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Great Lakes Research Advisory Board

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GREAT LAKES RESEARCH ADVISORY BOARD

FOURTH SEMI-ANNUAL REPORT

OCTOBER 1974

INTERNATIONAL JOINT COMMISSION
International Joint Commission

United States and Canada

Gentlemen:

Transmitted herewith is the Fourth Semi-Annual Progress Report of the Great Lakes Research Advisory Board.

This report covers the activities of the Board and its working committees and groups from April 1974 to September 1974.

Respectfully submitted,

James P. Bruce  
Chairman  
Canadian Section

A. F. Bartsch  
Chairman  
United States Section
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This Fourth Semi-Annual Report to the International Joint Commission describes the status of a variety of activities and accomplishments of the Great Lakes Research Advisory Board.

Following Board review and comment, reports on three studies were completed: "Asbestos in the Great Lakes Basin"; "Evaluation of International Joint Commission Public Hearings" and "Total Dissolved Solids in the Upper Great Lakes". As part of the Nearshore Great Lakes Eutrophication Investigation, the Board contracted a consultant to prepare a position paper, preliminary to a Workshop on this subject; due late in 1974.

Responding to recent references, the Board continues to study viruses, investigate an International Great Lakes research projects forecast directory and explore computerized information retrieval systems. The Board will periodically review information related to Great Lakes Simulation modelling and the effectiveness of wastewater disinfection techniques. The development of scientific water quality criteria and objectives for the Great Lakes are being collated and documented. The development of bacteriological water quality criteria, of concern to the Board, is proceeding.

Problems involving lake dynamics including shore erosion and long-range lake level forecasting are currently under review. In addition, modelling approaches are being developed to predict thermal effluent plumes. Attempts at interfacing existing hydrodynamic (physical) and chemical/biological models of the Great Lakes are being discussed. Lake surface current measurement methods, requiring technology development involving electronic and navigational expertise, are also being studied.
The implications to fish life of steam electrical generating plant water use is under discussion. Other research topics in this category include: oil spill remedial technology in fast flowing waters, archives of fish and wildlife tissues and of sediment samples.

The Board concludes that:

- the quantitative estimation of changes in biomass is an essential part of the current research investigation of nearshore Great Lakes eutrophication;

- research is required to improve and standardize laboratory analytical methodology for asbestos fibrils and to study their physiological effects and relationship to asbestosis or cancer;

- greater research efforts should be directed toward the potential epidemiological hazards of waterborne viruses associated with man's activities;

- research on disinfection, including chlorination and ozonation of sewage effluent, should be oriented toward determining the potential harmful effects of such practices versus the benefits;

- the question of bacteriological water quality criteria should receive greater attention.

- greater attention be given to the investigation of dispersal mechanisms on local and whole-basin states in the Great Lakes.
The Board recommends that:

- research on asbestos fibrils be expanded to include the improvement and standardization of laboratory methods and to study physiological effects, as cited in the Board's Asbestos Report;

- greater emphasis be given to studying waste heat input to the Great Lakes and to the relationship between population density and distribution;

- studies be made of larval and juvenile fish kills, particularly as they relate to cooling water use in certain steam electrical generating plants;

- problems involving lake dynamics, such as shore erosion and the associated long-range forecasting of lake levels, receive greater research attention;

- research be focused on oil spill remedial technology in fast flowing waters.
III  INTRODUCTION

The Research Advisory Board was established under the provisions of the April 1972 Canada - United States Agreement on Great Lakes Water Quality in order to: review research activities concerned with and applicable to the quality of the waters of the Great Lakes System; recommend on research needs to the IJC and provide scientific advice on specific problems referred to it by the Commission and the Great Lakes Water Quality Board.

In its Second Semi-Annual Report - September 1973, the Great Lakes Research Advisory Board identified research areas pertaining to Great Lakes water quality which were not adequately addressed by current programs. These topics which deemed worthy of consideration for research support were listed in a document published separately as "Research Needs: Great Lakes Water Quality" and distributed widely to the Great Lakes scientific community for comment.

The Board's Third Semi-Annual Report - April 1974 addressed several new references and expanded on certain of the above-mentioned research items. Acting on the Board's request for release of this report, the Commission, at its summer meeting, sanctioned its circulation by the Board to libraries and to the research community represented by the Board.

The Fourth Semi-Annual Report of the Great Lakes Research Advisory Board to the International Joint Commission (IJC) covers Board activities and accomplishments since submitting its April 1974 report. It should be noted that these activities and accomplishments reflect the progress made by the standing committees in response to Board directives. In addition, future activities of the Board are briefly described.
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NEARSHORE GREAT LAKES EUTROPHICATION INVESTIGATION

Responding to a proposal from its Standing Committee on Eutrophication, the Board recommended that the Commission support a Workshop on this topic. Nearshore eutrophication (i.e. lake-ageing) problems would be addressed as evidenced by colonies of Cladophora or other attached algae with special emphasis directed toward the quantitative determination of biomass.

Following IJC approval of the expenditure of funds for this purpose, Mr. J.H. Neil, Limnos Ltd., Toronto, was hired under contract from August 1 - November 30, 1974, to prepare a comprehensive report on Cladophora in the Great Lakes. This summary paper will incorporate both published and unpublished data describing current knowledge of the problem posed by Cladophora in the Great Lakes and comment on its impact and the utility of applying existing control technology, and will identify further research needs.

The consultant will present a keynote address to the Board's Workshop on Cladophora, scheduled for late 1974. The consultant and the Eutrophication Standing Committee will together review the Workshop arrangements and selection of participants.
ASBESTOS IN THE GREAT LAKES BASIN

Prompted by growing public concern over the heavy discharge of finely ground taconite tailings directly into Lake Superior from the Reserve Mining Company's plant in Duluth, Minnesota, the IJC requested a report on the subject. This topical study coincided with current litigation between the Reserve Mining Company and the United States of America.

The report was assembled and prepared by the International Joint Commission's Great Lakes Regional Office in its role of secretariat to the Great Lakes Research Advisory Board. It draws largely upon documented information and comments provided by individuals serving on the Commission's Great Lakes Water Quality and Research Advisory Boards, Reference Groups, Committees and Regional Office Staff. Much of the material presented was provided by Dr. J.R. Kramer under a contract to Canada Centre for Inland Waters.

The report addresses the properties of asbestos, its identification and particle (fibril) enumeration together with its treatment and removal, and its distribution in the Great Lakes Basin. Particular emphasis is given to Lake Superior. The public health aspects are also discussed. The bibliography and Appendices with selected excerpts from pertinent documents enhance the informative value of this report.

Research requirements, conclusions and recommendations reflect the comments and concerns expressed by members of the Research Advisory and Water Quality boards in response to an earlier draft of the report. Primary research needs are to improve and standardize laboratory analytical methodology and to investigate the physiological effects of asbestos in food and drink and the causal relationship to asbestosis or cancer.
EVALUATION OF IJC PUBLIC HEARINGS

The IJC Great Lakes Regional Office Staff collaborated with the Canada Centre for Inland Waters (CCIW) in the review and distribution of a questionnaire for attendees at three sets of IJC Public Hearings. Although the twelve public hearings extend beyond the region covered by the Great Lakes Water Quality Agreement, it is considered necessary to utilize them as part of the process of developing a public participation policy for recommendation to the Commission since they constitute the only presently existing mechanisms for soliciting such participation.

Nearly 60 percent of the 400 questionnaires mailed to attendees were completed and returned. An analysis of these forms the basis of the report, an interim version of which was reviewed by the Board and transmitted to the Commission in compliance with the latter's request. This document was favorably reviewed by the Commission at its summer meeting. The final report will be available to the Commission for its October 1974 Meeting, following comment and approval by the Board.

TOTAL DISSOLVED SOLIDS IN THE UPPER GREAT LAKES

A request was forwarded from the Water Quality Objectives Subcommittee, Great Lakes Water Quality Board, to the Standing Committee on Analytical Sampling and Measurement Methods, Research Advisory Board; for action. Definition of the parameter "Total Dissolved Solids" (TDS) and a recommended measurement procedure were required.

The report of the Committee study indicated the need for an operational definition based upon membrane filtration, and recommended that the measurement of specific conductance be substituted for conventional gravimetric determinations of total dissolved solids in the open waters of the Great Lakes; particularly for the Upper Great Lakes with low concentrations of dissolved material. Appropriate correlation factors
The OECF's Office of the Deputy Administrator, Michael C. Coffin, has been conducting a comprehensive review of the OECF's activities and operations. The review is aimed at identifying areas for improvement and ensuring the effective implementation of OECF's policies and programs.

The review has been conducted in collaboration with various stakeholders, including the OECF's staff, external experts, and other government agencies. The review team has been working closely with the OECF's management to identify areas for improvement and develop recommendations for future actions.

The review has identified several areas for improvement, including:

- Strengthening the OECF's organizational structure and management processes
- Improving the OECF's communication and coordination with other government agencies
- Enhancing the OECF's capacity to implement and audit its programs
- Developing a more effective monitoring and evaluation framework

The review team has made several recommendations to address these areas and improve the OECF's performance. These recommendations will be discussed with the OECF's management in a forthcoming meeting.

The OECF is committed to implementing the recommendations of the review and improving its performance. The OECF's management will provide regular updates on the progress of the review and implementation of the recommendations.
were developed to relate the specific conductance values to water quality standards, expressed as total dissolved solids. In addition, specifications for suitable equipment were recommended for the accurate measurement of specific conductance in these waters.

The Research Advisory Board will make this report available to interested groups and individuals.

RESEARCH PROJECTS DIRECTORY AND FORECASTS

At its Eighth Meeting, the Board requested that Dr. Watson (IJC Regional Office), Dr. Finsah (U.S. National Oceanic and Atmospheric Administration, NOAA) and Mr. McCulloch (Environment Canada) review the needs of the Research Community and of the Board, to recommend on the preparation of an International Project Forecast Directory and Bibliography issued annually by the Regional Office. The un-indexed Canadian material for 1973 will be processed and the U.S. project data for 1974 procured using Dr. Finsah's forms. Dr. Finsah has already published the 1973 U.S. data.

Following discussion and correspondence, a meeting was held in Windsor. Mr. McCulloch presented the concept presently under development for the Canadian Great Lakes Working Group to solicit data from the researcher and to circulate this rapidly to others in the field. The use of a computer is anticipated for much of the processing.

Following review of this proposal, it was found acceptable in principle for United States (i.e. international) use, but would require additions to cover "effort in man-years" and identification of the
were developed to replace the obsolete communication system to entire nation.

many efforts were made to accommodate the needs of the electric power sector and

specific controls in these sectors.

The nuclear power industry will need specific materials to

sustain these changes and innovations.
V CURRENT ACTIVITIES

VIRUSES

At the request of the Research Advisory Board, Appendices 4 and 5, of the Third Semi-Annual Report - April 1974, were forwarded to the Commission which then transmitted the report to the Governments. Also forwarded was the Board's request:

- that significantly greater emphasis be placed on research concerning potential epidemiological hazards of waterborne viruses associated with man's activities.

RESEARCH PROJECTS DIRECTORY AND FORECASTS

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Following review of this proposal, it was found acceptable in principle for United States (i.e. International) use, but would require additions to cover: "effort in man years" and identification of the
cooperating or supporting agencies. Discussions are continuing covering the format of the questionnaire and the degree of response expected; reflecting in effect the differences in complexity between the United States and Canadian funding agency requirements and the management value of the information received. The Canadian Great Lakes Working Group format is presently catering directly to the researcher's informational needs, whereas the NOAA form is also useful to those administering research funds and wishing to be informed of research projects. The non-funded projects are classed as "forecasts" in this instance.

**COMPUTERIZED INFORMATION RETRIEVAL**

The Board approval of the Social Sciences, Economic and Legal Aspects Standing Committee's recommendation for an international literature search initiated the Committee's projected long range program. The search will identify past and present research projects in the socio-economic, legal and institutional fields, especially as they affect or are affected by Great Lakes water quality, to improve the Committee's and the Board's understanding of the state-of-the-art in these areas of interest. The other Standing Committees will similarly benefit.

Special arrangements for this computerized search were made through the IJC Regional Office, Windsor, with the United States Environmental Protection Agency's Environmental Research Center, Cincinnati, Ohio, for involving their research library staff and computer facilities to access eight available data sources in the United States. Representatives of the Windsor Office and the Great Lakes Basin Commission, Ann Arbor, assigned to this task, received considerable assistance from the library staff in developing appropriate descriptors and applying key words to scope this study to extract maximum information from the data banks searched. To date, several hundred citations and research project abstracts have been received, using the five Great Lakes as identifiers and thirty-two descriptors pertaining to societal activities and their water quality implications.
CONCEPTUALIZED INFORMATION RESOURCES

The broad objective of the present initiative, "Conceptualized Information Resources," is to build a conceptual framework for understanding the relationships and interactions among various components of information systems. This initiative involves the development of a comprehensive model that integrates different perspectives and disciplines. The model aims to provide a holistic view of the information environment, encompassing both technical and organizational aspects.

Key components of the conceptual model include:

1. Information Sources
2. Information Users
3. Information Needs
4. Information Systems
5. Information Policies
6. Information Management

The model suggests that effective management of information resources requires a coordinated approach that aligns the interests of all stakeholders. It highlights the importance of understanding the interdependencies between these components to ensure the efficient use of resources and the provision of relevant, timely, and accurate information.

The initiative also emphasizes the need for continuous assessment and adaptation to address evolving information needs and technological advancements. By doing so, it seeks to enhance the effectiveness of information systems and improve decision-making processes.

Overall, the initiative aims to foster a deeper understanding of the complex interplay between information sources, users, and systems, ultimately contributing to the development of more responsive and sustainable information management strategies.
The Board also approved expenditure of its funds up to a $500 maximum to purchase documents or texts identified through the search and considered necessary for the Committee's assignment.

Evaluation of the information obtained in this initial, computerized, search of the available United States data sources on the Great Lakes Basin will demonstrate the utility of this approach to the Committee in particular and to the Board in general. Equivalent Canadian data sources will be included at a later date.

GREAT LAKES SIMULATION MODELLING REVIEW

Following a Research Advisory Board-sponsored meeting of the Ad Hoc Committee on the Need for a Great Lakes Simulation Modelling Symposium early in 1974, a small group of attendees representing the Board's interests concluded that the existing state-of-the-art of simulation modelling is insufficiently advanced to warrant a symposium on this topic and that, consequently, formal international co-ordination of Great Lakes modelling is not yet appropriate but that all relevant aspects of modelling ought to be monitored by the Board.

In response to the concerns raised by this report, the Board at its Eighth Meeting, established a Modelling Review Ad Hoc Committee. With Dr. C. Mortimer as its Chairman, this committee will report periodically to the Board.

WATER QUALITY CRITERIA AND OBJECTIVES

The Water Quality Board sanctioned joint meetings of the separate groups. Mr. Fetterolf has been requested by the Water Quality Board to continue as Chairman of the Water Objectives Subcommittee (WQOS). Dr. William Brungs has been appointed Chairman of the Research Advisory Board's Standing Committee on the Scientific Basis for Water Quality Criteria (SBWQC).
Both committees resolved the apparent overlap of responsibilities such that the WQOS will address those parameters for which there is a significant, published, data base. The SBWQC Committee has received requests from the WQOS for information on objectives for which it is felt that there are limited data available. Requests were made for: ammonia, arsenic, barium, selenium, asbestos and phthalates. Additions to this list will be made.

Following reviews of the published and unpublished data, the SBWQC Committee will recommend to the WQOS prior to their December 1974 Meeting, the feasibility of establishing numerical objectives. The rationale and background information will follow at a later date.

WASTEWATER DISINFECTION

In its Third Semi-Annual Report - April 1974, the Research Advisory Board recommended that: "increased, co-ordinated research efforts on the disinfection, including chlorination and ozonation of sewage effluents, be directed toward the determination of the potential harmful effects of such practices versus the benefits".

This topic continues to be addressed by the Standing Committee on Water and Wastewater Treatment, as a facet of its overall study. It recently received a resume of university research on chlorination ozonation operations for review and discussion at its next meeting.

In addition, the Standing Committee on Health Aspects is concerned with the threat posed by viruses and other pathogens in sewage, both from on-shore communities and that discharged by vessels in the Great Lakes, where epidemics in recreational waters may result.

Both Standing Committees are addressing the problem of public health hazards posed by inadequate sewage disinfection: the Health Aspects from the epidemiological standpoint and the other from the efficiency of existing and proposed wastewater disinfection facilities. In addition, the problems of chlorination of wastewater and the choice of suitable alternatives, is an item of study for the latter group.
PHTHALATE ESTERS

The question of phthalic acid esters - used widely in the plastics industry, for example - as pollutants was noted in the Board's Third Semi-Annual Report - April 1974, by the three standing Committees of the Board concerned. Other "plasticizers" have also received attention.

A state-of-the-art paper on phthalate esters was prepared by Dr. Barabas for the Analytical Sampling and Measurement Methods Committee and reviewed by the Board at its Eighth Meeting. It was noted that several analytical laboratories located in the Great Lakes region would be capable of analyzing for these substances routinely, in water samples.

The Health Aspects Committee addressed the health hazards presented by phthalate esters and other "plasticizers" in such documents as were available to it and a more extensive report is anticipated on this aspect. These materials show low toxicity but are persistent.

Indicator bacteria were never intended to serve any purpose other than to provide information on the possible presence of fecal materiel. They are now used as guidelines for water treatment and water use - often overzealously. Also, amongst swimmers eyes, ear, nose and throat ailments represent 60% of all illnesses recorded, gastrointestinal disturbances 20% and skin irritations and infections the remainder. How, then, can a supposed aquatic indicator protect against these infections?

Possible alternative indicators of fecal contamination are available, including chemical measurement of fecal steroids. Other bacteria, viruses and fungi present in Great Lakes waters may occasionally cause upper respiratory tract, ear and skin infections but little or no quantitative information is available on these organisms and their effects.
The choice of properties may vary – they apply to the

Secretary-General's report on the future of the

United Nations Peacekeeping Force in the

Democratic Republic of the Congo (UNDPF) – Report

of the Secretary-General. Draft "operational" force and

operational area

The future of the UNDPF is under the leadership of

the UN Secretary-General, and the structure of the

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BACTERIOLOGICAL WATER QUALITY

The Board, in its "Research Needs" document, focused attention on whether coliform assays are valid indicators of human health hazards in drinking and recreational waters. There has been no clearly demonstrated relationship between coliform counts and diseases, particularly in relation to swimming use. Direct epidemiological evidence is lacking in support of any water pollution indices and coliform counts are unable to gauge the risk of upper respiratory tract and epidermal (including fungal) diseases. Some researchers have suggested alternatives for assessing faecal contamination.

At its Eighth Meeting, the Board invited a presentation on "Bacteriological Water Quality Criteria: A Summary" by Mr. B.J. Dutka, CCIW. Several problems and research needs were identified. A number of "standard" methods are used in North America for coliform tests. They vary in several ways and provide differing results.

Indicator bacteria were never intended to serve any purpose other than to provide information on the possible presence of faecal material. They are now used as guidelines for water treatment and water use—often overzealously. Also, amongst swimmers' eye, ear, nose and throat ailments represent 68% of all illnesses recorded, gastrointestinal disturbances 20% and skin irritations and infections, the remainder. How, then, can a supposed enteric indicator protect against these infections?

Possible alternative indicators of faecal contamination are available, including chemical measurements of faecal sterols. Other bacteria, yeasts and fungi present in Great Lakes waters may occasionally cause upper respiratory tract, ear and skin infections but little or no quantitative information is available on these organisms and their effects.
Early indications of change in the trophic state of lakes may possibly be provided by studying changes in heterotrophic bacterial populations.

A limited amount of research is underway in these matters and the Standing Committees on Health Aspects, Scientific Basis for Water Quality Criteria and for Water and Wastewater Treatment are currently addressing the question of relative importance of needs and research emphasis.

Horizontal dispersion scales and coefficients can be calculated from this latter approach.

In addition, the problems of shore erosion associated with long-term forecasting of lake levels are under consideration together with the modelling of thermal effluents and the difficult task of interfacing hydrodynamical (physical) and chemical/biological models. Associated topics receiving attention include diffusion transport mechanisms, both horizontal and vertical, in the lakes and the exchange between sediments and water columns above them.

STUDIES ON WASTE HEAT IN THE GREAT LAKES

Larval Fish Kills and Steam Electrical Generating Plants

There are very few studies of lake-wide or discrete fish populations which focus on larval and juvenile mortality as factors affecting the abundance of harvestable adults. Use of water for cooling at some steam electric generating stations is an added source of mortality by impingement on intake screens and thermal and mechanical effects in-plant. Lake-wide or wide-related knowledge of behaviour of larval and
LAKE DYNAMICS RESEARCH NEEDS

The Standing Committee on Lake Dynamics is considering the desirability of holding two workshops on:

- the dynamics of flow in stratified fluids with particular reference to thermocline formation and development of the upper mixed layer and

- methods of tracking fleets of drogues drifting over distance scales of 1 to 100 km. and time scales of hours to weeks.

Horizontal dispersion scales and coefficients can be calculated from this latter approach.

In addition, the problems of shore erosion associated with long-term forecasting of lake levels are under consideration together with the modelling of thermal effluents and the difficult task of interfacing hydrodynamical (physical) and chemical/biological models. Associated topics receiving attention include diffusion transport mechanisms, both horizontal and vertical, in the lakes and the exchange between sediments and water columns above them.

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THIS NOTICE TO REGISTER YOUR

Application to the Secretary of State for the Environment shall be

registered under the following dates:

- 1st April to 1st May
- 1st June to 1st July
- 1st August to 1st September
- 1st October to 1st November

Registering your application can be completed

after this notice is published.

DEPARTMENTS OF THE UNITED KINGDOM

Identity by any means, including electronic means, will be

required to submit your application.

Please ensure you attach all necessary documents.

Department of the Environment, North Somerset

This notice to register your application is to be

submitted to the Secretary of State for the Environment.

It is hereby notified that the application shall be

registered as follows:

- From 1st April to 1st May
- From 1st June to 1st July
- From 1st August to 1st September
- From 1st October to 1st November
juvenile fish, their standing crops and natural mortality rates is generally lacking. Such information must be coupled with knowledge of plant-related mortality to determine if recoupment is affected detrimentally by plant operation.

This information, plus research to partition the effects of in-plant mortality and to evaluate intake location and design as factors in fish mortality, is required before scientifically-sound conclusions can be reached on the impact of cooling water use to the aquatic ecosystem. These conclusions will lead to logical decisions on methods of operation for existing and future generating stations.

The Significance of Population Distribution

The question of population density and distribution in the context of waste heat generation and its input to the Great Lakes, will be given further consideration by the Standing Committee on the Scientific Basis for Water Quality Criteria, in co-operation with the Water Quality Objectives Subcommittee.

Miscellaneous Topics

The Board is considering a variety of topics, suggested recently. These include:

- research on oil spill remedial technology in fast flowing waters;
- surveillance information for the lower Great Lakes studies, especially regarding polychlorinated biphenyls (PCB's) and radioisotopes;
- the value of preserving archives of wildlife, and fish tissues, and bottom sediments, for future research and
- the toxicity of materials, definition and measurement.

* At its Ninth Meeting, the Board reviewed the reasons for cancelling the recent oil spill control experiment "Operation Preparedness" on the St. Clair River. The inadequacies of existing oil spill contingency measures were discussed in this context and it was agreed that research needs required identification.
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