

0. CONCLUSIONS

Where did this research take us? The conclusions of the study, presented in each of the chapters below, can be summarized in three parts. First, we explore a number of methodological issues related to recreation demand analysis and the benefits of water quality enhancement. Of particular importance is our theoretical work incorporating substitution between sites in formal demand models and using these models to derive benefit estimates. Hopefully, our work in this area will help other researchers as they try to clarify some of the issues treated in this study, and the broader questions of water quality management.

Second, we use these models to analyze day recreation trips in the Boston SMSA, with particular emphasis on how changes in water quality would influence recreation behavior. These empirical results are of interest to national and regional water quality planning and management, and may also be useful to recreation planners.

Finally, both the methodological and empirical findings of this research suggest several areas where additional research is critical for resolving the issues of this report.

1. Empirical Findings

Perceived Water Quality Does Not Seem to be Related to Actual Water Quality. Bacteria counts, nutrients and so on are not perceived by human senses. Turbidity and color are perceived moderately well by recreationists, but with only a low degree of reliability. Reputations of beaches as being good or bad may be a much more important determinant of water quality perception than the actual quality of the water itself. This conclusion tends to undermine any causal links between recreation behavior and water quality.

Recreation Behavior Is Not Strongly Linked to Objective Measures of Water Quality. No evidence was found to reject this null hypothesis. On the contrary, under direct questioning, water quality appears to follow behind proximity, beach cleanliness, setting and beach facilities in importance to site choice or attendance. These findings are confirmed in the multiple site demand analysis. Some evidence suggests that good water quality is important in determining which sites are visited, but not the number of visits to the site. In light of this finding, the principal benefit, in terms of recreational usage, of water quality improvements in urban areas such as the Boston SMSA would be to reopen beaches which are proximal to large population concentrations.

Despite the Insensitivity of Recreation Demand to Water Quality, Respondents in the Boston SMSA were Willing to Pay from Between \$20 to \$26 Per Family Per Year for Improved Water Quality. The willingness-to-pay persists across income groups, occupational levels, and amount of education. Water quality appears to be a merit good of significant value. Perhaps, then, attempts to quantify benefits on the basis of consumption are misguided. Water quality, like democracy or national defense, are "goods" desired for their own conservation.

Willingness-to-Pay Seems to be Correlated with Water Quality. That is, people are willing to pay more to maintain water quality at a site with good water quality than at a site with poorer water quality. Over the range of water quality represented in the sample of sites, there are, therefore, increasing returns to water quality. This finding may be of significant practical importance in water quality planning since the incremental costs of water quality improvements tend to increase as higher levels of water quality are attained.

Finally, Where Water Quality Improvements Expand Recreation Opportunities, Adequate Facilities and Maintenance Must be Provided to Gain The Benefits. People are sensitive to beach cleanliness and minimal beach facilities, such as a changing room. These must be provided to gain the potential benefits of water quality enhancement. Coordination with parks and recreation departments, generally institutionally separated from water quality agencies, must be established and maintained, and adequate funds for these new responsibilities must be insured.

2. Methodology

Multiple Site Demand Models which Provide Exact Measures of Benefits as Measured by Consumer Surplus can be Specified.

Traditional recreation demand studies ignore intersite substitutions; existing multiple site demand models do not meet the technical economic criteria for consumer surplus computations. A model which meets these conditions was specified. Estimation of its parameters was attempted but was unsuccessful. Methods for dealing with the attendant problems are outlined.

Factor Analysis can Effectively Reduce the Number of Dimensions of Water Quality, but the Resulting Factors are not Better "Explainers" of Recreation Behavior than the Variables From Which they are Drawn. Cross-sectional data on twelve water quality measures could be reduced to four factors which "explained" most of the variance in the data. These factors have natural interpretations. However, certain of the original variables perform as well as the factors in the statistical analysis relating water quality perception and recreation demand to water quality variables.

3. Avenues for Further Research

Why do People Care About Water Quality if they are not Sensitive to Consuming its Uses? This conservation ethic seems to be behind much contemporary environmental concern. Methods for measuring its value and weighing it in the political calculus could provide the basis for more efficient natural resource management. Further, a more precise statement of its nature might help clarify the issues concerning environmental preservation on one hand, and resource exploitation on the other.

Improved Methodology for Estimating System Demand Equations for a Large Number of Similar Goods is Needed. In the large, multi-equation techniques are very expensive and are capable of handling only a limited number of alternatives. The problem lies both in existing software, and the statistical techniques in use. In the small, further work on the model specified in this study could proceed by aggregating sites to some (much) smaller number of representative sites.

Finally, the Analysis Should be Extended to Non-urban Areas. While at present most of the nation lives in or close to major cities, there is some evidence that those demographic trends are shifting, and significant exurbanization has occurred during the late 1960's, and through the 1970's. How does this affect recreational needs and their relationship to water quality? Less urban areas typically have higher levels of water quality than urban areas, so the recreational usage may not be constrained by water quality, and conservation value may be less as well.

APPENDIX I. SITE FACILITY INVENTORY FORM

SITE CATALOG

1. Site Name _____
2. Address _____
3. Owner or Manager _____
4. What fees are charged (list purpose & amount) _____

ACCESS & PARKING

5. Rapid Transit: route name/no. _____
6. Bus: route name/no. _____
7. Auto Road: route name/no. _____
8. Distance to major highway (miles) _____
9. Number of parking spaces _____

SETTING

10. Urban _____ Rural _____
11. Surrounding Land Use
 - a) low density residential (1 & 2 family homes)
 - b) high density residential (includes multifamily buildings)
 - c) commercial
 - d) industrial
 - e) agricultural
 - f) natural

12. If Natural Land Use, select from below categories

- a) not applicable
- b) salt marsh or other wet lands
- c) wooded or forest
- d) mountainous of cliffs

13. Type of Body of Water

- a) ocean or great lake
- b) lake or pond
- c) river
- d) stream

SIZE

14. Water frontage (in feet) _____

15. Beach area _____

16. Water surface area (if appropriate) _____

17. Total site area _____

BEACH CHARACTERISTICS

18. Material

- a. sand
- b. gravel
- c. grass or ground cover
- d. rocks
- e. paving

19. Describe transition from land to water
- a. gradual, sloping
 - b. abrupt
20. Describe nature of water bottom
- a. muddy
 - b. sand
 - c. rocks
 - d. vegetation
21. Water movement
- a. no movement
 - b. slow movement
 - c. rapid
22. Presence of flies or other insects
- a. none
 - b. some
 - c. many

FACILITIES

23. What special facilities are available for swimming
- a. bathhouse
 - b. raft or float
 - c. diving board
 - d. delimited swimming area
 - e. life guards (how many? _____)
 - f. other _____

24. What special facilities are available for boating?
- a. marina
 - b. boat launch ramps (how many? _____)
 - c. boat rental facilities (what kinds of boats? _____)
 - d. services and supplies
 - e. gasoline
 - f. other _____
25. What special provisions or facilities are provided for fishing?
- a. program of fish stocking
 - b. list type of fish _____
 - c. suppliers (of bait, etc.) _____
26. What non-water based facilities are provided?
- a. playground
 - b. game areas
 - number of tennis courts _____
 - number of ball fields _____
 - other _____
 - c. number of developed camp sites _____
 - d. amusement park or other facilities _____
 - e. number of miles of walking trails _____

USER CONVENIENCE FACILITIES

27. Which and how many of each of the following sanitary facilities are provided?

- a. drinking fountains _____
- b. sinks or water for washing _____
- c. flush toilets _____
- d. pit toilets _____
- e. litter containers _____

EATING FACILITIES

28. What picnic facilities are available?

- a. size of area in acres _____
- b. number of picnic tables _____
- c. number of fireplaces _____
- d. number of grills _____
- e. number of shelters _____
- f. total square feet of sheltered area _____

29. How far is it to the nearest

- a. Restaurant?
 - 1. on-site
 - 2. distance in miles _____
- b. Concession Stand?
 - 1. on-site
 - 2. distance in miles _____

APPENDIX II. WATER QUALITY SAMPLING

WATER QUALITY SAMPLING

Water quality samples were taken at all the sites over the two-day period, September 12-13, 1974. Both days were sunny with ambient day time air temperatures between 65° and 80°F. After rinsing the sample bottles with the water at the site, two one-liter samples were taken from a depth of approximately one foot in water at least three feet deep. The sample bottles were kept in an ice chest until delivered to the laboratory for analysis.

The analysis was performed by Eco-Control, Inc. of Cambridge, Massachusetts. The methods used to analyze the water samples for the parameters chosen were those recommended in the "Compendium of Analytical Methods" prepared in 1973 by the MITRE Corporation for the Environmental Protection Agency (PB-228 425). In general, the methods recommended come from "Standard Methods for Examination of Water and Waste Water," 13th Edition, American Public Health Association, Washington, D.C. (1971).

APPENDIX III. THE SURVEY INSTRUMENT

SURVEY OF WATER-BASED RECREATION

ID# _____

CARD

PART I: PARTICIPATION IN WATER-BASED RECREATION

Hello, my name is _____, and I am taking a public opinion survey for Urban Systems Research and Engineering, Inc. I'd like to ask you some questions about the types of recreation you or members of this household participated in last summer, and the recreation areas you might have visited. (Last summer is the 15 weeks between Memorial Day--May 27--through Labor Day--September 2.)

(1) First of all, last summer in the Boston Area did any members of your household:

<u>a. yes/b. no</u>	<u>Reasons</u>
---	---
---	---
---	---
---	---
---	---
---	---

- A. go swimming
- B. go boating
- C. go fishing
- D. go picnicking
- E. go bicycling
- F. go someplace especially to walk or stroll

If not, why not?

- REASONS:
- a. not interested
 - b. don't know how
 - c. don't have the appropriate equipment
 - d. too expensive
 - e. water too dirty
 - f. water too cold
 - g. good places too crowded
 - h. good places too far away
 - i. don't own auto, good places can not be accessed by public transportation
 - j. lack of time
 - k. poor health
 - l. other (please specify) _____

G. What other types of recreation did members of your household engage in this summer?

(If NO ACTIVITIES RECORDED, SKIP TO PART II, Q.2)

(2) The card shows some of the major fresh and salt water beaches in the Boston Area. Could you please tell me:

A. Which sites did you personally visit, and the number of times you visited each of those sites. Are there any sites which you visited which are not on this list? (Record those sites and the number of visits to each. Add visits and ask:)

So you personally visited a beach, lake or stream about _____ times this past summer?

B. Now I would like to find out about visits by anyone in this household to fresh and saltwater beaches in the Boston Area. Could you please tell me the number of visits by any household member to each of these sites. Are there any sites which you visited which are not on the list? (Record those sites and the number of visits to each. Add visits and ask:)

So members of this household visited a beach, lake or stream about _____ times this past summer.

C. About how long, on average, was spent at each of the sites you listed in the two questions above?

- a. less than one hour
- b. over one hour but less than three hours
- c. over three hours but less than six hours
- d. more than six hours

(3) Travel:

A. For each site visited, how did you get there?

- | | |
|---------------|----------------|
| a. walking | e. subway |
| b. bicycle | f. taxi |
| c. automobile | g. other _____ |
| d. bus | |

B. About how long does it take to get there that way? (in minutes)

C. How much does it cost to get there?

If by bus or subway or taxi, how much is the roundtrip fare? If by auto what was the price of tolls? (the total cost for the visiting group)

(4) Expenditures:

For each site, about how much does it cost when your party goes there? (total cost for the group)

parking

entry

food

liquor

other (including rentals, gasoline for boats, etc.)

Add and Record Total/Visit

(5) For each site about how many people from your household, on average, make the trip?

(6) Activities:

For each site you visit what activities do you participate in? (Record the most important activities up to three.)

a. swimming

e. strolling

b. boating

f. bicycling

c. fishing

g. picnicking

d. sunbathing

h. other _____

(7) If the respondent did not visit the closest site, ask:

_____ beach is the major recreation site closest to your home, yet you did not mention having visited it. Why not?

- REASONS:
- a. not aware of that site
 - b. do not like the facilities
 - c. too crowded
 - d. beach too dirty
 - e. water too cold
 - f. water too dirty
 - g. don't own auto, not accessible by public transportation
 - h. too expensive
 - i. not interested in the activities available there
 - j. other (please specify) _____

PART II: PERCEPTION

(1) For each site you visited would you please rate it on a scale from 1-5. For this rating, 1 means bad, 2 is moderately bad, 3 is fair, 4 is moderately good, and 5 is good.

- A. water temperature
- B. water quality (clarity, color, weeds, odor, etc.)
- C. beach facilities (availability)
- D. beach quality (setting, maintenance)
- E. crowding

(2) Are there any sites with which you are familiar, but did not visit this summer? If so, which are they and would you please rate in a similar fashion those sites.

(3) Are there any sites which you have visited this or other seasons, or are familiar with, which you do not intend to visit again? If so, please list the sites and why you do not intend to use them.

<u>Site #</u>	<u>Reasons</u>
-- --	---
-- --	---
-- --	---

REASONS:

- | | |
|-----------------------|-----------------------------|
| a. too crowded | g. poor beach facilities |
| b. too far away | h. non-auto access too poor |
| c. too expensive | i. change in activities |
| d. water too cold, | j. other (please specify) |
| e. water too dirty | _____ |
| f. beach too littered | |

(4) Let's talk about the beach, lake, or river site you visited most. That was _____, site number ____.

<u>Site #</u>	<u>Reason</u>
-- --	---

A. Why do you visit this site most often?

- REASONS:
- a. it is close
 - b. it is cheap
 - c. the water temperature is nice
 - d. the water quality is good
 - e. my family always came here
 - f. not too crowded
 - g. nice setting
 - h. beach is clean
 - i. nice facilities
 - j. my friends go there
 - k. other _____

-
- B. If water quality became much worse (declined to a ranking of 1) what would your response be?
- a. still visit the same beach as much
 - b. visit that site less frequently and some other site more (specify which one)
 - c. visit that site less frequently and participate in some other non-water-based recreation more (specify which activity)
 - d. participate in outdoor recreation less, no change in other leisure
 - e. participate in outdoor recreation less, and indoor recreation more
-
- C. If beach facilities became much worse (declined to a ranking of 1) what would your response be?
- a. still visit the same beach as much
 - b. visit that site less frequently and some other site more (specify which one)
 - c. visit that site less frequently and participate in some other non-water-based recreation more (specify which activity)
 - d. participate in outdoor recreation less, no change in other leisure
 - e. participate in outdoor recreation less, and indoor recreation more
-
- D. If beach quality became much worse (declined to a ranking of 1) what would your response be?
- a. still visit the same beach as much
 - b. visit that site less frequently and some other site more (specify which one)
 - c. visit that site less frequently and participate in some other non-water-based recreation more (specify which activity)
 - d. participate in outdoor recreation less, no change in other leisure
 - e. participate in outdoor recreation less and Indoor recreation more

-
- E. If crowding became much worse (declined to a ranking of 1), what would your response be?
- a. still visit the same beach as much
 - b. visit that site less frequently and some other site more (specify which one)
 - c. visit that site less frequently and participate in some other non-water-based recreation more (specify which activity)
 - d. participate in outdoor recreation less, no change in other leisure
 - e. participate in outdoor recreation less and indoor recreation more

-
- F. If this site were closed, what would your response be?
- a. visit the site that you now visit second most often and still go to the beach as often as before
 - b. visit second most frequently visited site more, but reduce total number of visits
 - c. visit all sites now visited more, but reduce total number of visits
 - d. participate in non-water-based outdoor recreation more (specify which activity)
 - e. participate in outdoor recreation less, no change in other leisure
 - f. participate in outdoor recreation less and indoor recreation more

-
- G. How much could the cost of visiting this site be raised before you started visiting your second most favorite site more?
- a. \$.50
 - b. \$1.00
 - c. \$2.00
 - d. \$3.00
 - e. \$4.00
 - f. \$5-10.00
 - g. more than \$10.00

-
- H. Suppose that this site were to become very polluted and the water quality would be reduced to a ranking of 1. This could be avoided if sufficient funds were raised to pay for the necessary clean-up. If these funds were to be raised through an entrance fee, what is the most you would be willing to pay to prevent this decline in water quality?
- a. \$.50
 - b. \$1.00
 - c. \$2.00
 - d. \$3.00
 - e. \$4-00
 - f. \$5-10.00
 - g. more than \$10.00

I. Suppose that the water quality could be made much better (improved to a ranking of 5) if sufficient funds were raised to pay for the necessary clean-up. If these funds were to be raised through an entrance fee, what is the most you would be willing to pay to achieve the water quality improvement?

- a. \$.50
- b. \$1.00
- c. \$2.00
- d. \$3.00
- e. \$4.00
- f. \$5-10.00
- g. more than \$10.00

1st ___
2nd ___
3rd ___

(5) In choosing a site what is the most important characteristic? 2nd most important? 3rd most important?

- a. presence of a bathhouse/changing room
- b. absence of litter
- c. presence of a lifeguard
- d. presence of a marine/boat launching facility
- a. stocked game fish
- f. a natural setting
- g. water temperature
- h. water appearance
- i. presence of other beach facilities
- j. cost (parking fees, entry fees)
- k. proximity
- l. where your friends go
- m. where your family always went
- n. other _____

1st ___
2nd ___
3rd ___
4th ___
5th ___

(6) Thinking of water quality, the attractiveness of the water for swimming depends on the color, odor, clearness, amount of floating debris or scum, and the amount of aquatic weeds. Which characteristic is the most important? 2nd most important? Please rank these characteristics.

- a. color
- b. odor
- c. clearness
- d. floating debris
- e. aquatic weeds

(7) What is your favorite water-related activity?
DO NOT READ RESPONSES

- a. swimming
- b. boating (canoeing, sailing, etc-)
- c. fishing
- d. wading
- e. water skiing
- f. picnicking by water
- g. bicycling by water
- h. walking/strolling by water
- i. other (please specify) _____

1st ___
2nd ___
3rd ___

(8) What other recreation activities have members of your household engaged in this summer? (rank according to preference) DO NOT READ RESPONSES

- a. swimming, in a pool
- b. tennis
- c. field sports (softball, baseball, football)
- d. basketball
- e. golf
- f. picnicking
- g. walking for pleasure
- h. bicycling
- i. outdoor spectator sports
- j. indoor recreation activities
- k. other (please specify) _____

1st ___
2nd ___
3rd ___

(9) Of all the recreational activities we have discussed including both those related to water and those not, what do you do most often? 2nd most often? 3rd most often?

- a. swimming
- b. boating
- c. fishing
- d. wading
- e. water skiing
- f. other water-based (please specify) _____
- g. swimming, in a pool
- h. tennis
- i. field sports (softball, baseball, football)
- j. basketball
- k. golf
- l. picnicking
- m. walking for pleasure
- n. bicycling
- o. outdoor spectator sports
- p. indoor recreation activities
- q. other non-water-based (please specify) _____

-
- (10) Among the water-based activities covered in this interview, are there any which you would enjoy doing but do not get to as much as you would like to in the Boston Area?
(Record Response Below)

PART III: PERCEPTION

- (1) How many people are in the household? Could you tell me how many fall into each age category?

Number

Age Range

-
-
-
-
-
-
- A. 0-6 (pre-school)
B. 7-13 (elementary school-junior high)
C. 14-17 (high school/too young to drive)
D. 18-25 (college age)
E. 26-65
F. 65

- (2) Who is the Respondent?

-
- A. Sex -- a. Male
b. female
-
- B. In which of these groups is your own age?
a. 0-6 (pre-school)
b. 7-13 (elementary school- junior high)
c. 14-17 (high school/too young to drive)
d. 18-25 (college age)
e. 26-65
f. 65
-
- C. Which of these best describes your status in this household?
a. grandparent
b. father
c. mother
d. sibling
e. other relative
f. live alone or with unrelated individuals

— (3) Which letter corresponds to the total household (including children) annual income after taxes, in other words, the total take-home pay?

- a. 0-4999
- b. 5000-7499
- c. 7500-9999
- d. 10,000-12,499
- e. 12,500-14,999
- f. 15,000-19,999
- g. 20,000-24,999
- h. 25,000-29,999
- i. 30,000-34,999
- j. 35,000-40,000
- k. greater than 40,000

— (4) What is the occupation of the principal income earner?

- a. Professional, Technical, and Kindred
- b. Managerial
- c. Production Superintendent/Foreman
- d. Skilled Laborer
- e. Unskilled or Semi-skilled
- f. Clerical/Secretarial
- g. Retired
- h. Student
- i. Housewife
- j. Other (please specify) _____

— (5) What is your occupation?

- a. Professional, Technical and Kindred
- b. Managerial
- c. Production Superintendent/foreman
- d. Skilled Laborer
- e. Unskilled or Semi-skilled
- f. Clerical/Secretarial
- g. Retired
- h. Student
- i. Housewife
- j. Other (please specify) _____

— (6) What is the highest level of educational attainment represented in the household?

- a. elementary/junior high school
- b. some high school
- c. completed high school
- d. some college (including junior college)
- e. vocational/technical school
- f. completed college
- g. post-graduate

(8) What is the last grade in school you yourself completed?

- a. elementary/junior high school
- b. some high school
- c. completed high school
- d. some college (including junior college)
- e. vocational/technical school
- f. completed college
- g. post-graduate

(9) Do you own any of the following equipment? If so, please estimate its approximate original retail cost and the year purchased,

<u>Original Retail Cost</u>	<u>Year Purchased</u>	<u>Item</u>
\$		A. Boat
\$		B. Outboard Motor
\$		C. Boat Trailer
\$		D. Other Boat Equipment
\$		E. Fishing Tackle (rod, reel, tackle box, etc.)
\$		F. Fishing Licenses
\$		G. Backpack
\$		H. Waterskis
\$		I. Special Clothing (wetsuit, waders, etc.)
\$		J. Bicycle
\$		K. Cooler
\$		L. Other Items (please specify) _____

(10) Leisure Time

A. How many days per week does the principal income earner usually work?

- a. less than four
- b. four
- c. five
- d. six
- e. seven

B. How long is his or her paid vacation (# weeks)?

- a. none
- b. up to one week
- c. over one week, up to two weeks
- d. over two weeks, up to three weeks
- e. over three weeks, up to one month
- f. over one month, up to two months
- g. over two months

— (10) Do you own an automobile? If yes, how many?

- a. No, none
- b. Yes, 1
- c. Yes, 2
- d. Yes, 3
- e. Yes, more than 3

— (11) A. How often do you or anyone in this household use public transportation?
(highest level in household)

- a. never
- b. almost never
- c. occasionally
- d. frequently

— B. About how far away is the nearest subway or bus stop?

- a. 1 block (1/8 mile)
- b. 2 blocks (1/4 mile)
- c. 3 blocks (3/8 mile)
- d. 4 blocks (1/2 mile)
- e. more than 1/2 mile

— (12) How would you describe your ethnic background?

RECORDING FORM

SITES	PERSONAL VISITS		DURATION	TRAVEL MODE	TRAVEL TIME	TRAVEL COST	EXPENDITURE	GROUP SIZE	ACTIVITIES			1 or 2							
	1a	2b							3c	4a	4b	4c	4d	6			a	b	c
			1st	2nd	3rd														
1. Kings Beach (Swampscott)																			
2. Lynn Beach (Lynn)																			
3. Nahant Beach (Nahant)																			
4. Revere Beach (Revere)																			
5. Short Beach (Revere)																			
6. Winthrop Beach (Winthrop)																			
7. Constitution Beach (Orient Heights) Beach (Boston)																			
8. Castle Island (Boston)																			
9. Pleasure Bay (Boston)																			
10. City Point (Boston)																			
11. L & M Street Beaches (Boston)																			
12. Carson Beach (Boston)																			
13. Malibu (Savin Hill) Beach (Boston)																			
14. Tenean Beach (Boston)																			
15. Wollaston Beach (Quincy)																			
16. Nantasket Beach (Hull)																			
17. Wingaersheek Beach (Gloucester)																			
18. Crane's Beach (Ipswich)																			
19. Plum Island (Newbury)																			
20. Duxbury Beach (Duxbury)																			
21. White Horse Beach (Plymouth)																			
22. Breakheart Reservation (Saugus)																			
23. Sandy Beach (Upper Mystic Lake) (Winchester)																			
24. Boughton's Pond (Blue Hills Reservation) (Milton)																			
25. Wright's Pond (Medford)																			
26. Walden Pond (Concord)																			
27. Stearns Pond (Harold Parker State Forest) (Andover)																			
28. Cochituate State Park (Natick)																			
29. Hookinton State Park (Hookinton)																			
30. Esplanade/Storrow Lagoon (Boston)																			
31. Charles River, between Weeks and Anderson Bridges (Cambridge)																			
32. Spy Pond (Arlington)																			
OTHER (please specify)																			
33. _____																			
34. _____																			

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16. ABSTRACT <p>Considerable past work has attempted to estimate the recreational benefits which might accrue from water quality improvements. The theoretical underpinnings of this work, however, are becoming increasingly suspect. This report explores demand models, new to recreational analysis, which are based on site characteristics and individual preferences to estimate benefit measured by consumer's surplus.</p> <p>The empirical findings of this study are based on a structured survey of 467 representative households in the Boston SMSA. Our focus was specifically day trips to a system of Boston area beaches, but considerable additional data on willingness-to-pay, substitution between sites and activities, water quality perception and general recreation behaviour was developed as well. The reader will find an extensive review of the post-war literature on recreation economics and water quality benefits.</p>		
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