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Great Lakes Research Advisory Board: Fourth Semi-Annual Report to the International Joint Commission, Version 1

Great Lakes Research Advisory Board

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I SUMMARY

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.

A. Accomplishments

Reports on three studies are undergoing final review: "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.

B. Current Activities

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 and environmental effects of wastewater disinfection techniques. Certain scientific water quality criteria are being developed to provide a basis for objectives applicable to the Great Lakes. The Board is examining alternatives to coliform assays as indicators of human health hazards in drinking and recreational waters.

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.

C. Matters Under Early Consideration

The Board is addressing a variety of topics including:

- the implications to fish life of steam electrical generating plant cooling water intake structures;
- oil spill remedial technology in fast flowing waters;
- identification of water quality factors affecting human health;
- preserving archives of wildlife and fish tissues, and bottom sediments for future research.
II CONCLUSIONS AND RECOMMENDATIONS

1. Following the earlier recommendations by the Board, the Standing Committee on Analytical Sampling and Measurement Methods concluded that by use of a given correlation factor, the total dissolved solids values determined gravimetrically could be estimated from specific conductance measurements.

The Board therefore recommends the use of this correlation factor and the notation described in the Standing Committee's report, for water quality studies on the Great Lakes.

2. It was concluded that direct epidemiological evidence is lacking in support of any health related indices of water pollution and that there is no demonstrated relationship between coliform counts and diseases.

The Board recommends that increased, coordinated research efforts be directed to determine valid indicators of human health hazards in drinking and recreational waters.

Additional conclusions will follow upon final review of the asbestos fibres report and completion of the phthalate ester report, incorporating the comments of the Health Aspects Committee.
The Research Advisory Board was established under the provision 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 additional 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.

The Board's Third Semi-Annual Report - April 1974 addressed several new topics 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.
IV ACCOMPLISHMENTS

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 or early 1975. The consultant and the Eutrophication Standing Committee will review the selection of participants, methods for proceedings preparation and the arrangements of the Workshop which will summarize available information and identify additional research needs.

ASBESTOS IN THE GREAT LAKES BASIN with Emphasis on Lake Superior

Prompted by growing public concern, the IJC requested a review on the topic of asbestos in the Great Lakes Basin with emphasis on Lake Superior. This topical study coincided with current litigation between the Reserve Mining Company and the United States of America.
The draft report, 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, is under final review. It draws largely upon scientific reports, 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.

The report includes discussion of the properties of asbestos, treatment and removal, health effects, occurrences in the Basin and Lake Superior, and research needs. Also, it reviews taconite mining, current investigations and the chronology of related legal activities.

EVALUATION OF IJC PUBLIC HEARINGS

The IJC Great Lakes Regional Office Staff collaborated with the Canada Centre for Inland Waters (CCIW) in distribution of a questionnaire for attendees at three sets of IJC Public Hearings. Although the twelve public hearings extended beyond the region covered by the Great Lakes Water Quality Agreement, it was considered necessary to use utilize them as part of the process of proposing improvements to public hearing procedures to the Commission. At present, such hearings constitute the major mechanism for soliciting such participation.

Nearly 60 percent of the 400 questionnaires mailed to attendees were completed and returned. An analysis of these by Margaret Sinclair (CCIW) provides 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 to the Commission is in preparation and was submitted in draft to the Commission in late September for advance information. The Board will be reviewing the report and providing any additional comments before the end of 1974.
The Upper Lakes Reference Group requested that the Research Advisory Board define the parameter total dissolved solids and recommend a measurement procedure.

The Standing Committee on Analytical Sampling and Measurement Methods recommended that the measurement of specific conductance be substituted for conventional gravimetric determinations of total dissolved solids in the waters of the Upper Great Lakes.

An appropriate correlation factor was developed to relate the specific conductance values to water quality standards, expressed as total dissolved solids.

The final report, providing the recommended procedure, has been prepared by the Research Advisory Board and has been made available to the Upper Lakes Reference Group, interested groups and individuals.
At its Ninth Meeting the Board appointed an Ad Hoc Committee, chaired by Dr. E. Aubert, (National Oceanographic and Atmospheric Administration), to prepare the guidelines and procedures for an International Project Forecast Directory and Bibliography which will be issued annually by the International Joint Commission Regional Office. Preparation for this project has been proceeding and the first draft of the questionnaire format will be reviewed at the Tenth Meeting of the Research Advisory Board.

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. Of these, fifty appropriate citations have been selected.

The Board recommended expenditure of up to $500 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 interest concluded that the existing state-of-the-art of simulation modelling is insufficiently advanced to warrant a Research Advisory Board symposium on this topic and that, consequently, formal international coordination 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 (University of Wisconsin) as its Chairman, this committee will report periodically to the Board.

WATER QUALITY CRITERIA AND OBJECTIVES

The Water Quality Board and Research Advisory Board agreed to joint meetings of the two committees concerned with these matters. Mr. Fetterolf (State of Michigan) has been requested by the Water Quality Board to continue as Chairman of the Water Objectives Subcommittee.
Dr. William Brungs (U.S. EPA) has been appointed Chairman of the Research Advisory Board’s Standing Committee on the Scientific Basis for Water Quality Criteria (SBWQC).

The Water Quality Objectives Subcommittee will study those parameters for which there is a significant data base and make recommendations to the Water Quality Board. The SBWQC Committee identified substances for which there are insufficient data to set reliable objectives: 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 for these and other substances. 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 reviews. It recently received a resume of university research on chlorination and 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 epidemiological hazards 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, its impact on aquatic organisms, and the choice of suitable alternatives, is an item of study for the latter group.

**PHTHALATE ESTERS**

The question of the significance of phthalic acid esters which are used widely in the plastics and the chemical industries, was noted in the Board's Third Semi-Annual Report - 1974.

Dr. Barabas (CCIW) has prepared a review on the phthalate esters which was considered by the Board at its Eighth Meeting. This report was concerned with the levels of phthalate esters found in the natural environment and the analytical methodology in use for detection of these materials. The Health Aspects Committee addressed the question of potential health hazards which are represented by the phthalate esters and other "plasticizers" and their comments will be incorporated in a report.

An initial conclusion is that these materials are of low toxicity but are very persistent in the environment.

**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. 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. 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.

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.

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.

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, in order to calculate horizontal dispersion scales and coefficients.

In addition, the problems of water quality degradation due to shore erosion associated with long-term forecasting of lake levels are under consideration besides 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.
VI MATTERS UNDER EARLY CONSIDERATION

The Board has just initiated consideration of a variety of topics. These include:

- impact studies of cooling water from steam electrical generating plants on aquatic communities;
- evaluation of cooling water intake location and design on larval and juvenile fish mortality;
- identification of research needs in oil spill clean-up technology in fast flowing waters;
- the value of preserving archives of wildlife and fish tissues and bottom sediments, for future research;
- clarification of definition and measurement of the toxicity of materials;
- the significance to human health of radioactivity from the increasing numbers of nuclear electrical generating stations in the Great Lakes Basin;
- need for improved integration of information to relate the health status of residents of the Great Lakes region to the environment;
- evaluation of information (i.e. from studies of the lower Great Lakes) on the effects of persistent substances such as PCB's, phthalate esters, heavy metals, asbestos and radioisotopes on human health.
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