GREAT LAKES FISHERY COMMISSION

Research Completion Report[1]

Value Systems and Attitudes of Fishery and Environmental Managers Related to Lake Trout Rehabilitation

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EXECUTIVE SUMMARY

An ecosystem approach to Great Lakes lake trout rehabilitation requires explicit consideration of all stakeholders. Fishery and environmental resource managers are stakeholders whose views are critical to adopting and implementing lake trout rehabilitation program objectives.

We used a combination of content analysis and a self-administered mail questionnaire to (1) identify how attitudes and values of fishery and environmental managers affect acceptability and attainment of lake trout rehabilitation goals; and (2) describe managers' perceptions of the attitude and values of other lake trout stakeholders. Based on the questionnaire for managers, we also developed a measurement instrument that management agencies might use to assess the attitudes and values of other stakeholders.

We censused 919 Great Lakes fishery and environmental managers related to these objectives. Provincial/state fishery managers expressed stronger support for artificial vs. natural systems, for utilitarian vs. ecological goals, and for placing relatively greater emphasis on anglers and economic benefits compared to federal fishery managers. Environmental managers assigned higher priority to goals associated with reestablishing native species, and lower priority to goals associated with satisfying anglers than did their fishery management counterparts. Differences observed for Canadian vs. U.S. fishery managers were similar to those between environmental vs. fishery managers.

Canadian fishery managers tended to have a broader view of which groups were important stakeholders in lake trout management, placing less relative emphasis on anglers and more on other citizens in the Great Lakes Basin and on nonconsumptive fishery users. Managers perceived the strongest support for lake trout rehabilitation goals as coming from federal government agencies, with support lower among the angling public and the fishing-support industry. Managers perceived a variety of social, institutional, and biological barriers exist for lake trout rehabilitation for each of the Great Lakes.

Differences in perceptions and beliefs exist among fishery and environmental agencies, provincial/state and federal agencies, and Canadian vs. U.S. agencies. The challenge for the future of ecosystem management is to recognize and accept these differences among managers' perceptions and work within their bounds, or to work to change the beliefs held by various stakeholders related to support or opposition for lake trout rehabilitation.

INDEX WORDS: Lake trout, human dimensions, attitudes, fishery management.

INTRODUCTION

In its Strategic Vision, the Great Lakes Fishery Commission (GLFC) advocated an ecosystem approach to fishery management and research on the Great Lakes, and acknowledged such an approach should include explicit attention to all affected and concerned people, or stakeholders (GLFC 1992). The term "stakeholders" includes individual members of the public; organized groups such as angler associations, charter boat operators, and environmental interest groups; and resource managers or other government representatives.

Attitudes and values that stakeholders hold toward the environment, toward the Great Lakes, and toward fishery management in general are part of the management environment (Krueger et al. 1986), providing either constraints on what is possible to accomplish through fishery management activities, or support for attaining particular management goals. For example, some stakeholders may place a high value on ecologically self-sustaining systems, while others place a high value on economic benefits that can be produced from ecological systems. Personal and professional attitudes, values, and perceptions about fishery resource management challenges, such as lake trout rehabilitation in the Great Lakes, may affect support for setting and reaching certain fishery management goals (Scarnecchia 1988).

The GLFC Vision Statement included milestones related to lake trout rehabilitation in the Great Lakes, specifically: (1) "No further loss of native aquatic populations or species"; and (2) "Achievement of lake trout restoration objectives in Lake Superior, and detection of increasing levels of naturally reproduced yearlings in each of the other Great Lakes" (GLFC 1992). Many stakeholders will influence whether or not these milestones will be achieved, but perhaps none so profoundly as the fishery and environmental professionals who must adopt the goal, implement management activities to help reach the goal (focusing on habitat, populations, and communities), and communicate the worth of the goal with other governmental and non-governmental stakeholders. The attitudes and values of these professionals may influence to what extent they will adopt and promote lake trout rehabilitation goals.

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This project grew out of an inquiry initiated by the Great Lakes Fishery Commission Board of Technical Experts (BOTE). BOTE held a visioning session involving a small group of invited social scientists and fishery professionals to identify the major human-related issues likely to have a great impact on the future of fisheries management in the Great Lakes. Among the issues identified was the controversy surrounding lake trout rehabilitation in the Great Lakes. The group noted this controversy was not the usual managers vs. various public segments, but rather managers vs. managers in many cases. Thus, the group identified the need to understand more about manager attitudes about and support for lake trout rehabilitation in the Great Lakes. A BOTE Task Force was created to address this issue in 1991.

Perceived benefits associated with lake trout management vary among managers and user groups (Eshenroder 1987). Conflicts among agencies exist regarding appropriate lake trout management strategies (e.g. Busiahn 1990), and managers recognize the necessity of greater interagency coordination (e.g., Ontario Ministry of Natural Resources 1987; Lake Erie Committee 1988). These conflicts and lack of a coordinated vision may be due, at least in part, to differences in the personal views of managers within these agencies, and the resulting differences in levels of support for lake trout rehabilitation in the Great Lakes. Understanding managers' personal views is a first step toward identifying the source of potential and actual conflicts.

The objectives of this study were to:

(1) identify how attitudes and values of fishery and environmental managers affect acceptability and attainment of lake trout rehabilitation goals;

(2) describe managers' perceptions of the attitudes and values of other lake trout stakeholders; and

(3) develop a measurement instrument that management agencies might use to assess the attitudes and values of other stakeholders.

This report includes a description of the methods used and results obtained. General methods and approaches are described below, followed by a section describing results obtained. Results tables are included in two appendices. Appendix 3 contains tables from the

manuscript entitled "Fishery and Environmental Managers' Attitudes About and Support for Lake Trout Rehabilitation in the Great Lakes", which has been accepted for publication in the *Journal of Great Lakes Research* in the special RESTORE conference volume. Much of the text of this final report is similar to that in the article to appear in that volume. Appendix 4 contains results tables not included in the *JGLR* manuscript, but discussed in the body of this report. The majority of this report addresses Objectives 1 and 2. The measurement instrument identified in Objective 3 is presented in Appendix 5.

METHODS

Content Analysis

We conducted a content analysis of 52 documents related to Great Lakes lake trout and general fisheries management. The documents reviewed included management reports, research reports, and planning materials related to lake trout rehabilitation. The document review was conducted to identify hypotheses to be tested via the questionnaire design targeted toward managers, and to ensure a valid and reliable instrument would be created. We did this through identifying: (1) appropriate terminology used by managers to refer to lake trout-related responsibilities; and (2) the existing range of values, opinions about management goals, and perceived constraints on lake trout rehabilitation.

We used the NOTEBOOK II bibliographic database system to categorize and analyze the data. Appendix 1 contains the data headings and explanation of the coding system used to record the data.

Mail Census

We conducted a mail census of 919 fishery and environmental professionals who were identified as having Great Lakes responsibilities within their agencies. Professionals (hereafter referred to as managers) included in the census were non-seasonal employees with management, research, or administrative functions, who were employed in federal, provincial, state, and tribal fisheries and environmental management and research agencies, with responsibilities related to the Great Lakes (See Table 1, Appendix 3). The population of Great Lakes managers was identified through soliciting lists of relevant management agencies from the Great Lakes Fishery Commission and from other resources listing resource management agencies (e.g., directories produced by the

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International Joint Commission and the National Wildlife Federation). The director or chief of each management agency was contacted by a combination of telephone and mail methods to: (1) identify all agency staff with any Great Lakes responsibilities; and (2) identify any other relevant agencies not on the lists provided by GLFC. We also used committee and advisory group lists provided by GLFC to double-check the completeness of the staff lists we received from agencies.

We developed a 13-page self-administered mail questionnaire, based in part on observations at meetings (e.g., GLFC Lake Trout Task Area basin-wide meetings and GLFC SIMPLE workshops) provided further insights about proper terminology and important concepts to include in the survey instrument.

A draft of the research instrument was subjected to professional peer review to further enhance its validity. The peer review team consisted of two Canadian fishery professionals, two U.S. fishery professionals, two academic scientists (one with a biological orientation, the other from the social sciences), and one Great Lakes Fishery Commission scientist.

Instrument Description

The final instrument included questions about support for lake trout rehabilitation goals, attitudes about Great Lakes fisheries management specifically and environmental issues generally, personal management philosophies, perceived constraints on lake trout rehabilitation, perceived importance of various stakeholder views, and descriptive characteristics of managers participating in the study. Specific topics addressed in the questionnaire are explained below. Appendix 2 contains the final research instrument, and a list of objectives/concepts we sought to measure accompanied by the appropriate item number from the research instrument.

To assess managers' beliefs about Great Lakes fishery management goals, the questionnaire contained a list of 14 potential fishery management goals for the Great Lakes. Managers were asked to indicate the importance of each, using a 5-point scale ranging from "none" to "very high". Goal importance was analyzed through a principal components factor analysis using a correlation matrix with varimax rotation, and a reliability test was conducted. Thirteen items were included in the final

scale analysis, with a reliability score of 0.73 (Cronbach's alpha). One item (establish self-sustaining non-native populations) was deleted from the scale to improve scale reliability.

Two seven-point scale items in the questionnaire were designed to measure the degree to which managers' own world views reflected a management philosophy supporting natural or artificial systems, and a philosophy underpinned by a belief in ecological vs. utilitarian reasons for management. A completely natural system was defined as "no introduced species, no stocking, management is achieved by controlling anglers (harvest) and protecting (restoring) habitat." A world view supporting a completely artificial system was defined as "a belief that exotic species might fit better with the system or provide more total benefits, such as filling an empty niche, that stocking can provide additional benefits (especially in degraded habitats), that managing the fisheries is like farming in which intensive technological inputs can achieve more benefits than a natural system." An ecological management philosophy was defined as believing that "management actions are primarily to maintain the ecosystem, not necessarily to benefit humans; humans are only part of the system; all species are considered important regardless of their value to humans." A utilitarian management philosophy was defined as believing that "human needs and desires are given a top priority in any management actions, i.e., the purpose of maintaining a well-functioning ecosystem is to provide human benefits; emphasis is placed on species with high value to humans."

A five-point scale ranging from "strongly agree" to "strongly disagree" was used to assess managers' attitudes toward three potential top priorities for Great Lakes fishery management. These priorities included (1) self-reproducing/self-sustaining native fish populations; (2) non-native, self-sustaining fish populations; and (3) economic value of fish populations.

Managers' attitudes toward 11 Great Lakes fishery management issues with a bearing on the potential success of lake trout rehabilitation programs were assessed with a five-point scale ranging from "strongly agree" to "strongly disagree". Issues included items such as the relative importance of long-term management goals vs. current angler benefits, and the public health implications of toxics in lake trout for continuation of lake trout rehabilitation efforts. We report here results for fishery managers only, due to space constraints.

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We measured managers' support for lake trout rehabilitation based on the following goal statement: "Lake trout rehabilitation is the restoration of self-sustaining lake trout populations able to withstand harvest. Self-sustaining populations maintain sufficient levels of abundance from one generation to the next with no stocking." We used a seven-point scale ranging from "strongly support" to "strongly oppose."

We asked managers to characterize the importance of a set of potential constraints/barriers that may limit the ability to achieve the goal of lake trout rehabilitation. Managers rated barriers for each lake with which they were familiar. We used a 5-point scale ranging from "not important" to "very important."

We assessed managers' beliefs associated with the future direction of Great Lakes lake trout management by asking them to indicate which of four statements best reflected their personal beliefs. The four statements included a range from abandoning lake trout management altogether to striving for self-sustaining populations with no concern for providing angler harvest opportunities.

We asked managers to indicate what priority they believed should be assigned to the views of a variety of possible stakeholders relative to Great Lakes lake trout rehabilitation. We used a 5-point scale ranging from "very low priority" to "very high priority." We also asked managers to indicate how strongly they believed that each type of stakeholder supports or opposes the goal of lake trout rehabilitation. We used a 5-point scale ranging from "strongly supports" to "strongly opposes."

Census Implementation

In the fall of 1992, all Great Lakes managers were sent a mail questionnaire, accompanied by a cover letter from the Executive Secretary of the GLFC. The intent of the cover letter was to stimulate managers to participate in the study by completing and returning their questionnaires. Staff of the GLFC, however, did not participate in the implementation of the study (i.e., contacting managers, mailing questionnaires), nor did they receive any completed, returned questionnaires. Respondent confidentiality was assured through the research protocols followed by the Human Dimensions Research Unit and approved by the Human Subjects Committee of Cornell University (CU). All questionnaire coding and analysis was performed at CU. Up to three reminder mailings were sent as

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necessary to nonrespondents to increase the final response rate. The first and third reminders each included a letter; the second reminder included a letter and a replacement questionnaire.

Returned questionnaires were coded and analyzed using SPSS (SPSS, 1986). Data analysis included calculation of frequencies of response in certain categories, and of various group means. Overall means reported here are the unweighted means of responses from all respondents. Means for each group (e.g., U.S. fishery managers) include responses from all respondents within that group. Standard deviations are reported with each mean score as a measure of dispersion of the data.

Inferential statistical tests were inappropriate to employ in this study to determine the significance of differences among groups, since the entire population of Great Lakes managers was included in the census. No samples were taken, thus statistical probabilities to infer differences between sample means are not legitimate. The finite population correction factor for such a group of data is zero, producing no sampling variability that would affect comparisons (Cochran, 1977). Inferential statistics would be appropriate only if Great Lakes managers are treated as part of a larger population of managers throughout Canada and the United States (personal communication, E.F. Frongillo, Cornell University, April, 1994), which is not the intent of this study.

Instrument for Other Stakeholders

The research instrument used to census managers, as described above, was modified to remove the manager-oriented direction of questions. Most questions from the manager instrument were included in this second research instrument, however, to allow eventual comparison between managers and other stakeholders with whom the instrument is used. This research instrument is not discussed further in this report. Potential users should be cautioned that the instrument still must be evaluated in the context of the audiences and objectives of the particular study in which it will be used. It is likely specific wording may need to be changed to reflect the terminology and definitions used by certain audiences. The instrument currently uses fairly technical language and assumes a fair degree of familiarity with lake trout rehabilitation issues. Depending on the audience with whom it will be used, substantial modification may be necessary. Effort should be made to retain those items deemed most important for comparative purposes between managers and other stakeholders.

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RESULTS

Content Analysis

A summary of the results and interpretation of the content analysis is included in Appendix 1. Most documents used the terms "lake trout rehabilitation." Some used "restoration" and "reestablish". sometimes including the terms "self-sustaining", "self-reproducing", or "naturally-reproducing."

All documents in the sample either supported lake trout rehabilitation or advocated no explicit position. Several of the documents did not address lake trout rehabilitation specifically but rather focused on Great Lakes rehabilitation. In these articles, lake trout rehabilitation may have been implied by calls for a return to more natural conditions.

No documents advocated a dominant artificial fishery for the Great Lakes. Many documents focused on the benefits of natural ecosystems, although seldom for ecological or species diversity reasons. Several documents envisioned a mixed fishery for the Great Lakes because of the total benefits package available. Some documents noted that non-native species that have value and are self-reproducing should be considered "natural" (naturalized species).

Values mentioned most frequently were utilitarian. For example, lake trout rehabilitation was supported largely for utilitarian reasons and the belief that ecosystems with native species provide the most benefit to people. Documents seldom mentioned ecological or biological diversity reasons in support of lake trout rehabilitation.

Non-agency stakeholders' opinions about lake trout rehabilitation were seldom discussed. Considering the importance that these stakeholder opinions play in fisheries management, it would be valuable to assess managers' perceptions of stakeholder opinions. Stakeholders and communication networks were discussed in general, rather than specific, terms in the documents reviewed.

Constraints identified related to lake trout rehabilitation were grouped into biological, habitat, social, and agency/institutional categories to represent dimensions of resource management problems. Constraints were also grouped into input, process, output, and impact categories to represent the types of responsibilities and information and resource needs faced in resource management problems. The assignment of constraints to each category was patterned after the natural resource indicator system

developed by Knuth and Nielsen (1989). Appendix 1 contains a summary of the specific constraints identified in each of these categories. These constraints laid the basis for developing the section of the research instrument dealing with perceived constraints to lake trout rehabilitation.

Biological constraints noted most frequently related to sea lamprey and species interactions. The most frequently-cited habitat constraints related to toxics and pollution. Frequently-cited social constraints related to overfishing and harvest. Less agreement emerged (based on frequency of mention in documents) regarding agency constraints, but common themes were the complexity of the issue and diversity/lack of coordination of agencies.

Input constraints noted most frequently related to a lack of knowledge, with many specific areas described in which more knowledge was needed. Process constraints were noted less frequently, but various types of monitoring were noted as important. Output and impact constraints were also noted less frequently than input constraints, with no consensus emerging (based on frequency of mention within documents) except for the constraint provided by public awareness, understanding, and support (or lack thereof).

Questionnaire Response Rate

After all reminder mailings were completed, we achieved an overall response rate of 86%, with the following response rates within various groups: 86.2% among Canadian managers, 85.3% among U.S. managers, 89.9% among fisheries managers, and 77.6% among environmental quality managers (Table 1, Appendix 3). Dolsen and Machlis (1991) suggested response rates greater than 65% provide no reason to reject study results or require a nonresponse followup; other authors reject results if response rates are below 70% (Goyder, 1985). Because of the high response rate and the distribution of nonrespondents across agencies and jurisdictions in our study, we did not employ a nonresponse follow-up procedure.

Respondents were distributed among types of positions in management agencies, although regional managers were usually the largest percentage of respondents within any group of agencies (Table 2, Appendix 3). Job responsibilities for over half of all respondents included research, with management and administration also important. The educational background of respondents tended to

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be fisheries within fishery management agencies, and water quality/chemistry/toxicology or aquatic ecology within environmental management agencies. State/provincial respondents outnumbered federal respondents, reflecting the number of state/provincial managers included in the census population.

Beliefs About Great Lakes Fishery Management Goals

A principal components factor analysis of managers' ratings of importance of potential Great Lakes fishery management goals produced four factors accounting for 68.1% of the variance (Table 3 Appendix 3). The factor assigned the highest mean importance included items related to reestablishing native species and protecting ecological diversity (Table 4, Appendix 3). The factor second in mean importance included items related to providing edible fish to anglers and other fish consumers. The third factor included items related to satisfying anglers, and the fourth factor included items related to providing economic benefits to state, local, and industry sectors.

The mean importance ratings for Great Lakes fishery management goals assigned by environmental managers were almost identical to those of fishery managers for each of the four factors (Table 4, Appendix 3). The importance assigned to the goal of providing edible fish exhibited the greatest variability among the four goals. The goal of providing economic benefits was ranked last overall and exhibited the least variability.

Canadian managers (fishery and environmental quality) assigned more importance to the goals of re-establishing native species, providing edible fish, and providing economic benefits than did their U.S. counterparts (Table 1, Appendix 4). Canadian managers assigned less importance to the goal of satisfying anglers than did U.S. managers.

Fishery managers differed in their mean importance ratings for the four goals based on country and level of government agency in which they were employed (Table 4, Appendix 3). Canadian fishery managers assigned somewhat higher importance to goals of reestablishing native species, providing edible fish, and providing economic benefits than did U.S. fishery managers. U.S. fishery managers assigned somewhat higher importance to the goal of satisfying anglers than did Canadian fishery managers. Tribal fishery managers assigned the highest mean importance to providing edible

fish, which received the highest rating of any goal by any group of managers (3.5 on a 0-4 scale), and a relatively high rating to reestablishing native species. Satisfying anglers was the least important goal according to tribal fishery managers. Federal fishery managers assigned higher importance to the goal of reestablishing native species than did provincial/state managers, and lower importance to the goal of satisfying anglers.

Managers who supported the overall goal of lake trout rehabilitiation in the Great Lakes assigned a higher importance rating to the goal of re-establishing native species/protecting ecological diversity than did managers who were neutral or opposed to lake trout rehabilitation (Table 1, Appendix 4). Managers who opposed the overall goal of lake trout rehabilitiation assigned a higher importance rating to the goal of satisfying anglers than did managers who supported the overall goal.

Managers who believed lake trout management in the Great Lakes should strive for self-sustaining populations of lake trout with no concern about supporting harvest assigned the highest importance rating to the goal of reestablishing native species, compared to other goals and to managers who believed in other future directions for lake trout management (Table 2, Appendix 4). Managers who believed lake trout management should maintain stocking to provide harvest opportunities assigned the greatest importance to the goal of satisfying anglers.

Managers who supported the overall goal of lake trout rehabilitation in the Great Lakes believed that lake trout management should strive to acheive self-sustaining populations capable of supporting some harvest (Table 3, Appendix 4). Managers who opposed the overall goal of lake trout rehabilitation in the Great Lakes were split in believing lake trout management should be abandoned in favor of other species (24%), maintain stocking to supply harvest opportunities (36%), or strive for self-sustaining populations with no concern for harvest (26%).

Managers' Attitudes Toward Management

World Views

Overall, Great Lakes managers tended to support "natural" over "artificial" systems, and "ecological" over "utilitarian" reasons for management (Table 5, Appendix 3). Variation in responses within groups, based on the standard deviation, was greater for the ecological/utilitarian scale than for

the natural/artificial scale. The mean score for environmental managers was oriented more strongly toward "natural" and "ecological" descriptors than for fishery managers. Among fishery managers, Canadians tended to be aligned more strongly toward "natural" and "ecological" descriptors than were U.S. managers. Mean scores of tribal fishery managers exhibited the greatest magnitude difference between the two types of philosophies, with these managers tending strongly toward "natural" systems, but less strongly toward "ecological" reasons for management. Federal fishery managers exhibited the least difference in mean ratings of the two philosophy diads. Provincial/state fishery managers exhibited the most utilitarian mean score (3.7 on a 7-point scale) of any group, although it was below the midpoint of the range between ecological and utilitarian.

The scores of Canadian managers (fishery and environmental) as a group indicated they tended more toward environmentalism, natural world views, and ecological world views than their U.S. counterparts (Table 4, Appendix 4).

Priorities for Fishery Management

Regarding managers' attitudes toward potential top priorities for Great Lakes fishery management, most managers (71%) agreed that self-reproducing/self-sustaining native fish populations should be the top priority for management (Table 6, Appendix 3). Over one-fifth of fishery managers, however, disagreed that top priority should be placed on self-sustaining native fish populations. For fishery managers, disagreement with this item as top priority was most evident among U.S. managers. Most (86%) Canadian fishery managers agreed self-sustaining native fish populations should be the top priority. Support for this priority was most evident among tribal fishery managers, and least evident among provincial/state fishery managers.

Canadian managers overall (fishery and environmental) exhibited very high agreement (86%) that self-sustaining native fish populations should be the top priority (Table 5, Appendix 4).

Managers who opposed the overall goal of lake trout rehabilitation exhibited strong disagreement (68%) that self-sustaining native fish populations should be the top priority (Table 5, Appendix 4).

Most managers disagreed that the top priority should be non-native, self-sustaining fish populations (75%) or the economic value of fish populations (62%) (Table 6, Appendix 3). Over 40% of U.S. fishery managers, however, either agreed or were neutral that economic values should be top priority, whereas 79% of Canadian fishery managers disagreed with that statement. Most of the agreement with the statement that economic values should be top priority was exhibited by state fishery managers in Pennsylvania, Michigan, and Ohio. In these states, over half of the fishery managers agreed with or were neutral toward the economic values statement. Local managers and scientists exhibited the least disagreement with the economic values statement. Almost all tribal fishery managers disagreed that non-native, self-sustaining fish populations should be the top management priority.

Higher percentages of Canadian managers (fishery and environmental) exhibited disagreement with the priority of non-native fish populations and economic values of fish populations than among U.S. managers (Table 5, Appendix 4).

Managers opposed to the overall goal of lake trout rehabilitation exhibited greater agreement than those supportive or neutral for the top priority being non-native fish populations, with a majority of this group supporting non-native populations as the top priority (Table 5, Appendix 4). Managers opposed to the overall goal of lake trout rehabilitation also exhibited greater agreement that the economic value of fish populations should be a top priority than did those in support or neutral, but a plurality of those opposing the lake trout rehabiliation goal disagreed that economic values should be top priority.

Great Lakes Fishery Management Issues

When fishery managers were asked about their attitudes toward 11 Great Lakes fishery management issues with a bearing on the potential success of lake trout rehabilitation programs, most (78.9%) agreed that self-sustaining fish populations are the most economical management alternative, but agreement was more common among Canadian fishery managers (85.0%) than among U.S. fishery managers (75.6%) (Table 6, Appendix 4). More agreement with that statement was exhibited among Canadian managers (fishery and environmental) than among U.S. managers.

Most (72.6%) fishery managers disagreed with the statement that long-term management goals should not be pursued at the expense of current benefits to anglers (Table 6, Appendix 4). Disagreement with that statement was most evident among federal fishery managers (81.9%) and least evident among provincial/state fishery managers (67.8%), with the least disagreement evident among hatchery managers. More managers who opposed the goal of lake trout rehabilitation exhibited agreement with this statement than managers who supported the goal.

Most (78.6%) fishery managers agreed that Great Lakes fishery management should provide benefits to more people than anglers and associated industries (Table 6, Appendix 4). Agreement with this statement was more prevalent among Canadian fishery managers (90.2%) than among U.S. fishery managers (72.5%), and among federal fishery managers (85.6%) compared to provincial/state fishery managers (75.2%). Canadian managers (fishery and environmental) were more likely to agree with this statement than were U.S. managers. Fewer managers who opposed the goal of lake trout rehabilitation were likely to agree with this statement compared to managers who supported the lake trout goal.

Only about one-fourth (24.4%) of fishery managers agreed that fishery management should assign more priority to nonconsumptive fisheries-related values than consumptive values (Table 6, Appendix 4). Agreement with this statement was more evident among Canadian (30.7%) than U.S. fishery managers (21.0%), and among federal (36.8%) compared to provincial/state fishery managers (18.3%). Canadian managers (fishery and environmental) exhibited greater agreement with this statement than their U.S. counterparts. Managers opposing lake trout rehabilitation goals were less likely to agree with this statement than those supporting lake trout rehabilitation.

Most fishery managers (65.2%) disagreed with the statement that management resources should not be devoted to endangered and threatened species at the expense of economically valued species (Table 6, Appendix 4). Disagreement was more evident among federal fishery managers (74.1%) than among provincial/state fishery managers (61.6%) and tribal fishery managers (52.4%). Managers opposing the goal of lake trout rehabilitation were more likely to agree with the statement than were those supporting lake trout rehabilitation.

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Managers opposing the lake trout rehabilitation goal were more likely to agree with the statement that the Great Lakes is no longer a natural ecosystem (75%) compared with those who support lake trout rehabilitation (53%) (Table 6, Appendix 4).

Fishery managers were somewhat divided in their attitudes toward the statement that maintenance of fish stocks through artificial propagation is a viable long-term solution to degraded communities, with 32.5% in agreement and 50.1% in disagreement (Table 6, Appendix 4). Canadian managers (fishery and environmental) were less likely to agree with the statement than were their U.S. counterparts. Managers who opposed lake trout rehabilitation were more likely to agree with this statement than were managers who supported lake trout rehabilitation. Examined by job responsibility, disagreement with this statement was strongest among regional-level managers and research personnel and weakest among hatchery personnel. Agreement that artificial propagation is a viable long-term solution was more evident among U.S. (41.3%) than Canadian (15.9%) fishery managers, and among provincial/state (37.0%) than federal (22.9%) fishery managers.

Most (85.7%) fishery managers disagreed with the statement that the increased threat to public health from toxics is severe enough to cancel the lake trout rehabilitation program (Table 6, Appendix 4). Little variation in percent disgreeing was found between groups of fishery managers. Managers who opposed the goal of lake trout rehabilitation were more likely to agree with the statement than were managers supporting the goal.

Managers who opposed lake trout rehabilitation goals were more likely to agree with the statement that lake trout rehabilitation should continue as long as there were no negative local or state economic impacts, compared to managers supporting lake trout rehabilitation (Table 6, Appendix 4)

Managers who oppposed lake trout rehabilitation goals were more likely to agree with the statement that given the harvest demand of anglers, a self-sustaining population of lake trout will never meet demand, compared to managers suppporting lake trout rehabilitation (Table 6, Appendix 4).

Most (76.6%) fishery managers agreed with the statement that fishery managers should manage expectations of anglers rather than meeting demand through artificial stocking (Table 6, Appendix 4). Agreement with the statement was almost universal for Canadian fishery managers (92.4%), less so for

U.S. fishery managers (68.3%). According to job responsibility, agreement with the statement was most prevalent among those with research duties and least prevalent among those with hatchery responsibilities. Those agreeing with the statement spent a greater percent of work time (23.6%) on lake trout than did those disagreeing with the statement (15.6%). Agreement with the statement was more prevalent among federal (83.8%) and tribal (81.9%) than provincial/state (72.7%) fishery managers. Over 40% of state fishery managers in Indiana, Michigan, and New York disagreed with the statement.

Support/Opposition Toward Lake Trout Rehabilitation

Overall support for the goal of lake trout rehabilitation differed by lake, with managers expressing almost total (91%) support for rehabilitation in Lake Superior, but split in opinion about rehabilitation in Lake Erie (56% support) (Table 7, Appendix 3). Among only those managers whose work was assigned to a given lake, support for lake trout rehabilitation was generally higher than the support expressed overall by managers throughout the Great Lakes Basin. The comparisons of specific lake managers vs. managers overall, respectively, were: Lake Superior 96.0% vs. 91.4%; Lake Michigan 80.9% vs. 79.1%; Lake Huron 91.2% vs. 84.8%; Lake Erie 60.0% vs. 56.0%; and Lake Ontario 82.1% vs. 72.9%.

Comparing managers holding different positions in agencies, support for lake trout rehabilitation was most evident among agency directors (93%), local managers (91%), and regional managers (90%), and least evident among local scientists (83%) (Table 7, Appendix 4). Comparing the types of work performed by managers, support for lake trout rehabilitation was most evident among those engaged in policy (90%) and least evident among those engaged in management (86%) and hatchery (87%) responsibilities. Comparing educational backgrounds of managers, support for lake trout rehabilitation was most evident among those with policy (91%) or land-use management education (90%), and least evident among those with an environmental engineering education (75%).

The greatest difference in level of support for lake trout rehabilitation between fishery and environmental managers was exhibited for Lake Erie (53% vs. 61%) (Table 7, Appendix 3). The greatest differences between Canadian and U.S. fishery managers were evident for Lake Huron (93%

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vs. 82%) and Lake Erie (43% vs. 59%). The greatest differences based on level of government

agency were evident for Lake Erie (65% federal vs. 47% provincial/state) and Lake Ontario (83%

federal vs. 69% provincial/state).

Canadian managers (fishery and environmental) exhibited stronger support than U.S. managers

for lake trout rehabilitation in Lakes Huron and Ontario, and weaker support for Lakes Michigan and

Erie (Table 8, Appendix 4).

Future Directions for Lake Trout Management

When asked about their beliefs associated with the future direction of Great Lakes lake trout

management, a majority of managers (77%) believed that lake trout management should strive for self-

sustaining populations able to support harvest (Table 8, Appendix 3). Some environmental managers

(16%) and federal fishery managers (15%) believed lake trout management should strive for self-

sustaining populations with no concerns about supporting harvest. Some U.S. fishery managers (16%)

and provincial/state managers (14%) believed that lake trout management should maintain stocking to

provide angler harvest.

Managers' beliefs about the appropriate future direction for lake trout management in the Great

Lakes differed somewhat according to the lake for which they had responsibility in their jobs (Table 9,

Appendix 4). Few managers from any lake believed that lake trout management should be abandoned

in favor of other species. Most managers from every lake believed that lake trout management should

strive for self-sustaining populations of lake trout capable of supporting some harvest, with the least

support coming from those managers working the Uppper Great Lakes (Superior, Michigan, Huron)

(69%). Other Upper Great Lakes managers believed lake trout management should maintain stocking

for harvest (24%) or strive for self-sustaining lake trout populations with no concern about supporting

harvest (7%). The strongest support for striving for self-sustaining populations with no concern for

harvest came from among managers responsible for the Canadian Great Lakes (excluding Michigan)

(24%).

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Relationship to World Views

Managers who supported the goal of lake trout rehabilitation held world views more strongly oriented toward natural and ecological, rather than artificial and utilitarian (Table 10, Appendix 4). Managers who believed lake trout management should strive for achieving self-sustaining lake trout populations with no concern for supporting harvest held the strongest natural and ecological world views. Managers who believed lake trout management should maintain stocking to provide harvest opportunities tended most strongly toward artificial and utilitarian world views.

Relationship to Job Responsibilities

Managers who supported the overall goal of lake trout rehabilitation in the Great Lakes tended to spend a greater percentage of their time on the job engaged in lake trout responsibilities than did managers opposed or neutral to the goal (Table 9, Appendix 3). Managers who supported lake trout rehabilitation goals also tended to have spent fewer years employed in a Great Lakes position, fewer years in their current agency, and fewer years in their current position than managers opposing the goal.

We compared the importance ratings for four potential Great Lakes fishery management goals based on managers' beliefs about the appropriate future direction of Great Lakes lake trout management (Table 10, Appendix 3). Managers believing that lake trout management in the Great Lakes should be abandoned assigned the highest importance rating to fishery management goals associated with satisfying anglers and providing edible fish. Managers believing future lake trout management should focus on maintaining harvest through stocking assigned the highest importance rating to goals associated with satisfying anglers. Managers believing future lake trout management should strive for self-sustaining populations with or without harvest assigned the highest importance to the goal of reestablishing native species.

Perceived Barriers to Achieving Lake Trout Rehabilitation

Managers perceived achieving the goal of lake trout rehabilitation would be easiest to achieve for Lake Superior, and most difficult to achieve for Lakes Ontario, Michigan, and Erie (Table 11,

Appendix 4). Even those who supported the goal of lake trout rehabilitation believed it would be difficult to achieve in these lakes.

Managers differed somewhat in the perceived importance of potential barriers to lake trout rehabilitation in the Great Lakes (Tables 12 - 16, Appendix 4). The most important barriers for achieving lake trout rehabilitation in the Great Lakes included tribal fisheries harvest (Superior, Huron), lack of ability to control sea lampreys (Superior, Huron), inadequate biological knowledge (Superior, Huron), lack of agency resources (Superior, Huron), inadequate enforcement (Superior), high angler harvest (Michigan), inadequate spawning (Michigan, Erie, Ontario), inadequate fry survival (Michigan, Erie, Ontario), loss of lake trout genetic variability (Michigan, Huron, Erie, Ontario), fish-health problems caused by contaminants (Michigan, Ontario), inadequate egg viability (Erie), lack of suitable habitat (Erie), and human health problems caused by contaminants (Ontario).

Managers' Attitudes Toward Lake Trout Program Stakeholders

Overall on a five-point scale, managers assigned highest priority (4.2) to the views of stakeholders within provincial or state fisheries agencies, followed by the Great Lakes Fishery Commission (4.1), federal fisheries agencies (4.0), provincial or state environmental agencies (3.8), and federal environmental agencies (3.6) (Table 17, Appendix 4). Agency-appointed advisory groups (3.4), and the angling public, fish-consuming public, and tribal governments were assigned lower mean priority (3.3), with the lowest priority assigned to such stakeholders as local legislators (2.5), charterboat associations (2.7), commercial fisherman's associations (2.8), sportsmen's associations (3.0), and Great Lakes-related environmental groups (3.1). The greatest magnitude difference between the priorities assigned by fishery managers vs. environmental managers were for stakeholders in provincial or state environmental agencies (3.7 vs. 4.0), and in federal environmental agencies (3.4 vs. 3.8). On average, Canadian fishery managers assigned higher priorities for each stakeholder compared to their U.S. counterparts, except for Fisheries and Oceans Canada (3.9 vs. 4.1) and the angling public (3.2 vs. 3.4). Interestingly, the greatest magnitude difference between Canadian and U.S. fishery managers was the mean importance assigned to the Council of Great Lakes Governors (3.4 vs. 2.9),

followed by the differences in importance assigned to the Great Lakes Fishery Commission (4.4 vs. 4.0) and local legislators (2.7 vs. 2.3).

Managers expressed their perceptions about the degree of support or opposition for lake trout rehabilitation that was occurring among various groups of stakeholders (Table 18, Appendix 4). Managers perceived the strongest support would be found among government agencies such as the Great Lakes Fishery Commission, U.S. Fish and Wildlife Service, Department of Fisheries and Oceans Canada, International Joint Commission, and provincial and state fishery agencies. Much less support is perceived to come from among various public groups, including the angling public, the fish-consuming public, sportsmen's associations, and concerned citizens. Environmental groups were perceived as having stronger support for lake trout rehabilitation than were these other "public" groups. Managers' perception that a high priority should be given to the views of particular stakeholder groups was associated with perceptions that those groups were strong supporters of lake trout rehabilitation (Table 18, Appendix 4).

A plurality of managers in both Canada (45%) and the U.S. (42%) agreed with the statement that environmentalists within the non-fishing public want fisheries management to move away from stocking (Table 19, Appendix 4). Environmental managers (38%) were less likely than fishery managers (48%) to agree with the statement. Managers' agreement with the statement varied with the location (Lake) on which a manager focused on the job (Table 20, Appendix 4). Managers with responsibility on Lake Erie only were in least agreement with the statement (31%). The greatest agreement came from managers with joint responsibility for the Lower Great Lakes (Erie and Ontario) (61%).

A plurality of managers in the U.S. (46%) agreed with the statement that anglers who fish the Great Lakes are not willing to accept the year-to-year fluctuations of a naturally-sustained fishery (Table 19, Appendix 4). More Canadian managers disagreed (39%) with the statement than agreed (36%). Agreement with the statement was most evident among those managers with responsibility for the Lower Great Lakes (Erie, Ontario) (66%), and least evident among those managers with no specific lake focus (37%) (Table 20, Appendix 4).

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A plurality of managers (48%) disagreed with the statement that anglers who fish the Great Lakes are not willing to accept restrictive regulations necessary for lake trout rehabilitation (Table 19, Appendix 4). Disagreement was strongest among those managers responsible for Lake Superior only (71%), and least evident among those responsible for Lake Ontario only (33%) (Table 20, Appendix 4).

A majority of managers disagreed (59%) with the statement that anglers prefer native lake trout over exotic salmonids (Table 19, Appendix 4). Many fishery managers disagreed (71%), but most environmental managers either were neutral or had no opinion (56.8%). Disagreement with the statement was most evident among managers responsible for Lake Huron only (73%), and least evident among managers with no specific lake focus (47%) (Table 20, Appendix 4).

DISCUSSION AND CONCLUSIONS

As Great Lakes resource management agencies move toward adopting an ecosystem approach as a way of doing business, they will find themselves involved more actively with a variety of stakeholders, including counterpart resource management agencies throughout the Great Lakes Basin. Under an ecosystem approach, traditional jurisdictional boundaries will be transcended, and fishery managers will work jointly with environmental managers, provincial/state managers with federal, and Canadian with U.S. managers to adopt and implement appropriate Great Lakes management programs. Those involved in this scenario for future Great Lakes resource management must recognize that current values and approaches to Great Lakes resource management differ among these groups of agency stakeholders, described here relative to differences in approach to lake trout rehabilitation programs. Lack of adequate coordination, cooperation, and shared beliefs, however, is not unique to Great Lakes lake trout management, but rather a characteristic of resource management institutions throughout the Great Lakes Basin (Donahue, 1987).

Key differences between provincial/state and federal fishery managers reflect both historical mandates of these agencies and possible future conflicts as financial and other resources are apportioned by governments to support Great Lakes fishery management programs, including those for lake trout. Provincial/state fishery managers expressed stronger support for artificial vs. natural

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systems, for utilitarian vs. ecological goals, and for placing relatively greater emphasis on anglers and economic benefits compared to federal fishery managers. These attitudes reflect the close relationship historically between recreational anglers (especially licensed anglers in the U.S.) and state/provincial fishery managers, a relationship from which federal fishery managers have been largely removed. Differences between these government agencies and tribal agencies centered largely on the low importance assigned by tribal fishery agencies to recreational anglers, and the difference between the tribal world view favoring natural systems yet tending to support a utilitarian resource management philosophy.

Ecosystem management means traditional disciplinary boundaries must be transcended (Edwards and Regier, 1990); fishery managers will work even more closely with environmental quality managers in the future. These two groups of managers enter this relationship sharing some common ground, but also with evident differences in beliefs about resource management. Although fishery and environmental managers assigned similar importance ratings to several potential fishery management goals, environmental managers assigned higher priority to goals associated with reestablishing self-reproducing, self-sustaining populations of native species, and lower priority to goals associated with the economic value of fish populations than did their fishery management counterparts. These priorities reflect the world views of the environmental managers, which are oriented more strongly to natural systems and ecological management philosophies than are the views of fishery managers, and again, the traditional close relationship of fishery managers and angler stakeholders.

Ecosystem management also means national boundaries must be transcended. Differences similar to those between environmental vs. fishery managers were observed for Canadian vs. U.S. fishery managers. Canadian fishery managers assigned higher priority to goals associated with reestablishing native species and lower priority to goals associated with satisfying anglers, and reflected world views tending more strongly toward natural systems and an ecological management philosophy. In addition, Canadian fishery managers tended to have a broader view of which groups were important stakeholders in lake trout management, placing less relative emphasis on anglers and more on other citizens in the Basin and on nonconsumptive fishery users. Ecosystem management

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calls for wide inclusion of affected stakeholders in decision-making processes, yet Canadian and U.S. fishery agencies may find it hard to reach agreement on who are the affected stakeholders.

The possibility of achieving Basin-wide consensus on lake trout rehabilitation goals may be limited by differences in key beliefs of managers. The challenge for the future of ecosystem management is either to work within the limitations presented by differing belief systems and underlying values, or work to understand the differences and the reasons for those differences in pursuit of a common vision for the Great Lakes.

Insufficient understanding of other parties' belief systems and values often increases the level of conflict in decision-making and management processes (Susskind and Cruikshank, 1987). Various opportunities exist to enhance each manager's understanding of the viewpoints, and importantly, the reasons behind those viewpoints, regarding lake trout rehabilitation and other Great Lakes resource management issues. These opportunities include expansion of research efforts such as this to specific groups and issues, and use of computer modeling and simulation processes.

Research identifying the degree of manager support and reasons underlying that support could be effectively employed in many resource management dialogues, from general discussion of the merits of adopting an ecosystem approach, to discussion of stocking protocols for particular lakes, for example. Such research could be of the type employed here (i.e., quantitative census or survey), or could use qualitative approaches such as focus groups to explore the range of beliefs and values underlying those beliefs among smaller groups of managers (e.g.; lake-specific) on discrete topics. Over time, a growing information base will be established to allow time-series comparisons, i.e., comparison of managers' understanding of one another prior to the research effort, and after results are available and discussed. Open, active interpretation of the research results increases the likelihood of achieving understanding of the reasons behind various beliefs.

Simulation activities, such as the SIMPLE exercise sponsored by the Great Lakes Fishery Commission for Lakes Ontario and Michigan, are also useful in assisting managers to "talk through" how they might react to certain hypothetical resource management challenges. These explorations allow participants in the dialogue to understand the decision-making processes and criteria employed

by others. As noted above, time-series research would be useful with simulation activities, measuring beliefs, values, and anticipated decisions prior to a simulation exercise/group discussion, and after the exercise. Such measurement can help improve the effectiveness of simulation activities in the future for promoting the widespread understanding of reasons underlying various management decisions.

Great Lakes resource management will not necessarily be improved through widespread adoption of the same beliefs, values, and approaches by all managers throughout the Basin. The danger of pursuing such a goal is the phenomena of "groupthink", where new ideas and improved approaches are discarded, if they are raised at all, because they do not fit with the currently accepted paradigm. Creativity and innovation may be lost. A more productive goal may be to foster understanding of the reasons behind certain management viewpoints, so commonalities in ultimate goals can be identified and pursued. A variety of negotiation and conflict resolution techniques are available to help foster such understanding (e.g., Bingham, 1986; Fishery and Ury, 1989). Shared understanding, which comes about through knowledge, is the first step toward achieving mutually beneficial solutions to problems (Fishery and Ury, 1989), including problems of Great Lakes resource management.

ACKNOWLEDGMENTS

LITERATURE CITED

Bingham, G. 1986. *Resolving Environmental Disputes: A Decade of Experience*. Washington, D.C.: The Conservation Foundation.

Busiahn, T., ed. 1990. *Fish community objectives for Lake Superior*. Ann Arbor, MI: Great Lakes Fishery Commission Special Publication 90-1.

Cochran, W.G. 1977. *Sampling Techniques*. New York: John Wiley and Sons.

Dolsen, D.E. and G.E. Machlis. 1991. Response rates and mail recreation survey results: how much is enough? *Journal of Leisure Research*. 23(3): 272-277.

Donahue, M.J. 1987. *Institutional arrangements for Great Lakes management*. East Lansing, MI Michigan Sea Grant College Program, MICHU-SG-87-200T.

Edwards, C.J. and Regier, H.A. 1990. *An ecosystem approach to the integrity of the Great Lakes turbulent times*. Ann Arbor, MI: Great Lakes Fishery Commission Special Publication 90 4

Eshenroder, R.L. 1987. Socioeconomic aspects of lake trout rehabilitation in the Great Lakes. *Trans. Am. Fish. Soc.* 116:309-313.

Goyder, J. 1985. Nonresponse effects on relationships between variables. *Public Opinion Quarterly* 40: 360-369.

Fishery, R. and Ury, W. 1989. *Getting to Yes: Negotiating Agreement Without Giving In*. Hammondsworth, England: Penguin Books, Ltd.

Great Lakes Fishery Commission. 1992. *Strategic Vision of the Great Lakes Fishery Commission for the Decade of the 1990's*. Ann Arbor, MI: Great Lakes Fishery Commission.

Knuth, B.A. and L.A. Nielson. 1989. Social and institutional performance indicators for wildlife and fishery resource management systems. *Society and Natural Resources*. 4:351-366.

Krueger, C., Decker, D., and Gavin, T. 1986. A concept of natural resource management: an application to unicorns. *Trans. NE Sect. Wildl. Soc.* 43:50-56.

Lake Erie Committee. 1988. *Lake Erie fish community goal and objectives*. Ann Arbor, MI: Great Lakes Fishery Commission.

Ontario Ministry of Natural Resources. 1987. *Lake Superior Strategic Fisheries Plan, 1985-2000*. ON: Ontario Ministry of Natural Resources.

Scarnecchia, D.L. 1988. Salmon management and the search for values. *Can. J. Fish. Aqu. Sci.* 45(11):2042-2050.

SPSS, Inc. 1986. *Statistical package for the social sciences users' guide, 2nd edition*. Chicago, IL: SPSS, Inc.

Susskind, L. and Cruikshank, J. 1987. *Breaking the impasse.* New York, NY: Basic Books.

Appendix 1: Content Analysis Report

GLFC -- LAKE TROUT REHABILITATION
Content Analysis Report

Terminology:
Most articles used "lake trout rehabilitation" or "rehabilitation of lake trout" while some used the terms "restoration" and "reestablish" sometimes including the term "self-sustaining", "self-reproducing" or "naturally-reproducing".

Lake Trout Rehabilitation:
All articles in the sample either supported lake trout rehabilitation or a position was not identifiable. A number of the articles did not really dea with lake trout rehabilitation, but rather rehabilitation of the Great Lakes In these articles lake trout rehabilitation may have been implied by calling for a return to more natural conditions, however, some articles had a very specific focus and never mentioned lake trout rehabilitation.

Rating the strength of the lake trout rehabilitation attitude was difficult. Each article had a different focus or objective, so it may not have included a discussion of the importance or a rationale for lake trout rehabilitation, yet it does not mean that a low or negative attitude towards lake trout rehabilitation should be inferred, but rather in this article the authors did not give much clue to its importance. I did not give any "very strong" ratings (5) because no article advocated that lake trout rehabilitation should continue at the expense of the sports fishery. The low to moderate ratings generally resulted from indications that while lake trout rehabilitation was a good goal, other goals (such as satisfying anglers) have equal or higher importance.

Natural vs. Artificial Attitude:
No article advocated a strictly artificial fishery for the Great Lakes. Many talked about the benefits of natural ecosystems (although seldom for ecological or species diversity reasons!), however, a number envision a mixed fisheries for the Great Lakes because of the total benefits package available. Some even mentioned that non-native species which have value and are self-reproducing should be considered "natural" (naturalized species).

Vales:
If a value was identifiable, it was almost exclusively "utilitarian". For example, lake trout rehabilitation is supported largely for utilitarian reasons and the belief that natural (native species) ecosystems provide the most benefit. Ecological or diversity reasons were seldom mentioned.

Perceptions:
Except for a couple articles, stakeholders' opinions about lake trout rehabilitation or fisheries management were not discussed. Considering the importance that stakeholder opinions can or do play in fisheries management it will be valuable to assess managers' beliefs of stakeholder opinions and it was surprising that more coverage was not found in the articles.

Stakeholders and Communication Networks:

There was little mention of stakeholders or communication networks in this sample of literature, except for article #33 (Donahue 1987) which deals with the institutional environment for the management of the Great Lakes ecosystem and discusses strengths and weaknesses, however, nothing is specif to lake trout, but is a good description of all governmental players.

Constraints:

Overall the entire list of constraints provides a good overview for developing a research instrument (questionnaire), however, it may not be very good for ranking the constraints. This is because some articles were very focused and may have covered a very specific constraint giving it a high value out of context with other possible constraints. In the same light, a highly focused article will not cover some important constraints which are unrelated to the article topic, yet still be important (eg., need for public input would not be covered in a paper about lake trout spawning). Also, many categories are inter-related. Generally, sea lamprey, over-fishing, species interactions (competition) and habitat problems are the overall possible constraints, however, a large number of more specific problems are noted.

MODEL:

I modeled the relationship between general value orientations and attitudes towards lake trout rehabilitation and natural vs. artificial ecosystems. Beliefs are used to form the pathways of possible relationships. In this model a person with an ecological orientation would prefer natural systems by two possible beliefs (B1 or B6) and yet either support or oppose lake trout rehabilitation based on their belief of whether it is feasible. The more complicated part of the model is for those with a utilitarian value orientation (which appears to be the majority of managers). Depending on their beliefs a utilitarian person can support either artificial or natural systems and support or oppose lake trout rehabilitation. This demonstrates the importance of identifying a complete belief structure to understand managers' attitudes and behaviors.

SIMPLIFIED SET OF BELIEFS
1. Natural (lake trout) provides the most (utilitarian) benefits
2. Mixed or artificial system provides the most (utilitarian) benefits
3. Lake trout rehabilitation not worth the expense
4. Lake trout rehabilitation <u>can't</u> be accomplished
5. Lake trout rehabilitation <u>can</u> be accomplished
6. Ecological benefits outweigh utilitarian benefits
7. Lake trout rehabilitation is good for the artificial system by adding benefits

This set of beliefs can become more complicated in a number of ways. First it will be important to expand on the B4-B5 beliefs to find out what constraints managers believe make lake trout rehabilitation impossible or at least must be overcome to make lake trout rehabilitation succeed. Second may be to explore the managers' perceived roles in fisheries management, such as, who their clients are (e.g., Are their main clients anglers or society as a whole?).

ECOLOGICAL PATHWAYS

Value Orientation

Utilitarian	Ecological

B1 and/or B6

Natural Systems

Artificial or Mixed Systems

B5

B4

Support	Undecided	Oppose
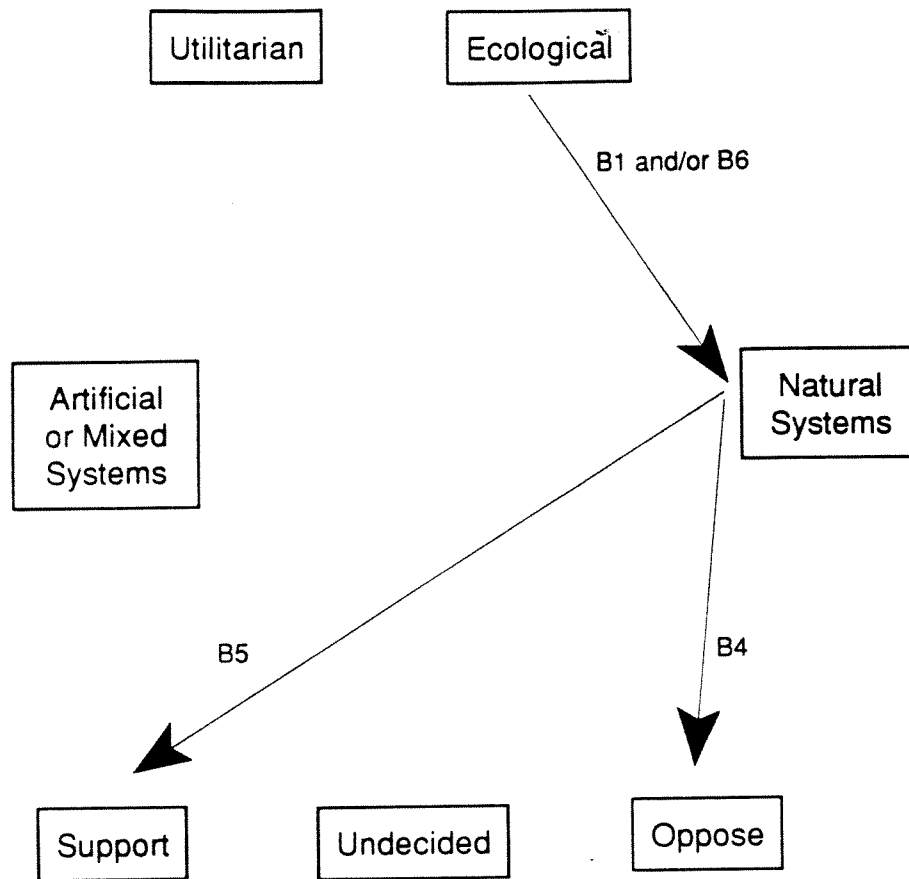
Lake Trout Rehabilitation

UTILITARIAN PATHWAYS

Value Orientation

| Utilitarian | | Ecological |

Artificial or Mixed Systems

Natural Systems

B2

B1

B5

B7 and B5

B3 or B4

B3 or B4

| Support | Undecided | Oppose |
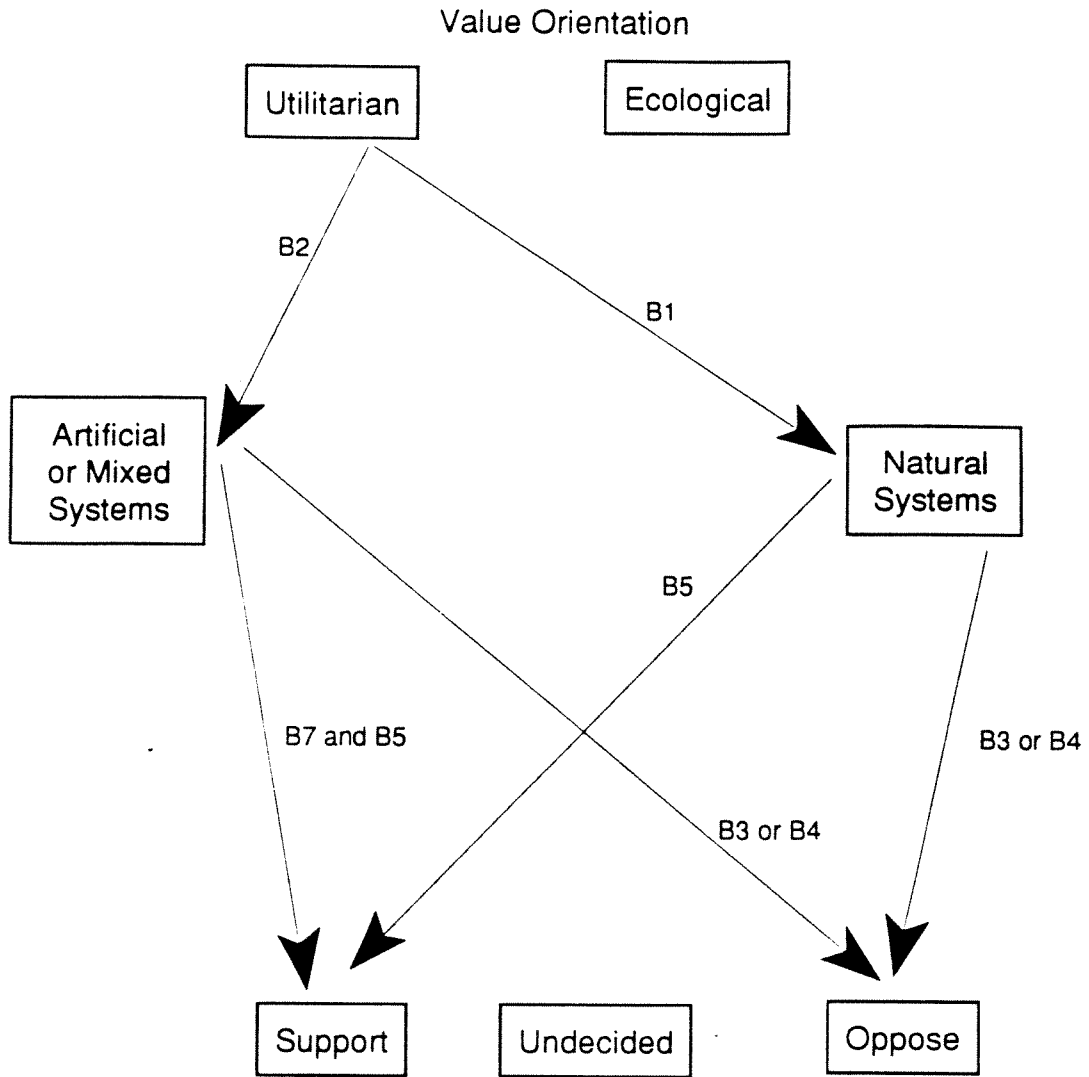
Lake Trout Rehabilitation

GLFC -- LAKE TROUT REHABILITATION
Headings for NOTEBOOK

ID # / Author
Year
Title   -- from reference list
Publisher
Type
Subtype

TERMINOLOGY   simply list the various terminology (with comments as necessary)

ATTITUDES 1   Support/Oppose/Mixed ---> Lake Trout Rehabilitation
    1 = implied but not stated; close to a mixed rating
    2 = low level: lots of conditions stated or not many good arguments for position or a stated low level of support/opposition
    3 = moderate level: position easily identifiable but some conditions are stated or moderate level stated
    4 = strong level: major thrust of the article is supporting the position (support/oppose), a few possible exceptions
    5 = very strong level: no other position is acceptable

ATTITUDES 2   Natural/Artificial/Mixed ---> ecosystems, etc.
    1 = implied but not stated; close to a mixed rating
    2 = low level: lots of conditions stated or not many good arguments for position or a stated low level of support/opposition
    3 = moderate level: position easily identifiable but some conditions are stated or moderate level stated
    4 = strong level: major thrust of the article is supporting the position (support/oppose), a few possible exceptions
    5 = very strong level: no other position is acceptable

VALUES   list "Kellert" type values (with comments as necessary)

SUMMARY VALUES   overall value statement (if possible or applicable)

PERCEPTIONS   list perceptions about other lake trout stakeholders
    1 = minor point, little else mentioned
    2 = minor point, slightly explored
    3 = moderate point
    4 = important point, contributes strongly to an attitude position or an important constraint
    5 = crucial point of the article; is a part of the attitude position or the major constraint

SH1 (G-A)	STAKEHOLDERS: government, active

> 1 = minor point, little else mentioned
> 2 = minor point, slightly explored
> 3 = moderate point
> 4 = important point, contributes strongly to an
>   attitude position or an important constraint
> 5 = crucial point of the article; is a part of the
>   attitude position or the major constraint

SH2 (G-P)	STAKEHOLDERS: government, potential

> *use above rating scale*

SH3 (O-N-A)	STAKEHOLDERS: organized nongovernmental, active

> *use above rating scale*

SH4 (O-N-P)	STAKEHOLDERS: organized nongovernmental, potential

> *use above rating scale*

SH5 (U-N-A)	STAKEHOLDERS: unorganized nongovernmental, active

> *use above rating scale*

SH6 (U-N-P)	STAKEHOLDERS: unorganized nongovernmental, potential

> *use above rating scale*

NETWORK 1	active

> *use above rating scale*

NETWORK 2	potential

> *use above rating scale*

RATING SCALE FOR BARRIERS/CONSTRAINTS (BC1 to BC8)
> 1 = not a problem
> 2 = possible problem, easily solved
> 3 = small problem, solvable with some effort
> 4 = moderate problem, uncertain if solvable or only
>   with great difficulty
> 5 = major problem, not likely to be solved

BC1 - BIO	organismal/species oriented
BC2 - HAB	habitat/environmental oriented
BC3 - SOC	social/society/public oriented
BC4 - AGEN	agency/institutional oriented
BC5 - INPUT	related to management inputs
BC6 - PROC	related to management activities and processes
BC7 - OUT	related to management objectives and direct outcomes
BC8 - IMPAC	related to broader effects and impacts
BC GENERAL	general summary conclusion

ANALYSIS OF LAKE TROUT MATERIALS

Terminology:

NUMBER
26 Lake Trout Rehabilitation / Rehabilitation of Lake Trout
 4 Restoration of Lake Trout / Lake Trout Restoration
 4 Restoration of Self-sustaining Lake Trout
 5 (Stable) Self-sustaining Lake Trout (Stocks/Populations)
 2 Reestablish Self-sustaining Lake Trout (Populations)
 1 Reestablish Lake Trout
 1 Self-reproducing Stocks of Lake Trout
 1 Naturally-reproducing, Native Fish Populations
 1 Development of an Adequate Adult Stock of Lake Trout

Lake Trout Rehabilitation (Attitudes):
Position:
Support.....35
Oppose...... 0
Mixed....... 0

17 --> no position identified

Strength:
1 = implied.............. 6
2 = low level............ 3
3 = moderate level.......11
4 = strong level.........15
5 = very strong level.... 0

Natural vs. Artificial (Attitudes):
Position:
Natural.......17
Artificial.... 0
Mixed.........10

25 --> no position identified

Strength:
1 = implied.............. 2
2 = low level............ 4
3 = moderate level....... 8
4 = strong level......... 3
5 = very strong level.... 0

Values:

1 = UTILITARIAN......16
2 = ECOLOGICAL....... 1
3 = both............. 3

32 --> no position identified

Perceptions: number of statements mentioned / rated values of statements

Article # (number)

1. (1)   - Chemical control of sea lamprey have come under growing
             public scrutiny (1)

6. (1)   - Sportsmen generally have greater empathy towards naturally
             reproduced species (1) -- **SUPPORT**

8. (1)   - People (in Ontario) want abundant high quality food, high
             environmental quality and diverse outdoor recreation
             opportunities (1)

10. (1)   - Commercial fishers want to harvest more lake trout (1)

13. (4)   - Local groups and general public often promote "quick-fix,
             short-term" management actions (3) -- **OPPOSE**
           - Anglers have difficulty in appreciating the significance of
             their own catch relative to total harvest (3)
           - Season and possession limits are often not willingly
             accepted by anglers (2)
           - Client groups feel that the Ministry should "manage the
             resource not the user" (3)

21. (1)   - Public supports control of sea lamprey but not with
             chemicals (2)

30. (2)   - The public will support lake trout rehabilitation (2) --
             SUPPORT
           - Increased rates of natural reproduction from planted stocks
             will be a useful indicator of environmental improvements (3)

35. (1)   - Charter boat fishery opposes more restrictive regulations
             for Lake Trout (1)

36. (2)   - Many fishery managers now consider the maintenance of fish
             stocks through artificial propagation as a long-term
             solution to degraded fish communities (5) -- **OPPOSE**
           - Anglers believe that managers have more control over fishery
             dynamics than they actually do, or would have with natural
             systems (4)

40. (1)   - Some people want pure lake trout (2) -- **SUPPORT**

48. (4)   - The environmental core of the non-fishing public wants us to
             move away from stocking (1) -- **SUPPORT**
           - Sport-fishing sector wants stocking of non-native species
             (created a huge demand) (3) -- **OPPOSE**
           - Stocking creates the public perception that stocking can
             solve anything (4) -- **OPPOSE**
           - Anglers are not prepared to accept the normal year-to-year
             fluctuations of a naturally sustaining fishery (4)

Stakeholders:

GOVERNMENT - ACTIVE:

6. - Canadian Center Inland Water (1)
   - Canadian Department Fisheries and Oceans (1)
   - Corps of Engineers (1)
   - Coastal Management Program (1)
   - County Fishery Advisory Boards (1)
   - Environmental Protection Agency (1)
   - Fish and Wildlife Management Boards (1)
   - Fish and Wildlife Service (1)
   - Great Lakes Commission (1)
   - Great Lakes Fishery Commission (1)
   - International Joint Commission (1)
   - National Marine Fisheries Service (1)
   - National Oceanic and Atmospheric Administration (1)
   - New York Sea Grant Institute (1)
   - New York State Conservation Council (1)
   - Office General Services (1)
   - Ontario Ministry of Natural Resources (1)
   - Office Parks, Recreation and Historic Preservation (1)
   - St. Lawrence Eastern Ontario Commission (1)

9. - U.S. Fish and Wildlife Service (1)

GOVERNMENT - POTENTIAL:

5. - legislators (1)
   - administrators (1)

ORGANIZED - NONGOVERNMENT - ACTIVE:

10. - tribal fisheries (1)
    - Great Lakes Sport Fishing Councils (2)

ORGANIZED - NONGOVERNMENT - POTENTIAL:

5. - advisory groups (1)
   - anglers' organizations (1)

UNORGANIZED - NONGOVERNMENT - ACTIVE:

7. - commercial fishery (1)
    - sport fishery (1)
    - general public (1)

13. - angling public (1)
    - general public (1)

35. - charter boat fishery (1)

UNORGANIZED - NONGOVERNMENT - POTENTIAL:

1. - fish consuming public (1)
    - recreation related stakeholders (1)
    - employment/income related stakeholders (1)

5. - recreational fisheries (1)
    - commercial fisheries (1)

9. - commercial fishermen (1)
    - sport fishermen (1)

20. - recreational anglers (1)
    - commercial fisheries (1)

35. - anglers (1)
    - commercial fishery (1)

36. - fishing public (1)
    - service industry for the fishery (3)

Communication Network 1 -- ACTIVE:

1. - GLFC (1)
    - International Joint Commission's Water Quality Board (1)

6. - GLFC (2)
    - NYSDEC (2)

7. - GLFC (1)
    - Ontario Ministry of Natural Resources -- OMNR (1)
    - Lake Superior Fisheries Management Committee (1)

9. - U.S. Fish and Wildlife Service -- USFWS (1)

13. - OMNR (1)

19. - GLFC (1)
    - Sea Lamprey Advisory Board (1)
    - Lake Committees (1)
    - Lake Trout Technical Committee (1)

20. - Lake Committees (1)
    - USFWS (1)
    - GLFC (1)
    - Dept. of Fisheries and Oceans (1)

26. - NYSDEC (1)
    - OMNR (1)
    - USFWS (1)
    - GLFC (1)
    - Dept. of Fisheries and Oceans (1)
    - Lake Ontario Committee (1)

27. - GLFC (1)
    - Lake Committees (1)

28. - GLFC (1)
    - USFWS (1)
    - Lake Committees (1)

30. - International Joint Commission -- IJC (1)
    - GLFC (1)

*33. - IJC (4)
     - Great Lakes Commissions (4)
     - GLFC (4)
     - Council of Great Lakes Governors (4)

36. - GLFC (1)

37. - GLFC (1)
    - USFWS (1)
    - Fisheries and Oceans Canada (1)

38. - GLFC (1)
    - IJC (1)
    - Great Lakes Basin Committee (1)

39. - Great Lakes Basin Commission (1)

43. - IJC (1)

46. - IJC (1)
    - GLFC (1)
    - International Association for Great Lakes Research (1)
    - Great Lakes Tommorrow (1)
    - The Center for the Great Lakes (1)
    - Great Lakes United (1)

49. - GLFC (1)

Communication Network 1 -- POTENTIAL:

37. - Great Lakes environmental management agencies (1)

BIOLOGY CONSTRAINTS:

CATEGORY	NUMBER	RANGE	MEAN
Sea lamprey....................................	20	2-4	3.2
Species interactions; Competition; Exotic or Non-natives species............................	14	2-4	2.6
Forage base...................................	9	3-4	3.1
Overharvest; Fishing mortality; Incidental commercial catch...............................	8	2-4	3.2
Diseases......................................	7	3-4	3.1
Low recruitment; Mortality rates too high; Low survival.....................................	7	3-4	3.4
Genetics; Genetic variability lost..............	6	2-5	3.5
Selection of spawning sites by lake trout; Lack of homing instincts............................	5	2-3	2.4
High egg - fry mortality.......................	4	1-3	2.0
Fish stocking; Supplemental stocking (including lake trout)...................................	3	3-4	3.6
Lake trout accumulate contaminants; Contaminant loading of eggs................................	2	1-3	2.0
Spawning success; Fertilization rates..............	2	2-3	2.5
Introgression.................................	1	-	4.0
Poor stocking locations.......................	1	-	2.0
Insufficient numbers of spawners................	1	-	1.0
Density dependent population responses.............	1	-	2.0

HABITAT CONSTRAINTS:

CATEGORY	NUMBER	RANGE	MEAN
Toxic contaminants; chemicals; pollution; water quality.......................................	22	2-4	2.7
Habitat loss; quantity.........................	10	2-4	3.3
Habitat degradation; quality....................	8	2-4	3.0
Climatic change; global warming..................	4	1-2	1.8
Water level manipulations......................	2	2-2	2.0
Summer nursey habitat..........................	1	-	3.0

SOCIAL CONSTRAIN TS:

CATEGORY	NUMBER	RANGE	MEAN
Overfishing; overexploitation; harvest............	20	2-4	3.2
User conflicts (recreational/commercial)..........	5	2-4	2.6
Unrealistic user expectations.....................	4	2-4	3.0
Contaminants......................................	4	2-3	2.3
Public support of goals and objectives............	3	2-4	3.0
Illegal harvest..................................	3	2-3	1.7
Public's acceptance of chemical control of sea			
lamprey...................................	2	2-3	2.5
Lack of an holistic perspecitve...................	2	3-4	3.5
Demand for non-native, sports fish................	2	3-4	3.5
Incidental commercial harvest.....................	1	-	2.0
Water use conflicts...............................	1	-	2.0
Acceptability of regulations and restrictions......	1	-	3.0
Unknowns concerning tribal fisheries..............	1	-	2.0

AGENCY CONSTRAINTS:

CATEGORY	NUMBER	RANGE	MEAN
Inadequate enforcement...............................	5	2-3	2.4
Inadequate control of exploitation; inadequate regulations.......................................	4	2-4	3.0
Inter-agency coordination	4	2-4	2.5
Establish stocking priorities; stocking plans......	4	1-3	2.0
Adopt ecosystem perspective; lack of an holistic perspective.......................................	3	3-4	3.3
Insufficient inter-agency cooperation..............	3	1-4	2.3
Agencies can't agree about smelt or sea lamprey management strategies.............................	2	3-4	3.5
Need routine assessments; evaluation...............	2	3-4	3.5
Needs to be committed to public involvement; ineffective communication.........................	2	3-3	3.0
Relaxation of water/air quality standards..........	1	-	2.0
Commitment to goal..................................	1	-	3.0
Not enough stocking of lake trout..................	1	-	2.0
Inadequate scientific and technical knowledge......	1	-	2.0
Overlapping responsibilities.......................	1	-	2.0
Should focus on the values that constitute "quality" fishing..................................	1	-	3.0
Need to adopt genetic principles aimed at preserving genetic variability....................	1	-	4.0
Need to establish fish community goal statements...	1	-	3.0
Need to consider water level manipulation effects..	1	-	3.0
Need to formalize agency commitments to standardization of gear and methods..............	1	-	3.0
Need annual progress reports.......................	1	-	1.0
Past inadequate management.........................	1	-	1.0
Poor attention to basin-wide management goals......	1	-	4.0
Divergent philosophies.............................	1	-	4.0
Need to determine a population level for lake trout	1	-	4.0
Are under more pressure to provide stable fisheries with artificial systems................	1	-	4.0
Some managers foster an exaggerated appearance of being in control.................................	1	-	4.0
Complex mosaic of coastal resource management concerns..	1	-	2.0
Lack of an organized and coordinated response to contaminant problems.............................	1	-	3.0
Need to gather and use socioeconomic information...	1	-	3.0

INPUT CONSTRAIN TS:

CATEGORY	NUMBER	RANGE	MEAN
Inadequate knowledge..............................	35**	2-4	2.6
Lack of resources..................................	8	2-4	2.8
Need input from the public; public involvement.....	3	2-3	2.3
Need measurable criteria to assess the progress of lake trout rehabilitation.......................	2	2-3	2.5
Need more lake-wide monitoring.....................	2	2-2	2.0
Need long-term data sets; time-series data sets....	2	2-3	2.5
Need better regulations and enforcement capabilities......................................	2	2-2	2.0
Need to study incubation and spawning of a self-sustaining lake trout population............	1	-	2.0
Need to sample juveniles to identify recruitment...	1	-	2.0
Need to determine public values and interests and how to transfer such information into management practice..	1	-	4.0

**Specific list of inadequate knowledge areas:
        3 general
        3 about the forage species
        3 about fish diseases
        3 about effects of contaminants (in early-life history)
        3 about the resource users (social information)
        2 sea lampreys
        2 illegal harvest
        2 economic values of sport and commercial fisheries
        1 population dynamics
        1 angling and commercial catch statistics
        1 food habits
        1 about the "existence" value of lake trout
        1 interactions among native, naturalized and stocked species
        1 incidental catch
        1 magnitude of mortality
        1 mortality components (including catch by user)
        1 species interactions
        1 about density-dependent effects
        1 spawning habitat
        1 about the various genetic strains of lake trout
        1 growth and maturity (lake trout)
        1 about all aspects of lake trout

PROCESS CONSTRAIN TS:

CATEGORY	NUMBER	RANGE	MEAN
Monitoring everything; assessments................	4	2-3	2.3
Stocking...	2	2-4	3.0
Need to standardize methods......................	2	3-3	3.0
Creating refuges.................................	1	-	2.0
Creating priority zones..........................	1	-	2.0
Controlling mortality levels.....................	1	-	2.0
Establishing adequate law enforcement............	1	-	2.0
Improve detecting procedures for young lake trout..	1	-	3.0
Mechanical problems - resulted in poor stocking strategies......................................	1	-	1.0
Need to follow measures to reduce potential threat of fish diseases................................	1	-	3.0
Develop better techniques for estimating lamprey and natural mortality............................	1	-	2.0
Need to report annual mortality data attributed to the various sources..............................	1	-	3.0
Need to assess lake trout extractions............	1	-	2.0
Need to assess sea lamprey attacks...............	1	-	2.0
Need more public input in decision process........	1	-	4.0

OUTPUT CONSTRAIN TS:

CATEGORY	NUMBER	RANGE	MEAN
Educational brochures.............................	3	1-2	1.7
Educate client groups to develop realistic expectations about the resource...................	3	3-3	3.0
Identify and protect lake trout habitat............	2	2-4	3.0
Develop criteria (success) for lake trout rehabilitation...................................	2	2-3	2.5
Law enforcement needs to be better aligned with fish management goals; enforcement programs......	2	2-4	3.0
Need more evaluation research......................	2	3-3	3.0
Need to place habitat need high on the agenda of environmental decision-makers....................	1	-	3.0
Reestablish and maintain the basic predator community structure that evolved since the last ice age......................................	1	-	3.0
Need ongoing monitoring of contaminants............	1	-	2.0
How to use economic data...........................	1	-	2.0
Reduce indiscriminate fish loss....................	1	-	3.0
Get better estimates of incidental and illegal harvests..	1	-	3.0
Identify lake trout spawning grounds...............	1	-	2.0
Monitoring; surveillance programs..................	1	-	4.0
Public participation; education programs...........	1	-	4.0
Must consider the culture of fishing...............	1	-	3.0
Social scientists need to be integrated into management...	1	-	3.0
Reduce commercial exploitation on forage base......	1	-	4.0

IMPACT CONSTRAIN TS:

CATEGORY	NUMBER	RANGE	MEAN
Public awareness; understanding; support and responsibility.....................................	7	2-3	2.7
Control; reduce lake trout exploitation............	4	2-4	2.8
Reduce sea lamprey.................................	3	2-4	3.3
Control diseases (EED).............................	1	-	4.0
Reduce negative effects of contaminants on human health..	1	-	4.0

Appendix 2: Research Instrument and Question/Objective Matrix for Managers

OBJECTIVE BY QUESTION MATRIX
FOR: LAKE TROUT REHABILITATION QUESTIONNAIRE

Revised 12 January 1993
Larry M. Gigliotti

OBJECTIVE 1:   Identify how attitudes and values of fishery and environmental managers affect acceptability and attainment of lake trout rehabilitation goals.

A. Attitudes about lake trout rehabilitation and fisheries management

1. Support for/opposition to (and beliefs about) lake trout rehabilitation goals

    QUESTIONS: 1, 2, 5p, 5q, 5n

2. Support for/opposition to (and beliefs about) "self-sustaining" fisheries

    QUESTIONS: 3, 5a, 5d

3. Support for/opposition to (and beliefs about) different types of fishery systems

    QUESTIONS: 5b, 5c, 5g, 5h, 5i, 5m, 7

4. Comparison of support for lake trout rehabilitation with support for other fishery management goals

    QUESTIONS: 6

5. Who do managers perceive as their clients and beliefs about their clients?

    QUESTIONS: 11, 12, 5f, 5j, 5k, 5l, 5r

6. Support for long-term vs. short-term planning horizon

    QUESTIONS: 5e

B. Environmental values

1. Kellert's classification

    QUESTIONS: 8

2. Broad values (NEP)

QUESTIONS: 10

C. Descriptive characteristics of managers

QUESTIONS: 13-18

OBJECTIVE 2:   Identify the barriers or constraints managers perceive are
                  most likely to hinder attainment of lake trout
                  rehabilitation goals.

A. Beliefs about the possibility of attaining lake trout
    rehabilitation goals

QUESTIONS: 4

B. Organismal/species oriented constraints (biological factors)

QUESTIONS: 9 (d k l m n o q t)

C. Habitat/environmental oriented constraints (biological, physical,
    chemical factors)

QUESTIONS: 9 (i j)

D. Social/society/public oriented constraints (psychological,
    sociological, economic, philosophical factors)

QUESTIONS: 9 (a b c e f g h)

E. Agency/institutional oriented constraints (economic, organizations,
    institutional philosophy factors)

QUESTIONS: 9 (p r s u v w x y z aa bb cc)

OBJECTIVE 3:   Describe managers' perceptions of the attitudes and values
                  of other lake trout stakeholders.

QUESTIONS: 11, 12

Lake Trout Rehabilitation in the Great Lakes: Views of Fishery and Environmental Management Agency Professionals

Sponsored by the
Great Lakes Fishery Commission
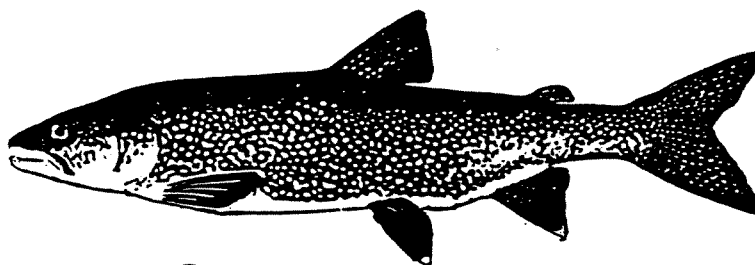
Human Dimensions Research Unit
Department of Natural Resources
New York State College of Agriculture and Life Sciences
Fernow Hall, Cornell University, Ithaca, N.Y. 14853
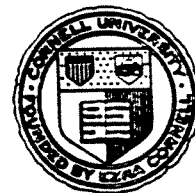
ABOUT THIS QUESTIONNAIRE

This survey is being conducted by the Human Dimensions Research Unit in the Department of Natural Resources at Cornell University. The questionnaire measures attitudes and opinions about the rehabilitation of self-sustaining lake trout populations in the Great Lakes. This information will be used to characterize the views of fishery and environmental management professionals in the Great Lakes regarding lake trout rehabilitation and potential constraints and problems that need to be solved. This is a Great Lakes Fishery Commission–Social Science Task Area project.

DIRECTIONS FOR FILLING OUT THE QUESTIONNAIRE

- *Please try to answer what you believe to be true for you. The best answer is the one which most closely reflects your own feelings and beliefs.*

- *We are interested in hearing from EVERYONE who receives this questionnaire. Call Larry M. Gigliotti at (607) 255-2829 if you have any questions.*

- *Do not write your name on the questionnaire.*

- *Your answers will be treated confidentially. The questionnaire has an identification number so that your name can be checked off our list when you return your questionnaire so that we do not bother you with additional mailings or telephone calls. Your name will never be associated with the information you provide.*

- *Please return the questionnaire using the addressed, pre-paid return envelope provided.*

THANK YOU FOR YOUR COOPERATION!
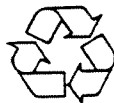
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Throughout this questionnaire, the goal of "lake trout rehabilitation" refers to the restoration of self-sustaining lake trout populations able to withstand some harvest. Self-sustaining populations are able to maintain sufficient levels of abundance from one generation to the next with no stocking.

1. Overall, how strongly do you __personally__ support or oppose the goal of lake trout rehabilitation for the Great Lakes? *(Circle one number.)*

1	2	3	4	5	6	7	8
Strongly Support			Neutral			Strongly Oppose	Undecided

2. Does your level of support or opposition vary by Lake? *(Check one.)*

☐ NO — **SKIP TO QUESTION 3**
☐ YES — Please answer the following question for __each__ Lake

How strongly do you __personally__ support or oppose the goal of lake trout rehabilitation for: *(please circle one number for each lake)*

LAKE SUPERIOR?

1	2	3	4	5	6	7	8
Strongly Support			Neutral			Strongly Oppose	Undecided

LAKE MICHIGAN?

1	2	3	4	5	6	7	8
Strongly Support			Neutral			Strongly Oppose	Undecided

LAKE HURON?

1	2	3	4	5	6	7	8
Strongly Support			Neutral			Strongly Oppose	Undecided

LAKE ERIE?

1	2	3	4	5	6	7	8
Strongly Support			Neutral			Strongly Oppose	Undecided

LAKE ONTARIO?

1	2	3	4	5	6	7	8
Strongly Support			Neutral			Strongly Oppose	Undecided

3. **Which statement best reflects how you <u>personally</u> feel about lake trout management in the Great Lakes?** *(Check one.)*

☐ a. Lake trout management should be abandoned altogether (i.e., all management efforts should be directed towards other species).

☐ b. Lake trout management should be conducted as an ongoing program of stocking fish to maintain harvest opportunities.

☐ c. Lake trout management should strive for self-sustaining populations that could withstand some harvest.

☐ d. Lake trout management should strive for self-sustaining populations, <u>but</u> need not be concerned with providing angler harvest opportunities.

IF YOU CHECKED (c) or (d): How many <u>more</u> years should be devoted to trying to attain self-sustaining lake trout populations (beyond the time already spent), before stopping the program?

_____ YEARS

☐ **Check here if you believe the program should be continued <u>as long as it takes</u> to attain self-sustaining lake trout populations.**

4. **How difficult do you think it will be to achieve the goal of lake trout rehabilitation (the restoration of self-sustaining lake trout populations able to withstand some human harvest) for the Great Lakes? See the definitions in the box below.** *Circle one number for each lake.*

> <u>VERY EASY:</u> the current level of effort will reach the goal in a few more years.
>
> <u>IMPOSSIBLE:</u> The effort to reach the goal would be so great that it would never be achieved.

	Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult	Impossible	No Opinion
Lake Superior	1	2	3	4	5	6	7
Lake Michigan	1	2	3	4	5	6	7
Lake Huron	1	2	3	4	5	6	7
Lake Erie	1	2	3	4	5	6	7
Lake Ontario	1	2	3	4	5	6	7

5. **How strongly do you personally agree or disagree with the following statements related to Great Lakes fisheries management?** 1=Strongly Agree, 2=Agree, 3=Neither Agree Nor Disagree (Neutral), 4=Disagree, 5=Strongly Disagree, 6=No Opinion. *(Circle one number for each statement.)*

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Opinion
a) Self-reproducing/self-sustaining, <u>native</u> fish populations should be the top priority for management of the Great Lakes fisheries............................	1	2	3	4	5	6
b) The economic value of a fish population should be the top consideration when assigning priorities for management of the Great Lakes fisheries............................	1	2	3	4	5	6
c) Non-native species that can be self-sustaining should be considered more important than native species in assigning priority for management of the Great Lakes fisheries............................	1	2	3	4	5	6
d) Self-sustaining fish populations are the most economical management alternative..	1	2	3	4	5	6
e) Long-term management goals should not be pursued at the expense of current benefits to anglers...	1	2	3	4	5	6
f) Great Lakes fishery management should provide benefits to more people than anglers and the fishery-related industries that support the anglers...............	1	2	3	4	5	6
g) Fishery management should assign more priority to nonconsumptive fisheries-related values than consumptive values......	1	2	3	4	5	6
h) Management resources should not be devoted to endangered or threatened species at the expense of economically valued species....	1	2	3	4	5	6
i) The Great Lakes is no longer a natural ecosystem...	1	2	3	4	5	6
j) Environmentalists within the non-fishing public want fisheries management to move away from stocking..	1	2	3	4	5	6

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Opinion
k)	Anglers who fish the Great Lakes are not willing to accept the normal year-to-year fluctuations of a naturally sustained fishery...	1	2	3	4	5	6
l)	Anglers who fish the Great Lakes are not willing to accept the restrictive regulations necessary for lake trout rehabilitation..	1	2	3	4	5	6
m)	Maintenance of fish stocks through artificial propagation is a viable long-term solution to degraded fish communities.......................................	1	2	3	4	5	6
n)	The increased threat to public health from toxics in the longer-lived lake trout is severe enough to justify cancellation of the lake trout rehabilitation program.....................	1	2	3	4	5	6
o)	Anglers prefer the native lake trout over the exotic salmonid species................	1	2	3	4	5	6
p)	Lake trout rehabilitation should only continue as long as the program does not cause negative local or state economic impacts...........................	1	2	3	4	5	6
q)	Given the harvest demand of anglers, a self-sustaining population of lake trout will never meet the demand................	1	2	3	4	5	6
r)	Fisheries managers should try to influence expectations among anglers rather than try to meet the demand of anglers through artificial stocking methods...	1	2	3	4	5	6

6. How much importance do you think fisheries managers should give to each of the following potential Great Lakes fishery management goals? *(Circle one number for each goal.)*

Potential Fishery Management Goals	IMPORTANCE				
	NONE	SLIGHT	MODERATE	HIGH	VERY HIGH
a) Satisfying anglers..........................	0	1	2	3	4
b) Providing economic benefits to local economies............................	0	1	2	3	4
c) Providing economic benefits to state economies............................	0	1	2	3	4
d) Protecting ecological diversity......	0	1	2	3	4
e) Providing economic benefits to commercial fisheries....................	0	1	2	3	4
f) Providing economic benefits to the charter boat industry...............	0	1	2	3	4
g) Providing edible fish to anglers....	0	1	2	3	4
h) Providing edible fish to the non-angling public.........................	0	1	2	3	4
i) Providing a diversity of game species for anglers.......................	0	1	2	3	4
j) Protecting endangered and threatened species.......................	0	1	2	3	4
k) Establishing self-sustaining native populations.........................	0	1	2	3	4
l) Establishing self-sustaining non-native populations..................	0	1	2	3	4
m) Re-establishing the native fish fauna in the Great Lakes...............	0	1	2	3	4
n) Establishing a self-regulating fish community in the Great Lakes......	0	1	2	3	4
o) Rehabilitation of self-sustaining lake trout populations able to withstand angler harvest..............	0	1	2	3	4

7. Controversies involving Great Lakes fisheries management often reflect a central split in thinking about management resulting from two opposing world views. Where do you think your <u>personal</u> management philosophy fits on this continuum between "<u>completely natural</u>" to "<u>completely artificial</u>" as defined in the box below? *(Circle one number.)*

1	2	3	4	5	6	7
Completely Natural						Completely Artificial

COMPLETELY NATURAL: no introduced species, no stocking, management is achieved by controlling anglers (harvest) and protecting (restoring) habitat.

COMPLETELY ARTIFICIAL: a belief that exotic species might fit better with the system or provide more total benefits, such as filling an empty niche, that stocking can provide additional benefits (especially in degraded habitats), that managing the fisheries is like farming in which intensive technological inputs can achieve more benefits than a natural system.

8. A second split in thinking relates to the <u>REASONS</u> for management, namely ecological reasons vs. utilitarian reasons. Where do you think your <u>personal</u> management philosophy fits on this continuum between "<u>ecological</u>" reasons and "<u>utilitarian</u>" reasons as described in the box below? *(Circle one number.)*

1	2	3	4	5	6	7
Ecological						Utilitarian

ECOLOGICAL: management actions are primarily to maintain the ecosystem, not necessarily to benefit humans; humans are only part of the system; all species are considered important regardless of their value to humans.

UTILITARIAN: human needs and desires are given a top priority in any management actions, i.e., the purpose of maintaining a well-functioning ecosystem is to provide human benefits; emphasis is placed on species with high value to humans.

NOTE: Management actions and end results can be the same in each view—the difference is in the underlying reasons.

1=Not Important; 2=Slightly Important; 3=Moderately Important; 4=Important; 5=Very Important; 0=No Opinion.

Please write one number in each box for each lake with which you are familiar.

Possible Constraints to Lake Trout Rehabilitation	Lake Superior	Lake Michigan	Lake Huron	Lake Erie	Lake Ontario
n) Inadequate fry survival	☐	☐	☐	☐	☐
o) Predation on young lake trout	☐	☐	☐	☐	☐
p) Too much emphasis on stocking yearlings	☐	☐	☐	☐	☐
q) Lack of an adequate forage base	☐	☐	☐	☐	☐
r) Lack of ability to control sea lampreys	☐	☐	☐	☐	☐
s) Inadequate hatchery capabilities	☐	☐	☐	☐	☐
t) Fish diseases	☐	☐	☐	☐	☐
u) Inadequate fisheries regulations	☐	☐	☐	☐	☐
v) Inadequate environmental regulations	☐	☐	☐	☐	☐
w) Inadequate enforcement	☐	☐	☐	☐	☐
x) Inadequate knowledge--Biological	☐	☐	☐	☐	☐
y) Inadequate knowledge--Socioeconomic	☐	☐	☐	☐	☐
z) Inadequate use of socio-economic information	☐	☐	☐	☐	☐
aa) Lack of agency resources/too expensive	☐	☐	☐	☐	☐
bb) Lack of interagency coordination	☐	☐	☐	☐	☐
cc) Inadequate agency commitment to the goal of lake trout rehabilitation	☐	☐	☐	☐	☐

9. The following are possible constraints/barriers that may limit the ability to achieve the goal of lake trout rehabilitation. Please rate how important you think each is as a factor in why lake trout rehabilitation could fail, for each lake. If you are unable to rate constraints for particular lakes, please check the lakes below for which you will <u>not</u> rate the constraints, then move on to assigning ratings to those lakes with which you are familiar.

I am unable to rate constraints for (check all that apply):

☐ Lake Superior; ☐ Lake Michigan; ☐ Lake Huron; ☐ Lake Erie;

☐ Lake Ontario.

For each constraint below, write one number for each lake you did not check above to indicate how important you believe the constraint is.

1=Not Important; 2=Slightly Important; 3=Moderately Important; 4=Important; 5=Very Important; 0=No Opinion.

Please write one number in each box for each lake with which you are familiar. Leave empty the boxes for any lake(s) you checked (✓) above.

Possible Constraints to Lake Trout Rehabilitation	Lake Superior	Lake Michigan	Lake Huron	Lake Erie	Lake Ontario
a) High angler harvest	☐	☐	☐	☐	☐
b) Tribal fisheries harvest	☐	☐	☐	☐	☐
c) Illegal harvest	☐	☐	☐	☐	☐
d) Mortality of angler-released lake trout	☐	☐	☐	☐	☐
e) Lack of public support for the goal of rehabilitation	☐	☐	☐	☐	☐
f) Unrealistic user expectations	☐	☐	☐	☐	☐
g) Inadequate acceptance of regulations	☐	☐	☐	☐	☐
h) Human health problems caused by contaminants	☐	☐	☐	☐	☐
i) Fish-health problems caused by contaminants	☐	☐	☐	☐	☐
j) Lack of suitable habitat	☐	☐	☐	☐	☐
k) Loss of lake trout genetic variability	☐	☐	☐	☐	☐
l) Inadequate spawning	☐	☐	☐	☐	☐
m) Inadequate egg viability	☐	☐	☐	☐	☐

11. **The views of a variety of stakeholders could be considered when making lake trout management decisions. What priority should be given to the views of each of the possible stakeholders listed below?** *(Circle one number for each stakeholder.)*

Possible Stakeholders	PRIORITY					
	Very Low	Low	Moderate	High	Very High	I Don't Know
a) Each province or state environmental agency	1	2	3	4	5	6
b) Each province or state fishery agency	1	2	3	4	5	6
c) Department of Fisheries and Oceans Canada	1	2	3	4	5	6
d) Environment Canada	1	2	3	4	5	6
e) U.S. Fish and Wildlife Service	1	2	3	4	5	6
f) U.S. Environmental Protection Agency	1	2	3	4	5	6
g) International Joint Commission	1	2	3	4	5	6
h) Great Lakes Fishery Commission	1	2	3	4	5	6
i) Council of Great Lakes Governors	1	2	3	4	5	6
j) Agency-appointed advisory groups	1	2	3	4	5	6
k) Great Lakes Commission	1	2	3	4	5	6
l) Local legislators	1	2	3	4	5	6
m) Tribal governments	1	2	3	4	5	6
n) Sportsmen's associations	1	2	3	4	5	6
o) Commercial fishermen's associations	1	2	3	4	5	6
p) Charter Boat associations	1	2	3	4	5	6
q) Environmental groups related to the Great Lakes	1	2	3	4	5	6
r) Angling public in general	1	2	3	4	5	6
s) Concerned citizens in general	1	2	3	4	5	6
t) Fish-consuming public	1	2	3	4	5	6
u) Stakeholders whose income is related to Great Lakes fisheries.	1	2	3	4	5	6

10. The following is a general environmental attitudes scale that will be used to compare managers' attitudes with those of other public groups. Please read the following statements and indicate to what extent you agree or disagree with each statement. (1=Strongly Agree, 2=Mildly Agree, 3=Mildly Disagree, 4=Strongly Disagree). *(Circle one number for each statement.)*

	Strongly Agree	Mildly Agree	Mildly Disagree	Strongly Disagree
The balance of nature is very delicate and easily upset	1	2	3	4
When humans interfere with nature it often produces disastrous consequences	1	2	3	4
Plants and animals exist primarily to be used by humans	1	2	3	4
Humans must live in harmony with nature in order to survive	1	2	3	4
Humans were created to rule over the rest of nature	1	2	3	4
Humans have the right to modify the natural environment to suit their needs	1	2	3	4
We are approaching the limit to the number of people that the Earth can support	1	2	3	4
The Earth is like a spaceship with only limited room and resources	1	2	3	4
There are limits to growth beyond which our industrialized society cannot expand	1	2	3	4
To maintain a healthy economy we will have to develop a "steady state" economy in which industrial growth is controlled	1	2	3	4
Humans need not adapt to the environment because they can remake it to suit their needs	1	2	3	4

DESCRIPTIVE CHARACTERISTICS OF PROFESSIONALS:

13. **What is your position in your agency?** *(Please check one box that most closely describes your position.)*

   ☐ Agency chief or director
   ☐ Bureau chief or director (e.g., Fisheries or Water Quality bureau director)
   ☐ Program chief or director (e.g., Great Lakes program director)
   ☐ Regional manager (e.g., lake manager)
   ☐ Regional scientist/biologist
   ☐ Local manager (e.g., for county, area, district)
   ☐ Local scientist or biologist (e.g., for county, area, district)
   ☐ Technician
   ☐ Other, please describe: _____

14. **What type of work do you do** *(check all that apply):*

   ☐ ADMINISTRATION
   ☐ RESEARCH/ASSESSMENT
   ☐ MANAGEMENT
   ☐ HATCHERY
   ☐ ADVISORY
   ☐ EDUCATIONAL
   ☐ POLICY
   ☐ Other, please specify: _____

15. **In your job, do you have a focus on a particular Lake(s)?**

   ☐ NO SPECIFIC FOCUS
   or *(check ALL that apply)*
   ☐ Lake Superior
   ☐ Lake Michigan
   ☐ Lake Huron
   ☐ Lake Erie
   ☐ Lake Ontario

12. **In general, how strongly do you think each of the following stakeholders supports or opposes the goal of lake trout rehabilitation?** *Circle one number for each stakeholder.*

Possible Stakeholders	Goal of Lake Trout Rehabilitation					
	Strongly Supports		Neutral		Strongly Opposes	I Don't Know
a) Each province or state environmental agency..............	1	2	3	4	5	6
b) Each province or state fishery agency..........................	1	2	3	4	5	6
c) Department of Fisheries and Oceans Canada..........................	1	2	3	4	5	6
d) Environment Canada....................	1	2	3	4	5	6
e) U.S. Fish and Wildlife Service.......	1	2	3	4	5	6
f) U.S. Environmental Protection Agency...	1	2	3	4	5	6
g) International Joint Commission....	1	2	3	4	5	6
h) Great Lakes Fishery Commission	1	2	3	4	5	6
i) Council of Great Lakes Governors	1	2	3	4	5	6
j) Agency-appointed advisory groups..	1	2	3	4	5	6
k) Great Lakes Commission..............	1	2	3	4	5	6
l) Local legislators...........................	1	2	3	4	5	6
m) Tribal governments.......................	1	2	3	4	5	6
n) Sportsmen's associations.............	1	2	3	4	5	6
o) Commercial fishermen's associations................................	1	2	3	4	5	6
p) Charter Boat associations.............	1	2	3	4	5	6
q) Environmental groups related to the Great Lakes..........................	1	2	3	4	5	6
r) Angling public in general.............	1	2	3	4	5	6
s) Concerned citizens in general......	1	2	3	4	5	6
t) Fish-consuming public..................	1	2	3	4	5	6
u) Stakeholders whose income is related to Great Lakes fisheries.	1	2	3	4	5	6

16. **What was your educational emphasis for any degrees you hold?** *(Check ALL that apply.)*

- ☐ FISHERY BIOLOGY
- ☐ FISHERY MANAGEMENT
- ☐ AQUATIC ECOLOGY
- ☐ WETLAND ECOLOGY
- ☐ LAND-USE MANAGEMENT
- ☐ ENVIRONMENTAL ENGINEERING
- ☐ POLICY-ORIENTED
- ☐ WATER QUALITY
- ☐ CHEMISTRY
- ☐ TOXICOLOGY
- ☐ Other, please specify: _____

17. **How long have you been employed:**

a) in any Great Lakes-related position? _____ YEARS

b) by your current agency? _____ YEARS

c) in your current position? _____ YEARS

18. **About what percent of time on your job do you spend working on issues related to lake trout?**

_____ % of time

Please use the space below or on the back cover for any additional comments you wish to make. To return this questionnaire, place it in the envelope provided and drop it in the nearest mailbox.

Thank you for your time and effort.

Printed on recycled paper

Appendix 3: Data Tables from the Journal of Great Lakes Research Manuscript

TABLE 1. *Agency Great Lakes staff included in census.*

Agency Contacted	Number of Staff Contacted	Responded
Federal		
Canadian Wildlife Service	2	2
Dept. of Fisheries and Oceans Canada	61	53
Environment Canada	14	11
Great Lakes Commission	3	3
Great Lakes Fishery Commission	14	8
International Joint Commission	5	5
U.S. Army Corps of Engineers	6	5
U.S. Environmental Protection Agency	99	76
U.S. Fish and Wildlife Service	118	106
Provincial		
Ontario Ministry of the Environment	46	35
Ontario Ministry of Natural Resources	143	130
State		
Illinois Dept. of Conservation	6	6
Illinois Environmental Protection Agency	5	5
Indiana Dept. of Environmental Management	39	27
Indiana Dept. of Natural Resources	13	13
Michigan Dept. of Natural Resources, Fisheries Division	73	67
Michigan Dept. of Natural Resources, Office of the Great Lakes	2	2
Michigan Dept. of Natural Resources, Surface Water Quality Division	45	34
Minnesota Dept. of Natural Resources	26	24
Minnesota Pollution Control Agency	5	3
New York Dept. of Environmental Conservation, Bureau of Fisheries	32	32
New York Dept. of Environmental Conservation, Division of Water	20	16
Ohio Dept. of Natural Resources	11	11
Ohio Environmental Protection Agency	15	13
Pennsylvania Dept. of Environmental Resources	5	3
Pennsylvania Fish Commission	10	8
Wisconsin Dept. of Natural Resources, Bureau of Fisheries	56	50

Fishery and Environmental Managers' Attitudes About and Support for Lake Trout Rehabilitation in the Great Lakes

by

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RUNNING TITLE: Managers' Attitudes About Lake Trout Rehabilitation

TABLE 2.   *Characteristics of respondents.*

Characteristics	Canadian Fisheries	Canadian Env. Quality	U.S. Fisheries	U.S. Env. Quality
		N		
Number of respondents	183	48	350	205
		Percent		
Position in agency				
Agency or program director	7.1(11.1)[a]	8.3(12.5)	14.5(13.3)	19.1(11.6)
Regional manager/scientist	33.8(12.9)	39.6(11.1)	25.7(15.2)	30.9(10.3)
Local manager/scientist	30.1(10.7)	8.3(10.2)	26.6(12.7)	25.0(10.5)
Technician	13.7(10.6)	16.7(13.8)	20.8(8.4)	3.9(4.2)
Other	15.3(12.9)	27.1(9.2)	12.4(11.9)	21.1(8.5)
Type of responsibility[b]				
Administration/policy	38.3	33.3	35.1	37.7
Research	57.9	50.0	54.0	57.8
Management	35.5	33.3	40.5	31.4
Hatchery	10.9	0.0	20.1	0.0
Other	24.6	41.7	22.7	22.4
Educational emphasis[b]				
Fisheries	65.4	35.4	75.1	22.4
Aquatic/wetland ecology	35.8	52.1	35.1	37.8
Water quality/chemistry/ toxicology	20.1	56.3	14.8	46.8
Land use	11.2	4.2	3.8	8.5
Engineering	1.1	20.8	0.3	19.9
Other	22.9	22.9	20.3	25.4
Type of agency				
State/provincial	71.0	72.9	60.9	58.5
Federal	29.0	27.1	32.9	41.5
Tribal			6.2	

[a]Figures in parentheses indicate the mean number of years employed in a Great Lakes-related position. [b]Percentages do not add to 100% because respondents could check more than 1 category.

TABLE 1. *Continued.*

Agency Contacted	Number of Staff	
	Contacted	Responded
Wisconsin Dept. of Natural Resources, Bureau of Water Resources Management	17	16
Tribal Chippewa-Ottawa Treaty Fishery Management Authority	7	7
Great Lakes Indian Fish & Wildlife Commission	21	14

TABLE 4. *Managers' beliefs about the importance of potential Great Lakes fishery management goals, by agency type, county, and level of government.*

Potential Fishery Management Goals[b]	Overall	Agency Type		Fisheries Agency		Fisheries Agency		
		Environmental	Fisheries	Canada	U.S.	Federal	Prov./State	Tribal
Reestablish native species/ protect ecological diversity	3.0(0.7)	3.1(0.6)	3.0(0.7)	3.1(0.6)	2.9(0.7)	3.2(0.6)	2.8(0.7)	3.3(0.6)
Provide edible fish	2.7(0.9)	2.8(0.9)	2.7(0.8)	2.9(0.8)	2.6(0.8)	2.7(0.8)	2.7(0.8)	3.5(0.6)
Satisfy anglers	2.4(0.7)	2.3(0.7)	2.4(0.7)	2.1(0.6)	2.5(0.7)	2.2(0.7)	2.5(0.7)	2.0(0.8)
Provide economic benefits	1.9(0.6)	1.9(0.6)	1.9(0.6)	2.1(0.6)	1.9(0.6)	1.9(0.6)	1.9(0.6)	2.2(0.8)

(Columns grouped under: Mean Importance Score[a])

[a]Importance was measured on a 5-point scale, ranging from 0 = none to 4 = very high; standard deviations are indicated in parentheses. [b]Goals listed are four factors produced through principal components factor analysis of an importance scale with 13 items. Cronbach's alpha for scale reliability = 0.73.

TABLE 3.   *Factor loadings for the four factors produced through principal components factor analysis. (Cronbach's alpha for scale reliability = 0.73.)*

Factors/Items	Factor Loadings
Reestablish native species/protect ecological diversity	
Establish self-sustaining native populations	.802
Protect endangered and threatened species	.790
Reestablish native fish fauna in the Great Lakes	.772
Protect ecological diversity	.755
Establish a self-regulating fish community in the Great Lakes	.625
Provide edible fish	
Provide edible fish to the non-angling public	.883
Provide edible fish to anglers	.800
Satisfy anglers	
Provide a diversity of game species for anglers	.801
Satisfy anglers	.638
Provide economic benefits	
Provide economic benefits to local economies	.856
Provide economic benefits to state economies	.801
Provide economic benefits to the charter boat industry	.773
Provide economic benefits to commercial fisheries	.678

TABLE 6. *Managers' attitudes toward potential top priority for Great Lakes fishery management, by agency type, country, and level of government.*

Top Priority for Great Lakes Fishery Management Should Be:	Percent of Managers							
	Overall	Agency Type		Fisheries Agency		Fisheries Agency		
		Environmental	Fisheries	Canada	U.S.	Federal	Prov./State	Tribal
Self-reproducing/self-sustaining native fish populations								
Agree	71.1	73.8	69.7	86.3	60.9	78.3	64.6	85.7
Neutral	10.8	16.1	8.2	7.1	8.7	14.5	5.6	0.0
Disagree	16.7	6.5	21.7	6.6	29.8	7.2	29.2	14.3
No opinion	1.4	3.6	0.4	0.0	0.6	0.0	0.6	0.0
Non-native, self-sustaining fish populations								
Agree	7.7	7.2	7.8	5.5	9.1	3.6	10.1	4.8
Neutral	15.1	15.3	14.9	10.4	17.3	12.0	17.2	0.0
Disagree	75.0	73.5	76.0	83.6	71.8	83.8	70.9	95.2
No opinion	2.2	4.0	1.3	0.5	1.8	0.6	1.8	0.0
Economic value of fish populations								
Agree	15.7	14.1	16.5	6.6	21.9	10.8	18.3	33.3
Neutral	21.2	25.7	18.8	14.2	21.3	21.0	16.9	33.3
Disagree	61.7	57.0	64.1	78.7	56.2	68.2	63.9	33.4
No opinion	1.4	3.2	0.6	0.5	0.6	0.0	0.9	0.0

TABLE 5. *Managers' adoption of world views related to natural vs. artificial systems and ecological vs. utilitarian management philosophies, by agency type, country, and level of government.*

World View	Overall	Agency Type		Fisheries Agency		Fisheries Agency		
		Environmental	Fisheries	Canada	U.S.	Federal	Prov./State	Tribal
Natural vs. Artificial Systems[a]	3.1(1.1)	2.9(1.1)	3.1(1.2)	2.7(0.9)	3.4(1.2)	2.8(1.1)	3.3(1.2)	2.8(1.2)
Ecological vs. Utilitarian Management Philosophies[b]	3.2(1.4)	2.9(1.3)	3.4(1.4)	2.9(1.2)	3.6(1.5)	2.7(1.2)	3.7(1.4)	3.5(1.8)

Column group header: Mean Score[a,b]

[a]Natural vs. artificial systems world view was measured on a 7-point scale where 1 = completely natural to 7 = completely artificial; standard deviations are indicated in parentheses. [b]Ecological vs. utilitarian management philosophy was measured on a 7-point scale where 1 = ecological to 7 = utilitarian; standard deviations are indicated in parentheses.

TABLE 8.   Managers' beliefs about the appropriate future direction for lake trout management in the Great Lakes, by agency type, country, and level of government.

Great Lakes Lake Trout Management Should:	Percent of Managers							
	Overall	Agency Type		Fisheries Agency		Fisheries Agency		
		Environmental	Fisheries	Canada	U.S.	Federal	Prov./State	Tribal
Be abandoned in favor of other species	1.7	0.4	2.3	2.7	2.0	1.2	3.0	0.0
Maintain stocking to support harvest	10.4	10.1	10.7	1.1	15.7	3.6	14.2	9.5
Strive for self-sustaining populations that support some harvest	76.6	73.5	77.7	85.2	73.8	80.2	76.0	85.7
Strive for self-sustaining populations, but with no concern for harvest	11.3	16.0	9.3	11.0	8.5	15.0	6.8	4.8

TABLE 7. *Managers' attitudes toward lake trout rehabilitation in each of the Great Lakes, by agency type, country, and level of government.*

Attitude Toward Lake Trout Rehabilitation By Lake	Percent of Managers							
	Overall	Agency Type		Fisheries Agency		Fisheries Agency		
		Environmental	Fisheries	Canada	U.S.	Federal	Prov./State	Tribal
Overall for Great Lakes								
Support[a]	86.6	83.2	88.1	91.7	86.2	91.5	85.7	100.0
Oppose	5.9	3.7	6.9	5.5	7.6	5.5	8.0	0.0
Lake Superior								
Support	91.4	88.8	92.5	93.9	91.8	93.4	91.6	100.0
Oppose	2.7	2.1	3.1	2.8	3.2	3.6	3.0	0.0
Lake Michigan								
Support	79.1	81.7	77.7	76.0	78.6	87.2	72.4	85.7
Oppose	6.8	5.0	7.7	3.0	10.0	4.9	9.3	4.8
Lake Huron								
Support	84.8	81.6	86.1	93.3	82.2	90.8	83.2	95.2
Oppose	5.1	4.2	5.6	3.9	10.7	4.9	6.0	4.8
Lake Erie								
Support	56.0	61.3	53.4	43.4	58.7	64.6	47.2	62.0
Oppose	22.8	16.0	26.3	33.7	22.3	19.3	30.3	19.0
Lake Ontario								
Support	72.9	70.4	73.9	75.4	73.1	82.9	69.2	76.2
Oppose	11.4	9.3	12.5	15.1	11.0	9.8	14.3	4.8

[a]Third response category not shown in table was "neutral."

TABLE 10. *Relationship between managers' beliefs about the appropriate future direction of Great Lakes lake trout management and attitudes toward the importance of potential fishery management goals.*

| | Mean Importance of Goals[a] | | | |
| | Great Lakes Lake Trout Management Should: | | | |
Potential Fishery Management Goals	Be Abandoned	Maintain Stocking	Attain Self-sustaining Populations With Harvest	Attain Self-sustaining Populations With No Concern For Harvest
Reestablish native species/ protect ecological diversity	2.1(0.9)	2.3(0.7)	3.1(0.6)	3.3(0.5)
Provide edible fish	2.3(1.2)	2.5(0.9)	2.8(0.8)	2.7(0.9)
Satisfy anglers	2.3(0.9)	2.8(0.7)	2.3(0.7)	2.1(0.7)
Provide economic benefits	1.7(0.7)	1.9(0.7)	2.0(0.6)	1.9(0.7)

[a]Importance was measured on a 5-point scale ranging from 0 = none to 4 = very high; standard deviations are indicated in parentheses.

TABLE 9. *Employment characteristics of managers in support of, neutral toward, or opposed to lake trout rehabilitation in the Great Lakes.*

Mean Employment Characteristics	Goal of Lake Trout Rehabilitation			
	Overall	Support	Neutral	Oppose
Percent of time spent on issues related to lake trout	17.0(24.6)[a]	18.7(25.8)	5.9(13.8)	12.1(16.6)
Number of years in a Great Lakes-related position	11.7(8.2)	11.7(8.2)	9.9(7.0)	14.1(8.6)
Number of years in current agency	14.5(8.8)	14.4(8.8)	14.4(9.0)	17.0(9.1)
Number of years in current position	7.5(6.5)	7.3(6.5)	8.0(6.2)	10.3(7.5)

[a]Standard deviations are indicated in parentheses.

Appendix 4: Additional Data Tables

Table 4-2. Managers' beliefs about the importance[a] of potential fishery management goals, according to managers' beliefs about the appropriate future direction for lake trout management in the Great Lakes.

| | | Lake Trout Management Should: | | | |
Potential Fishery Management Goals	Be Abandoned	Maintain Stocking	Strive for Self-Sustaining Population With Harvest	Strive for Self-Sustaining Population No Concern for Harvest
Re-establishing native species/ protecting ecological diversity	2.1	2.3	3.1	3.3
Providing edible fish	2.3	2.5	2.8	2.7
Satisfying anglers	2.3	2.8	2.3	2.1
Providing economic benefits	1.7	1.9	2.0	1.9

[a]Importance was measured on a 5-point scale ranging from 0 = none to 4 = very high.

Table 4-1. Managers' beliefs about the importance[a] of potential fishery management goals—overall, by country, and by support/oppose goal of lake trout rehabilitation.

Potential Fishery Management Goals	Overall	Country		Overall Goal of Lake Trout Rehabilitation		
		U.S.	Canada	Support	Neutral	Oppose
Re-establishing native species/protecting ecological diversity	3.0	3.0	3.2	3.1	2.6	2.3
Providing edible fish	2.7	2.7	2.9	2.8	2.6	2.5
Satisfying anglers	2.4	2.5	2.1	2.4	2.4	2.7
Providing economic benefits	1.9	1.9	2.1	1.9	2.0	1.9

[a]Importance was measured on a 5-point scale ranging from 0 = none to 4 = very high.

Table 4-4. Managers' adoption of world views related to natural vs. artificial systems and ecological vs. utilitarian management philosophies, overall, and by country.

| | | Country | |
| | Overall | U.S. | Canada |
Values		Percent	
New Environmental Paradigm Scale[a]	1.7	1.7	1.6
Natural to Artificial World View	3.1	3.2	2.7
Ecological to Utilitarian World View	3.2	3.4	2.8

[a]NEP scale was measured using a 4-point scale where 1 = strongly agree to 4 = strongly disagree.
Natural to Artificial and Ecological to Utilitarian were measured on a 7-point scale where 1 = completely natural or ecological to 7 = completely artificial or utilitarian.

Table 4-3. Managers' beliefs about the appropriate future direction for lake
           trout management in the Great Lakes, by their support or
           opposition to the goal of lake trout rehabilitation.

Lake Trout Management Should:	Overall Goal of Lake Trout Rehabilitation		
	Support	Neutral	Oppose
		Percent	
Be Abandoned in Favor of Other Species	0.2	1.9	23.8
Maintain Stocking for Harvest	7.0	26.4	35.7
Strive for Self-sustaining Population With Some Harvest	82.3	60.4	14.3
Strive for Self-sustaining Population With No Concern for Harvest	10.5	11.3	26.2

Table 4-6.   Managers' attitudes toward Great Lakes fishery management issues—overall, by country, by agency type, and by support/oppose goal of the lake trout rehabilitation.

Attitudes Toward Great Lakes Fishery Management Issues	Country			Agency Type		Overall Goal of Lake Trout Rehabilitation			Fisheries Agency		Fisheries Agency		
	Overall	U.S.	Canada	Fisheries	Env. Mgmt.	Support	Neutral	Oppose	U.S.	Canada	State or Prov.	Federal	Tribal
							Percent						
Self-sustaining fish populations are the most economical management alternative.													
Agree	74.6	72.5	80.1	78.9	65.9	77.1	69.0	61.4	75.6	85.0	78.3	79.8	81.0
Neutral	10.8	11.2	9.7	9.1	14.2	10.4	16.4	13.6	9.6	8.3	9.2	9.5	4.8
Disagree	9.2	11.0	4.9	9.1	9.3	8.1	9.1	20.5	11.9	3.9	10.1	7.7	4.8
No Opinion	5.4	5.3	5.3	2.9	10.6	4.4	5.5	4.5	2.9	2.8	2.4	3.0	9.4
Long-term management goals should not be pursued at expense of current benefits to anglers.													
Agree	15.0	16.3	11.8	13.9	17.3	13.7	21.8	29.5	16.0	9.8	17.4	7.2	9.5
Neutral	14.4	14.1	14.8	12.2	19.0	14.0	20.0	15.9	11.7	13.1	13.3	9.7	14.3
Disagree	68.5	67.2	72.1	72.6	60.1	71.1	54.6	54.6	70.8	76.0	67.8	81.9	76.2
No Opinion	2.1	2.4	1.3	1.3	3.6	1.2	3.6	0.0	1.5	1.1	1.5	1.2	0.0
Great Lakes fishery management should provide benefits to more people than anglers and associated industries.													
Agree	78.5	74.7	87.8	78.6	78.4	80.9	57.1	72.8	72.5	90.2	75.2	85.6	81.0
Neutral	11.6	12.8	8.3	11.6	11.2	11.0	26.8	4.5	14.0	7.1	11.8	10.2	19.0
Disagree	8.1	10.5	2.6	8.8	6.8	7.0	12.5	22.7	12.3	2.2	11.5	4.2	0.0
No Opinion	1.8	2.0	1.3	1.0	3.6	1.1	3.6	0.0	1.2	0.5	1.5	0.0	0.0
Fishery management should assign more priority to nonconsumptive fisheries-related values than consumptive values.													
Agree	28.0	25.9	33.2	24.4	36.0	29.5	21.4	15.9	21.0	30.7	18.3	36.8	23.8
Neutral	29.5	28.5	32.5	28.6	32.0	29.9	37.5	20.5	25.7	34.1	25.1	34.3	38.1
Disagree	38.8	41.4	32.5	44.7	25.9	38.0	35.7	61.3	50.4	34.1	53.9	27.1	38.1
No Opinion	3.7	4.2	1.8	2.3	6.1	2.6	5.4	2.3	2.9	1.1	2.7	1.8	0.0

Table 4-5   Managers' attitudes toward potential top priority for Great Lakes fishery management, overall, by country, and by support/oppose goal of lake trout rehabilitation.

Attitude Toward Great Lakes Fishery Management Issues	Overall	Country U.S.	Canada	Overall Goal of Lake Trout Rehabilitation Support	Neutral	Oppose
		Percent				
Self-reproducing/self-sustaining, native fish populations should be top priority for management.						
Agree	71.1	64.5	86.4	75.9	58.9	22.7
Neutral	10.8	12.3	7.0	9.6	25.0	9.1
Disagree	16.7	21.5	5.7	13.7	12.5	68.2
No Opinion	1.4	1.7	0.9	0.8	3.6	0.0
Non-native, self-sustaining fish populations should be top priority for management.						
Agree	7.7	7.9	7.0	3.8	14.3	56.9
Neutral	15.1	16.5	11.4	13.4	41.0	13.6
Disagree	75.0	73.0	80.3	81.3	41.1	29.5
No Opinion	2.2	2.6	1.3	1.5	3.6	0.0
Economic value of fish population should be top priority for management.						
Agree	15.7	18.5	9.2	13.4	28.6	37.2
Neutral	21.2	23.3	15.7	20.0	37.4	16.3
Disagree	61.7	56.7	73.8	66.0	30.4	44.2
No Opinion	1.4	1.5	1.3	0.6	3.6	2.3

Table 4-6. (Continued)

Attitude Toward Great Lakes Fishery Management Issues	Country			Agency Type		Overall Goal of Lake Trout Rehabilitation			Fisheries Agency		Fisheries Agency		
	Overall	U.S.	Canada	Fisheries	Env. Mgmt.	Support	Neutral	Oppose	U.S.	Canada	State or Prov.	Federal	Tribal
							Percent						

Lake trout rehabilitation should continue as long as no negative local or state economic impacts.

Agree	17.9	19.5	14.0	18.0	17.7	14.5	36.4	44.4	20.2	13.7	20.9	12.0	18.2
Neutral	20.1	20.3	20.1	19.5	21.7	20.0	29.1	15.6	17.6	23.1	20.3	17.5	22.7
Disagree	55.1	53.6	58.0	57.2	50.2	60.3	21.8	33.3	56.7	58.3	53.2	65.7	54.6
No Opinion	6.9	6.6	7.9	5.3	10.4	5.2	12.7	6.7	5.5	4.9	5.6	4.8	4.5

Given harvest demand of anglers, a self-sustaining population of lake trout will never meet demand.

Agree	29.2	30.3	27.2	33.1	21.5	28.4	25.5	55.5	34.5	30.3	36.6	27.4	22.7
Neutral	19.1	19.4	18.3	17.6	22.3	19.4	21.8	15.6	18.6	15.7	14.6	23.2	22.7
Disagree	38.4	37.8	38.9	42.0	30.0	41.5	27.2	13.3	42.2	41.6	42.8	38.4	54.6
No Opinion	13.3	12.5	15.6	7.3	26.2	10.7	25.5	15.6	4.7	12.4	6.0	11.0	0.0

Fisheries managers should manage expectations of anglers rather than meeting demand through artificial stocking.

Agree	74.2	68.8	87.3	76.6	69.2	76.4	58.2	66.7	68.3	92.4	72.7	83.8	81.9
Neutral	12.6	14.9	7.0	11.3	15.2	12.1	18.2	17.8	14.7	4.9	12.9	8.4	9.1
Disagree	9.2	11.6	3.5	9.6	8.4	8.8	14.5	11.1	13.8	1.6	12.6	4.2	4.5
No Opinion	4.0	4.7	2.2	2.5	7.2	2.7	9.1	4.4	3.2	1.1	1.8	3.6	4.5

Table 4-6. (Continued)

Attitudes Toward Great Lakes Fishery Management Issues	Country			Agency Type		Overall Goal of Lake Trout Rehabilitation			Fisheries Agency		Fisheries Agency		
	Overall	U.S.	Canada	Fisheries	Env. Mgmt.	Support	Neutral	Oppose	U.S.	Canada	State or Prov.	Federal	Tribal
						Percent							
Management resources should not be devoted to endangered or threatened species at the expense of economically value species.													
Agree	15.6	14.8	17.9	15.4	16.3	14.2	25.0	29.5	14.9	16.4	18.3	10.2	9.5
Neutral	16.4	16.1	17.0	18.1	12.6	16.0	19.6	15.9	18.7	16.9	18.3	15.7	33.3
Disagree	66.2	66.9	64.2	65.2	68.3	68.7	53.6	52.3	64.6	66.2	61.6	74.1	52.4
No Opinion	1.8	2.2	0.9	1.3	2.8	1.1	1.8	2.3	1.8	0.5	1.8	0.0	4.8
Great Lakes is no longer a natural ecosystem.													
Agree	53.7	54.4	51.0	55.5	49.0	52.5	55.4	74.9	58.2	50.5	58.4	51.8	38.1
Neutral	11.6	10.8	13.7	10.9	13.4	12.2	14.3	2.3	9.6	13.2	10.4	11.4	14.3
Disagree	32.5	32.4	33.5	32.1	34.0	34.2	23.2	20.5	30.4	35.2	30.0	34.3	47.6
No Opinion	2.2	2.4	1.8	1.5	3.6	1.1	7.1	2.3	1.8	1.1	1.2	2.4	0.0
Maintenance of fish stocks through artificial propagation is a viable long-term solution to degraded fish communities.													
Agree	31.2	36.5	18.8	32.5	28.8	29.0	36.4	57.8	41.3	15.9	37.0	22.9	36.4
Neutral	17.4	18.2	14.8	15.7	20.4	16.9	30.9	11.1	16.4	14.3	14.4	16.3	31.8
Disagree	48.7	42.0	65.1	50.1	46.0	52.6	29.1	28.9	40.3	68.8	47.4	57.8	31.8
No Opinion	2.7	3.3	1.3	1.7	4.8	1.5	3.6	2.2	2.0	1.1	1.2	3.0	0.0
Increased threat to public health from toxics is severe enough to cancel lake trout rehabilitation program.													
Agree	5.8	5.5	6.6	5.9	5.6	3.9	12.7	26.7	6.1	5.5	6.7	4.2	4.6
Neutral	6.1	6.2	6.1	5.7	7.2	4.2	20.0	15.6	5.2	6.6	6.5	4.2	4.5
Disagree	84.6	84.7	84.2	85.7	82.0	89.5	58.2	57.7	85.8	85.7	83.9	89.2	90.9
No Opinion	3.5	3.6	3.1	2.7	5.2	2.4	9.1	0.0	2.9	2.2	2.9	2.4	0.0

Table 4-7. (Continued)

				Lake Trout Management Should:			
	% checking	Overall Goal of Lake Trout Rehabilitation			Be	Maintain	Self-sustaining Pop. With	Self-sustaining Pop. With No Concern for
Respondent Characteristics	category	Support	Neutral	Oppose	Abandoned	Stocking	Harvest	Harvest
					Percent			
Education Emphasis								
Fishery biologist	50.5	86.2	5.5	8.3*	2.4	11.6	76.5	9.5
Fishery Management	31.4	86.8	3.7	9.5*	2.5	11.4	76.8	9.3
Aquatic Ecology	36.0	89.0	4.4	6.6*	1.5	5.9	78.6	14.0*
Wetland Ecology	4.4	85.3	5.9	8.8	0.0	6.1	72.7	21.2
Land-use Management	6.7	90.2	2.0	7.8	2.0	8.2	81.6	8.2
Environ. Engineering	6.9	75.0	23.1	1.9*	0.0	13.7	70.6	15.7
Policy-oriented	4.2	90.6	6.3	3.1	0.0	3.1	84.4	12.5
Water Quality	16.0	84.1	9.2	6.7	0.8	7.6	74.0	17.6
Chemistry	12.4	85.9	9.8	4.3	0.0	12.1	73.6	14.3
Toxicology	7.7	86.4	8.5	5.1	0.0	3.4	83.0	13.6
Other	19.3	90.2	3.5	6.3	2.8	7.6	79.3	10.3

*Statistically significant difference between those with that educational emphasis versus those without that emphasis at $P \leq .05$ using Chi-square test.

Table 4-7. Managers' position in agency, type of work, and educational areas, by their support or opposition for the goal of lake trout rehabilitation, and by their beliefs about the appropriate future direction of lake trout management in the Great Lakes.

Respondent Characteristics	Overall % of resp.	Overall Goal of Lake Trout Rehabilitation			Lake Trout Management Should:			
		Support	Neutral	Oppose	Be Abandoned	Maintain Stocking	Strive for Self-sustaining Pop. With Harvest	Strive for Self-sustaining Pop. With No Concern for Harvest
					Percent			
Position in Agency								
Agency/bureau director	3.6	92.6	7.4	0.0	0.0	14.8	74.1	11.1
Program director	9.9	86.4	6.8	6.8	0.0	12.2	74.3	13.5
Regional manager	5.2	90.2	4.9	4.9	0.0	7.7	87.2	5.1
Regional scientist	24.9	88.0	7.3	4.7	0.5	7.4	82.0	10.1
Local manager	8.5	91.0	4.5	4.5	1.5	10.6	78.8	9.1
Local scientist	17.3	82.6	7.6	9.8	3.0	10.5	74.5	12.0
Technician	14.4	85.3	6.4	8.3	4.5	10.9	71.9	12.7
Other position	16.2	85.5	11.3	3.2	1.6	12.9	72.6	12.9
Types of Work Done	% checking category							
Administration	28.3	88.2	6.8	5.0	0.9	7.4	82.0	9.7
Research/Assessment	55.9	87.8	6.8	5.4	1.6	7.7	79.2	11.5
Management	36.3	86.0	7.2	6.8	2.6	11.3	76.2	9.9
Hatchery	11.4	86.5	10.1	3.4	1.1	18.0	70.8	10.1
Advisory	13.5	89.5	6.7	3.8	1.0	5.8	83.6	9.6
Educational	11.6	89.9	4.5	5.6	3.4	4.6	80.5	11.5
Policy	18.8	90.4	4.8	4.8	0.7	7.7	80.4	11.2

Table 4-9. Managers' beliefs about the appropriate future direction for lake trout management in the Great Lakes according to the lake or group of lakes focused on in their jobs.

				Lake Focus in Job					
Lake Trout Management Should:	No Specific Focus (n=227)	Lake Superior Only (n=82)	Lake Michigan Only (n=86)	Lake Huron Only (n=33)	Lake Erie Only (n=68)	Lake Ontario Only (n=75) Percent	Upper Great Lakes (Sup., Mich., Huron) (n=30)	Lower Great Lakes (Ont., Erie) (n=38)	Canadian Great Lakes (no Mich.) (n=35)
Be Abandoned in Favor or Other Species	2.3	3.7	1.2	0.0	1.5	4.3	0.0	0.0	0.0
Maintain Stocking for Harvest	9.0	4.9	14.5	12.5	9.0	7.2	24.1	10.8	2.9
Strive for Self-sustaining Population With Some Harvest	77.0	86.5	69.8	87.5	74.6	78.4	69.0	81.1	73.6
Strive for Self-sustaining Population With No Concern for Harvest	11.7	4.9	14.5	0.0	14.9	10.1	6.9	8.1	23.5

Table 4-8. Managers' attitudes toward lake trout rehabilitation in each of the Great Lakes, overall and by country..

Support/Oppose Lake Trout Rehabilitation	Overall	Country	
		U.S.	Canada
		Percent	
Overall			
Support	86.6	85.7	88.6
Neutral	7.5	8.2	6.1
Oppose	5.9	6.1	5.3
For Lake Superior			
Support	91.4	90.7	92.9
Neutral	5.9	6.7	4.0
Oppose	2.7	2.6	3.1
For Lake Michigan			
Support	79.1	80.3	75.8
Neutral	14.1	11.9	19.9
Oppose	6.8	7.8	4.3
For Lake Huron			
Support	84.8	81.9	91.2
Neutral	10.1	12.1	5.7
Oppose	5.1	6.0	3.1
For Lake Erie			
Support	56.0	60.2	45.9
Neutral	21.2	20.8	21.8
Oppose	22.8	19.0	32.3
For Lake Ontario			
Support	72.9	72.2	74.2
Neutral	15.7	18.0	10.7
Oppose	11.4	9.8	15.1

Table 4-11. Perceived difficulty of achieving the goal of lake trout
rehabilitation for each lake, by managers' support or opposition
for the goal for each lake.

Difficulty of Achieving Goal	Support/Oppose Lake Trout Rehabilitation by Lake		
	Support	Neutral Percent	Oppose
Lake Superior			
Very Easy to Easy	49.1	7.5	21.1
Neither Easy Nor Difficult	21.4	20.0	31.5
Difficult to Impossible	15.6	7.5	31.6
No Opinion	13.9	65.0	15.8
Lake Michigan			
Very Easy to Easy	4.2	2.0	2.1
Neither Easy Nor Difficult	19.0	9.2	0.0
Difficult to Impossible	56.3	39.8	87.3
No Opinion	20.5	49.0	10.6
Lake Huron			
Very Easy to Easy	11.1	4.3	0.0
Neither Easy Nor Difficult	30.0	12.9	11.4
Difficult to Impossible	38.5	30.0	71.5
No Opinion	20.4	52.8	17.1
Lake Erie			
Very Easy to Easy	1.8	2.0	0.0
Neither Easy Nor Difficult	10.6	3.4	1.2
Difficult to Impossible	57.4	57.2	90.7
No Opinion	30.2	37.4	8.1
Lake Ontario			
Very Easy to Easy	3.6	1.9	0.0
Neither Easy Nor Difficult	14.1	12.3	6.3
Difficult to Impossible	60.0	40.6	83.6
No Opinion	22.3	45.2	10.1

Table 4-10. Managers' adoption of world views, by support or opposition to the goal of lake trout rehabilitation, and by beliefs about the appropriate future direction of lake trout management.

Values	Overall Goal of Lake Trout Rehabilitation			Lake Trout Management Should:			
	Support	Neutral	Oppose	Be Abandoned	Maintain Stocking	Strive for Self-sustaining Pop. With Harvest	Strive for Self-sustaining Pop. With No Concern for Harvest
				Mean[a]			
New Environmental Paradigm Scale	1.7	1.9	1.7	1.8	1.9	1.7	1.6
Natural To Artificial World View	3.0	3.6	3.8	3.6	4.1	3.0	2.7
Ecological to Utilitarian World View	3.1	3.9	4.1	4.3	4.4	3.1	2.6

Table 4-13. Perceived importance of possible barriers to lake trout
rehabilitation in Lake Michigan—overall, by managers who support
rehabilitation, and by managers believing the goal will be
difficult to impossible to achieve.

Barriers to Lake Trout Rehabilitation	Lake Michigan		
	Overall Mean	Support Goal Importance	If Goal Is Difficult to Impossible to Barrier[a]
Tribal fisheries harvest	3.5	3.4	3.5
Lack of ability to control sea lampreys	3.4	3.3	3.4
Inadequate biological knowledge	3.5	3.5	3.6
Lack of agency resources/too expensive	3.3	3.3	3.4
Inadequate enforcement	3.0	3.0	3.0
Unrealistic user expectations	3.4	3.4	3.5
Inadequate environmental regulations	3.3	3.4	3.3
High angler harvest	3.8	3.7	3.9
Lack of interagency coordination	3.0	3.0	3.0
Illegal harvest	2.9	2.9	2.9
Lack of public support for goal	3.4	3.3	3.4
Inadequate agency commitment to goal	3.2	3.2	3.3
Loss of lake trout genetic variability	3.6	3.6	3.7
Inadequate fisheries regulations	2.8	2.8	2.8
Predation on young lake trout	3.2	3.2	3.1
Inadequate acceptance of regulations	2.7	2.7	2.7
Inadequate spawning	3.7	3.7	3.8
Inadequate use of socio-economic information	2.5	2.5	2.4
Inadequate socio-economic knowledge	2.5	2.5	2.5
Human health problems caused by contaminants	3.4	3.5	3.4
Inadequate fry survival	3.8	3.9	3.9
Fish-health problems caused by contaminants	3.6	3.7	3.6
Too much emphasis on stocking yearlings	2.5	2.5	2.4
Inadequate egg viability	3.5	3.6	3.6
Lack of adequate forage base	2.6	2.6	2.5
Fish diseases	2.8	2.8	2.8
Mortality of angler-released lake trout	2.3	2.3	2.3
Lack of suitable habitat	3.0	3.0	3.0
Inadequate hatchery capabilities	2.3	2.3	2.3

[a]Mean importance of barrier was rated on a scale where 1 = not important to 5
= very important.

Table 4-12. Perceived importance of possible barriers to lake trout rehabilitation in Lake Superior—overall, by managers who support rehabilitation, and by managers believing the goal will be difficult to impossible to achieve.

Barriers to Lake Trout Rehabilitation	Lake Superior		
	Overall Mean	Support Goal Importance	If Goal Is Difficult to Impossible to Barrier[a]
Tribal fisheries harvest	3.4	3.4	3.5
Lack of ability to control sea lampreys	3.2	3.2	3.7
Inadequate biological knowledge	3.2	3.2	3.5
Lack of agency resources/too expensive	3.1	3.1	3.3
Inadequate enforcement	2.9	2.9	3.1
Unrealistic user expectations	2.8	2.9	3.3
Inadequate environmental regulations	2.8	2.8	3.1
High angler harvest	2.8	2.8	3.3
Lack of interagency coordination	2.8	2.8	3.2
Illegal harvest	2.8	2.8	3.1
Lack of public support for goal	2.7	2.7	3.1
Inadequate agency commitment to goal	2.7	2.7	3.0
Loss of lake trout genetic variability	2.7	2.7	3.2
Inadequate fisheries regulations	2.6	2.6	3.0
Predation on young lake trout	2.5	2.5	3.2
Inadequate acceptance of regulations	2.5	2.5	2.9
Inadequate spawning	2.5	2.5	3.2
Inadequate use of socio-economic information	2.5	2.4	2.9
Inadequate socio-economic knowledge	2.4	2.4	2.8
Human health problems caused by contaminants	2.4	2.4	2.7
Inadequate fry survival	2.4	2.4	3.2
Fish-health problems caused by contaminants	2.4	2.4	2.8
Too much emphasis on stocking yearlings	2.3	2.3	2.4
Inadequate egg viability	2.3	2.2	3.0
Lack of adequate forage base	2.2	2.2	2.5
Fish diseases	2.2	2.2	2.6
Mortality of angler-released lake trout	2.0	2.0	2.5
Lack of suitable habitat	2.0	1.9	2.4
Inadequate hatchery capabilities	1.9	1.9	2.2

[a]Mean importance of barrier was rated on a scale where 1 = not important to 5 = very important.

Table 4-15. Perceived importance of possible barriers to lake trout rehabilitation in Lake Erie—overall, by managers who support rehabilitation, and by managers believing the goal will be difficult to impossible to achieve.

Barriers to Lake Trout Rehabilitation	Lake Erie			
	Overall	Support Goal	Oppose Goal	If Goal Is Difficult to Impossible
	Mean Importance to Barrier[a]			
Tribal fisheries harvest	1.7	1.8	1.7	1.7
Lack of ability to control sea lampreys	2.8	2.9	2.7	2.7
Inadequate biological knowledge	3.3	3.2	3.1	3.3
Lack of agency resources/too expensive	3.2	3.2	3.3	3.2
Inadequate enforcement	2.9	2.9	2.8	2.8
Unrealistic user expectations	2.9	2.8	2.8	2.9
Inadequate environmental regulations	3.3	3.3	3.3	3.3
High angler harvest	3.1	3.1	2.9	3.1
Lack of interagency coordination	2.9	2.9	2.9	2.9
Illegal harvest	2.5	2.6	2.4	2.5
Lack of public support for goal	3.0	2.9	3.1	3.0
Inadequate agency commitment to goal	3.1	3.1	2.9	3.1
Loss of lake trout genetic variability	3.5	3.4	3.7	3.6
Inadequate fisheries regulations	2.3	2.3	2.2	2.3
Predation on young lake trout	3.1	3.0	3.3	3.1
Inadequate acceptance of regulations	2.3	2.3	2.2	2.3
Inadequate spawning	3.8	3.8	4.0	3.9
Inadequate use of socio-economic information	2.5	2.5	2.4	2.4
Inadequate socio-economic knowledge	2.6	2.6	2.5	2.5
Human health problems caused by contaminants	3.0	3.0	3.1	3.1
Inadequate fry survival	3.7	3.6	3.9	3.7
Fish-health problems caused by contaminants	3.1	3.2	2.9	3.1
Too much emphasis on stocking yearlings	2.4	2.5	2.3	2.4
Inadequate egg viability	3.4	3.3	3.4	3.5
Lack of adequate forage base	2.5	2.5	2.3	2.4
Fish diseases	2.3	2.4	2.1	2.2
Mortality of angler-released lake trout	2.1	2.2	2.0	2.1
Lack of suitable habitat	3.7	3.5	4.1	3.9
Inadequate hatchery capabilities	2.2	2.3	2.0	2.2

[a]Mean importance of barrier was rated on a scale where 1 = not important to 5 = very important.

Table 4-14. Perceived importance of possible barriers to lake trout
rehabilitation in Lake Huron—overall, by managers who support
rehabilitation, and by managers believing the goal will be
difficult to impossible to achieve.

Barriers to Lake Trout Rehabilitation	Lake Huron		
	Overall Mean	Support Goal Importance	If Goal Is Difficult to Impossible to Barrier[a]
Tribal fisheries harvest	3.5	3.5	3.8
Lack of ability to control sea lampreys	3.9	3.9	4.2
Inadequate biological knowledge	3.4	3.5	3.5
Lack of agency resources/too expensive	3.4	3.4	3.5
Inadequate enforcement	3.0	3.0	3.0
Unrealistic user expectations	3.2	3.2	3.4
Inadequate environmental regulations	3.0	3.0	3.1
High angler harvest	3.3	3.3	3.4
Lack of interagency coordination	2.9	2.9	3.0
Illegal harvest	2.8	2.8	2.7
Lack of public support for goal	3.0	3.0	3.2
Inadequate agency commitment to goal	3.1	3.1	3.1
Loss of lake trout genetic variability	3.3	3.4	3.5
Inadequate fisheries regulations	2.6	2.6	2.7
Predation on young lake trout	2.9	2.9	3.0
Inadequate acceptance of regulations	2.6	2.5	2.7
Inadequate spawning	3.3	3.3	3.5
Inadequate use of socio-economic information	2.5	2.5	2.5
Inadequate socio-economic knowledge	2.6	2.6	2.6
Human health problems caused by contaminants	2.7	2.6	2.7
Inadequate fry survival	3.2	3.2	3.3
Fish-health problems caused by contaminants	2.6	2.7	2.8
Too much emphasis on stocking yearlings	2.5	2.5	2.5
Inadequate egg viability	2.8	2.8	3.0
Lack of adequate forage base	2.3	2.2	2.3
Fish diseases	2.3	2.3	2.4
Mortality of angler-released lake trout	2.0	2.0	2.1
Lack of suitable habitat	2.4	2.3	2.4
Inadequate hatchery capabilities	2.2	2.1	2.3

[a]Mean importance of barrier was rated on a scale where 1 = not important to 5
= very important.

Table 4-17. Managers' perceptions of the level of priority that should be assigned to the views of each of the possible stakeholders—overall, by country, and by agency type.

Possible Stakeholders	Overall	Country		Agency Type		Fisheries Agency	
		U.S.	Canada	Fisheries	Envt. Mgmt.	U.S.	Canada
Province or state fishery agency	4.2	4.2	4.3	4.3	4.1	4.3	4.4
Great Lakes Fishery Commission	4.1	4.0	4.3	4.1	4.0	4.0	4.4
Dept. Fisheries & Oceans Canada	4.0	4.0	4.0	4.0	4.0	4.1	3.9
U.S. Fish & Wildlife Service	4.0	3.9	4.1	3.9	4.1	3.9	4.0
Province or state env. agency	3.8	3.7	3.9	3.7	4.0	3.6	3.8
Environment Canada	3.6	3.6	3.6	3.5	3.8	3.6	3.5
International Joint Commission	3.6	3.5	3.8	3.6	3.6	3.5	3.8
U.S. EPA	3.5	3.4	3.7	3.4	3.8	3.3	3.6
Agency-appointed advisory groups	3.4	3.4	3.7	3.5	3.3	3.4	3.7
Great Lakes Commission	3.4	3.3	3.5	3.4	3.3	3.3	3.5
Angling public	3.3	3.3	3.2	3.3	3.3	3.4	3.2
Fish-consuming public	3.3	3.3	3.3	3.2	3.4	3.2	3.3
Tribal governments	3.3	3.2	3.4	3.3	3.3	3.2	3.4
Concerned citizens	3.2	3.2	3.3	3.2	3.2	3.1	3.3
Stakeholders whose income is related to Great Lakes fisheries	3.1	3.1	3.3	3.1	3.2	3.0	3.3
Environmental groups related to Great Lakes	3.1	3.1	3.3	3.1	3.3	2.9	3.3
Council of Great Lakes Governors	3.1	3.0	3.3	3.1	3.1	2.9	3.4
Sportsmen's associations	3.0	3.0	3.1	3.0	3.1	3.0	3.1
Commercial fishermen's associations	2.8	2.7	3.1	2.8	2.8	2.7	3.0
Charterboat associations	2.7	2.7	2.8	2.7	2.7	2.7	2.8
Local legislators	2.5	2.4	2.7	2.4	2.5	2.3	2.7

[a]Priority level was measured on a scale where 1 = very low to 5 = very high.

Table 4-16. Perceived importance of possible barriers to lake trout rehabilitation in Lake Ontario—overall, by managers who support rehabilitation, and by managers believing the goal will be difficult to impossible to achieve.

Barriers to Lake Trout Rehabilitation	Lake Ontario			
	Overall	Support Goal	Oppose Goal	If Goal Is Difficult to Impossible
	Mean Importance to Barrier[a]			
Tribal fisheries harvest	1.9	1.8	2.2	1.9
Lack of ability to control sea lampreys	3.2	3.1	3.1	3.1
Inadequate biological knowledge	3.5	3.6	3.4	3.7
Lack of agency resources/too expensive	3.4	3.3	3.5	3.4
Inadequate enforcement	3.0	3.0	3.0	2.9
Unrealistic user expectations	3.4	3.4	3.5	3.5
Inadequate environmental regulations	3.5	3.5	3.5	3.6
High angler harvest	3.5	3.5	3.6	3.5
Lack of interagency coordination	2.8	2.7	3.4	2.8
Illegal harvest	2.5	2.5	3.1	2.5
Lack of public support for goal	3.3	3.3	3.3	3.4
Inadequate agency commitment to goal	3.0	2.9	2.8	3.0
Loss of lake trout genetic variability	3.6	3.6	3.3	3.7
Inadequate fisheries regulations	2.4	2.4	2.5	2.5
Predation on young lake trout	3.3	3.2	3.5	3.3
Inadequate acceptance of regulations	2.6	2.6	2.8	2.6
Inadequate spawning	3.6	3.7	3.4	3.7
Inadequate use of socio-economic information	2.5	2.4	2.8	2.4
Inadequate socio-economic knowledge	2.5	2.5	3.0	2.6
Human health problems caused by contaminants	3.6	3.6	4.1	3.7
Inadequate fry survival	3.9	4.0	4.0	4.0
Fish-health problems caused by contaminants	3.6	3.5	3.6	3.7
Too much emphasis on stocking yearlings	2.6	2.5	2.5	2.6
Inadequate egg viability	3.5	3.5	3.4	3.5
Lack of adequate forage base	2.8	2.8	2.8	2.9
Fish diseases	2.4	2.3	2.3	2.4
Mortality of angler-released lake trout	2.3	2.2	2.7	2.3
Lack of suitable habitat	3.3	3.3	3.5	3.5
Inadequate hatchery capabilities	2.2	2.2	2.1	2.2

[a]Mean importance of barrier was rated on a scale where 1 = not important to 5 = very important.

Table 4-19. Managers' perceptions of attitudes of other stakeholders—overall, by country and agency type.

Managers' Perceptions of Attitudes of Other Stakeholders	Overall	Country		Agency Type	
		U.S.	Canada	Fisheries	Environmental Management
		Percent			
Environmentalists within non-fishing public want fisheries management to move away from stocking.					
Agree	44.6	45.2	44.0	48.2	37.7
Neutral	22.8	22.0	24.5	22.0	24.3
Disagree	11.6	14.1	5.7	12.0	10.9
No Opinion	21.0	18.7	25.8	17.8	27.1
Anglers who fish Great Lakes are not willing to accept year-to-year fluctuations of a naturally sustained fishery.					
Agree	42.4	45.5	35.8	47.1	33.3
Neutral	12.4	11.7	13.5	12.1	12.4
Disagree	36.2	35.0	39.3	37.2	34.2
No Opinion	9.0	7.8	11.4	3.6	20.1
Anglers who fish Great Lakes are not willing to accept restrictive regulations necessary for lake trout rehabilitation.					
Agree	30.9	33.1	25.8	33.0	27.0
Neutral	12.4	11.2	15.3	13.4	10.1
Disagree	47.6	47.1	48.9	49.6	43.1
No Opinion	9.1	8.6	10.0	4.0	19.8
Anglers prefer native lake trout over exotic salmonids.					
Agree	7.6	8.4	5.7	6.8	9.3
Neutral	17.6	17.0	18.8	13.4	26.2
Disagree	58.8	59.2	58.5	70.9	33.9
No Opinion	16.0	15.4	17.0	8.9	30.6

Table 4-18. Managers' perceptions of the strength of support/opposition for the goal of lake trout rehabilitation among possible stakeholders, compared with the perceived priority that should be assigned to each stakeholder's views.

Possible Stakeholders	Perceived Support/Opposition for Goal of Lake Trout Rehabilitation			
	Overall	High Priority Given to Their Views	Moderate Priority Given to Their Views	Low Priority Given to Their Views
			Mean[a]	
Province or state fishery agency	2.0	2.0	2.2	2.9
Great Lakes Fishery Commission	1.5	1.5	1.7	1.4
Dept. Fisheries & Oceans Canada	1.9	1.8	2.2	2.2
U.S. Fish & Wildlife Service	1.6	1.6	1.7	1.5
Province or state environmental agency	2.4	2.2	2.5	2.8
Environment Canada	2.3	2.1	2.5	2.4
International Joint Commission	2.0	1.9	2.3	2.2
U.S. EPA	2.4	2.2	2.6	2.4
Agency-appointed advisory groups	2.4	2.3	2.5	2.6
Great Lakes Commission	2.2	2.0	2.4	2.5
Angling public	2.6	2.5	2.6	2.7
Fish-consuming public	2.7	2.6	2.7	2.9
Tribal governments	2.3	2.0	2.5	2.6
Concerned citizens	2.6	2.4	2.6	2.8
Stakeholders whose income is related to Great Lakes fisheries	2.6	2.5	2.5	2.8
Environmental groups related to Great Lakes	2.2	1.9	2.2	2.5
Council of Great Lakes Governors	2.6	2.3	2.8	2.8
Sportsmen's associations	2.6	2.6	2.6	2.7
Commercial fishermen's associations	2.7	2.6	2.7	2.8
Charterboat associations	2.8	2.6	2.8	2.8
Local legislators	3.0	2.7	2.9	3.1

[a]Support/opposition was measured on a scale where 1 = strongly support to 5 = strongly oppose.

Appendix 5: Research Instrument for Other Stakeholders

Table 4-20. Respondents' perceptions of attitudes of other stakeholders by the lake or lakes managers focus on in job duties.

Managers' Perceptions of Attitudes of Other Stakeholders	Lake Focus in Job								
	No Specific Focus	Lake Superior Only	Lake Michigan Only	Lake Huron Only	Lake Erie Only	Lake Ontario Only	Upper Great Lakes (Sup., Mich., Huron)	Lower Great Lakes (Ont., Erie)	Canadian Great Lakes (no Mich.)
						Percent			
Environmentalists within non-fishing public want fisheries management to move away from stocking.									
Agree	40.2	50.7	40.0	43.8	31.3	50.0	34.6	60.5	55.9
Neutral	22.3	18.5	21.2	25.0	14.9	27.0	31.0	15.8	23.5
Disagree	9.4	14.8	20.0	15.6	13.4	2.7	17.2	5.3	8.8
No Opinion	28.1	16.0	18.8	15.6	40.4	20.3	17.2	18.4	11.8
Anglers who fish Great Lakes are not willing to accept year-to-year fluctuations of a naturally sustained fishery.									
Agree	36.9	39.0	51.7	45.5	44.1	44.6	43.3	65.8	38.2
Neutral	13.3	14.6	11.8	24.2	11.8	10.8	6.7	2.6	14.7
Disagree	32.0	42.7	30.6	27.3	38.2	35.1	50.0	23.7	41.2
No Opinion	17.8	3.7	5.9	3.0	5.9	9.5	0.0	7.9	5.9
Anglers who fish Great Lakes are not willing to accept restrictive regulations necessary for lake trout rehabilitation.									
Agree	28.0	19.5	37.6	42.4	26.5	37.0	43.4	36.8	23.5
Neutral	10.2	7.3	15.3	9.1	14.7	17.8	13.3	21.1	11.8
Disagree	43.6	70.8	41.2	45.5	54.4	32.9	43.3	36.8	58.8
No Opinion	18.2	2.4	5.9	3.0	4.4	12.3	0.0	5.3	5.9
Anglers prefer native lake trout over exotic salmonids.									
Agree	7.6	13.4	5.9	0.0	14.7	5.5	6.7	5.3	2.9
Neutral	21.4	20.7	11.8	21.2	13.2	12.3	20.0	15.8	23.5
Disagree	46.9	58.6	69.4	72.7	53.0	65.8	70.0	68.4	56.0
No Opinion	24.1	7.3	12.9	6.1	19.1	16.4	3.3	10.5	17.6

Public Opinion Survey on
Lake Trout Rehabilitation in the Great Lakes

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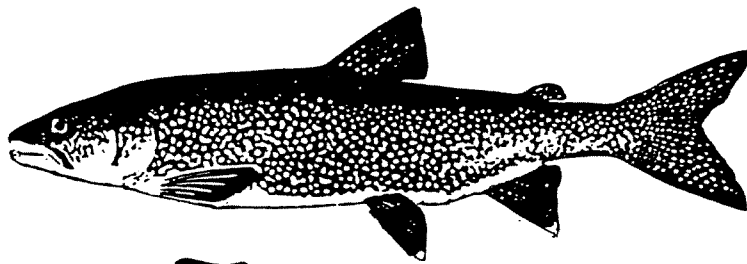
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ABOUT THIS QUESTIONNAIRE

This survey is being conducted by *(list sponsor)*. The questionnaire measures your attitudes and opinions about the rehabilitation of self-sustaining lake trout populations in the Great Lakes. This information will be used to characterize the views of people like you and others related to managing lake front in the Great Lakes.

DIRECTIONS FOR FILLING OUT THE QUESTIONNAIRE

- *Please try to answer what you believe to be true for you. The best answer is the one which most closely reflects your own feelings and beliefs.*

- *We are interested in hearing from EVERYONE who receives this questionnaire. Call (contact person and phone number) if you have any questions.*

- *Do not write your name on the questionnaire.*

- *Your answers will be treated confidentially. The questionnaire has an identification number so that your name can be checked off our list when you return your questionnaire so that we do not bother you with additional mailings or telephone calls. Your name will never be associated with the information you provide.*

- *Please return the questionnaire using the addressed, pre-paid return envelope provided.*

THANK YOU FOR YOUR COOPERATION!
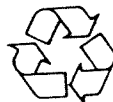
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3. **Which statement best reflects how you personally feel about lake trout management in the Great Lakes?** *(Check one.)*

☐ a. Lake trout management should be abandoned altogether (i.e., all management efforts should be directed towards other species).

☐ b. Lake trout management should be conducted as an ongoing program of stocking fish to maintain harvest opportunities.

☐ c. Lake trout management should strive for self-sustaining populations that could withstand some harvest.

☐ d. Lake trout management should strive for self-sustaining populations, but need not be concerned with providing harvest opportunities.

IF YOU CHECKED (c) or (d): How many more years should be devoted to trying to attain self-sustaining lake trout populations (beyond the time already spent), before stopping the program?

_____ YEARS

☐ **Check here if you believe the program should be continued as long as it takes to attain self-sustaining lake trout populations.**

4. **How difficult do you think it will be to achieve the goal of lake trout rehabilitation (restoring self-sustaining lake trout populations able to support some human harvest) for the Great Lakes? See the definitions in the box below.** *Circle one number for each lake.*

> **VERY EASY:** the current level of effort will reach the goal in a few more years.
>
> **IMPOSSIBLE:** The effort to reach the goal would be so great that it would never be achieved.

	Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult	Impossible	No Opinion
Lake Superior	1	2	3	4	5	6	7
Lake Michigan	1	2	3	4	5	6	7
Lake Huron	1	2	3	4	5	6	7
Lake Erie	1	2	3	4	5	6	7
Lake Ontario	1	2	3	4	5	6	7

> Throughout this questionnaire, "lake trout rehabilitation" refers to restoring self-sustaining lake trout populations able to support some harvest. Self-sustaining populations are able to maintain adequate abundance from one generation to the next with no stocking.

1. Overall, how strongly do you **personally** support or oppose the goal of lake trout rehabilitation for the Great Lakes? *(Circle one number.)*

1	2	3	4	5	6	7	8
Strongly Support			Neutral			Strongly Oppose	Undecided

2. Does your level of support or opposition vary by Lake? *(Check one.)*

☐ NO   **SKIP TO QUESTION 3**
☐ YES   Please answer the following question for <u>each</u> Lake

How strongly do you **personally** support or oppose the goal of lake trout rehabilitation for: *(please circle one number for each lake)*

LAKE SUPERIOR?

1	2	3	4	5	6	7	8
Strongly Support			Neutral			Strongly Oppose	Undecided

LAKE MICHIGAN?

1	2	3	4	5	6	7	8
Strongly Support			Neutral			Strongly Oppose	Undecided

LAKE HURON?

1	2	3	4	5	6	7	8
Strongly Support			Neutral			Strongly Oppose	Undecided

LAKE ERIE?

1	2	3	4	5	6	7	8
Strongly Support			Neutral			Strongly Oppose	Undecided

LAKE ONTARIO?

1	2	3	4	5	6	7	8
Strongly Support			Neutral			Strongly Oppose	Undecided

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Opinion
k)	Anglers who fish the Great Lakes are not willing to accept the normal year-to-year fluctuations of a naturally sustained fishery..	1	2	3	4	5	6
l)	Anglers who fish the Great Lakes are not willing to accept the restrictive regulations necessary for lake trout rehabilitation.......................................	1	2	3	4	5	6
m)	Maintenance of fish stocks through artificial propagation is a viable long-term solution to degraded fish communities..	1	2	3	4	5	6
n)	The increased threat to public health from toxics in the longer-lived lake trout is severe enough to justify cancellation of the lake trout rehabilitation program..........................	1	2	3	4	5	6
o)	Anglers prefer the native lake trout over the exotic salmonid species.................	1	2	3	4	5	6
p)	Lake trout rehabilitation should only continue as long as the program does not cause negative local or state economic impacts..........................	1	2	3	4	5	6
q)	Given the harvest demand of anglers, a self-sustaining population of lake trout will never meet the demand................	1	2	3	4	5	6
r)	Fisheries managers should try to influence expectations among anglers rather than try to meet the demand of anglers through artificial stocking methods...	1	2	3	4	5	6

5. How strongly do you personally agree or disagree with the following statements related to Great Lakes fisheries management? 1=Strongly Agree, 2=Agree, 3=Neither Agree Nor Disagree (Neutral), 4=Disagree, 5=Strongly Disagree, 6=No Opinion. *(Circle one number for each statement.)*

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Opinion
a) Self-reproducing/self-sustaining, <u>native</u> fish populations should be the top priority for management of the Great Lakes fisheries....................................	1	2	3	4	5	6
b) The economic value of a fish population should be the top consideration when assigning priorities for management of the Great Lakes fisheries.............................	1	2	3	4	5	6
c) Non-native species that can be self-sustaining should be considered more important than native species in assigning priority for management of the Great Lakes fisheries.............................	1	2	3	4	5	6
d) Self-sustaining fish populations are the most economical management alternative..	1	2	3	4	5	6
e) Long-term management goals should not be pursued at the expense of current benefits to anglers...	1	2	3	4	5	6
f) Great Lakes fishery management should provide benefits to more people than anglers and the fishery-related industries that support the anglers..............	1	2	3	4	5	6
g) Fishery management should assign more priority to nonconsumptive fisheries-related values than consumptive values......	1	2	3	4	5	6
h) Management resources should not be devoted to endangered or threatened species at the expense of economically valued species....	1	2	3	4	5	6
i) The Great Lakes is no longer a natural ecosystem...	1	2	3	4	5	6
j) Environmentalists within the non-fishing public want fisheries management to move away from stocking..	1	2	3	4	5	6

7. **Controversies involving Great Lakes fisheries management often reflect a central split in thinking about management resulting from two opposing world views. Where do you think your _personal_ philosophy about Great Lakes fishery management fits on this continuum between "_completely natural_" to "_completely artificial_" as defined in the box below?** _(Circle one number.)_

1	2	3	4	5	6	7
Completely Natural						Completely Artificial

COMPLETELY NATURAL: no introduced species, no stocking, management is achieved by controlling anglers (harvest) and protecting (restoring) habitat.

COMPLETELY ARTIFICIAL: a belief that exotic species might fit better with the system or provide more total benefits, such as filling an empty niche, that stocking can provide additional benefits (especially in degraded habitats), that managing the fisheries is like farming in which intensive technological inputs can achieve more benefits than a natural system.

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8. **A second split in thinking relates to the REASONS for management, namely ecological reasons vs. utilitarian reasons. Where do you think your _personal_ philosophy about Great Lakes fishery management fits on this continuum between "_ecological_" reasons and "_utilitarian_" reasons as described in the box below?** _(Circle one number.)_

1	2	3	4	5	6	7
Ecological						Utilitarian

ECOLOGICAL: management actions are primarily to maintain the ecosystem, not necessarily to benefit humans; humans are only part of the system; all species are considered important regardless of their value to humans.

UTILITARIAN: human needs and desires are given a top priority in any management actions, i.e., the purpose of maintaining a well-functioning ecosystem is to provide human benefits; emphasis is placed on species with high value to humans.

NOTE: Management actions and end results can be the same in each view—the difference is in the underlying reasons.

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6. **How much importance do you think fisheries managers should give to each of the following potential Great Lakes fishery management goals?** *(Circle one number for each goal.)*

Potential Fishery Management Goals	IMPORTANCE				
	NONE	SLIGHT	MODERATE	HIGH	VERY HIGH
a) Satisfying anglers............................	0	1	2	3	4
b) Providing economic benefits to local economies.............................	0	1	2	3	4
c) Providing economic benefits to state economies.............................	0	1	2	3	4
d) Protecting ecological diversity......	0	1	2	3	4
e) Providing economic benefits to commercial fisheries......................	0	1	2	3	4
f) Providing economic benefits to the charter boat industry...............	0	1	2	3	4
g) Providing edible fish to anglers....	0	1	2	3	4
h) Providing edible fish to the non-angling public.........................	0	1	2	3	4
i) Providing a diversity of game species for anglers.........................	0	1	2	3	4
j) Protecting endangered and threatened species.........................	0	1	2	3	4
k) Establishing self-sustaining native populations..........................	0	1	2	3	4
l) Establishing self-sustaining non-native populations..................	0	1	2	3	4
m) Re-establishing the native fish fauna in the Great Lakes...............	0	1	2	3	4
n) Establishing a self-regulating fish community in the Great Lakes......	0	1	2	3	4
o) Rehabilitation of self-sustaining lake trout populations able to support angler harvest..................	0	1	2	3	4

Possible Barriers to Lake Trout Rehabilitation	Not Important	Slightly Important	Moderately Important	Important	Very Important	No Opinion
m) Inadequate egg survival of lake trout.............................	1	2	3	4	5	6
n) Inadequate survival of newly-hatched lake trout..................	1	2	3	4	5	6
o) Predation on young lake trout..	1	2	3	4	5	6
p) Too much emphasis on stocking yearlings.............................	1	2	3	4	5	6
q) Lack of adequate food for lake trout..............................	1	2	3	4	5	6
r) Lack of ability to control sea lampreys.............................	1	2	3	4	5	6
s) Inadequate hatchery capabilities..........................	1	2	3	4	5	6
t) Fish diseases........................	1	2	3	4	5	6
u) Inadequate fisheries regulations...........................	1	2	3	4	5	6
v) Inadequate environmental regulations...........................	1	2	3	4	5	6
w) Inadequate enforcement of regulations.......................	1	2	3	4	5	6
x) Inadequate biological knowledge..........................	1	2	3	4	5	6
y) Inadequate socioeconomic knowledge..........................	1	2	3	4	5	6
z) Inadequate use of socio-economic information...........	1	2	3	4	5	6
aa) Lack of agency resources/too expensive............................	1	2	3	4	5	6
bb) Lack of interagency coordination........................	1	2	3	4	5	6
cc) Inadequate agency commitment to the goal of lake trout rehabilitation........................	1	2	3	4	5	6

9. **The following are possible barriers that may limit the ability to achieve the goal of lake trout rehabilitation. Please rate how important you think each reason is as a factor why lake trout rehabilitation could fail for one of the Great Lakes with which you are most familiar.**

Please indicate which Lake you are considering *(check one)*:

☐ Lake Superior; ☐ Lake Michigan; ☐ Lake Huron; ☐ Lake Erie; ☐ Lake Ontario.

Please circle one number for each item listed, thinking about the lake you checked (√) above.

Possible Barriers to *Lake Trout Rehabilitation*	Not Important	Slightly Important	Moderately Important	Important	Very Important	No Opinion
a) High angler harvest..................	1	2	3	4	5	6
b) Tribal fisheries harvest.............	1	2	3	4	5	6
c) Illegal harvest.........................	1	2	3	4	5	6
d) Death of lake trout released by anglers..............	1	2	3	4	5	6
e) Lack of public support for the goal of rehabilitation..............	1	2	3	4	5	6
f) Unrealistic public expectations...........................	1	2	3	4	5	6
g) Inadequate adherence to regulations............................	1	2	3	4	5	6
h) Human health problems caused by contaminants......................	1	2	3	4	5	6
i) Fish-health problems caused by contaminants...........................	1	2	3	4	5	6
j) Lack of suitable habitat............	1	2	3	4	5	6
k) Loss of lake trout genetic variability...............................	1	2	3	4	5	6
l) Inadequate spawning of lake trout..	1	2	3	4	5	6

11. **The views of a variety of people or groups could be considered when making lake trout management decisions. What priority should be given to the views of each of the possible groups listed below?** *(Circle one number for each group.)*

Possible Groups	Very Low	Low	Moderate	High	Very High	I Don't Know
a) Each province or state environmental agency...............	1	2	3	4	5	6
b) Each province or state fishery agency.........................	1	2	3	4	5	6
c) Department of Fisheries and Oceans Canada.........................	1	2	3	4	5	6
d) Environment Canada....................	1	2	3	4	5	6
e) U.S. Fish and Wildlife Service.......	1	2	3	4	5	6
f) U.S. Environmental Protection Agency...	1	2	3	4	5	6
g) International Joint Commission....	1	2	3	4	5	6
h) Great Lakes Fishery Commission	1	2	3	4	5	6
i) Council of Great Lakes Governors	1	2	3	4	5	6
j) Agency-appointed advisory groups...	1	2	3	4	5	6
k) Great Lakes Commission..............	1	2	3	4	5	6
l) Local legislators.............................	1	2	3	4	5	6
m) Tribal governments........................	1	2	3	4	5	6
n) Sporting associations...................	1	2	3	4	5	6
o) Commercial fishing associations................................	1	2	3	4	5	6
p) Charter Boat associations.............	1	2	3	4	5	6
q) Environmental groups related to the Great Lakes..........................	1	2	3	4	5	6
r) Angling public in general.............	1	2	3	4	5	6
s) Concerned citizens in general......	1	2	3	4	5	6
t) Fish-consuming public..................	1	2	3	4	5	6
u) People whose income is related to Great Lakes fisheries.	1	2	3	4	5	6

10. **The following questions ask about your general attitudes toward the environment. Please read the following statements and indicate to what extent you agree or disagree with each statement.** (1=Strongly Agree, 2=Mildly Agree, 3=Mildly Disagree, 4=Strongly Disagree). *(Circle one number for each statement.)*

	Strongly Agree	Mildly Agree	Mildly Disagree	Strongly Disagree
The balance of nature is very delicate and easily upset	1	2	3	4
When humans interfere with nature it often produces disastrous consequences	1	2	3	4
Plants and animals exist primarily to be used by humans	1	2	3	4
Humans must live in harmony with nature in order to survive	1	2	3	4
Humans were created to rule over the rest of nature	1	2	3	4
Humans have the right to modify the natural environment to suit their needs	1	2	3	4
We are approaching the limit to the number of people that the Earth can support	1	2	3	4
The Earth is like a spaceship with only limited room and resources	1	2	3	4
There are limits to growth beyond which our industrialized society cannot expand	1	2	3	4
To maintain a healthy economy we will have to develop a "steady state" economy in which industrial growth is controlled	1	2	3	4
Humans need not adapt to the environment because they can remake it to suit their needs	1	2	3	4

18. **Which of the following best describes the area where you currently live?**
(Check one.)

_____ Rural, town, or village (under 5,000 population)

_____ Small city of 5,000 to 24,999 population

_____ City of 25,000 to 99,999 population

_____ Large city of 100,000 population or over

19. **How many years of school did you complete, counting 12 years for high school graduation, and 1 year for each additional year of college, technical, or vocational training?**

_____ years

20. **What is your race?** *(Check all that apply.)*

_____ White, not of Hispanic origin

_____ White, of Hispanic origin

_____ Black or African American

_____ Asian or Pacific Islander

_____ Native American Indian

_____ Other

21. **Please circle your approximate 1995 TOTAL HOUSEHOLD INCOME before taxes, in thousands of dollars:**

Less than 10	10	12	14	16	18	20	22	24	26	28
30	32	34	36	38	40	45	50	55	60	65	70
75	80	85	90	95	More than 95					

22. **Are you a member of a fishing, sporting, or environmental organization?**

_____ No _____ Yes *(Please list* _____

_____)

12. **Which Great Lakes did you fish in 1994?** *(Check all that apply.)*

☐ None
☐ Lake Superior
☐ Lake Michigan
☐ Lake Huron
☐ Lake Erie
☐ Lake Ontario

13. **How many days did you spend fishing for any species in the Great Lakes during 1994?** *(Count any part of a day as one day.)*

_____ days

14. **How many days did you spend fishing for lake trout in the Great Lakes during 1994?** *(Count any part of a day as one day; count any days on which you were seeking to catch lake trout.)*

_____ days

15. **Please indicate how desirable fishing for the following species in the Great Lakes is to you.** *(Circle one number for each species.)*
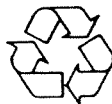
	Not At All Desirable	Somewhat Desirable	Desirable	Very Desirable	Extremely Desirable	Not Applicable
a. lake trout.............	1	2	3	4	5	6
b. coho salmon.........	1	2	3	4	5	6
c. chinook salmon...	1	2	3	4	5	6
d. brown trout..........	1	2	3	4	5	6
e. rainbow trout........	1	2	3	4	5	6

16. **In what year were you born?** 19_____

17. **Are you male or female?** _____ Male _____ Female

Please use the space below for any additional comments you wish to make. To return this questionnaire, place it in the envelope provided and drop it in the nearest mailbox.

Thank you for your time and effort.