Water Supply and Water Management Problems of the Great Lakes

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The water of the Great Lakes is the primary physical fact in the lives of the 35-odd million people now living and working in the Great Lakes region in Canada and the United States. It is not necessary to remind anyone that the importance of the Great Lakes will increase as the population increases. Nor does it seem necessary to warn that as the demands increase on the water of the Great Lakes, it will be necessary to improve management techniques and institutional arrangements.

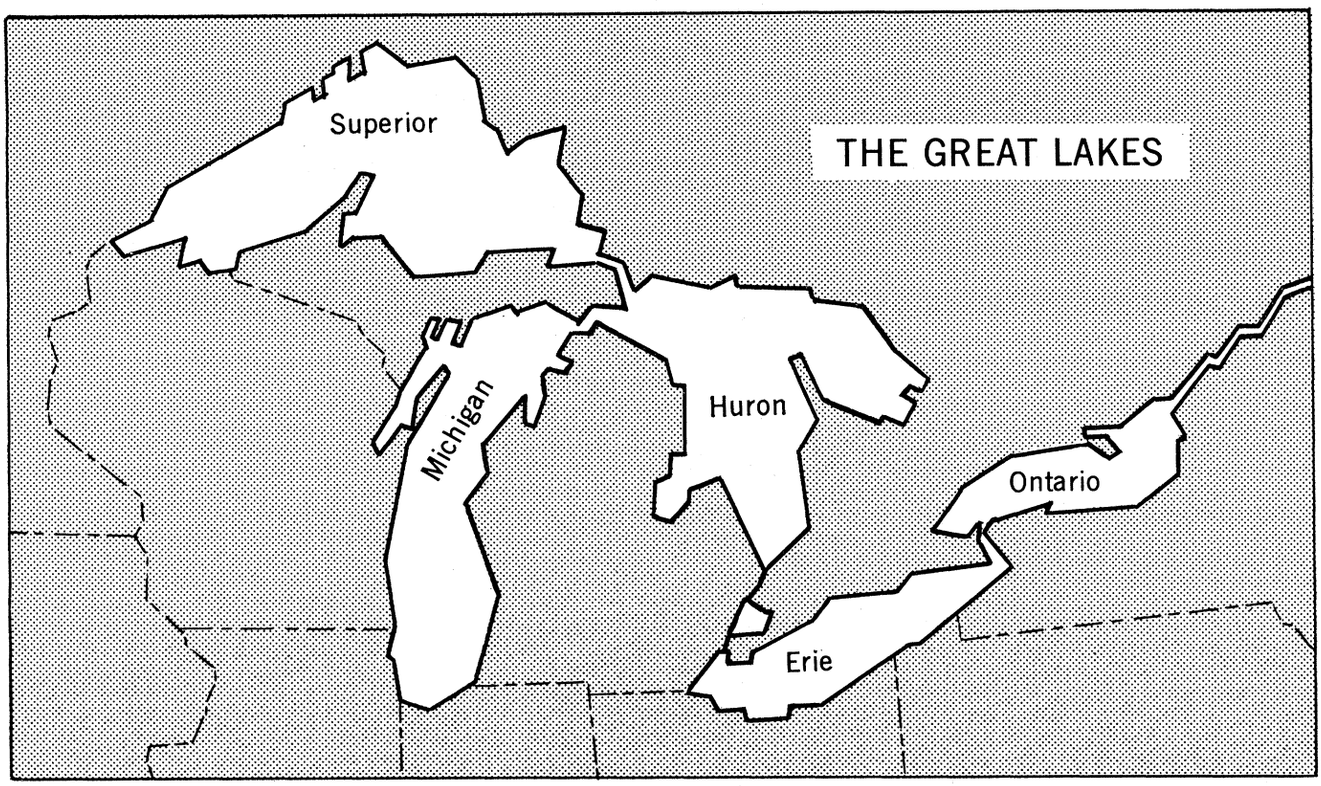
It is estimated that by the end of the century 70 million people will live adjoining the Lakes. The ability of this population to use the waters depends, and will always depend, on two things: the physical hydrology and biochemistry of the Lakes; and how man manipulates what he knows about how water moves into, across, through, and out of the Lakes, and how this movement affects the distribution of nutrients, sediment, pollutants, and biota.

The Great Lakes form one of the most magnificent natural features on earth. They cover about 95,000 square miles and contain nearly 5500 cubic miles of water—about one-fifth of all the fresh water in all the lakes and rivers of all the continents. They provide a waterway from Duluth, Minnesota, and Gary, Indiana, to Kingston, Ontario—distances of nearly 1200 miles. Throughout these reaches they link mineral, industrial, and agricultural resources to form one of the most productive regions on the globe. The drops in water levels, particularly in the vicinity of Niagara Falls and along tributary streams, generate hydroelectric power for municipalities and industry. Their fish are still an important source of food, fertilizer, and protein. Their shorelines, inlets, bays, and islands form a natural recreation area that is larger and closer to more people than any other in the world. And finally, they are the sink for the wastes of the people living along their shores, and for the wastes of their industries, farms, and construction projects.

Until recently, man's use of the Great Lakes had affected them only slightly. During the past few years, however, the acceleration of eutrophic changes in Lake Erie has made people conscious of the extent to which their practices are changing the quality of the water and making the management of the Lakes more difficult. Although attention has been—and is being—focused on the quality aspects of the Lake waters, it is gradually being accepted that an understanding of the physical hydrology of the Lakes is basic to the rational management of both the quantity and quality of their waters.

The physical hydrology of the Lakes—or any large body of water—can be divided into four parts. These are: The energy balance—how much energy comes into the water, how much is lost, and where and when; the meteorology of the lake—how much water precipitates onto the Lake and in what form, how much is evaporated, and how these vary, under different weather conditions, in time and space; the terrestrial water budget—inflow and outflow through surface tributaries and the groundwater system; and, finally, the patterns of internal water movement and how they vary under different conditions of temperature, wind, water level, and location.

These broadly grouped hydrological factors are basic to the changes, both natural and man-induced, that affect man's activities. They determine, among other things, the use and development of shoreline facilities, the distribution of snow and rain along the shorelands, the formation and breakup of ice, and the movement and circulation of water and the wastes it carries. The fact that the Lakes are large—



some have referred to them as freshwater model oceans—greatly increases their influence on weather phenomena and permits their internal physical and biological processes to assume a far greater complexity than they would have in a small lake. It is becoming generally accepted that the scale differences between the Great Lakes and the usual lake selected for limnological studies are so great that it is virtually impossible to extrapolate data from one to the other. Lake Ontario, the smallest of the Great Lakes, is about 500 times greater in area than, and contains about 10,000 times the amount of water as Lake Mendota, Wisconsin, which covers 15 square miles and is not usually thought of as a small lake.

One of the first efforts to investigate a large lake synoptically and comprehensively is the International Field Year for the Great Lakes, a program developed by a binational steering committee under the general guidance of both the Canadian and the U.S. National Committees for the International Hydrological Decade. The operational phase of the Field Year will begin 1 January 1972, and will involve a full year of coordinated studies of the physical hydrology of Lake Ontario. Biological and geochemical studies consistent with the broad objectives of the Field Year will be coordinated by the Canada Centre for Inland Waters and the Smithsonian Institution.

Management of the waters of the Great Lakes would be complex under any circumstances, but it is further complicated by the multiplicity of political and institutional arrangements. The Great Lakes border on two countries, and involve eight of the U.S. states and one of the Canadian provinces. Counting only the major units, there are five international institutions, ranging from the treaty-based International Joint Commission to the International Association for Great Lakes Research, a scientific society. In Canada, eight federal and three provincial departments and agencies and several universities are concerned with the water and related resources in the Great Lakes Basin. In the United States, the major institutions involved include 7 federal departments and their several agencies, 10 independent federal commissions and agencies, 25 major state departments, and 15 major universities in the eight bordering states, plus literally dozens of private companies, groups, associations, and foundations. Obviously the most difficult problems or the deepest and murkiest waters may not be those of the physical hydrology of the Lakes.

The purpose of the symposium on Water Supply and Water Management Problems of the Great Lakes is to examine what is known of the interactions of the physical dynamics of the Lakes and the management practices that stress the system. The program will cover the following topics: Present and projected water uses and demands; present management practices and related problems; water management institutional arrangements—U.S., Canadian, and international; general hydrology of the Great Lakes and the reliability of data on the component phases; goals, organization, and arrangements for participation in the International Field Year for the Great Lakes; scientific programs and studies of the International Field Year for the Great Lakes; engineering approaches to management—past, present, and future; and, improved management of the Lakes through meteorological controls.

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