

Human Dimension Research Needs for Great Lakes Fishery Management

A Guide for Potential Researchers

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INTRODUCTION

Human dimensions-related issues play a central role in Great Lakes fisheries in terms of fishery values, desired management outcomes, and management challenges. Management objectives often focus on a limited number of ecological and social management goals. In contrast, the diversity of socio-economic and cultural values attached to Great Lakes fisheries and identified desired human dimension (HD) outcomes do not seem explicitly reflected in current management practices. Some ecological and social management goals also seem to be in direct conflict with each other, such as the demand for stocked non-native species and the goal to restore native fishes. Also, absent is a strong sense of “causality;” that is, an understanding of the myriad factors—social, economic, and ecological—that affect whether these goals will be achieved.

Recognizing the need to better incorporate the human dimension into Great Lakes fishery management, the Great Lakes Fishery Commission (commission), in 2002, developed a “Human Dimensions of Great Lakes Fishery Management” research theme (Dobson, Riley, and Gaden 2005). The human dimensions theme is designed to contribute to a well-rounded research program; one that investigates both the natural and social dimensions of the Great Lakes fishery³. The theme aimed to help researchers develop social science-based research projects aimed at improving fishery management. Under the theme, the commission funded eight HD research projects ranging from the general use of human dimensions information in Great Lakes fishery management to better understanding how managers responded to specific threats like the fish virus VHS.

The 2002 HD theme, though useful, was developed without substantive input from fishery managers which, the commission concluded, potentially reduced the relevance of the research to practitioners. In response, we present a revised HD theme that was informed through semi-structured interviews with active fishery managers, biologists, and other experts (hereafter referred to as “research participants”) to understand from the practitioners themselves the intersection of social science and fishery management. The authors also conducted an extensive review of HD-related literature, recognizing the need to integrate a broad understanding of HD with the sentiments of the Great Lakes fishery management community.

The updated HD theme is intended to attract research proposals that improve fishery management and are grounded in rigorous social science theory and methods; the intent is to maximize compatibility between management needs and HD research products. This paper offers conclusions distilled from a larger piece of work that presents the full research and results behind the HD theme presented here (Heck et al 2014). This theme will be considered a success to the degree that it:

1. Attracts quality social science proposals directed at informing Great Lakes fishery policy and management.

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³ For a complete overview of the commission’s fishery research program, see <http://www.glfrc.org/research/FisheryDesc.php>.

2. Generates knowledge that is directly applicable to and used in management decision-making.
3. Helps identify, understand, and predict effects of major social and economic changes on Great Lakes fishery policy and management.
4. Develops and maintains an epistemic community of HD researchers that contributes to the theme and Great Lakes fishery management.

AREAS FOR HUMAN DIMENSIONS RESEARCH IN FISHERY MANAGEMENT

Fishery managers and biologists interviewed for this paper perceived a lack of interest in Great Lakes fisheries within the HD research community. Although a large body of HD research exists on marine fisheries (especially for commercial fisheries), the Great Lakes region has received less attention. The relative paucity of Great Lakes HD literature points to a need for the research community to take greater advantage of the commission's support for more HD research. Moreover, the opportunity also exists for fishery managers to do more to seek to understand the implications of HD research findings on management and for HD practitioners to better design and deliver their research in a manner compatible with manager needs. Paramount is the desire to communicate the need for HD research more widely among the scientific community and to promote the Great Lakes as an exciting area of interest to HD academics.

Based on the semi-structured interviews and a review of HD literature, the authors identified seven areas for research, organized into three general categories: economics, values, and governance. Under each research area, specific questions related to management priorities (again, informed through interviews and the literature) are provided as starting points for researchers as they craft their proposals to the commission's fishery research program.

The commission invites researchers—after developing a synthetic research question (described below) and other supporting documentation⁴—to submit HD research proposals related to the following areas:

I. The economic value of Great Lakes fisheries

1. What is the economic value of the Great Lakes fishery and how does understanding the value relate to fishery management?

- What are direct economic values of fisheries at the lake level and basin-wide and how do they compare to other sectors?
- What is the contribution of fisheries to provincial, regional, and local economies?
- What is the economic value of ecosystem services (e.g., wetlands, habitat restoration, clean, healthy, and more resistant freshwater ecosystem)?
- What is the economic value of non-use values?
- What are costs and benefits of government spending on fisheries compared to generated revenue?
- Which factors influence the economic value of fisheries?

⁴ Visit www.glf.org/science for information about the commission's science program and how to submit a research proposal. See also: The Strategic Vision of the Great Lakes Fishery Commission, 2011-2020 (www.glf.org/pubs/specialpubs/strategicvision2012.pdf) and Council of Lake Committees Research Priorities (www.glf.org/research/FRclc.php).

II. Attitudes, values, and beliefs about Great Lakes fisheries

2. *What are the values, expectations, and beliefs towards Great Lakes fisheries?*

- In what ways do user and non-user groups, as well as municipalities, value Great Lakes fisheries?
- What expectations do stakeholders have towards fishery management?
- What are the public's beliefs about Great Lakes fisheries?
- What are the drivers of values, expectations, and beliefs

3. *What are the larger socio-demographic trends in the Great Lakes region and how will change affect values, expectations, and fishery management?*

- What are the current patterns of fishing and other recreation?
- What are the projected changes in these patterns?
- How are these changes likely to affect stakeholder distribution and their engagement and expectations for Great Lakes fishery management?

4. *How can traditional and local ecological knowledge inform fishery management?*

- What contributions can local and traditional ecological knowledge make to Great Lakes fisheries management (e.g. policy making, decision-making)?
- How can local and traditional knowledge be better integrated into fishery policy and decision-making (e.g. improve sharing of information and increase trust and application of this knowledge into fishery management)?
- What are the barriers to doing so and how can they be overcome?

III. Governance and institutions

5. *From “users” to “stakeholders”:* How to engage a broader stakeholder community effectively in the planning and management of fisheries?

- How can managers elicit opinions of vocal and non-vocal stakeholder groups?
- What is the best way to sustain relationships between stakeholder groups and managers?
- How can poorly organized groups increase their participation and/or influence in the decision-making process?
- Can increased stakeholder involvement in management actions lead to increased agency capacity?
- What are key changes in stakeholders anticipated in response to socio-demographic change?

6. *Who should pay for (and have a voice in) fishery management?*

- What funding mechanisms would be more equitable and capable of distributing costs of fishery management among the general public?
- How would a change in funding strategy or other payment mechanisms affect governance and management?

7. *Is Great Lakes fishery management effective and how should effectiveness be assessed?*

- How do HD vision statements translate into management objectives?
- Which measurable criteria and indicators can be used to assess effectiveness of fishery management?
- How does management perform vis-à-vis these indicators?

SYNTHETIC QUESTIONS AND ADVICE FOR RESEARCHERS

To guide their projects, researchers are encouraged to propose “synthetic” research questions; that is, questions that cut across more than one of the seven HD research areas presented above. Proposals that are too broad or too narrow in scope will not be well-received by the proposal review board (Board of Technical Experts; BOTE). Synthetic questions should be designed to reflect the researcher’s creativity, strengths, and interests and, thus, are not presented here. Two example synthetic questions are:

How will attitudes (HD research area 2) and participation (3) shift/differ between traditional ‘users’ and broader ‘stakeholders’ (4)?

How will trends in participation (3) affect economic value of Great Lakes fisheries (1) and what are the implications for changing funding structure (6)?

Research proposals should address clear aims and objectives, demonstrate and effectively communicate academic rigor in methods, indicate how the data relate to fishery management in the Great Lakes, and outline potential application of the information.⁵ Research proposals are evaluated based on the scientific merit of proposals, rationale, innovativeness, budget, logistics, and qualifications of the principal investigators. Proposals will also have a high priority for funding if they directly relate to a research theme (such as expressed here) and/or to research priorities identified by the management agencies.⁶ HD researchers should consider consulting a fishery manager during the research design and consider including a manager on the research team. Researchers also should follow the pre- and full proposal templates⁷ carefully and develop a rigorous research design that:

- States clearly the rationale for the proposed project, linking the proposal to the HD theme.
- States how the study relates to commission priorities.
- Presents a synthetic research question or questions and explains carefully the research objectives.
- Explains the methods used to achieve each of the objectives.
 - Describes why the particular methods were selected.
 - Describes how the data will be analyzed.
 - Explains how the methods will address the research question(s) and how the methods will ensure the proposed objectives are met.
 - Addresses all “reliability” and “validity” issues and describes the steps taken to increase both to the greatest extent possible.
 - Acknowledges any limitations of the proposed study.
- Presents a reasonable budget.
- Lists the expected output from the study (e.g., journal articles, a PhD student).

⁵ See www.glf.org/science for details and instructions

⁶ See www.glf.org/research/FRclc.php

⁷ See www.glf.org/research/sp.php

Research also should provide information for current management or be relevant in the future (e.g. for monitoring or adaptation purposes), indicate a clear geographic scale (e.g. lake vs. basin wide), and address a targeted species or community, or larger ecosystem considerations.

DISCUSSION

The following section explains in greater detail the foundation of the seven research areas, based on semi-structured interviews with active fishery managers and a literature review. Italicized quotations are from interview participants.

Human dimensions are important but application of HD information falls short of its potential

Human dimensions-related issues are interwoven into most fishery management decisions. Important to management are human values and desired outcomes, yet such HD facets are not always known or, if they are, not always consistent with biological realities. People possess a wide range of values, from species-specific desires to culturally deep or even non-consumptive sentiments. In some cases, the range of values is inherently contradictory, for example, when consumptive and non-consumptive ideals clash.

While some interview participants were quite aware of the value of HD information, the actual incorporation of HD into Great Lakes fishery management, in the minds of interview participants, often falls short. Primary barriers to incorporating HD into management stem from within fishery agencies (such as the fishery management staffs' attitudes and experiences with HD data), concerns about the quality of data, and perceived difficulties to integrate different types of data. Lack of experience with HD information and how such information is collected exposes a critical need to increase familiarity and understanding among fishery management about social science methods, applicability and transferability of HD research findings to management, and tools for integrating HD information into planning and decision-making. Conversely, HD researchers need to engage managers and include them in proposal development to ensure their objectives address a critical management need, the study design is appropriate to achieve objectives, and the results are provided in a format that allows a seamless integration to management practices. Otherwise, the future integration of HD information into management decision-making and practices might not advance despite funded research projects.

In general, a lack of training in and familiarity with social science methods and data among managers, and a lack of understanding of management structures and processes among HD researchers, hinders such integration. There is the potential, then, for a significant gap in understanding the effects of large scale social trends that may be perceived as "basic" social science information in that such information does not always accrue to any particular management topic. Examples include studies on drivers of social attitudes and motivations that could be transferable to fisheries and provide insights into changes in fishery patterns, attitudes, values, and beliefs. Drivers of change might not be directly related to fishery management, although they are part of the wider fishery management context (e.g., demographic changes, economic development, or wider beliefs and attitudes that influence values and behaviors towards fishing and fishery management). Managers need to be open to such information to better understand drivers of change, which was of high interest to interview participants in this theme revision. At the same time, social scientists need to design studies and present data in a format that managers can understand and apply.

Many fishery managers appeared suspicious of the academic rigor and credibility of HD data and, thus, seemed reluctant to use such information as a basis for fishery management. To some extent, this perception could stem from the fact that HD data is often received informally (e.g., via user complaints, phone calls, informal meetings) or not collected systematically over a clearly defined geographic area or

from a target group. Ensuring that HD information is collected systematically (and communication of this) would likely heighten its credibility and improve its application.

On a management and decision-making level, the question about the timing of HD data integration is critical. Social science often is considered after ecological information has been collected and analyzed. If decisions were already made based on ecological data and then are challenged as HD information becomes available, natural scientists perceive decisions as political rather than based on careful consideration of data. HD information, thus, should be integrated from the start and not as an “*appendage at the end*” to increase acceptance of the final decision. A valuable approach to help such integration would be to foster more interdisciplinary research across the natural and social sciences. These studies would logically combine both types of data from the beginning and thereby also facilitate data integration. More transparency of the decision-making process would also add to a better understanding of how a decision has been made.

Increasing the application of HD information is critical to better integrate multiple aspects of Great Lakes fishery management

Despite the limited application of HD data to Great Lakes fishery management thus far, interview participants suggested HD research needs for a variety of economic, social, and governance aspects of the fishery. This recognition indicates an understanding among managers of the variety of HD aspects underlying fishery management.

The economic value of Great Lakes fisheries: Economics play a prominent role in Great Lakes fishery management. Throughout the interviews for this theme revision, interview participants often couched economic information as “*a common currency for communicating value and benefit*” of fisheries to justify management decision and money spent. Interview participants noted that if the public, the press, decision-makers, and politicians truly understood the economic value of Great Lakes fisheries, stewardship would improve tremendously and greater investment in fisheries (e.g. more public funding) would be justified. The monetary assessment of ecosystem services was judged as important to validate habitat restoration and wetlands conservation.

Managers expressed an interest in better understanding the benefits and costs of decisions and their impact on specific user groups and communities (e.g. trade off analysis of impacts of different catch rate scenarios, or models about the ratio between the costs of fishery management versus its economic value). Economic impact assessments are needed for net values and dollar values of allocations to commercial and recreational fisheries and, in the words of one manager, “*to know what the effect of my decision is or staff’s decision is on my stakeholders, in particular on the economic side.*” Moreover, information about tax revenues and impacts of different fisheries on provincial and regional economics would assist management efforts.

Another information need identified is a better understanding among managers of the influence of external socio-economic and environmental factors on economic values. Examples include changes in fuel price and exchange rates, and the influence of societal trends e.g. the market value of local fish vs. imported fish as society has become more critical about food production and origin, and the impacts of invasive species. Beyond the direct users of the resource, participants also noted the importance of better understanding non-use values, which are perceived as people’s willingness to pay for knowing “*that they have a healthy fish community in the river near their house*” or the intrinsic value of “*Great Lakes ecosystems and the fisheries that they support,*” which might be economically more “*important than the shipping industry*”.

Economic studies, report the fishery managers, would be particularly valuable to demonstrate the direct and indirect economic contribution of fisheries at the local, state, and regional levels. The information could be used to justify management decisions and expenses by fishery management agencies and thereby potentially increase political support and funding for fishery management if the economic value of fisheries is acknowledged. It will be important to not only assess direct economic benefits but also indirect economic impacts to account for the wider economic impacts of fisheries to local communities and regional economies in the basin. Existing economic research also usually emphasizes the value of consumptive use. Yet, additional need exists to assess the value of ecosystem services to better justify expenses for habitat or wetland conservation and to assess the economic value of non-consumptive values to better reflect the spectrum of HD values attached to fisheries.

Personal values, demographics, and the social dimension of Great Lakes fisheries: Social information helps demonstrate the values that are attached to fisheries, thereby demonstrating support and interest in having fisheries in the Great Lakes. Examples include non-economic values such as quality of life that might attract people to the Great Lakes basin; the value of local food, cultural and historic value of fisheries; and the value of ecosystem services. Managers and politicians also need some guidance into how to weigh the various values against the economic benefits from fisheries.

Interview participants were interested in knowing more about angler and commercial fishers' expectations towards their fishing experience (e.g., catch rates, species and size class preference, and preferred gear types) and expectations for management directions (e.g., how much they think should be invested in the resource to improve and protect it). In line with a broadened understanding of stakeholders, managers are interested in understanding the broader public's level of knowledge and awareness about the Great Lakes ecosystem and fisheries. Managers pointed out, for instance, the need to understand the level of support for environmental issues and fishery issues because, in the words of one participant, *"if the general average person doesn't care much then we're not going to have much of a future"*.

Beyond knowing the social aspects, fishery managers expressed an interest in understanding what influences people's values, expectations, and beliefs. Examples of such influences include demographics, residence, a vested economic interest, education, and cultural background. Interview participants repeatedly pointed out that information on participation patterns and motivations for fishery participation are scarce. Due to recent declines in recreational fishing participation, managers emphasized the need to better understand reasons why people fish. This information was perceived as critical to understand underlying demographic factors affecting participation in fishing and, thus, was seen as critical to understand, predict, and address changes in user patterns. By understanding which variables influence participation in fishing, managers believe they could do a better job increasing participation. Beyond basic demographic shifts, variables that might influence participation in fishing included (1) the quality of the fishing experience (e.g., fish abundance, size, species, quality), (2) personal attributes (e.g., time available to go fishing, love of the outdoors, family tradition and upbringing), (3) environmental change (e.g. presence of invasive species), and (4) economic changes (e.g., fluctuation in gasoline price).

Fishery managers, thus, see stakeholder values, expectations, and beliefs about fisheries as important elements in the planning and decision-making process. This information can help to identify points of convergence and divergence between managers and users. Indeed, social science studies on user patterns, values, expectations, attitudes, and local knowledge identified as most critical in planning and decision-making and should be included early on. This accompanies the fact that fishery management in the Great Lakes is striving towards more integration of stakeholder input into management goals and objectives.

In addition to understanding the users' values and needs, interviewees emphasized a need to know the values of non-vocal and non-organized stakeholders, as managers felt they only receive input from a small subset of vocal or organized users. This information need is driven by the fact that government

agencies serve the entire public and, thus, must understand not just the values of the most vocal segment of the public, but everyone.

Understanding values, expectations, attitudes, local ecological knowledge, and user patterns is still quite limited, and decisions are often not based on solid HD information that has been collected in a systematic, academic manner. Advancing the collection of HD information that is based on rigorous methods and carefully designed objectives will help to improve the understanding of stakeholders' expectations, attitudes, knowledge, beliefs, and values and would provide valuable insights for planning and decision-making. Collection of such data from the start of a management initiative—and the communication that such data is available—will result in decisions based on rigorous natural and social science data and allow informed trade-off analysis and decision-making that are defensible, credible, and thus more accepted by fishery management staff and stakeholders alike.

Governance and institutions: Interview participants noted that research into governance is needed throughout the management process. Managers recognized that public engagement is complicated, but at the same time, they perceived it as the “*recipe for success*” and necessary to increase awareness about why specific management decisions were made. Managers were particularly interested in engaging stakeholders beyond the “*first tier*” of commercial and recreational fishermen in the decision-making process. Interview participants emphasized the actual engagement process, particularly how to engage stakeholders in a balanced fashion and to represent non-vocal and non-organized users/the as opposed to vocal minorities in the decision-making process. Likewise, the stakeholders themselves likely have certain expectations for how they will be involved in management. A better understanding of the process by both managers and stakeholders would help in the design of effective structures for engagement.

Managers seemed keen on better understanding and involving non-vocal and non-organized users and stakeholders that may not fish but still have an interest in the Great Lakes and their fisheries. Further stakeholder engagement, however, raised questions about agency capacity. While an interest in knowing more about user groups and including them in management was indicated, agencies are already struggling to deal with significant budget cuts and might not have the capacity to reach beyond their traditional constituents. On this note, the potential for revising the current funding model for fishery management—distributing the costs more widely to the general public and other recreationists—was widely noted. Explicit information needs include research on the implications of changes in tax laws and ways to make agencies base funded rather than dependent on soft money and license sales. Examples included increases in sales tax to fund fishery management efforts, which is perceived, in the words of one manager, as “*a more steady source of income... [since] it doesn't fluctuate with users*. Base funding is justified because “*everybody appreciates the Great Lakes, and most people use the Great Lakes from one time or another in every given year . . . whether they are drinking the water from the Great Lakes, or really going out and appreciating them*”.

Another critical information need will be the systematic assessment of management effectiveness, especially of HD management objectives. Results of HD monitoring and evaluation efforts will allow officials to adapt management according to findings and to address critical HD management challenges. Current monitoring and evaluation efforts, however, emphasize ecological indicators; the regular assessment of social, economic, or governance indicators appears to be missing. A few managers mentioned the use of some vocal stakeholders' opinions as an indication of their satisfaction or dissatisfaction with current management. They, reasonably, were not comfortable with the representativeness of such views. An explanation for the lack of systematic evaluation efforts in the HD realm might be a lack of clearly defined management objectives and targets for HD management goals and a lack of clarity about what management wants to achieve

In the eyes of managers, assessing and communicating management effectiveness is important to justify decisions and expenses. Moreover, a better appreciation for success would help agencies gain public trust, confidence, and support for fisheries. Evaluation of management is also critical in the political arena. Managers mentioned that *“if you go to legislature and you want that money renewed, you won’t get the money if you cannot demonstrate if programs are effective ...”* While some ecological monitoring is undertaken in the Great Lakes, no systematic evaluation exists against management goals and objectives, especially in the case of social science questions described herein. One first step suggested during interviews would be to better define fishery management outcomes, especially HD ones. Comments highlighted that governments and groups *“promote things like vision statements but they don’t [try] to translate that into what it means on the ground”* Future research should assess how vision statements translate into management objectives and detailed insights into what fishery management in the Great Lakes is trying to achieve.

CONCLUSION

This study involved a review of literature and in-depth interviews with Great Lakes managers and practitioners to explore HD information needs for Great Lakes fisheries. This approach was chosen to enhance the relevance of future HD research to Great Lakes fishery management, in an attempt to bridge the gap between science and policy making, and to strive for a greater balance between advancing scientific knowledge and applied research.

Overall, this theme finds that the application of HD information will not only depend on the supply of HD data and tools for more transparent decision-making, but also on the willingness by fishery managers to apply HD data. The supply of HD information will become increasingly valuable as trust towards results grows and fishery managers actually integrate the information into management. Currently, many managers still perceive HD information as a luxury and detached from ecological concerns, rather than core to fishery management despite multiple apparent management challenges that are HD based. Such attitudes still conspire against placing HD information on an equal footing with ecological data for fishery management, even though fishery management is ultimately about understanding and managing people as well as fish and the ecological systems they inhabit.

This new theme aims to change the overall status of HD information and seeks to improve its applicability in Great Lakes fishery management. The Great Lakes Fishery Commission awards funds for well-constructed HD research projects that conform to the tenets outlined in this theme. The goal is to help officials integrate the ecological and social aspects of fishery management.

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