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Technical Report No. 25

PUBLIC POLICY AND INSTITUTIONAL
INTERACTION PROJECT
GREAT LAKES SURVEY QUESTIONNAIRE
FIRST PROGRESS REPORT

BY
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AND
A. P. MATHEWS, RESEARCH ASSISTANT

MARCH 1972

MICHU-SG-72-203

Multidisciplinary Research in the Great Lakes

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THE UNIVERSITY OF MICHIGAN SEA GRANT PROGRAM

TABLE OF CONTENTS

	Page
LIST OF TABLES	iv
INTRODUCTION	1
ON-GOING ANALYSIS	4
Highlights: One-Way Frequency Distributions	4
PRELIMINARY ANALYSIS: CROSSTABULATION	16
OBSERVATIONS	23
APPENDIX 1. SURVEY QUESTIONNAIRE	25
APPENDIX 2. ONE-WAY FREQUENCY DISTRIBUTIONS	35

LIST OF TABLES

Table	Page
1. Variable VAR002 <u>LAKE</u>	5
2. Issues Relating to the Destruction of Resources	6
3. Issues Relating to the Utilization of Resources	7
4. Issues Concerned with Problems of Planning for the Wise Use of Resources	8
5. Effect on the Maintenance of Water Quality	10
6. Possible Solutions to the Problem of Deteriorating Water Quality	11
7. Benefit of Certain Factors Under the Present Social and Economic Conditions	13
8. Effect of Certain Factors on Future Water Quality	14
9. Controversial Issues in Water Quality Management Expected to Arise in the Next Five Years	15
10. Lake by Water Quality	17
11. Lake by Population Density	18
12. Population Density by Water Quality	19
13. Destruction of Resources Due to Inadequate Municipal Sewage Treatment Facilities by Water Quality	20
14. Water Quality by Additional Wastewater Treatment Plans as a Solution	21

INTRODUCTION

In January 1971, personnel from a number of Michigan Sea Grant research projects assisted in the preparation of a survey questionnaire (Appendix 1). The objective of this questionnaire is to collect data related to the utilization of resources along the shoreline of the Great Lakes. The survey questionnaire is designed to obtain data related to the following major categories:

- (1) Issues concerned with the destruction of resources
- (2) Issues concerned with the utilization of resources
- (3) Issues concerned with problems of planning for the wise use of resources
- (4) Rating (by respondents) of the quality of the inshore waters and the shoreline and beaches along their area of jurisdiction of the Great Lakes
- (5) Identification of government agencies responsible for protecting the quality of shoreline (inshore) waters
- (6) Identification of the role of different groups in either aiding or hindering maintenance of water quality and quality of shoreline and beaches along the Great Lakes
- (7) Identification and ranking of solutions to the problem of deteriorating water quality
- (8) Identification of certain factors of growth under current economic and social conditions and the effect of these growth factors on future water quality

In February and March, 1971, the survey questionnaire was sent to over 650 units of government in the United States and Canada. These units of government included townships, cities, counties, and regional governments. The

recipients of the questionnaire all have jurisdiction over shoreline and/or waters of the Great Lakes and the connecting waterways. By September, 1971, over 200 questionnaires had been returned. 177 of the returned questionnaires contained information requested. During the period of September-December 1971, all of the information received from these 177 questionnaires was prepared for analysis. The questionnaire contained eight questions; however, as shown in Appendix 2, these eight questions represented 196 variables. As a result, nearly 35,000 units of information were coded into computer cards for preliminary analysis. This first progress report is intended to provide an initial indication of the results obtained from the preliminary analysis of the data collected.

The major goal of this research effort is to provide a realistic indication of the range of resource problems and issues perceived by units of government along the Great Lakes shorelines. The nature of these problems and issues as reported by the units of government may indicate where research efforts need to be concentrated in order to alleviate identified problems. Furthermore, the questionnaire provides an opportunity for identification of new issues or problems which may have important implications for resource utilization in the future. Finally, while the authors of this report are primarily concerned with water quality and factors which influence water quality, other groups at research centers and universities in both Canada and the United States have been advised of the availability of the data collected. It is anticipated that personnel from these research centers and universities may desire analysis of data related to other areas of interest. Accordingly,

this research project of the University of Michigan Sea Grant Program will make every effort to respond effectively to special requests for additional data analysis.

ON-GOING ANALYSIS

HIGHLIGHTS: ONE-WAY FREQUENCY DISTRIBUTIONS

One-way frequency distributions provide statistics related to each of the 196 variables as specified in Appendix 2. Table 1 shows the one-way frequency distribution for the responses received by lake. From Table 1, it is clear that the greatest number of respondents reported upon conditions in Lake Michigan and Lake Erie.

70 per cent of the respondents indicate the source of water pollution to be either within their own area, or from both within and outside of their area of jurisdiction. 92 per cent rated the water quality along their shoreline to be of medium quality or lower than medium quality. 40 per cent stated that the water quality in their area should be considered to be of low or very low quality. State agencies were identified as being primarily responsible for the protection of water quality in the Great Lakes.

The rated importance of the various issues that need to be considered in planning for water quality and resource management are shown in Tables 2, 3, and 4. While each issue may be of some relevance to the particular area concerned, it is now possible to differentiate the more prevalent and important problems from the remaining. Of the issues in the destruction of resources, inadequate municipal and industrial sewage treatment appear to be the most common factors contributing significantly to the deterioration of water quality. Beach and slope erosion are of some concern in the deterioration of shoreline quality, while at the same time it is seen from Table 3 that

TABLE 1

VARIABLE VAR002 LAKE

Lake	Frequency	
	Absolute	Adjusted
Ontario	14*	8.9%
Erie	42	26.8
Huron	19	12.1
Michigan	63	40.1
Superior	<u>19</u>	<u>21.1</u>
	157**	100.0%

*14 of the 177 questionnaires returned were from units of government which have shoreline jurisdiction along Lake Ontario.

**20 of the 177 questionnaires returned were not lake specific. For example, certain of these responses came from federal agencies in Washington, D.C. which are responsible for all lakes; others represent units of government on the connecting waters between the lakes.

TABLE 2

ISSUES RELATING TO THE DESTRUCTION OF RESOURCES

Issues	Adjusted Relative Frequency		
	Unimportant	Somewhat Important	Important
Water pollution due to inadequate municipal sewage facilities	19.0%	18.3%	62.7%
Water pollution due to inadequate industrial sewage facilities	33.5	13.6	52.9
Water pollution due to agricultural runoff	56.1	26.8	17.1
Pollution of both land and water due to disposal of solid waste materials	47.4	26.7	25.9
Beach and slope erosion	31.8	24.3	43.9
Sedimentation due to poor land use practices	60.8	24.1	15.1
Alteration of shoreline by filling or dredging	55.6	15.9	28.5
The threat of thermal pollution	61.6	18.4	20.0

TABLE 3

ISSUES RELATING TO THE UTILIZATION OF RESOURCES

Issues	Adjusted Relative Frequency		
	Unimportant	Somewhat Important	Important
Inadequate accessibility, both functional and visual, to the waters edge	30.2%	30.2%	39.6%
Conflict over land use by competing users	41.7	23.6	34.7
Poor quality development adjacent to shoreline	32.7	27.4	39.9
Decreasing land available for public use	24.7	14.0	61.3
Congestion and inferior facilities in recreation developments	31.0	24.5	44.5
Reduced enjoyment of shore areas due to erosion prevention structures	67.7	20.5	11.8
Lack of proper marina facilities	34.9	26.4	38.7
Lack of proper port facilities	51.8	20.9	27.3
Inconsistency of contrasting land use characteristics within the shore zone	51.8	26.3	21.9
Inadequate adaption of transportation to the shore zone	49.6	20.9	29.5

TABLE 4

ISSUES CONCERNED WITH PROBLEMS OF PLANNING FOR THE WISE USE OF RESOURCES

Issues	Adjusted Relative Frequency		
	Unimportant	Somewhat Important	Important
Inadequate emphasis on water-oriented environmental planning by all levels of government	24.2%	31.9%	43.9%
Lack of inter-agency cooperation with regard to this matter	34.5	28.5	37.0
A piecemeal approach to planning—solving of immediate problems with no long range comprehensive planning	27.0	27.6	45.4
Need for state or province-wide zoning of shorelands	40.7	17.2	42.1
Lack of resource information	45.6	22.5	31.9
Inadequate zoning and building regulations	38.3	21.5	40.2
Lack of planning methods, goals, policies, and identification of user values	30.2	26.3	43.5

erosion prevention structures are not considered to have any significant effect on the enjoyment of shore areas. The issues in planning that may be related to the degradation in water and shoreline quality are inadequate emphasis on water-oriented environmental planning, and lack of long range comprehensive planning.

Table 5 summarizes the significant data received, with regard to the effect of different groups on the maintenance of water quality in the particular shoreline areas represented by the respondents. The respondents have indicated that state agencies have the greatest effect on the maintenance of water quality in their area, which supports information reported earlier. Furthermore, in terms of net effect, state agencies, federal agencies, and conservation groups are positive forces in the maintenance of water quality. The other groups, namely, real estate developers, industrial corporations, and utility companies are observed to exert net negative effects on the water quality. Homeowners appear to be essentially without major capability of either aiding or hindering maintenance of water quality.

Table 6 summarizes the results obtained from question number six which requested information regarding possible solutions to the problem of deteriorating water quality. The two solutions which were ranked highest by the respondents to date are (1) more funds to build additional wastewater treatment plants, and (2) stricter enforcement of existing water quality regulations. Following the two solutions noted above, the next strongest support is directed toward increased coordination of the activities of the existing agencies in water quality management. It should be noted that the solution which received

TABLE 5

EFFECT ON THE MAINTENANCE OF WATER QUALITY
(% in each category)

Groups	Aid	Influence		Hinder	Influence	
		Hardly Any	Great Deal		Hardly Any	Great Deal
Conservation Groups	99.3	26.8	37.7	0.7	0.0	0.0
Real Estate Developers	35.5	61.3	12.9	64.5	14.3	46.5
Homeowners	62.7	24.6	15.9	37.3	24.4	34.2
Industrial Corporations	40.0	42.9	22.9	60.0	13.4	55.7
Utility Companies	57.1	43.5	28.2	42.9	12.2	54.5
Federal Agencies	90.6	30.1	40.9	9.4	44.4	33.3
State Agencies	94.9	16.7	54.6	5.1	40.0	20.0

TABLE 6

POSSIBLE SOLUTIONS TO THE PROBLEM
OF DETERIORATING WATER QUALITY

Issues	Yes	Very Important
More funds to build additional wastewater treatment plants	89.9%	71.6%
Stricter enforcement of existing regulations	89.2	73.0
New regulations to further restrict the sources of pollution	83.8	53.6
Redistribution of responsibility for pollution control among existing government agencies	63.5	38.1
Creation of new agencies with responsibility for water pollution control	60.5	22.8
Increased leadership from public officials in water quality	74.9	59.4
Increased coordination of the activities of the existing agencies in water quality management	82.0	65.0

the least support is the one which involves the creation of new agencies with responsibility for water pollution control.

The benefit of certain growth factors under the current social and economic conditions and the effect of these factors on future water quality are shown in Tables 7 and 8. The respondents favor growth under controlled development conditions overwhelmingly to a strictly "no growth" policy. 54 per cent of the respondents indicate that industrial development would be beneficial to the area, under the current social and economic conditions, and this effect is considered to be detrimental to the future water quality in the area by 42 per cent of the respondents. Nuclear power plants are perceived to be more beneficial and less detrimental to the water quality in the area than fossil fuel power plants.

Some of the controversial issues that are expected to arise in water and shoreline quality management in the next five years are shown in Table 9. Financing for sewer construction, curbing industrial pollution, zoning, and land use planning seem to be issues already emerging into focus at the present time. The information presented in Tables 1-9 is an indication of the type of results which may be obtained from an examination of the one-way frequency distributions for each of the 196 variables represented in the questionnaire.

TABLE 7

BENEFIT OF CERTAIN FACTORS UNDER THE PRESENT
SOCIAL AND ECONOMIC CONDITIONS

Issues	Adjusted Relative Frequency		
	Not Beneficial	Somewhat Beneficial	Beneficial
Urban growth	44.0%	21.3%	34.7%
Recreational growth	11.4	15.8	72.8
Industrial development	23.2	23.1	53.7
Protection of water quality	2.6	4.4	93.0
Preservation of existing natural shoreland areas	5.7	7.6	86.7
More control of development	13.8	20.6	65.6
"No growth" policy	74.2	13.8	12.0
The construction of nuclear power plants	57.4	21.0	21.6
The construction of fossil fuel power plants	75.4	19.7	4.9
Agricultural development	34.6	33.9	31.5
Mining operations	83.1	6.8	10.1

TABLE 8

EFFECT OF CERTAIN FACTORS ON FUTURE WATER QUALITY

Issues	Adjusted Relative Frequency		
	Not Detrimental	Somewhat Detrimental	Detrimental
Urban growth	42.4%	24.5%	33.1%
Recreational growth	57.2	20.2	22.6
Industrial development	29.8	27.9	42.3
The construction of nuclear power plants	33.3	18.9	47.8
The construction of fossil fuel power plants	29.3	17.0	53.7
Agricultural development	65.4	22.5	12.1
Mining operations	44.4	10.4	45.2

TABLE 9

CONTROVERSIAL ISSUES IN WATER QUALITY MANAGEMENT
EXPECTED TO ARISE IN THE NEXT FIVE YEARS

Issues	Adjusted Relative Frequency
Financing needed, sewer construction	38.4%
Storm drain construction	4.0
Industrial pollution	7.3
Solid wastes	5.1
Thermal pollution	3.4
Erosion control	5.1
Construction of recreational facilities	9.0
Zoning	15.3
Land use planning	5.1
Regional planning	2.8
Marine sewage discharge	3.4

PRELIMINARY ANALYSIS: CROSSTABULATION

Crosstabulation displays the interaction between two or more variables. The preliminary crosstabulation analysis conducted upon the Great Lakes survey questionnaire data has been designed to investigate relationships between water quality and certain other variables. This preliminary analysis, which is displayed in Tables 10-14, reveals certain interesting relationships, and some descriptive but tentative statements can be made from an examination of the information shown. For example, Table 10 is the crosstabulation of lake by level of water quality (variable 002 by variable 032). The information in Table 10 indicates that the water quality of Lakes Erie and Ontario as reported by the respondents is perceived to be much lower in water quality than the upper Great Lakes. Lake Superior is perceived to have the highest quality of all of the Great Lakes.

Given the information which has been collected, it is feasible to utilize crosstabulation as a means to identify relationships between variables. From Table 10, it is observed that Lake Erie has the lowest quality water, followed by Lakes Ontario, Michigan, Huron, and Superior. Table 11 is a crosstabulation of lake by population density. Lakes with low quality water tend to have the largest percentage of high population density areas. On the other hand, the areas characterized by high water quality tend to have low population densities. Accordingly, as population density increases, it may be expected to be associated with lower quality water. Table 12 tests this hypothesis. In Table 12 the water quality has been aggregated into two categories - (1) High-Medium

TABLE 10

LAKE BY WATER QUALITY

Lake	Water Quality				Row
	High	Medium	Low	Very Low	Total Count
Erie	2.4%*	24.4%*	58.5%*	14.6%*	41
Ontario	0.0	38.5	61.5	0.0	13
Michigan	9.8	62.3	26.2	1.6	61
Huron	15.8	63.2	21.1	0.0	19
Superior	10.5	84.2	5.3	0.0	19
Column Total Count	12	81	53	7	153

*Column per cent.

TABLE 11

LAKE BY POPULATION DENSITY

Lake	Population Density (Persons/Square Mile)					Row Total Count
	LT20	20-49	50-99	100-999	GT1000	
Erie	0.0%*	9.8%*	9.8%*	48.8%*	31.7%*	41
Ontario	0.0	0.0	0.0	64.3	35.7	14
Michigan	14.3	33.3	22.2	23.8	6.3	63
Huron	21.1	31.6	26.3	21.1	0.0	19
Superior	31.6	47.4	5.3	5.3	10.5	19
Column Total Count	19	40	24	49	24	156

*Column per cent.

TABLE 12

POPULATION DENSITY BY WATER QUALITY

Population Density (Persons/Square Mile)	Water Quality		Row Total Count
	High-Medium	Low-Very Low	
LT20	100.0%*	0.0%*	18
20-49	78.0	22.0	41
50-99	62.5	37.5	24
100-999	46.8	53.2	47
GT1000	25.0	75.0	24
Column Total Count	93	61	154

*Column per cent.

TABLE 13

DESTRUCTION OF RESOURCES DUE TO INADEQUATE MUNICIPAL
SEWAGE TREATMENT FACILITIES BY WATER QUALITY

Inadequate Municipal Sewage Treatment	Water Quality				Row Total Count
	High	Medium	Low	Very Low	
Unimportant, Your Area	50.0%*	14.3%*	18.6%*	22.2%*	30
Somewhat Important, Your Area	33.3	19.5	16.9	0.0	29
Important, Your Area	16.7	66.3	64.4	77.8	98
Column Total Count	12	77	59	9	157

*Column per cent.

TABLE 14 .

WATER QUALITY BY ADDITIONAL WASTEWATER
TREATMENT PLANTS AS A SOLUTION

Additional Wastewater Treatment	Water Quality				Row Total Count
	High	Medium	Low	Very Low	
Unimportant, Your Area	70.0%*	13.3%*	5.6%*	12.5%*	21
Somewhat Important, Your Area	10.0	13.3	18.5	0.0	21
Important, Your Area	20.0	73.4	76.0	87.5	105
Column Total Count	10	75	54	8	147

*Column per cent.

quality and (2) Low-Very Low quality. As the population density increases, the percentage reporting high-medium water quality falls and the percentage reporting low-very low water quality increases.

Finally, it is of interest to examine the relationship between factors which are perceived to lead to the destruction of resources due to inadequate municipal sewage treatment facilities by water quality. A significant break in the perceived importance of inadequate sewage treatment facilities occurs when one moves from high quality to medium quality water. 50 per cent of the high quality respondents indicated that inadequate municipal sewage treatment facilities are unimportant in their area of jurisdiction. Only 17 per cent of the respondents from high water quality areas perceived inadequate sewage treatment facilities to be important in destruction of resources in their area of jurisdiction. However, the respondents from medium water quality areas more than reversed the trend. In the latter case 66 per cent perceived inadequate municipal sewage treatment facilities to be important in the destruction of resources in their area while only 14 per cent perceived the factor to be unimportant. This information together with the data shown in Table 14 suggests that the inadequacy of existing wastewater treatment facilities or the need for additional wastewater treatment facilities is not perceived to be important until the water quality in the area has deteriorated to some degree.

OBSERVATIONS

The vast quantity of data collected will require a continuing effort to analyze and refine. However, it appears that several trends are evident which may have significant information value for the Sea Grant Program as a whole. One of these trends is the perceived need for additional wastewater treatment facilities coupled with the shortage of funds available to build such facilities. One implication which follows is the importance of assuring that each dollar invested in such wastewater treatment facilities is being utilized in the most productive manner possible. Such a condition requires application of advanced wastewater treatment techniques throughout the Great Lakes. Second, the importance of state agencies in the actual control of water quality has been identified. Means should be devised to assist and assure that Sea Grant is providing appropriate assistance and information to such agencies throughout the Great Lakes to assure that these state agencies avail themselves of the latest techniques for advanced wastewater treatment. Third, the actual effectiveness of implementing water quality may not rest with creation of new 'super' agencies, but rather with improving the effectiveness of coordination between and among existing organizations.

The researchers involved in the analysis of this data welcome feedback from all the Sea Grant projects regarding elaboration or more detailed analysis of specific variables which may be of particular interest to the individual projects.

APPENDIX 1

SURVEY QUESTIONNAIRE

No. _____

It will be appreciated if you can take the time to answer the following eight questions and return them in the enclosed, stamped return envelope. Your answers will help us gain a general insight into local perception of problems concerning the quality and management of the shoreline waters of the Great Lakes. We realize that in many cases your answers will be of your own opinion, but we ask that you attempt to make them as representative as you can of the agency that you represent.

1. A previous request for information was sent to your agency and to numerous others along the shoreline of the Great Lakes early in 1970. The results of that survey identified that following primary issues confronting those concerned with managing and planning for this area. Could you rate the importance of each issue for your particular area of jurisdiction by circling the appropriate number.

ISSUES CONCERNED WITH THE DESTRUCTION OF RESOURCES

		Not Important in your area		Very Important in your area		Not Applicable	
		1	2	3	4	5	
a)	Water pollution due to inadequate municipal sewage facilities						_____
b)	Water pollution due to inadequate industrial sewage facilities						_____
c)	Water pollution due to agricultural runoff						_____
d)	Pollution of both land and water due to disposal of solid waste materials						_____
e)	Beach and slope erosion						_____
f)	Sedimentation due to poor land use practices						_____
g)	Alteration of shoreline by filling or dredging						_____
h)	The threat of thermal pollution						_____

ISSUES CONCERNED WITH THE UTILIZATION OF RESOURCES

	Not Important in your area			Very Important in your area		Not Applicable
	1	2	3	4	5	
a) Inadequate accessibility, both functional and visual, to the waters edge	1	2	3	4	5	_____
b) Conflicts over land uses by competing users e.g. developer/conservationist	1	2	3	4	5	_____
c) Poor quality development adjacent to shoreline	1	2	3	4	5	_____
d) Decreasing land available to public use	1	2	3	4	5	_____
e) Congestion and inferior facilities in recreation developments	1	2	3	4	5	_____
f) Reduced enjoyment of shore areas due to erosion prevention structures such as breakwaters or retaining walls	1	2	3	4	5	_____
g) Lack of proper marina facilities	1	2	3	4	5	_____
h) Lack of proper port facilities	1	2	3	4	5	_____
i) Inconsistency of contrasting land use characteristics within the shore zone	1	2	3	4	5	_____
j) Inadequate adaption of transportation systems to the shoreline zone	1	2	3	4	5	_____

ISSUES CONCERNED WITH PROBLEMS OF PLANNING FOR THE WISE USE OF RESOURCES

a) Inadequate emphasis on water oriented environmental planning by all levels of government	1	2	3	4	5	_____
b) Lack of inter-agency cooperation with regard to this matter	1	2	3	4	5	_____
c) A piecemeal approach to planning-solving of immediate problems with no long range comprehensive planning	1	2	3	4	5	_____
d) Need for state or province wide zoning of shorelands	1	2	3	4	5	_____
e) Lack of resource information	1	2	3	4	5	_____
f) Inadequate zoning and building regulations	1	2	3	4	5	_____
g) Lack of planning methods, goals, policies and identification of user values	1	2	3	4	5	_____

2. Of the issues concerned with the destruction of resources which you rated as important, could you indicate where the source of this problem is:

_____ in you area

_____ outside of your area of jurisdiction (specify) _____

3.a) How does your agency rate the quality of the waters along the shorelines of the Great Lakes in your area of jurisdiction?

_____ High quality - no pollution at any time of the year

_____ Medium quality or generally high quality but some indications of pollution at certain times of the year. This does not restrict human use however.

_____ Low quality or polluted to the extent that human use of the waters is occasionally restricted.

_____ Very low quality or seriously polluted to the extent that human use of the waters would pose a severe health hazard.

3.b) How does your agency rate the quality of the shoreline and beaches of the Great Lakes in your area of jurisdiction.

_____ High quality - no deterioration has occurred

_____ Medium quality - some minor deterioration has occurred

_____ Low quality - deterioration has occurred to the extent that human enjoyment of the shorelands is somewhat reduced

_____ Very low quality - deterioration is excessive and consequently human use and enjoyment of the area is severely limited

4. Which agencies and/or groups are charged with protecting the quality of these waters along the shoreline in your jurisdiction?

_____ Federal offices or agencies (specify) _____

_____ State/provincial agencies (specify) _____

_____ Regional agencies e.g. special purpose agencies such as a water supply or sewer district? _____

_____ Local agencies (specify) _____

5.a) Have attempts in your area to improve and maintain the quality of the waters along the shoreline been aided or hindered by the following types of groups and to what degree? Check aid or hinder and circle the appropriate number.

			Hardly any of influence in your area			A great deal of influence in your area		Not Applicable
	Aid	Hinder	1	2	3	4	5	
Conservation groups	___	___	1	2	3	4	5	_____
Ecology activists	___	___	1	2	3	4	5	_____
Rod and gun clubs	___	___	1	2	3	4	5	_____
Professional planners, landscape architects, engineers etc.	___	___	1	2	3	4	5	_____
Other civic associations (specify) _____	___	___	1	2	3	4	5	_____
Student groups	___	___	1	2	3	4	5	_____
Real estate developers	___	___	1	2	3	4	5	_____
Homeowners	___	___	1	2	3	4	5	_____
Industrial corporations	___	___	1	2	3	4	5	_____
Utility companies	___	___	1	2	3	4	5	_____
Federal agencies and regulations	___	___	1	2	3	4	5	_____
State agencies and regulations	___	___	1	2	3	4	5	_____
Others (specify) _____	___	___	1	2	3	4	5	_____

5.b) Have attempts in your area to improve and maintain the quality of the shoreland and beaches been aided or hindered by the following types of groups and to what degree? Check aid or hinder and circle the appropriate number.

	Aid	Hinder	Hardly any of influence in your area			A great deal of influence in your area		Not Applicable
			1	2	3	4	5	
Conservation groups	___	___	1	2	3	4	5	_____
Ecology activists	___	___	1	2	3	4	5	_____
Rod and gun clubs	___	___	1	2	3	4	5	_____
Professional planners, landscape architects, engineers etc.	___	___	1	2	3	4	5	_____
Other civic associations (specify) _____	___	___	1	2	3	4	5	_____
Student groups	___	___	1	2	3	4	5	_____
Real estate developers	___	___	1	2	3	4	5	_____
Homeowners	___	___	1	2	3	4	5	_____
Industrial corporations	___	___	1	2	3	4	5	_____
Utility companies	___	___	1	2	3	4	5	_____
Federal agencies and regulations	___	___	1	2	3	4	5	_____
State agencies and regulations	___	___	1	2	3	4	5	_____
Others (specify) _____	___	___	1	2	3	4	5	_____

6. If your agency feels that the water quality in your area is deteriorating what does it consider to be possible solutions to this problem? How important are these solutions rated? Circle the appropriate number.

	Not important in your area			Very Important in your area	
	1	2	3	4	5
_____ More funds to build additional waste water treatment plants	1	2	3	4	5
_____ Stricter enforcement of existing regulations and standards	1	2	3	4	5
_____ New regulations aimed at further restricting the sources of pollution	1	2	3	4	5
_____ Redistribution of responsibility for pollution control among existing government agencies	1	2	3	4	5
_____ The creation of new agencies with responsibility for water pollution control	1	2	3	4	5
_____ Increased leadership from public officials in the field of water quality	1	2	3	4	5
_____ Increased coordination of the activities of the existing agencies who have responsibility for managing the water quality in your area	1	2	3	4	5
_____ Other (Specify)	1	2	3	4	5

7. In regard to water quality and shoreline protection in your agency's jurisdiction what controversial issues, if any are expected to arise in the next five years? For each of these can you indicate the extent to which your agency has jurisdiction over the problem and what the agency's position might be.

Issue	Position	Jurisdiction				
		No responsibility			Complete responsibility	
		1	2	3	4	5
Example: Financing needed Sewer construction	Pro.	1	2	3	4	5
1.		1	2	3	4	5
2.		1	2	3	4	5
3.		1	2	3	4	5
4.		1	2	3	4	5

8. The last question is in two parts. The first part pertains to the effect of certain factors upon economic and social conditions in your area. The second part pertains to the relationship between certain factors and the water quality along the shoreline in your area.

a) Does your agency feel the following factors would be beneficial to your area in light of the present economic and social conditions there? If so how beneficial would they be? Circle the appropriate number.

	Not beneficial			Very beneficial	
	1	2	3	4	5
_____ Urban growth	1	2	3	4	5
_____ Recreational growth	1	2	3	4	5
_____ Industrial development	1	2	3	4	5
_____ Protection of water quality	1	2	3	4	5
_____ Preservation of existing natural Shoreland areas	1	2	3	4	5
_____ More control of development	1	2	3	4	<u>5</u>
_____ "No growth" policy	1	2	3	4	5
_____ The construction of nuclear fuel power plants	1	2	3	4	5
_____ The construction of fossil fuel power plants	1	2	3	4	5
_____ Agricultural development	1	2	3	4	5
_____ Mining operations	1	2	3	4	5
_____ Other (specify)	1	2	3	4	5

b) Does your agency feel that any of the following factors will prove detrimental to the future quality of the waters along the shoreline in your area? If so how detrimental do you feel they will be? Circle the appropriate number.

_____	Urban growth	1	2	3	4	5
_____	Recreational growth	1	2	3	4	5
_____	Industrial development	1	2	3	4	5
_____	The construction of nuclear fuel power plants	1	2	3	4	5
_____	The construction of fossil fuel power plants	1	2	3	4	5
_____	Agricultural development	1	2	3	4	5
_____	Mining operations	1	2	3	4	5
_____	Other (specify)	1	2	3	4	5

APPENDIX 2

ONE-WAY FREQUENCY DISTRIBUTIONS

The variables VAR001 to VAR005 define property characteristics of the system, and information on these were obtained from the Great Lakes Water Use map prepared by the Department of Fisheries and Forestry, Ottawa, Canada. The rest of the variables VAR006 to VAR196 were defined based on the material in the questionnaire.

Property Characteristics:

- VAR001: Location; USA or Canada
- VAR002: Lake; Erie, Ontario, Michigan, Huron, Superior
- VAR003: Land Use; industrial, residential, residential and industrial, agricultural, recreational, wild
- VAR004: Governing agency; township, county, city, state, regional
- VAR005: Population density; persons/square mile

Issues concerned with the destruction of resources:

- VAR006: Water pollution due to inadequate municipal sewage treatment facilities
- VAR007: Water pollution due to inadequate industrial sewage facilities
- VAR008: Water pollution due to agricultural runoff
- VAR009: Pollution of both land and water due to disposal of solid waste materials
- VAR010: Beach and slope erosion
- VAR011: Sedimentation due to poor land use practices
- VAR012: Alteration of shoreline by filling or dredging
- VAR013: The threat of thermal pollution

Issues concerned with the utilization of resources:

- VAR014: Inadequate accessibility, both functional and visual to the water's edge
- VAR015: Conflicts over land uses by competing users
- VAR016: Poor quality development adjacent to shoreline
- VAR017: Decreasing land available for public use
- VAR018: Congestion and inferior facilities in recreation developments
- VAR019: Reduced enjoyment of shore areas due to erosion prevention structures such as breakwaters and retaining walls
- VAR020: Lack of proper marina facilities
- VAR021: Lack of proper port facilities
- VAR022: Inconsistency of contrasting land use within the shore zone
- VAR023: Inadequate adaption of transportation systems to the shoreline zone

Issues concerned with the problems of planning for the wise use of resources:

- VAR024: Inadequate emphasis on water-oriented environmental planning by all levels of government
- VAR025: Lack of interagency cooperation with regard to this matter
- VAR026: A piecemeal approach to planning--solving of immediate problems with no long range comprehensive planning
- VAR027: Need for state- or province-wide zoning of shorelands
- VAR028: Lack of resource information
- VAR029: Inadequate zoning and building regulations
- VAR030: Lack of planning methods, goals, policies, and identification of user values
- VAR031: Source of the problem, causing destruction of water resources--within, or outside your area of jurisdiction

- VARO32: Water quality along the shorelines of the Great Lakes in your area of jurisdiction
- VARO33: Quality of the shoreline and beaches in your area of jurisdiction
- VARO34: Agency protection of water quality along the shoreline in your area of jurisdiction

Effect of certain group or socio-economic activities on the maintenance and improvement of water quality along the shoreline:

- VARO35: Conservation groups
- VARO36: Conservation groups, aid
- VARO37: Conservation groups, hinder
- VARO38: Ecology activists
- VARO39: Ecology activists, aid
- VARO40: Ecology activists, hinder
- VARO41: Rod and gun clubs
- VARO42: Rod and gun clubs, aid
- VARO43: Rod and gun clubs, hinder
- VARO44: Professional planners, landscape architects, engineers, etc.
- VARO45: Professional planners, landscape architects, engineers, etc., aid
- VARO46: Professional planners, landscape architects, engineers, etc., hinder
- VARO47: Other civic associations
- VARO48: Other civic associations, aid
- VARO49: Other civic associations, hinder
- VARO50: Student groups

VAR051: Student groups, aid
VAR052: Student groups, hinder
VAR053: Real estate developers
VAR054: Real estate developers, aid
VAR055: Real estate developers, hinder
VAR056: Homeowners
VAR057: Homeowners, aid
VAR058: Homeowners, hinder
VAR059: Industrial corporations
VAR060: Industrial corporations, aid
VAR061: Industrial corporations, hinder
VAR062: Utility companies
VAR063: Utility companies, aid
VAR064: Utility companies, hinder
VAR065: Federal agencies and regulations
VAR066: Federal agencies and regulations, aid
VAR067: Federal agencies and regulations, hinder
VAR068: State agencies and regulations
VAR069: State agencies and regulations, aid
VAR070: State agencies and regulations, hinder
VAR071: Others
VAR072: Others, aid
VAR073: Others, hinder

Variables VAR074 to VAR112 are defined in the same manner as the above variables from VAR035 to VAR073, and describe the effect of the groups and socio-economic activities referred to above, on the maintenance and improvement of the quality of the shoreland and the beaches.

Possible solutions to the problems of deteriorating water quality and the importance of these solutions:

- VAR113: More funds to build additional wastewater treatment plants
- VAR114: Importance of more funds for additional wastewater treatment plants as a solution
- VAR115: Stricter enforcement of existing regulations and standards
- VAR116: Importance of stricter enforcement of existing regulations and standards as a solution
- VAR117: New regulations aimed at further restricting the sources of pollution
- VAR118: Importance of new regulations aimed at further restricting the source of pollution as a solution
- VAR119: Redistribution of responsibility for pollution control among existing governmental agencies
- VAR120: Importance of redistribution of responsibility for pollution control among existing governmental agencies as a solution
- VAR121: The creation of new agencies with responsibility for water pollution control
- VAR122: Importance of creation of new agencies with responsibility for water pollution control as a solution
- VAR123: Increased leadership from public officials in the field of water quality
- VAR124: Importance of increased leadership from public officials in the field of water quality as a solution

VAR125: Increased coordination of the activities of the existing agencies who have responsibilities for managing water quality in your area

VAR126: Importance of increased coordination of the activities of the existing agencies who have responsibility of managing water quality, as a solution

VAR127: Other solutions

VAR128: Importance of other solutions

Benefit of certain growth factors under the current social and economic conditions:

VAR129: Urban growth

VAR130: Recreational growth

VAR131: Industrial development

VAR132: Protection of water quality

VAR133: Preservation of existing natural shoreland areas

VAR134: More control of development

VAR135: "No growth" policy

VAR136: The construction of nuclear fuel power plants

VAR137: The construction of fossil fuel power plants

VAR138: Agricultural development

VAR139: Mining operations

VAR140: Other factors

The effect of some of the above factors on the future water quality in the area:

VAR141: Urban growth

VAR142: Recreational growth

- VAR143: Industrial development
- VAR144: The construction of nuclear fuel power plants
- VAR145: The construction of fossil fuel power plants
- VAR146: Agricultural development
- VAR147: Mining operations
- VAR148: Other factors

Controversial issues expected to arise in the next five years in regard to water quality and shoreline protection in the agency's jurisdiction, the agency's position on the issues, and the extent of the agency's jurisdiction over the problems:

- VAR149: Financing needed for sewer construction
- VAR150: Financing needed for sewer construction, pro
- VAR151: Financing needed for sewer construction, con
- VAR152: Financing needed for storm drain construction
- VAR153: Financing needed for storm drain construction, pro
- VAR154: Financing needed for storm drain construction, con
- VAR155: Industrial pollution
- VAR156: Industrial pollution, pro
- VAR157: Industrial pollution, con
- VAR158: Present solid waste treatment methods
- VAR159: Present solid waste treatment methods, pro
- VAR160: Present solid waste treatment methods, con
- VAR161: Thermal pollution
- VAR162: Thermal pollution, pro
- VAR163: Thermal pollution, con

VARI64: Marine sewage discharge
VARI65: Marine sewage discharge, pro
VARI66: Marine sewage discharge, con
VARI67: Erosion control
VARI68: Erosion control, pro
VARI69: Erosion control, con
VARI70: Industrial development
VARI71: Industrial development, pro
VARI72: Industrial development, con
VARI73: Marsh land development
VARI74: Marsh land development, pro
VARI75: Marsh land development, con
VARI76: Cluster development
VARI77: Cluster development, pro
VARI78: Cluster development, con
VARI79: Construction of recreational facilities
VARI80: Construction of recreational facilities, pro
VARI81: Construction of recreational facilities, con
VARI82: Construction of nuclear power plants
VARI83: Construction of nuclear power plants, pro
VARI84: Construction of nuclear power plants, con
VARI85: Zoning
VARI86: Zoning, pro
VARI87: Zoning, con

VAR188: Preservation of natural shoreline
VAR189: Preservation of natural shoreline, pro
VAR190: Preservation of natural shoreline, con
VAR191: Land use planning
VAR192: Land use planning, pro
VAR193: Land use planning, con
VAR194: Regional planning
VAR195: Regional planning, pro
VAR196: Regional planning, con

