

CHAPTER I

INTRODUCTION

The Upper Great Lakes Connecting Channels (UGLCC), for the purpose of this report, includes the St. Marys River, St. Clair River, Lake St. Clair, and the Detroit River. They are important components of the Great Lakes Basin ecosystem and a valuable resource. They serve as commercial transportation corridors, as a source of drinking water and industrial water, as historical and recreational resources, and as habitat for a wide diversity of fauna and flora.

The intensive use which has taken place throughout this system has resulted in serious environmental degradation in many areas. As early as the 1940s concern existed about bacterial contamination, phenol problems and excessive levels of metals, phosphorus and mercury. Attention is currently being focused on toxic substances in water, sediment and biota throughout the system and their effects on human health and the ecosystem.

Since 1974 the Detroit, St. Clair, and St. Marys Rivers have been designated as "Problem Areas" and, more recently, as "Areas of Concern" by the International Joint Commission. Despite massive clean-up efforts and the expenditure of millions of dollars by industry and government there remain areas in which general or specific objectives of the 1978 Great Lakes Water Quality Agreement (GLWQA) are exceeded (1). There have been noticeable improvements since the 1960s; however, significant environmental degradation and continuing impairment of beneficial uses occur.

1. Purpose and Objectives

Although there have been numerous investigations and reports on the environmental quality of the Connecting Channels, there has previously been no attempt to integrate the information and focus the scientific studies to produce recommendations for specific action or identify remedial needs. This study was a landmark

binational efforts in the continuing restoration of the Great Lakes system. This report, by the Management Committee of the UGLCC Study to the sponsoring agencies, is intended to provide guidance for the remediation of these degraded waters and a framework for long term monitoring to assess the effectiveness of pollution controls. The vehicle for the delivery of the recommendations, options and implementation will be the Remedial Action Plan (RAP) process. RAPs are currently being prepared for all 42 "Areas of Concern". These plans will identify problems, goals for remediation, and remedial actions as well as responsible agencies for implementation, a schedule for implementation, and necessary monitoring programs (1).

Specifically, the objectives for the study were as follows:

- 1) To determine the existing environmental condition of the St. Marys River, St. Clair River, Lake St. Clair and the Detroit River at its influx into the Western Basin of Lake Erie and to identify information gaps.
- 2) To undertake additional, needed studies to:
 - a) identify and quantify the impacts of conventional and toxic substances from point sources, nonpoint sources (both runoff and contaminated groundwater) and tributaries, on beneficial human uses and on plant and animal populations in, along, and below these waters;
 - b) determine the adequacy of existing or proposed control programs to ensure or restore beneficial uses; and
 - c) recommend appropriate control and surveillance programs to protect and monitor these waterways and the downstream lakes.

2. Study Approach

In establishing this study, certain concepts were identified based on the 1978 GLWQA and experience gained from earlier binational efforts. Of particular importance to the overall study design were the concepts: ecosystem approach, enhanced data quality management, mass balance requirements, and regulatory management focus.

- 1) **Ecosystem Approach.** The Connecting Channels and Lake St. Clair are complex ecosystems characterized by high volumes and flows, strong currents and circulation patterns, deposition and re-suspension of sediments, diverse biota, extensive wetlands, and atmospheric and terrestrial interactions. Superimposed on this system are human activities in terms of physical alterations

and pollutant loadings. In order to identify impacts to the system and develop management scenarios for control and remediation, all factors and their interactions have to be evaluated and taken into consideration. This effectively is the ecosystem approach as defined in the Great Lakes Water Quality Agreement between Canada and the United States, (1978, amended 1987) (1).

- ii) **Enhanced Data Quality Management.** The experience of earlier interagency, multi-media studies on the Great Lakes has demonstrated the need to recognize and incorporate data quality assurance and quality control (QA/QC) which are crucial to the overall utility of study results. These considerations need to be taken into account at the beginning of the study and not viewed in hindsight. This concept was given considerable priority within the UGLCC Study and responsibility was vested in a Data Quality Management Workgroup. Responsibilities of this workgroup included reviewing analytical and field protocols; reviewing internal quality assurance programs of participating laboratories; assessing the statistical validity of program results; and running a series of "round robin" analyses based on controlled mixtures. In addition, investigators were encouraged to exchange split samples.
- iii) **Mass Balance Requirements.** In setting-up the UGLCC Study emphasis was placed on providing data that could be directly applied to identify remedial strategies and develop regulatory actions. In order to relate the potential source data to the environmental conditions, study participants agreed to explore the use of pollutant mass balance models. This was considered to be the most comprehensive approach for the study design and was also compatible with the ecosystem approach noted earlier. If mass balance models could be developed and verified, aquatic ecosystem objectives could easily be related to pollutant loads.

Ecosystem complexity and a general lack of historical data for some areas, along with the limited time frame of the UGLCC Study have limited the use of complex models. Preliminary models have been developed and will be utilized to provide a guide to the development of management options where possible.

- iv) **Regulatory Management Focus.** Previous binational studies of the Great Lakes tended to emphasize baseline descriptions along with identification of stresses to the overall environment. Rarely have specific regula-

tory options and strategies been identified and agreed to by the participating jurisdictions. From the outset the UGLCC Study has emphasized regulatory management recommendations (i.e. control and abatement) as the key output for the study. This is particularly timely as given the request by the Great Lakes Water Quality Board of the International Joint Commission and the recently updated GLWQA for specific RAPs in the Areas of Concern.

These four concepts formed the framework to the study, although it should be noted that in all cases time and resource constraints prevented their complete implementation. However, their identification and subsequent guidance to the study were extremely valuable.

3. Management Structure

To oversee planning, implementation and reporting, a three-tier management structure was established consisting of the Management Committee, the Activities Integration Committee and eight specific activity workgroups. Resources necessary to undertake and maintain the planning and administration of the study were provided by the participating agencies. Secretarial support was provided by the U.S.EPA's Great Lakes National Program Office (GLNPO).

- i) Management Committee. This committee consisted of representatives of the principal U.S. and Canadian agencies. It was co-chaired by U.S.EPA and Environment Canada. Members were agency managers who were in a position to ensure follow-up to study priorities and needs. In addition to the regular members, the chairperson of the International Joint Commission's UGLCC Task Force was an observer on this committee. He provided a formal link with the Great Lakes Water Quality Board.

The Management Committee provided overall guidance to the study by identifying issues, establishing the study's structure, approving the work plans, and approving the final report. This committee was also responsible for identifying environmental management requirements in the study area with regard to appropriate regulatory options.

- ii) Activities Integration Committee. The AIC was a subcommittee of the Management Committee. It was responsible for preparing and overseeing implementation of the study work plans and for the final report. The AIC was co-chaired by Environment Canada and the U.S.EPA.

Members were workgroup chairpersons plus 2 scientific coordinators.

- iii) Study Workgroups. Eight workgroups were established for this study: biota, sediment, water quality, data quality management, modeling, point source, nonpoint source, and long-term monitoring. A regulatory task force was established to review existing regulatory measures and help evaluate proposed remedial measures. The results of this review have been incorporated directly into the final report (Chapter III). Members of workgroups were technical experts from among the participating agencies. Each workgroup operated under the guidance of a single chairperson.

4. Schedule

The UGLCC Study was conducted in 3 phases. Phase 1 was the planning stage which included the development of work plans, quality assurance programs and preliminary models. This phase was initiated with a planning workshop for 60 key participants. A comprehensive technical literature review was also carried out during the planning phase in order to identify gaps and plan the next phase (2).

Phase II included the two field seasons (1985 and 1986). A mid-course workshop was held between the two study years for the benefit of about 100 of the principal investigators. This workshop was established to prepare work plans for the 1986 activities; exchange information from the previous field season; identify progress to date and additional needs; and identify and resolve logistics of ship support and equipment sharing.

The final phase - the report writing phase - began in January 1987 at a writers workshop held in Windsor. This workshop provided 40 workgroup participants, both chairmen and principal investigators, the opportunity to discuss and finalize reporting formats, writing process, logistics, and timing as well as identify inter and intra workgroup co-ordination needs. A workshop was held in Ann Arbor in January 1988 for six of the workgroups to present their results and information to those synthesizing workgroup reports into the four area reports. A final workshop, held in Burlington in June 1988, was conducted for the AIC to review each of the four area reports prior to submission of the draft final report to the Management Committee.

The report writing was carried-out in four stages. The first stage consisted of the preparation of the approximately 170 individual project reports by the principal investigators. The second stage consisted of 26 media specific workgroup reports (3) which were prepared from the project reports. Area synthesis

writing constituted the 3rd stage. Four teams (1 for each geographic area), each with Canadian and U.S. co-leads, integrated the workgroup products into a single report for each of the geographic areas. The 4th stage of writing was the drafting of the final report and executive summary. At this stage the key conclusions and recommendations of the study were identified and prepared by the AIC. The draft final report was presented to the Management Committee on July 20, 1988 for final review. The technical comments that were received were used to prepare the final report which was formally submitted to the sponsoring agencies.

5. Technical Activities

In order to meet the objectives of the UGLCC Study a number of activities were identified with regard to technical data needs. These were grouped according to workgroup subject areas (eg. point source, biota, sediment, etc.) and formed the basis for defining specific projects or investigations. Activities included, for example, assessing combined sewer overflows, tributary monitoring, describing circulation patterns and sediment re-suspension, and estimating nonpoint source loadings of nutrients and toxics. For the 1986 field season, 72 activities were defined and approximately 170 specific projects were undertaken.

The technical activities were designed particularly to: (1) describe the nature and abundance of macrophytes, benthos and fish in order to establish baseline conditions to which future monitoring of habitat and population structure could be compared; and (2) identify pollutant sources and loadings in order to drive the models and develop remedial strategies.

6. Parameters of Interest

The Activities Integration Committee identified a number of contaminants including heavy metals, organic contaminants and conventional pollutants which are known or suspected to be in exceedence of criteria or at high levels in portions of the study area. These are listed in Table I-1. For additional information on the selection of these parameters and their occurrence in the study area, the reader is referred to the report outlining pre-UGLCC Study conditions (2).

TABLE I-1
UGLCCS parameters of concern.

COMMON ABBREVIATIONS	PARAMETERS
<u>Organics</u>	
PCBs	Polychlorinated biphenyls
HCB	Hexachlorobenzene
OCS	Octachlorostyrene
PAHs	Polycyclic aromatic hydrocarbons
	Oil and Grease
	Phenols (total phenolics)
	Chlorinated phenols
<u>Metals</u>	
Cd	Cadmium
Pb	Lead
Zn	Zinc
Hg	Mercury
Cu	Copper
Ni	Nickel
Co	Cobalt
Fe	Iron
Cr	Chromium
<u>Conventional/Other</u>	
P	Phosphorus
NH3	Ammonia
	Chlorides
	Residue chlorine
	Cyanide
	Chloramines

7. References

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