

# **STRENGTHENING THE CONNECTION BETWEEN GREAT LAKES SCIENCE AND POLICY**

**Final Report of the Great Lakes Science-Policy Initiative**

**Prepared for The Joyce Foundation**

by

**The International Association for Great Lakes Research**



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## **1. EXECUTIVE SUMMARY**

Creation of public policy based on sound science has long been recognized as a vital need for effective management and protection of the Great Lakes; however, delivering scientific findings to policy-makers in a timely, useful manner has been problematic. Policy-makers have often lacked timely access to scientific information. And when they do have access, this information is often too technical and needs interpretation to be truly useful for decision-making. Clearly, there is a need to strengthen Great Lakes science-policy linkages.

In response to this need, the International Association for Great Lakes Research (IAGLR), under funding from The Joyce Foundation, initiated a two-year project to help strengthen the science-policy linkage in the Great Lakes Basin. IAGLR believes that this project has laid the foundation for an ongoing exchange of information between scientists and policy-makers to ensure informed management and protection of the Great Lakes. IAGLR is uniquely positioned to strengthen the science-policy linkage because of unparalleled membership of more than 900 scientists and researchers, its world-class repository of scientific knowledge found in the *Journal of Great Lakes Research*, and its well-recognized and highly effective annual conferences.

As part of the project, IAGLR posted 24 years of the *Journal of Great Lakes Research* online, in a searchable, printable format. The online availability of the journal has been very well received throughout the Great Lakes Basin. Since going online, the JGLR archive has become the most popular section of the IAGLR web site. Total monthly “hits” on IAGLR’s web site now exceed 200,000.

Another major accomplishment of the project was the creation of an Expert Directory. This is a database of the Association’s member scientists and researchers who have agreed to serve as expert contacts to policy-makers on various issues. Although it has only been available since late August 2002, there are signs that interest is increasing. For example, visits to the main expert directory page and the number of directory searches have both shown a steady increase through December. Anecdotal feedback has been promising. IAGLR will continue to track and promote usage, and compile feedback for this promising tool.

The project also involved efforts to learn from key scientific and policy organizations within the Great Lakes Basin through surveys and meetings, and three pilot projects to help strengthen the science-policy linkage. Stakeholder input included advice on important Great Lakes issues that could benefit from a strengthened science-policy linkage; an assessment of the resources developed as part of the pilot projects; and recommendations for future actions. Responses to a survey conducted at the beginning of the project guided the selection of three issues that served as the pilot projects for strengthening the science-policy linkage. In addition, stakeholders also provided key recommendations for continuing to strengthen this linkage. Priority recommendations for strengthening the science-policy linkage in the Great Lakes Basin include the following (no rank order implied):

- Undertaking Strategic Planning and Outreach;
- Performing Strategic Evaluation Work;
- Championing Additional Pilot Projects;
- Establishing Scholarships and Fellowships;
- Convening Special Symposia;
- Initiating a Collaborative Interdisciplinary Study or Project;

- Undertaking an Urban Nonpoint Source Pollution Study that Fosters Sustainable Patterns of Land Use Development; and
- Expanding the Focus of the State of the Lakes Ecosystem Conference.

## **2. ACKNOWLEDGEMENTS**

The International Association for Great Lakes Research (IAGLR) wishes to thank all individuals who contributed to the success of this Great Lakes science-policy project, including Science-Policy Advisory Board members, Steering Committee members, partner institutions, scientists and researchers who volunteered to be part of the expert directory for policy-makers, and participants in the public meetings and fora held over the last two years. In addition, IAGLR wishes to thank The Joyce Foundation for providing the financial support to make this binational effort to strengthen the Great Lakes science-policy linkage possible.

## **3. INTRODUCTION**

Informing public policy with sound science has long been recognized as a vital need for effective management and protection of the Great Lakes; however, delivering scientific findings to policy-makers in a timely, useful manner has been problematic. Policy-makers have often lacked timely access to scientific information. And when they do have access, this information is often too technical and needs interpretation to be truly useful for decision-making. Clearly, there is a need to strengthen Great Lakes science-policy linkages.

Efforts are underway in the region to address part of this problem. For example, some organizations are identifying emerging research issues (e.g., International Joint Commission's Science Advisory Board), while others are identifying and filling research needs (e.g., Great Lakes Fishery Commission). Other organizations provide valuable services by informing the region of legislative developments (Northeast Midwest Institute), or advocating on its behalf (Great Lakes Commission). Still others communicate research findings among the research community (Great Lakes Environmental Research Laboratory, Environment Canada's National Water Research Institute) and to the general public, including students (Sea Grant Institutions).

Yet none has emerged as the source for scientific information geared directly at informing policy-makers to advance sound public policy. A call has gone out to binational organizations, such as the International Association for Great Lakes Research (IAGLR), to play a greater role in clarifying and reaching agreement on research priorities, and in strengthening science-policy linkages.

IAGLR is uniquely positioned to foster this connection between science and policy. IAGLR's mission is to promote all aspects of large lakes research and communicate research findings. This international, multidisciplinary organization has more than 900 members and provides a broad range of science and expertise to a number of audiences. Each year it convenes the premiere Great Lakes research conference, and the organization has become the repository of Great Lakes science over the years via its *Journal of Great Lakes Research*. Published since 1975, the journal contains the foremost collection of multidisciplinary Great Lakes scientific knowledge in the world.

This collection of both scientists and science positions IAGLR to effectively serve the policy-making community in the interest of advancing sound policy. Building on its strengths, and in keeping with its stated goal to reach out to policy-makers, IAGLR undertook a two-year

project (2001-2002) titled “The Great Lakes Science-Policy Initiative.” This project, supported by The Joyce Foundation, lays the foundation for the ongoing exchange of information between scientists and policy-makers to ensure informed management and protection of the Great Lakes Basin Ecosystem.

Through the Great Lakes Science-Policy Initiative, nine key tasks and projects were undertaken to strengthen the science-policy linkage for the Great Lakes during 2001-2002. These included:

- Surveying key Great Lakes policy institutions and organizations to identify high-priority policy issues where further scientific information is desired;
- Establishing a Science-Policy Advisory Board to guide the project;
- Building a web-based directory of scientists and researchers from the Association who are willing to interact with and answer questions for policy-makers;
- Building a repository of Great Lakes research based on the *Journal of Great Lakes Research*, readily available and searchable via the Association's web site to provide the scientific background for key issues over time;
- Identifying Great Lakes policy development organizations and institutions to partner with IAGLR in a pilot project to address high-priority issues identified by the Policy Advisory Board;
- Translating the relevant science for policy-makers into a useful, readily accessible format available via the Association's web site;
- Facilitating dialogue between policy-makers and scientists in answering specific questions, addressing issues, and furthering policy development on priority issues;
- Evaluating and fine-tuning the approaches of the project in strengthening science-policy linkages and developing recommendations for the Association and Great Lakes community regarding continued use of this and other tools; and
- Disseminating information about the project throughout the two years to advertise the initiative, secure participation, and share results.

This report summarizes the output from these tasks and projects, and offers IAGLR's advice on bridging the gulf between environmental policy and research in the region.

This project used the scientific knowledge that exists in the Association's journal, the technical expertise of the Association's scientists, and the insights of key Great Lakes policy organizations and institutions to strengthen the connection between Great Lakes science and policy. IAGLR believes strongly that the Association is uniquely positioned to meet the scientific and research needs of the Great Lakes policy-making community and play a major role in ongoing efforts to strengthen the science-policy linkage in the Great Lakes Basin.

## **4. PROJECT ACTIVITIES AND DELIVERABLES**

### **4a. Survey of Great Lakes Policy Issues**

In January 2001, IAGLR created a steering committee to help guide the project. In general, the steering committee met quarterly. Steering committee members include:

- Stephen Bocking (Associate Professor, Environmental and Resource Studies Program Trent University, Peterborough, Ontario);
- Joseph DePinto (IAGLR Publications Committee Chair; Limno-Tech, Inc., Ann Arbor, Michigan);
- Wendy Foster (IAGLR Business Manager, Ann Arbor, Michigan);
- John Gannon (Senior Scientist, International Joint Commission, Windsor, Ontario);
- John Hartig (Great Lakes Science-Policy Director for IAGLR and River Navigator for the Greater Detroit River American Heritage River Initiative, Detroit, Michigan);
- Michael Jones (Department of Fisheries and Wildlife, Michigan State University, East Lansing, Michigan);
- Gail Krantzberg (Director, Great Lakes Regional Office, International Joint Commission, Windsor, Ontario);
- Gerald Matisoff (Chairman, Department of Geological Sciences, Case Western Reserve University, Cleveland, Ohio);
- Paula McIntyre (IAGLR Webmaster; President, Loracs Creations, Inc., Cedar, Michigan);
- R. Stephen Schneider (Managing Editor, *Journal of Great Lakes Research*; University of Michigan Biological Station, Ann Arbor, Michigan);
- John Stone (Director of Project Surveys and Evaluation; Visiting Scientist, National Oceanic and Atmospheric Administration-Great Lakes Environmental Research Laboratory, Ann Arbor, Michigan); and
- Rochelle Sturtevant (Sea Grant Extension Agent, National Oceanic and Atmospheric Administration-Great Lakes Environmental Research Laboratory, Ann Arbor, Michigan).

In the spring of 2001, with input from the project steering committee, IAGLR designed and conducted the Survey of Great Lakes Policy Issues. The project steering committee first established rules of inclusion for identifying the stakeholder organizations to survey. To be considered a project stakeholder, organizations had to (1) offer an organizational, rather than personal view of Great Lakes issues; (2) maintain a broad, Great Lakes basin-wide policy mandate; (3) have traditional cultural ties to the basin; and (4) play a role in Great Lakes policy-making, advising, or resource management. A total of 150 stakeholder organizations were thus invited to participate in the survey, and 65 responses were received. Respondents represented a wide range of organizations from both sides of the international border. Thirty-three responses were received from American organizations; 17 from Canadian organizations; 11 from binational organizations, and four from native organizations. Governments represented included the American and Canadian federal governments, most state governments, and Ontario. Responses were also received from organizations based in universities, from industry, and from “governance” organizations (such as the International Joint Commission).

Respondents were asked to identify and rank high-priority policy issues in the region and to identify desired information to assist policy-makers in decision-making regarding these issues. Water quality was considered the most important issue, followed by water quantity and invasive species. Other issues included development, governance, ecology, the use and roles of science, climate change, and fisheries. With a few exceptions, ranking of issues within each organizational type paralleled the overall ranking.

Within these issue areas, a broad range of more specific concerns were noted:

- Water quality encompassed concerns regarding contaminants within all ecosystem components (including the atmosphere and sediments) as well as concerns relating to health risks to humans and to other biota. Respondents would like to use science for a variety of purposes relating to water quality, including understanding existing problems, identifying emerging problems, setting priorities, measuring the effectiveness of policy, and improving policy.
- Concerns relating to water quantity were primarily motivated by the issue of water diversion or export. Science was noted as potentially useful in measuring current resources and predicting their future state, assessing the environmental impacts of water diversion, and in developing policies to protect Great Lakes water.
- Concerns relating to invasive species were dominated by awareness of their ecological impacts, and by the perception that ballast water is their chief means of entry into the Great Lakes. Comments also indicated a widespread view that while there is an adequate scientific understanding of invasive species, what is lacking are effective controls on these species. Science was noted as potentially useful in helping to prevent, through technical, legal or political means, new species introductions; in limiting the impact of species already present; and in understanding these impacts.
- Concerns relating to development most often emphasized the environmental impact of land-based development, particularly in urban areas. Less frequently mentioned were other aspects of development, including the impacts of shipping, and of dredging. Science was noted as potentially useful in assessing the impacts of development, defining the relation between environmental priorities and development, identifying appropriate policy responses, and improving management techniques.
- Issues relating to the use and role of science were most often raised by industry respondents. Concerns included that scientific results be interpreted and reviewed appropriately, through peer review or other means; that research be adequately supported, so that it is able to provide an effective basis for decisions; that research results be applied; and that science or scientific advice can be politically motivated.

- Concerns expressed regarding ecology included reference to Great Lakes ecosystem health or integrity, as well as concerns relating to habitat protection or restoration.
- Smaller numbers of respondents identified issues of governance, of climate change, or of fisheries, as matters requiring attention.

Most respondents stated that their organization now uses science in formulating or implementing Great Lakes policies. Respondents use a range of sources for scientific information, including the Internet, solicited sources (such as consultants), and scientific journals.

Respondents' recommendations for making Great Lakes science more accessible to policy activities most often emphasized the need to improve the dissemination of science, as well as the need to enhance the relevance of science, through improved dialogue between science and policy-makers. Improved dissemination was seen as potentially facilitated by improved translation or summaries of research results; improved access to research results, particularly through centralized databases; and by meetings and other forms of direct communication between scientists and those who use science. Greater relevance of science was seen as potentially facilitated through more opportunities for interaction between scientists and policy-makers; greater awareness among scientists of policy priorities; and more focused attention to the policy implications of Great Lakes scientific research.

Data collected through the survey enabled IAGLR and partner organizations to develop more focused information exchanges among Great Lakes science and policy communities. A detailed report of survey methods, findings, and recommendations was released in July 2001, and is available through the IAGLR web site at <http://www.iaglr.org/scipolicy/report070201.pdf>.

#### **4b. Establish a Science-Policy Advisory Board**

Interested representatives of participating stakeholder organizations were then asked to serve on a Science-Policy Advisory Board to help guide the project. Criteria for involvement were that the organization was involved in Great Lakes policy development, had interest in the project, and were willing to devote time to the project. More than 50 people participated in the first science-policy advisory board meeting, held on June 13, 2001, in Green Bay, Wisconsin. The Advisory Board's first tasks included reviewing the survey results and reaching agreement on key issues and sets of questions for which IAGLR and partner organizations could strengthen the linkage between Great Lakes science and policy.

Based on the survey results, input from the first Science-Policy Advisory Board meeting, and input from the project steering committee, the group selected three issues to serve as pilot projects for strengthening the science-policy linkage. These pilot projects included (1) a congressional briefing on Great Lakes issues, focused on the Detroit River and Lake St. Clair; (2) an aquatic nuisance species science translation document; and (3) the Oakridges Moraine (Ontario) land-use and water quality experience.

IAGLR held a second meeting of its Science-Policy Advisory Board on June 4, 2002, at the University of Manitoba, in conjunction with IAGLR's annual conference. Approximately 20 people participated in this meeting, the purposes of which were to provide an update of progress on Great Lakes Science-Policy Initiative and obtain specific advice on creative ways to strengthen science-policy linkages in the Great Lakes Basin. The many excellent recommendations obtained through this meeting may be viewed online at [http://www.iaglr.org/scipolicy/manitoba\\_recs.php](http://www.iaglr.org/scipolicy/manitoba_recs.php).

In a continuing effort to improve communication between members of the Advisory Board, IAGLR also set up a listserv to help inform member organizations about the project. The list contains more than 150 active subscriptions and provides an excellent way to share information and obtain advice from advisory board members.

#### **4c. Build an Expert Resource Directory**

As part of the Great Lakes Science-Policy Initiative, IAGLR developed an Experts Directory to offer policy-makers and other Great Lakes stakeholders an opportunity to directly interact with IAGLR member scientists and researchers. This directory allows policy-makers to directly contact experts on various Great Lakes issues via the IAGLR web site (*i.e.*, a “one-stop-shopping” for Great Lakes expertise). The experts are available to answer direct questions via e-mail or over the phone, to give interviews or quotes regarding issues in the news, to give presentations to various organizations on important Great Lakes topics, or to prepare a testimony for public hearings on key issues.

#### **Development**

The development of the Expert Directory required the following tasks: developing a list of relevant topics and soliciting members to serve as experts; collecting contact and expertise information from the solicited volunteers; determining technical issues such as database structure and interfaces; programming the scripts and database; populating the database; and testing. The experts for this database were drawn from the IAGLR membership. The initial call for volunteers to populate the database went out in October of 2001 via the IAGLR membership listserv. Members were asked to provide their contact information along with a list of 1-3 topics on which they have expertise and would be willing to share that expertise with policy-makers. This initial solicitation produced 38 volunteers with a wide range of topics listed. Following the initial solicitation, IAGLR committee members personally contacted colleagues to participate in this venture. As a result, an additional 46 members have volunteered, bringing the total to 84. (The current total in the database is 72, because participation is restricted only to IAGLR members.)

To develop a searchable database, IAGLR combined topics given by the volunteer experts to a manageable list that covered potential areas of interest among policy-makers. The steering committee then assigned each expert to the appropriate categories in this list and asked the experts to review their assignments and make necessary changes to a draft version of the database. In addition, the committee thought that policy-makers might want to access expertise by geographical areas in addition to issue topics. Therefore, during testing, the volunteer experts were asked to also indicate any special lake or geographic area for which they have a special knowledge.

After this review and revision, the Expert Directory was released to the public on August 20, 2002, via the following announcement to the IAGLR member listserv and on the IAGLR web site:

#### **Great Lakes Expert Directory Available to Policy-makers**

The International Association for Great Lakes Research announces the release of an online directory of Great Lakes scientists and researchers available to provide expert advice to Great Lakes policy-makers. The directory was developed with support from the Joyce Foundation as part of IAGLR's Great Lakes Science-Policy project.

The Experts Directory is available online at <http://www.iaglr.org/experts/directory.php> and is searchable by topic, geographical area, and expert's last name. In addition, a complete list of experts may be viewed.

#### Use of IAGLR Expert Directory

It is too soon to tell the degree to which this database will be used by policy-makers over the long term. However, monthly hits to the directory have been tracked for the first four months of availability, and are summarized in Table 1.

**Table 1. Monthly visits to IAGLR's Expert Directory, September-December 2002.**

| Page  | Sept | Oct | Nov | Dec |
|---|------|-----|-----|-----|
| The main expert directory page:<br>( <a href="http://www.iaglr.org/experts/directory.php">http://www.iaglr.org/experts/directory.php</a> )                                | 72   | 109 | 103 | 118 |
| The page that displays an individual expert's listing:<br>( <a href="http://www.iaglr.org/experts/expert_view.php">http://www.iaglr.org/experts/expert_view.php</a> )     | 62   | 36  | 106 | 53  |
| The page that searches the database:<br>( <a href="http://www.iaglr.org/experts/searchprocess.php">http://www.iaglr.org/experts/searchprocess.php</a> )                   | 45   | 43  | 65  | 77  |
| The page searches that displays all the experts, sorted alphabetically: ( <a href="http://www.iaglr.org/experts/browse.php">http://www.iaglr.org/experts/browse.php</a> ) | 34   | 22  | 20  | 18  |

A better evaluation of the usage of the database would be to survey the experts to determine whether they had been contacted and the nature of the request. We recently asked the volunteer experts to relate this information if available. Some individuals had been contacted but did not have our request for information prior to the contact. Therefore, they could not confirm that our web site was the source of their contact. Others noted that they had been contacted as a result of IAGLR's Expert Directory and provided satisfactory feedback to the individual requesting information.

This service has the potential to create an important linkage between the scientific community and the policy-making community in the Great Lakes Basin. Participating scientists can become aware of the key issues that are on the public's mind and what questions they have about these issues, while policy-makers can avail themselves of technical expertise on issues of importance to them and their constituency. Therefore, IAGLR intends to further advertise this service and continue to follow-up on its usage.

#### **4d. Build a Repository of Great Lakes Research Based on IAGLR's *Journal of Great Lakes Research***

On April 29, 2002, IAGLR unveiled 24 years of Great Lakes research online. To better inform public policy with sound science, IAGLR converted its hard copy archive (spanning the years 1975-1998) of the *Journal of Great Lakes Research* to electronic format (PDF) and made it easily accessible via a searchable database on its web site (see

<http://www.iaglr.org/jglr/db/search.php>). The archive is the only resource of its kind: a multidisciplinary, peer-reviewed collection of papers from various scientific, management, and policy perspectives on the Great Lakes.

The Association has continued its commitment to this archive by placing the newer issues online. Abstracts for the latest issue will be placed online as they become available, as will PDFs for the issue two years prior to the current one. The JGLR search engine currently searches the abstracts of articles from the journal's inception in 1975 through the current issue, and displays both abstracts and complete articles for all articles through 2000.

In addition, the Association has begun the practice of issuing press releases to highlight the latest issues, and includes links to the main JGLR web page (for example, see [http://www.iaglr.org/hot/pr/020624\\_1.php](http://www.iaglr.org/hot/pr/020624_1.php)).

### Development

Development of the JGLR database included the following tasks: defining technical requirements, interfaces and protocols; scanning volumes from 1975 through 1998 and converting to PDFs; programming the scripts and database; entering the metadata for each article; and testing.

### Description

Visitors to the online archive are presented with several search options to help them locate articles of interest. These are listed below:

- Search Terms: can search using one or more keywords against any combination of title, abstract and keyword fields. The user can further specify to search for any of the terms, all of the terms, or the exact phrase.
- Author's Last Name: can search on one or more last names. The user can further specify to search for any or all of the names.
- Year of Publication: can enter one or more years. The user can then specify whether to search for articles from any of those years, or from the entire range of years specified.
- Volume: can enter one or more volume numbers. The user can then specify whether to search for articles from any of those volumes, or from the entire range of volumes specified.
- Number of Results Per Page: can specify whether to display 10, 25, or 50 results per page.
- List First: can select whether to display first the most recent or the oldest articles matching the search.

Options that yield the largest search result are selected as the defaults (with 10 results per page). In addition, the search supports partial word entries; e.g., a search on "smi" in the author's last name field will yield articles written by "smith" and "smihula." This feature is useful when a person can't remember the exact spelling of a name.

## Use of the JGLR Archive

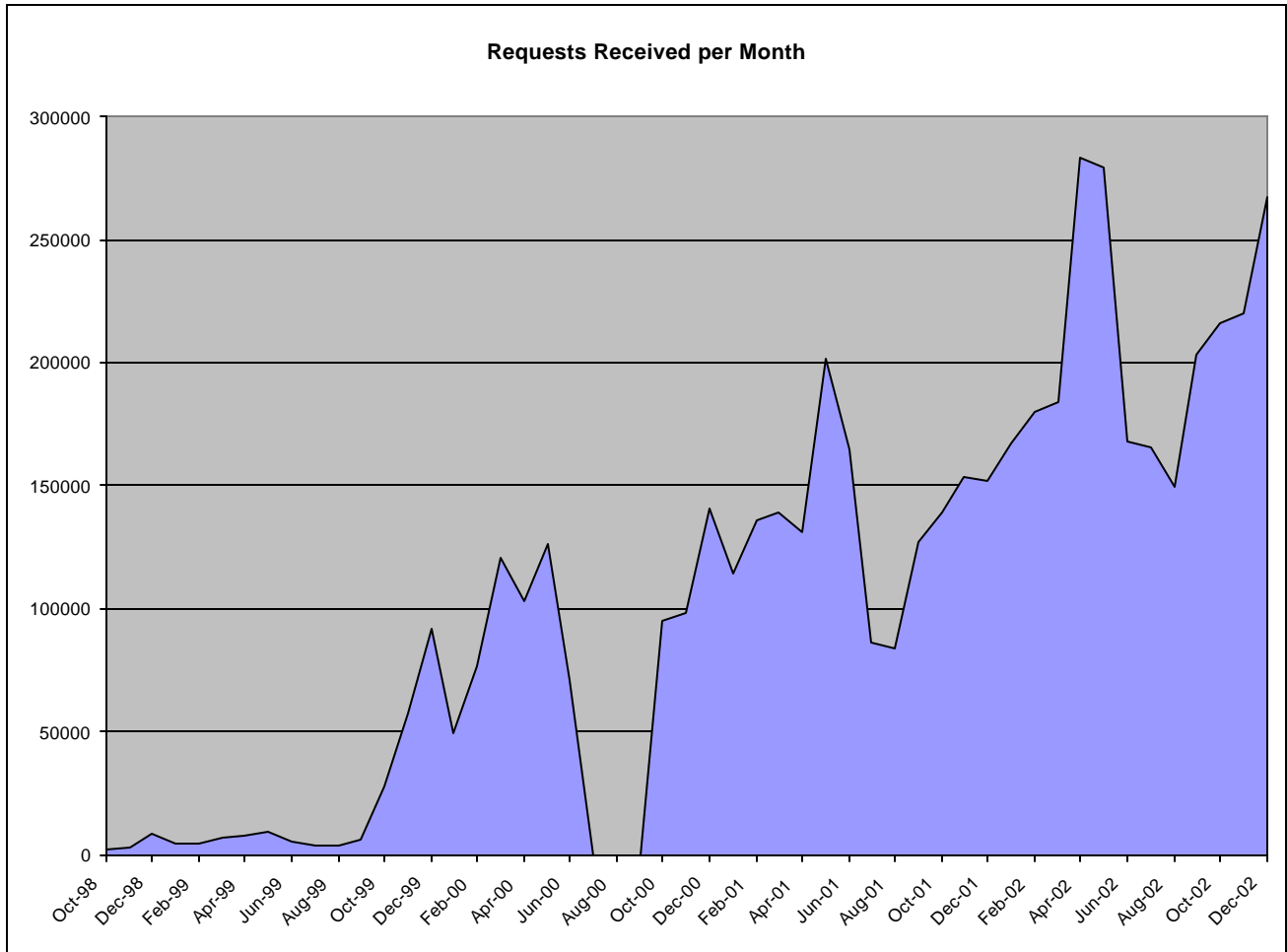
Immediate response to the archive was positive. “The searchable archive on this site is phenomenal,” stated one Army Corps of Engineers lieutenant colonel. The day the archive was announced, April 29, was one of the busiest days on record for the IAGLR web site (for the period October 2000 through December 2002). More importantly, this initial enthusiasm has been borne out by the archive’s ongoing use.

Since going online, the JGLR archive has become the most popular section of the IAGLR web site. In May 2002, the “searchprocess” page (which is the page accessed when the user hits the “Search” button to conduct a search of the database) was the third most popular public page on the site. In June, it was the second most popular, and in July it became the most popular page on the site, where it has remained, except for in December, when the conference abstract submission page had the greatest number of hits (submission deadline was mid-December).

Figure 1 shows usage of the IAGLR web site as indicated by requests (or “hits”) received per month. The overall trend of these statistics indicates growth over time, with a slowdown in activity during the summer, and peak activity occurring just prior to the Association’s annual conference (typically held in early June). Other minor spikes correspond with key conference activities, such as abstract submission and registration.

What is interesting to note is that post-conference, the statistics do not always indicate a clear pattern in terms of a most popular page (other than the home page, which always places near or at the top). It now appears that the JGLR archive has assumed this status.

**Figure 1. Visits to the IAGLR web site per month, October 1999-December 2002.**



*Notes: The site was redesigned in late October 1999. The new design resulted in a much larger quantity of graphics, and each graphic counts as a "request" in the statistics. This explains some of the large jump in the statistics at that time. Statistics are missing for Jul-Sep 2000 due to move to new server.*

#### **4e. Identify Great Lakes Policy Development Partners for Pilot Project**

As noted earlier, three issues were chosen to conduct pilot projects to strengthen the science-policy linkage. These included:

- Congressional Briefing on Detroit River and Lake St. Clair environmental and natural resource issues;
- aquatic invasive species; and
- urban nonpoint source pollution.

Early on in the project, IAGLR obtained commitments from Great Lakes policy development organizations and institutions to participate in a pilot project aimed at strengthening the science-policy linkage.

For the Detroit River Lake St. Clair pilot project IAGLR partnered with U.S. Senator Debbie Stabenow (Michigan) and elected officials in her district.

For the aquatic nuisance species pilot project IAGLR partnered with the Great Lakes Panel on Aquatic Nuisance Species (a group of federal, state, and advocacy representatives). A special science translation report was prepared for the Great Lakes Panel on Aquatic Nuisance Species by Dr. Dave Reid of the National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory; Dr. Hugh MacIsaac of the University of Windsor; Dr. John Gannon of the U.S. Geological Survey's Great Lakes Science Center, Mr. Mark Burrows of the International Joint Commission, Ms. Marg Dochoda of the Great Lakes Fishery Commission; Dr. Doran Mason of the National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory; Commander Pat Gerrity of the U.S. Coast Guard; and Dr. John Hartig of the Greater Detroit American Heritage River Initiative.

The urban nonpoint source pollution pilot project was led by Stephen Bocking of Trent University. He partnered with the International Joint Commission on a project to learn from the experiences of Oak Ridges Moraine, north of Toronto, Ontario, relative to the impact of land use practices on water quality (what was the state of science, what was the state of policy, what worked and why, what lessons are applicable to other parts of the basin).

For each of these pilot projects, IAGLR chose the Great Lakes policy development organization or institution to help build institutional capacity, encourage outreach, and potentially lead to changes in strengthening the science-policy linkage.

#### **4f. Translate Relevant Science for Policy-makers**

Three pilot projects were undertaken to translate relevant science in an effort to strengthen the science-policy linkage. The information in this section is structured by pilot project.

##### Congressional Briefing on Detroit River and Lake St. Clair Environmental and Natural Resource Issues

In an effort to help strengthen the linkage between Great Lakes science and policy, and to help catalyze actions to preserve one of our nation's most valuable natural resources, Senator Debbie Stabenow of Michigan organized and hosted a congressional briefing and boat tour of the Detroit River and Lake St. Clair on August 14, 2001. This congressional briefing and boat tour offered a unique opportunity for scientists, researchers, and natural resource managers to brief elected officials and key policy-makers on timely Great Lakes issues. It was held aboard the 80-foot *Pride of Michigan* used as a training vessel for the U.S. Naval Sea Cadet Corps.

More than 40 people participated in the August 14<sup>th</sup> event, including elected officials, policy-makers, university professors, government scientists and natural resource managers, and representatives of the U.S. Naval Sea Cadet Program – Great Lakes Division. The program for the day-long briefing and boat tour included:

- Introductory comments and welcome from Senator Stabenow;
- Issue-specific briefings by experts, followed questions and answers;

- Roundtable discussion at the end of both the morning and afternoon sessions; and
- Concluding remarks by Senator Stabenow.

At the end of both the morning and afternoon sessions, a survey was given to each elected official and policy-makers to obtain feedback on the usefulness of the congressional briefing and boat tour, and to obtain suggestions for how to strengthen the Great Lakes science-policy linkage in the future. The survey was initiated and conducted by IAGLR.

All verbal comments received regarding the congressional briefing and boat tour were very positive. One common comment was that this congressional briefing and boat tour should become an annual event. Communication of current and timely scientific and research results to key policy-makers is essential. It was noted that the briefing material and fact sheets distributed at the congressional briefing and boat tour were valuable (<http://www.iaglr.org/scipolicy/factsheets/factsheets081401.pdf>). Participants appreciated concise information that was clearly communicated in understandable terms.

All survey responses from the elected officials and their staff was very positive. One common suggestion for improvement was to next time include state elected officials and key representatives from the Michigan Department of Natural Resources and Michigan Department of Environmental Quality. Additionally, experts from nongovernmental organizations like Ducks Unlimited, Friends of Detroit River, Michigan United Conservation Clubs, and others have much to offer in strengthening the Great Lakes science-policy linkage. Much feedback was received that another congressional briefing could occur at one of the annual or semi-annual Great Lakes meetings where many key people are in attendance (e.g., meetings hosted by the Great Lakes Commission, Council of Great Lakes Governors, Northeast Midwest Institute, International Joint Commission, Great Lakes Fishery Commission, International Association for Great Lakes Research). It was also suggested that there should be follow-up on the discussions on recommended actions by staff of the elected officials and federal and state agencies to ensure timely management actions. Perhaps at the next congressional briefing staff could generate a short list of action items with specific responsibilities for follow-up.

One other suggestion received was to focus on fewer issues and allow for more in-depth discussion. For example, it was suggested that focus of the next congressional briefing might be on exotic species from ballast water. Many participants identified exotic species as a very timely and relevant issue. One way of addressing exotic species from ballast water would be to get expert scientists/researchers and some key program managers to prepare a succinct synthesis of the recent research and science regarding exotic species from ballast water (i.e., What do we know? What do we not know? What are the recent experiences with treatment and control, and how effective have they been? What scientific and engineering advice can we provide to policy-makers?). This succinct synthesis should probably be 5-10 pages long, clearly communicated, and easily understood. The idea is to synthesize the science and engineering, and translate it in an understandable fashion for a timely discussion with senior policy-makers. The target audience for this synthesis document would be senior elected officials from federal, provincial, and state governments, and other senior policy advisors and makers. This synthesis document could then be distributed in advance of the next congressional briefing to help prepare elected officials and other policy-makers for discussions. The expert scientists/researchers and some key program managers would then present a brief summary of the current state of knowledge relative to the science and management of exotic species from ballast water at the congressional briefing and would be available to enter into a major discussion with the elected officials and key policy-

makers. This would also allow for reaching agreement on a short list of action items with specific responsibilities for follow-up. Although this suggestion of preparing an easily-understood, scientific synthesis was made for the exotic species issue, the suggestion of preparing an easily-understood, scientific synthesis would also apply to other timely Great Lakes issues as well.

Finally, it was suggested that additional congressional briefings and science-policy dialogues must have a lead champion from both the elected official community and the scientific community. For current scientific knowledge to be translated for elected officials and other key policy-makers, and for continued improvement in effective Great Lakes policy development based on sound science, more partnerships will be needed between elected officials and scientific organizations like government research laboratories, universities, international organizations like Great Lakes Fishery Commission and the International Joint Commission, professional societies like the International Association for Great Lakes Research, and others. For more information on this pilot project, see IAGLR's web site (<http://www.iaglr.org/scipolicy/stabenowtour.pdf>).

### Aquatic Invasive Species

In an effort to translate the science on aquatic invasive species, a group of IAGLR scientists prepared a report titled "Research and Management Priorities for Aquatic Invasive Species in the Great Lakes." This science translation report was prepared for policy-makers to help understand what is known and not known about the aquatic invasive species issue. Human activities are profoundly affecting the earth's support systems. Population growth has been accompanied by a variety of stresses of natural ecosystems, including habitat destruction and modification, chemical contamination, and the unintentional introduction of various nonindigenous invasive species.

Some nonindigenous invasive species have had significant adverse effects on human, plant or animal health, local and regional economies, and on the ecosystems they invade. Recent examples of notorious invasive species include fire ants and African honey bees in the southern U.S., West Nile virus and Asian longhorn beetles in the eastern U.S. and Canada, and, of course, the zebra mussel in the Great Lakes and eastern half of the U.S. and Canada.

The Office of Technology Assessment calculated almost \$100 billion in U.S. economic losses over an 85-year period from just 79 nonindigenous species. Another researcher has estimated losses to the United States economy of at least \$137 billion per year associated with the effects of nonindigenous species on native ecosystems, agriculture, and natural resources, including the costs for control efforts. As noted by the Union of Concerned Scientists, the accuracy of such calculations is difficult to assess, but probably is a minimum. In addition to economic and human health costs, nonindigenous invasive species are anticipated to be the leading cause of biodiversity change in lakes in the coming century and of extinctions in North American freshwater ecosystems.

The Great Lakes are the largest freshwater ecosystem on earth (not counting the polar ice caps). They are the economic, cultural, and recreational lifeblood of millions of North Americans. They are the gateway to the heartland waters of the United States and Canada. Threats to the ecosystem have changed through the times, and so too must responses. Introduction of aquatic nonindigenous species is arguably the most serious economic and ecological threat to the Great Lakes today.

Key conclusions and recommendations include:

- Aquatic species invasions continue to pose one of the greatest risks to the health and productivity of our coastal marine ecosystems and the Great Lakes.
- A major federal funding increase of at least \$30 million per year for the Great Lakes region is needed to push for rapid progress towards solutions to the problems outlined in this document. The piecemeal and relatively small annual funding requested by the Administration and provided by Congress, and the funds available through Canadian agencies, are not sufficient for substantive progress. Invasive species are no longer just a matter of scientific interest and local concern - they represent a threat to the marine/aquatic biosecurity of the United States, Canada, and the other coastal nations of the world. Invasive species have a direct impact where we live and play, and they affect our standard and style of living in an adverse manner. Winning the invasive species challenge means investing in a reasonable 10-year goal: to eliminate new introductions of aquatic invasive species by 2013. Oceanic shipping (ballast tanks) has been the primary vector for new aquatic species introductions and will continue to be the most significant and high-risk vector until effective treatment technologies are developed, proven, and made suitable for installation and use aboard a variety of large ships.
- Without government leadership and funding, availability of approved ballast water/ballast tank treatment technologies is at least a decade away, perhaps longer.
- The development of an effective, practical ballast water treatment standard or standards remains a major hurdle to progress on the development and testing of treatment technologies.
- The lack of reliable and flexible full-scale testing platforms is an obstacle to testing promising ballast water treatment technologies. Test platforms, in the form of leased vessels, shore-based test facilities, or MARAD vessels, need to be available for full-scale tests under actual vessel operating conditions.
- Given that many of the aquatic invaders that have established in the Great Lakes in recent years originate from Eurasia, an interdiction program based on assessment of potential high-threat invader organisms in European fresh and brackish water systems should be undertaken. This will require international collaboration and cooperation.
- Information to track and identify shifts in patterns of trade coming into the Great Lakes should be compiled and maintained on an annual basis.
- Increased resources are needed to support aquatic invasion science research, to advance our understanding of the invasion process, the development of reliable risk assessment models, and the ability to identify and evaluate potential future invaders.

- Genetic tools to identify relationships among source communities and newly established communities should be emphasized. This is perhaps the best tool we have to demonstrate source-donor relationships.
- Although the ballast tank vector remains the highest prevention priority, increased resources should be directed towards other vectors, such as aquaculture, the bait industry, and the aquarium industry.
- The barrier between the Mississippi River and the Great Lakes should be maintained and upgraded to prevent movement of exotic species between both ecosystems.

For more information on this aquatic invasive species report, see IAGLR's web site (<http://www.iaglr.org/scipolicy/ais>).

### Urban Nonpoint Source Pollution

In an effort to strengthen the science-policy linkage for the issue of urban nonpoint source pollution, Stephen Bocking of Trent University partnered with the Science Advisory Board of the International Joint Commission on a project to learn from the experiences of Oak Ridges Moraine, north of Toronto, Ontario, relative to the impact of urban nonpoint source pollution. This pilot project found that one major unsolved problem in the Great Lakes is urban nonpoint source pollution – contaminated runoff from impervious surfaces (such as roads, parking lots, and roofs), and from other sources, such as lawns and construction sites. This form of pollution is rooted in fundamental aspects of the North American way of life, particularly the expansion of low-density suburban areas, much of which consists of impervious, contaminated surfaces or lawns.

Just as the origins of nonpoint source urban pollution are diffused across the landscape, so too is responsibility. Regulation of urban development largely rests with hundreds of municipalities or other regional bodies within the Great Lakes region. These are often poorly equipped to adopt a broad, ecosystem perspective to the issue; they also often lack the expertise necessary to understand the problem or to regulate its sources effectively.

The complexity of the problem, and the lack of capacity of many of the responsible agencies, pose a special challenge for science. Much scientific information is available regarding nonpoint source pollution: its sources, control, and remediation. There are also numerous scientific uncertainties. But attention needs to be focused not simply on research or information needs, but on identifying problems in the linkage between scientific information and land use decisions more generally.

In particular, the role of science in encouraging more innovative forms of urban development that can reduce nonpoint source pollution needs to be considered. Such forms—often under the rubric of "smart growth"—are more compact, efficient and environmentally sustainable than conventional suburban development. These virtues of smart growth have been widely noted, but the political and economic will to actually implement this form of development is often lacking.

The case study of an environmental controversy involving suburban development on the Oak Ridges Moraine, north of Toronto, illustrates some of the obstacles to smart growth, and the role that science might play in overcoming these obstacles. In particular, it highlights how

science can contribute to broadening the basis for environmental protection, beyond managerial and technical approaches, by empowering communities to understand, and to protect their local environment, fostering a civic environmentalism.

To extend our understanding of the issues raised by this pilot project, and to further the objectives of the IAGLR/Joyce Foundation project on science and policy, IAGLR should consider partnerships with local agencies responsible for nonpoint source pollution. These partnerships—perhaps focused on two or three specific sites within the Great Lakes basin—would explore in more detail the factors that affect adoption of sustainable urban development patterns, and IAGLR's potential contribution to improving the effectiveness of science in the urban development process.

Other key conclusions and recommendations from this urban nonpoint source pollution pilot project include:

- Urban nonpoint source pollution constitutes one of the most complex—scientifically and politically—environmental challenges facing the Great Lakes community.
- Some aspects of urban nonpoint source pollution can be ameliorated through managerial or technological strategies and practices. However the problem is also rooted in basic aspects of North American society, including dominant patterns of low-density suburban development. Therefore, political, as well as technical, solutions are required. Science can play a role in facilitating both kinds of solutions.
- Effective management of urban nonpoint source pollution requires a variety of approaches to research: basic research to identify emerging problems (such as the input of pharmaceutical products into waterways); focused research on managerial and technological innovations, with a view to continual improvement of best management practices; research aimed at perfecting selected environmental indicators, particularly those that allow for comparison with national and international trends, as well as a steady, sustained commitment to monitoring; and public communication and involvement in science, including community monitoring activities.
- Management of urban nonpoint source pollution is highly fragmented, discouraging ecosystem or watershed-based approaches. To be effective, solutions require coordination amongst a diverse array of agencies at the binational, federal, state/provincial and local levels. Efforts to improve scientific research and information dissemination must therefore be designed to encourage this coordination; ideally, science—through provision of an agreed-upon knowledge base—can provide a basis for interagency cooperation. The binational experience may be a useful source of models for cooperation at the local level on nonpoint source pollution.
- There is an essential role for senior governments in the science of urban nonpoint source pollution, both in requiring better coordination and planning at the local level, and in facilitating this with appropriate assistance: by conducting research, enhancing the capabilities of local governments to do their own research, and disseminating research results more widely to local staff (e.g. through training) and to the general public.
- Efforts to communicate scientific information to policy-makers and other audiences should be informed by an understanding of the political and institutional contexts in which that information is applied, including the political and economic obstacles to effective environmental protection. These communication efforts should especially ensure that scientific information is available to all members of a community.

- The assumptions that guide the application of scientific information to political and managerial decision-making—for example, regarding the appropriateness of the precautionary principle—must themselves be openly examined as an element of the decision-making process.
- More research on the benefits, economic or otherwise, of nonpoint source pollution control would be beneficial, to contribute to political support for control initiatives.

For more information on this urban nonpoint source pollution report, see IAGLR's web site (<http://www.iaglr.org/scipolicy/nps/>).

#### **4g. Facilitate Dialogue between Policy-makers and Scientists Regarding Information Needs**

As noted earlier, IAGLR conducted a Great Lakes policy-makers survey to begin communication between policy-makers and scientists, and to help gain insights into key issues that would benefit from a strengthened science-policy linkage. This survey report is available at:

<http://www.iaglr.org/scipolicy/report070201.php>

In addition, IAGLR held two special meetings at its annual conferences in 2001 and 2002 to foster dialogue. See links below for additional information:

<http://www.iaglr.org/scipolicy/kickoff.php>

<http://www.iaglr.org/scipolicy/manitoba.php>

News releases and announcements were also used to promote communication and dialogue. See "Project News" page below for examples:

<http://www.iaglr.org/scipolicy/news.php>

In June 2002, IAGLR also established a listserv to help inform the Great Lakes policy and science communities about the project. The initial distribution list was comprised of the stakeholders invited to participate in the survey conducted in the first year of the project. In addition, a "Subscribe" feature was added to the project web page, which has netted a few additional subscribers, bringing the total to 157. At this time, the listserv is "announcement only," with updates coming from IAGLR's Science-Policy Director John Hartig.

Awareness of the listserv expressed during the evaluation was surprising low, given that the invitation to participate in the evaluation went out to this list. To increase the profile of the listserv, more recent announcements have included a standard heading and footer to formally identify the source and purpose of the message.

As noted earlier, three pilot projects were undertaken to help strengthen the science-policy linkage:

- Congressional Briefing on Detroit River and Lake St. Clair environmental and natural resource issues;
- aquatic invasive species; and
- urban nonpoint source pollution.

Each of these pilot projects provided good opportunities to facilitate dialogue between policy-makers and scientists on information needs. All provided valuable insights into key factors for successful dialogue and into the nature of information, level of detail, length, the importance of science translation, etc. to promote successful dialogue.

Finally, IAGLR is convening a special session titled “Strengthening the Connection Between Great Lakes Science and Policy” at its 2003 Annual Conference in Chicago, Illinois. This session features eight talks and a one-hour panel discussion to further dialogue between policy-makers and Great Lakes scientists.

#### **4h. Evaluate and Fine-tune Approaches to Strengthen the Science-Policy Linkage**

As part of this project, IAGLR conducted, during autumn 2002, an evaluation of Great Lakes Science-Policy Resources created through its *Great Lakes Science-Policy Initiative*. A web-based evaluation was conducted among 156 Great Lakes science-policy stakeholders identified through an earlier *Survey of Great Lakes Policy Issues* (see, e.g., <http://www.iaglr.org/scipolicy/survey/surveymain.php>). Responding stakeholders (N=26) represented a wide range of organizations on both sides of the international border. Sixteen responses were received from American organizations, including two Native/Tribal groups; 10 responses were received from Canadian organizations, none of which were Tribal. Governments represented included the American and Canadian federal governments, state government, Ontario and Quebec. Responses were also received from non-profit groups and organizations based in universities and industry, as well as from “governance” organizations (such as the IJC). Thirty-one percent of respondents described their organizational role as “policy management,” 15 percent as “policy advising” and “education,” respectively, 12 percent as “scientific research,” and eight percent as “lobby/advocacy,” “policy making,” and “policy research,” respectively.

#### **Key Evaluation Findings: Science-Policy Resource Awareness, Value, Utilization, and Improvement**

These groups provided information regarding their current and projected future use of IAGLR’s science-policy resources, as well as advice for improving them and creating new resources to respond to emerging Great Lakes issues. A key finding was that most stakeholders were not aware of IAGLR’s science-policy resources. The survey was conducted as some of the resources were being released, however, so the relatively low level of stakeholder awareness is to be expected. Still, this finding points to the need for further project outreach.

Of the seven resources created through this initiative (i.e., on-line journal, expert directory, congressional briefing, aquatic invasive species science translation, urban nonpoint source pollution case study, science-policy listserv, and advisory board recommendations), the on-line journal consistently rated highest among stakeholders in terms of resource awareness, potential value, and current and future utility. Indeed, most stakeholders rated all of IAGLR’s science-policy resources as valuable to their organization and indicated that they will use them to

inform and evaluate their current and future policy activities, particularly with regard to “best practices” in environmental resource management.

Stakeholders were asked to offer suggestions for increasing awareness of and improving specific resources among Great Lakes science-policy stakeholders. For all resources, the most common suggestion was to provide links to other science and policy related websites and listservs, including government networks, libraries, and industry association publications, and implement a strategic marketing/outreach program through those sources.

Stakeholders were also asked to suggest up to three additional Great Lakes issues that they would like IAGLR to address through its existing suite of science-policy resources. Aquatic Invasive Species remained the most commonly identified issue for continued treatment through IAGLR’s science-policy initiative, despite having been the focus of the aquatic invasive species science translation document.

The evaluation also sought stakeholder suggestions for new science-policy resources for IAGLR to create through potential future science-policy activities. The new resources mentioned most frequently included the development formal environmental management partnerships among Great Lakes scientists, policy makers, and resource managers, and the development of a senior manager’s science-policy “tool kit” to facilitate the process.

#### Stakeholder Evaluation Comments: Critical Issues and Continued Outreach

Finally, stakeholders were asked to identify and discuss additional pertinent information not previously covered in the evaluation survey. The spirit of the comments received are best captured in the following two responses:

- “These resources have great potential, and we would very much like to see this project succeed because it has potential to fill a void recognized by many. This should be supplemented by more issues that connect/address the affect of land management on water resources. This would broaden the type of policies that could be influenced with these resources. The synthesis of critical issues (e.g., aquatic invasive species) could be a fabulous resource for digesting technical information for a broader audience. Could you dedicate a short section in the journal to these types of synthesis articles? This way there would be incentive to publish them and you would be able to provide a bank of resources similar to what I envision the aquatic invasive species science summary could be. Most of the journal articles, while useful, are several steps away from being applied to policy, mostly because they seldom make management or policy recommendations specific enough to translate into policy.”
- “I am a casual IAGLR member, as you may determine from my responses. But, the fact that I am so unfamiliar with your resources and programs, even though I carefully review each issue of the Journal of Great Lakes Research, suggests that more should be done to promote the organization’s other offerings.”

These comments reflect the dominance of the on-line journal among IAGLR’s suite of resources and the stakeholder perception that, given further planning and outreach, this resource presents great potential for strengthening science-policy connections in the Great Lakes.

## Evaluation Recommendations: Strategic Planning and Outreach

Considering this evaluation was conducted at the end of this project cycle – as the science-policy resources were being released and advertised among the public – and given stakeholder preferences for strategic outreach, the following recommendations are offered to guide potential future planning, outreach, and evaluation activities pertaining to the science-policy initiative:

- Initiate a collaborative strategic planning process to direct future project-related activities aimed at strengthening science-policy linkages throughout the Great Lakes basin. The strategic planning process will enable IAGLR and key science-policy stakeholder organizations to (a) jointly *define* specific long-term (e.g., five-year) project goals and objectives; (b) *guide* potential future activities relative to those objectives; and (c) *assess* the degree to which the objectives have been achieved and, ultimately, Great Lakes science-policy linkages have been strengthened.
- Design and implement an on-going project evaluation. The evaluation will build upon the strategic planning process as recommended above, and will include partnering with key stakeholder organizations to (a) implement project objectives/activities; (b) assist stakeholders with science-policy resource access and utilization; and (c) obtain real-time stakeholder feedback regarding resource enhancement to better meet their science-policy needs. This information will enable IAGLR to adaptively manage the science-policy process as new issues, policy-makers, and elected officials emerge over time throughout the basin. The evaluation will also include a follow-up survey of all stakeholder organizations to assess project outcomes, specifically the degree to which IAGLR's project activities have strengthened science-policy connections among Great Lakes stakeholder organizations.

A full report of evaluation methods, findings, and recommendations has been prepared under separate cover and may be viewed and downloaded at (<http://www.iaglr.org/scipolicy/evaluation/evalmain.php>).

### **4i. Disseminate Project Information**

Throughout the first year of this project, a significant outreach effort was undertaken to advertise this initiative and to make both scientists/researchers and policy decision-makers aware of the benefits to be derived from this enhanced communication. This included publishing an editorial on the project in the Journal of Great Lakes Research ([http://www.jglr.org/2001/num2/27\\_2\\_155-116.pdf](http://www.jglr.org/2001/num2/27_2_155-116.pdf)) and disseminating information to IAGLR members and potential members of the Science-Policy Advisory Board.

During the second year, efforts focused on disseminating project results and encouraging interaction between policy-makers and scientists on the three policy issues identified by the Science-Policy Advisory Board.

These efforts included announcements via regional listservs (such as the IAGLR membership listserv and GLIN-announce), as well as coverage in regional newsletters and web sites, and special sessions at IAGLR's annual Conference on Great Lakes Research.

### Outreach at IAGLR Conferences

IAGLR's annual Conference on Great Lakes Research provided the perfect vehicle for sharing vital information and securing ongoing participation in the initiative.

IAGLR 2001 Conference in Green Bay – The 2001 conference in Green Bay was the inaugural meeting of the science-policy advisory board. It highlighted the project objectives, reviewed preliminary results of the survey, and discussed potential topics for demonstration projects to strengthen the science-policy linkage.

IAGLR 2002 Conference in Winnipeg – The 2002 conference updated science-policy advisory board members on progress and identified some key, practical suggestions for strengthening the science-policy linkage in the Great Lakes Basin. See attached link for additional information ([http://www.iaglr.org/scipolicy/manitoba\\_summ.php](http://www.iaglr.org/scipolicy/manitoba_summ.php)).

IAGLR 2003 Conference in Chicago – A special session titled *Strengthening the Connection Between Great Lakes Science and Policy* is scheduled for the IAGLR/ILEC joint conference in June 2003. This session will profile IAGLR's work undertaken in the last two years to strengthen the science-policy linkage under the grant from The Joyce Foundation. Chaired by John Hartig, the session will feature presentations on each of the three pilot projects, the survey and evaluation efforts, the expert directory and the *Journal of Great Lakes Research* archive, and key project recommendations. A panel discussion will also be held to discuss how to move forward and continue the efforts to strengthen the science-policy linkage.

### Online Marketing Efforts

The project also included a number of online marketing efforts highlighted below.

IAGLR Web Site – The IAGLR web site was redesigned to include a prominent link to the Great Lakes Science-Policy Initiative project from the home page, which featured a logo for the project. The project section features links to all products, as well as a news page announcing each. Project news also was featured on the site's general "News and Announcements" page, and listed for a time on the association's home page under "Hot Topics."

In addition, the IAGLR web site is being redesigned to provide more prominence and immediate access to several of the projects developed under the grant, including the ability to search the journal and the expert directory from every page on the site.

Project Listserv – A listserv was set up and used to facilitate dialogue between policy-makers and scientists (see June 14<sup>th</sup> announcement on web site -- <http://www.iaglr.org/scipolicy/news.php>).

IAGLR E-mail Notes – IAGLR members that subscribe to the association’s biweekly listserv also received regular project updates.

Other Web Sites – IAGLR became a GLIN Daily News sponsor, which enabled the Association to submit press releases to the GLIN Press Room. IAGLR submitted press releases regarding the JGLR archive, the expert directory, and the aquatic invasive species and nonpoint source pollution reports.

In addition, links to project resources (including the JGLR archive and the aquatic nuisance species report) were requested from other relevant sites. The following are some of the sites that include links to these resources: Great Lakes Fishery Commission, Great Lakes Environmental Research Laboratory, U.S. Geological Survey’s Great Lakes Science Center, and Great Lakes Information Network.

The aquatic invasive species report was formally requested by the Midwest Natural Resource Managers Group (senior policy-makers and managers) of the U.S. federal government for use in policy discussions and formulation.

#### Offline Marketing Efforts

IAGLR informally promoted the project to key policy-makers throughout the basin. This included encouraging use of key project reports and soliciting practical advice to strengthen the science-policy linkage.

IAGLR also requested publicity for key developments in regional newsletters. The JGLR archive was mentioned in several newsletter, including Great Lakes Commission Advisor, Sea Grant newsletters, etc. In addition, several key Great Lakes institutions have linked to project summaries on the IAGLR web site (e.g., Great Lakes Environmental Research Laboratory, Great Lakes Science Center, Sea Grants, Great Lakes Fishery Commission, Michigan Office of the Great Lakes, etc.). In addition, the project team contacted the media for the aquatic invasive species report, resulting in at least two articles:

- In *The News Herald* in Southgate, Mich. (<http://www.iaglr.org/scipolicy/ais/news/nh.php>); and
- In the *Erie Times-News* in Erie, Pa. (<http://www.iaglr.org/scipolicy/ais/news/tn.php>).

## **5. CONCLUSIONS AND RECOMMENDATIONS**

Great Lakes policy development and implementation often occur in an institutionally complex environment. Indeed, there are many levels of government and many key players in the policy arena that make it particularly challenging.

Not only is Great Lakes policy development and implementation institutionally complex, it also is particularly challenging because of the disciplinary differences between scientists and policy-makers/politicians. This is sometimes described as the knowledge-power axis, where policy-makers/politicians are often perceived as having all the power and scientists having all the knowledge. One obvious challenge is to try to get more scientists involved in Great Lakes policy

development and implementation, and more policy-makers/politicians involved in learning and applying Great Lakes science.

To affect policy development and implementation requires building a strong consensus and mandate. Building a strong consensus and mandate for a particular Great Lakes issue will require good science. Experience has shown that having good science as the foundation for Great Lakes policy development and implementation means less argument. Less argument translates into a higher probability of success in the policy arena. From a Great Lakes policy-makers' perspective, good science is generally described as:

- Relevant (a priority to Great Lake managers and policy-makers);
- Current (up-to-date information and knowledge);
- Robust (supported by a strong weight of evidence);
- Recognizes limits (sensitive to scientific uncertainty and knowledge gaps; understands limits of current knowledge and scientific understanding);
- Understandable (clearly communicated, in a concise fashion, and with aptness of thought); and
- Accessible (science is easily accessible via the Internet and other mechanisms).

The U.S.-Canada Great Lakes Water Quality Agreement calls for use of a systematic and comprehensive ecosystem approach (i.e., accounting for interrelationships among water, air, land, and all living things, including humans, and involving all user groups in management) in water resource planning, research, policy development, and management. Use of an ecosystem approach requires not only a strong scientific foundation, but a strong linkage between science and policy as well. Although there are some very good examples of use of an ecosystem approach in the Great Lakes, much more can and should be done to operationalize use of an ecosystem approach and strengthen the science-policy linkage.

Although there is no single best way to implement an ecosystem approach and establish a strong, effective linkage between science and policy, all successful approaches follow an adaptive management framework. Adaptive planning and management recognizes the uncertainties and imperfect knowledge of ecosystems. Adaptive planning and management is an iterative learning process that integrates the environment with economic and social understanding, and helps reduce uncertainty in management decisions by using knowledge/information gained from past experiences to reassess priorities for future actions. It strives for continuous improvement through an iterative decision-making process based on trial, monitoring, and feedback. Put another way, an inclusive decision-making process is used to assess, set priorities, and take action in an iterative fashion for continuous improvement. Any long-term effort to strengthen the science-policy linkage in the Great Lakes Basin must also be viewed as an iterative process for continuous improvement.

Through IAGLR's project to strengthen the science-policy linkage in the Great Lakes Basin, many excellent suggestions were received. Suggested actions and activities to strengthen the science-policy linkage can be generally grouped into the following categories:

- Clarify and reach agreement on priorities;
- Plan cooperatively;
- Share responsibilities for delivery of programs;
- Share resources;

- Build partnerships and cooperative relationships;
- Integrate research, monitoring, and management;
- Develop new approaches to science, policy, and management issues; and
- Communicate the value and benefits of a strong linkage amongst science, research, policy, and management (Table 2).

**Table 2. Examples of suggested activities to help strengthen the science-policy linkage in the Great Lakes Basin.**

| <b>CATEGORY</b>                                 | <b>SUGGESTED ACTIVITIES</b>  |
|---|--|
| Clarify and reach agreement on priorities       | <ul style="list-style-type: none"> <li>• Use mechanisms like the International Joint Commission (IJC), Great Lakes Fishery Commission (GLFC), and Great Lakes Commission (GLC) to clarify and reach agreement on research and policy priorities</li> <li>• Ensure that research priorities explicitly address management goals and policy needs</li> </ul>   |
| Plan cooperatively                              | <ul style="list-style-type: none"> <li>• Use mechanisms like the IJC, GLFC, and GLC to foster cooperative planning and management</li> <li>• Make greater use of informal mechanisms of binational, science-policy cooperation (e.g., Wayne State University, University of Windsor, and others held a 2002 workshop to evaluate the effects of PCB control measures in Detroit River and Western Lake Erie)</li> <li>• Champion cooperative planning processes like remedial action plans (RAPs) and lakewide management plans (LaMPs)</li> <li>• Maximize science use and management result (i.e., by ensuring use of available science, ensuring no conflict among management goals, and furthering integrated action)</li> <li>• Develop more congressional and parliamentary dialogues and committees to increase communication and cooperation on science transfer to policy-makers</li> </ul> |
| Share responsibilities for delivery of programs | <ul style="list-style-type: none"> <li>• Combine U.S. and Canadian surveillance efforts into a single, binational program</li> <li>• Develop more government-university and public-private centers of specialty in science analysis, science transfer, etc.</li> <li>• Further community-based, volunteer, monitoring programs and ensure that data/knowledge can be used in policy development and management</li> </ul>  |

|  |   |
|--|---|
| Share resources  | <ul style="list-style-type: none"> <li>• Encourage university and government scientists to take sabbatical leaves in policy and management organizations</li> <li>• Establish more cooperative agreements between research institutions and resource management agencies</li> <li>• Establish more government funded faculty positions to strengthen the science-policy linkage (e.g., Partnership on Ecosystem and Resource Management between Michigan Department of Natural Resources-Fisheries Division and Michigan State University)</li> </ul>   |
| Build partnerships and cooperative relationships                 | <ul style="list-style-type: none"> <li>• Utilize more partnerships like HabCARES (Habitat Conservation and Restoration Strategies) that pool resources from numerous partners to strengthen the science-policy linkage in an issue-driven and product-driven fashion for management purposes</li> <li>• Develop more partnerships like Canada’s Lake Superior Programs Office that promote strong science-policy linkages</li> <li>• Co-locate management agencies on university campuses to foster stronger science-policy linkages</li> <li>• Establish more centers of excellence to strengthen science-policy linkages</li> <li>• Undertake cooperative projects among organizations like the Council of Great Lakes Industries, IJC, governments, IAGLR, etc. to strengthen science-policy linkages</li> </ul> |
| Integrate research, monitoring, and management efforts           | <ul style="list-style-type: none"> <li>• Encourage U.S. Environmental Protection Agency and Environment Canada to expand the focus of the State of the Lakes Ecosystem Conferences to include not only status and trends, but the policy/management response as well</li> <li>• Encourage IJC and GLFC to initiate a five-year rotating cycle of reporting out on progress, reviewing and evaluating progress, and setting management and policy priorities by Great Lake (all monitoring data, research information, and management actions would be discussed in an open forum with scientists and policy-makers)</li> </ul>  |
| Develop new approaches to science, policy, and management issues | <ul style="list-style-type: none"> <li>• Undertake resource management projects like experiments with strong science-policy linkages (e.g., Green Bay Mass Balance Study, Hamilton</li> </ul>   |

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|---|---|
|   | <p>Harbour Habitat Rehabilitation Project)</p> <ul style="list-style-type: none"> <li>• Develop new data sources and management tools (like the Detroit River habitat inventories and GIS technologies)</li> <li>• Develop new funding alternatives (e.g., a portion of license plate fees designated for integrated research and policy development; leverage, challenge, and partnership grants)</li> </ul>   |
| <p>Communicate the value and benefits of a strong linkage amongst science, research, policy, and management</p> | <ul style="list-style-type: none"> <li>• All Great Lakes researchers and scientists must take personal responsibility for translating their science and making sure that their science is used in ecosystem-based management initiatives</li> <li>• Data and information from all research should be easily accessible and understandable through the Internet to foster communication and dialogue</li> <li>• Governments, in cooperation with IAGLR, could sponsor a collaborative effort that quantifies the benefits of science-based, ecosystem management in the Great Lakes Basin</li> </ul> |

Improvements can be made in each of the above categories and areas. The suggested activities presented above are not comprehensive or perfect, but are intended to give practical suggestions to help strengthen the science-policy linkage and provide the necessary foundation for effective Great Lakes management. The rate of change in environmental and resource issues, and programs, is accelerating. Therefore, decision-makers in research, science, policy, and management cannot be afraid to change.

All policy-makers recognize that sound and credible decision-making depends on good science, good databases, and effective science transfer. Sound science will be even more important in ecosystem-based, decision-making processes that require understanding of cause-and-effect relationships of persistent toxic substances, exotic species, climate change, changes in food web structure and function, and continued habitat loss and degradation. In addition, sound science is a prerequisite to setting priorities and targeting greatest risks.

### Recommendations

Many good suggestions and recommendations were made to strengthen the Great Lakes science-policy linkage throughout this two-year project. For example, IAGLR's June 4, 2002, Science Policy Advisory Board meeting (convened as part of the Association's annual conference at the University of Manitoba) provided many good ideas and recommendations ([http://www.iaglr.org/scipolicy/manitoba\\_recs.php](http://www.iaglr.org/scipolicy/manitoba_recs.php)). However, as noted above, strengthening the science-policy linkage in the Great Lakes Basin is a process that should follow an adaptive management framework to assess, set priorities, and take action in an iterative fashion for continuous improvement.

Based on an assessment of the project steering committee, there are a number of ongoing efforts to strengthen the science-policy linkage in the Great Lakes Basin; however, much more

can and should be done to strengthen this linkage. Recommended priorities (no rank order implied) for strengthening the science-policy linkage in the Great Lakes Basin include:

- *Strategic Planning and Outreach* – IAGLR’s Outreach Committee should work in cooperation with the Great Lakes Sea Grant Network and others to develop a strategic plan to systematically strengthen the science-policy linkage in the Great Lakes Basin. This would place a high priority on outreach (e.g., issuing news releases of timely journal articles, preparing an annual conference summary, developing science translation documents, etc.). The strategic planning process would be collaborative and direct future project-related activities aimed at strengthening science-policy linkages throughout the Great Lakes Basin. This strategic planning process would define long-term (e.g., five-year) project goals and objectives; guide potential future activities relative to those objectives; and periodically assess the degree to which the objectives have been achieved and, ultimately, Great Lakes science-policy linkages have been strengthened.
- *Strategic Evaluations* – As part of the strategic planning process noted above, evaluations should be performed by IAGLR, in partnership with key stakeholder organizations, to implement project objectives/activities; assist stakeholders with science-policy resource access and utilization; and obtain real-time stakeholder feedback regarding resource enhancement to better meet their science-policy needs. This information will enable IAGLR to adaptively manage the science-policy process as new issues, policy-makers, and elected officials emerge over time throughout the basin. The evaluation should also include a follow-up survey of all stakeholder organizations to assess project outcomes, specifically the degree to which project activities have strengthened science-policy connections among Great Lakes stakeholder organizations.
- *Additional Pilot Projects* – The aquatic invasive species pilot project was very well received. It is recommended that IAGLR do more of these science transfer pilot projects in cooperation with policy partners like the Council of Great Lakes Governors, North East Midwest Institute, etc. Such pilot projects would produce scientific knowledge assessments on specific topics for policy-makers. Emphasis should be placed on effective, reliable, and timely translation of information and views between scientists and policy-makers. For example, IAGLR could develop a white paper on the research and policy/management needs for the establishment of a common resource-based standard for evaluating water withdrawals/diversions in the Great Lakes Basin. Another example would be for IAGLR to help develop a science transfer report for policy-makers on the anoxic dead zone in Lake Erie.
- *Scholarships and Fellowships* – IAGLR could issue a scholarship for someone to work intensively to strengthen the science-policy linkage on a timely Great Lakes issue and/or could offer a policy fellowship like the Sea Grant Knauss Fellowships and Great Lakes Commission Fellowships that would work to strengthen the science-policy linkage on a specific issue.
- *Special Symposia* – IAGLR should convene more special symposia with policy institutions (e.g., Council of Great Lakes Governors, North East Midwest Institute, Great

Lakes Commission, Great Lakes Fishery Commission, International Joint Commission) to tackle specific issues and develop an action agenda to strengthen the science-policy linkage. Special emphasis should be placed on enticing the right people (e.g., key policy-makers) to participate.

- *Collaborative Study or Project* – Federal, state, and provincial governments should be challenged to carry out a major, collaborative, interdisciplinary initiative that would systematically strengthen the science-policy linkage. For example, a Four-Party Agreement (U.S. Environmental Protection Agency, Environment Canada, Michigan Department of Environmental Quality, and Ontario Ministry of the Environment) exists for management of the Detroit River watershed. Currently, there is a piece-meal approach to monitoring, research, policy development, and management activities for the Detroit River. A collaborative, interdisciplinary project could be initiated under the Four-Party Agreement to integrate and coordinate monitoring, research, policy development, and management activities, potentially facilitated by the IJC and/or GLFC. This collaborative project would be managed jointly by policy-makers and research scientists/resource managers.
- *Urban Nonpoint Source Pollution* – IAGLR should initiate a study of how to strengthen the linkage between science and policy with respect to urban nonpoint source pollution, with a special emphasis on the role of science in fostering more sustainable patterns of urban development (often referred to as "smart growth"). This initiative could take the form of a set of parallel case studies of successful "smart growth" initiatives. An appropriate study design would focus on two cases in the United States, and one in Canada, so as to account for the significance of varying jurisdictional/governance structures. In each study, the specific contributions that science has made in encouraging these initiatives would be identified, as well as more general lessons, applicable to other urban areas across the Great Lakes Basin. These lessons could be used to "kick start" the iterative learning process that is the basis for adaptive policy and management, by providing practical examples of what has worked elsewhere. These studies could be conducted in cooperation with policy partners either within or outside the region, as the issues at stake are shared by urban areas across North America.
- *State of the Lakes Ecosystem Conference (SOLEC)* – SOLEC conferences are hosted by the U. S. Environmental Protection Agency and Environment Canada on behalf of the two Countries every two years in response to the Canada-U.S. Great Lakes Water Quality Agreement. These successful conferences provide a forum for exchange of information on the ecological condition of the Great Lakes and surrounding lands. A major purpose is to reach a large audience of people in the government (at all levels), corporate, and not-for-profit sectors that make decisions that affect the lakes. Five such conferences have been held to date that focus on the condition or state of the Great Lakes Basin Ecosystem. U.S. Environmental Protection Agency and Environment Canada should expand the focus of SOLEC from solely reporting on condition/state of the ecosystem to reporting on condition/state and policy/management response. SOLEC provides a unique opportunity to strengthen the science-policy linkage in the Great Lakes Basin by expanding binational

discussions to include our knowledge of both condition/state and policy/management response.