Sixth Biennial Report Emphasizes Virtual Elimination of Persistent Toxic Substances

"Are humans and our environment in danger from persistent toxic substances now? Are future generations in danger? Based on a review of scientific studies and other recent information, we believe the answer to both questions is yes."

by Sally Cole-Misch

Thus concludes the International Joint Commission in its Sixth Biennial Report on Great Lakes Water Quality, released in mid-April on the 20th anniversary of the signing of the Great Lakes Water Quality Agreement. The Commission’s report focuses on persistent toxic substances, and the steps needed to reach the Great Lakes Water Quality Agreement’s goal of virtual elimination of the inputs of these substances to the Great Lakes system.

The Commission concludes in its report that, based on information and advice from a variety of sources, persistent toxic substances are too dangerous to the biosphere and to humans to permit their release in any quantity. When results of the many studies that indicate injury or the likelihood of injury to species throughout the food chain are considered together, it finds that the weight of evidence is sufficient to reach this conclusion.

As a result, the Commission suggests several steps for action. While it recommends that Governments review but not renegotiate the Agreement (as required after every third biennial report from the Commission), it does recommend that the Agreement definition of a persistent toxic substance be revised. This revision would include “those substances with a half-life in any medium — water, air, sediment, soil or biota — of greater than eight weeks, as well as those toxic substances that bioaccumulate in the tissue of living organisms.” The present definition refers only to those substances with a half-life in water of greater than eight weeks. Half-life is that time required for a substance’s concentration to diminish to one-half its original value.

Because actions to date have not sufficiently reduced or eliminated certain chemicals, including polychlorinated biphenyls (PCBs), DDT, dieldrin, toxaphene, mirex and hexachlorobenzene, the Commission also recommends that these persistent toxic substances be sunset as soon as possible. Sunsetting is a process to restrict, phase out and eventually ban the manufacture, generation, use, transport, discharge and disposal of a substance. Those uses of lead and mercury that result in their discharge or disposal into the environment should also be sunset.

The Commission received a great deal of information and advice over the past two years concerning the use of chlorine in the Great Lakes basin. The Commission recommends that the Parties consult with industry and other affected interests to develop

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timetables to sunset the use of chlorine and chlorine-containing compounds as industrial feedstocks.

The recently evolving programs created by governments, interest groups, municipalities and industries, the Commission concludes, begin to focus on the specific issues facing the Great Lakes ecosystem and are encouraging signs of action. For example, the Binational Program to Protect the Lake Superior Basin, announced last fall by the Governments of Canada and the United States in cooperation with Michigan, Minnesota, Wisconsin and Ontario (see Focus, Volume 16, Issue 3, page 6), includes several provisions to restore and protect the basin through special designations, and pollution prevention and enhanced regulatory programs.

The Commission voices its support for this program and recommends that the governments also establish a deadline for eliminating point or direct releases of persistent toxic substances into Lake Superior or its tributaries. It also suggests that the Parties agree to prohibit new or increased direct discharges and establish a coordinated phaseout of existing sources.

The Sixth Biennial Report also includes recommendations on further strategies to sustain the Great Lakes-St. Lawrence ecosystem. Several recommendations previously made in the Commission’s Special Report on Great Lakes Environmental Education (see Focus, Volume 16, Issue 1, page 18) are repeated, including calls for increased emphasis on the Great Lakes and environmental education at all age, grade and subject levels, establishment of a Great Lakes Education Clearinghouse, and support for curriculum development and teacher training programs.

Finally, the Commission recommends that the Parties join with states, provinces and local governments to identify and designate sustainable development areas. Areas of high quality that are being pressed by economic growth would benefit from new community-based programs to ensure that development in these areas is sustainable in economic and environmental terms. In particular, the Commission supports the model program for the Grand Traverse Bay region in Lake Michigan and recommends that the Parties support it as the first of these sustainable growth areas. The resulting program could also provide a model for Areas of Concern to strive for once rehabilitated.

Copies of the Commission’s Sixth Biennial Report on Great Lakes Water Quality are available from its three offices. Contact the International Joint Commission at:

1250 23rd Street NW, Suite 100
Washington, DC 20440
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L’élimination virtuelle des substance toxiques rémanentes au coeur du Sixième Rapport biennal de la Commission mixte internationale

par Sally Cole-Misch

"Les substances toxiques rémanentes mettent-elles actuellement en danger les êtres humains et l'environnement? Et les générations futures? Si l'on se fie aux études scientifiques et à d'autres données récentes, la réponse à ces deux questions est oui."

 Elle est la conclusion que tire la Commission mixte internationale dans son Sixième Rapport biennal sur la qualité de l'eau dans les Grand Lacs, qui sera rendu public à la mi-avril à l'occasion du vingtième anniversaire de la signature de l'Accord relatif à la qualité de l'eau dans les Grands Lacs. Le rapport de la Commission porte sur les substances toxiques rémanentes et sur les mesures à prendre en vue d'atteindre l'objectif énoncé dans l'Accord, c'est-à-dire éliminer virtuellement leur déversement dans le réseau des Grands Lacs.

La Commission conclut dans son rapport que, à la lumière de l'information et des avis recueillis de diverses sources, les substances toxiques rémanentes présentent trop de risques pour la biosphère et pour l'être humain pour qu'on en permette le rejet, même...
en infinites quantités. Les nombreuses études mettant en évidence l’occurrence ou la probabilité de dommages chez diverses espèces le long de la chaîne alimentaire ont ensemble une valeur probante suffisante pour que la Commission en arrive à cette conclusion.

En conséquence, la Commission suggère plusieurs voies d’intervention. Ainsi, elle recommande aux Gouvernements de revoir l’Accord, sans toutefois le renégocier (comme cela est prévu à chaque troisième rapport biennal de la Commission) et d’en profiter pour redéfinir l’expression “substance toxique rémanente”. La nouvelle définition se lisait ainsi: “les substances dont la demi-vie dans tout milieu, que ce soit l’eau, l’air les sédiments, le sol ou le biote, est supérieure à huit semaines, ainsi que les substances qui se bioaccumulent dans les renvois qu’aux substances dont la demi-vie dans l’eau est supérieur à huit semaines. La demi-vie désigne le temps requis pour que la concentration originelle d’une substance diminue de moitié.

Comme les mesures prises à ce jour n’ont pas permis de réduire suffisamment ou d’éliminer certaines substances chimiques, notamment les biphényles polychlorés (BPC), le DDT, la dieldrine, le toxaphène, le mirex et l’hexachlorobenzène, la Commission recommande également de soumettre ces substances à un échéancier précis, et le plus tot possible. Il s’agirait en fait de restreindre, d’éliminer progressivement et d’interdire ultimement la fabrication, la génération, l’utilisation, le transport, le rejet et l’élimination d’une substance. Les utilisations de plomb et de mercure qui entraînent le rejet ou l’élimination de ces substances dans l’environnement doivent également faire l’objet de mesures analogues.


La Commission constate en outre que les programmes mis sur pied par les gouvernements, les groupes d’intérêt, les municipalités et les entreprises commencent depuis peu à cibler les enjeux propres à l’écosystème des Grands Lacs, et elle y voit des signes encourageants sur les plans de l’action. Par exemple, le programme binational de protection du bassin du lac Supérieur, annoncé l’automne dernier par les gouvernements du Canada et des États-Unis en coopération avec le Michigan, le Minnesota, le Wisconsin et l’Ontario (voir Focus, volume 16, numéro 3, page 6), comprend plusieurs dispositions visant le restauration et la protection du bassin au moyen de mesures spéciales de désignation, de mesures de prévention de la pollution et de programmes de réglementation améliorés.

La Commission appuie ce programme et recommande que les gouvernements établissent en outre une date limite pour l’élimination des rejets ponctuels ou directs de substances toxiques rémanentes dans le lac Supérieur ou ses tributaires. Elle suggère également que les Parties conviennent d’interdire l’accroissement en nombre ou en volume des sources de rejets directs et se dotent d’un protocole d’élimination progressive des sources actuelles.


Enfin, la Commission recommande que les Parties, en collaboration avec les gouvernements des États, des provinces et des municipalités, délimitent et désignent des zones de développement durable. Ainsi, les zones de grande qualité sur lesquelles s’exercent des pressions de croissance économique profiteraient de nouveaux programmes ancrés dans la collectivité et axés sur le développement durable au plan tant économique qu’environnemental. En particulier, la Commission appuie le programme pilote pour la région de Grand Traverse Bay dans le lac Michigan et recommande que les Parties fassent de celle-ci la première zone de développement durable. Le programme définitif pourrait également servir de modèle de développement pour les secteurs préoccupants, une fois ceux-ci restaurés.

On peut se procurer un exemplaire du Sixième Rapport biennal sur la qualité de l’eau dans les Grands Lacs en s’adressant à l’un des trois bureaux suivants de la Commission mixte internationale:

18ème étage 100, rue Metcalfe Ottawa, Ontario (613) 995-2984
1250 23rd Street NW Suite 100 Washington DC 20440 (202) 736-9000

8ème étage 100, avenue Ouellette Windsor (Ontario) 48232
ou P.O. Box 22869 Detroit (Michigan) (313) 226-2170

La Commission recommande que les Parties se mobilisent de manière concertée et dans un esprit de collaboration pour favoriser le respect et l’application de ces recommandations.

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**Invisible Miracles of RAPs**

*by John Hartig and Neely Law*

In a seven year period, remedial action plans (RAPs) have gone from obscurity to an institutional household name in the Great Lakes basin. RAPs have broken new ground by adopting the ecosystem approach, encouraging public participation, and establishing integrated institutional structures (e.g., citizen committees, stakeholder groups, basin committees, public advisory committees) to facilitate stakeholder involvement in remediation and to coordinate related programs and organizations. RAPs cannot take credit for the cleanup efforts completed prior to their development, but RAPs can take credit for the increased appropriations, both human and monetary, as a result of their inclusive and coordinated approach to remediation. RAPs thus act as catalysts to expedite the cleanup of the 43 Great Lakes Areas of Concern.

Mike Zarull, a research scientist with Canada’s National Water Research Institute, has been involved with RAPs since their conception in 1985. He believes that:

“...The two greatest accomplishments of RAPs are the creation and maintenance of stakeholder groups and, through them, the development of consensual, ecosystem goals. The stakeholder groups have provided a personalized forum to affect remediation and a means to make visions of the future become a reality. Consensual goals have provided both the framework and the impetus for voluntary action, what someone once de-scribed to me as invisible miracles. These invisible miracles are the steps taken by industry, business and citizens on a voluntary basis to improve their local environment, often without any acknowledgement of their accomplishment. These unforced and unsolicited actions demonstrate the true potential for the RAP program to succeed.”

One example of a successful RAP program is in Hamilton Harbour, where Stelco and Dofasco — two of the largest steel companies in Canada — have been active participants since the beginning. Recognizing the need to control contaminants at their source, they voluntarily have spent approximately $75 million for plant improvements and process changes that have resulted in substantial reductions in pollutant loadings. Although industries have been making environmental improvements for decades, many recent plant improvements and process changes have been accelerated by the RAP process. These industrial process improvements and reductions in pollutant loadings are examples of the invisible miracles fostered by the RAP process.

In the St. Louis River/Bay Area of Concern, the RAP process is also credited with pushing control of contaminants at their sources. Nancy Larson, Wisconsin’s St. Louis River/Bay RAP coordinator, says:

“...The RAP is grappling with the problems of contaminated sediments, which are relics of past industrial activities as well as continuing inputs of toxic substances. At a recent public hearing in Superior, Wisconsin, public testimony overwhelmingly supported a draft permit that would greatly limit discharges of toxic substances by a local oil refinery and major employer. By contrast, in the 1970s, strong local support was demonstrated for the company’s request for relaxed permit conditions.

“The RAP’s main strength, I think, is in the way it has formed coalitions to look for solutions to environmental problems and to champion protection for the resource. The RAP committee recognizes the importance of viable local industries, but they are interested in supporting efforts to have industry — and everyone else — do business in a responsible manner.”

Today, institutional cooperation is more important that ever before. Carl Anderson, co-chairperson of the Ashtabula River RAP Advisory Council, recognizes how RAPs are facilitating cooperation and coordination:

“In 1989, RAP council members met with Ohio officials to solicit state support for a sediment sampling program. Local industry initiated and helped to coordinate and fund a $1.4 million river sediment sampling program to accelerate and delineate the pollution problem in the Ashtabula River. Local, state and federal elected officials began to work together with private citizens and industry to seek the financial resources to implement the remedial dredging of Ashtabula River.”

“The two greatest accomplishments of RAPs are the creation and maintenance of stakeholder groups and, through them, the development of consensual, ecosystem goals.”

Greater cooperation at the local level is also paying dividends at the state level. Ava Hottman, chief of the Division of Water Quality Planning and Assessment for the Ohio Environmental Protection Agency (Ohio EPA) says:
An aerial view of the mouth of the Maumee River (circa 1983).

"RAPs are changing the way Ohio EPA approaches and solves environmental problems. Through the ecosystem approach, a cross-media approach to problem solving is being undertaken, as evidenced by different agencies and organizations undertaking joint investigations and implementing mutually beneficial remedial actions. As a result, RAPs have been the catalyst for securing resources to get on with remediation. For example, $500,000 has been obtained to implement sediment and nutrient recommendations called for in the Maumee River RAP; $400,000 will be used to tackle urban stormwater runoff programs under the Cuyahoga and Maumee River RAPs; and $1.3 million has been obtained to investigate and prioritize abandoned hazardous waste sites in the entire Maumee River basin."

Through the ecosystem approach and public participation, RAPs account for the interrelationships between different organizations and programs and establish broad-based coalitions for remediation. Local ownership of RAPs is viewed as essential to elevate the priority given to plan implementation. In Wisconsin, Green Bay is considered a priority by state and local representatives because it was designated an Area of Concern and because of public participation in the RAP process. The broad representation of stakeholders in the Green Bay RAP Citizen's Advisory and Implementation Committees has enabled the development of an integrated resource management strategy with widespread support. It has also paid off in financing where, to date, $170 million has been committed to RAP projects. Vicky Harris, Green Bay RAP coordinator, states that:

"The Green Bay RAP implementation program resembles a community patchwork quilt of projects and funding sources. While the RAP provides the overall pattern, many organizations and governments contribute carefully selected pieces to the RAP quilt. There are some major holes that need patching, but the quilt is growing steadily, piece by piece."

This would not have occurred had it not been for Area of Concern designation and the RAP process. This also holds true for RAPs in Lake Superior where, according to Jake Vander Wal, manager of federal/provincial environmental programs for Lake Superior:

"The RAP teams and Public Advisory Committees (PACs) in Thunder Bay and Nipigon Bay have become partners with all levels of government and numerous public interests. This partnership has initiated aquatic habitat and shoreline restoration projects valued at $10 million. This includes $3 million committed by Environment Canada through their Great Lakes Cleanup Fund."

Similarly, in Hamilton, RAP Coordinator Keith Rodgers says that:

"The Canada Department of Fisheries and Oceans is the lead in a cooperative effort among the Royal Botanical Gardens, the Harbour Commissioners and several environmental groups and industries to raise the $12.6 million required to provide fish, bird and wildlife habitat and public access to more of the harbour, with some spinoff benefits to boaters and shore protection concerns. Without the RAP, this scale of project may not have seen the light of day."

This level of institutional cooperation among government, industry and the public also sets the stage for effective decisionmaking. Empowering the public can expedite RAP development and implementation because the citizens collectively define the goals at the local level. One good example is in the Rouge River in southeast Michigan. Jim Murray, director of the Wayne County Division of Public Works, notes:

"The Rouge River RAP gave citizens an opportunity to participate in fulfilling their vision for the Rouge. Because of the cost of restoring the Rouge, it is vital that citizens partici-
pate in the process and understand their continuing role. The Rouge River RAP and the involvement of the key stakeholders through the Rouge River Basin Committee have been the catalyst to secure over $500 million for sewer improvements to address combined sewer overflows. Without the RAP and the support of the stakeholders, this would not have been possible. The challenge now is to sustain the RAP process and its momentum in order to fully restore all uses in the Rouge River.”

Action for remediation cannot and has not happened over night. Over the past seven years, RAP institutional structures, government agencies and others have become increasingly aware of the amount of time and money needed to remediate their specific Area of Concern. Through consistent and coordinated efforts, however, RAPs are securing greater resources. Barry Boyer, a member of the Buffalo River RAP Citizen’s Committee says that:

“The RAP gave us two great political advantages: we have a specific plan for cleaning up the river, and the major community constituencies are signed on to it. We’re now getting more than one million dollars in new funding to restore the Buffalo River. Some of that may have happened without the RAP — but certainly not all of it.”

As the above quotes demonstrate, the RAP program has established an unprecedented amount of public support for the cleanup of Great Lakes Areas of Concern. RAPs have created a synergetic relationship among the people living in, affected by and responsible for the Areas of Concern. Citizens are integral parts to developing the RAP goals, planning implementation and educating the broader public. As a result, RAPs serve as catalysts for many invisible miracles that collectively will rehabilitate Areas of Concern. To sustain the RAP process, this record of success must be continued and milestones celebrated in the overall goal of restoring and protecting the Great Lakes Basin Ecosystem.

**Commission Approves RAP Review Process**

At its February Executive Session, the International Joint Commission approved the following guidelines for its review of remedial action plans. The guidelines are the result of guidelines previously developed by the Water Quality and Science Advisory Boards, and comments provided at the Stage 2 workshop and at meetings with jurisdictional representatives.

The goal of Remedial Action Plans (RAPs) is to define the actions and the timetables to restore all beneficial uses in Areas of Concern. Restoration of uses is to be achieved through implementation of programs and measures to control sources and remediate environmental problems. The jurisdictions and Parties are responsible for preparation of the RAPs and the International Joint Commission, in its advisory capacity, will track their development, review and evaluate their adequacy to restore beneficial uses, and track implementation. The Commission wishes to ensure that its reviews are impartial, properly focused, and consistent for all RAPs.

The purposes of the three-stage review process is to evaluate each RAP for efficacy to abate sources/inputs, resolve identified pollution problems, and restore beneficial uses. The review should provide constructive criticism and advice. Again, each RAP will be submitted to the Commission for review and comment at three stages. The Commission RAP review process is intended to build upon the initial work of the Water Quality and Science Advisory Boards, and streamline the process in order to make it more effective. Questions in the table at right are based on the points outlined in Annex 2 of the Great Lakes Water Quality Agreement, additional questions formulated by the Water Quality and Science Advisory Boards, and input from the Parties and jurisdictions.

The Commission RAP Steering Committee will coordinate the RAP review process. Upon receipt of a RAP, the RAP Steering Committee will ensure that the plan is distributed to six to 12 technical peer reviewers (the Water Quality Board and Science Advisory Boards will automatically receive a copy of the RAP along with an invitation to provide review comments). When all technical reviews of a RAP have been received, a draft coordinated review will be prepared.

The centerpiece of the RAP review process is a meeting of the technical reviewers, the relevant RAP coordinator(s), public advisory committee or stakeholder group representatives, the IJC RAP review manager, a senior official of the jurisdiction and Party concerned, and the members of the Commission RAP Steering Committee. The Commission considers it important that at least one Commissioner attend each RAP review meeting. The purpose of this meeting is to defini-
### Table: RAP Review Process

#### STAGE 1: Adequacy of Problem Definition

- Have the environmental problems in the Areas of Concern been adequately described, including identifying beneficial uses impaired, the degree of impairment and the geographic extent of such impairment?
- Has there been identification of specific objectives of the Agreement that are not met to the extent that such failure has caused or is likely to cause impairment of beneficial uses, including the area’s ability to support aquatic life?
- Have the causes of the use impairments been identified, including a description of all known sources of pollutants involved and an evaluation of other possible sources? Have societal causes such as demographics, economic forces, private and public sector activities, and technological changes been described and their contribution to use impairments investigated?
- Does the plan embody a systematic and comprehensive ecosystems approach? Have problems, sources and causes been examined within an interdisciplinary framework?
- To what extent are relevant human health issues addressed in the RAP? Have human health data been included and evaluated?
- Have stakeholders been identified? Have they been involved in defining problems and causes? Has the broader community been informed about the RAP? Are there regular opportunities for public input? Is there a detailed plan for public participation and information?
- If there are data or information missing, is there a mechanism to fill these gaps?

#### STAGE 2: Identification of Remedial and Regulatory Measures

- Have Stage 1 data and information gaps been filled?
- Are the RAP goals and objectives clear and precise? Are they consistent with the general and specific objectives of the Agreement? Do the RAP goals reflect the aspirations of the community? Is there a mechanism for acknowledging and resolving differences of opinion?
- Have existing remedial and preventive programs and legislation been assessed, alternative remedial and preventive measures evaluated, and additional remedial and preventive actions to restore beneficial uses been identified, including a schedule for implementation? Has this been done within a systematic and comprehensive ecosystem approach? What beneficial uses (if any) will not be restored? Does the RAP indicate why?
- Have work plans and resource commitments been made? If not, is there a process in place to obtain them?
- Have stakeholders and beneficiaries been identified? Have they been involved in the RAP planning process? Is there a mechanism for their involvement in implementation and cooperative problem solving?
- Has the public participation process been documented? Have there been regular opportunities for the community at large to be involved in planning? Will there be mechanisms to involve them in implementation?
- Is there provision for periodic public review and updating of the RAP by the jurisdictions and Parties?
- Has a surveillance and monitoring program to track effectiveness of remedial actions and confirmation of beneficial uses been adequately described?
- To what extent, and in what ways, does the RAP ensure the protection of beneficial uses in the Area of Concern once those uses are restored?

#### STAGE 3: Restoration of Beneficial Uses

- Have all identified remedial measures to restore all beneficial uses been implemented? If not, why?
- Do surveillance and monitoring data confirm restoration of beneficial uses? If not, why?
- Is there a pollution prevention program in place, incorporating a philosophy of zero discharge of persistent toxic substances?

To have these sessions in the communities concerned, the financial and staff resource realities may require that two or, if possible, more RAPs be considered at each session, perhaps obviating that possibility in some cases. These sessions are considered technical review meetings and not public meetings for receiving broader comment. At the completion of the meeting, the Commission's RAP review manager and the RAP Steering Committee members will finalize immediately the coordinated review and a draft letter for consideration by the Commission at its next meeting. The intent of this process is to obtain a draft Commission response to the RAP within five months of submission.
BRIEFS

The Great Lakes Critical Programs Act of 1990 (see Focus, Volume 16, Issue 1, page 10) required the U.S. Environmental Protection Agency (US EPA) to issue guidance on uniform water quality standards for the Great Lakes by June 30, 1991. Development of the guidance is part of the Great Lakes Water Quality Initiative, begun in 1989. The standards are to be consistent with the terms and goals of the revised 1978 Great Lakes Water Quality Agreement between the United States and Canada.

A federal/state technical steering committee responsible for developing and proposing these standards reached agreement last December and sent its guidance to U.S. EPA headquarters for its review. Representatives from each of the Great Lakes states’ natural resource agencies, U.S. federal agencies, and members of the public and industrial communities served on the committee. The initiative as agreed to by the committee will:

- require the eight states to standardize regulations by 1994;
- prohibit new pollution sources in the Great Lakes or their tributaries from using dilution to meet pollution standards;
- force existing pollution sources to phase out treatment-by-dilution by 2004;
- require states to consider the effects of pollution on wildlife when setting water quality standards;
- single out several dozen toxic chemicals to be sunset or banned from release;
- close loopholes in some state regulations that allow dischargers to avoid restrictions by dumping into a river or stream that feeds into the lake, rather than the lake itself; and
- serve as a model for other regions of the country in establishing standardized water regulations.

Look for the committee’s proposed guidance to be published in the U.S. Federal Register sometime this year, along with information on how to provide comments to US EPA on the initiative. After comments are received, the agency will make any required revisions and will republish the final version. States will have two years to comply with the guidelines.

In its new report, MISA Issues Resolution Process Report, the Ontario government outlines its new focus for the Municipal-Industrial Strategy for Abatement (MISA) program. The new focus moves the program into the regulatory phase by setting effluent limits for sector-specific contaminants, prohibiting cross-media transfer of pollutants such as from air to water, and creating a zero discharge approach to ban and/or phase out specific persistent toxic substances from release into the environment.

The five-year-old MISA program targets 3,000 industries that discharge effluents directly into lakes and another 12,000 who tie into sewer systems. This newest pollution prevention component will include limits that “enable industry to overcome its reliance on end-of-pipe technology,” said Ontario Minister of the Environment Ruth Grier.

For a copy of the issues resolution report or other MISA documents — including the Preliminary Report on the Second Six Months of Process Effluent Monitoring in the MISA Pulp and Paper Sector — contact the Public Information Centre, 135 St. Clair Avenue West, First floor, Toronto, ON M4V 1P5, telephone (416)323-4321.

In early February 1992, a U.S.-Canadian government task force announced its new program under the Binational Program to Restore and Protect Lake Superior. The program specifically addresses the goals of the U.S.-Canada Binational Lake Superior Initiative announced at the International Joint Commission’s Biennial Meeting last fall (see Focus, Volume 16, Issue 3, page 6), by focusing on long-term pollution prevention and creating new programs and demonstration projects that help to eliminate persistent toxic substances throughout the Lake Superior watershed.

A Lake Superior Advisory Forum was also created in response to the binational initiative. The forum, which includes 22 Canadian and U.S. members from environmental organizations, industries, municipalities and other stakeholder groups in the Lake Superior region, has held more than 30 consultation sessions with the public thus far. It has also created a “twinning project” between Duluth, Minnesota and Thunder Bay, Ontario to share technical information regarding waste treatment, recycling, waterfront development and remedial action plans.

For more information on the Lake Superior program or the advisory forum, contact Karen Plass, Lake Superior Center, 353 Harbor Drive, Duluth, MN 55802, telephone (218)720-3033.

Congratulations to Dr. William Stapp and the creators of the Global Rivers Environmental Education Network, who received the Environment and Conservation Challenge Award from President Bush and the Council of Environmental Quality. Dr. Stapp, professor of environmental education at the School of Natural Resources at the University of Michigan, was presented with the award during ceremonies at the White House late last fall. The award was presented for Dr. Stapp and GREEN’s innovative program to educate others about river water quality, how to monitor the river, and actions citizens can take to improve or preserve that quality. The program has expanded over the past five years to students in more than 120 countries, who communicate with each other via computers. For more information, see Focus, Volume 12, Issue 2, page 14 or contact Marc Cromwell, GREEN, University of Michigan, School of Natural Resources, Dana Building, Ann Arbor, MI 48105, telephone (313)764-1410.

The Milwaukee Metropolitan Sewerage District (MMSD) has convened a Greater Milwaukee Toxics Minimization Task Force to assist in implementing a toxics management strategy for the community. The task force includes representatives from industry, labor, academia, environmental organizations, and engineering and environmental law firms. The task force also acts independently to conduct community outreach programs and as an information clearinghouse.

https://scholar.uwindsor.ca/ijcfocus/vol17/iss1/1
The strategy developed by the task force contains several recommendations to MMSD to achieve toxic loading reductions and communitywide pollution prevention. The goals include improving the MMSD toxics database to maximize the effectiveness of an ongoing toxics reduction program and to document progress; reducing currently nonregulated sources of toxics to the MMSD system; and achieving further reductions from regulated sources of toxic substances to the MMSD system.

Several community organizations are helping to achieve these recommendations. For example, the Lake Michigan Federation and MMSD are teaming up to launch a two-year, household pollution prevention educational campaign to reduce the nonregulated sources of toxics to the MMSD system. MMSD serves almost one million people within a 420 square mile area and operates two wastewater treatment plants. Its permits allow discharges of up to 320 million gallons of wastewater to Lake Michigan daily.

For additional information, contact Kathy Bero, Lake Michigan Federation, 647 W. Virginia, Milwaukee, WI 53204, telephone (414)271-5059.

The Ontario Waste Management Corporation has announced its third annual Outstanding Waste Reduction Achievement Award competition for 1992. All Ontario companies that have reduced levels of hazardous or liquid industrial waste are encouraged to enter the competition by May 30, 1992. The competition will be judged by an independent panel of engineers, chemists and media representatives according to several criteria, including quantity and toxicity of waste reduced, reused or recycled; environmental benefits and cost savings; degree of complexity and innovation; and applicability to other companies.

For entry forms and competition details, contact Mel Kostovick, Award Program Coordinator, Ontario Waste Management Corporation, 2 Bloor Street West, Toronto, ON M4W 3E2. (416)923-2918 or 1-800-268-1178; fax (416)923-7521.

If you attended the International Joint Commission's 1991 Biennial Meeting in Traverse City, Michigan, you might remember that several officials, organizations and citizens in that city have created the Grand Traverse Bay Watershed Initiative. The program was initiated to develop a comprehensive management plan for the Grand Traverse Bay, recognizing its unique physical characteristics and the high level of water quality it has maintained despite several threats to this quality. Recently, the region's county boards of commissioners and local organizations, agencies and officials signed a Partnership Agreement, which commits them to cooperatively provide technical and financial assistance to support the multi-year initiative. It also recognizes that the region's future quality of life and economic health depend on maintaining and sustaining the natural resources of the watershed.

For information on the initiative and the agreement, contact Mark Breederland, Northwest Michigan Council of Governments, P.O. Box 506, Traverse City, MI 49685-0506, telephone (616)929-5022.

Marine-Net is an electronic bulletin board servicing the maritime community. Membership provides users with access to others in the marine industry, ancillary industries, shippers and various agencies. The Marine-Net project was conceived by the Great Lakes-St. Lawrence Maritime Forum and developed by the Ontario Ministry of Transportation. Membership fees of $300 (Cdn) a year plus $19 (Cdn) an hour connect time ($10 in Toronto) allows participants to send and receive electronic mail, conference, and transfer files. Members also have free access to hundreds of conferences on WEB, a Canadian electronic network of organizations working on environmental, human rights and international development issues.

For more information on Marine-Net, contact Andrew Kibedi, Freight Policy Division, Ministry of Transportation, Second Floor, West Tower, 1201 Wilson Avenue, Downsview, ON M3M 1J8. (416)235-4041; fax (416)235-4932.

At its December and February Executive Sessions, the International Joint Commission welcomed several new members to its Council of Great Lakes Research Managers. Dr. Alfred Beeton, previously the U.S. co-chair to the Great Lakes Science Advisory Board and director of the Great Lakes Environmental Research Laboratory, has joined the Council, as has Denis Croux, acting director of the Research Grants Division of the Social Sciences and Humanities Research Council in Canada, and Lynn Cleary, director, Ecotoxicology and Ecosystems, St. Lawrence Centre of Environment Canada. New U.S. members include Dr. Barry Johnson, assistant surgeon general and assistant administrator for the Agency for Toxic Substances and Disease Registry, Center for Disease Control, Dr. John Laflien, director of the National Soil Erosion Research Laboratory of the U.S. Department of Agriculture's Research Service, and Dr. Charles Remsen, Director of the Center for Great Lakes Studies at the University of Wisconsin-Milwaukee.

The U.S. Section of the International Joint Commission moved in January 1992 to comply with new federal building safety requirements. Located in the same building as the International Boundary Commission (which demarcates the boundary between the United States and Canada), the new Washington, DC office is next to Rock Creek Park, between the DuPont Circle and Foggy Bottom metrorail stops. The new address is International Joint Commission, 1250 23rd Street NW, Suite 100, Washington, DC 20440, telephone (202)736-9000.
Commission Releases First Report Under Detroit-Windsor / Port Huron-Sarnia Air Reference

by Sally Cole-Misch

Sufficient information exists on airborne toxic chemicals in the Detroit-Windsor and Port Huron-Sarnia regions to conclude that there is a significant public health issue requiring immediate and additional emission abatement and preventive measures. This conclusion and others are included in the International Joint Commission’s first report that responds to a 1989 letter from the Governments of the United States and Canada. The letter recommences the 1975 Reference on the state of air quality in the region (see Focus, Volume 13, Issue 3, page one).

The Commission also concluded that, while the region’s ambient concentrations of airborne toxics are similar to those found in other urban areas of comparable size and industrial development, further research and pollution prevention strategies are needed to better understand the potential human health effects of airborne toxic chemicals in the region. These deficiencies should not, however, deter immediate action to prevent emissions of the 15 priority carcinogens identified by the Board.

The Commission’s report reflects investigations and recommendations prepared by its advisory board (see Focus, Volume 16, Issue 1, page 3), comments provided in two public meetings in March and April 1991, and written submissions. Based on this input, the Commission concluded that a lack of ambient air monitoring data, emission inventories and health-related studies on potentially important toxic substances makes it difficult to analyze the human health and environmental effects of these chemicals. Multiple routes of exposure must be analyzed to assess the total risk of the burden of toxic chemicals on human health.

The Commission thus recommended in its report to Governments that:

- a comprehensive air toxics monitoring program be developed and implemented for the region;
- Governments initiate and implement pollution prevention programs to eliminate or phase out airborne toxic emissions in the region, with priority given to the 15 known carcinogens listed in the board’s Group I list;
- emission inventory data be updated and procedures developed to assess the relative and cumulative importance of various pathways by which humans are exposed to toxic chemicals;
- incineration facilities in the region be phased out of use or eliminate the production and emission of dioxins, furans, PCBs and inorganic materials, especially mercury and hydrochloric acid. Uniform state and provincial control requirements should be established for incineration facilities based on the principle of zero discharge of persistent toxic substances;
- a regional ozone control strategy be developed, in consultation with Michigan and Ontario, that includes emission controls for mobile and stationary sources; and
- information and databases be compiled on noncancer effects as a result of human exposure to airborne toxic chemicals.

Other recommendations address risk assessment models, air quality objectives for sulphur dioxide and particulate matter, and research on additional chemicals that may require immediate abatement and preventive measures.

The Commission will continue tracking and reporting on air quality trends in the region, monitoring government regulations and initiatives developed to reduce toxic air emissions, and assessing health risks posed by airborne chemicals. For further information on the reference, contact Edward Bailey at the Commission’s Canadian Section Office, 100 Metcalfe Street, 18th floor, Ottawa, ON K1P 5M1, telephone (613)995-2984 or Joel Fisher, International Joint Commission, 1250 23rd Street NW, Suite 100, Washington, DC 20440, telephone (202)736-9000. To obtain a copy of the report, contact the same offices or the Regional Office, 100 Ouellette Avenue, Windsor, ON N9A 6T3 or P.O. Box 32869, Detroit, MI 48232, telephone (519)256-7821 in Canada or (313)226-2170 in the US.
Damage Estimation Studies Begin in Levels Study

by Anne Sudar

The Levels Reference Study Board’s first issue of its own newsletter, UPDATE/AU COURANT (bilingual newsletter), was mailed to approximately 2,000 individuals and groups in December 1991. The purpose of the newsletter is two-fold: (1) to keep the public informed on study progress; and (2) to provide opportunities for the public to review and provide comments and suggestions on various study products. Working committee I, the Public Participation and Information Committee, will produce six more issues over the next 15 months. If you would like to receive the next issue of UPDATE/AU COURANT, write or call one of the contact people listed at the end of this section.

Detailed Site Studies Approved

Estimating the potential for damages due to water level changes is a key part of the study, but is not an easy task for an area as large as the shorelines of the Great Lakes and St. Lawrence River. The potential for damage will be estimated using several scenarios, ranging from options to take no new measures to various types of additional lake level regulation measures, such as three-lake and five-lake regulation. The difference between damages incurred in the various scenarios will be one factor considered in the overall evaluation of measures.

To work within time and money constraints, researchers will use a two-pronged approach:

- update stage-damage curves (curves that show the relationship between lake levels and property damages) with 1985-1990 data to estimate damages, in dollars, that would be caused by progressively higher or lower water levels; and
- complete 13 detailed site studies to determine the damage potential for these sites at a higher level of detail.

The Levels Reference Study Board met in Toronto, Ontario on December 3, 1991 and approved the following 13 sites for the detailed studies:

Densely populated urban sites:
Montreal, PQ (St. Lawrence River)
Toronto, ON (Lake Ontario)
Chicago, IL (Lake Michigan)
Duluth, MN (Lake Superior)

Residential sites:
Berrien County, MI (Lake Michigan)
Hoover Beach, NY (Lake Erie)
Belle River to Stoney Point, ON (Lake St. Clair)

Agricultural sites:
Port Glasgow to Port Burwell, ON (Lake Erie)
Ottawa County, OH (Lake Erie)

Industrial/Commercial sites:
Oswego County, NY (Lake Ontario)
Thunder Bay, ON (Lake Superior)

Recreational sites:
Alexandria Bay, NY (St. Lawrence River)
Severn Sound, ON (Lake Huron/Georgian Bay)

Progress Review Meetings Planned for Spring

Working committees 2, 3 and 4 will complete several important tasks this spring. To provide citizens and members of the study team with an opportunity to review specific aspects of study progress and to provide comments prior to finalizing various products, four progress review meetings are planned for spring 1992. Each meeting will include a public session during the evening of the first day. These include:

Potential Damages and Erosion Processes: May 27 in Burlington, Ontario
Natural Resource Impacts: May 4 in Baraga, Michigan
Regulation Scenarios, Crisis Conditions, and Land Use and Management: May 12 in Toledo, Ohio
Evaluation Criteria: June 2, tentatively scheduled for Ann Arbor, Michigan

If you are interested in attending any of the above public meetings or would like more information, please contact Ruth Edgett or Anne Sudar as listed at the end of this update.

Study Participants Refine List of Measures

Study participants agreed on 18 categories of measures for examination. The results of this examination will form the basis for the study’s final recommendations in March 1993. Measures are actions that could be taken to reduce the problems caused by changing water levels and flows in the Great Lakes-St. Lawrence River system.

The categories, including regulation of lake levels and flows, land use regulation, shore protection alternatives and adaptive practices, were derived from an original list of more than 100 potential actions compiled during Phase I of the study. This consolida-
tion process was referred to as the initial screening of measures.

In order to keep the list of measures to a manageable size, a questionnaire was circulated to study participants who ranked the actions according to how well each action would be responsive to the study's requirements or planning objectives. In the process, measures such as the possibility of modifying weather and creating a sixth Great Lake were dropped. The remaining measures are divided among five broad categories at a special workshop in October 1991. They include:

I. Water Levels and Flows
   Regulation Practices
   1. Review Existing Regulation Plans
   2. Five-Lake Regulation
   3. Three-Lake Regulation

II. Land Use Regulatory Practices
    1. Setback Requirements
    2. Elevation Requirements
    3. Habitat Protection
    4. Shoreline Alteration Requirements
    5. Deed Restrictions/Regulations
    6. Development Controls for Public Infrastructure
    7. Nonstructural Land Use Practices

III. Land Use Incentive Based Practices
    1. Tax Incentives/Disincentives
    2. Loans
    3. Grants
    4. Insurance

IV. Shore Protection Alternatives
    1. Structural Shore Protection to Prevent Flooding
    2. Structural Shore Protection to Prevent Erosion
    3. Nonstructural Shore Protection

V. Adaptive Practices
   (operational adjustments by the water use categories that reduce the adverse consequences of fluctuating water levels)

The working committees will determine the effects each measure could have and assess how successfully the measures respond to the study planning objectives or requirements. This will ensure that the needs of each impact — or interest — category are taken into consideration. Various scenarios will be explored under each measure and combinations of measures also will be examined.

Native Peoples' Views on Great Lakes Water Levels

by Doug Cuthbert, Howard Reynolds and Michael C. Williams

Native people are one of ten interest groups identified in the Commission's Great Lakes-St. Lawrence Levels Reference Study. Other groups include shoreline riparians who have experienced shoreline flood and erosion damage, commercial shipping and hydroelectric power businesses whose economic gains or losses are tied to hydrologic conditions in the watershed, and recreational boaters whose activities are directly affected by fluctuating water levels. These interest groups are more easily recognizable and their views have traditionally been considered in lake levels studies. But what of the views of Native communities? Where are they located and how are they affected by changing water levels?

When the Reference study “team” was formed, the study board and Commission appointed two Native representatives to the Citizens Advisory Committee (CAC): Michael C. Williams of the Walpole Island First Nation, located at the confluence of the St. Clair River and Lake St. Clair, and Howard Reynolds from the Keeweenaw Bay Indian Community on the south shore of Lake Superior.

A survey of Native communities on the Great Lakes-St. Lawrence River shoreline (consistent with the previously completed Ontario riparian survey) was completed by the Walpole Island Heritage Centre of the Walpole Island First Nation. The survey was undertaken to ensure that Native views are considered in the Levels Reference Study and to provide information on the views of shoreline Native communities regarding changes in water levels. Charlene Kiyoshk, investigator for this task, submitted her final survey report on October 21, 1991. Survey data is being analyzed by working committee 2 members and will be available to First Nations/Tribal Communities.

Forty Native communities were identified as bordering the Great Lakes and St. Lawrence River shorelines, nine on United States shoreline and 31 on Canadian shores. The majority of these communities are on Lake Superior (10) and on the shoreline or connecting channels to Lake Huron and Georgian Bay (23). The remaining communities are located in the St. Clair River area (two), Lake Michigan (one), Lake Erie (one), and the St. Lawrence River (three).

Although analysis of the survey data has not been completed, observations made in the report include:

“All Native Peoples are different and it (their view of fluctuating water levels) depends on where they live. Most depend on natural resources for their livelihood and sustenance and would judge things according to their own people’s needs and preferences.

“Most Native people see themselves as a part of nature and its natural processes, and in that respect have learned
LAKE LEVELS UPDATE

to live in harmony with nature and the Creator’s will, rather than trying to control or manage it.

"When the (Levels Reference Study) analysis is being conducted, it would be wise to consider the Native Peoples’ unique history, philosophies and values before conclusions are drawn."

The most commonly held Native view of the fluctuating lake levels issue is that humans were put on earth by the Creator as part of the environment and thus they must live in balance with it. Native people believe the fluctuation of Great Lakes levels is a natural phenomenon that cleanses the system, and humans should not attempt to bring lake levels under their control. By doing too many things without knowing what the long-range effects will be, humans often destroy much of the balance of nature. Some feel that imposing lake level regulation on the system is based on dollar value rather than environmental value, the latter of which represents the long-term, true worth and value of the Great Lakes-St. Lawrence system.

Because of their history, Native peoples tend to be suspicious and cautious when dealing with governments. Yet, they believe that governments have an obligation to all people to protect their health and wellbeing. To not do this is a breach of trust and the inherent rights of all people, Native and non-native alike.

Direct your comments and inquiries on the Levels Reference Study to:

In Canada:
Ruth Edgett
Levels Reference Study
c/o Great Lakes Water Level Communication Centre
Environment Canada
867 Lakeshore Road
Burlington, ON L7R 4A6
(416) 336-4581 / 4629

In the United States:
Anne Sudar
Levels Reference Study
c/o Institute for Water Resources
U.S. Army Corps of Engineers
Casey Building
Fort Belvoir, VA 22060-5586
(703) 355-2336

Council Develops 1990-91 Great Lakes - St. Lawrence Research Inventory

by Zsolt Kocats and Peter Seidl

To understand and minimize adverse human impacts on the Great Lakes - St. Lawrence River Basin Ecosystem, a strong and directed program of research is essential. Research provides information to understand the ecosystem and human impacts within it, and to develop remedial strategies within responsible and informed environmental policies. The Great Lakes Water Quality Agreement requires that the Parties delineate research needs to support achievement of the Agreement’s goals.

The Council of Great Lakes Research Managers was created by the Commission in 1984 to provide guidance and advice on research. It identifies research trends, assists in research coordination and disseminates research-related information. Council members come from federal, state and provincial government research programs and private institutions.

In 1991, the Council initiated a survey of Great Lakes research to examine how it is addressing Agreement goals. The resulting 1990-91 Great Lakes - St. Lawrence Research Inventory provides a benchmark for use in future research coordination efforts in the basin. Specifically, it will aid efforts to reduce duplication and will facilitate the development of collaborative binational studies and multidisciplinary approaches to water quality issues.

To prepare the inventory, information on recent and ongoing Great Lakes research projects was solicited from federal, state and provincial agencies and institutions. Projects were categorized and entered into a computerized database. Documenting basin research activities is a large-scale undertaking, and is subject to a number of limitations: it is time consuming and labor-intensive to locate and contact all organizations conducting or funding relevant research in the basin; preparing the inventory is dependent on each agency's system of tracking and documenting research, and the specificity of project descriptions; and information on research from some organizations could not be obtained. Because of these constraints, the current inventory is incomplete.

Overview of Research in the Basin

Forty-nine agencies and institutions submitted project descriptions. The inventory consists of 634 research projects carried out at 160 institutions, addressing 701 objectives. Total funding amounts to approximately $77 million (US). Institutions of Council members...
represent approximately 50 percent of this total. Figure 1 illustrates the distribution and funding of research projects among major categories. Overall, the majority of research projects investigate toxic substances, while basic research and anthropogenic impacts other than toxic substances or eutrophication command roughly equal research efforts. Eutrophication receives a lower level of research. In comparison with results of the 1982 Great Lakes Research Review prepared by the Science Advisory Board, relative government research effort expended on toxic substances has increased approximately 50 percent, to 60 to 70 percent of the total in 1990/91.

Figure 2 illustrates the distribution of funding and projects among major toxic substance concerns. Studies specific to polluting substances (identification, properties, analytical methods) and those focusing on pollutant sources receive a relatively low proportion of the total effort. Projects investigating the levels, transport and fate of contaminants predominate, followed by modeling, atmospheric deposition and soil/groundwater studies.

The majority of studies addressing toxic chemical exposure investigate contaminant concentrations in biological tissues at the population or individual level. This is partially due to the large number of toxic contaminants released into the ecosystem, which requires a considerable expenditure on toxicity testing and field studies of effects. Remedial research is dominated by studies of contaminated sediment remediation and waste treatment methods development.

**Research Addressing Commission Priorities**

Nearly half of the recently developed Commission priorities for 1991-1993 are directly or indirectly connected to research. To determine how much of recent Great Lakes research addresses

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**Figure 1. Distribution and funding according to topic**

**Figure 2. Distribution of funding and projects among issues concerning toxic substances**
Commission priorities, projects were regrouped and results are presented in Table 1. The total resources allocated to research addressing priority areas amounts to approximately 40 percent of the inventory total.

The largest proportion of research addressing a Commission priority is associated with virtual elimination of persistent toxic substances. Relatively few projects focus on developing selection criteria to decide which substances should be subject to virtual elimination (element 1). Although scientific research may contribute to this process, this element is more closely related to regulatory activities. The variety of potential contaminant sources (element 2) requires extensive research, however, which is reflected in the relatively large amount of resources allocated to this element. Sediment remediation techniques receive the greatest proportion of funding allocated to element 3, reflecting the magnitude of sediment contamination problems affecting the Great Lakes.

Technology development aimed at preventing the generation and release of toxic substances (element 4) receives a moderate amount of research effort. However, studies outside the basin and similar efforts of private industry may add significantly to those listed in the inventory. A significant number of projects investigate the use of indicators to track levels and effects of persistent toxic substances in the ecosystem (element 5), particularly health effects indicators.

A major portion of research projects also address the Commission’s human health priority. Much of this research is not specifically designed to investigate Great Lakes related human health issues, however, and a large amount of human health research efforts outside the basin have only general applicability to Great Lakes health issues. As a result, the inventory is considered a starting point to assess research relevant to this priority. Continued on p.16

<table>
<thead>
<tr>
<th>PRIORITY AND ELEMENT</th>
<th>NO. OF PROJECTS</th>
<th>FUNDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy for Virtual Elimination of Persistent Toxic Substances</td>
<td>177</td>
<td>25.3</td>
</tr>
<tr>
<td>Element 1: Selected Criteria for Toxic Substances</td>
<td>3</td>
<td>0.1</td>
</tr>
<tr>
<td>Element 2: Source Investigation</td>
<td>51</td>
<td>11.9</td>
</tr>
<tr>
<td>Element 3: Contaminant Remediation</td>
<td>70</td>
<td>9.1</td>
</tr>
<tr>
<td>Element 4: Evaluation of Virtual Elimination Tools</td>
<td>22</td>
<td>2.0</td>
</tr>
<tr>
<td>Element 5: Indicators (biological, health-related, socio-economic)</td>
<td>31</td>
<td>2.2</td>
</tr>
<tr>
<td>Human and Ecosystem Health</td>
<td>35</td>
<td>4.1</td>
</tr>
<tr>
<td>Element 1: Applicability of Investigative/Integrative Approaches to Human Health</td>
<td>34*</td>
<td>3.7*</td>
</tr>
<tr>
<td>Element 5: Transmission of Health Effects to Progeny</td>
<td>1*</td>
<td>0.4*</td>
</tr>
<tr>
<td>Preparation of a Special Report to the Parties on Groundwater Contamination</td>
<td>24</td>
<td>1.8</td>
</tr>
<tr>
<td>Tracking Parties’ Work in Deposition of Airborne Toxic Substances to Lake Superior</td>
<td>6*</td>
<td>1.2*</td>
</tr>
<tr>
<td>TOTAL</td>
<td>242</td>
<td>32.4</td>
</tr>
</tbody>
</table>

* Numbers may be inaccurate due to inadequate detail in project descriptions

Table 1. Numbers of projects and funding allocated in 1990/91 to International Joint Commission priorities

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![Figure 3. Research efforts for exotic species identification and control](image-url)
The recent invasion of the Great Lakes by the zebra mussel has prompted a large-scale response by the Great Lakes research community. The inventory lists 63 projects dealing with exotic species, with total annual government funding in 1990-1991 of approximately $6 million. Socioeconomic consequences of exotic species invasions, and research funded or conducted entirely by private industry, were not surveyed.

Figure 3 (previous page) illustrates the allocation of research effort to various exotic species and the breakdown of projects according to research and management needs. The majority of projects investigate the effects, biology, spread and control of zebra mussels and the sea lamprey, whereas other invaders receive much less attention. Most studies of ecosystem effects examine fish populations, which reflects concerns for the potential damage to economically important fishery resources. Few studies address prevention of exotic species invasions, suggesting that exo-tic species research is largely reactive.

**Conclusion**

The 1990/1991 Inventory of Great Lakes - St. Lawrence Research provides much needed baseline information regarding government-funded research activities relevant to the Great Lakes Water Quality Agreement. Numerous requests for information regarding the inventory have come from agencies, organizations and individuals, and many are using the inventory in research program development. This renewed effort to track Great Lakes research also provides data to assess future trends and to evaluate the responsiveness of government-funded research to emerging issues.

For more information about the Council and its research inventory, contact Peter Seidl, International Joint Commission, 100 Ouellette Avenue, Eighth Floor, Windsor, ON N9A 6T3, telephone (519)256-7821 or in the U.S. contact him at P.O. Box 32869, Detroit, MI 48232, telephone (313)226-2170.

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**Biennial Meeting Participants Surveyed by Council Questionnaire**

*by Jeffrey Reutter and Peter Seidl*

At the International Joint Commission’s Biennial Meeting last fall, a questionnaire was distributed to all participants by its Council of Great Lakes Research Managers. The survey asked participants to voice their opinions about the Commission’s proposed list of priorities for the next two years, with particular emphasis on virtual elimination of persistent toxic substances and human health. A total of 203 meeting participants responded to the survey. The following statistics outline various characteristics of the respondents and their attitudes concerning the Commission’s Great Lakes priorities for 1991 - 1993.

<table>
<thead>
<tr>
<th><strong>Respondent Profile</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total respondents:</strong> 203; 86% from the United States, 14% from Canada</td>
</tr>
<tr>
<td><strong>Age of respondents:</strong> 10 to 77 years old; mean age of 41.3</td>
</tr>
<tr>
<td><strong>Sex of respondents:</strong> 100 female, 100 male, with three questionnaires with no gender indicated</td>
</tr>
</tbody>
</table>

| **Highest degree or diploma received:** |
| High School 16% Associate 6% Bachelor 37% |
| Master’s 26% Ph.D. 9% Other 6% |

| **Affiliation:** |
| Environmental organization 46% |
| Scientists 18% |
| Government 16% |
| Academia 10% |
| Business 9% |
| Policymakers 8% |

| **Lake nearest their home:** |
| Lake Huron 19% |
| Lake Superior 8% |
| Lake Erie 24% |
| Lake Michigan 37% |
| Lake Ontario 9% |

| **Do their concerns focus on the watershed, lake or basin scale?** |
| Watershed 5% |
| Lake 11% |
| Great Lakes basin 84% |
Responses to Questions Concerning Commission Priorities

Do you agree with the Commission priorities of:

<table>
<thead>
<tr>
<th>Priority</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human health</td>
<td>99%</td>
</tr>
<tr>
<td>Virtual elimination of persistent toxic substances</td>
<td>98%</td>
</tr>
<tr>
<td>Integrity or health of the lakes</td>
<td>97%</td>
</tr>
<tr>
<td>Public awareness/education</td>
<td>97%</td>
</tr>
<tr>
<td>Remedial action plans</td>
<td>95%</td>
</tr>
</tbody>
</table>

What other issues should be considered priorities?

- Nuclear energy
- Incineration issues
- Chlorine phaseout
- Consumer education
- Wetlands
- Sustainable development
- Biological pollution
- Groundwater contamination

Current efforts to address virtual elimination are adequate. Agree or disagree?

(Percentage by affiliation)

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree overall</td>
<td>69%</td>
</tr>
<tr>
<td>Environmental groups</td>
<td>86%</td>
</tr>
<tr>
<td>Municipal governments</td>
<td>75%</td>
</tr>
<tr>
<td>Policymakers</td>
<td>44%</td>
</tr>
<tr>
<td>Industry</td>
<td>33%</td>
</tr>
<tr>
<td>Disagree overall</td>
<td>24%</td>
</tr>
<tr>
<td>Strongly agree overall</td>
<td>22%</td>
</tr>
<tr>
<td>Industrial representatives</td>
<td>100%</td>
</tr>
<tr>
<td>Agree overall</td>
<td>22%</td>
</tr>
<tr>
<td>Industrial representatives</td>
<td>100%</td>
</tr>
</tbody>
</table>

What is a reasonable timeframe to address and/or solve the virtual elimination and human health issues?

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 years</td>
<td>60%</td>
</tr>
<tr>
<td>10 years</td>
<td>25%</td>
</tr>
<tr>
<td>20 years</td>
<td>14%</td>
</tr>
<tr>
<td>50 years, 100 years or seven generations</td>
<td>.5%</td>
</tr>
</tbody>
</table>

Should more tax dollars be spent on virtual elimination or zero discharge of persistent toxic substances?

<table>
<thead>
<tr>
<th>Agreed</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>50%</td>
</tr>
<tr>
<td>Disagree</td>
<td>5%</td>
</tr>
<tr>
<td>Agree</td>
<td>30%</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>8%</td>
</tr>
<tr>
<td>Unsure</td>
<td>7%</td>
</tr>
</tbody>
</table>

Should greater investment be made on research to improve technology to address virtual elimination or zero discharge?

<table>
<thead>
<tr>
<th>Agreed</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>37%</td>
</tr>
<tr>
<td>Disagree</td>
<td>6%</td>
</tr>
<tr>
<td>Agree</td>
<td>37%</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>11%</td>
</tr>
<tr>
<td>Unsure</td>
<td>10%</td>
</tr>
</tbody>
</table>

Current efforts to address human health are adequate. Agree or disagree?

(Percentage by affiliation)

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree overall</td>
<td>66%</td>
</tr>
<tr>
<td>Scientists</td>
<td>46%</td>
</tr>
<tr>
<td>Policymakers</td>
<td>50%</td>
</tr>
<tr>
<td>Disagree overall</td>
<td>24%</td>
</tr>
<tr>
<td>Scientists</td>
<td>49%</td>
</tr>
<tr>
<td>Policymakers</td>
<td>31%</td>
</tr>
<tr>
<td>Strongly agree overall</td>
<td>0%</td>
</tr>
<tr>
<td>Agree overall</td>
<td>0%</td>
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This survey summarizes opinions of a small subset of attendees at the Commission’s biennial meeting; however, several points are clear. There is a strong interest in the entire Great Lakes ecosystem, and participants felt that current efforts to address issues facing the ecosystem are inadequate. They would like additional tax dollars to be spent in these areas, including investments in more research and the development of better technology.

To obtain detailed results of the questionnaire, contact Peter Seidl. (Address and telephone number are at end of preceding article.)
The following reports are available from the International Joint Commission’s Great Lakes Regional Office, 100 Ouellette Avenue, Eighth floor, Windsor, ON N9A 6T3 or P.O. Box 32869, Detroit, MI 48232. For further information about these or other IJC reports, call (519)256-7821 in Canada or (313)226-2170 in the U.S.

- **Sixth Biennial Report on Great Lakes Water Quality**
- **Air Quality in the Detroit-Windsor/Port Huron-Sarnia Region.** A report to the Governments of Canada and the United States Pursuant to the Reference of September 1988.
- **The Control of Discharges of Toxic Pollutants into the Great Lakes and their Tributaries: Development of Benchmarks**
- **Proceedings of the Expert Consultation Meeting on Mink and Otter**
- **Proceedings of the Workshop on Lake Trout and Salmonids**
- **Great Lakes-St. Lawrence Research Inventory 1990-1991**
- **Bibliography of Reports, January 1992**

A new, revised fourth edition of the *Directory of Great Lakes Education Material*, which provides an extensive list of audiovisuals, publications, newsletters, classroom activities and manuals to assist educators in learning more about the Great Lakes and how they can be incorporated into all subjects and grade levels, is available free of charge from the International Joint Commission’s Regional Office in Windsor. Please order from the address and telephone listed above.

**Water Quality 2000**, a coalition of 86 organizations including industrial, environmental, academic, professional and scientific groups, has released its interim report titled *Challenges for the Future*. The report reflects a broad-based consensus on key water quality problems facing the United States. The report concludes that, while significant progress has been made as a result of the U.S. Clean Water Act, more progress is needed to control pollution from its source. For more information on *Water Quality 2000*, contact Tim Williams or Margaret Molano at (703)684-2418. To obtain a copy of *Challenges for the Future* call (680)666-0206. The cost is $20 (US funds).

The Betrayal of the Great Lakes, a 55-minute program produced as part of the Michigan at Risk series, examines the reasons why the Great Lakes ecosystem is still in serious trouble. The first 25 minutes focuses on events of the International Joint Commission’s Biennial Meeting in Traverse City, Michigan in September 1991; the following 30 minutes includes call-in questions and panel discussions on zero discharge of persistent toxic substances.

To receive a copy of the videotape, contact Michigan Public Broadcasting, c/o WKAR-TV, Michigan State University, East Lansing, MI 48824-1212.

The first edition of the *Health and Environment Organization Network for the Upper Great Lakes Connecting Channels* is available through the Citizens Environment Alliance, PO Box 548, Windsor, ON N9A 5N7, telephone (519)973-1116. The guide provides an outline of issues affecting four Areas of Concern (Detroit River, St. Clair River, Spanish River and St. Marys River) and a listing of organizations involved in the areas’ cleanup activities. Future updates will be available.

The *Gulf of St. Lawrence: Small Ocean or Big Estuary* is a summary of workshop reports and reviews of scientific articles presented at the workshop-symposium on oceanography and fisheries in the Gulf of St. Lawrence, held at the Maurice Lamontagne Institute in March 1989. More than 150 scientists from universities and government agencies in the Atlantic provinces reviewed research on the Gulf of St. Lawrence, which combines the characteristics of an ocean and an estuary. The publication, available in Canadian bookstores, is edited by J.C. Theriault and was published in 1991.

Activities of the pilot environmental education program held on Isle Royale in July 1991 have been preserved in videotape form (see *Focus*, Volume 16, Issue 3, page 21). The 30-minute program is available on loan to interested educators from the Lake Superior Center, 353 Harbor Drive, Duluth, MN (218)720-3033 or the International Joint Commission, Great Lakes Regional Office, 100 Ouellette Avenue, Eighth floor, Windsor, ON N9A 6T3. (519)256-7821 or (313)226-2170.

New sport fish consumption guidelines are included in the 1992 *Guide to Eating Ontario Sport Fish*. The guide includes new guidelines for dioxins and furans, based on Health and Welfare Canada’s criteria to determine how much of each
chemical may be present in food products. To obtain a copy of the guide, contact the Ontario Ministry of the Environment, Public Information Centre, 135 St. Clair Avenue West, First floor, Toronto, ON M4V 1P5. (416)323-4321.

Drinking Water: Quality on Tap is a half-hour videotape program, accompanied by a study guide, that can be used as a discussion guide in the classroom, and with citizen organizations and decisionmakers. To order a copy of the video write to the League of Women Voters of Michigan, 200 Museum Drive, Lansing, MI 48933-1997 or call (800)292-5823 (in Michigan) or (517)484-5383.

The Freshwater Foundation, a component of their Great Lakes Groundwater Information System (GWIS), is publishing a special groundwater supplement insert, Facets of Groundwater, to be inserted quarterly in U.S. Water News. Facets will focus on groundwater issues in the eight states and two provinces that form the Great Lakes basin. Each issue of Facets will include several articles on a particular groundwater theme as well as news in each state or province, a calendar of events, and a list of educational materials from the region.

For subscription information to US Water News (and Facets), contact US Water News Inc., 230 Main Street, Halstead, KS 67056. (316)835-2222. For additional information on Facets, contact Jeffrey Travis, Freshwater Foundation, Spring Hill Center, 725 County Road 6, Wayzata, MN 55391. (612)449-0892.

Fate of the River is a 30-minute VHS videotape program that focuses on the important role of watersheds in the Great Lakes basin. The program includes a teacher's manual and can be obtained from Moyra Romano, Education Through Video Ltd., 7 Wellwood Avenue, Toronto, ON M6C 1G8. (416)656-6953.

A Profile of Lake St. Clair is an informative guide for residents, visitors, local officials and others interested in Lake St. Clair. It addresses the lake's early history, geology and human settlement and helps readers gain a better understanding of the decisions that will preserve the lake for future generations.

To purchase a copy (MICHU-SG-91-701) for $1 (US funds), or for information on additional lake profiles and other publications about the Great Lakes, contact Michigan Sea Grant Communications, 2200 Bonisteel Boulevard, Ann Arbor, MI 48109. (313)764-1138.

The 1992 Information Please Environmental Almanac is a collection of local, national and international facts on environmental concerns, from energy efficient home appliances and global warming to pesticides, food safety and waste management. A "green" section ranks major U.S. cities, provides environmental profiles of various states, Canadian provinces and 146 countries, and an overview of critical global conditions and trends.

To review a copy contact Mary Jensen, Marketing Assistant, World Resources Institute at (202)662-2596. To place an order, contact World Resources Institute, P.O. Box 4852, Hampden Station, Baltimore, MD 21211. (410)416-6963 or US toll free (800)882-0504.

A 23-minute videotape, The Wealth in Wetlands, features techniques to restore wetlands and provides sources of help for wetland restoration and conservation. A copy of the video is available for loan or purchase for $10 (US funds) from the National Association of Conservation Districts, P.O. Box 855, League City, TX 77574-0855. (800)825-5547.

Training Student Organizers (TSO) is a curriculum guide containing step-by-step lesson plans for organizing anti-litter campaigns, recycling centers, energy conservation activities, alternative energy efforts and many other environmental improvement projects. Lesson plans and narratives describe how to beautify local parks and preserve open spaces, while action projects are provided in detail for eight environmental issues: energy conservation, solid waste, water, air, open space beautification and preservation, noise pollution, nuclear energy and transportation.

To receive a copy of the curriculum, send check or money order for $10 (US funds) to Council on the Environment, Inc., 51 Chambers Street, Room 228, New York, NY 10007. (212)566-0990.

Waste in the Workplace is a guidebook to help businesses minimize waste, better manage disposal costs and identify potential recyclables. The guide targets small businesses and provides a process to assess the contents and volume of a company's waste. Copies of the book are available for $9.95 (US funds) plus $2.50 shipping and handling to Keep America Beautiful, Inc., 9 West Broad Street, Stamford, CT 06902. (203)323-8987.

To the Last Drop, a board game suitable for ages 9-12, takes a closer look at the quality of Indiana's water. Indiana's Water Riches Curriculum includes conservation ideas and geography and is available by ordering board game #4-H778 for $10 (US funds). Also available is an Instructor's kit, #4-H779, which includes videocassette, tabloid newspapers, instructor's guide and the board game for $70 (US funds). Materials are available through the Purdue University Cooperative Extension Service and 4-H Youth Department. Make checks payable to Purdue University, Media Distribution Center, 301 South Second Street, Lafayette, IN 47905-1092.

The 1992 Conservation Directory lists information on environmental conservation, education, legislation and natural resource management organizations, including Canadian, American and international citizen groups and government agencies. To receive a copy of the 416-page directory, order #79559, send check or money order for $22.50 (US funds) to the National Wildlife Federation, 1400 Sixteenth Street N.W., Washington, DC 20036-2266. (202)797-6800.
Status of Torch Lake Area of Concern

by Steve Perry

One of the most scenic and historically rich spots in Michigan is the Keweenaw Peninsula, known as "Copper Country." This is a fitting name, since the Keweenaw was once home to the world's largest supply of copper found at or near the surface. Evidence of this bygone era can still be seen in deserted buildings and mine shafts that dot the countryside, and in shorelines blanketed with copper ore tailings. The tailings or stamp sands were produced when copper ore conglomerates were stamped to release the native copper. The tailings were then either discarded on the shoreline or in the lake.

One Keweenaw site that is a major victim of these milling wastes is Torch Lake. For more than 80 years, facilities on the lake's shores served as milling systems, smelting plants, and, most importantly, ports to transport raw copper to factories for final product development. Torch Lake received approximately 200 million tons of stamp sands during the milling operations, which resulted in over 20 percent of the lake being filled. The lake also received discharges of industrial wastes and raw sewage from the local counties.

Other methods to obtain copper from the area involved extracting copper from the stamp sands that passed through the stamping process, using chemicals such as cupric ammonium carbonate, coal tar creosote, pyridine oil, wood creosote, pine oil and xanthate. Tailings dumped into Torch Lake were dredged and, when returned to the lake after additional copper was extracted, also included these chemical additives.

After mining operations ceased in the late 1960s, the lake once again felt the impact of the past when the Lake Linden leaching plant was salvaged in 1972. Located at the northwest corner of the lake, approximately 27,000 gallons of cupric ammonium carbonate were discharged into the lake from the plant, including copper concentrations of 1,400 milligrams per liter (mg/L) and ammonia concentrations of 20,000 mg/L. After mixing with the water in the spill area, the copper concentration rose to 1 mg/L, versus a maximum allowable level of 11 micrograms per liter.

Reasons for Listing an Area of Concern

It wasn't long after the last mill was shut down in 1968 when residents near Torch Lake saw repercussions of the mining era on their environment. In 1983, tumors were detected in the liver, spleen and mesenteries of Torch Lake's sauger and walleye, and fish consumption advisories were subsequently issued by the Michigan Department of Public Health. Based on these advisories and documentation on the level of copper tailings in the lake, Torch Lake was identified as an Area of Concern.

Michigan Department of Natural Resources' Surface Water Quality Division completed a Stage 1 Remedial Action Plan (RAP) for the Torch Lake Area of Concern in October 1987, which was reviewed by the International Joint Commission and its Great Lakes Water Quality Board. The Commission and its review team found that the RAP did not meet the requirements of a Stage 1 RAP as outlined in Annex 2 of the Great Lakes Water Quality Agreement. For example, further studies were needed to determine what caused the tumors on fish. It was recommended that the Torch Lake RAP be revised to satisfy the requirements of Stage 1 and that a more precise evaluation of goals and objectives be established to answer these cause-effect relationships. As of March 1992, a revised Stage 1 RAP has not been submitted to the Commission for its review.
Further Studies and Expected Remediation

In addition to the RAP, further investigation and remediation of Torch Lake is occurring through the U.S. Superfund program. Torch Lake is listed 24th on Michigan's Sites of Environmental Contamination Priority List. A study performed by the U.S. Environmental Protection Agency (US EPA) Environmental Response Team evaluated the acute and toxic effect levels in the lake's sediments to determine levels of copper toxicity and associated components that could contribute to sediment contamination.

The Environmental Response Team performed a surface water test in August 1989 with the aid of a remote operated vehicle. Drums were located at depths between six and 15 feet, 720 of which were found to be empty. A total of 103 drums contained some form of substance; of these, 83 were located on the shoreline and 20 were recovered from the lake. The contents are being tested and will soon be reported to US EPA.

The team's final report, submitted in November 1991, included indepth study descriptions, test procedures and data analysis. Sediment analyses and other testing results indicated high levels of heavy metals throughout the study area, including 22 sampling locations within Torch Lake and three sampling locations in adjoining Portage Lake. The team concluded that the majority of sediments are toxic and not able to support a normal benthic community.

While the reestablishment of the lake's ecosystem to its premining state is desired, the size of the area and scope of the problems makes this doubtful. To address this challenge, US EPA has divided the Torch Lake Superfund area into three units, called Operable Units 1, 2 and 3. Each unit concentrates on specific areas of contamination in the Area of Concern, such as tailings in Torch Lake and on the shoreline, sampling of surface water, groundwater and sediments, and determining the contamination risks posed by tailings throughout the mid-Keweenaw region.

The three units of the proposed cleanup plan will be fully implemented by early 1993. For further details on the Torch Lake Superfund Site and its remediation, contact the Lake Linden-Hubbell Public Library, 610 Calumet, Lake Linden, MI 49945, telephone (906)296-0698 or Joe B. Lee, Remedial Project Manager, Office of Superfund (5H5-N), US EPA, Region V, 230 S. Dearborn Street, Chicago, IL 60604, telephone 1-800-621-8431.

Letters to the Editor

Please address all correspondence to Editor, FOCUS on International Joint Commission Activities, 100 Ouellette Avenue, Eighth floor, Windsor, ON N9A 6T3 or P.O. Box 32869, Detroit, MI 48232. Letters may be edited to meet space requirements. Please include your name and address with all correspondence.

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Dear Editor:

With reference to the article and photograph in a recent issue of the IJC newsletter concerning zebra mussels, it occurred to me that the zebra mussels are a resource and can be "harvested" for agricultural land improvement.

While the harvesting process and application of the resulting "fertilizer" to the land may not be economical from a profit standpoint, the result could be spectacular. Much farmland in Ontario is deficient in calcium and magnesium, and it is a known fact that ground limestone added to such soils will improve yields up to 30%. Since the shell of this mussel is largely calcium and magnesium carbonate, its use for agricultural land improvement looks like a natural. The nitrogen from the high protein content of the mussel itself and the glue with which it fastens itself to any object could be an added benefit to the soil.

Harvesting could be by means of cribs placed at strategic locations in water ways on which the mussels could grow. The cribs could be made of wood, biodegradable plastic or any material strong enough to support a load of mussels and which could be ground and pulverized. The pulverized material could be added directly to the land or first mixed with compost or sewage sludge. This could be an opportunity for an enterprising entrepreneur.

Thus the zebra mussel could be a valuable resource instead of a liability.

Walter Brown
Mississauga, Ontario

*****

Dear Editor:

Just wanted to let you know that I enjoy Focus a lot! Informative, concise, well designed for scanning and retrieval. Bravo! I'm a performance engineer, instructional designer and trainer with interests in forestry, soil science, hydrology and climatic change. Your organization and publication provide ample opportunities for me to grow, both professionally and personally. Keep up the good work and keep me on your mailing list.

Charles Chesney
Corvallis, Oregon


## RAP UPDATES

During the last five months, nine plans have been submitted to the International Joint Commission for its review and comments. As Focus goes to press, here's an update of these plans.

### Lake Superior
- Jackfish Bay Stage 1
- Nipigon Bay Stage 1
- Peninsula Harbour Stage 1
- Thunder Bay Stage 1

Distributed to reviewers; comments due in spring and review meetings with communities to follow.

### Lake Michigan
- Milwaukee Estuary Stage 1

Review comments received and review meeting held with community on February 21.

### Lake Erie
- Maumee River Stage 1

Review comments received and review meeting held with community on January 22; response completed and forwarded to Governments.

### Lake Ontario
- Oswego River Stage 2

Review committee being established.

### Connecting Channels
- Detroit River Stage 1

Review comments received and review meeting held with community on January 21; response completed and forwarded to Governments.

- Cornwall/Massena

Stage 1 reviewed and comments provided to New York, Ontario and others; review of Stage 2, received during review of Stage 1, is underway; meeting with community planned for late spring.

## EVENTS

### International Joint Commission Schedule of Meetings

The following includes meetings scheduled by the Commission and its various boards. Please contact an IJC office for further information.

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<td>Commission Semi-Annual Meeting</td>
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### General Conferences

A five-day, in-residence teacher workshop cosponsored by the International Joint Commission's Educator's Advisory Council and Brock University will be held on the campus of Brock University, St. Catharines, Ontario on July 19-24, 1992. Participants of the Great Lakes Environmental Education Institute will share values, insights and resources on the Great Lakes Basin Ecosystem. To receive information and registration contact the Commission's Regional Office, 100 Ouellette Avenue, Eighth floor, Windsor, ON N9A 6T3, (519)256-7821 or P.O. Box 32869, Detroit, MI 48232, telephone (313)226-2170.

The first annual Federal Environmental Restoration Conference and Exhibition
Administrator: Focus on International Joint Commission Activities (ISSN 0832-667)

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will be held at the Sheraton Premiere in Vienna, VA on April 15-17, 1992. Government and private sector participants will network and exchange regulatory and technical information on federal agency environmental programs.

For registration contact the Federal Environmental Restoration, 7237 Hanover Parkway, Greenbelt, MD 20770-3602. (301)982-9500; fax (301)220-3870.

The American Fisheries Society, in cooperation with more than 45 conservation organizations, is presenting the World Fisheries Congress in Athens, Greece on May 3-8, 1992. More information can be obtained by contacting Yanin Walker, American Fisheries Society, 5410 Grosvenor Lane, Suite 110, Bethesda, MD 20814-2199. (301)897-8616.

The semi-annual meeting of the Great Lakes Commission will be held in Chicago, Illinois on May 11-13, 1992. In addition to the business session, a May 11 Regional Groundwater Education Summit will bring policymakers, technical experts, educators and others together to review and refine a draft groundwater education strategy for the Great Lakes region. The summit is hosted by the Commission and the Michigan State University Institute of Water Research's GEM program. For more information contact the Great Lakes Commission, The Argus II Building, 400 South Fourth Street, Ann Arbor, MI 48103-4816. (313)665-9135.


The Fourth North American Symposium on Society and Resource Management will be held in Madison, Wisconsin on May 17-20, 1992. The focus of the conference is to discuss social and biological aspects of natural resource and environmental issues. Plenary addresses, roundtable discussions, a poster session and field trips are also planned.

For registration information contact Mary Miron, Symposium Coordinator, School of Natural Resources, University of Wisconsin, 1450 Linden Drive, Room 146, Madison, WI 53706. (608)262-6968.

An international workshop designed for environmental professionals will be held at the University of Oxford, Oxford, England on May 18-20, 1992. The primary purpose of the workshop, entitled European Perspectives on Waste Management, is to present the most current European perspectives on waste management and to create an international exchange of information.

To receive more information contact the California State Polytechnic University, Pomona, 3801 West Temple Avenue, Pomona, CA 91768-4030. (714)869-2288.

Waterways for the World is holding an International Conference on the Contribution of Tourism and Environment to the Sustainable Development of the Great Rivers on May 31 to June 3, 1992 in Montreal, Quebec. Throughout the conference, participants will have an opportunity to discover and discuss the Great Lakes and the St. Lawrence River.

For registration information contact Waterways for the World International Conference, 105 McGill Street, Fourth floor, Montreal, PQ H2Y 2E7. (514)283-9202; fax (514)283-9451.

The 35th Annual Conference of the International Association for Great Lakes Research (IAGLR) will be held May 31 to June 4, 1992 at the University of Waterloo in Waterloo, Ontario. This year's conference is sponsored by the Water Network, University of Waterloo, Wilfrid Laurier University and the Quaternary Sciences Institute. A plenary session will focus on the roles of universities and governments in large lake research.

For further information contact Dr. Marie Sanderson, The Water Network, Faculty of Environmental Studies, University of Waterloo, Waterloo, ON N2L 3G1. (519)885-1211, ext 6962/2433; fax (519)746-0658.

The Canadian Water Resources Association is holding its 45th Annual Conference entitled Resolving Conflicts and Uncertainty in Water Management on June 3-5, 1992 in Kingston, Ontario. For further information contact the CWRA Conference Committee, c/o Cataraqui Region Conservation Authority, PO Box 160, 1641 Perth Road, Glenburnie, ON K0H 1S0; Fax (613)547-6474 or Dr. Dan Shrubsole, Department of Geography, Faculty of Social Science, University of Western Ontario, London, ON N6A 5C2; fax (519)661-3292.

The Fourth Annual Process Design Workshop on Industrial and Toxic Wastewater Management will be held on June 8-12, 1992 in Waterloo, Ontario. This workshop will cover process fundamentals, design and application with hands-on experience in problem solving, and demonstration of various state-of-the-art technologies.

For further information contact Evelyn James, Computational Hydraulics Incorporated, 36 Stuart Street, Guelph, ON N1E 4S5. (519)767-0197; fax (519)767-2770.

Stone Laboratory, Ohio's freshwater biological field station located on Gibraltar Island in Lake Erie, is holding a six-day Marine and Aquatic Education course on June 14-20, 1992. This course will assist participants in (1) learning about the Great Lakes through a variety of classroom, laboratory and participatory learning activities; (2) relating Great Lakes concepts and issues to a variety of subject areas and age levels; and (3) exploring options to resolve various issues facing the Great Lakes and to involve students in this process.

For more information contact Jo Ann Damon, The Ohio State University, Office of Academic Affairs, 1314 Kinne Road, Room 1541, Columbus, OH 43212-1194. (614)292-8949.
On June 15-17, 1992, the Associate Committee on Hydrology will host the Canadian Hydrology Symposium in Winnipeg, Manitoba. This symposium will examine the interdependence between hydrology and sustainable development, and explore opportunities to integrate hydrological considerations into decisionmaking processes. For more information contact Dale R. Kimmett, CHS:92 Chairman, c/o Water Resources Branch, Inland Waters Directorate, Environment Canada, Ottawa, ON K1A 0H3. (819)997-1508; fax (819)997-8701.

Inland Seas Education Association, together with the Bay Area Adventure School and Traverse Tall Ship Company, will conduct a ten-day course of Great Lakes science, history and traditional seamanship aboard the schooner Manitou. The Tall Ship Voyage of Discovery program will be held June 18-27, 1992 at the Bay Area Adventure School.

A six-day course, Island Discovery Sail, is also available on the Manitou from August 16-22, 1992. This program will include navigation, seamanship, island biology and geology, history and Great Lakes ecology.

Other day trips are also planned for mini-schoolship educational programs. To receive a newsletter of the Inland Seas Education Association or further information on the above programs, contact Tom Kelly, Inland Seas Education Association, 624 Third Street, Traverse City, MI 49684-4223. (616)941-5577.

Two short courses will be presented at Colorado State University. The first is Design of Water Quality Monitoring Networks to be presented June 8-12, 1992 and the second, entitled Activated Sludge Process Control, will be held on June 22-26, 1992. The courses are designed for those involved with the design, operation and/or management of a water quality monitoring network for surface and subsurface monitoring.

For additional information contact Thomas G. Sanders, Program Leader, Environmental Engineering, Department of Civil Engineering, Colorado State University, Fort Collins, CO 80523. (303)491-5484; fax (303)491-7727.

A Great Lakes Environmental Education Institute will take place at Isle Royale National Park on July 31-August 7, 1992. Through hands-on experiences, participants will develop an integrated curriculum model to infuse Great Lakes topics into all subject areas. The program will include educators from Russia to provide an international perspective of water-related issues.

For more information on the workshop, contact The Lake Superior Center, 353 Harbor Drive, Duluth, MN 55802. (218)720-3033.