on goodness of fit, the best regression equation explaining payments for very good quality is as follows (t-scores in brackets):

(WTP for very good water quality)

$$= -\ 4.3091 - 25.7109\ (\text{CHILDREN}) + 0.3417\ (\text{USEVG}) + 1.9583\ (\text{TRIPS})$$
$$(0.197)\quad (-2.002)\qquad\qquad (2.230)\qquad\qquad (6.512)$$

$$-\ 28.9309\ (\text{TAX COMMENT}) + 0.7670\ (\text{INCOME})$$
$$(-2.016)\qquad\qquad (2.298)$$

R^2 (adj.) = 0.176, F = 13.71, n = 299

where:

WTP = willingness to pay

CHILDREN = 1 for children in group (age <18) = 0 for no children in group

USEVG = number of trips respondent would make to surveyed beach if its water quality were very good

TRIPS = total number of trips made last year to all beaches in Ontario

TAX COMMENT = 1 if respondent made comment re: high taxes or the need to shift government spending
= 0 otherwise

INCOME = respondents household income (1988, $1,000's)

As expected, the allusion to tax in the willingness to pay question did seem to bias results downwards by about $30.00 for respondents who expressed concern with this payment mechanism. The presence of children in the family seems to depress responses as well, perhaps because it reduces available income. Every $10,000 increase in income implies an increase of $7.67 in willingness to pay. The USEVG and TRIPS variables likely reflect the level of commitment to beach activity. While all of these variables are statistically significant (P = 0.05), the low correlation coefficient suggests a considerable amount of unexplained variation in the dependent variable. Similar results were obtained for a regression explaining the willing to pay to prevent degradation. The tax variable depressed payments by $45.00 and every $10,000 of income increased the payment by $5.35.

4.0 TRAVEL COST ANALYSIS OF WATER QUALITY VALUES

4.1 Overview of the Travel Cost Method

The travel cost method infers the value of non-market resource amenities like water quality by observing the behaviour of resource users. Unlike the contingent value approach, there is no reliance on valuations volunteered to interviewers in response to hypothetical questions; rather information is collected from survey respondents on actual site visitation frequencies, travel and other trip costs and various other factors such as family income. The integration of this information in order to formulate a model describing resource use behaviour relies on certain key concepts (Mendelsohn and Markstrom, 1989):

a) The decision to visit a site is analogous to any other decision to purchase a good or service save that the cost of travel to the site comprises a significant portion of its "price".

b) People will make repeated trips to a site as long as the implicit value of the pleasure they derive from each successive trip is at least as great the costs of the trip.

c) The value of each successive or marginal trip is less than earlier trips with the last trip being just worth making; other things being equal then, a higher cost for a user will result in a lower visitation frequency.

d) The net value of a single trip is the implicit value associated with pleasurable or fulfilling aspects of the trip less the actual trip cost; this net value is called the "consumer surplus".

e) Where the value of a trip derives from a non-marketed amenity such as water quality then that value can be attributed to that amenity.

f) There is a complementarity between marketed goods such as those used for travel (gas, vehicles) and non-marketed amenities like water quality. The consumption of the non-marketed amenity requires the consumption of complementary marketed goods and the more valuable the amenity the greater will be the expenditure on complementary goods, other things being equal.

The economist interprets these concepts in terms of more rigorously defined assumptions concerning the exact nature of the complementarity, the role of income and the interrelationship of demands for all the various goods and services that a person consumes (see for example Freeman III, 1979).In simple terms, however, the value of a visit to a recreation site is inferred from the cost incurred to visit that site and the value of some non-marketed amenity associated with a recreation site is inferred from the extra cost incurred to access sites where that amenity is provided in greater quantity or quality.

Mendelsohn and Markstrom describe three types of travel cost models. The simple travel cost model describes visitation at a single site from multiple origins about that site. The resulting demand curve for site visits ignores any possible interactions with other sites that could influence consumer decisions. The multiple site travel cost model establishes a separate equation describing visitation to each site within a destination zone. Each equation incorporates information on the cost and quality of competing sites in order to better reflect the complex nature of the site visitation decision making process. The generalized travel cost model deals with visitation to a number of competing sites but does so by combining all site visitation data within one general equation. It assumes that travel costs to substitute sites are the same and is subject to bias and error when this assumption is violated as it usually is.

The data set prepared for this study is suitable for the estimation of either a simple travel cost model or a generalized model. While the preparation of information on substitute sites for a multiple site model is feasible, it was not possible to undertake the requisite work for this study. In this study, a generalized travel cost model is estimated as well as simple travel cost models for each beach.

In this analysis the household was assumed to be the decision making unit. This assumption established a clear basis for defining key variables such as income, the value of time and consumer surplus.

The analysis was limited to data for day users who reported using Ontario beaches in the year prior to the survey year (1987). Only day use activity was considered because the summary statistics describing day users and campers suggested that these were very different types of use that could not reasonably be described by a single travel cost demand curve.

4.2 Beach Visitation Costs

Beach visitation costs will include:

- out-of-pocket costs for gas, food, entry fees, etc.
- depreciation costs for vehicles and for recreation equipment.
- opportunity costs for that time spent in travel and on the beach.

These costs can be classified as unavoidable costs, such as for transportation, entry fees and travel time; or as discretionary costs for snacks, rentals, film, etc. These two categories are distinguished in the cost analysis since discretionary costs do not necessarily have any direct bearing on beach use decisions while unavoidable costs must be incurred in order to visit a beach.

Statistics for primary cost data from the interviews (Question 13) are summarized in Table 4.1. As might be expected, day user costs are lower than costs for all users which will include costs of campers. Values under the category "other car costs" are very low because only 15 out of 489 respondents {3%) provided any data for this category. Given this low reporting rate, these costs are omitted from the analysis. A season pass was reported by 51 respondents (10%).This cost is treated as a sunk cost and is omitted in the calculation of cost variables because the marginal entry cost to the holder of a seasonal pass is zero; the cost of the pass should have no influence on subsequent decisions to go to a beach.

TABLE 4.1. Reported Out Of Pocket Costs For A Beach Visit[1].

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
COSTS FOR ALL USERS ($ 1988)[2]:						
Gas	4.04	4.88	3.26	3.74	1.34	3.46
Other Car Costs	0.06	0.09	0.64	0.04	-	0.15
Public Transit	-	-	0.12	-	0.36	0.09
Meals/Snacks	11.48	29.85	10.63	17.97	4.89	15.05
Entry Fees	4.48	22.75	3.96	7.81	-	7.85
Season Passes	2.62	20.2	6.90	13.41	-	8.69
Equipment Rental	0.72	3.36	-	1.67	-	1.18
Other Supplies	0.03	1.64	0.02	0.48	0.09	0.46
TOTAL	23.43	82.63	25.53	45.12	6.68	36.93
No. of obs.	103	97	84	107	98	489
COSTS DAY USERS($ 1988):						
Gas	4.04	3.50	3.05	2.73	1.22	2.88
Other Car Costs	0.06	0.06	0.09	0.03	-	0.05
Public Transit	-	-	0.13	-	0.37	0.10
Meals/Snacks	11.48	10.46	8.08	7.83	4.85	8.50
Entry Fees	4.48	12.81	3.19	4.25	-	4.57
Seasonal Passes	2.62	7.75	7.44	7.77	-	4.82
Equipment Rental	0.72	2.63	-	1.37	-	0.88
Other Supplies	0.03	0.04	-	0.01	0.08	0.03
TOTAL	23.43	37.25	21.98	23.99	6.52	21.83
No. of obs.	103	71	78	94	96	442

NOTES:

1. Cost figures are for all members of the beach party.

2. "All users" include campers and stop overs. The high cost for "all users" at Rockwood and Guelph is due to campers in the sample.

A variety of out-of-pocket cost items will depend on group size. Since user groups are not always family groups, costs reported by respondent groups must first be adjusted to correspond to the size of the household unit in keeping with the prior assumption that the household is the decision making unit. Entry fees and travel costs can vary with group size as is confirmed by the following regression (t-scores in brackets):

$$\text{(TRAVEL + ENTRY COST)} = \underset{(12.872)}{5.129} + \underset{(9.727)}{0.090}\ \text{(TRAVEL DISTANCE)} + \underset{(4.882)}{0.294}\ \text{(PARTY SIZE)}$$

$$R^2\ (\text{adj.}) = 0.375, \quad F = 75.32, \quad n = 249$$

Cost variables normalized to the size of the household using regression curves such as this did not perform well in preliminary regression estimates of the travel cost demand curves. Entry costs were therefore adjusted as follows:

HOUSEHOLD ENTRY COSTS = PARTY ENTRY COSTS x (HOUSEHOLD SIZE/PARTY SIZE)

Costs for gas were assumed to be constant for a given trip and were not varied as a function of household size.

The cost of visiting the beach should also include the value of time that is spent on the journey. Most respondents do not have a clear choice between working extra hours or going to the beach, but there are other home activities (such as painting the house) which may be income-saving, so it is reasonable to put a value on travel time. Various estimates have been made of the opportunity cost of time for commuting; these lie mostly between 25 and 50 percent of the wage rate (Freeman III 1979). In this study the wage rate was calculated from reported data on before-tax family income (1988 $) and household employment as follows:

WAGE RATE = (ANNUAL FAMILY INCOME)/(2000 HRS X NO. OF EMPLOYED HOUSEHOLD MEMBERS)

Rather than assume a factor in the 25 to 50 percent range to derive the opportunity cost of time from the estimated wage rate, preliminary regression results were used to infer a factor of 12 percent (see Section 4.3). This factor implies an opportunity cost for leisure travel that is lower than that for commuting time which seems reasonable if leisure time spent driving is considered to be less stressful or in fact is viewed as recreational in its own right.

Another cost associated with a beach visit is the opportunity cost of time spent on the beach. Rather than incorporating this as another cost item, we have included the actual time spent on the beach as a separate variable in the travel cost model. There may also be capital costs related to beach equipment, such as lawn chairs, air bed, wind surfer and coolers. These costs are all to a large extent discretionary and are also sunk costs like the season pass discussed above. Nevertheless, a variable identifying the number of items of equipment was developed from questionnaire data to test the role of equipment in beach use decisions.

Estimates of unit costs, wage rates and normalized household trip costs are reported in Table 4.2. These estimates were used to define the cost variables developed for the travel cost model. Values in Table 4.2 are based only on reported data. No estimates were made in the event of missing data, and observations with missing data were omitted from regression tests.

TABLE 4.2. Beach Visitation Cost Data For Day Users.

	Kelso	Rockwood	50 Point	Guelph	Sunnyside	Total
UNIT COST DATA:						
Gas Cost/km						
Average	0.133	0.189	0.282	0.192	0.298	0.198
(no. obs.)	(97)	(62)	(74)	(83)	(52)	(368)
Entry Fee/Person						
Average	1.10	1.65	1.57	1.74	-	1.47
(no. obs.)	(94)	(59)	(45)	(77)	-	(275)
Hourly Wage Rate						
Average	17.36	15.71	14.72	14.66	14.53	15.44
(no. obs.)	(93)	(62)	(74)	(82)	(84)	(395)
UNAVOIDABLE HOUSEHOLD COSTS/TRIP:						
Gas, Transit, Entry Fees						
Average	7.28	6.70	5.71	6.07	1.60	5.33
(no. obs.)	(93)	(53)	(72)	(83)	(92)	(393)
Travel Time Cost [1]						
Average	1.95	1.42	1.00	1.07	0.92	1.27
(no. obs.)	(90)	(53)	(69)	(83)	(90)	(385)
Total Unavoidable Costs						
Average	9.29	8.04	6.82	7.04	2.51	6.59
(no. obs.)	(90)	(51)	(69)	(80)	(90)	(380)
DISCRETIONARY HOUSEHOLD COSTS/TRIP:						
Average	8.54	7.74	8.00	6.63	4.67	7.07
(no. obs.)	(103)	(69)	(82)	(91)	(98)	(443)

NOTE: 1. Travel time costs are the opportunity costs associated with time spent in transit by employed household members.

4.3 Development of a Travel Cost Demand Curve

If the population was evenly spread across the province the number of visits to any beach from any origin would depend simply on how far the locality was from the beach. In fact, population is unevenly distributed and the actual pattern of visitation to a particular beach will depend on how far the beach is from large population centres. Consequently, survey data will exhibit an uneven distribution of observations across the full range of travel distances, with large numbers of observations for large centres. In the regression analysis, an allowance must be made for this uneven distribution of information in order to get unbiased estimates of the demand curve.

The standard travel cost model described by Freeman (1979) requires division of the region around a beach into distance zones and estimating a visitation rate for each zone. Descriptive variables are averaged across all respondents within each zone and one is left with as many observations as there are zones, rather than one observation per respondent. This procedure overcomes the problem of unevenly distributed data, but entails the loss of information on individual respondents. It is desirable to treat each respondent as a separate observation in order to avoid this loss of information. This was accomplished in this study by weighting individual observations by the inverse of the number of households in the home location. In keeping with the format of the generalized travel cost model data for all five beaches were grouped together.

This approach introduced another source of bias since the five beaches, which had equal representation in the data set (approximately 1/5 of the observations for each), differed markedly in their level of popularity and use; popular beaches being therefore under-represented in the data. To overcome this bias, the individual observations from each beach were weighted by the average count of beach users over the survey period (see Table 2.1). Data used in the regression results reported below were therefore weighted using the following term:

$$\frac{\text{(average no. of persons on beach "i")}}{\text{(no. of households in origin "j")}}$$

A sample of preliminary regression results are provided in Table 4.3. Variables shown here and in subsequent tables are as follows:

TRIPS/YR	-	respondent reported beach visits to the interview beach for 1987.
COST.DIRECT	-	direct costs of a beach visit including gas, entry fees and public transit (1988 $).
COST.TRAVEL	-	value of travel time associated with a beach visit (1988 $).
QUALITY	-	respondent rating of water quality from 1 = "very poor" to 5 = "very good".
CROWDING	-	beach user congestion measured as average seasonal mid-day user count (on beach and in water) divided by linear beach length (m). Beach counts were made at each beach on interviewing days.
INCOME	-	household income in 1,000's of dollars ($1988)
EQUIPMENT	-	number of types of beach equipment brought by respondents (i.e. barbecue, lawn chairs, toys, boat, etc.)
LENGTH.STAY	-	reported length of stay for the visit at the time of the interview (hours).
EDUCATION	-	equal to one if respondent has a post-secondary education, zero otherwise
DAYSOFF	-	reported number of household leisure days each week (i.e. days off together).
CHILDREN	-	number of children in beach party (< 18 years old) used as a proxy for children in household.

TABLE 4.3. Travel Cost Model Regressions[1].

	A		B		C	
DEPENDENT VARIABLE = TRIPS/YR						
Constant	7.690	(2.991)*	2.764	(1.461)	3.119	(1.660)
COST.DIRECT	-0.729	(-6.204)*	-0.876	(-7.684)*	-0.824	(-0.605)*
COST.TRAVEL	-0.107	(-1.899)	-0.124	(-2.459)*	-0.108	(-2.200)*
QUALITY	2.017	(5.214)*	2.141	(5.649)*	2.183	(5.767)*
CROWDING	-1.350	(-2.627)	-1.226	(-2.350)*	-1.376	(-2.686)*
INCOME	0.057	(1.870)	0.064	(2.119)*	0.064	(2.117)*
CHILDREN	0.314	(1.489)	-		-	
LENGTH.STAY	-0.313	(-1.130)	-		-	
EDUCATION	0.688	(0.839)	-		-	
DAYSOFF	-2.036	(-3.210)*	-		-	
EQUIPMENT	-	-	0.442	(1.444)	-	
R^2	0.255		0.255		0.223	
F	15.236*		19.224*		22.585*	
No. obs.	376		378		378	

NOTE:

1. The independent variables are listed in the left column. T-scores are provided in brackets after each estimated coefficient and an asterisk (*) denotes that these are significant at P = 0.05.All regressions are weighted ordinary least squares regressions with weights defined as:

(no. of beach users)/(no. of origin households)

In regression A, a broad range of variables are tested. The coefficients for these variables all have the expected signs with the exception of the DAYSOFF variable which should probably be positive. In a regression that is not listed, the DAYSOFF variable was replaced with a variable giving the number of vacation days; the coefficient was still negative and also it was not significant (P = 0.05). In regression B the last four variables are dropped and EQUIP is added. It however is not significant. A variety of other regressions tested variables such as respondent ratings of individual water quality attributes, outdoor recreation expenditures, and the total trip duration. None of these yielded useful results. The best set of explanatory variables are those shown in regression C in Table 4.3.

In the preliminary regression work, tests were also completed with partitioned data. In one test day users who were not swimming were dropped from the data set in light of the possibility that they would be less familiar with or sensitive to water quality conditions. This change had no significant effect on the coefficients.

A second test used data partitioned into five groups corresponding to the five water quality ratings. The results suggested a significant systematic interaction between the cost and water quality variables. A second set of regressions was therefore completed to investigate this interactive effect using regression C variables as a basis for the analysis. These regressions are reported in Table 4.4. In the first regression (A), the combination of coefficients on the cost and the (cost x quality) variables should yield an overall cost coefficient that is negative. This is not the case for the COST.DIRECT variable.

Moreover, the COST.TRAVEL coefficients are not significant. Both of these problems are overcome in regression B which drops the simple cost variables, leaving only the interactive terms. Regression C is virtually identical to regression B save that it adds the two cost variables beforehand using a weight on the COST.TRAVEL term that is based on the ratio of the cost variable coefficients in regression B. This weight measures the discount on the wage value of time that is used to measure the opportunity cost of travel time. Regression C is used for further analysis below.

TABLE 4.4. Travel Cost Model With An Interactive COST.QUALITY Term[1].

	A		B		C	
DEPENDENT VARIABLE = TRIPS/YR						
Constant	-9.621	(-3.806)*	-1.514	(-0.870)	-1.515	(-0.879)
COST.DIRECT	1.744	(4.194)	-		-	
COST.DIRECT x QUALITY	-0.750	(-6.360)*	-0.273	(-9.250)*	-	
COST.TRAVEL	-0.069	(-0.397)	-		-	
COST. TRAVEL x QUALITY	-0.008	(-0.165)	-0.033	(-2.461)*	-	
QUALITY	6.261	(9.106)*	3.921	(9.625)*	3.921	(9.648)*
CROWDING	-1.772	(-3.635)*	-1.623	(-3.283)*	-1.623	(-3.290)*
INCOME	.0.051	(1.780)	0.059	(2.072)*	0.059	(2.113)*
(QUALITY x (COST.DIRECT + 0.12 x COST.TRAVEL))	-		-		-0.273	(-10.288)*
R^2(adj.)	0.311		0.279		0.281	
F	25.338*		30.191*		37.841*	
No. obs.	378		378		378	

NOTE:

1. The independent variables are listed in the left column. T-scores are provided in brackets after each estimated coefficient and an asterisk (*) denotes that these are significant at P = 0.05. All regressions are weighted ordinary least squares regressions with weights defined as:

(no. of beach users)/(no. of origin households)

Table 4.5 gives separate regression results for each beach. The regression for Sunnyside users is strikingly different from the other results; the variables all have improperly signed coefficients and are insignificant (P = 0.05). To understand these results, recall that Sunnyside is almost always posted, few people visit it and fewer still go there to swim. Yet those that do visit go there very often, despite their journey time being nearly as long as the journey time of people visiting other beaches. The negative coefficient for water quality in the Sunnyside regression, implies that people who think the water quality is worse visit the beach more often. Using the behaviourial model this would suggest negative benefits from improving water quality at Sunnyside, but clearly the Sunnyside visitors have a different motivation in visiting the beach: perhaps they visit often because it provides a park-like setting close to the city, a particularly valuable resource for those with lower incomes and no private transport. As their comments indicate, they would still get more pleasure from the beach if the water quality were improved.

Finally, travel cost models shown in Table 4.6 use alternative measures of the dependent variable. Instead of using actual trips reported for 1987, the two contingent measures of visitation frequency summarized in Table 2.13 are used as dependent variables. These are the trips per year that respondents indicated they would make to the beach that they were visiting if its water quality were either "very good" or "very poor". The regression results in Table 4.6 provide an alternative estimate of the travel cost demand curve (regression C, Table 4.4) for values of the QUAL variable set at 1.0 and 5.0. The significant regression coefficients in Table 4.6 all have appropriate signs. Furthermore, the magnitude of the cost coefficients in Table 4.6 are not significantly different (P = 0.01) from the cost coefficient of the basic model (regression C of Table 4.4) when this is adjusted for the appropriate water quality index value as follows:

VERY GOOD WATER QUALITY
cost coefficient (QUAL=5) = - 0.273 x 5 = - 1.365

VERY POOR WATER QUALITY
cost coefficient (QUAL=1) = - 0.273 x 1 = - 0.273

TABLE 4.5. Travel Cost Model Regressions By Beach [1].

	KELSO		ROCKWOOD		50 POINT		GUELPH		SUNNYSIDE	
DEPENDENT VARIABLE = TRIPS/YR										
Constant	-12.515	(-2.410)*	-8.307	(-2.371)*	-5.927	(-0.863)	-5.246	(-1.926)	31.493	(6.328)*
((COST.DIRECT + 0.12 x COST.TRAVEL) x QUALITY)										
	-0.560	(-7.147)*	0.190	(-4.445)*	-0.223	(-2.448)*	-0.347	(-5.293)*	0.107	(0.271)
QUALITY	10.089	(6.035)*	4.113	(4.558)*	4.488	(2.372)*	3.843	(5.012)*	-5.721	(-1.861)
INCOME	0.059	(0.863)*	0.103	(2.358)*	0.024	(0.277)	0.099	(1.430)*	-0.200	(-1.888)
R^2 (adj.)	0.396		0.235		0.089		0.476		0.079	
F	18.260*		9.903*		3.200*		16.157*		3.526*	
No. Obs.	80		88		69		51		90	

NOTE:

1. The independent variables are listed in the left column. T-scores are provided in brackets after each estimated coefficient and an asterisk (*) denotes that these are significant at P = 0.05. All regressions are weighted ordinary least squares regressions with weights defined as:

   (1/no. of origin households)

   The beach user term is not used in weighting since it does not vary for a given beach and the "CROWDING" variable is dropped for the same reason.

TABLE 4.6. Travel Cost Models With Contingent Use Variables[1].

DEPENDENT VARIABLE[2]	Trips/year If QUAL Were Very Good		Trips/year If QUAL Were Very Poor	
Constant	17.604	(6.446)*	3.189	-(4.083)*
(COST.DIRECT + 0.12 x COST.TRAVEL)	-1.606	(-9.795)*	-0.163	(-3.482)*
CROWDING	-2.068	(-2.440)*	-0.311	(-1.279)
INCOME	0.244	(-5.177)*	-0.005	(-0.344)
R^2 (adj.)	0.227		0.027	
F	37.871*		4.525*	
no. obs.	377		376	

NOTES:

[1] The independent variables are listed in the left column. T-scores are provided in brackets after each estimated coefficient and an asterisk (*) denotes that these are significant at P = 0.05. All regressions are weighted ordinary least squares regressions with weights defined as:

(no. of beach users)/(no. of origin households)

[2] Respondents were asked:
"How much would you use this beach each year if it had:
Very good water quality ____ (days),
Very poor water quality ____ (days).

4.4 The Value of Improved Water Quality

In Chapter 3, the value to beach users of a change in water quality was determined by means of direct "willingness-to-pay" questions eliciting respondent evaluations. The travel cost demand curve provides an alternative method of estimating the value of water quality by virtue of the information that it provides concerning how beach users respond to changes in water quality. With an improvement in water quality, the demand curve shifts out to the right (see Figure 4.1). This indicates that at any given level of trip cost, households are willing to visit a beach with good quality water more frequently. Conversely, they are willing to incur higher time and direct travel costs to get to such beaches.

The total value of a beach visit is interpreted as the total trip cost that a household would willingly incur to partake of the visit, and this is measured with a demand curve as the vertical distance from the curve to the x-axis. The net benefit to the household of a beach visit is this total value less the actual trip costs measured by the price line. This net benefit is a surplus amount in excess of actual trip cost and is accordingly called consumer's surplus.

For a given household, the total consumers's surplus for all beach trips in a year is measured as the area under the demand curve and above the price line. When the demand curve shifts outward due to an improvement in water quality, this area gets larger, or consumer's surplus is greater. The value assigned to the improvement in water quality is the change in consumer's surplus shown as the shaded area in Figure 4.1.

The consumer surplus value is approximately analogous to the willingness-to-pay figures discussed in Chapter 3.0 above. The analogy is only approximate because the consumer surplus figures are based on the user response to an experienced differential in water quality; it is a "user" value. The willingness-to-pay figure on the other hand can encompass non-use values such as the value a household may assign to an environmental enhancement simply because of an aesthetic or ecological appreciation that does not depend on direct use (an existence value). Moreover, the willingness-to-pay question used for this study (Question 28) prompts respondents to consider water quality improvements at all beaches that they might use while the consumer surplus measure is specific to the use of one beach.

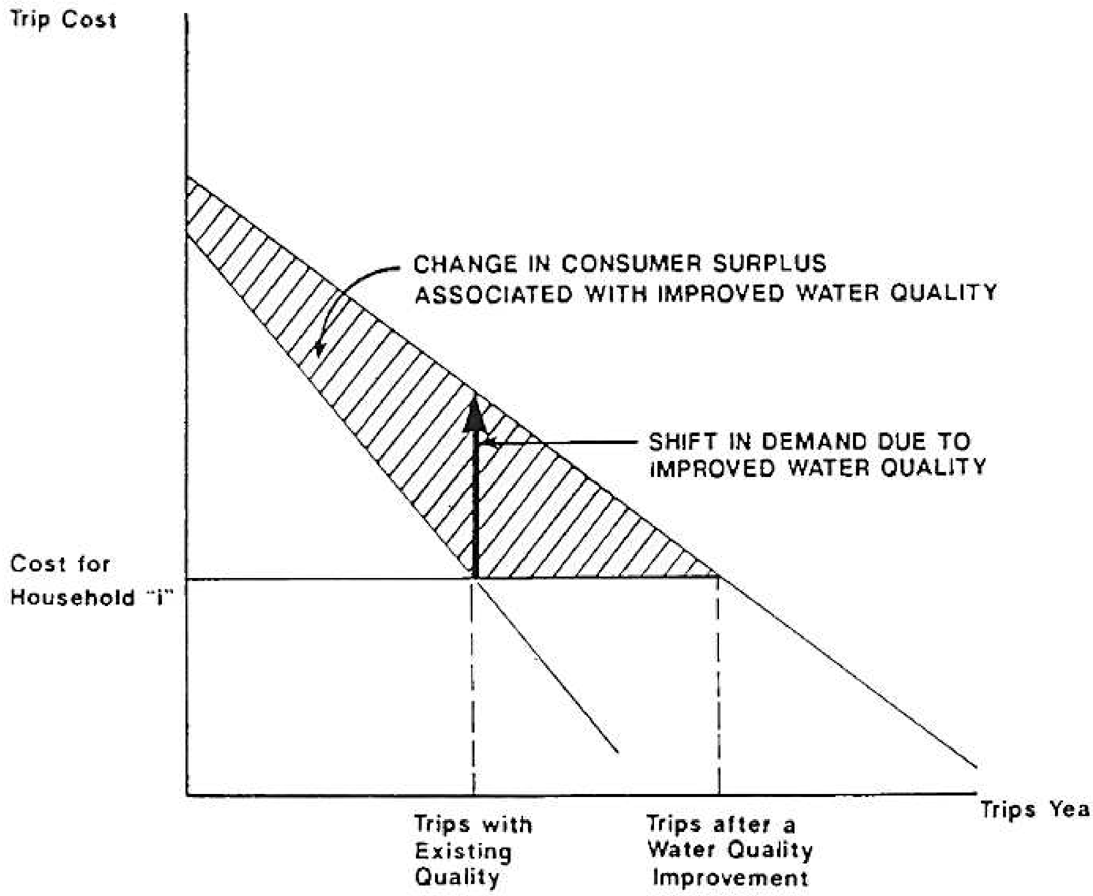


Figure 4.1: The Demand for Beach Recreation.

The willingness-to-pay figures are therefore expected to be larger than the consumer surplus figures.

Consumer surplus was estimated for each respondent separately using that respondent's trip frequency, income, trip cost and water quality rating data and the parameters of regression C in Table 4.4. The same calculation was repeated assuming "very good" and "very poor" water quality ratings.

The consumer surplus calculation was also repeated for each respondent using responses to the contingent questions about willingness to travel to and to visit a beach with very poor or very good quality conditions (Questions 19 and 27 in the questionnaire). Question 27 of the survey asks:"If this particular beach wasn't available, what's the longest time that you would have travelled to reach a beach like this one with (1) the same water quality? (2) very good water quality? and (3) very poor water quality?" Figure 4.2 gives a diagram of the respondent's situation for the "very good" quality response. The data on respondent visitation to the beach last year, and visitation frequency if the water quality were very good define points B and E on the diagram. Responses to Question 27, which are used to define points on the Y-axis, represent the travel cost beyond which visitation is zero.

The value at point A is the maximum cost of travel to a beach of the same water quality. Similarly the value at point D is the cost of travel to a very good beach. The area of benefit or consumer surplus for existing trips is ABC and the gain from improved water quality is measured by area DEBA. The calculation corresponding to very poor water quality is completely analogous to this.

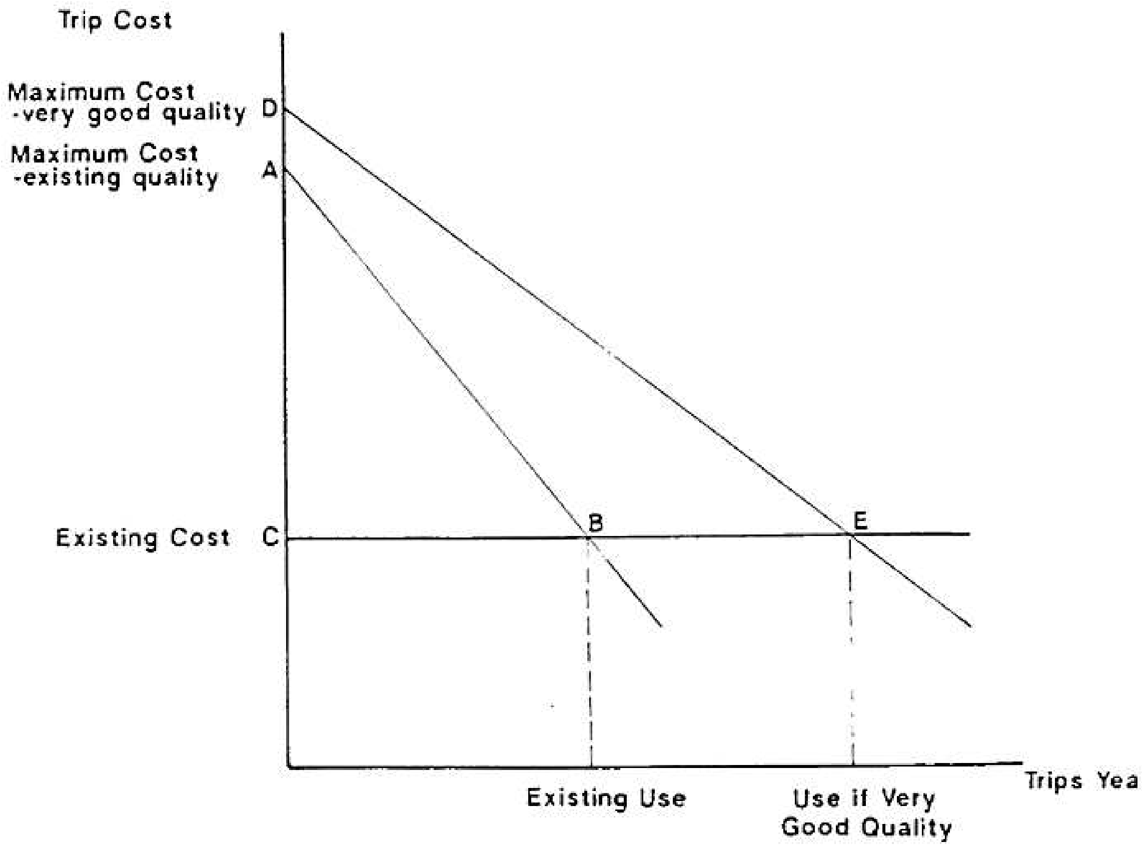


Figure 4.2: Demand Curve from Contingent Use Data

Results for the consumer surplus calculations measuring the value of annual household beach visits are provided in Table 4.7. The annual household value assigned to a change in water quality was estimated as the difference in consumer surplus measurements as follows:

(value of an improvement from existing to very good quality)
= (consumer surplus for very good quality) - (consumer surplus for existing quality)

(value of a deterioration from existing to very poor quality)
= (consumer surplus for existing quality) - (consumer surplus for very poor quality)

These estimates are provided in Table 4.8 along with the willingness-to-pay results from Chapter 3.

Both sets of measures of consumer's surplus in Table 4.7 behave as expected with average values increasing as water quality increases. It is evident from these statistics that the distributions of individual respondent measures have a high positive skew.

The alternative valuations of a change in water quality, shown in Table 4.8, are in greater agreement than the data in Table 4.7. The results indicate that the annual value assigned by a household to an improvement in water quality from existing to very good conditions lies in the \$60 to \$70 range with the annual household loss associated with a deterioration to very poor conditions lying between \$10 and \$50.The three estimates of value for an improvement in water quality are not significantly different from each other (based on t-tests, P = 0.05).The fact that the willingness-to-pay figure is similar to the consumer surplus figures for improvements despite a question format that would logically suggest that it should be higher indicates the possible influence of downward bias related to mention of taxation in the willingness-to-pay question (see Chapter 3.0).

The willingness-to-pay measure of value associated with prevention of a deterioration in water quality is three times as large as consumer surplus measures of the same value, and is significantly different from these (t-tests, P = 0.05). The close agreement between the two consumer surplus values of a deterioration in water quality and the high non-response rate for the willingness-to-pay question regarding deterioration are factors arguing in favour of the consumer surplus values over the willingness-to-pay estimate.

TABLE 4.7. Consumer Surplus Estimates Of The Value Of Annual Beach Visits.

Basis Of Estimate	Consumer's Surplus Estimated with [1] a Travel Cost Demand Curve			Consumer's Surplus Estimated with [1] Contingent Measures of Beach Use		
Water Quality Condition	Very Poor	Existing	Very Good	Very Poor	Existing	Very Good
Average	$101	$111	$179	$4	$24	$114
St. Deviation	$340	$343	$493	$17	$61	$290
Minimum	$0	$0	$0	$0	$0	$0
Lower Quartile	$0	$0	$0	$0	$0	$10
Median	$0	$2	$11	$0	$3	$28
Upper Quartile	$25	$46	$100	$0	$15	$89
Maximum	$2931	$2931	$3997	$146	$586	$3671
No. obs. [2]	358	363	332	272	272	272

NOTES:

1. Monetary values ($1988) represent the value assigned by respondent households to beach visits by all household members over the period of a year.
2. Number of observations vary as a result of omissions due to missing values for certain observations the omission of outliers.

TABLE 4.8. Comparing Alternate Estimates Of The Value Of Water Quality[1].

Basis of Estimate	Consumer Surplus [2] Travel Cost Demand Curve		Consumer Surplus [2] Contingent Beach Use		Willingness to Pay [3]	
Water Quality Change From Existing To:	Very Good	Very Poor	Very Good	Very Poor	Very Good	Very Poor
Average	$61	$13	$71	$17	$62	$52
St. Deviation	$150	$28	$154	$46	$117	$124
Minimum	$0	$0	$0	$0	$0	$0
Lower Quartile	$0	$0	$4	$0	$0	$0
Median	$6	$1	$20	$0	$30	$20
Upper Quartile	$42	$12	$60	$9	$100	$60
Maximum	$1065	$210	$1222	$337	$1000	$1000
No. Obs.	316	332	263	263	305	143

NOTES:

1 Figures represent the annual value to the household of changes in water quality at beaches that are used for swimming.

2 Consumer surplus values measured as the difference in areas under demand curve for existing, very good and very poor water quality.

3 Willingness to pay to either achieve very good water quality conditions or to prevent degradation to very poor conditions. The value for "very poor" is not a measure of willingness to accept compensation.

4.5 Evaluating Benefits For Water Quality Improvements

The travel cost demand curve model developed in Section 4.3 together with water quality perception relationships developed in Section 2.5 can be used to evaluate the response of demand to an improvement in water quality at beaches similar to those covered in the survey. Background information for the analysis, provided in Table 4.9, are averages of household trip frequency and annual household consumers surplus estimated for individual survey respondents. These estimates are based on regression C in Table 4.4.

To illustrate the use of this data, consider the following hypothetical case: a beach with water quality that is given an overall rating of poor (= 2) resulting from fair ratings (= 3) for clarity, temperature, waves and algae and a posting frequency resulting in beach closures for 80% of the season. Elimination of postings would increase overall water quality rating to a value of 2.8.

The water quality rating values given above result from calculations using the regression curves describing respondent ratings of posting frequency (Section 2.6):

$$(POSTED16/5) = 0.976\ (1 - POST)^{0.287}$$

and the overall water quality ratings (Table 2.13, TSLS regression):

$$(QUAL1/5) = 1.19\ (TEMP14/5)^{0.31}\ (WAVES14/5)^{0.5}\ (CLAR14/5)^{0.27}\ (ODOUR14/5)^{0.33}\ (ALGAE14/5)^{0.51}\ (POSTED16/5)^{0.65}$$

(Both curves expressed here in exponential form)

Setting all rating variables except POSTED16 at 3.0 and substituting the expression for POSTED16 into the QUAL1 equation gives:

$$QUAL\ 1 = 2.76\ (1\text{-}POST)^{0.19}$$

It is this expression that is used above to derive the QUAL1 ratings of 2 and 2.8 corresponding respectively to posting frequencies of 80% and 0%.

TABLE 4.9. Estimated Beach User Responses To Changes In Water Quality [1].

Water Quality Rating	Average No. of Beach Trips/Season	Average Consumer Surplus for Beach Use
1 = Very Poor	4.2	$101
2 = Poor	5.4	$118
3 = Fair	7.0	$135
4 = Good	9.0	$155
5 = Very Good	11.4	$179

NOTE:

[1] These estimates are based on regression C in Table 4.4

Given this change, the individual household currently using the beach in question would respond by increasing seasonal trip frequency from 5.4 (Table 4.9) to about 6.6 (interpolating between fair and poor). Annual consumer surplus for the household would increase by $15 as a result of the improvement. Had the initial water quality conditions for indicators other than postings been good (= 4), the overall rating (QUAL1) would have increased from fair (= 3.1) to good (= 4.2) with the elimination of postings. Household trip frequency would then increase by two trips per season and annual consumer surplus by $20.

Application of these results in estimating the aggregate benefit associated with demand for beach trips to a site is best done with demand data obtained from a model such as the Usher *et al* (1981) modified gravity model. Such models incorporate substitution effects between sites related to site quality through aggregate provincial demand for beach recreation is estimated using predetermined participation rates that do not vary with water quality or other beach improvements. Since water quality improvements at one or more sites can be expected to both redistribute beach use activity (a substitution effect) and to increase overall use (a net growth in demand), evaluation of benefits for water quality improvements based on gravity model predictions of use will be conservative.

Estimates of beach use generated by gravity models or by user surveys are usually provided in the form of numbers of user site visits per season, whereas the estimates of beach value provided here are annual values per household. Estimated site visitation data must therefore be converted to a household basis before being used to estimate beach user benefits. This is accomplished as follows:

(no. of user households) = (no. beach visits)/(visits per household x person per household)

The estimated mean household size for survey respondents was 2.9 persons while estimated numbers of trips per household are provided in Table 4.9 above. For a beach with fair water quality and providing 20,000 individual user days of recreation over the summer season, the estimated number of households using the site would therefore be (20,000 + (2.9 x 7.0) or 985. Total annual consumers surplus associated with their use of the beach would be (985 x $135) or $132,975 per year. For those same households, an improvement in water quality to a rating of "good" would be valued at (985 x ($155 - $135)) or $19,700.

5.0 DISCUSSION

The analysis, reported in the above chapters, strives to throw light on certain empirical questions related to the valuation of water quality as well as filling key gaps in our understanding of beach use behaviour in Ontario. Promising results are obtained in a number of areas, but just as many questions are raised and a basis is established for further investigation of some of these questions.

A primary contribution of the study has been the development of basic descriptive information on beach use by Ontario residents including statistics on party size, travel time and distance, length of stay and expenditure patterns. The distribution of user origins for survey beaches was characterized. Data were also collected on visitation rates for these beaches and for all beaches used by respondents. The need for such data is evident in the work of Usher *et al* (1981) which falls back on the judgement of its authors in setting certain values to describe beach visits.

Freeman (1979) identifies a need for empirical work on the relationship between travel time and the length of stay at a recreation site. A simple regression here showed a weak positive relationship suggesting that beach users will stay longer if they have to travel further. The length of stay did not however, prove to be a significant variable in the travel-cost demand curve.

Freeman also notes that there is a lack of research into the opportunity cost of travel time for recreation, with available information being derived from studies on commuter travel time. Regression results in this study suggested that the opportunity cost of travel time for recreation is 12% of the wage rate rather than 25% to 50% as found in commuter travel time work (Freeman, 1979). This is an intuitively appealing result since recreation travel is likely to be less stressful than daily commuter travel.

Three different approaches were used to estimate the value of changes in water quality.

- one based on willingness to pay,
- a travel cost model approach using data on actual beach use behaviour,
- a second travel cost model approach using contingent beach use behaviour data.

All three approaches assumed that the household was the basic decision making unit and examined the magnitude and behaviour of the annual value that households place on water quality at beaches.

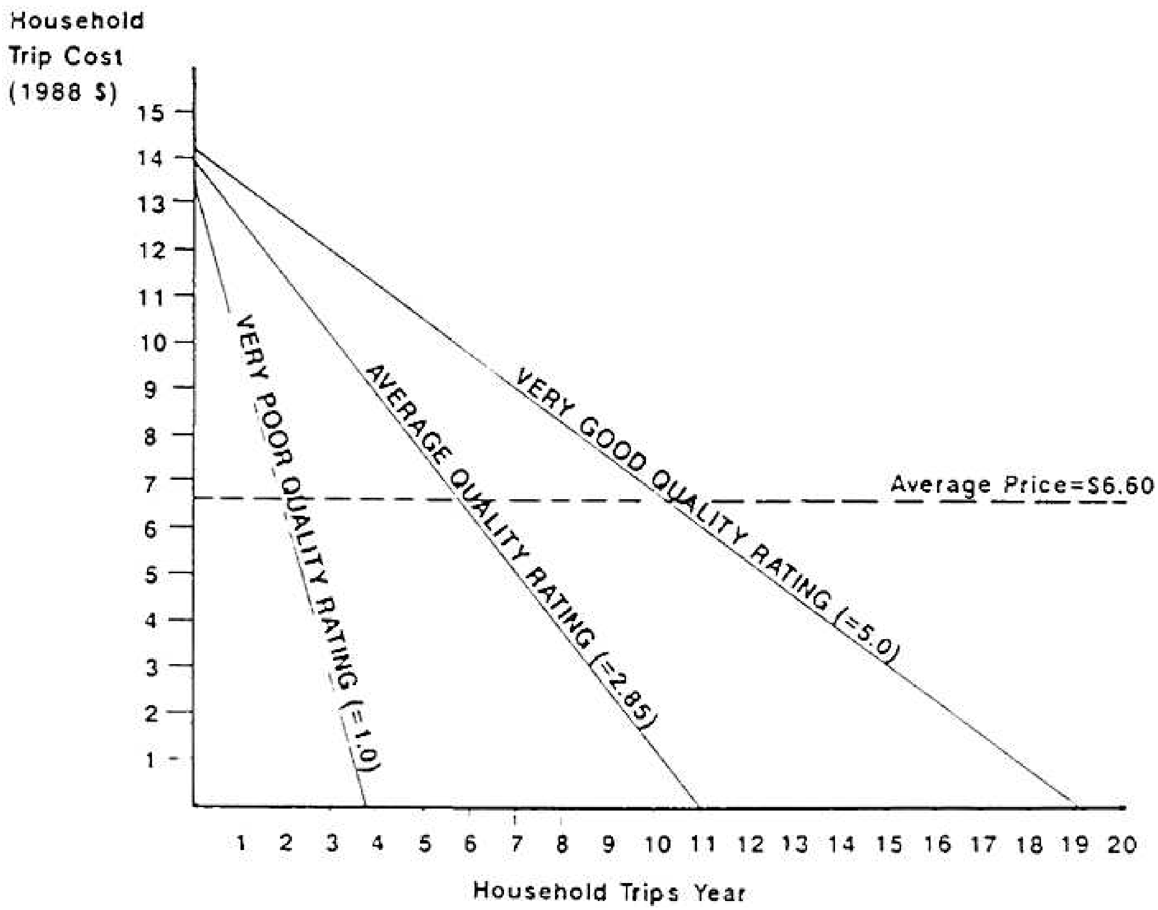
There was close agreement in the estimates of value for an improvement in water quality from existing conditions to a very good condition ($60 to $70 per year per household). There was less agreement concerning the loss of value attending a deterioration to very poor conditions; average willingness to pay to prevent deterioration was about $50 while corresponding travel cost estimates of consumer surplus were in the $10 to $20 range.

Willingness-to-pay results showed evidence of payment vehicle bias. This bias was quantified by virtue of an analysis of respondent comments on the willingness-to-pay question. The use of open ended questions in this context provided insight that would not otherwise have been acquired. Other significant determinants of willingness to pay were income, presence of children in the household and levels of beach use activity by the household.

In the travel cost analysis using actual visitation data, a generalized travel cost model was estimated using individual respondent data rather than data lumped by origin. Weighted regression techniques were used to overcome problems of statistical bias in estimation. The resulting demand curve for beach trips (household trips per year) included trip cost, income, water quality and beach crowding as explanatory variables. These were all significant and properly signed. Cost and water quality had a strong interactive affect on trip visitation frequency. The nature of this interaction is readily apparent in Figure 5.1 showing the demand curve (regression C from Table 4.4) evaluated at the mean of the income and crowding variables. The curve is seen to pivot outwards from a price intercept that barely changes. One explanation for the essentially fixed price intercept may be that it reflects a constraint on trip cost related to the time available for recreational travel on a day trip. There will also be a limit to the number of summer leisure days available for day trips to a local beach and this may be reflected in the x-axis intercept of the demand curve for a very good quality beach.

The demand curve provides insight into the factors affecting the beach visitation frequency of households that are committed to participation in beach activity and lets us evaluate the household consumer surplus associated with their beach use. The principal limitations of this demand curve formulation are that:

- it does not describe aggregate community demand (encompassing both participating and non-participating households).
- it does not account for the impact on demand of alternative beaches that serve as substitutes.
- it does not apply to popular provincial beaches such as Grand Bend or Wasaga.



TRIPS YEAR = -1.515 - 0.273 (Cost - Quality) - 3.921 (Quality)
-1.623 (Crowding) - 0.059 (Income)

Evaluated at mean values for crowding (0.76 persons m beach) and income ($41,500).

Figure 5.1: Demand Curve for Household Trips to a Beach with Varying Water Quality.

The survey data base provides information on overall household beach use including:

- number of trips and days of visit at each beach used in 1987,
- travel time to each beach,
- ratings of water quality and posting frequency for each beach.

The opportunity therefore exists for further model development to overcome some of the limitations noted above.

The second travel cost approach relied on an analysis of responses to contingent questions about use. Contingent questions usually focus on value (i.e. the willingness-to-pay questions), but Maler and Wyzga (1976, p 93) identify one survey study that posed contingent questions concerning levels of use (fishing trips) under an hypothesized improvement in water quality. In the work reported here, the contingent use questions went a step further in addressing both activity levels and willingness to travel. The resulting information anchored the intersection points of a demand curve for each respondent along the price axis and the price line. With the assumption of a linear demand curve, one could then proceed directly to an estimation of consumer surplus for each household.

This approach has an important appealing feature - it poses the contingent question using a format that is directly analogous to the decision making process of the respondent. The questions deal with travel time and visitation frequency which are in effect the "decision variables" of the respondent. They do not require the respondent to make a leap in logic from those things about which he/she is accustomed to thinking to a more abstract concept - i.e. total value.

In the end, it was reassuring that the approach based on contingent use data generated values for water quality improvement that were comparable to the alternative measures discussed above. The application of this approach here was however an exploratory effort that would undoubtedly benefit from a more careful consideration of its underlying theoretical properties and of the methodological approach (i.e. sampling, question design, etc.).

A significant feature of all three approaches to the estimation of water quality values at beaches was the presence of a strong positive skew in the estimates of individual respondent values with a small proportion of individuals apparently ascribing a very large value to beach use activity. This small number of large positive values had a marked impact on measures of average value which were from twice as large to an order of magnitude larger than estimates of median value. If the extreme values represent outliers and not bona fide measures of amenity value, then the average values may be seriously biased and will provide unrealistically optimistic estimates of benefit for water quality improvement measures. While statistical procedures exist to identify outliers, the issue here is more substantive than one of simple estimation procedure. It concerns the question of whether or not certain individuals actually value environmental amenities to the extent indicated by such survey data. A more detailed comparative analysis of the individual respondent data from the survey for this study may throw some light on this question.

An important issue related to the skewed distribution of individually held values pertains to procedures for calculation of consumer surplus. In this study, the calculation was performed for each respondent independently and the resulting data was averaged. An alternative approach entails calculation of consumer surplus at the means for the independent regressors. This procedure produced estimates of value which were much closer to the median than the mean estimates obtained using individual respondent data. If the positive skew in the distribution of value assignments across respondents is a real and meaningful phenomena, then evaluations based on consumers' surplus measured at the mean for regressor data may introduce a considerable negative bias into the analysis.

Opportunities for further research are never lacking. In the case of this research, certain opportunities have already been noted above. For example, the survey database would lend itself to the estimation of demand curves incorporating substitutes. Alternative formulations such as multi-site models or a standard travel cost model based on data aggregated by zone could also be estimated. The opportunity exists to examine demand for major provincial beaches and perhaps to improve estimates of the distance decay parameters in gravity models such as that of Usher *et al* (1981). Beyond this, the research has investigated methodological approaches that merit further evaluation and verification and has raised questions concerning the significance of extreme observations in determining average amenity values.

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APPENDIX A

STUDY AREA SELECTION

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1.0 BEACH SELECTION PROCESS

1.1 Selection of Candidate Beaches

1.1.1 Sources for Candidate Beaches

The selection of candidate beaches for initial consideration was based largely on data records from the Ontario Recreation Supply Inventory (ORSI) (Usher *et al.*, 1987). The ORSI data records were compiled between 1975 and 1980. An additional 12 conservation areas, not included in the ORSI data, were identified using the Conservation Areas Guide (Ontario Ministry of Natural Resources, 1986). Three municipal beaches, not listed in the ORSI data were identified from topographic maps.

1.1.2 Criteria for Inclusion in Long List

Three criteria were used to identify sites to be included in the initial candidate field (the "long list"):

I) The site must have an active beach area. (Used to eliminate certain conservation areas).

ii) The beach must be under public administration. (ORSI data on computer diskette was conveniently sorted using Lotus software to eliminate beaches under commercial, private or unknown administration.)

iii) The beach must be within a 150 km radius of Waterloo, with emphasis on the region around London, Toronto and Hamilton.

1.1.3 Long List of Candidate Beaches

Using these criteria, a field of 51 candidate beaches was produced. These were located and marked on an Ontario road map and the approximate road distance from Waterloo was measured (Table 1).

TABLE 1. Long List of Candidate Beaches.

Name	ID No.	Operating Authority	Distance from K-W (km)
Rockwood	1	GRAND RIVER C.A.	35
Guelph Lake	2	GRAND RIVER C.A.	30
Conestogo Lake	3	GRAND RIVER C.A.	35
Belwood	4	GRAND RIVER C.A.	40
Luther Marsh	5	GRAND RIVER C.A.	80
Shades Mill	6	GRAND RIVER C.A.	25
Fanshawe	7	Upper Thames C.A.	100
Pittock	8	Upper Thames C.A.	60
Valens Reservoir	9	Hamilton Region C.A.	35
Christie Reservoir	10	Hamilton Region C.A.	50
Binbrook	11	Niagara Peninsula C.A.	75
Petticoat Ck.	12	Metro Toronto Region C.A.	130
Fifty Point	13	Hamilton Region C.A.	75
Milne	14	Metro Toronto Region C.A.	130
Albion Hills	15	Metro Toronto Region C.A.	95
Claireville	16	Metro Toronto Region C.A.	85
Norwich	17	Long Point Region C.A.	70
Chippawa Creek	18	Niagara Peninsula C.A.	100
Long Beach	19	Niagara Peninsula C.A.	130
Kelso	20	Halton Region C.A.	50
Waterford	21	Long Point Region C.A.	75
Norfolk	22	Long Point Region C.A.	130
Turkey Point	23	Provincial Park	100
Port Dover	24	Nanticoke Municipality	95
Toronto Islands	25	Toronto Municipality	120
Ashbridge's Bay	26	Toronto Municipality	120
Woodbine	27	Toronto Municipality	120
Sunnyside Beach	28	City of Toronto	110
Marie Curtis	29	Etobicoke Municipality	105
Westshore Glen	30	Pickering Municipality	135
Liverpool Rd.	31	Pickering Municipality	130

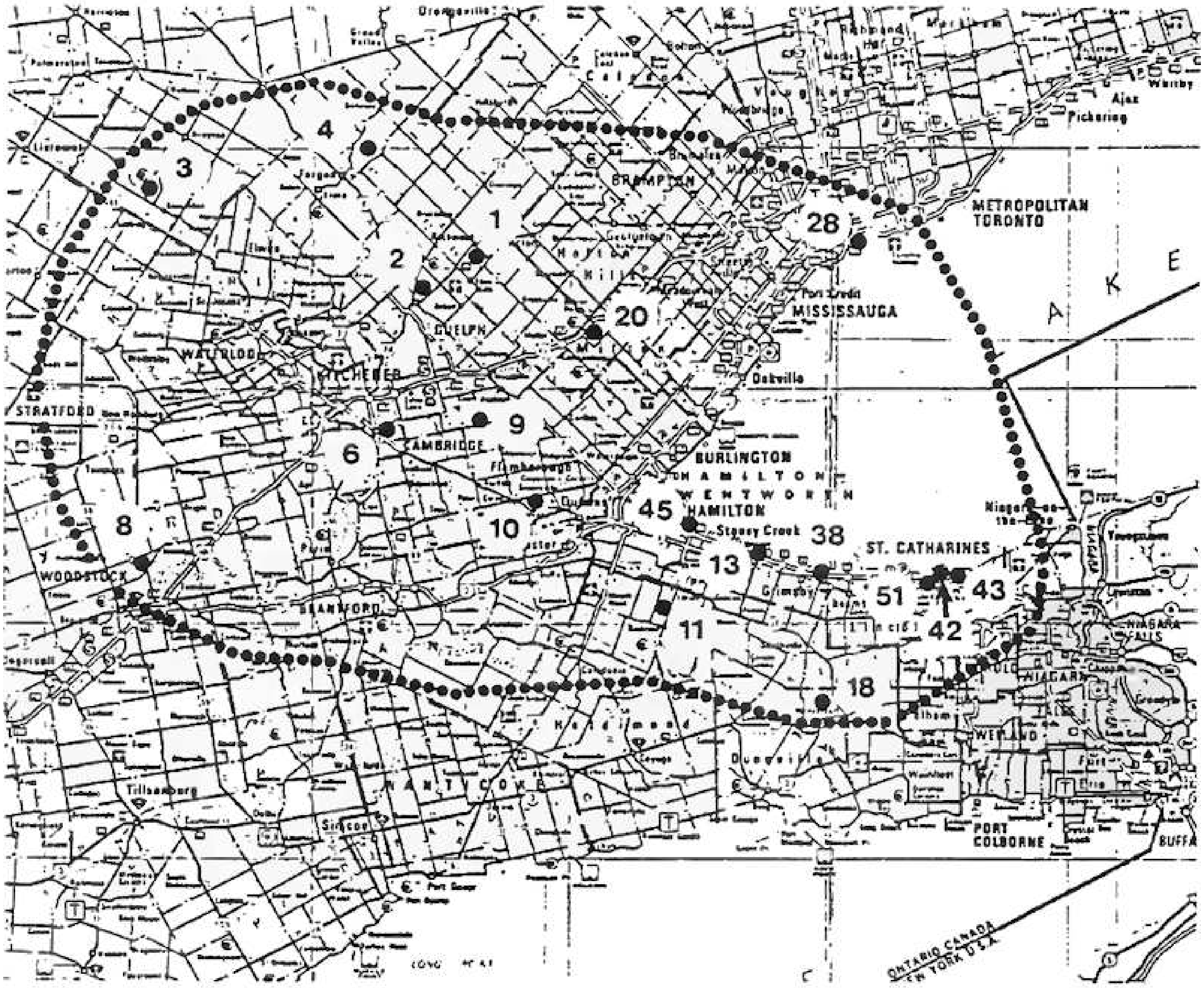
TABLE 1 Cont'd. Long List of Candidate Beaches.

Name	ID No.	Operating Authority	Distance from K-W (km)
Lakeview	32	Oshawa Municipality	140
Darlington	33	Provincial Park	145
Iroquois Beach	34	Whitby Municipality	140
Fralicks Beach	34	Scugog Municipality	190
Nickel Beach	36	Port Colborne Municipality	145
Humberstone Centennial	37	Port Colborne Municipality	145
Nelles Rd.	38	Grimsby Municipality	80
Milnes Dam	39	Markham Municipality	135
Sunset Beach	40	Richmond Hill Municipality	130
Queen's Royal	41	Niagara-on-the-Lake Municipality	130
Municipal Beach	42	St. Catharines Municipality	115
Lakeside	43	St. Catharines Municipality	115
Hamilton Beach	44	Hamilton	60
Confederation Park	45	Hamilton Region C.A.	60
Jack Darling	46	Mississauga Municipality	90
Lakeside	47	Mississauga Municipality	90
Albert E. Crooks	48	Mississauga Municipality	90
Guelph Recreation Park	49	Guelph Township	30
Bruce's Mill	50	Metro Toronto Region C.A.	130
Charles Dally	51	Niagara Parks Commission	115

1.2 Short List

1.2.1 Criteria for Inclusion on Short List

A decision was made to eliminate any beach further than 125 km from Waterloo and to focus on those beaches lying in a region surrounding Waterloo and extending to St. Catharines (Figure 1). The rational for selecting this region was to encompass a variety of population centres of various sizes (Waterloo, Kitchener, Guelph, Brantford, Burlington, Hamilton, St. Catharines along with numerous smaller centres) while at the same time facilitating easy access from Waterloo for carrying out the survey. The 18 beaches located within this area comprised the short list (Table 2).



KEY

No	Name	Cont'd.			
1	Rockwood	9	Valens Reservoir	28	Sunnyside Beach
2	Guelph Lake	10	Christie Reservoir	38	Victoria Terrace
3	Conestoga Lake	11	Binbrook	42	Municipal Beach
4	Belwood	13	Fifty Point	43	Lakeside
6	Shade's Mill	18	Chippawa Creek	45	Confederaton Park
8	Pittock	20	Kelso	51	Charles Dally

N

10 km SCALE

Figure 1. Location Of Short List Beaches.

TABLE 2. Short Listed Beaches.

Number	Name	Authority
1	Rockwood	Grand River C.A.
2	Guelph Lake	Grand River C.A.
3	Conestogo Lake	Grand River C.A.
4	Belwood	Grand River C.A.
6	Shade's Mill	Grand River C.A.
8	Pittock	Upper Thames C.A.
9	Valens Reservoir	Hamilton Region C.A.
10	Christie Reservoir	Hamilton Region C.A.
11	Binbrook	Niagara Peninsula C.A.
13	Fifty Point	Hamilton Region C.A.
18	Chippawa Creek	Niagara peninsula C.A.
20	Kelso	Halton Region C.A.
28	Sunnyside Beach	City of Toronto
38	Victoria Terrace	Grimsby Municipality
42	Municipal Beach	St. Catharines Municipality
43	Lakeside	St. Catharines Municipality
45	Confederation Park	Hamilton Region C.A.
51	Charles Dally	Niagara Park Commission

1.3. Final Selection

1.3.1 Telephone Interviews

For each beach included in the short list, a contact person was identified (generally the superintendent or assistant superintendent for the area) and interviewed by phone to obtain information on user levels and water quality (Figure 2). The results of these interviews were tabulated (Table 3) and then used in the final selection of beaches to be surveyed.

FIGURE 2. Telephone Survey Questionnaire

A) Relating to use*:*

i) Controlled or open access to beach?

ii) Is a gate count done ? Ball park figure for day users?

iii) Approximately what proportions of the gate count would use the beach?

iv) Do visitors come from local areas or from a larger region?

(v) Other facilities available - capping, canoeing, hiking, amusement arcade?

B) Relating to water quality:

i) Are water quality samples systematically collected? What are they analyzed for?

___ bacteria

___ suspended sediment

___ turbidity algae

ii) Are there periodic water quality conditions that discourage swimming?

___ algae

___ bacteria/beach posting

___ turbidity

___ temperature

___ high waves

___ debris washed on shore?

iii) Lake bottom composition and sand

Thank you very much for your time. If we wish to include ______________ in our survey this summer, we shall contact your office in writing regarding permission to do the work.

Who should we write to:

Based on what I have told you, do you thing there might be any problem with access for our staff this summer?

TABLE 3. Telephone Survey Results.

NAME	NO	CONTACT	ACCESS	USER COUNT	# OF BEACH USERS (SWIMMERS)	OTHER FACILITIES	FREQ. OF POSTING	TEMP	OTHER WATER QUALITY FACTORS	COMMENTS
Rockwood	1	Jim Muir 824-5061	controlled	Yes	moderate	hiking, canoeing fishing concessions camping	never	warm	-some algae not as bad as Guelph -cleaner than Guelph	
Guelph Lake	2	Jim Muir 824-5061	controlled	Yes	moderate	canoeing windsurf camping concessions	infrequent over past 10 yrs	warm	-weed growth -algae very bad (floating)	a university study on O_2 strat.
Conestogo Lake	3	Mike Stanwick 638-2873	controlled	beach patrol does rough head count	moderate to high	camping picnicking boat-launch concession	infrequent	cool (72°)	-turbid depending on run-off -algae blooms after rain	-sand bottom graded yearly
Belwood	4	Casey de Boer 843-2979	controlled	No	moderate	picnic ball diamond boating and skiing on reservoir elsewhere in park	never	good	-turbid -a little algae - no problem	-spring-fed quarry
Shade's Mill	6	Jim Reed 621-3697	controlled	Yes	85% of Users	fishing picnic hiking birdwatching	frequent 2-3 yrs ago now have a net to keep birds out -counts way down	comfort-able	-occasional blooms	water/beach interface is graded to break up anaerobic zone to control bacteria

TABLE 3 - cont'd Telephone Survey Results.

NAME	NO	CONTACT	ACCESS	USER COUNT	# OF BEACH USE'S (SWIMMERS)	OTHER FACILITIES	FREQ. OF POSTING	TEMP	OTHER WATER QUALITY FACTORS	COMMENTS
Pittock	8	Dave Hayman 451-2800	controlled	Yes	low	camping fishing windsurfing swimming pool canteen	frequent	warm	turbid	use is declining
Valens	9	Bill Fraser 528-3060	controlled	Yes	high	boat rentals fishing	curtain	cool	turbid	
Christie	10	Bill Fraser 628-3060	controlled	Yes	high	boat rentals fishing picnic hiking concessions	curtain in place with chlorination	cool	turbid	has always had a curtain
Binbrook	11	Kevin Ladley 416-227-1013	may be open this year	Yes	declining	hiking windsurfing fishing canoeing	-has had curtain -may be out this year	good	algae (blue- -green)	check after April 28 about curtain & access
Fifty Point	13	Bruce MacKenzie 416-643-2103	controlled	Yes	200 weekends/50 work days	concession baseball marina picnicking	none	cool	algae may wash up, winds increase turbidity, waves may be high on occasion	a perception that Lake Ontario is polluted by bacteria
Chippawa	18	Marg Miller 416-227-1013	last year controlled on week-ends not yet decided for this year			camping	none has curtain	good	aquatic weed problem	

TABLE 3 cont'd Telephone Survey Results.

NAME	NO.	CONTACT	ACCESS	USER COUNT	# OF BEACH USE'S (SWIMMERS)	OTHER FACILITIES	FREQ. OF POSTING	TEMP	OTHER WATER QUALITY FACTORS	COMMENTS
Kelso	20	Sandy Bell 416-336-1158	controlled	nos. in water 3 time/d	very high	grp camping picnicking sailing canoes	infrequent posting	daily recording	-some weed and occasional algae -sometimes turbid	some concern about survey no boat in swim area when use level high
Sunnyside	28	Bill Nett 416-392-7545	open	No	low	swimming pool	frequent	cold	---	high use of pool
Victoria Terrace	38	Bruce Atkinson 416-945-3519	open	No	moderate (2-30/d)	none	none	good	probably some algae	gravel bottom
Municipal	42	Tracy Cotton 416-682-9184	open	No	low	boaters, nice park & play-ground	last 5 yrs	good	algae less than Lakeside	gravel beach, not as popular as Lakeside
Lakeside	43	Tracy Cotton 416-682-9184	open	No	-SO	landmark carousel pavilion snackbar	last 5 yrs constantly	good	occasional algae accumulates on beach, also fish at times	100-200 ft before drop off
Confeder-ation Park	45	Lada Karbusicky 416-574-6141	Pay to Park	Cars (popular place)	low	concessions restaurant go-carts camping windsurfing pool'	infrequent	cold	occasional algae turbid waves may be high, industrial pollution	mostly sunbathing on beach
Charles Daily	51	Bud Burns 416-356-2241	controlled	Yes	very low	marina camping fishing				- stoney - not really a swimming area

1.3.2 Selection Criteria

The final selection of beaches from the short list involved three considerations:

I) a variety of water quality conditions, (eg. bacterial contamination, algae blooms and clean water) are required as independent variables in the survey.

ii) Beaches should be located so as to have the potential to draw users from a variety of distances, as this factor determines travel costs. Geographic location with respect to population centres was the main criterion used to estimate potential draw.

iii) There must be sufficient user activity at the beach to allow for user interviews.

1.3.3 Beaches Selected for Survey

Using these considerations each beach was evaluated first on the basis of water quality problems, then by location and potential draw and finally other characteristics were considered. The results of this evaluation (Table 4) allowed the selection of five beaches: Sunnyside as a beach which suffers from frequent posting; Guelph Lake with severe algae blooms; Rockwood having less severe algae problems; and Kelso and Fifty Point, two beaches with relatively good water quality. Total driving distance for sampling these five beaches would average approximately 120 km/day (Table 5).

TABLE 4. Beach Evaluation.

Water Quality	Name	No.	User Distribution	Comments	Decision
Frequently Pasted	Pittock	8	local-regional	some algae as well	Drop
	Sunnyside	28	Toronto	swimming at pool	Survey
	Municipal	42	local	Lakeside is the rain beach Municipal not much used	Drop
	Lakeside	43	local	posted last five years	Drop
Frequent Algae Blooms	Guelph Lake	2	regional	bad algae problems	Survey
	Conestogo	3	local	Algae not as bad as at Guelph Lake	Drop
	Fanshawe	7	local	further away than necessary, mostly London users	Drop
Chlorinated (curtain in place)	Valens	9	regional	survey of beach with curtain would be interesting	Drop
	Christie	10	local-regional	likely to draw mostly from Hamilton/ Burlington	Drop
	Binbrook	11	local-regional	curtain may be removed	Drop
	Chippawa	18	local-regional	too far	Drop

TABLE 4 - cont'd each Evaluation.

Water Quality	Name	No.	User Distribution	Comments	Decision
Lines to keep gulls out	Shade's Mill	6	local	users mostly from Cambridge area.	Drop
No major water quality problems	Rockwood	1	regional	some algae	Survey
	Belwood	4	regional	spring-fed quarry	Drop
	Fifty Point	13	local-regional	on Lake Ontario	Survey
	Kelso	20	regional	high use	Survey
	Victoria Terrace	38	local	user mostly from Grimsby	Drop
	Confederation Park	45	regional	mostly sunbathers, few swimmers	Drop
	Charles Dally	51	local	not much use as a beach	Drop

TABLE 5. Final Beach Selection.

NAME	NO.	AUTHORITY	DISTANCE (km)
Rockwood	1	Grand River C.A.	35
Sunnyside	28	City of Toronto	110
Guelph Lake	2	Grand River C.A.	30
Fifty Point	13	Hamilton Region C.A.	75
Kelso	20	Halton Region C.A.	50

1.4 References

Ontario Ministry of Natural Resources. 1988. "Conservation Areas Guide." Queens Printer for Ontario.

Usher, A., J.B. Ellis and M. Michalski. 1987. "Beach Use and Environmental Quality in Ontario." Policy and Planning Branch, Ontario Ministry of the Environment.

APPENDIX B

FIELD PROTOCOLS

TABLE OF CONTENTS

1.0 SAMPLING DATE SELECTION

Sampling is to be carried out on five days each week, including weekends and holidays. through July and August until approximately one hundred interviews are completed at each beach. A total of ten weeks are available for sampling during this period. On each day, all observations are to be made between 10:00 a.m. and 6:00 p.m. On days with heavy beach use, up to twenty interviews will be completed, while fewer will be completed when beach use is less intensive.

To ensure that each beach is sampled on weekends and on weekdays both early as well as late in the summer, the following procedure to select sampling days was used:

i) stratify the field of ten potential sampling "weeks" into two groups of five representing early and late summer.

ii) using a random number table assign a number between one and five (representing the five beaches) to the first sample day in each of the first five weeks. Repeat for the second group of five weeks.

iii) beach numbers are assigned sequentially to the remaining four sample days in each week.

iv) always sample on Friday, Saturday, Sunday and Monday of each week, with the fifth sampling day to be selected from the remaining three days of the week on a rotating basis.

Based on the above procedures, a preliminary assignment of beaches to sampling days is shown on Table 1.

TABLE 1: Sampling Days.

WEEK	Fri [a]	Sat [b]	Sun	Mon	Tues, Wed or Thurs
		- - - - - - - - - - - - - Beach No	- - - - - - - - - - - -		
1	2	3	4	5	1
2	3	4	5	1	2
3	1	2	3	4	5
4	4	5	1	2	3
5	5	1	2	3	4
6	3	4	5	1	2
7	4	5	1	2	3
8	1	2	3	4	5
9	2	3	4	5	1
10	5	1	2	3	4

[a] Random assignment

[b] Systematic assignment

2.0 BEACH CHARACTERIZATION

2.1 Physical Description

Prior to actual interviewing each beach was visited to collect general descriptive data, such as beach dimensions, composition of beach sand (coarse, fine, etc.) and other beach or park attributes. Notes were recorded using the form shown in Figure 2.1.

2.2 Water Quality Parameters

All water quality observations were made at the time of interviewing, at or near the swimming area Offshore work was undertaken from a canoe. Figure 2.2 (3 pages) is a copy of the coding form used to record observations.

2.2.1 Surface Water Temperature

a) Sample at a location within the wading area of the beach having a depth of 0.5m.

b) Immerse the thermometer to a depth of 25 cm until the reading stabilizes and record the value to the nearest 0-5 degrees Celsius.

c) Repeat in the deep water zone outside the swimming area.

2.2.2 Water Colour

Equipment: Hach colour comparator kit.

a) Sample away from beach area to avoid turbidity caused by beach use.

b) Take water samples just below the surface.

c) Determine colour according to instructions included with Hach kit.

2.2.3 Secchi Disk Transparency

The purpose of this procedure is to obtain a measure of water clarity relevant to beach users Since water clarity will be influenced by use level however, it is important to measure undisturbed water clarity in addition to that in the beach area.

Figure 2.1 Beaches: Physical Description.

BEACH NAME: ____________________________ DATE: ______________

TERRESTRIAL

Beach Length (m): __________ Exposure: ____________ Lake Size: ____________
Dry Beach Width (m): ___________ Wet Beach Width (m): ________________

Dry Beach Composition: ____
____

Wet Beach Composition: ____
____

DEVELOPMENT & MANAGEMENT

Admission Fees: ___________________
Parking Availability: ____
Beach Supervision/Management: ____
Adjacent (backshore) description and facilities: _____________________________
____
____

Other Recreational Opportunities: ____
____

Development Aesthetics: ____
____

Development Intrusions: ____
____

Comments: ____
____

Figure 2.2 Beach Survey Data.

PART A - ON SHORE

BEACH: ____________DATE: ____________ STARTING TIME: ______NAME: ________
Wind Speed (m.p.h.) ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
1 Constant 2 Gushing

COMMENTS: ____

Cloud Cover: 0 1 2 3 4 5 6 7 8 9
1 Opaque 2 Translucent

Cloud Height: 1 Low 2 High
Relative Humidity: dry bulb: _____°C air temp: _____
wet bulb: _____°C R.H.: ______

Precipitation: 0 1 2 3 4

Odour Strength: 0 None 1 Noticeable 2 Strong
Odour Description: 0 Offensive 2 Slightly Offensive 2 Not Offensive

COMMENTS: ____
Waves: 0 calm 1 ripples 2 to 25 cm 3 over 25 cm

Shoreline Debris:

Dead Fish:	0	1	2	3	4
Dead Plant	0	1	2	3	4
Non-natural	0	1	2	3	4
Bird Droppings, feathers	0	1	2	3	4

COMMENTS: ____
____
____
____

Gate Count: _________________ Time: _______________
Dry Beach User Count: _____________ Time: _______________
Water User Count: _________________ Time: _______________
Beach Posted: 0 NO 1 YES

Figure 2.2 (cont'd) Beach Survey Data

PART B - FROM BOAT

BEACH: ____________DATE: ____________ STARTING TIME: ______NAME: ________

Surface Water temperature: °C

Wading Zone	1 ___________	2 ____________	3 _____________
Deep Zone	1 ___________	2 ____________	3 _____________

Secchi transparency: (m)

Swim Area	1 ___________	2 ____________	3 _____________
Undisturbed Area	1 ___________	2 ____________	3 _____________

Water Colour: _______________________ (Undisturbed area)

Surface algae :	0	1	2	3	4	type _______
Submerged algae:	0	1	2	3	4	type _______
Aquatic plants:	0	1	2	3	4	

Floating debris	0	1	2	3	4
Dead Fish:	0	1	2	3	4
Plant Material	0	1	2	3	4
Oil/Grease/Scum	0	1	2	3	4
Non-natural	0	1	2	3	4

COMMENTS: ____

____

____

____

____

____

Figure 2.2 (cont'd) Beach Survey Data Form

KEY

Cloud Cover:

0	None	5	½ to ⅝
1	0 to ⅛ covered	6	⅝ to ¾
2	⅛ to ¼	7	¾ to ⅞
3	¼ to ⅜	8	overcast
4	⅜ to ½	9	sky obscured / hazy

Precipitation:

0	None	3	intermittent showers
1	threatening	4	rain
2	drizzle		

Algae/Plants:

0	None	3	frequent
1	trace	4	abundant
2	occasional		

Shoreline/floating Debris:

Dead Fish	Dead Plant	Non-natural	Bird Droppings, etc.
0 None	0 None	0 None	0 None
1 Trace	1 Trace	1 Trace	1 Trace
2 one	2 occasional	2 occasional	2 occasional
3 two to five	3 frequent	3 frequent	3 frequent
4 more than five	4 abundant	4 abundant	4 abundant

Equipment: Secchi disk attached to cord calibrated in decimeters

a) Find a location close to or within the wading zone that appears to have a water clarity representative of the area.

b) Lower the disk from the shaded side of the boat until it disappears. record this depth. Raise the disk and record the depth at which it reappears. The mean of these two values is the Secchi Transparency Value. If the disk reaches the bottom before disappearing record as "visible to bottom".

c) Replicate three times at this location.

d) Repeat procedure at a point not influenced (or influenced minimally) by beach activity. This will give the "Undisturbed Water Transparency" value. If possible this measurement is to be done where water is deeper than the Secchi Transparency Depth.

2.2.4 Algae

Surface Algae

The occurrence of algae on the water surface within the swimming area should be noted and qualitatively described as: 'abundant', 'frequent', 'occasional', 'trace' or 'none observed'.

Submerged Algae

The occurrence of submerged algae within the wet beach area was noted and qualitatively described as: 'abundant', 'frequent', 'occasional', 'trace' or 'none observed'.

Aquatic Plants

The occurrence of vascular aquatic plants within the wet beach area was noted and qualitatively described as: 'abundant', 'frequent', 'occasional', 'trace' or 'none observed'.

2.2.5 Odour

a) The intensity of beach odour was described using the following terms: 'none detected', 'noticeable', 'strong'.

b) The nature of beach odour was described using the following terms: 'offensive', 'slightly offensive', 'not offensive'.

2.2.6 Waves

The nature of the water surface within the beach area was described using the following terms:

calm - a smooth surface with no evidence of wind activity on water;
ripples - slightly disturbed surface but no distinct waves;
waves - up to 25 cm in height
- over 25 cm in height

Wave height was measured from crest to trough using a meter stick at a position where water depth is one meter.

2.2.7 Floating Debris

The occurrence of floating debris within the beach area was visually assessed and described as follows. 'none', 'trace'. 'occasional', 'frequent', 'abundant'

individual observations were made for oil/grease/scum, dead fish, plant material, and non-natural debris.

2.2.8 Shoreline Debris

The occurrence of shoreline debris was visually assessed and described as follows: abundant', 'frequent', 'occasional', 'trace', and 'none observed'.

Individual observations were made for dead fish, dead plant matter, non-natural debris, and bird droppings/feathers.

2.2.9 Bacterial Contamination

Beach posting noted at time of visit.

2.3 METEOROLOGICAL PARAMETERS

2.3.1 Relative Humidity

Equipment: sling psychrometer
conversion tables
distilled water

Instructions included with the instrument were followed.

Reference: World Meteorological Organization, 1971- Guide to meteorological instrument and observing practice. WMO Report No. 8, Geneva- Secretariat of the WMO.

2.3.2 Air Temperature

Air temperature was obtained using a dry thermometer shielded from direct and reflected radiation.

2.3.3 Wind Speed

Equipment: hand-held wind speed meter

a) Measurements taken at a height of 1-5 m at a location on the beach away from non-representative obstructions.
b) Maximum wind speeding during ten consecutive 30 second intervals were measured and recorded.
c) the nature of the wind was described as: 'constant', 'gusting'.

2.3.4 Cloud Cover

a) Cloud cover was estimated visually and reported in oktas covered by cloud. One okta equals one eighth of the area of the sky (WMO, 1971).
b) Cloud height was reported as 'low'- (e.g. cumulonimbus clouds), altocumulus) or 'high' (e.g. stratus).
c) Clouds were described as 'translucent' (sun can been seen through clouds) or 'opaque (sun not distinguishable).

2.3.5 Precipitation

The occurrence of precipitation was recorded using the following categories:

a) no precipitation
b) precipitation threatening
c) drizzle
d) intermittent showers
e) steady rain

3.0 BEACH USER LEVELS

1. Gate Count
   obtain from operating authority (at end of season)

2. Users on Shore
   Count of the number of persons using the dry portion of the beach.

3. Users in the Water
   Count of the number of persons in the water including those wading near the shore.

APPENDIX C

INTERVIEW FORM

17-636

BEACH USER INTERVIEW FORM

27 JUNE, 1988

Day ____ Month _____ Time (hr) _____ am/pm

Interviewer: ____ DB ____ LB Other _______________

Location: ___ Sunnyside ____ Rockwood ___ Guelph ___ Kelso ___ 50Pt

Is the beach posted today? YES ___ NO ___

Principal Respondent’s gender

___ MALE ___ FEMALE

Responses from one or more in party?

___ ONE ___ MORE

Time to complete Interview?

___ Very Quick ___ Usual Time ___ Very Long

Other Comments on Interview

Hello, my name is ________________ . I'm doing a confidential survey for the Ontario Ministry of the Environment. The purpose of the survey is to help the Ministry determine the value of water quality improvements at Ontario beaches. We are interviewing people over the age of 18 who are using the beach today. The questionnaire will take at 15 minutes and respondents may refuse to answer any question that they object to. IF you are in this age category, would you be willing to participate in the survey?

ATTRACTION TO THIS BEACH

1. Could you rate the following features of this beach and park area:

Accessibility	Very poor	Poor	Fair	Good	Very good
Beach Size	Very poor	Poor	Fair	Good	Very good
Water Quality	Very poor	Poor	Fair	Good	Very good
Water Temperature	Very poor	Poor	Fair	Good	Very good
Facilities	Very poor	Poor	Fair	Good	Very good
Grounds Upkeep	Very poor	Poor	Fair	Good	Very good
Scenery	Very poor	Poor	Fair	Good	Very good

2. What are the main features of this park and beach that make this an attractive area for your party? ____

3. Is there anything that you dislike About the water quality at this beach?

   ____

4. Is there anything in general that you dislike about this beach?

   ____

BEACH ACTIVITIES

5. Could you check off the activities you will take part in today?

SWIMMING , WADING	___	PICNIC	___
MOTOR BOATING	___	CANOEING	___
WINDSURFING	___	SAILING	___
HIKING	___	WATER SKIING	___
CYCLING	___	BAIL GAMES, FRISBEE	___
RELAXING, SUN BATHING	___	PEOPLE WATCHING	___
SCUBA, SNORKEL	___	OTHER	___

6. Is the beach here the main reason for today's trip to this park?

   YES ___ NO ___

LENGTH OF STAY

7. A) How long will you be staying here ? ___ hrs "OR" ___ days

   B) Is the visit to this beach area a stop-over on a longer vacation?
   NO ___ YES ___ —> How long will the vacation Last? ____ days

DESCRIPTION OF TRAVEL

8. How much time did it take to travel here from your home or your last stop-over?
   ____.__ hrs "OR" _____ min.

9. How far did you travel to get here from your home or your last stop-over?
   ______ miles "OR" _____ kilometers

10. Could you indicate the method of travel you used to get here:

CAR TRUCK VAN	___	CAMPER MOTOR HOME	___	MOTOR BIKE	___	BIKE	___	WALK	___	BUS	___	CAB	___

11. For yourself and others with you how would you rate the trip to get here on a scale from very enjoyable to very unenjoyable:

    Very Enjoyable __ Enjoyable __ Neither __ Un-enjoyable __ Enjoyable __

EQUIPMENT AND RECREATION EXPENDITURES

12. Could you check off the equipment that you brought with you:

Lawn Chairs	___	Cooler	____	Barbeque	____
Beach Toys	___	Fishing Gear	____	Air Mattress	____
Canoe	___	Sail Board	____	Sail Boat	____
Radio	___	Tent	____	Cook Stove	____

Other Camping Gear ___

13. Your trip and stay here today will cost a certain amount for transportation and other items. Could you estimate these cost for earth item below to the nearest dollar?

GAS	_________
OTHER CAR COSTS	_________
PUBLIC TRANSIT, CAB	_________
MEALS AND SPACES	_________
PARK ENTRY FEES	_________
"OR"	
SEASON PASS	_________
EQUIPMENT RENTALS	_________
OTHER SUPPLIES	_________

PERCEPTION OF MATER QUALITY

14. Circle the terms that best describe water conditions here today?

Water Temperature	Very cold	Cold	Medium	Warm	Very warm
Waves	Very rough	Rough	Medium	Calm	Very calm
Water Clarity	Very Clear	Clear	Medium	Murky	Very murky
Odour	Very strong	Strong	Noticeable	Faint	None
Algae, Water Weeds	Very heavy	Heavy	Some	Little	None

15. Is the water quality here today worse or better than expected?

Much Worse ___ Worse ___ Same ___ Better ___ Much Better ___

16. To the best of your knowledge how often is this beach posted each year?

All The Time ___ Frequent ___ In-Frequent ___ Hardly ___ Ever Never ___

17. Would you continue to come to this beach during the season:

IF IT WAS POSTED? YES ___ NO ___

IF ALGAE OR WATER WEEDS WERE PRESENT? YES ___ NO ___

If the response to either is "YES" then would you also swim at the beach when these conditions exist?

POSTED: YES ___ NO ___ ALGAE: YES ___ NO ___

GENERAL USE OF BEACHES

18. How often did you visit this beach last year? _______

19. How much would you use this beach each year if it had:

Very Good Water Quality: _____ DAYS Very Poor Water Quality: ____ DAYS

20. How many Ontario beach trips in total did you make last year? ______

		BEACH 1	1 BEACH 2	BEACH 3	BEACH 4
21.	What other beaches did you visit last year?				
22.	About how many trips did you make to each?				
23.	How many days did you spend at each?				
24.	How much time does it take you to travel to each?				
25.	Is their water quality VERY GOOD, GOOD, FAIR, POOR, or VERY POOR? Comments?				
26.	Are these beaches posted ALL THE TIME, FREQUENTLY, INFREQUENTLY, HARDLY EVER or NEVER?				

VALUE OF BEACH RECREATION

VERY POOR	POSTING - MOST OF THE TIME ALGAE AND WATER WEEDS - USUALLY PRESENT
VERY GOOD	POSTING - NEVER ALGAE AND WATER WEEDS - RARE

27. You indicated that you travelled _____min. to get here. If this particular beach wasn't available, what's the longest time that you would have travelled by car to reach a beach like this one with water quality:

    "THE SAME" ______ " VERY GOOD" _____ "VERY POOR" _____ HRS or MIN

28. Instead of considering extra travel time to get to a beach with good water quality, I would like you to consider how much value you place in good water quality at the Ontario beaches that you use:

    What's the most that you would be willing to pay say as taxes over the period of a year to assure very good water quality at any Ontario beach that you might want to use.

    Would Pay Nothing ___ Reluctant To Pay ___ Willing To Pay ___ ----> $_____

    What's the most that you would be willing to pay over the period of a year to prevent very poor water quality conditions from developing at these beaches?

    Would Pay Nothing ___ Reluctant To Pay ___ Willing To Pay ___ ----> $_____

29. Why do you choose these amounts?

    ____
    ____
    ____

BACKGROUND INFORMATION

30. Where is your home? ____________________________________

31. How many people came in your group today in each of the following age categories? (Underline your age category).
UNDER 12 ___ 12 TO 18 ___ 19 TO 40 ___ 41 TO 65 ___ OVER 65 ___

32. How many of these individuals are in your family? ________

33. Could you indicate your approximate family income before taxes?

___ BELOW $10,000 ___ $40,000 TO $49,999
___ $10,000 TO $19,999 ___ $50,000 TO $59,999
___ $20,000 TO $29,999 ___ $60,000 TO $69,999
___ $30,000 TO $39,999 ___ $70,000 OR MORE

34. Could you indicate your occupation and that of other adults in your household.

	SELF	SPOUSE	OTHER	OTHER
Retired				
Student				
Trades				
Home-maker				
Professional				
Services				
Technical				
Seeking Work				
Other				

35. What is the last grade of school completed by these individuals?

	SELF	SPOUSE	OTHER	OTHER
Grade 1 To 8				
Grade 9 To 11				
Secondary Diploma				
Some Post-Secondary				
College Diploma				
University Degree				

GENERAL LEISURE

36. How many days off can your household members usually spend together during a regular summer week?

___ one day or less ___ two days ___ three days or more

37. How much vacation does your household take in a year? ___ days

38. About how much would you normally spend in a month on outdoor recreation? (eg. swimming, skiing, etc.)
$ ____________

CLOSING COMMENTS

Thank you for your time. Do you have any questions about this work or any comments about the interview that you would like me to *pass* on to the Ministry?

____

____

____