

# SIXTH ANNUAL REPORT

## GREAT LAKES WATER QUALITY



**INTERNATIONAL JOINT COMMISSION**

UNITED STATES / CANADA

(1978)



WASHINGTON

1717 H Street NW  
Washington, QC. 20440  
(202) 632-9456

OTTAWA

100 Metcalf Street  
18th Floor  
Ottawa, Ontario K1P 5M1  
(613) 995-2984

The 1977 Annual Report of the Great Lakes Water Quality Board and its four appendices (B-Surveillance, C-Remedial Programs, D-Radioactivity, E-Status Report On Organic And Heavy Metal Contaminants In The Lakes Erie, Michigan, Huron And Superior Basins, F-Hazardous Waste Disposal), the 1977 Annual Report of the Great Lakes Research Advisory Board and its special report "The Ecosystem Approach," and the Final Report of the Pollution from Land Use Activities Reference Group, "Environmental Management Strategy for the Great Lakes Basin", are available, supplies permitting from:  
International Joint Commission,  
Great Lakes Regional Office,  
100 Ouellette Avenue,  
Windsor, Ontario, Canada N9A 6T3  
Telephone Numbers:  
United States — (313) 963-9041  
Canada — (519) 256-7821

To the Government of Canada  
Government of the United States  
Government of the State of Illinois  
Government of the State of Indiana  
Government of the State of Michigan  
Government of the State of Minnesota  
Government of the State of New York  
Government of the State of Ohio  
Government of the State of Pennsylvania  
Government of the State of Wisconsin  
Government of the Province of Ontario

The International Joint Commission is pleased to transmit its Sixth Annual Report on Great Lakes Water Quality in accordance with the Great Lakes Water Quality Agreement of 1972.

In this report the Commission has provided a review of the first five years of its activities under the 1972 Great Lakes Water Quality Agreement and its review of the more significant findings to the end of 1977, based principally upon reports of the Great Lakes Water Quality Board and the Research Advisory Board which were submitted in July, 1978.



# Chapter I

## Summary

In this, its Sixth Annual Report on Great Lakes Water Quality, the Commission has attempted to provide a brief review of the first five years of activities under the 1972 Great Lakes Water Quality Agreement in addition to highlighting the more significant findings which appear in the 1977 Annual Reports of the Great Lakes Water Quality Board and the Research Advisory Board. The review of the first five years is followed by an assessment of Great Lakes water quality for 1977, a discussion of regulatory and remedial programs, the ecosystem, research activities and special problems, and an evaluation of the Commission's information and public participation program.

Although the Commission notes that remedial programs have begun to show limited results in the reduction of phosphorus concentrations and levels of PCBs, DDT, DDE, mercury and Mirex in some parts of the lakes, it is aware that these improvements have not yet reached substantial proportions, nor are they basin wide. When one considers the magnitude and nature of the problems to be overcome, it is not surprising that progress towards cleaning up the Great Lakes has fallen short of the goals set in the 1972 Great Lakes Water Quality Agreement. Continued progress towards achieving the goals of the 1972 Agreement will depend largely upon the successful implementation of programs to deal with the major problems of persistent toxic substances, high phosphorus concentrations, airborne pollutants, and the disposal of municipal and hazardous industrial wastes.

Pollution of the Great Lakes by toxic substances remains a critical problem to be solved. The full scope of the threat to human health and the environment has yet to be defined, but it is serious and effective controls are needed promptly.

Eutrophication of lakes Erie and Ontario remains a major problem and phosphorus loadings even to the Upper Lakes continues to be greater than the targets established in the 1972 Agreement. Refined target loadings are needed, and further reductions in phosphorus loadings through waste treatment are required in addition to the limitation of phosphorus in detergents.

Contributions of pollutants such as phosphorus and heavy metals are reaching the lakes in significant amounts through atmospheric fallout and from land runoff. Recent studies have indicated that possible sources of these pollutants are outside the basin and may have, in fact, traveled many hundreds and even thousands of miles before reaching the lakes.

With phosphorus control programs implemented in most municipal waste treatment plants in the basin, disposal of large amounts of sludge has become a major problem. In addition, great concern has developed in both countries over disposal — present and past — of toxic industrial wastes. Because of potential adverse impacts on human health and the environment, program emphasis on developing safe disposal programs is urgently needed.

Further, it now appears that considering the various individual components of the Great Lakes System in isolation of others may be insufficient to resolve the above problems. The ecosystem approach, recommended by the Commission in its Fifth Annual Report and now developed in greater detail by the Research Advisory Board, provides the framework by which these components can be more fully integrated with one another.

There are, of course, many other problems which continue to significantly adversely impact on the water quality of the Great Lakes, particularly Erie and Ontario, and which interfere with a full and wise use of the water resource. The Commission commends both the Great Lakes Water Quality Board and the Research Advisory Board for their excellent reports to the Commission on an assessment of the condition of the lakes during the calendar year 1977, as well as the progress made by the two Governments in implementing remedial and control programs and coordinating research activities. The Commission endorses the many recommendations made by both boards. A copy of those recommendations is included in this report as Appendix A.

The Commission, however, has identified what it believes to be the current major problems in the Great Lakes: persistent toxics, high phosphorus concentrations, contributions from airborne pollutants, and disposal of municipal and hazardous industrial wastes, and makes the following recommendations regarding them:

1. That the Governments of the United States and Canada, with urgency, collaborate in developing a program which :
  - (a) establishes a running inventory of toxic chemicals used, manufactured or imported into the Great Lakes Basin
  - (b) evaluates their risk to human health and the environment .
  - (c) establishes, at the earliest possible date, compatible and effective programs for their management, transport, and disposal.
2. That the Governments accelerate their enforcement programs to control phosphorus loadings to the Great Lakes through:
  - (a) reductions in the use of phosphorus in detergents, where not already in force
  - (b) continued improvement of phosphorus removal at sewage treatment plants
  - (c) identification and development of programs for the control of tributary loadings from land use practices.
3. That Governments expedite the control of point source discharges of wastes, especially of those contributing to problem areas through:
  - (a) the establishment of effluent limitations to meet water quality objectives in the Boundary Waters, taking cognizance of the provisions of the 1978 Canada-United States Great Lakes Water Quality Agreement for the designation of limited use zones
  - (b) the improvement of the operation and maintenance of municipal waste treatment facilities in order, to ensure that the design capabilities are met in normal operation
  - (c) the development of improved methods for handling and disposal of municipal sludge, including pretreatment of wastes
  - (d) utilization of alternative technology for disposal or reuse of wastes and waste treatment by-products, and, where possible, the expanded use of land application of wastes and sludge.
4. That the Governments collaborate in the identification and assessment of sources of atmospheric pollution of the boundary waters, and adopt appropriate source control programs.

The Commission further recommends

5. that the International Great Lakes Surveillance Plan be funded in full, at least through 1987.
6. that an immediate joint Canada-United States effort be made to review and assess alternative dredged material disposal policies in the Great Lakes Basin.

## Chapter II

### Introduction A Five Year Perspective

Six years ago, the Governments of Canada and the United States signed the 1972 Great Lakes Water Quality Agreement, and agreed to undertake measures deemed necessary to restore and enhance the water quality of the Great Lakes System. The International joint Commission was directed to assist in implementing the Agreement. Its responsibilities under the Agreement included the collection, analysis and dissemination of information concerning the operation and effectiveness of programs and measures undertaken to achieve the goals of the Agreement. The Commission was also required to report annually to federal, state and provincial governments on progress toward implementing programs and achieving the objectives set forth in the Great Lakes Water Quality Agreement.

In each of its Annual Reports to Governments, including this Sixth Report, the Commission has relied heavily upon the work of the Great Lakes Water Quality Board and the Research Advisory Board designated by the Commission as its principal advisors on Great Lakes water quality matters. One of the dominant themes in recent reports, that progress towards the goals of the Agreement has been "generally slow, uneven and in certain cases, disappointing", continues to be the case.

Although progress has been slow, public surveys indicate that those who use the Great Lakes see overall improvements. The latest findings of the Water Quality Board provide some evidence of this recovery. A clear response to remedial programs implemented by both countries was observed in some nearshore locations of western Lake Erie, Lake Ontario and Lake Michigan where significant decreases in phosphorus concentrations and accompanying reductions in algae growth were found. The high levels of DDT in eastern Lake Michigan, mercury levels in western Lake Erie and levels of PCBs, DDE and Mirex in Lake Ontario have also decreased over the past nine years.

During the life of the Agreement, the emphasis on assessing progress in improving water quality has shifted from whole lake to specific problem areas. The determination of changes in water quality in large bodies of water over a short period of time is difficult, if not impossible. Nearshore areas, however, respond to remedial measures more rapidly and the effectiveness of programs can be monitored through improvement in water quality in these areas. Within the Great Lakes Basin, the geographical areas where the water quality objectives are not being met have been identified as problem areas. In most cases these areas are situated at the mouths of tributaries or in the vicinity of populated urban centers. Measurements of water quality to assess the compliance with the general and specific objectives of the Agreement indicate that there are presently 47 problem areas, the same number as in 1976, showing degraded water quality resulting from industrial, municipal and nonpoint sources.

In 1971, prior to the signing of the Great Lakes Water Quality Agreement, the construction program of municipal treatment facilities for the removal of phosphorus was well underway on the Canadian side of the basin, while a similar program in the United States was just beginning. Since that time, substantial progress has been made, particularly on the United States side. Today, facilities are considered adequate for 63 percent of the sewered population in the United States portion and an impressive 99 percent of the sewered population in the Canadian portion of the basin, compared to 5 percent and 80 percent, respectively, in 1971.

In spite of progress observed over the past six years, the total municipal input of phosphorus to the Lower Great Lakes continues to far exceed the limitation of the 1972 Agreement. Detroit, the largest contributor, accounts for nearly 60 percent of the municipal phosphorus load to Lake Erie even though its phosphorus discharge has been reduced by over 80 percent in the past 8 years.

As to industry, a review of the pollution abatement progress of the steel, pulp and paper, and petroleum refining industries over the period 1967-1977 indicates that all three have reduced their pollutant loadings. Progress in controlling pollution from the pulp and paper industry has been more rapid in the United States than in Canada, while treatment levels in the oil refining industry are comparable. All jurisdictions have made progress in reducing pollutants from the steel industry from their 1967-1968 levels. However, improved loadings data are needed, especially from the State of Ohio.

Though progress has been made in industrial pollution control, it is evident that much more effort is required to control certain sources of specific pollutants. Because of improved analytical methods, many compounds previously undetected are being discovered in the Great Lakes System. It is not known how all of these recently identified compounds can affect man or his environment at the levels detected and under existing conditions, nor is it presently possible to judge how many more new contaminants will be detected in the future. The ability of many toxics to accumulate and even to biomagnify compounds the problem. The Commission concludes that toxic substances are a major problem to be faced now and in the years ahead in the Great Lakes Basin.

Two major investigations which the Governments requested the Commission to undertake at the time of the 1972 Agreement was signed have been completed. The Reference Group on Upper Lakes Pollution, established in 1972 to conduct a study of the water quality of lakes Superior and Huron, submitted its final report to the Commission in 1976. The International Reference Group on Pollution from Land Use Activities, also established in 1972, made its final report to the Commission in July 1978. Both of these reports have been distributed extensively in Canada and the United States and are the subject of the Commission's attention.

The Commission has noted on several occasions, particularly in its Third Annual Report in 1974, that the timetable for the clean-up effort has been generally misunderstood. In that report, the Commission observed that the provision of the 1972 Great Lakes Water Quality Agreement that "programs to achieve water quality objectives ... shall be either completed or in the process of implementation by December 31, 1975" led to the erroneous belief that between 1972 and 1975 the lakes were to be cleaned up. On the basis of progress to date, it is unrealistic to believe that pollution that has been going on for some 200 years can be remedied in terms of several years. Restoration and enhancement of the Great Lakes System in the decades ahead will necessitate that current programs be conducted with a broadened perspective and awareness. Air, water, minerals and living organisms, including man are all interacting parts of the Great Lakes Basin Ecosystem. The growing awareness and concern for long-range transport of airborne pollutants and land based sources of pollutants exemplify a recognition that the waters of the Great Lakes cannot be restored in isolation of these external stress factors. The Commission believes that these problems which face the Great Lakes Basin, its people and its Governments will require a broader, holistic approach for their solutions. The resolution of these problems will require an ecosystem approach which considers man and his consumptive societal needs as an integral, interactive component of the ecosystem in which he lives.

Since 1972 the Commission has sought ways to carry out improved public information/education and involvement programs relating to the Great Lakes Water Quality Agreement. Considerable progress has been made in educating the public on activities in both the United States and Canada in implementing the Great Lakes Agreement through publications and special reports, the public nature of the Commission's Great Lakes Water Quality Board Meetings, and the conduct of public workshops and seminars on specific problems and studies.

## Chapter III

### Water Quality Assessment —1977

#### Whole Lake Assessment

The Commission is pleased to be able to report to the Governments that overall the Great Lakes, especially lakes Michigan and Ontario are responding to the significant efforts by various jurisdictions to control most known point sources of pollution.

#### Lake Erie

Continued improvements in the control of phosphorus by the Province of Ontario and the State of Michigan over the last ten years have resulted in major reductions in loadings to Lake Erie from the Detroit River. It must also be recognized, however, that these reductions have not resulted in any appreciable change in phosphorus concentrations in the open waters of the lake. Lake Erie is a shallow lake and internal regeneration of biologically available phosphorus from the sediments during the summer extends the lag time between control program implementation and the identification of significant improvements.

PCB levels in the eggs of the herring gulls have increased slightly over the past few years in the western and central basins of Lake Erie. However, concentrations of mercury, another persistent contaminant, have declined in fish taken from Lake St. Clair, because of upstream controls. If this trend continues, the ban on human consumption of fish from this area should be reassessed.

#### Lake Ontario

As in the case of Lake Erie, phosphorus levels in localized areas in Lake Ontario have declined significantly since 1972, but again with no correspondingly significant changes in whole lake concentrations. The Commission also notes that recent studies have estimated flow-through time in Lake Ontario to be six years rather than the previously estimated fifteen years, resulting in a more rapid flushing of phosphorus from the system. Biological and chemical reactions also serve to further decrease the availability of phosphorus in the lake waters. In these ways the Lake Ontario phosphorus problem has been reduced. The nitrogen content of Lake Ontario, however, has been increasing at a steady rate over the last nine years probably due to a lack of source controls, including point source control, land runoff and airborne sources. Because of the implications for nutrient availability to the lake, the Commission will address this situation in detail during an intensive examination of Lake Ontario now scheduled for 1981-82.

PCBs, DDE, and Mirex residues in herring gulls have declined from 1975 levels, but mercury contamination in nearshore fish populations-remains a problem, and Mirex levels in some species continue to be higher than the United States guideline; this in spite of the discontinuance of the known sources of Mirex to Lake Ontario. Since it appears that Mirex has accumulated in the sediments from which it is released to the water, it is not known how long it will take for the Mirex to finally disappear.

#### Lake Michigan

Abatement programs conducted by the adjacent states have contributed to continuing general lake water quality improvement. This has resulted in reductions of taste and odor problems in drinking water, reductions in the *Cladophora* biomass, and improved use of the lake for bathing.

#### Lakes Superior and Huron

Although nearshore problem areas have been identified in both Lake Superior and Lake Huron basins, the general or whole lake quality of these waters remains better than the present water quality objectives would provide. The lakes are in very good condition and there appears to be no observable whole lake deterioration taking place as a result of continuing local problems.

It is apparent, however, that unless remedial programs are implemented in these problem areas, particularly in Saginaw and Georgian bays, deterioration of the present high quality condition in Lake Huron can be anticipated.

Thus, the present quality of the water in Lake Huron should be recognized as "tenuous" and every effort must be made to ensure that nutrient loadings are substantially restricted to prevent significant degradation from taking place. This situation has been confirmed by both the Upper Lakes and Pollution from Land Use Activities reference groups.

### **Problem Areas**

Forty-seven problem areas have been identified in the Great Lakes, the same number as a year ago. These include eight areas in lakes Superior and Huron, four in Lake Michigan, nine in Lake Ontario and eighteen in Lake Erie. Of the 47, 17 are located wholly on the Canadian side of the boundary, and 28 wholly within the United States. Two areas — Detroit River and the Lower Niagara River — received pollutants from both United States and Canadian sources.

It is important to note that since 1975 there have been no significant changes in the status of the problem areas. They remain localized areas of significant water quality degradation and as such must be considered to have significant impacts on the present conditions of the lakes, particularly lakes Erie and Ontario.

Although a number of specific dischargers identified in the problem areas are in compliance with the required programs, problems still exist. This could mean that either residual effect is still evident or that more stringent regulations should be applied in order to correct the problem. The Commission intends to study this matter further.

The Commission believes that priorities should be given to remedial programs and surveillance efforts in the problem areas, especially in the large metropolitan and industrial centers of the basin. With the implementation of adequate pollution control in these areas the emphasis could then shift to preventative measures.

### **Toxic and Hazardous Substances**

The presence of toxic and hazardous substances in the Great Lakes and their potential adverse effects on human health continue to be of major concern to the Commission. In its 1977 report to Governments, the Commission endorsed a number of recommendations on the toxic substance problem which are reemphasized in this report. During the past year further studies and information have indicated that the toxic problem may be larger and more complex to deal with than anticipated. Thus the Commission recommends with a sense of urgency that the Governments collaborate in evaluating the risk of toxic chemicals to human health and the environment and ensuring that control programs are intensified and coordinated.

A start has been made on identifying all chemical compounds being used, manufactured or imported into the Great Lakes Basin. To date this list contains over 2800 compounds. The problem in completing this inventory is the availability of data, particularly in Canada. While programs exist for industries to report any chemical used, manufactured or imported for use in Canada, much of the information is confidential and/or proprietary, and is not available to Environment Canada for enforcement action under the Canada Environmental Contaminants Act. The Commission strongly urges the Canadian Government to undertake whatever legislative actions are necessary to require that industries report all chemical compounds in use, manufactured or imported, and to ensure that this information is made available to the appropriate regulatory agencies.

Of equal concern, however, is the growing problem of hazardous waste disposal. This matter was the subject of an important conference held in November 1977 by the IJC Great Lakes Water Quality Board. The board has characterized the problem as a "dilemma."

Methods presently in use for disposing of hazardous wastes have resulted in contamination of ground-waters, development of odors and aesthetic problems and the abandonment of stockpiles of wastes. Even as this report is being written, heavy rains in Niagara falls, New York have caused toxic chemicals to leach to the surface in an area formerly used as a chemical waste dump or land fill site and now used as a site for residential housing. The full ramifications of the consequences of this leaching on the health of the people now living in this area are known to be serious, but it may be some time before they are completely identified and appropriate corrective action is taken.

Chemical dumps are located in literally hundreds and maybe thousands of sites throughout the basin and there is an urgent need to determine their location and contents and, if possible, their potential for adverse effects on the Great Lakes Basin Ecosystem.

The Water Quality Board has recommended, and the Commission concurs, that Canada and the United States should unite their efforts in studying toxic waste disposal problems. The Commission recommends that the Governments develop an accurate inventory of such disposal areas in the basin using certain concepts in establishing toxic waste disposal control programs. These concepts are attached as Appendix B. The Commission has requested the Water Quality Board to examine this problem and to advise the Commission on the feasibility and cost of preparing such an inventory. The Commission is aware that an inventory of waste disposal sites in the Great Lakes Basin has been made by PLUARG, but the inventory does not indicate what kinds of wastes and what quantities have been disposed to the sites.

## **Radioactivity**

Concentrations of radionuclides in the Great Lakes remain low and similar to those found in 1976. Whatever radioactivity does exist is believed to have originated from worldwide nuclear testing. A major change in the recommendations of the International Commission on Radiological Protection (ICRP) for calculation of radiological commitment to the whole body was published in 1977. As a result of this change, higher levels of some radionuclides will be permitted in the Great Lakes water than have been in the past. This change has been reflected in the specific objective for radioactivity of 1 millirem intake per year already incorporated in the new Great Lakes Water Quality Agreement.

The disposal of high level radioactive wastes, particularly nuclear power plant spent fuel, is still a complex question and is under intensive study in both countries. Since there is serious public concern for the disposal problem, especially in areas of planned or potential disposal, a fully acceptable solution will require satisfying that public concern.

Nevertheless, the Commission believes it vital to the safety of the people of the Great Lakes Basin that assured safe disposal methods be developed soon since the pressure for nuclear power plant siting in the Great Lakes Basin is increasing and substantial increases in the number of such plants are expected in both countries by the turn of the century.

## **Nonpoint Sources**

Climaxing an extensive five-year effort the Commission has received a comprehensive report on pollution of the Great Lakes Basin by land drainage. The report informs the Commission that substantial amounts of phosphorus are reaching the lakes by runoff from urban and rural areas as well as from the atmosphere. The report raises considerable doubt, however, as to the biological availability of phosphorus from these sources, especially runoff. Sediments, a large number of synthetic industrial organic compounds, some previously used pesticides and potentially some heavy metals are also polluting the lakes.

The Pollution from Land Use Activities Reference Group, which undertook the study for the Commission, has recommended environmental management strategies as a means of controlling pollutants in "hydrologically active areas" where they occur in the greatest abundance.

The report was made available to the public in preparation for a series of public hearings held in November and early December of 1978. Because of some uncertainties regarding phosphorus, the Water Quality Board has recommended a further one year study before the Commission completes its report. The Commission plans to send a report or status report to the Governments in the first half of 1979.

## **Surveillance**

The International Great Lakes Surveillance Plan was developed by the Water Quality Board and recommended to Governments by the Commission in 1975. Although the Water Quality Board reports that funding for the Plan by the Governments has been adequate for the past two years, the Commission is concerned that the program be continued

at higher levels in the years ahead.

When the Plan was first implemented, the required average annual expenditures were estimated to be \$16 million. Because some parts of the program are still not fully developed, the actual expenditures have been considerably less than this estimate, totaling \$7 million in 1977 and \$9.5 million in 1978. Those undeveloped segments include a nearshore fish contaminants program, additional sampling for radioactivity and atmospheric loads to the Great Lakes, and sampling of tributaries during heavy runoff periods.

The Commission's ability to assess the progress being made by the two countries in improving the lakes' water quality, as well as to evaluate the effectiveness of control programs and strategies, has rested substantially on the ability of its boards to acquire adequate amounts of data by means of surveillance and monitoring programs.

The Commission believes it is of paramount importance that the Governments support a vigorous surveillance and monitoring program in the Great Lakes. For this reason it recommends the International Great Lakes Surveillance Plan for full funding, at least through 1987.

## Chapter IV Regulatory and Remedial Programs

### Legislation

During 1977, amendments to federal laws relating to water quality control were enacted in both the United States and Canada. In Canada, Parliament passed amendments to the Fisheries Act in mid-1977 which went into effect September 1, 1977. In the United States, significant changes in the water pollution control program were made by the Clean Water Act of 1977 (PL 95-217) which became law in December. The law provides the mid-course corrections in the program which was established in-1972 by PL 92-500.

In Canada amendments to the Fisheries Act provide for the protection of fish habitat from landfill and construction in foreshore areas. The amendments also broaden authority to regulate existing and proposed industrial activities which may pollute waterways. Mandatory spill reporting will be instituted; with the amended act, either those responsible for a spill or the carrier of the substance is obligated to clean it up. Penalties for pollution offenses have been significantly increased, to up to \$100,000 per day per offense. Under the amended act, commercial fishermen, through civil action, can recover income lost due to pollution from land based sources.

The water pollution control amendments in the United States place stronger emphasis on toxic pollutants and give greater responsibility to the states. The amendments authorize the federal expenditure of \$4.5 billion nationwide for construction of municipal waste treatment facilities for the fiscal year ending September 30, 1978 and \$5.0 billion each year for the following four years. Municipal dischargers that failed to meet the July 1, 1977 compliance deadline for secondary treatment may receive extensions up to July 1, 1983 on a case-by-case basis. The new deadline is determined by the availability of federal funds and by the necessary construction time. Approximately 15% of the obligated United States state and federal funds for construction grants in the period 1973 to 1977 were spent in the Great Lakes Basin. Amendments to the United States Clean Water Act require use of alternate treatment techniques such as spray irrigation, where cost effective, and provide for increased grants where alternate or innovative techniques are applied.

For industrial dischargers, the amendments authorize an extension of the 1977 compliance deadline to no longer than April 1, 1979, under very restricted conditions and require EPA to take into account benefit/cost analysis when requiring best available technology (BAT). The basic deadline for the application of BAT previously required for 1983 has now been extended to July 1, 1984. Industry is also required to use best management practices to control site runoff, spills, sludge disposal, and the like. EPA is expected to make best management practice a general provision of every permit.

Although there were revisions in 1977 to the United States requirements for treatment of waste from commercial vessels, there are still inconsistencies in the treatment requirements for both commercial vessels and pleasure craft in the Great Lakes. A vessel crossing jurisdictional or international boundaries could be out of compliance with domestic legislation.

Amendments to Section 208 of the United States Clean Water Act authorize funds for use by the Department of Agriculture in programs to implement best management practices for agricultural non-point pollution sources wherever such practices are part of an approved Section 208 plan.

The United States Congress did not include a phosphorus detergent ban in the Clean Water Act, but both House and Senate hearings on a ban are expected: A 0.5% limit became effective in Michigan in October 1977. Wisconsin passed legislation in 1977 for a ban to become effective in 1979.

In the section of the United States Clean Air Act Amendments of 1977 (PL95-95) dealing with international air pollution, a new regulatory mechanism has been enacted which supplants the previously available abatement conference process. This approach calls for a state to alter its implementation plan when EPA has determined air pollution of United States origin may reasonably be anticipated to endanger, public health or welfare in a foreign country, provided that the other country is willing and capable of extending similar protection to the United States.

## **Water Quality Objectives**

In May 1977, the Commission forwarded to the Governments a report on new and revised water quality objectives and definitions that were developed by the Water Quality and Research Advisory boards. The Commission's report recommended that the objectives be incorporated into the Great Lakes Water Quality Agreement.

In January 1978, the Water Quality Board recommended a second group of 12 new and revised water quality objectives to the Commission in a special report. On June 29, 1978, the Commission was advised by Governments that the new objectives for copper, iron, parathion, hydrogen sulphide, nickel, mirex, guthion and ammonia were included in the proposed 1978 Great Lakes Water Quality Agreement. The remaining four, for chlorine, cyanide, silver, and temperature, were referred back to the Commission for further consideration and study.

The Commission held a public hearing on these new and revised objectives on July 21, 1978, at Windsor, Ontario. Emphasis was directed to the objectives which had been referred to the Commission for further study, although testimony was taken on all twelve.

The Aquatic Ecosystem Objectives Committee of the Research Advisory Board will develop specific aquatic ecosystem objectives based on broad ecological considerations. The Commission is now considering whether the social and economic implications of these objectives should then be within the jurisdiction of the Objective Assessment Subcommittee established by the Water Quality Board. The combined efforts of these two committees will give a new dimension to further specific water quality objectives recommended to the Governments by the Commission.

## **Municipal Highlights**

### **Waste Treatment**

Municipal treatment facilities provided adequate treatment, generally secondary treatment, for 63% of the sewered population in the United States portion of the Great Lakes Basin, and 99% in the Canadian portion.

In the United States, each discharger has a National Pollutant Discharge Elimination System (NPDES) permit which includes effluent limitations and a schedule for compliance; 41% of the municipal dischargers met the July 1, 1977, compliance deadline specified in their permits, and 32% received schedule extensions primarily because of the lack of federal funding. In Canada, 78% of the municipalities met their loading requirements for phosphorus discharge.

In the Great Lakes Basin in 1977, Ontario committed \$150,000,000 for construction of municipal sewage treatment plants. In the United States, \$716,000,000 was obligated by the federal and state governments.

The introduction of chemical treatment of municipal wastes for phosphorus removal has greatly increased the amount of sludge to be handled and disposed of and indeed, sludge disposal has become a basin wide problem particularly for the larger municipalities. Several municipalities, including Detroit, could remove more phosphorus than they are currently removing, but are limited by their sludge processing and disposal capabilities. Although alternatives to present sludge utilization and disposal practices, and ways to reduce the production of sludge itself are being actively pursued, it is urgent that a solution to this limiting problem be developed as quickly as possible.

### **Phosphorus Removal**

In the 1972 Agreement, the Parties agreed to a phosphorus effluent limitation of 1.0 mg/L for municipal sewage treatment plants discharging more than one million gallons per day to the Lower Lakes. If this criterion were met, the municipal loadings to Lake Erie and to Lake Ontario would be 7480 and 4520 kg/d, respectively. In actual fact the 1977 municipal loadings to lakes Erie and Ontario were 18,513 and 8,279 kg/d, respectively, more than twice the level that could be achieved if the criterion were met.

Detroit continues to be the largest municipal contributor of phosphorus, although it has reduced its phosphorus discharge by over 80% in the past eight years through a combination of treatment and a detergent phosphorus limitation. Nonetheless, Detroit still accounts for nearly 60% of the municipal phosphorus load to Lake Erie and indeed would still contribute 43% if all municipal dischargers, including Detroit, met their target loads. A court settlement outlines a schedule for the city to achieve compliance by August 1982.

The Commission is informed that Detroit is not in compliance with its abatement plan. Review of the city's program by the United States to insure that a viable solution is conceived and implemented seems essential and urgent. Similarly, immediate consideration should be given by Detroit to alternative proposals to service additional outlying areas, in view of the ongoing problems.

Other major municipal dischargers in excess of the 1.0 mg/L target are Buffalo, Toledo, Syracuse, Niagara Falls (N.Y.), and Cleveland. Southerly, Buffalo and Syracuse have corrective programs underway, however Toledo, Niagara Falls and Cleveland have major operational problems still needing solutions. Because of present and expected loadings of phosphorus and because of present and anticipated target loadings, alternate treatment and waste disposal methods must be considered as a necessary means of meeting water quality objectives. The Commission has requested the Great Lakes Water Quality Board and the Research Advisory Board to undertake a feasibility study of various alternative methods.

### **Phosphorus Limitation in Detergents**

As a means of meeting the phosphorus loading requirements of the Agreement, the Commission has in the past recommended banning phosphorus from all detergents manufactured for use in the Great Lakes Basin. A statewide ban is now in effect for Michigan, Indiana, and New York; Wisconsin has passed a law limiting phosphorus in detergents and Ohio is considering legislative action. Minnesota is enjoined from enforcing its detergent phosphorus ban and Pennsylvania has no ban. The Canadian legislation limits the phosphorus content of household detergents to 2.2% phosphorus by weight.

### **Industrial Progress**

The Water Quality Boards 1978 Report to the Commission compared the reductions in pollutant loadings of United States and Canadian dischargers in the pulp and paper, iron and steel, and petroleum industries. On a national basis, the United States and Canada have similar policies for reducing pollution from industrial sources. Both have developed effluent guidelines for appropriate minimum levels of treatment and both seek to meet Agreement objectives and jurisdictional standards and criteria for various water uses.

In the United States, enforceable permits limiting the amounts and concentrations of materials being discharged are issued under the National Pollutant Discharge, Elimination System (NPDES). In Canada, legally enforceable control programs or control orders are issued to individual industries. Ontario uses the federal minimum requirements in combination with consideration of local receiving water quality to determine effluent requirements and to negotiate compliance schedules for each major discharger.

One of the primary differences between the United States and Canadian approaches to effluent quality is that plants in the United States were generally required to achieve compliance by a specific date, July 1, 1977 — while in Canada, the compliance dates vary from plant to plant. In addition, the stringency of the Canadian and the United States effluent limitations may vary depending upon the industrial sector, the plant, and the pollutant being considered.

It is clear that much progress has been made, but that much more effort is required to control certain sources of specific pollutants. It is also evident from the information available that control of pollution from the pulp and paper industry is now more effective in the United States than in Canada. Pollution control programs in the two countries produced marginally better results from the United States steel industry and essentially equivalent results from the refining industry. The main reason for the variation in results of control programs appears to arise from different approaches to regulation. In the United States, a formalized permit program was introduced in the early '70s. In Canada, minimum requirements were established in 1971. In 1975, federal-provincial agreement was reached on their implementation. Formal approvals and orders procedures were fully implemented in 1976. These differences in

performance among jurisdictions are also reflected in the variations of legislative actions, economic conditions, and public interest in the two countries. Certain differences arise from variations in treatment requirements and the adaptation of those requirements to specific facilities to meet water quality objectives. Other differences may result from age and degree of modernization of a plant and the amount of corrective work involved.

The Commission recommends that the Governments ensure that effluent limitations for point sources to meet water quality objectives in the boundary waters be developed as a matter of priority, and that actions against dischargers with incomplete programs, especially those contributing, to problem areas, be expedited.

## **Phosphorus Loadings to the Great Lakes**

The 1977 estimated loadings to the Upper Lakes (Lakes Superior and Huron) were above the target loadings of the 1972 Water Quality Agreement, but were lower than the amounts deemed permissible by the Lippe' Lakes Reference Group in its 1976 report. The Reference Group nevertheless had recommended that loadings not be increased to ensure that the present high quality to water of those lakes be maintained.

The 1972 Agreement did not specify 1977 phosphorus target loadings for Lake Erie and Lake Ontario; it carried its loadings only to 1976. For comparison purposes however, the Commission notes with interest that the 1977 estimated loadings for the Lower Lakes were both lower than the 1976 target loadings in the 1972 Agreement. The reduced loadings are attributable in part to decreases in land runoff because of a dry year in 1977, resulting in less runoff. Thus in the future some adjustments to estimated loadings using precipitation information will be necessary to measure true progress toward meeting target loadings.

The Commission also wishes to point out that the Pollution from Land Use Activities Reference Group has recommended target loadings for Lake Superior and Lake Huron that are somewhat higher than those set out in the 1972 Agreement. The higher PLUARG loadings include estimates of phosphorus loadings from atmospheric and unmonitored areas which were not considered in setting targets contained in the 1972 Agreement. The conclusion is thus drawn by the Commission that the higher PLUARG loadings will not result in a degradation of the Upper Lakes from phosphorus.

There is a continuing problem in obtaining acceptable tributary estimates for Lake Erie. The procedures for determining estimates for atmospheric contributions to the lakes have not been well developed, thus making it necessary to use 1976 estimates for 4 of the 5 lakes in 1977. Development of procedures and methodology for obtaining these estimates and their implementation should have a high priority.

The Commission notes that data, provided in Table 5.4 of the Remedial Programs Subcommittee Report, Appendix C, show wide annual variations in phosphorus concentrations in 1975, 1976 and 1977 from the Cleveland Southerly Plant. These variations in concentration are reflected in the phosphorus loadings to Lake Erie. The Commission has requested its Water Quality Board to review these and other variations with the objective of developing a more rigorous system of statistical analysis.

## **Toxic Substances**

The Commission in its Fifth Annual Report stated that "the control and monitoring of toxic substances within the Great Lakes ecosystem is the most urgent problem facing the Governments under the present Water Quality Agreement ..." The Commission also urged early implementation of the new Toxic Substances Control Act in the United States and the Canada Environmental Contaminants Act.

The Commission is encouraged with the progress made by the Governments in banning and/or controlling the use of PCBs. However, the Commission is concerned that the United States has failed to reduce PCB allowable levels below 5 ppm though Canada has established 2 ppm as the limit and although the United States Food and Drug Administration has proposed a similar limit for the United States. Such disparities confuse the public and make environmental regulation vulnerable to unjustified attack. The Commission urges that the Governments consult urgently toward a mutually acceptable standard. The Commission continues to believe that the control and monitoring of toxic substances is the most urgent problem facing the lakes, that regulations covering specific toxic substances must be

promulgated quickly, and that the Governments must ensure early enforcement. The Water Quality Board and Science Advisory Board (formerly Research Advisory Board) have been asked to advise as to possible additional measures for the Commission to take or recommend.

## **Enforcement**

An inventory of major dischargers and their compliance with discharge requirements in the Great Lakes Basin was prepared by the Water Quality Board. Those industrial or municipal dischargers who in the judgement of pollution control agencies contribute large volumes of effluent or may be capable of discharging a significant pollutant are classified as major dischargers.

Of the 825 major dischargers listed, 51% of the dischargers in the United States and 64% in Canada met the effluent limitations imposed by pollution control agencies. It is noted, however, that Canada's compliance schedules which are based on a case-by-case consideration, are in some respects more lenient than those in the United States. A higher rate of compliance would have been expected if all dischargers had followed optimum operation and maintenance procedures to ensure that performances approached the design efficiency of the facilities. In the United States, 41% of the municipal dischargers and 58% of the industrial dischargers met the July 1, 1977 limits. In Canada, 78% of the municipalities and 41% of the industries met their negotiated loading requirements.

In order to realize expected benefits from the municipal treatment construction program, the Governments must place increased emphasis on operation and maintenance of existing municipal waste treatment facilities to achieve effluent limitations, including the 1972 Agreement goal of 1 mg/L or less of phosphorus in the effluent of plants located in the Lower Lakes region and having outflows in excess of 1 million gallons per day. The Commission hopes to evaluate this area and report on it in the next full report to Governments.

The United States Environmental Protection Agency (EPA) and the states initiated regulatory actions partly in response to the failure of dischargers to achieve the mandated July 1, 1977 compliance date. Of particular note is the court settlement establishing a compliance schedule for the City of Detroit. The Commission also notes, however, that the city is not complying with the terms of the settlement. Also, \$4,000,000 in penalties have been paid by the United States Steel Corporation, Gary, Indiana and a settlement of \$1,600,000 was paid by Ford Motor Company, Dearborn, Michigan for noncompliance with NPDES requirements. Twelve major legal actions in the United States and three in Canada were taken against polluters in the basin in 1977.



## Chapter V

### Ecosystem Approach

There has been a succession of problems facing the Great Lakes Basin over the years, such as waterborne transmission of typhoid fever and other diseases, eutrophication and, more recently, persistent organic chemical contamination. In its 1977 report to the Commission, the Research Advisory Board stated that continued emphasis on the measurement and control of the chemical and physical qualities of water, while necessary, may not be sufficiently broad in scope for effective, long term planning and management of boundary waters such as the Great Lakes. As a result, the board recommended the adoption of an ecosystem approach to the Great Lakes Basin. In a special report, *The Ecosystem Approach*, presented to the Commission July 1978, the board further elaborated on the scope and implication of its 1977 recommendation.

Substantial gains have been made under the Boundary Waters Treaty and the Great Lakes Water Quality Agreement of 1972 in the restoration and enhancement of the Great Lakes Boundary Waters. It is, however, becoming increasingly apparent, as pointed out by the Research Advisory Board's report and PLUARG studies, that water and water quality considered in isolation of other system components, stressors, or measures may be insufficient to restore and enhance the quality of the Great Lakes. Long range transport of airborne pollutants and the associated acid rain, nutrient loading and persistent organic contaminants illustrate the need for such a broader perspective and approach to these problems.

Population growth in the basin further points to the need for a broader perspective to program planning and management. The increased impact on the Great Lakes of man and consumption patterns resulting from water use must be recognized and considered as an integral, interactive component of the Great Lakes Basin ecosystem of which man is both a product and an integral part. Use of resources should be within the limits imposed by the carrying capacity and resilience of the system. Attitudes, perceptions and behavior must receive public and political recognition in this regard. Further, there must be recognition that man discharges his wastes and pollutants in the ecosystem of which he is part rather than to an environment which surrounds him.

The ecosystem approach should not divert attention from the gains to be made through the present water quality approach and the ongoing development of water quality objectives. The Commission views the ecosystem approach as providing the necessary means by which existing programs, which deal with environmental interests and responsibilities in the Great Lakes Basin, can be more fully integrated. For example, using the ecosystem approach, surveillance programs currently being conducted in support of the Great Lakes Water Quality Agreement could better integrate and evaluate changes occurring elsewhere in the system such as shifts in fish abundance and species composition, or better evaluate the influence of water quality on human health. Adoption of an ecosystem approach will provide a sounder and more comprehensive basis than is currently available for the prevention of transboundary injury to health or property on both sides of the border.

Recognizing that many of the Commission's activities have focused on aspects of Great Lakes Basin problems other than water quality, including human health; that ecosystem quality and integrity are implicit in many of the directives and activities of the Parties, the state and provincial governments; and believing that it is the intent of the Parties, as expressed in the Boundary Waters Treaty of 1909 and the Great Lakes Water Quality Agreement of 1972, to protect and enhance the Great Lakes Basin ecosystem, the Commission supports the Research Advisory Board's recommendations contained in *The Ecosystem Approach* report. The Commission endorses as policy the need for an ecosystem approach to problem identification, research, and management in the boundary waters of the Great Lakes Basin ecosystem. Further, the Commission urges the Parties to undertake a thorough review of the views and philosophies contained in the board's report for consideration of adoption of these recommendations. Most specifically the Commission urges that the Parties, the state and provincial governments, and the people of the Great Lakes Basin demonstrate by programs and policies their desire and ability to apply the ecosystem approach to one or more transboundary problems of common and current concern.



## Chapter VI

### Research Activities

In addition to the development and elaboration of the ecosystem approach, described in Section V, the Great Lakes Research Advisory Board focused its activities on two other critical Great Lakes concerns — toxic substances and phosphorus limitations. The issue of dredged material disposal is also discussed.

#### Toxic Substances

The Commission has informed the Governments of the many previously unrecognized contaminants which have been detected in the Great Lakes System, some of which are known toxicants and/or carcinogens. The Commission is increasingly concerned that significant decreases of the contaminant concentrations will not occur, even if discharges of the contaminant ceased immediately, because of the tremendous volume of water in the Great Lakes and resultant time lag in reactions to remedial programs and the tendency of many toxicants to be re-cycled in the water-sediment-biota system.

The Research Advisory Board with the approval of the Commission therefore undertook a program aimed at developing the means to forecast and aid in the control of 'organic compounds with potential for manifestation within the Great Lakes. A prototype search and retrieval system was developed by the board to determine which of the many compounds manufactured, used or imported into the basin, have the potential to concentrate in the Great Lakes biota. The technique used within the system to evaluate bioconcentration potential has been referred to as the "structure-activity correlation" technique. This technique relates the potential for toxicity of compounds to their chemical structure. Because most of the compounds of recent concern in the Great Lakes have bioconcentration potential, the Commission supports this approach as one significant tool for the control of toxic substances in the Great Lakes Basin. The Commission notes the board's views that the approach will simplify the analyses for contaminants in Great Lakes waters and biota by identifying possible compounds of concern, aid in Great Lakes surveillance efforts by identifying the sites to monitor for specific compounds, and delineate compounds for which objectives are required: As an example, the Research Advisory Board illustrated the usefulness of the prototype system by noting that one of the compounds, pentachloroaniline, selected by the system was selectively found recently in a fish sample which had been previously analyzed without pentachloroaniline having been detected.

The development and updating of a search and retrieval system for the Great Lakes will require: knowledge of the identity of specific compounds manufactured, processed and used in the Great Lakes Basin; the identity of compounds found in discharge systems to the Great Lakes; and, the assurance of good data within the retrieval system on known chemical, physical and toxicological properties of the compounds.

Several relevant data retrieval systems have been developed in Canada and the United States, but most of the efforts have been independent and limited in their scope. Considering the magnitude of the efforts required to develop and update such an information retrieval system for the Great Lakes, the Commission recommends that the Governments assure coordinated efforts in both countries to identify existing data bases and to aid in the development of a major coordinated (or joint) data base with information on physical, chemical, and toxicological data to enable assessment of chemicals used, manufactured, processed or imported into the Great Lakes Basin.

The Commission believes that a continually updated inventory of compounds used, manufactured and processed in the basin is an essential first step to prevent future manifestation of toxic substances within the Great Lakes. The data have been obtained from the United States under the Toxic Substances Control Act and through individual state inventory efforts (such as in Michigan and New York). While some of the data are confidential, they are on file with the United States EPA and/or the state environmental agencies. The Commission fully recognizes the occasional need for such confidentiality of information. However, the Commission has already expressed its concern that the two Canadian departments (Fisheries and Environment, and National Health and Welfare) with responsibilities under the Environmental Contaminants Act cannot easily obtain information for their use on compounds used, manufactured or imported within Canada. Under the Act, the two departments must first identify the compounds for which industry must supply detailed information on industrial production, use and import. The Commission concurs in the board's concern that the two Canadian departments with responsibility under the Environmental Contaminants Act may not be aware of many compounds manufactured, processed or imported in Canada, while two other departments

with no obligations under the Act do have such information. The continually updated data of Statistics Canada and Revenue Canada is by Canadian law, confidential and inaccessible to any other federal departments.

The Commission therefore recommends that the Parties to the Agreement initiate the development of a continually updated inventory which identifies chemical compounds used, manufactured, processed or imported in the Great Lakes Basin. Furthermore, the Commission expresses its concern that some information of a confidential nature will be difficult to obtain under existing laws in Canada and recommends that Canada take measures to make such information available to the regulatory agencies. In addition, efforts should also be made to prepare an inventory and evaluate various by-products in industrial effluents to the Great Lakes.

## **Phosphorus**

The Commission through the Research Advisory Board has intensified its efforts, within a conceptual overview to aid in the formulation of management decisions with regard to phosphorus control in the Great Lakes. Following task force reports on health and ecological implications of NTA which were presented to the Commission in 1977, two separate task forces of the Board are now evaluating the ecological and health implications of alternative detergent builders such as aluminosilicates, polysuccinates and polycarboxylates. Final reports by the task forces are expected within the next year.

To integrate the significant amount of data, knowledge and technology associated with phosphorus control strategies within the Great Lakes a task force on phosphorus management strategies has been established. The task force will evaluate the potential ecological, economic and health related impacts of alternative management strategies giving the strengths and weaknesses of each for consideration by policy makers. The task force functions are the first efforts, by the use of staged scenarios, to focus on preventative measures which can be taken "here and now assuring long term ecosystem quality in the Great Lakes. The final report of the task force is expected in January 1980.

The Commission wishes to advise Governments of the concern expressed in the board's report that the lack of knowledge on the biological availability of the various forms of phosphorus may cause tremendous resources to be unnecessarily expended to control forms which would not normally be biologically available. More cost effective control will result if resources are concentrated on sources with a high degree of biologically available phosphorus. For example, while it is known that phosphorus from point sources is highly available, the proportion of availability of phosphorus from land use and erosion runoff is not known and seems to vary from place to place. The task force will consider this issue. The Commission requests that the Governments delineate their programs directed to the determination of biological availability of phosphorus together with an evaluation of funding adequacies, as well as current agency assessments of biological availability. Support by the Governments of the task force activities is strongly urged by the Commission.

The Research Advisory Board report contains proposed objectives for total phosphorus concentrations for each of the five Great Lakes. Because they incorporate a management goal of maintaining or achieving a particular trophic state within the lakes, they are of major significance to implementing adequate phosphorus control programs and regulations. The Commission therefore is requesting its Water Quality Board to provide an immediate review of these proposed objectives. Following such a review, the Commission will hold public hearings before forwarding any recommendations to Governments.

## **Dredging**

In May 1975, the International Working Group on Abatement and Control of Pollution from Dredging Activities submitted its report to the Secretary of State for External Affairs (Canada) and the Secretary of State (United States). Subsequently, extensive and significant research efforts in Canada and the United States have been completed. On the basis of these research efforts, the Research Advisory Board's Expert Committee on Engineering and Technological Aspects has now reported to the Commission that the current research suggests that criteria for classifying dredged sediments (bulk analysis), might possibly be over-estimating the environmental impact of dumping dredged sediments in the open waters of the Great Lakes. Conversely, research has indicated that confined disposal of dredged sediments which is widely practiced in the Great Lakes area may have greater adverse environmental impact than originally perceived. Considering that confined disposal costs in the United States portions of the Great Lakes have been

approximately \$263 million, and that these confined disposal costs have been estimated to be at least 350% greater than open water disposal, an immediate joint United States-Canada effort should be undertaken to review and assess alternative dredged material disposal policies in the Great Lakes Basin. The assessment should be based on the intensive and recently completed Canadian and United States research efforts.

## **Evaluation of Canada-United States Research Programs**

In 1976, the Great Lakes Research Advisory Board forwarded to the Commission a "Great Lakes Water Quality Research Needs" document which reflected the opinions of the Great Lakes research community as to the research needs relative to the water quality problems of the Great Lakes. A subsequent effort was made by the Board to ascertain the degree of responsiveness of the total Canada-United States program to these research needs. Despite a significant attempt by a Committee of the Board, it was soon obvious that the requirements for such an assessment were much beyond the resources available to the Committee to define deficiencies in scope, adequacy and reliability of research results, and inadequacies for funding the specific research program areas.

Nonetheless, the resulting document entitled "Canada-United States Research Programs Pertinent to the Water Quality of the Great Lakes," submitted in July 1978, provides a perspective on the scope of research activity currently operative in the two countries. The Commission brings to the attention of Governments, the Committee's following assessment:

"In terms of general program objectives and research thrusts, it has been demonstrated that current efforts are responsive to major ecological and technological research issues identified as critical by the Research Advisory Board. Moreover, the concentration of mutual agency interest in issues previously highlighted suggests significant opportunities to foster both formal and informal international cooperation. Such cooperation would be particularly appropriate to research endeavors exogenous to the basin that produce results that can be transferred. Primary candidate areas include programs focused on the identification of health and environmental effects of toxics and trace organics and the development of technology for the control of such contaminants."

Recognizing that efforts are underway, for example by the Great Lakes Research Advisory Board and the Commission's Committee to Assess Health Effects of Great Lakes Water Quality to identify specific research programs for which international cooperation will be productive, and recognizing that long range environmental research programs are under continuous review and planning, the Commission recommends that Governments utilize the document "Canada-United States Research Programs Pertinent to the Water Quality of the Great Lakes" to minimize overlapping efforts and to facilitate international cooperation in such critical areas as the assessment of health and environmental effects of contaminants.



## **Chapter VII**

### **Other Problems of Special Concern**

#### **Land Disposal of Municipal Sludge**

There has been an enormous increase in the amount of municipal sewage sludge generated since 1972 because of municipal phosphorus control programs and increased secondary treatment in the basin. Disposal of this sludge is a problem in many areas.

Sludge management can involve recycling which encourages the use of sludge as low-value fertilizer and soil conditioner or disposal which considers sludge as a waste material. The problems associated with sludge disposal include the air pollution from incineration, odor problems with sludge handling, availability of land for disposal, developing the market for compost, cost and energy requirements for incineration, and in certain cases, high metal content and toxicity of sludge which make direct application to land for crop fertilization undesirable. Incineration is used in most large plants in the basin because of the unavailability of large tracts of land needed for other methods of disposal which are often beyond economical hauling distance and because of public resistance to the location, of sites in their communities.

In 1976, the United States passed the Resource Conservation and Recovery Act (PL, 92-580) amending the Solid Waste Disposal Act. This act encourages the recycling of sludge. United States EPA has proposed criteria for land spreading of solid waste and upon adoption of these criteria, guidelines will be promulgated under the Clean Water Act.

Ontario Regulation #824 under the Environmental Protection Act requires certificates of approval for sludge handling systems and for disposal sites. Guidelines have been developed for use of sludge on agricultural lands. The Ontario Ministry of the Environment encourages the use of sewage sludge on agricultural lands for fertilizing and soil conditioning.

The Commission recommends that Governments place increased emphasis on, research and development of techniques for disposal of municipal sludge, including pretreatment of waste entering the municipal systems and alternative technology for disposal or reuse of waste treatment by-products.

#### **Water Quality Impacts of Long Range Air Transport and Atmospheric Fallout**

Although both the United States and Canada have air pollution control laws, these acts are based on protection of human health. There are no known legal precedents in the United States or Canada to control air pollution on the grounds of water quality impairment. Amendments to the United States Clean Air Act provide a new regulatory mechanism which allows a state to alter its implementation plan when it has been determined by EPA that air pollution of the United States origin may reasonably be anticipated to endanger public health or welfare in a foreign country, provided that the other country is willing and capable of extending similar protection to the United States.

Studies of the Upper Lakes Reference Group and the Pollution from Land Use Activities Reference Group indicate that large amounts of pollutants are contributed to the Great Lakes from atmospheric sources, both from direct fallout into the lakes and from land runoff in the basin. Information presented to the Commission by its boards reemphasizes the position of the Commission as expressed in its Fifth Annual Report, Item 6 — Nonpoint Pollution.

"The impact of atmospheric pollution on water quality in the Great Lakes is of growing concern. Substantial quantities of nutrients and toxic materials are being deposited in the Great Lakes from air. For example, the Upper Lakes Reference Group has estimated that atmospheric deposition accounts for as high as 30-40% of the total loadings of copper, and lead in the Upper Lakes. The sources of these substances are often far distant from the Great Lakes and their deposition in the lakes, as well as the indirect contribution from land runoff of such depositions, is thus part of a larger problem of the long range transport of air pollutants. Despite the difficulties in controlling sources over a large geographical area and the legal complexities involved, the Commission urges the Governments to pursue control measures vigorously, and to adopt appropriate mechanisms for a consolidated effort to deal with the problem of the impact of atmospheric pollution on boundary waters."

## **Nuclear Fuel Cycle**

The Commission, through its Great Lakes Water Quality Board, is reviewing the potential impact of the nuclear fuel cycle on the Great Lakes ecosystem. The Commission is concerned about possible irreversible consequences of decisions relating to storage and disposal of high-level radioactive waste produced in nuclear generating stations or via fuel reprocessing. The review will include studies being conducted worldwide under the auspices of various governments. In the United States and in Canada, the agencies conducting the studies are different from those involved with the Great Lakes Water Quality Agreement institutions.

## **New Pollutants**

In its Fifth Annual Report to the Governments, the IJC included an Appendix to the Water Quality Board's report entitled "Status Report on Persistent Toxic Pollutants in the Lake Ontario Basin." That report listed available data on 50 toxic substances identified within the basin and a substantial number of others that heretofore had not been identified.

In this year's report (1977) the board has informed the Commission that an additional 38 compounds, previously undetected, have been found in Lake Ontario herring gulls and fish. Of the 38, some 14 are clearly manmade such as industrial pollutants and agricultural pesticide derivatives; however, the remaining 24 are of the polynuclear aromatic hydrocarbons (PAH) class for which 9 of the class are suspected carcinogens. The board adds that it is unclear whether or not the PAHs are derived from man's activities or by nature, such as from forest fires. However, their levels, so far, are not much different from those generally accepted as safe within foods.

The Water Quality Board has concluded, among other things, that with the progress being made in the field of analytical chemistry, it is likely that the frequency of newly found pollutants will increase, and cautions that such contaminants being found now does not mean they were not present before.

The Commission stresses that although the Governments have accomplished much in identifying Great Lakes contaminants, with the myriad of chemicals found and yet to be found, it will be necessary to determine the pollutants which must be monitored and ultimately removed from the Great Lakes Basin ecosystem. Additionally, the Commission is aware of the extremely difficult, expensive, and time consuming task of determining the health effects of such pollutants, and therefore the Commission supports the strategy presented by the Research Advisory Board in its report of 1978. That strategy, highlighted elsewhere in this report, if followed should help to reduce the number of chemicals to look for and measure to a manageable level.

## **Hazardous Waste Disposal**

Thousands of gallons of liquid industrial wastes are transported daily across state, provincial and international boundaries for the purpose of acceptable disposal. Increased amounts of wastes are being generated throughout the basin. Recognizing that disposal of hazardous wastes is a major problem in the United States and Canada, disposal experts from government agencies and representatives of the private sector have been discussing the problems associated with the generation, transportation, storage and disposal of hazardous wastes. Although the technology for waste processing is generally available, the most difficult problem is the location of landfill sites and liquid industrial waste facilities — generally due to local resistance by the public and the danger involved if proper techniques are not applied. The limited number of acceptable sites has resulted in the transportation of waste across international as well as state and provincial boundaries. The Commission believes that compatible national programs and regulations for the management of hazardous wastes should be developed in both countries.

Governments are reminded of the Love Canal incident which occurred recently near Niagara Falls, New York and which exemplifies the kind of problem which can develop from the improper disposal of toxic wastes. The Commission has requested the Water Quality Board to advise on the feasibility of undertaking an inventory of toxic waste disposal sites, both active and inactive, in the Great Lakes Basin.

## **Health Effects of Great Lakes Water Quality**

The Commission in each of its five annual reports on Great Lakes Water Quality has expressed increasing concern as to the hazardous nature of high levels of contaminants which bioaccumulate in fish and pose serious human health problems. This public health concern led to the establishment of a special committee on the Assessment of Health Effects of Great Lakes Water Quality in early 1978. The boards will provide direction to the committee to develop means of setting priorities and of expediting contaminant control programs in the interests of human health.

## **Public Information and Involvement**

During 1977 the Commission undertook several experimental programs. One was to better inform people of the Great Lakes Basin of the results of one of its major investigations, and a second to develop a mechanism for assuring substantial public involvement in the conduct of a study and preparation of a report.

First, the Commission sponsored a series of information workshops on the report of the Upper Lakes Reference Group prior to IJC hearings on the reference. The workshops were designed to inform an interested public as well as to assure meaningful testimony for the Commission's consideration in preparing its report and recommendations to the Governments. Second the Commission authorized the Pollution from Land Use Activities Reference Group to conduct a public consultation program throughout the Great Lakes Basin. The public consultation process provided a testing ground for the recommendations of PLUARG and as well gave extensive coverage to Agreement activities.

Over the last several years the Commission has taken other steps to involve the public. It has changed its hearing procedures to lessen formality and provide for interaction between presentors and those who prepare the reports which are the subject of the hearings. Since 1976, the IJC's Annual Meeting on the Great Lakes Water Quality Agreement has been open to the public and the media. In that same year the Commission's Water Quality Board began to hold news conferences after its regular meetings and in 1977 the board opened these meetings to the public.

Each year, more representatives of special interest groups (environmental, academic, industrial, civic) attend the Commission's Annual Meeting in Windsor. They have also been invited to special seminars and symposia such as the one which the Great Lakes Water Quality Board sponsored in 1977 on the transport and disposal of hazardous wastes.

The Great Lakes Regional Office's information program has also been expanded to serve the needs of a larger audience. Each year there has been an increasing public demand for copies of Commission reports. In 1978 the reports request list was placed on an internal office computer to improve control and distribution.

Several surveys on public perception were reported to the IJC this year which indicated that people are generally not aware of the magnitude of the clean up efforts of the two nations. Those who used the Great Lakes thought conditions are improving; and that those who did not use the lakes took their information mainly from the mass media and believed that water quality was deteriorating. The results underline the importance of the Commission's past recommendations to increase public access to information and to broaden public involvement opportunities. Governments should work to expand their environmental education programs in the Great Lakes Basin through the appropriate jurisdictions.



## Chapter VIII

### The Great Lakes Water Quality Agreement

Pursuant to the preparation of the Commission's Sixth Annual Report on Great Lakes Water Quality, negotiations to replace the 1972 Great Lakes Water Quality Agreement were completed and a new Agreement was signed by Governments on November 22, 1978. Future Commission Reports on Great Lakes Water Quality will be made under this new Agreement.

A provision of the 1972 Agreement was that the Parties should conduct a comprehensive review of the operation and effectiveness of this Agreement during the fifth year after its coming in force. In a Special Report to the Governments, dated February, 1977, the Commission set forth its views on various provisions of the Agreement for consideration by the Governments in their comprehensive review. These included the need for: further research on the effects of certain pollutants on public health and the environment; development of programs to control persistent toxic contaminants; strengthening of all pollution control efforts to protect public health; strong efforts to achieve agreed phosphorus loading reductions; measures to increase the effectiveness of land use planning as it relates to Great Lakes water quality; establishing agreed general target dates for the development and implementation of remedial measures in specific problem areas, and specific target dates for incomplete municipal and industrial treatment projects; a review of funding procedures with a view to minimizing delays experienced in the first five Years of the Agreement; and, clarifying of agency responsibilities for "joint activities" envisaged in the Agreement so as to allow the Commission to carryout its responsibilities regarding these matters.

The 1978 Agreement responds to the strong public support in both countries for Governments to increase their efforts in cleaning up the Great Lakes by incorporating details of programs to combat major problems identified in the various Commission Reports on Great Lakes Water Quality, including the above Special Report on the Various Provisions of the Great Lakes Water Quality Agreement. Included in the new Agreement are the following provisions:

- a) A commitment is made to the elimination of the discharge of toxic substances into the Great Lakes and to the establishment of an early warning system to anticipate and prevent future toxic substances problems.
- b) New, interim phosphorus loading targets are defined for each lake designed to achieve desired levels of water quality, whereas the original Agreement set targets based upon what was achievable. These provisional targets are to be finalized and their apportionment between the two countries negotiated within 18 months of the Agreement's signature.
- c) December 31, 1982 and December 31, 1983 are the final deadlines when municipal and industrial pollution control programs respectively are to be completed and operating.
- d) The International Joint Commission (IJC) is given a mandate to oversee all of the programs under the Agreement whereas, under the 1972 Agreement, some of the activities were assigned to the Parties. Staffing requirements for the IJC's Regional Office are to be reviewed in the first six months of the new Agreement.
- e) New and revised water quality objectives, both general and specific, are incorporated, including a specific objective for radioactivity which is the result of an extended series of protracted negotiations pursuant to the 1972 Agreement, as well as a list of hazardous polluting substances to be controlled in transboundary commercial transport, also the result of protracted negotiations.
- f) Provisions for dealing with pollution from land use activities are incorporated as a result of the Studies on Pollution from Land Use Activities undertaken pursuant to the 1972 Agreement.
- g) Provisions for dealing with the long range transport of airborne pollutants impacting upon Great Lakes water quality are included.
- h) The concept of the Great Lakes Basin and its human population as an ecosystem is explicitly recognized, which also includes an emphasis on the impact of pollutants on human health.

- i) Limited use zones, or areas that do not meet open lake water quality, are to be designated by the Parties.
- j) Monitoring and surveillance requirements have been revised and improved in order to better assess the effectiveness of control programs, and provision is made for an annual public inventory of dischargers and their progress in meeting pollution control requirements.
- k) Specific types of waste treatment controls are now to be established for all industries, and research commitments are made to clearly support Agreement goals.
- l) The Agreement outlines joint programs that include measures to deal with the major Great Lakes water quality problems.
- m) The Agreement defines more precisely the role of the IJC's supporting institutions, provides for information exchange and consultation, commits the Parties to the implementation of the Agreement, defines their existing rights and obligations and provides for a minimum five-year term for the Agreement.

Respectfully submitted

Robert J. Sugarman, Commissioner  
Chairman, United States Section

Charles R. Ross, Commissioner

Kenneth M. Curtis, Commissioner

Maxwell Cohen, Commissioner  
Chairman, Canadian Section

Bernard Beaupré, Commissioner

## Appendix A

### Recommendations of the Water Quality Board to the International Joint Commission

- A The Water Quality Board notes that a large number of potentially toxic chemicals at low concentration are being identified in the waters, fish and wildlife of the Great Lakes Ecosystem and also acknowledges that a thorough evaluation of the risk to human health and the environment is costly, requires a long time, and is demanding of scarce facilities and expertise. Therefore, the Water Quality Board recommends that:
- 1) Governments develop rational schemes to order priorities for evaluating the risk of toxic chemicals to human health and the environment;
  - (2) Governments expedite programs to control the production, use and disposal of chemicals that have been evaluated and considered a threat to human health or environmental quality.
- B The Water Quality Board recommends that compatible programs and regulations for the management of hazardous wastes be developed and enforced. Because this issue extends beyond the geographical area of the Great Lakes Basin, these programs should be national in scope in both countries and should permit inter-jurisdictional movements of hazardous wastes.
- C The Water Quality Board recommends that, in order to realize the expected benefits from the nearly completed municipal treatment construction program, the governments place increased emphasis on the operation and maintenance of existing municipal waste treatment facilities to achieve effluent limitations, including the 1972 Agreement goal of 1 mg/L or less of phosphorus in the effluent.
- D The Water Quality Board recommends that governments place increased emphasis on research and development of techniques for disposal of municipal sludge, including pretreatment of wastes entering municipal systems and alternative technology for disposal or reuse of waste treatment by-products.
- E The Water Quality Board recommends that, as a matter of priority, the governments ensure that effluent limitations for point sources be developed to meet water quality objectives in the boundary waters and actions against dischargers with incomplete programs be expedited, especially those contributing to problem areas.
- F The Water Quality Board recommends that in the environmental assessment of significant water intakes, the governments require an evaluation of the effect on lakewide fish populations.
- G The Water Quality Board, recognizing the importance of public awareness of the Great Lakes Water Quality Agreement activities, recommends that all jurisdictions and the International Joint Commission develop public information programs specifically related to their Great Lakes environmental activities.

### Recommendations of the Research Advisory Board to the International Joint Commission

Requests Governments to assure coordinated efforts in both countries to identify existing data bases and to develop new data bases with information on physical, chemical and toxicological data, to enable assessment of chemicals. The Board offers the suggestion of utilizing United States and Canadian national correspondents to the International Register of Potentially Toxic Chemical of the United Nations Environment Programme, for coordination.

Recommend an immediate joint United States-Canada effort to review and assess alternative dredged material disposal policies in the Great Lakes Basin. The assessment should be based on the intensive and recently completed Canadian and United States research efforts. If no mechanism is available under the current or the future revised Agreement, the Board is willing to organize a task force to undertake this effort.

Express to the Government of Canada its concern on the limitations of the Canada Environmental Contaminants

Act to control and prevent future manifestation of man-made chemicals within Canada and the Great Lakes ecosystem because of the inability of the Act to assure that the Departments, with responsibility for enforcement of the Act have access to information which will identify all substances in use, manufactured or imported within Canada.

## Appendix B

### Recommended concepts for establishing toxic waste disposal control programs

The Water Quality Board, after reviewing the results of the November 30, 1977 meeting, including case histories involving waste disposal problems, concluded that the solutions to the hazardous waste dilemma extend beyond the geographic area of the Great Lakes Basin, and control programs should be of national scope in the two countries. The following concepts should be addressed in developing programs in the United States and Canada:

1. The Great Lakes jurisdictions should adopt compatible regulations for the classification, identification transportation, and disposal of hazardous wastes. These regulations should:
  - (a) Establish a system of manifests to ensure governmental control of waste management and the protection of public health and the environment. Manifests should originate with the waste generator and accompany each shipment from its original production through its ultimate disposal or destruction.
  - (b) Require waste generators to identify their wastes, inform agencies of their plans for disposal, and obtain approval of disposal plans.
  - (c) Require that all those engaged in generation, transportation, storage, and disposal of hazardous waste provide bonds to ensure safe disposal of the waste.
2. All jurisdictions should develop procedures for the approval of processes for safe disposal of specific categories of waste and the location of low risk sites for waste handling facilities.
3. Jurisdictions should identify manufacturing methods that result in waste products that are difficult or impossible to dispose of and, following that, require modification of such methods to eliminate or reduce the quantities of such wastes over specified time limits.
4. Each jurisdiction should specify a state or provincial agency to approve of sites for specific waste disposal processes and to publicly identify and explain the location of approved sites for safe disposal of each category of hazardous waste.
5. Feasibility studies to investigate acquisition and/or operation of government owned disposal sites should be initiated.
6. All Great Lakes jurisdictions should cooperate on establishing international, strategically located, properly operated disposal sites.
7. Governments should discourage the imposition of bans on the transportation of hazardous wastes across jurisdictional or international boundaries by allowing unrestricted movements when carriers meet requirements of a proper waste manifest and have proof of advance approval by the receiving jurisdiction.
8. Great Lakes jurisdictions, in addition to receiving public comment, should engage in public education programs to stress that the use of approved methods and sites ensures safe, adequate hazardous waste disposal.