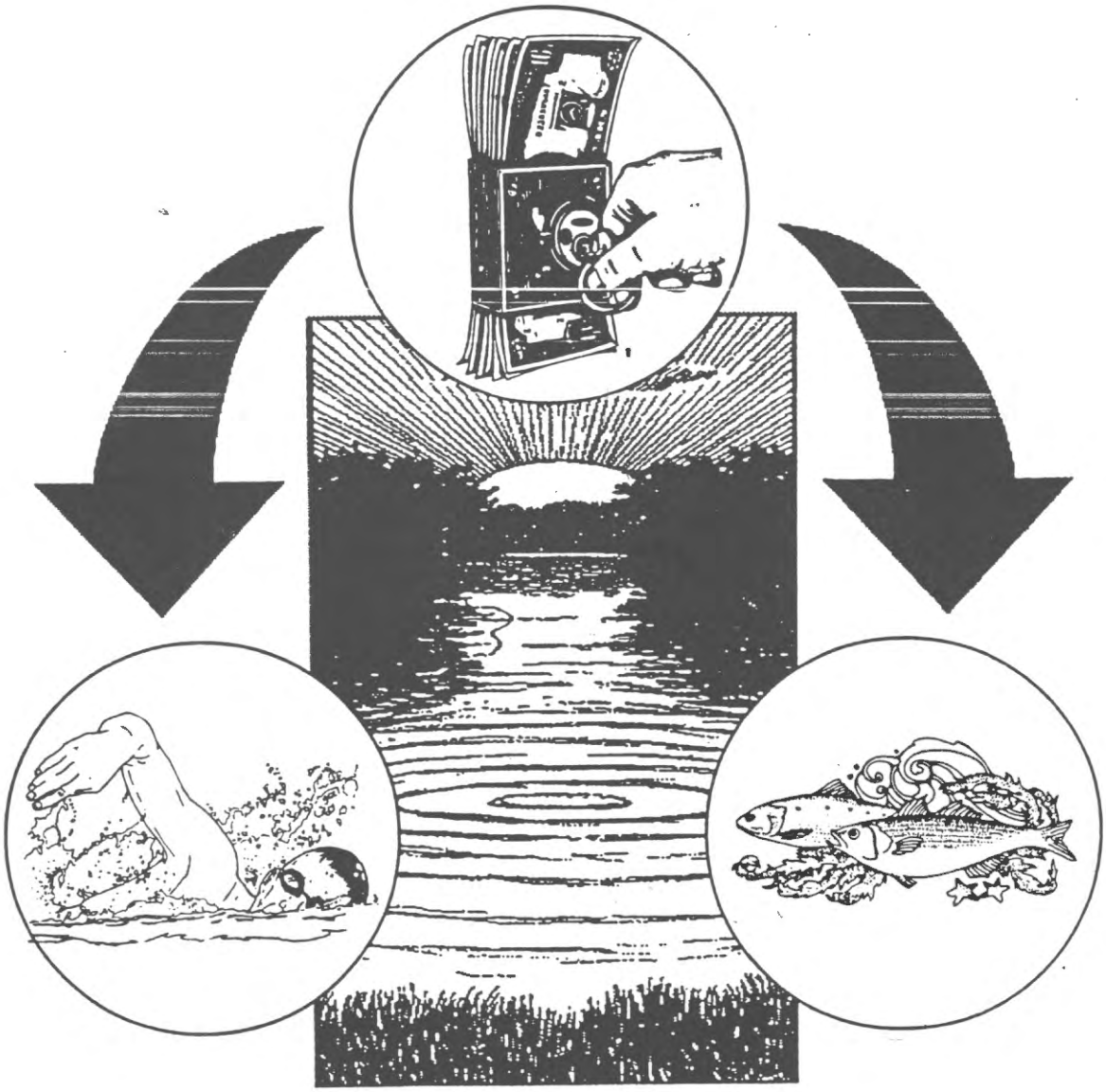
How Much is a Lake Worth To You?



A summary of an economic study conducted by the University of Connecticut and the Connecticut Department of Environmental Protection

1999

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This publication is a summary of the report, *Economic Evaluation of Connecticut Lakes With Alternative Water Quality Levels* by Kara J. Fishman, Robert L. Leonard, and Farhed A. Shah. The authors, respectively, are Graduate Research Assistant and Associate Professors in the Department of Agricultural and Resource Economics, University of Connecticut, Storrs, Connecticut.

The research was sponsored by the Connecticut Department of Environmental Protection, Bureau of Water Management with a grant from the U.S. Environmental Protection Agency's Clean Lakes Program. The Storrs Agricultural Experiment Station also supported this research.

I. Introduction

Researchers at the University of Connecticut (UConn) recently conducted a survey of lakeside property owners and public beach and boat launch users to find out what economic impacts they thought might occur if water quality deteriorated to a point that some recreational activities became unsafe. Property owners were asked how recreation restrictions would affect their property values. Public sites users were asked how losing recreational opportunities would affect their willingness to pay lake access fees.

One would assume that lowered water quality would create a cascading economic effect (Figure 1). Poor water quality curtails recreational opportunities which, in turn, makes lakeside property and public access sites less attractive and valuable to buyers and visitors. The bottom line is less revenue for lake towns from real estate taxes and fewer dollars collected at public beaches and boat launches.

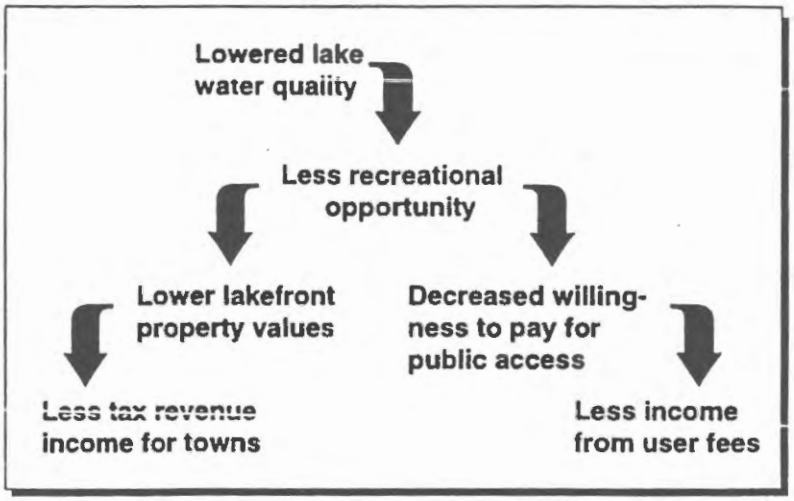


Figure 1: *Cascading Effect of Lowered Lake Water Quality*

The purpose of this survey was to document and add some real numbers to this cascading effect. Specifically, if a suburban lake in Connecticut becomes unsafe for swimming and fish caught in the lake are unsafe to eat:

- **How much would lakeside property values decrease?**
- **How much less would people be willing to pay at public sites?**
- **How much would lake towns lose in annual tax revenue from lakeside properties?**

II. Approach

In developing this economic evaluation study, UConn researchers:

- Defined four levels of lake water quality.
- Defined two types of lake users groups to be surveyed.
- Selected four Connecticut lakes to serve as sample lakes.

Categories of lake water quality

The UConn team devised four categories (A – D) of lake water quality based on two key recreational lake use factors (Figure 2):

- Is the lake safe for swimming?
- Can fish caught from the lake be eaten safely?

Category A defined water quality conditions which allowed for safe swimming and the safe consumption of fish. *Category B* defined conditions which made swimming unsafe but fish were safe to eat. *Category C* conditions allowed swimming but fish were unsafe to eat. *Category D* conditions yielded both unsafe swimming and contaminated fish.

Survey participants were asked to estimate economic impacts if current water quality conditions in the lake (Category A) deteriorated to a point that conditions depicted under Categories B – D occurred.

Figure 2: ***Alternative Levels of Water Quality Defined In The Survey***

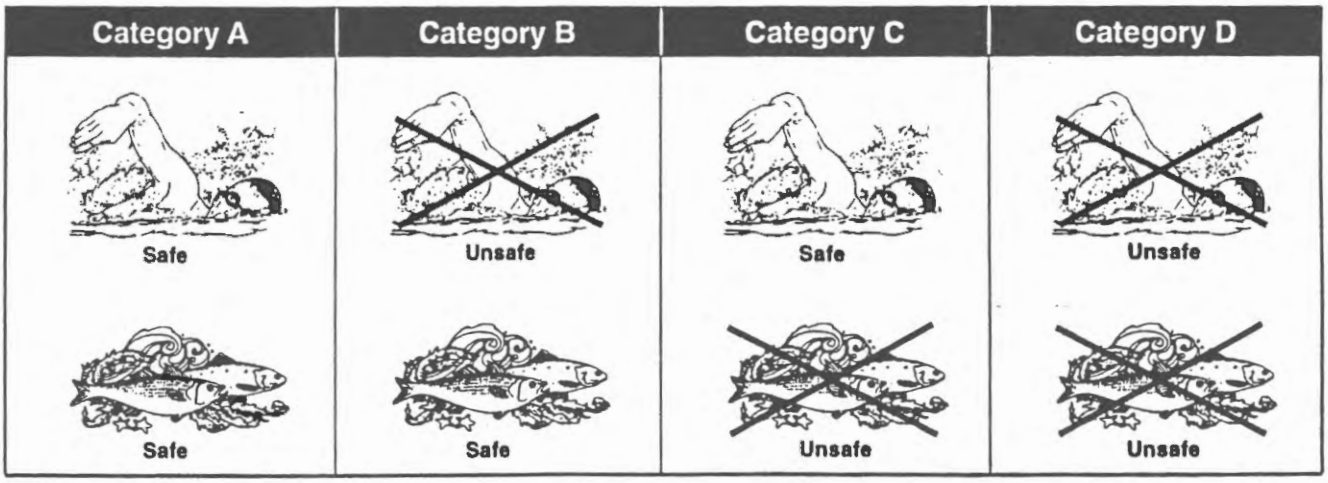
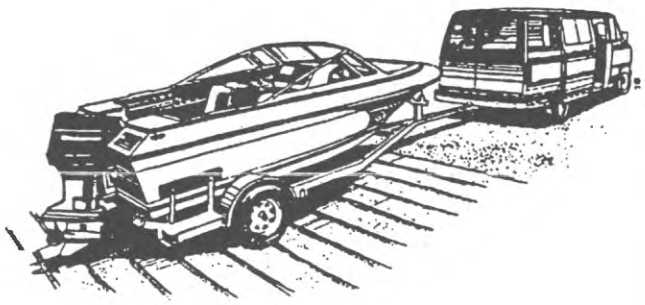


Figure 3: *User Groups Participating in the Survey*

Lakefront property owners



Public site users

Lake user groups

Two types of lake users participated in the survey (Figure 3):

- Lakefront property owners.
- People who access and use the lake at public sites (i.e., town swimming beaches and boat launch sites).

Both of these user groups have the potential to be affected by changes in water quality which restrict recreational activities, including swimming and eating fish from the lake. Each group has a different economic stake in the lake, however.

Lakefront property owners generally recognize and treat their house and land as a marketed good. The value of their property rises and falls with various economic factors including supply and demand, mortgage interest rates, local tax rates, as well as maintenance and improvement costs to their dwelling and landscape. The amenity that sets the property apart from other local properties is, of course, the lake itself. Consequently, there is a relationship between the the value of the lake and the value of the lakefront property.

Public site users, on the other hand, do not have a large monetary investment tied up in lakeside property. While they can appreciate the lake and the recreational opportunities it presents as much as property owners, they are also in the position to walk away from a lake with deteriorating water quality without any loss of real property. Their economic stake, however, can be measured in terms of their "willingness to pay" for lake access.

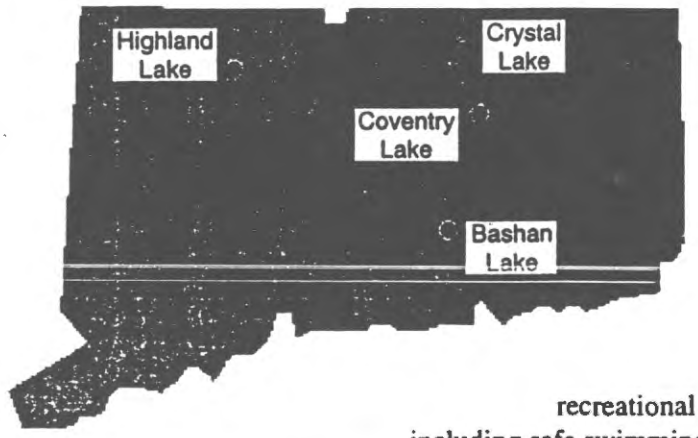


Figure 4: *Locations of the Survey Lakes*

Survey lakes

Four lakes were selected to serve as sample lakes for the survey (Figure 4).

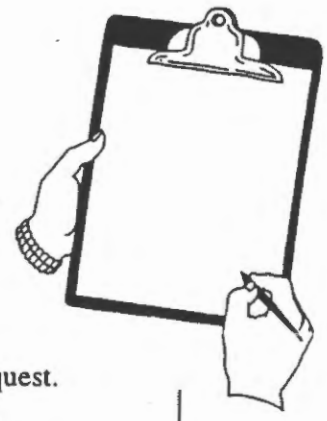
- Bashan Lake, East Haddam
- Coventry Lake, Coventry
- Crystal Lake, Ellington and Stafford
- Highland Lake, Winchester

Each lake is considered to be a high quality recreational lake and supports many forms of recreation, including safe swimming and safe consumption of fish. All have a boat launching area maintained by the state and residential lakefront development occurs at a density of four to eight times greater than the rest of the town. Coventry, Crystal, and Highland Lakes have swimming beaches. Crystal and Highland Lakes have been designated by the State as *Trophy Trout Lakes* and DEP applies special management rules to these lakes to enhance recreational fishing.

Table 1: Characteristics of the Survey Lakes

	Bashan Lake	Coventry Lake	Crystal Lake	Highland Lake
Drainage basin	Connecticut	Thames	Thames	Connecticut
Watershed area (sq. mi.)	1.99	3.32	2.78	7.05
Surface area (acres)	276	378	201	444
Maximum depth	48	40	50	62
Mean depth	16	29	20	20
Trophic status	Oligotrophic	Oligo-mesotrophic	Mesotrophic	Oligotrophic
Lakefront properties (approx.)	134	200	82	280
Public access				
State boat launch	1	1	1	1
Beach for town residents	0	1	1	2
Public beach	0	1	0	0
Common fish species				
Trout	X	X	X	X
Largemouth bass	X	X	X	X
Smallmouth bass	X	X	X	X
Chain pickerel	X		X	
Black crappie	X			
Yellow perch	X	X	X	X
Sunfish	X	X	X	

III. Conducting the Survey



Lakefront property owners

In the fall of 1995 and winter of 1995-96, UConn researchers mailed a survey package to 699 people who owned lakefront houses on, and homeowners with deed rights-of-way to, Bashan, Crystal, and Highland Lakes.* The packages were sent from the University and included a cover letter from the first selectman or town manager. The initial mailing was followed by a combination "thank you" and "reminder" letter with an offer of a replacement survey upon request.

The survey included a table that identified the four alternative levels of water quality (Categories A - D). Property owners were asked to estimate the current market value of their property given their lake was in Category A (safe to swim and safe to eat fish from the lake). They were then instructed to take the position that they would be willing, but not anxious, to sell their property. Respondents were then asked to estimate the percent reduction in market value that would occur given each of the alternative water quality conditions defined in Categories B - D. At total of 237 surveys were returned with complete responses for each of the four water quality categories (effective response rate of 33.9 percent).

In addition to the economic questions, survey recipients were also asked general questions regarding the use of the property, lot size and features, recreational activities, and household income levels.

Public site users

Public site users at Bashan, Coventry, Crystal, and Highland Lakes were surveyed in the summer of 1995. Individuals were approached at both public boat launches and swimming beaches. If they agreed to participate in the survey, the researchers asked them to state the maximum amount they would be willing to pay as an annual fee for use of the lake. This fee, it was explained, would be in addition to any entrance and parking fees that they were already paying. If the respondent answered with a positive figure, they were shown the table that identified the four alternative levels of water quality (Categories A - D). They were then asked to state the maximum amount they would be willing to pay as an annual fee given the recreational activity restrictions defined in Categories B –D. Only one person per household was surveyed and respondents who returned at a later date were not interviewed a second time by the survey team. A total of 423 people participated in the public site user survey.

In addition to the "willingness to pay" figures, public site survey participants were asked to identify their recreational activities, household income levels, and how much, if anything, they were currently paying to use the site. Other questions included frequency of visits, number of household members using the lake, the length of the visit, driving distance to the lake, and any substitute sites they might use.

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* Lakefront property owners at Coventry Lake were not included in the "official" survey. They were used as a pre-survey test group for the purpose of evaluating survey questions. The test survey was subsequently fine-tuned based on feedback from this test group.

IV. Survey Results

Lakefront property owners

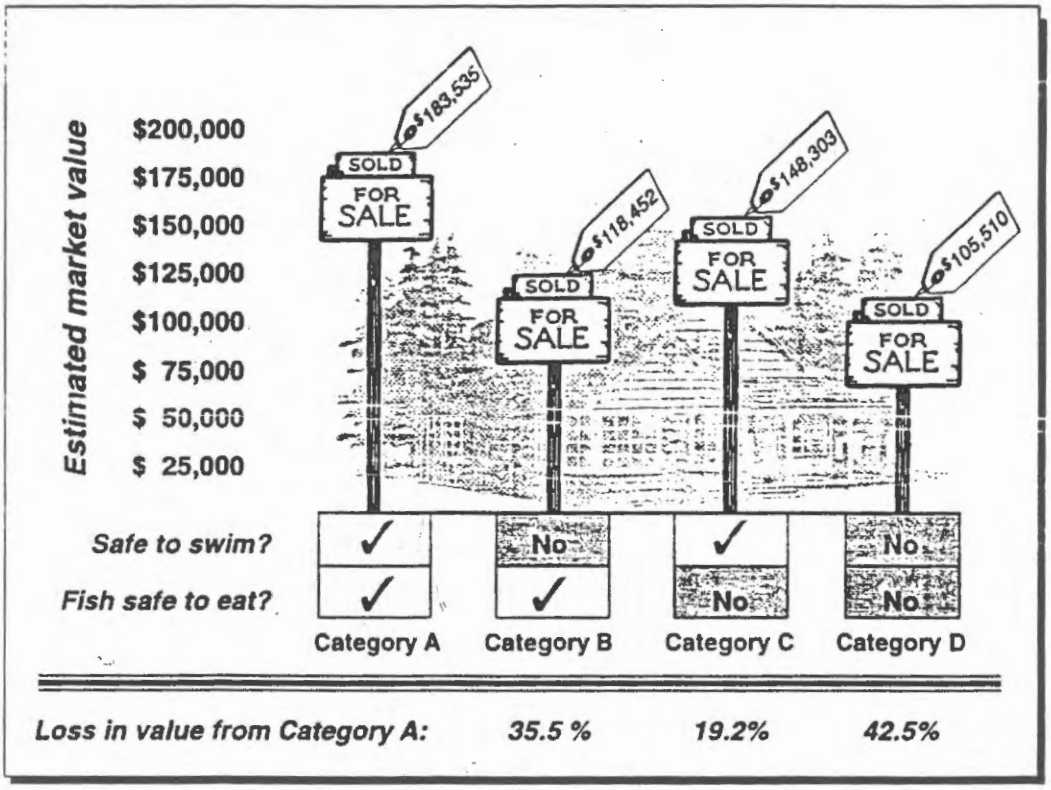


Figure 5:
Effects of Alternative Water Quality Levels on Individual Lakefront Property Values at Bashan, Crystal, and Highland Lakes (weighted average)

- **Significant reduction in property values occurs when lake water quality deteriorates to the point that it is no longer safe to swim or eat fish caught in the lake (Category D).**

  Based on survey data collected for the three lakes, a hypothetical loss of these two recreational activities will cause about a 43 percent reduction in lakeside property values.

- **The loss of swimming opportunities results in greater drop in property values than the contamination of fish.**

  The loss of swimming caused about a 36 percent reduction in value while the loss of the ability to safely eat fish caused a drop of about 19 percent.

Public site users

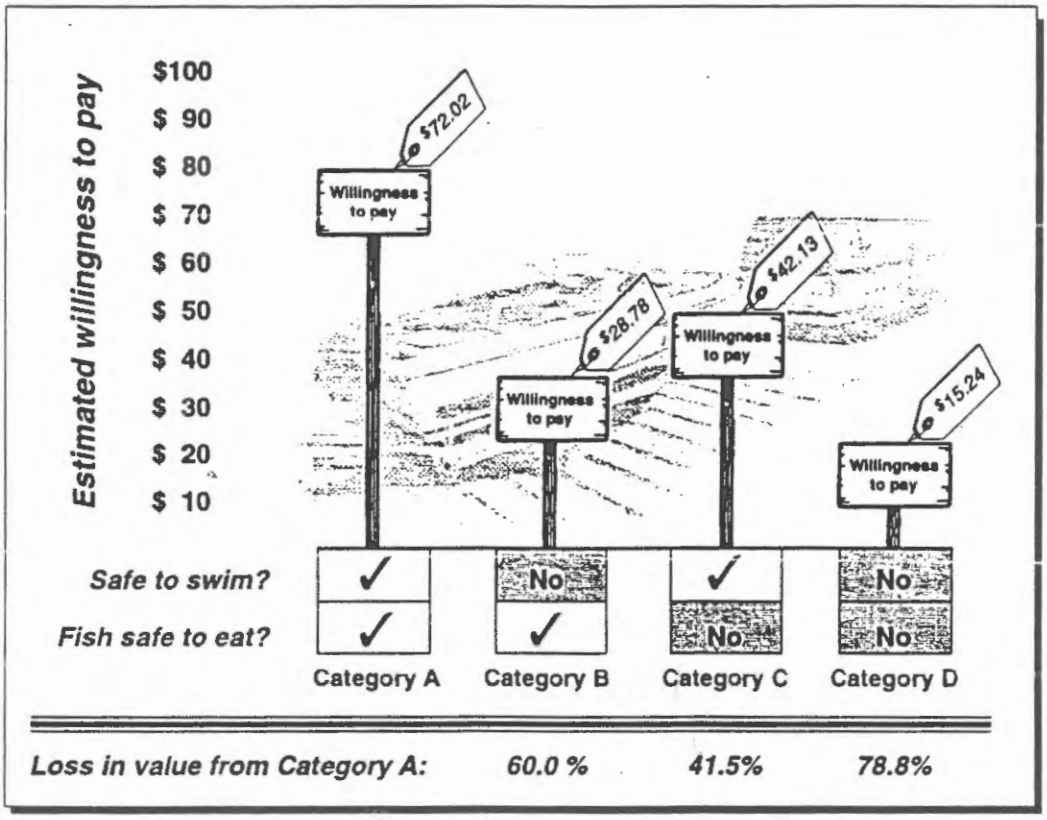


Figure 6:
Effects of Alternative Water Quality Levels on Annual Willingness to Pay by Public Site Users at Bashan, Coventry, Crystal, and Highland Lakes (weighted average)

- **Significant reduction in the amount of money users of public sites are willing to pay occurs when lake water quality deteriorates to the point that it is no longer safe to swim or eat fish caught in the lake (Category D).**

  Based on survey data collected for the four lakes, a hypothetical loss of these two recreational activities will cause about a 79 percent reduction in public site user's "willingness to pay."

- **The loss of swimming opportunities results in greater drop in willingness to pay than the contamination of fish.**

  The loss of swimming caused about a 60 percent in drop in the dollar amount public site users were of willing to pay to use the lake. The loss of the ability to safely eat fish resulted in a drop of about 42 percent.

Annual tax revenue

- **Significant reduction in the amount of tax revenue from lakefront properties occurs when lake water quality deteriorates to the point that it is no longer safe to swim or eat fish caught in the lake (Category D).**

  Based on survey data collected, a hypothetical loss of these two recreational activities will cause potential tax revenue losses from lakefront properties of:

  - *$554,490 (43%) for Highland Lake (Figure 7)*
  - *$286,793 (43%) for Bashan Lake (Figure 8)*
  - *$120,750 (39%) for Crystal Lake (Figure 9).*

  These losses were calculated based on the 1995 mill rate for each of the towns.

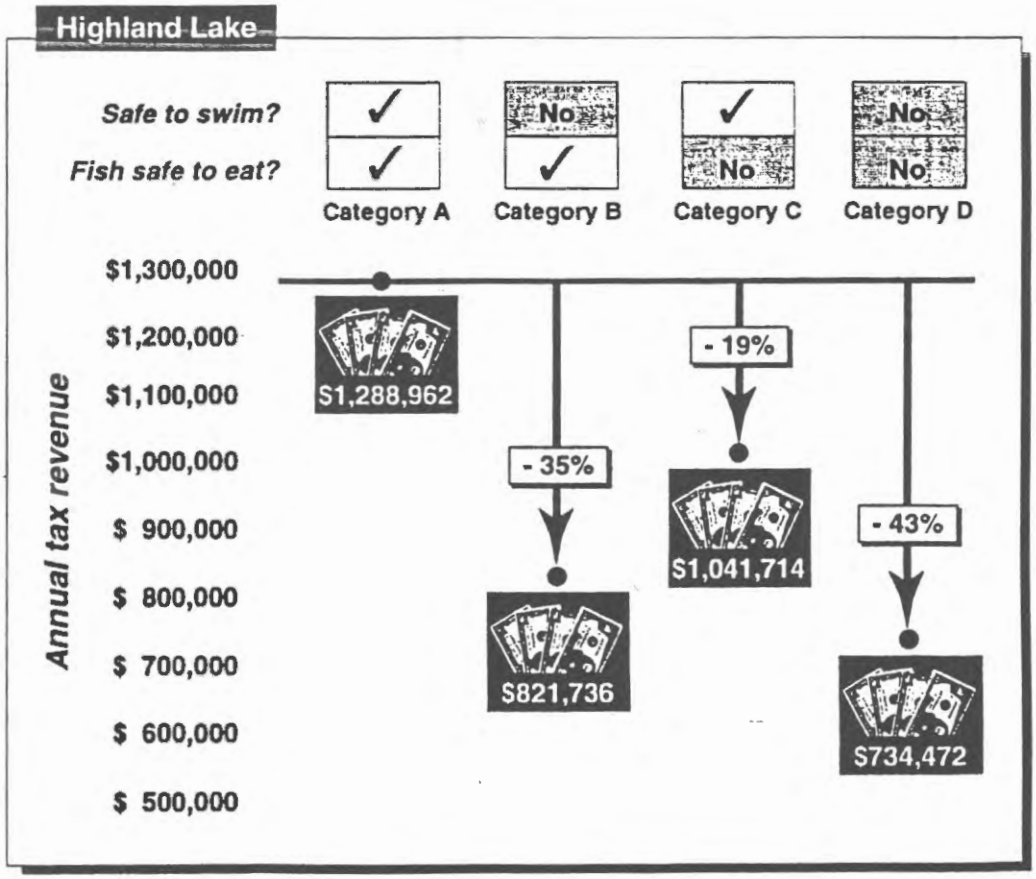


Figure 7: *Changes in Annual Tax Revenues from Lakefront Properties at Highland Lake Based on Alternative Water Quality Levels*

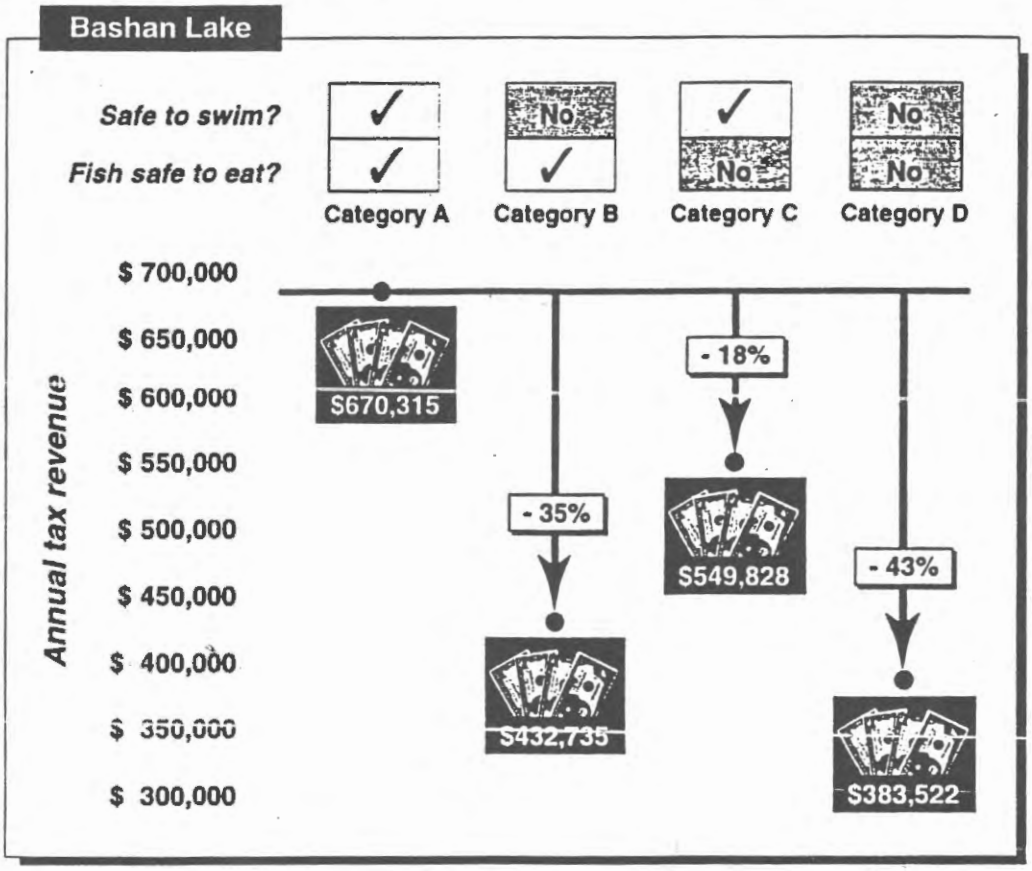


Figure 8:
Changes in Annual Tax Revenues from Lakefront Properties at Bashan Lake Based on Alternative Water Quality Levels

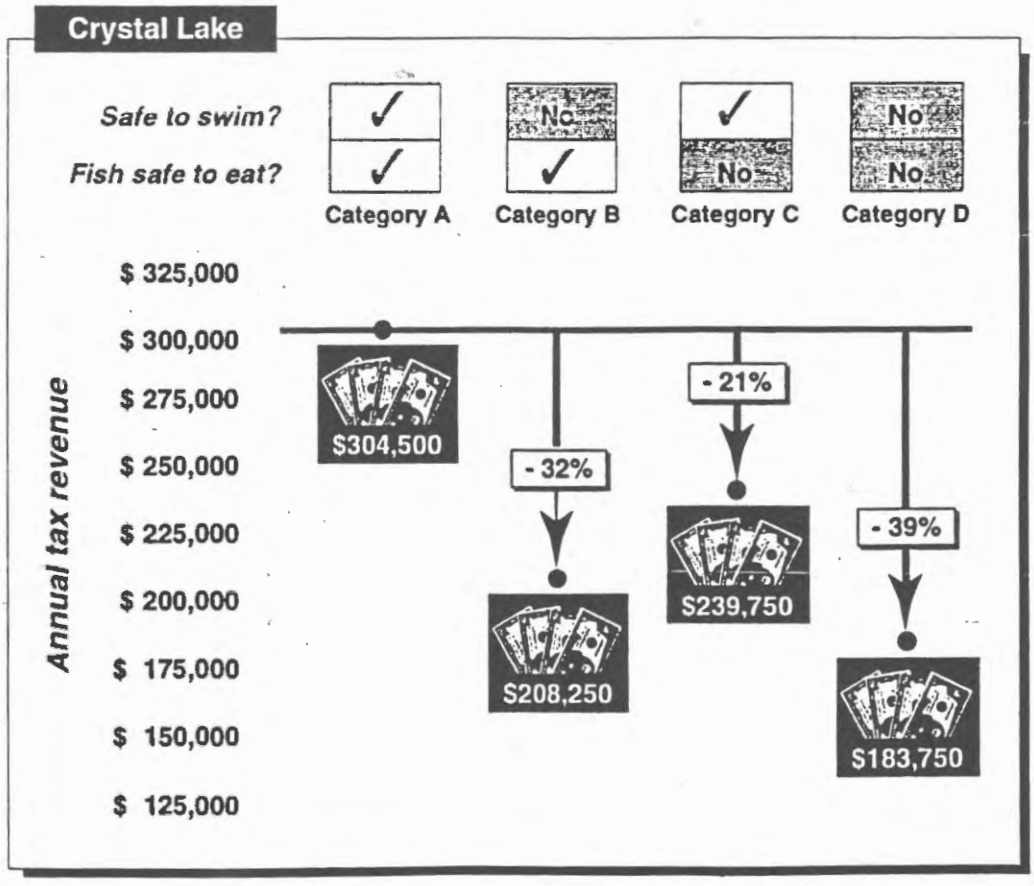


Figure 9:
Changes in Annual Tax Revenues from Lakefront Properties at Crystal Lake Based on Alternative Water Quality Levels

V. Summary and Conclusions

Summary

The results of this study supports the theory that there is a cascading economic effect associated with a reduction in lake water quality. Using a contingent valuation survey approach, UConn researchers presented lakeside property owners and public site users with four scenarios that linked water quality with two key lake use factors, safe swimming and the safe consumption of fish. Property owners were asked by mail survey how these recreation restrictions would affect their property values. Public sites users were asked in personal interviews how losing these recreational opportunities would affect their willingness to pay lake access fees.

Four Connecticut lakes were chosen as sample lakes: Bashan Lake in East Haddam, Coventry Lake in Coventry, Crystal Lake in Ellington and Stafford, and Highland Lake in Winchester. Public site users were surveyed at all four lakes. Property owners were surveyed at Bashan, Crystal, and Highland Lakes.

The survey was designed to answer three primary questions concerning the loss of safe swimming and the safe consumption of fish at the study lakes:

- **How much would lakeside property values decrease?**

  Lakeside property owners at Bashan, Crystal, and Highland Lakes indicated there would be a significant loss in property value associated with the loss of recreational opportunities at their lakes. Survey respondents estimated that values would drop 35 percent if swimming was not safe, 19 percent if fish were not safe to eat, and 43 percent if both swimming and fish consumption were unsafe *(See Figure 5)*.

- **How much less would people be willing to pay at public sites?**

  Public site users at Bashan, Coventry, Crystal, and Highland Lakes indicated that their willingness to pay lake access fees would be significantly affected by the loss of recreational opportunities. Survey respondents estimated that their willingness to pay would drop 60 percent if swimming was not safe, 42 percent if fish were not safe to eat, and 79 percent if both swimming and fish consumption were unsafe *(See Figure 6)*.

- **How much would lake towns lose in annual tax revenue?**

  Annual tax revenues from lakeside properties in the towns where Bashan, Crystal, and Highland Lakes are located are calculated to go down as property values decrease. Tax revenue reductions range from 32 to 35 percent if swimming was not safe, 18 to 21 percent if fish were not safe to eat, and 39 to 43 percent if both swimming and fish consumption were unsafe *(See Figures 7-9)*.

Conclusions

This study is the first attempt to review the economic importance of lake water quality in Connecticut. The results show that deteriorating water quality has a negative impact on property values, town tax revenues, and recreational use of the lakes. Conversely, these results suggest that improvements in lake water quality would have positive impacts on property values, town tax revenues, and recreational use of the lakes.

Survey results are remarkably consistent among the study lakes. Therefore, officials at other recreational lakes in Connecticut should be able to apply these findings and conclusions to their own lake. This information might be especially useful for town officials and lake groups who need background information to justifying increased expenditures for watershed and in-lake management activities (See the 1996 DEP publication, *Caring for Our Lakes, Watershed and In-Lake Management for Connecticut Lakes,* for information on potential projects).

Safe Swimming Versus Safe Fish Consumption

It is interesting to note that the loss of safe swimming opportunities had a larger negative economic impact to lakefront property owners and public site users than the loss of fish edibility. This probably reflects the fact that more people engage in swimming than fishing as a recreational activity. Additionally, the Fisheries Division of the Connecticut DEP reports that anglers today are more apt to view fishing as a sport rather than a food source, therefore eating fish caught from the lake might not be a large concern.

Supplemental data provided by lakefront property owners indicated that 100 percent of them engaged in swimming and/or sunbathing activities. Fishing, on the other hand, was listed as an activity by about 78 percent of the owners. Also, the contribution of property value of a dock or a sandy beach declines substantially if swimming became unsafe.

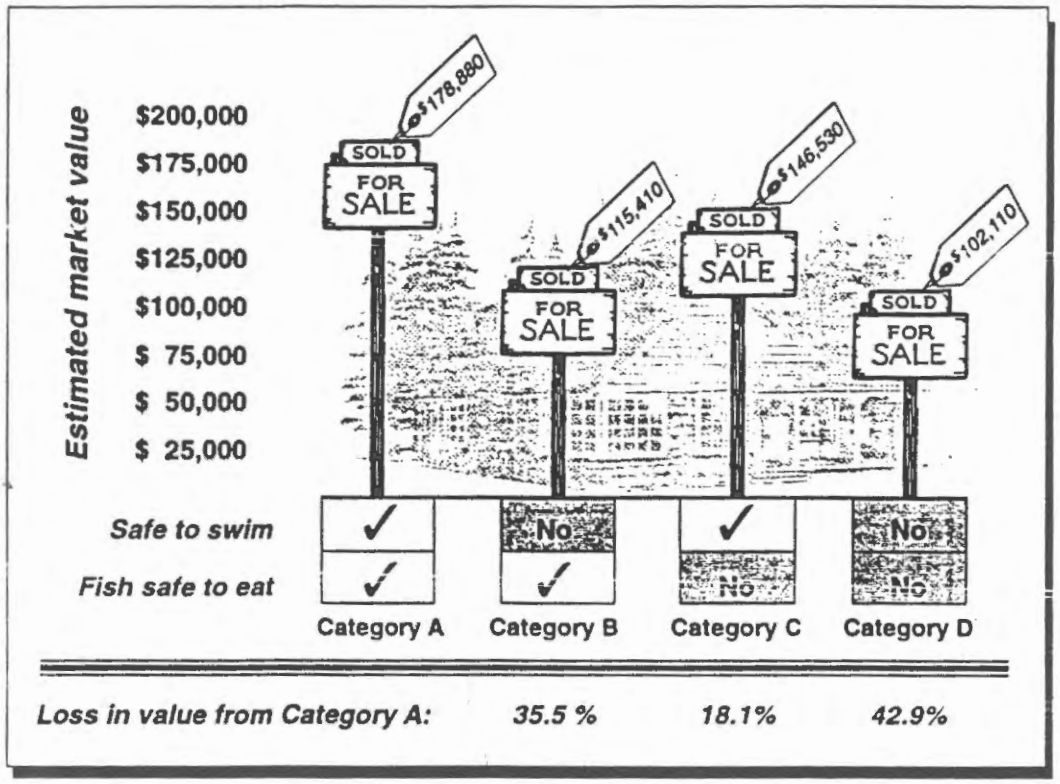
Not surprisingly, public site users at lakes with swimming beaches showed a greater drop in willingness to pay if lake water quality could not support safe swimming. Survey respondents at Bashan Lake, the one study lake without a swimming beach, indicated a 44 percent reduction in their willingness to pay lake access fees. In contrast, Coventry and Crystal Lake respondents indicated a 65 percent drop in their willingness to pay fees. Highland Lake respondents indicated a 57 percent reduction.

Appendix

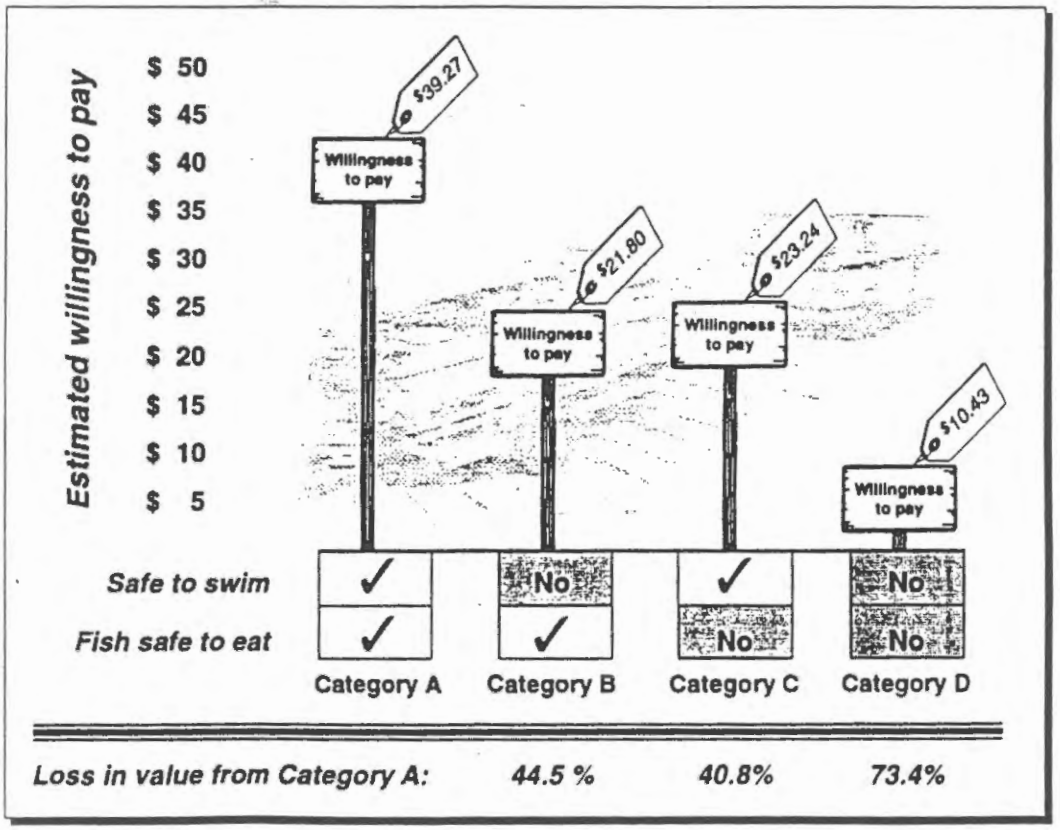
Results from Individual Lakes

Bashan Lake

Effects of Water Quality Levels on Individual Waterfront Property Values at Bashan Lake

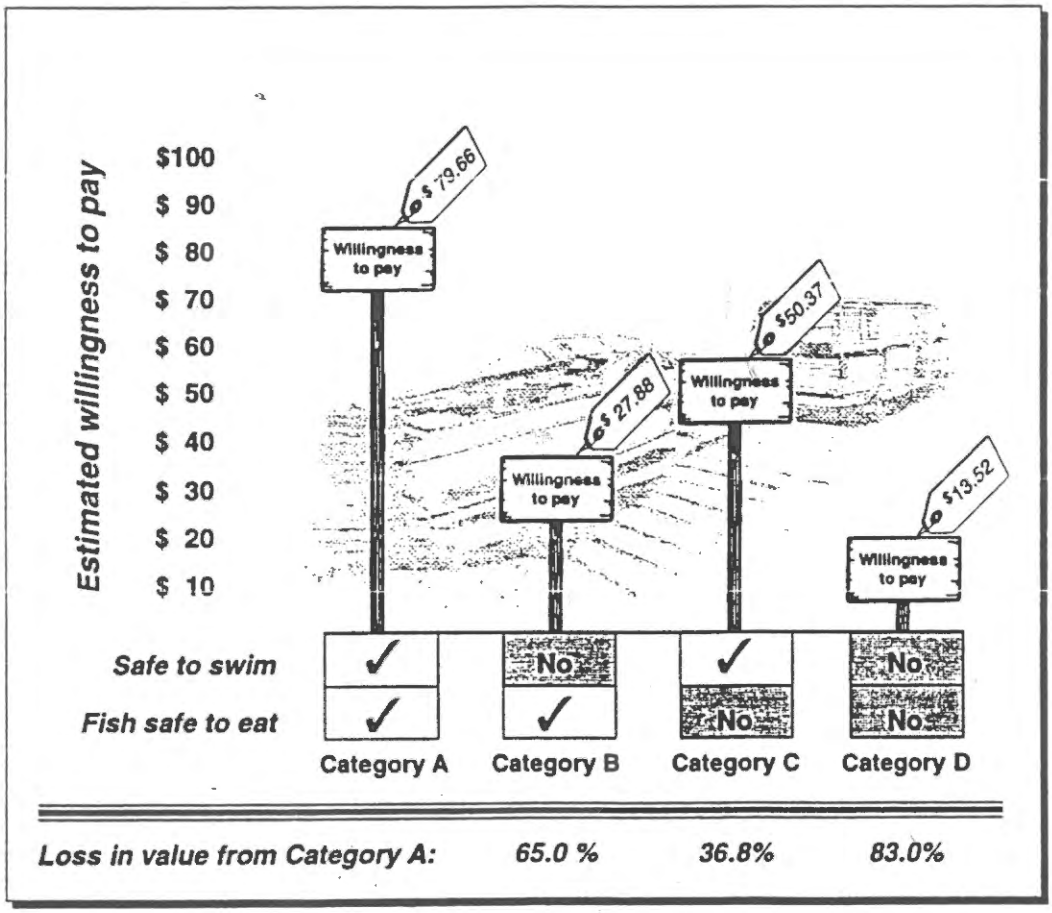


Effects of Water Quality Levels on Annual Willingness to Pay by Public Site Users at Bashan Lake



Coventry Lake

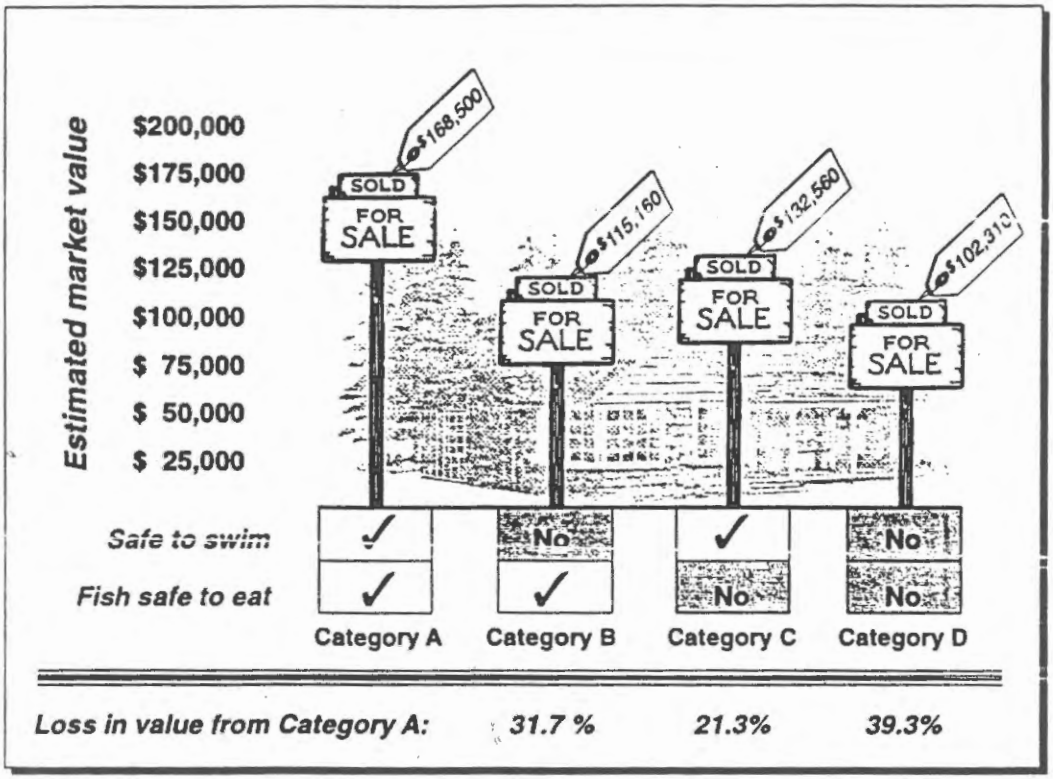
Note: Lakeside property owners were not surveyed at Coventry Lake



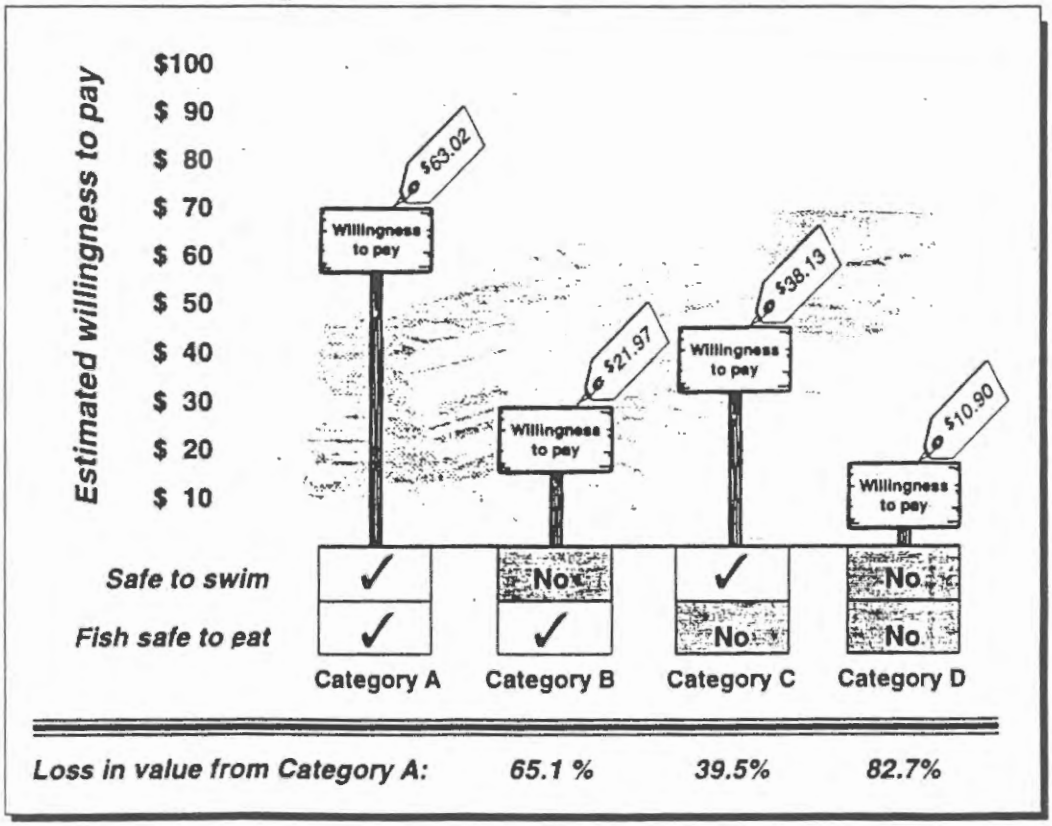
Effects of Water Quality Levels on Annual Willingness to Pay by Public Site Users at Coventry Lake

Crystal Lake

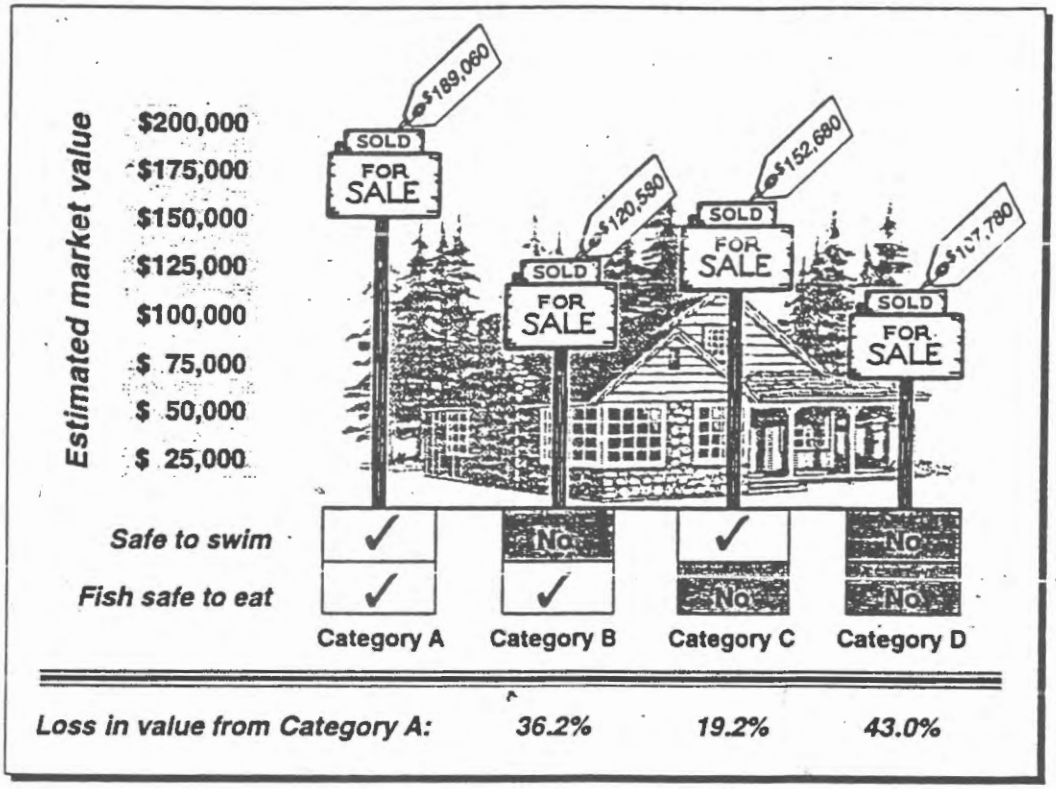
Effects of Water Quality Levels on Individual Waterfront Property Values at Crystal Lake



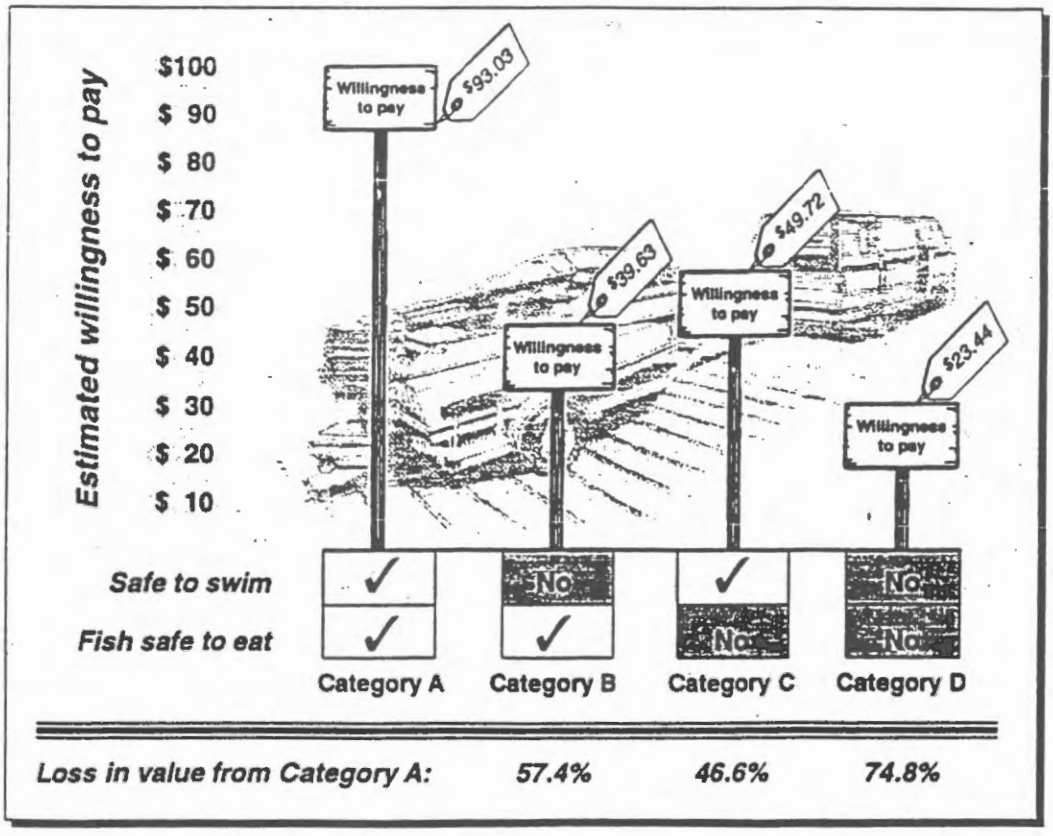
Effects of Water Quality Levels on Annual Willingness to Pay by Public Site Users at Crystal Lake



Highland Lake



Effects of Water Quality Levels on Individual Waterfront Property Values at Highland Lake



Effects of Water Quality Levels on Annual Willingness to Pay by Public Site Users at Highland Lake

FOR FURTHER INFORMATION

Economic Evaluation of Connecticut Lakes With Alternative Water Quality Levels by Kara J. Fishman, Robert L. Leonard, and Farhed A. Shah. This is the full report of the Connecticut lakes economic study. It goes into detail concerning research methods, data collection procedures, and statistical analysis used by the UCONN team.

Caring for Our Lakes - Watershed and In-Lake Management for Connecticut Lakes by Connecticut DEP, Bureau of Water Management (Revised 1996). This booklet provides an overview of methods and practices for maintaining and improving lake water quality.

Copies of the above documents are available from DEP:

Attn: Charles Lee
CT Department of Environmental Protection
Bureau of Water Management
79 Elm Street
Hartford, CT 06106-5127
Tel: (860) 424-3716

For information concerning safe swimming at public beaches contact the health department in your town or municipality. Most health departments collect and analyze water samples from swimming beaches once a week during the summer. The DEP also maintains a web site that includes information about beach closures in the state (http://dep.state.ct.us/).

For information concerning the safety of eating fish caught from Connecticut waters contact the Department of Public Health at (860) 509-7750.

John G. Rowland
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Commissioner

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