

PUBLIC POLICY AND INSTITUTIONAL INTERACTION PROJECT
GREAT LAKES SURVEY QUESTIONNAIRE

First Progress Report

by

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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 Total Count |
|--------------------------|---------------|--------|--------|----------|-----------------------|
| | High | Medium | Low | Very Low | |
| 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 |
|----|---------------------------------------------------------------------------|----------------------------------|---|---|-----------------------------------|---|-------------------|
| a) | Water pollution due to inadequate municipal sewage facilities | 1 | 2 | 3 | 4 | 5 | _____ |
| b) | Water pollution due to inadequate industrial sewage facilities | 1 | 2 | 3 | 4 | 5 | _____ |
| c) | Water pollution due to agricultural runoff | 1 | 2 | 3 | 4 | 5 | _____ |
| d) | Pollution of both land and water due to disposal of solid waste materials | 1 | 2 | 3 | 4 | 5 | _____ |
| e) | Beach and slope erosion | 1 | 2 | 3 | 4 | 5 | _____ |
| f) | Sedimentation due to poor land use practices | 1 | 2 | 3 | 4 | 5 | _____ |
| g) | Alteration of shoreline by filling or dredging | 1 | 2 | 3 | 4 | 5 | _____ |
| h) | The threat of thermal pollution | 1 | 2 | 3 | 4 | 5 | _____ |

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.

| | 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 | _____ |

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 | | | | | |
| _____ Stricter enforcement of existing regulations and standards | | | | | |
| _____ New regulations aimed at further restricting the sources of pollution | | | | | |
| _____ Redistribution of responsibility for pollution control among existing government agencies | | | | | |
| _____ The creation of new agencies with responsibility for water pollution control | | | | | |
| _____ Increased leadership from public officials in the field of water quality | | | | | |
| _____ Increased coordination of the activities of the existing agencies who have responsibility for managing the water quality in your area | | | | | |
| _____ Other (Specify) | | | | | |

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. | | | | | 5 |
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |

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 | 5 |
| _____ "No growth" policy | 1 | 2 | 3 | 4 | 5 |
| _____ The construction of nuclear fuel power plants | 1 | 2 | 3 | 4 | 5 |
| _____ The construction of fosil 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, argricultural, 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

VAR164: Marine sewage discharge

VAR165: Marine sewage discharge, pro

VAR166: Marine sewage discharge, con

VAR167: Erosion control

VAR168: Erosion control, pro

VAR169: Erosion control, con

VAR170: Industrial development

VAR171: Industrial development, pro

VAR172: Industrial development, con

VAR173: Marsh land development

VAR174: Marsh land development, pro

VAR175: Marsh land development, con

VAR176: Cluster development

VAR177: Cluster development, pro

VAR178: Cluster development, con

VAR179: Construction of recreational facilities

VAR180: Construction of recreational facilities, pro

VAR181: Construction of recreational facilities, con

VAR182: Construction of nuclear power plants

VAR183: Construction of nuclear power plants, pro

VAR184: Construction of nuclear power plants, con

VAR185: Zoning

VAR186: Zoning, pro

VAR187: 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

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