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Great Lakes Diversion and Consumptive Use: The Issue in Perspective

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I. PREFACE

The intent of this paper is to provide an overview of and perspective on the issue of Great Lakes diversion and consumptive use in support of The December 11-13, 1985 legal issues seminar sponsored by The Center for the Great Lakes. The Center recognizes that a productive seminar will depend upon the active and informed participation of those in attendance. Hence, this paper is presented as a means to: provide a common information base on the issue; focus attention on its present importance and future implications; introduce The Center's research in this area; and present the objectives of the "Great Lakes Legal Seminar: Diversion and Consumptive Use."

The following discussion is not a comprehensive overview of the issue, nor is it intended to be. Rather, it highlights:

- the emergence of the diversion and consumptive use issue as a leading regional policy consideration;
- the characteristics and impacts of existing Great Lakes diversions and consumptive uses;
- legislative and policy developments (within and outside the Great Lakes region) with implications for Great Lakes water management; and
- the importance of a thorough assessment of the present legal framework for Great Lakes water quantity management and a determination of legal and policy options which might be pursued to strengthen that framework.

The Center's legal research on the issue is discussed relative to this latter consideration.

The seminar attendee is encouraged to review this paper as a background reference prior to reading the legal analyses prepared by other contributing authors.

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II. A CALL FOR ACTION

The abundance and quality of the water resources of the Great Lakes Basin constitute a unique and vital regional asset. The Great Lakes and their connecting channels not only bring a physical definition to the region, but shape the character of its environment and lend strength and stability to its economic base. The Great Lakes system is seemingly endless; a 95,000 square mile expanse of surface water which drains twice as much land area and boasts of nine-tenths of the fresh surface water in the United States and one-fifth of that worldwide.[1] Within the Basin is found the industrial heartland of North America; a region which provides one-fifth of all U.S. manufacturing and almost one-half of that in Canada.[2] Nearly forty million North Americans live and work in the Basin, drawing their livelihoods, their pleasures and their quality of life from its waters and related amenities.[3]

Despite (or perhaps because of) these impressive statistics, the waters of the Great Lakes Basin have long been taken for granted. Continued availability of abundant, high quality water has long been assumed, and as a consequence, access to the resource has become an expectation rather than a privilege. The true value of the resource — and the region's dependency upon it — is recognized only in times of crisis, when supply or quality limitations impinge upon use patterns.

The historical undervaluation of Great Lakes water — in both economic and quality of life terms — has only recently shown signs of subsiding. Recognition that the Great Lakes provide an expansive yet fragile and exhaustible supply of water is emerging steadily, fostered by a series of recent developments:

- The continued depletion of the Ogallala aquifer and emerging water shortages in southern and southwestern regions of the United States has rekindled interest in some sectors for massive diversion schemes to mitigate shortages;
- Recent U.S. Supreme Court (*Sporhase v. Nebraska*) and lower federal court (*El Paso v. Reynolds*) decisions holding unconstitutional portions of state statutes which sought to prohibit or limit interstate transfers of water;[4]
- Projections by the International Joint Commission to the year 2000

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[1] INT'L JOINT COMM'N, GREAT LAKES DIVERSIONS AND CONSUMPTIVE USES, A REPORT TO THE GOVERNMENTS OF THE UNITED STATES AND CANADA UNDER THE 1977 REFERENCE 5 (1985) [hereinafter cited as INT'L JOINT COMM'N].

[2] GREAT LAKES GOVERNORS TASK FORCE, COUNCIL OF GREAT LAKES GOVERNORS, FINAL REPORT AND RECOMMENDATIONS ON WATER DIVERSION AND GREAT LAKES INSTITUTIONS 6 (1985) [hereinafter cited as FINAL REPORT].

[3] *Id.*

[4] Sporhase v. Nebraska, 458 U.S. 941 (1982); El Paso v. Reynolds, 597 F.Supp. 694 (D.N.M. 1984); El Paso v. Reynolds, 563 F.Supp. 379 (D.N.M. 1983).

which indicate significant increases in consumptive uses within the Basin with attendant impacts upon lake levels;[5]
- Increased incidents of ground and surface water contamination in the Basin which necessitate access to alternative supplies; and
- A prolonged economic recession in the midwest which brought widespread recognition of the Great Lakes as a key to economic recovery and stability and prompted officials to examine measures to protect the resource from pressures for depletion.

While the implied threat of massive out-of-basin diversions has been the principal catalyst in fostering public interest and political action on Great Lakes water quantity issues, the above developments have collectively assisted in placing the issue high on the agenda of policymakers in the various U.S. and Canadian jurisdictions in the Great Lakes/St. Lawrence River Basin.

The fact that the availability of Basin water resources has long been taken for granted is reflected in the present legal and regulatory framework for Great Lakes water quantity management. Unlike the framework in water-scarce states and provinces, intrajurisdictional water allocation and regulatory measures are minimal. Further, interjurisdictional measures — at both domestic and binational levels — are modest, vague and seldom utilized. This is particularly apparent when one examines the provisions of the International Boundary Waters Treaty of 1909 and the nature and extent of their historical application to Great Lakes water quantity management issues.[6] There is consensus in the region that 1) the nature and extent of this legal and regulatory framework is poorly understood; and 2) as presently constituted, it is questionable as to whether this framework is capable of providing Basin jurisdictions with authority to protect their shared water resources from harmful diversions and consumptive uses.

The recent developments documented above, when reviewed in light of present legal/regulatory uncertainties, place the Basin jurisdictions — both singly and collectively — in an undesirable position. The legal and regulatory framework for water quantity management must be reviewed (and possibly refined) to ensure that effective protective measures are available when the need for them arises.

Concern over the adequacy of the present legal and regulatory framework has prompted a flurry of legislative and policy activity in all Great Lakes jurisdictions over the last few years. Principal among these efforts has been the development of the Great Lakes Charter under the auspices of the Council of Great Lakes Governors.[7] Signed by Great

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[5] INT'L JOINT COMM'N, *supra* note 1, at 35, figure 7.

[6] *See* Treaty Relating to Boundary Waters and Boundary Questions, Jan. 11, 1909, United States-Great Britain, 36 Stat. 2448, T.S. No. 548 [hereinafter cited as Treaty of 1909].

[7] GREAT LAKES CHARTER, *reprinted in* GREAT LAKES GOVERNORS TASK FORCE, COUNCIL

Lakes governors and premiers in 1985, the Charter is a "good faith agreement" providing a vehicle to:

> conserve the levels and flows of the Great Lakes and their tributary and connecting waters; to protect and conserve the environmental balance of the Great Lakes Basin ecosystem; to provide for cooperative programs and management of the water resources of the Great Lakes Basin by the signatory states and provinces; to make secure and protect present developments within the region; and to provide a secure foundation for future investment and development within the region.[8]

In so doing, the Charter sets up a joint prior notice and consultative mechanism for major diversion and consumptive use proposals; provides for the development of a common data base; establishes a Basin water resources research and management program; and calls for the enactment of the necessary state and provincial legislation to provide for such.[9] Legislative initiatives in these various jurisdictions have been vigorously pursued over the last two years.

The impetus for The Center for the Great Lakes' legal analysis of the diversion and consumptive use issue is founded in this unprecedented level of legislative and policy activity. The Center recognizes that the success of the Charter and related regional initiatives and programs will be largely dependent upon the ability of policymakers to understand the domestic and international legal framework within which management measures might be pursued. This legal framework, however, is exceedingly complex and poorly understood. Prospective diversions and consumptive uses involve not only the rights of one individual user against those of another, but also the rights of eight states, two provinces and two federal governments whose economies are closely tied to the availability of Great Lakes water. The present absence of a thorough examination or codification of federal, state, provincial and international legal frameworks for approaching the diversion and consumptive uses issues is a fundamental deficiency in need of prompt attention.

III. THE CENTER'S STUDY: LEGAL ASPECTS OF GREAT LAKES DIVERSION AND CONSUMPTIVE USE

The Center's research on this topic, including the conducting of the legal seminar, is being undertaken to provide an information base and identify the legal options necessary to ensure the informed development of legally defensible and operationally sound regional water management strategies. Specifically, the three principal study objectives include:

OF GREAT LAKES GOVERNORS, FINAL REPORT AND RECOMMENDATIONS ON WATER DIVERSION AND GREAT LAKES INSTITUTIONS 40 app. III (1985) [hereinafter cited as Charter].

[8] *Id.*

[9] *Id.*

1) the identification and discussion of the federal, state, provincial and international legal frameworks governing water quantity management in the various Great Lakes jurisdictions;
2) the analysis of the legal options available to the Great Lakes jurisdictions, both singly and collectively, in addressing the diversion and consumptive use issue under current and alternate legal frameworks; and
3) the development of recommendations for consideration by the various Great Lakes jurisdictions as legislative, policy and program initiatives move forward.

The legal research effort entailed the assembly of a team of noted U.S. and Canadian water law experts and the commissioning of a series of legal analyses addressing key questions relevant to the diversion and consumptive use issue.[10] This effort has resulted in six papers addressing a range of relevant topics, including: the present legal framework for water quantity management at the U.S. and Canadian domestic levels as well as the binational arena; an assessment of this framework in light of emerging water management needs; a review of recent legislative and policy initiatives in the region; and the identification and analysis of legal, institutional and policy options for strengthening the region's ability to address large scale diversion and consumptive use proposals.

These analyses provide the basis for the legal seminar, at which papers are presented and legal options discussed and evaluated via open dialogue among participants. Sessions over the two-day seminar feature (among others) leading policy and elected officials from the U.S. and Canada, in the interest of highlighting current policy and legislative initiatives and future plans. A closing session places a decided emphasis on future needs, presenting thoughts on "where we go from here" in developing a regional water management strategy.

IV. PRESENT GREAT LAKES DIVERSIONS AND CONSUMPTIVE USES: AN OVERVIEW

A. Introduction

An understanding of the physical characteristics and usage patterns of the Great Lakes is necessary to comprehend the importance of the diversion and consumptive uses issue to the environment and economy of

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[10] *See* Council of Great Lakes Governors, Summary of Water Management Legislation to the Great Lakes States/Provinces (Dec. 1985) (legal analyses were prepared by Professor Joseph Sax, The University of Michigan Law School; Professor Paul Emond, Osgoode Hall Law School, York University; Professor Sharon Williams, Osgoode Hall Law School, York University; Professor Dan Tarlock, IIT Chicago Kent College of Law; Robert Sugarman, Principle, Sugarman and Hellegers; and the Canadian Environmental Law Research Foundation) (available at The Center for the Great Lakes).

the region. Toward this end, a brief description of the Great Lakes system is presented in the following discussion.

As an expansive and intensively used fresh water system, the Great Lakes enjoy an unparalleled global prominence. The system contains approximately sixty-five trillion gallons of fresh surface water, a full twenty per cent of the world's supply and ninety-five per cent of the entire U.S. supply.[11] Its component parts — the five Great Lakes — are among the fifteen largest freshwater lakes in the world, with Lake Superior the world's largest in surface area. Collectively, the lakes and their connecting channels comprise the world's largest body of fresh surface water. As both an international border and shared resource, the system extends approximately 2,400 miles from its westernmost shores to the Atlantic. Further, it drains a land mass over twice its size which extends through eight states and two provinces. Often termed the "inland sea" and recognized by U.S. federal law as the fourth seacoast, the Great Lakes provide over 10,000 miles of U.S. and Canadian coastline.[12] Within the vast Basin is a complex, yet fragile ecosystem with over 237 species and subspecies of fish; over 150,000 acres of coastal wetlands; almost forty million forested acres; and over thirty-two million acres of agricultural lands.[13]

B. Great Lakes Levels and Flows

Hydrologically, the Great Lakes system is best described as a series of connecting channels which permit a continual but constrained flow from Lake Superior to Lakes Michigan and Huron and on to the lower lakes of Erie and Ontario and subsequently to the St. Lawrence River and Atlantic Ocean. Retention time varies with the size and volume of the lakes, ranging from 191 years in Lake Superior to less than three years in Lake Erie.[14] During the course of the journey, waters of the Basin fall some 600 feet from Lake Superior to sea level.[15] Connecting channels include the St. Mary's River (between Lake Superior and Lakes Michigan, Huron), the St. Clair and Detroit Rivers (between Lakes Huron and Erie) and the Niagara River (between Lakes Erie and Ontario).[16]

The retention capacity and tremendous surface area of the Great Lakes permit the storage of large and varying amounts of precipitation and runoff with a relatively constant outflow through connecting channels. These characteristics, coupled with a pronounced time lag between

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[11] INT'L JOINT COMM'N, *supra* note 1, at 11.

[12] Merchant Marine Act Amendments, 46 U.S.C. §1101 (1982), *as amended by* Act of Oct. 21, 1970, Pub. L. No. 91-469, 84 Stat. 1018 (1970).

[13] GREAT LAKES BASIN COMM'N, GREAT LAKES BASIN FRAMEWORK STUDY apps. 8, 13, 17 (1975).

[14] *Id.* at app. 4.

[15] *Id.*

[16] *See* app., figure 1.

water entering the Basin and its drainage into the lakes proper is reflected in the absence of drastic short term lake level fluctuations.

Three types of lake level fluctuations due to environmental factors are present in the Great Lakes system.[17] The first consists of short term fluctuations involving temporary displacement of water surfaces without change in total water volume. Sustained high winds and atmospheric pressure changes are two principal meteorological factors which influence these fluctuations, most of which last one day or less.[18]

Seasonal fluctuations constitute a second determinant of lake levels. These variations, which are actual changes in the volume of the lakes, reflect the rates of precipitation, evaporation, watershed runoff and groundwater flow which vary between seasons. This seasonal phenomenon constitutes a regular cycle ranging from low lake levels during winter months to high levels in summer months. Considerable variation in the magnitude and timing of these fluctuations is observed.[19]

The third determinant of environmentally induced lake level changes is the long term random fluctuation upon which seasonal and short term fluctuations are superimposed. These variations in lake supplies are due to long term precipitation and evaporation patterns throughout the Basin. These fluctuations accounted for unusually low levels in the mid-1930's and the 1960's, as well as the high levels of the early 1950's, the 1970's and those continuing at present.[20]

In addition to environmentally induced fluctuations in lake levels, there are three principal human activities which are important determinants: regulatory works in connecting channels, diversion structures and consumptive uses.[21]

Two of the five Great Lakes are fully regulated.[22] The Lake Ontario outflow is regulated at the Moses Saunders Power Dam between Massena, New York and Cornwall, Ontario. Regulation has been in place since the completion of the St. Lawrence Seaway and power projects in 1958 and is carried out by the International St. Lawrence River Board of Control under the auspices of the International Joint Commission. The operation is guided by Regulation Plan 1958-D which requires that no less protection be afforded navigation and riparian interest downstream than would have occurred under conditions existing prior to construction of the power projects.[23]

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17 THE CENTER FOR THE GREAT LAKES, GREAT LAKES WATER LEVELS: AN OVERVIEW 1 (1985).

18 *Id.*

19 *Id.*

20 *Id.* at 2.

21 *Id.*

22 INT'L JOINT COMM'N, *supra* note 1, at 9.

23 Regulation Plan 1958-D in INT'L JOINT COMM'N, *supra* note 1, at 9.

The level of Lake Superior has been partially regulated since 1916 and fully regulated since 1921 at Sault Ste. Marie, Michigan and Sault Ste. Marie, Ontario through manipulation of the Soo locks, power plants and compensating works.[24] The International Lake Superior Board of Control, under the auspices of the International Joint Commission, is guided by Regulation Plan-1977. This plan is based on the principle of balancing the levels of Lakes Superior and Michigan-Huron for the benefit of the entire Great Lakes system. In the interest of protecting the Lake Superior shoreline, the plan requires that the level of Lake Superior rise no higher than 602 feet above sea level.[25]

C. Present Great Lakes Diversions

The term "diversion" pertains to any intra- or interbasin transfer of water which affects the levels and/or flows of the natural (i.e. unregulated) system. There are presently five diversions of water affecting the Great Lakes system: the Long Lac and Ogoki diversions, the Lake Michigan diversion at Chicago, the Welland Canal diversion and the New York State Barge Canal diversion.[26] All of the above diversions are long standing ones, each established for a different purpose and possessing a unique set of hydrologic, environmental and economic impacts. Each is discussed briefly (see Appendix, Figure 1).

1. Long Lac and Ogoki Diversions

The Long Lac and Ogoki diversions divert into Lake Superior waters naturally draining into James Bay to the north (see Appendix, Figures 2 and 2-a). The former connects, by virtue of a control dam, the headwaters of the Kenogami River with those of the Aquasaban River, which naturally discharges into Lake Superior. The latter, also by control dam, connects the upper Ogoki River to Lake Nipigon, which naturally discharges into Lake Superior. Completed in 1941 and 1943, respectively, the impetus for both diversions was the generation of hydropower. The Long Lac diversion has also been used extensively for the transport of pulpwood logs. The long term average of the two diversions is 5,600 cubic feet per second (cfs).[27]

Both diversions were the result of over a decade of negotiations between the United States and Canada. An exchange of notes in 1940 was the vehicle used, in which the United States agreed to "interpose no ob-

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[24] INT'L JOINT COMM'N, *supra* note 1, at 9.

[25] *Id.* at Regulation Plan-1977.

[26] *See* app., figure 1. This review of the five existing Great Lakes diversions summarizes the discussion in INT'L JOINT COMM'N, *supra* note 1, at 9-22. Quotes provided in this discussion were excerpted from this report.

[27] INT'L JOINT COMM'N, *supra* note 1, at 13.

jection" and further agreed to permit Ontario to access an equivalent flow at the Niagara River for hydropower production.[28]

Since the combined diversion effectively increases the volume of water entering the Great Lakes system, its impact is an increase in the mean level of all lakes in the system. These include: Lake Superior — 0.21 feet; Lakes Michigan-Huron — 0.37 feet; Lake Erie — 0.25 feet; and Lake Ontario — 0.22 feet.[29]

The most apparent environmental impacts are localized ones associated with the construction and operation of the diversion structures. Fish spawning and related habitat impacts have resulted from the initial construction of these diversions, diversion channels, creation of reservoirs and the alteration of the natural flow. The International Joint Commission indicates that "no significant basinwide environmental effects from these two diversions have been documented."[30]

From an economic standpoint, the Long Lac and Ogoki diversions provide substantial net annual benefits to navigation ($17.6 million) and power ($40.2 million) interests, while the increased water levels contribute to $4.8 million annual loss to coastal zone interests.[31]

2. *The Welland Canal Diversion*

The Welland Canal,[32] originally built in 1829, is a deep draft waterway which diverts Lake Erie water at Port Colburn across the Niagara Peninsula to Port Weller and into Lake Ontario (see Appendix, Figure 3). Constructed primarily for navigation purposes to bypass the Niagara River and the Falls, the Welland Canal is also used for hydropower production, as a municipal and industrial water supply source, and to enhance water quality in the Welland River. Modified significantly since its initial construction, which required a flow of approximately eighty-five cfs, the Canal now has an average annual diversion of 9,200 cfs allocated among these various uses.[33]

The previously referenced exchange of notes in 1940, with reaffirmation in the 1950 Niagara Treaty, established the allocation scheme among the United States and Canada. Per that agreement, Ontario is allocated at Niagara Falls the 5,600 cfs flow provided for in the 1950 Niagara Treaty. The binational Niagara Committee has oversight

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[28] *Id.* at 10, 75, app. F (Exchange of Notes, Oct. 14, 1940, United States-Canada, including Supplementary Notes, Oct. 31 & Nov. 7, 1940.

[29] *Id.* at 15.

[30] *Id.*

[31] *Id.* at 16.

[32] INT'L JOINT COMM'N, *supra* note 1, at 16, 18.

[33] Niagara River Water Diversion Treaty, Feb. 27, 1950, United States-Canada, 1 U.S.T. 694, T.I.A.S. No. 2130.

authority.[34]

The Welland Canal diversion is an intrabasin one, and while the net volume of water in the Great Lakes Basin is unaffected, lake level impacts are associated with it. By increasing the outflow capacity of Lake Erie, the diversion serves to reduce its mean level by approximately 0.44 feet. The impact upon Lakes Michigan-Huron is a lake level reduction of approximately 0.18 feet, and 0.06 feet for Lake Superior. The mean level of Lake Ontario is not measurably affected; the maximum levels, minimum levels and range are modestly altered.[35]

The principal environmental impact of the Canal has been on the Great Lakes fishery, as it has provided one access point for passage of the sea lamprey to the upper lakes. The impact upon the lake trout fishery has been substantial, as this predator was responsible for the virtual elimination of that fishery.[36]

Economic impacts of the Welland Canal diversion have not been fully quantified, but the resultant lake level impacts are found to provide significant navigation benefits, as well as some power generation and coastal zone benefits.

3. *The Lake Michigan Diversion at Chicago*

The completion of the Illinois and Michigan Canal in 1848 permitted the diversion of the Lake Michigan water through the Illinois waterway and into the Mississippi (see Appendix, Figure 4). Principal purposes include sanitation and navigation. With the exception of emergency situations, the diversion has been maintained at 3,200 cfs, mandated in a U.S. Supreme Court decree of 1980[37] and reflective of diversion rates since 1938. This volume is comprised of Lake Michigan withdrawals subsequently discharged into the Illinois River, runoff diverted to the Illinois River as a consequence of the diversion structure, and the direct diversion from Lake Michigan into the Illinois River.[38]

The Lake Michigan diversion at Chicago remains under the continuing jurisdiction of the U.S. Supreme Court, which has issued numerous judicial decrees over the past five decades.[39] The diversion rate has been a continuing issue over this period, and numerous proposals over the years to increase the diversion have prompted Canada and a number of Great Lakes states to maintain an active and vocal opposition to proposals adversely affecting their interests.

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34 INT'L JOINT COMM'N, *supra* note 1, at 18.

35 *Id.* at 20.

36 *See* app., figure 4.

37 Wisconsin v. Illinois, 441 U.S. 921 (1980).

38 INT'L JOINT COMM'N, *supra* note 1, at 15.

39 *See* Barker, *Lake Diversion at Chicago*, 18 CASE W. RES. J. INT'L L. 221 (1986).

Through the creation of an additional Lake Michigan outlet, the Chicago diversion reduces the net volume of water in the Great Lakes Basin, thereby lowering water levels. These include the following reductions in mean levels: Lake Michigan-Huron — 0.21 feet; Lake Superior — 0.07 feet; Lake Erie — 0.14 feet and Lake Ontario — 0.10 feet.[40]

Economic benefits associated with the diversion, although not explicitly quantified, are thought to be substantial. The diversion provides, in particular, navigation and water supply benefits. If the diversion were to be increased substantially, downstream navigation and power interests would benefit, while downstream shoreline interests may experience flooding under certain conditions. Further, an increased flow would, depending upon lake levels in the Great Lakes, result in economic costs to navigation and power interests.

4. The New York State Barge Canal

The New York State Barge Canal is an intrabasin diversion comprised of a series of interconnected canals which divert water from the Niagara River at Tonawanda, New York and eventually return it through the Oswego Canal and several tributaries (see Appendix, Figure 5). Completed in 1918 and used primarily for navigation purposes, the canal system provides a link between the Hudson River and Lake Ontario as well as joining the Erie Canal and Lake Ontario. The average flow is estimated at 700 cfs, with a maximum of approximately 1100 cfs during the navigation season.[41]

The canal diversion predates the U.S.-Canada Boundary Waters Treaty of 1909 and is therefore permitted via a grandfather clause.[42] It is further recognized in the Niagara River Treaty of 1950.[43] The International Niagara Committee is the binational body providing oversight.

Hydrologically, the New York State Barge Canal has no measurable impact upon the Great Lakes, as the point of diversion is downstream from the Lake Erie inflow and all water is returned to the Great Lakes system.

The International Joint Commission indicates that "no significant basin-wide environmental effects as a result of the New York Barge Canal diversion have been documented."[44] At a localized level, however, extensive environmental modification has occurred. The aquatic and wildlife habitat has been altered by drainage and dredging programs, the

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40 INT'L JOINT COMM'N, *supra* note 1, at 15.

41 INT'L JOINT COMM'N, *supra* note 1, at 20.

42 Treaty of 1909, *supra* note 6, at art. III., para. 3.

43 Niagara River Diversion Treaty, *supra* note 33; INT'L JOINT COMM'N, *supra* note 1, at 78, app. F (art.III).

44 INT'L JOINT COMM'N, *supra* note 1, at 20.

construction of dams which preclude anadramous fish runs, and flood control projects which have created or modified lakes and altered stream flows.[45] Water quality has also deteriorated through domestic, agricultural and industrially-induced pollution.[46]

The economic impact of the New York State Barge Canal diversion has been positive, as the navigation and municipal/industrial user benefits are believed to far exceed any alternate uses.

The cumulative impacts of the various diversions identified do affect the range of levels and flows within the Great Lakes system, raising the mean levels of Lakes Superior and Ontario by 0.07 and 0.08 feet, respectively and lowering Lake Michigan-Huron by 0.02 feet and Lake Erie by 0.33 feet.[47] The long term outflows from the various lakes have increased, although the aforementioned regulatory plans for Lake Superior and Ontario are adequate to accommodate them.

As indicated in earlier discussion, the principal economic impacts associated with Great Lakes diversions tend to fall in the area of hydropower generation, navigation and coastal interests. In general, any diversion which reduces the net volume of Great Lakes water or otherwise affects its flow will incur costs with respect to hydropower generation. Lowered water levels — particularly in ports and connecting channels — render commercial ships less efficient, as cargo capacity is compromised. Coastal interests tend to benefit from diversion scenarios in which a net reduction in lake levels occurs, as such reductions tend to lessen shoreline property damage.

Environmental impacts associated with Great Lakes diversions include those resulting from the construction and operation of control structures, as well as those resulting from the consequent alteration in water levels and flows. The construction/operation impacts, such as dredging, dam construction, variable flows and others, tend to affect water quality, species composition and the overall aquatic and wildlife habitat of a rather localized area. The obvious exception is suggested in the Welland Canal diversion, where the diversion provided the sea lamprey with one means of access to the substantial fishery stock throughout the upper lakes. The environmental impacts from the lowered (or heightened) water levels (as opposed to the diversion structure itself) tend to be broader in scope. Wetlands and coastal areas providing aquatic and wildlife habitat are particularly sensitive to fluctuations in lake levels. Water quality is of concern as well, as decreased volumes and/or flows result in higher concentrations of pollutants.

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[45] *Id.*

[46] *Id.*

[47] *Id.*

D. Consumptive Uses

The term "consumptive use," as defined by the International Joint Commission, pertains to "that portion of water withdrawn or withheld from the Great Lakes and assumed to be lost to them due to evaporation during use, transpiration from irrigated crops, leakage, incorporation into manufactured products, or similar occurrences during use."[48] Seven broad sectors of consumptive use in the Basin, in order of volume (1975) include:

1) Manufacturing operations, such as steel, paper and chemicals, where water is consumed during processing (2,490 cfs - fifty percent);
2) Municipal use, including distribution of water for all non-manufacturing operations, such as drinking and other domestic uses (830 cfs - seventeen percent);
3) Thermal generation power production for cooling purposes (480 cfs - ten percent);
4) Irrigation for agricultural lands, golf courses and all other purposes excluding domestic purposes (360 cfs - seven percent);
5) Rural-domestic uses, primarily groundwater withdrawals for private use (330 cfs - seven percent);
6) Mining uses; water for ore extraction, coal, petroleum and natural gas production and related purposes (250 cfs - five percent); and
7) Livestock watering, including that for drinking water, pond evaporation and cleaning (210 cfs - four percent).[49]

Unlike water diversions, which are site specific, consumptive uses are estimated only with difficulty. In the Great Lakes Basin, for example, 1975 figures prepared by the IJC Great Lakes Diversion and Consumptive Uses Study Board identified total Basinwide withdrawals of 75,000 cfs, with consumptive uses at 6.5 percent (4,950 cfs) of this total.[50] U.S. Geological Survey figures for 1980 identified total withdrawals at 58,530 cfs and consumptive uses at 3.7 percent (2,140 cfs) of this total.[51]

Despite historical limitations in the accounting of consumptive water use, it is generally agreed that such uses will increase substantially in future years, and in so doing, significantly affect Great Lakes levels and flows. The International Great Lakes Diversions and Consumptive Uses Study Board estimated sector-by-sector consumptive use projections to the year 2000 based upon assumptions relating to population growth rates, energy usage patterns, water usage/management patterns

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[48] *Id.* at 27.

[49] *Id.* at 27, 28, table 3b.

[50] *Id.* at 28, tables 3a & 3b (1975 IJC Great Lakes Div. & Consump. Uses Study Bd.).

[51] *Id.* at 30, table 6; Solley, Chase, & Mann, *Estimated Use of Water in the United States in 1980*, GEOLOGICAL SURVEY CIRCULAR No. 1001, at 37 (1980).

and the annual growth rate of the gross national product. The year 2000 "most likely projection" was 9,890 cfs: double the 1975 figures.[52] Dramatic increases were projected for power (435.4 percent) and manufacturing (86.7 percent). Other projected increases over 1975 levels were: municipal (28.9 percent); irrigation (75.0 percent); mining (32.0 percent); livestock (19.0 percent) and rural-domestic (9.1 percent).[53]

Based upon the "most likely projection," and assuming average supply conditions, the Study Board projected that the year 2000 would find a 0.07 foot reduction in the mean level of Lake Superior, and 0.20 foot reduction in Lakes Michigan, Huron and Erie. Impacts on Lake Ontario could not be determined with sufficient certainty to provide an estimate.[54]

Consumptive use impacts tend not to be as site specific as those associated with diversions because structural and operational requirements are not as extensive. Further, consumptive uses tend to be comparatively modest at any given location; the cumulative impacts upon the system are the principal concern. Economic and environmental impacts associated with the resultant reduction in water levels are similar to those discussed earlier in addressing diversion impacts.

V. LEGISLATIVE AND POLICY DEVELOPMENTS WITH GREAT LAKES POLICY IMPLICATIONS

A. Introduction

The rise of the diversion and consumptive use issue on the region's policy agenda has, in many respects, been driven by legislative and policy developments occurring in regions of the United States and Canada beyond the Great Lakes Basin. Such developments focus on the transboundary interbasin transfer of water for the purpose of either alleviating present shortages or harnessing the resource for a given economic use. In all cases, these developments are treading new or unsettled ground in interjurisdictional water quantity management. For this reason, even those legislative and policy decisions far removed from the Great Lakes region in geographic terms may have significant implications for future Great Lakes water management efforts and the nature and extent of the state, provincial and federal roles in determining what those efforts might be.

The following discussion highlights four of the more recent developments and their implications for Great Lakes management. They include: the High Plains - Ogallala Aquifer Regional Resources Study; the

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[52] INT'L JOINT COMM'N, *supra* note 1, at 36, tables 8a & 8b.

[53] *Id.*

[54] *Id.* at 36.

ETSI coal slurry pipeline proposal; Montana water marketing legislation and the GRAND Canal Project. While other developments in both the United States and Canada most certainly have notable water management implications as well, these case studies demonstrate the nature and extent of legislative and policy developments in other regions, and their significance to water management efforts in the Great Lakes Basin.

B. The High Plains - Ogallala Aquifer Regional Resources Study

One of the major factors behind the recently heightened concern that diversions may threaten the Great Lakes is the 1982 High Plains-Ogallala Aquifer Regional Resources Study.[55] The study was undertaken in response to Congressional concern over the continuing depletion of the aquifer and the prospective effects on the regional economy and on agricultural production.

Believed to be the largest underground reserve of fresh water in the world, the Ogallala Aquifer underlies approximately 174,000 square miles of land in parts of eight states — Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas and Wyoming.[56] The aquifer has been the principal source of water in this major agricultural area since the 1930's. Precipitation is the primary source of recharge to the aquifer. Because evapotranspiration rates are substantial, the rate of recharge is generally very low. Although this rate varies, the long term average annual recharge rate is probably a few tenths of an inch.[57]

Approximately ninety-five percent of all water pumped from the High Plains aquifer is used for agricultural purposes. Groundwater irrigation began during the end of the nineteenth century and developed rapidly after the great drought of the 1930's. Development and widespread use of the center-pivot system in the 1960's permitted irrigation in areas that had previously been unsuitable due to sandy soils and rolling terrain. As of 1978, approximately 170,000 wells were pumping water from the aquifer to irrigate about thirteen million acres across the High Plains. The result of this use has been a net depletion of the aquifer amounting to approximately five percent of the predevelopment volume. While this may not appear substantial, about seventy percent of this depletion has occurred in Texas where declines exceeding 100 feet in the

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[55] Pearson, *High Plains - Ogallala Aquifer Study Water Transfer Element*, in WRIR REPORT No. 145 (U.S. Army Corps of Engineers, Dallas, Texas, South-west Division) (1982). This study, authorized by Congress in 1976, was made to examine the feasibility of increasing water supplies to ensure the economic growth and vitality of the High Plains region.

[56] E. Gutentag, F. Heims, N. Kroethe, R. Luckey & J. Weeks, Geohydrology of the High Plains Aquifer in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming 56 (U.S.G.S. Prof. Paper 1400-B) (1984).

[57] *Id.* at 58.

aquifer water table have been common.[58]

One element of the study with significant implications for the Great Lakes was the investigation by the U.S. Army Corps of Engineers of possible interbasin transfers from "adjacent areas" as one of six water management strategies to be analyzed. A synopsis of these strategies follows:

- Baseline — expand the use of currently available water conservation and use technology and practices already in use; no new public policy to alter the trends in water consumption;
- Strategy One — stimulate voluntary action to reduce water demands through research, education, demonstration programs and incentives, using technology and practices not considered in the Baseline analysis;
- Strategy Two — assume Strategy One policies and programs, and project further water demand reduction by instituting mandatory programs to regulate water use;
- Strategy Three — add local augmentation actions to demand-reduction efforts, including practices such as cloud-seeding, local storage, groundwater recharge, desalination, and snowpack and vegetation management;
- Strategy Four — augment regional water supplies by intrastate surface water interbasin transfers, importing water into the High Plains Region in accordance with state water plans of the High Plains states;
- Strategy Five — augment by interstate surface water transfers, importing water from sources in areas adjacent to the Ogallala Region by means of large scale federal-state or federal projects to store and maintain irrigation of the acreage that would have reverted to dryland farming by 2020 under Strategy One or Two.[59]

Congress specifically prohibited the Corps from considering either the Columbia River Basin or the lower Mississippi River Basin for interbasin transfer. This limited possible sources to the Missouri River and to streams in Arkansas.

Examination of the "interstate water transfer" strategy yielded the following findings:

- all terminal storage reservoirs would be much higher in elevation than the points of diversion at the sources, requiring extremely large amounts of energy for pumping;
- total investment and unit costs per acre foot would be far beyond the user's (farmer's) ability to pay, requiring massive government subsidies;

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[58] *Id.*

[59] H. Banks, Future Water Demands in the United States 55 (1982) (paper presented at the Interbasin Transfer of Water ... The Great Lakes Connection, conference sponsored by the Wisconsin Coastal Management Council, Milwaukee, WI, May 10-11, 1982) [conference hereinafter cited as Interbasin Transfer Conference].

- the amount of water available in the Missouri River Basin, after allowances for present commitments and future inbasin needs, would be far less than that needed by the High Plains-Ogallala Aquifer area;
- if interbasin transfer were to originate from the Missouri River, it would involve tradeoffs with navigation downstream; reduce hydropower capacity; and seriously affect fish and wildlife habitat;
- there are limited amounts of surplus water in Arkansas, and therefore, diversions from the streams in that state would seriously affect Louisiana; and,
- the Missouri River Basin states and the State of Arkansas are opposed to exportation from the Missouri River or Arkansas streams.[60]

The findings clearly indicated that the "interstate water transfer" strategy would be ill-advised on both economic and environmental grounds. Rather, the study concluded that the only feasible water management strategy for alleviating stress on the Ogallala Aquifer was a reduction in consumptive use rates via greater emphasis on conservation and efficient use.[61]

While these study findings effectively rule out Great Lakes diversion as a viable option for alleviating water shortages in the High Plains region at this time, they are nonetheless of significance to the Great Lakes water management effort. The study highlighted the seriousness of the Ogallala Aquifer drawdown, and by identifying interstate water transfer as a possible mitigative action, granted some legitimacy to the concept and set a precedent for renewed consideration at a future point in time.

C. The ETSI Coal Slurry Pipeline Proposal

Another significant case addressing the issue of interbasin transfers of water and state water rights was the ETSI coal slurry proposal.[62] In 1982, the State of South Dakota and Energy Transportation Systems, Inc. (ETSI) announced that South Dakota had negotiated the sale of 50,000 acre feet of water per year from the Oahe Reservoir on the Missouri River. The water, intended for use in a coal slurry pipeline, would cost ETSI nearly $1.4 billion.

In the early 1970's, many cities in the southern states were shifting from natural gas to coal-fired power generation, in part to accommodate the national coal-conversion policy. Consequently, demand for the purchase of low sulphur coal from western states increased substantially. The cities were faced with heavy transportation costs in light of the rail-

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60 *Id.* at 56-57.

61 Pearson, *supra* note 55.

62 J. Smith, Allocation of Water in the Missouri River Basin: South Dakota and the ETSI Experience (1983) (paper presented at Diversion of Great Lakes Water, conference sponsored by the Western Michigan University Kalamazoo, Mich., Mar. 24-25, 1983).

roads' monopoly on coal transport. ETSI therefore proposed to enter the coal transportation market to provide an alternative to railroad transport by constructing a coal slurry pipeline linking Gillette, Wyoming to Arkansas and possibly Louisiana, a distance of up to 1800 miles.

In 1974, the Wyoming state engineer, under authorization from the state legislature, issued permits to ETSI to withdraw an average of 15,000 acre-feet of water annually from an underground aquifer known as the Madison Formation. However, the water field is located immediately adjacent to the Wyoming-South Dakota border and the withdrawal would result in drawdown of the formation in South Dakota possibly on the order of hundreds of feet. Water table levels of the city of Edgemont, South Dakota, for instance, were projected to drop approximately 275 feet, with extensive well-drilling the attendant outcome. In addition, projected depletion of the Fall River, which runs through the municipality of Hot Springs, would be severe, causing Hot Springs' annual wastewater treatment costs to increase by nearly $100,000. Most critical of all, the flow reductions would seriously affect flows in streams in the southern Black Hills, the cornerstone of South Dakota's tourist industry. ETSI's potential use of groundwater in Wyoming therefore presented an unacceptable threat to the groundwater resources of western South Dakota.[63]

Rather than accede to the arduous process of litigation, South Dakota developed an alternative proposal to provide coal slurry water for ETSI. After a series of negotiations, the South Dakota Conservancy District (the contracting entity for the state) and ETSI agreed that South Dakota would provide 50,000 acre-feet per year from the Oahe Reservoir as well as a legally approved water permit. ETSI, in return, would pay two million dollars when the water permit was granted, two million dollars when it was confirmed and approved by the South Dakota Supreme Court, and two million dollars each year thereafter (up to ten years) until construction began. In addition, ETSI would pay nine million dollars annually for fifty years once construction began. A pipeline would be constructed not only to transport water to the coal mines of Wyoming and from there south to transport slurry, but also to provide 4,300 to 6,700 acre-feet of water per year to water-poor communities in west-central South Dakota.[64]

Proponents of the scheme lauded it as a boon to South Dakota's economy. As the state with the lowest per capita income in the nation, South Dakota stood to benefit from the funds to develop other water resources in the state. Also attractive was the technical assistance that ETSI engineers would provide to South Dakota communities with water

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[63] *Id.* at 5.

[64] *Id.* at 7.

quality problems, as well as the jobs expected to be created from pipeline construction.[65]

Pipeline opponents expressed concern over the potential economic impacts of coal slurry on railroads, and the potential environmental impacts associated with the withdrawal, use and disposal of coal slurry water. Further concern was expressed that agricultural water uses would be forced out of business by the higher prices paid for industrial water.[66] Arguments concerning the effects of the pipeline on the Missouri River supply seemed to be unfounded. The withdrawal would amount to sixty-nine cfs, or about 0.28 percent of the Oahe Reservoir outflow, a quantity virtually undetectable if the flow of the Missouri were measured downstream.[67] Furthermore, a study conducted by the U.S. Office of Technology Assessment[68] concluded that sufficient quantities of suitable water were present. The study noted that the real barrier to use of water for slurry pipelines in western coal producing areas may be legal rather than physical. In addition, it noted that the primary environmental choices between coal pipelines and rail transportation for moving coal involve water use and temporary construction activity of pipelines versus the noise, land use disruption, and inconvenience associated with increased train traffic. However, because these concerns are site-specific, they could be neither confirmed nor rejected without the preparation of a comprehensive impact statement.

Questions were raised about the legality of the sale. In May, 1983 a U.S. federal district court ruled that the U.S. Department of Interior lacked statutory authority to consumate the sale.[69] This decision was later appealed to the Eighth Circuit Court of Appeals, but was not resolved because ETSI abandoned the project in August, 1984.

The financial arrangements that ETSI agreed to were unprecedented, but for political reasons it appears that ETSI would have had no choice. The Oahe Reservoir provided the only water that, if withdrawn, would have had no confirmed impact on other users. While surplus water supplies in Wyoming and Montana existed, they were not readily available. Wyoming required that ETSI receive, once it withdrew the appropriated groundwater, legislative approval before shipping it out of state.[70] In addition, by 1981 Wyoming state legislators were seeking to

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65 W. Neufeld, The Economics of Selling Water: The South Dakota Perspective, 138-39 (paper presented at the Interbasin Transfer Conference) (1982).

66 MONTANA SELECT COMMITTEE ON WATER MARKETING, REPORT TO THE 49TH LEGISLATURE, at I-10 (1984) [hereinafter cited as WATER MARKETING].

67 W. Neufeld, *supra* note 65, at 139-41; J. Smith, *supra* note 62.

68 U.S. OFFICE OF TECHNOLOGY ASSESSMENT, A TECHNOLOGY ASSESSMENT OF COAL SLURRY PIPELINES (1983).

69 Missouri v. Andrews, 586 F. Supp. 1268 (D. Neb. 1984).

70 J. Smith, *supra* note 62.

repeal the state's original 1974 approval.

Although never seen to completion, the ETSI proposal is indicative of the legal ramifications involved when an interbasin diversion is viewed as detrimental to riparian or downstream interests. In a Great Lakes context, the amount of water required for a single coal slurry pipeline would be miniscule in comparison to other diversion schemes, but the legal precedents established would likely be of significance. Thus, the ETSI case study provides useful insight into the interstate issues involved when a given party purchases the right of access to water resources for out of basin export.

D. Montana Water Marketing Legislation

In response to the ETSI proposal and other key developments,[71] the State of Montana in 1983 initiated a major change in its state water management policies. In that year, the state legislature mandated a study of the advantages and disadvantages of water marketing.[72] The study led to significant revision of the state's water policy in the interest of broadening Montana's authority over management of state waters to ensure adequate supplies for existing and future uses.

In 1985, the Montana legislature passed House Bill 680,[73] making significant changes in four areas of Montana water management policy: 1) codifying public interest criteria; 2) limiting private appropriation of water; 3) establishing the state as a proprietor of water under some circumstances; and 4) instituting a state water leasing program.[74] With respect to the last element, the state has enacted a water leasing program to be administered by the Department of Natural Resources and Conservation (DNRC).[75] In light of the legal precedent of *Sporhase* preventing statewide bans on water export, Montana established a policy requiring that water be leased from the state whenever large amounts of water are consumed or when any amount would be moved outside the state's major water basins.[76] Limited authority to lease 50,000 acre-feet per year of impounded surplus water was granted to the DNRC.

A lease is required for any "beneficial" use where consumption

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[71] *See* Sporhase v. Nebraska, 458 U.S. 941 (1982) (holding that groundwater is an article of commerce and thus state laws, preventing interstate movement of water, are presumptively unconstitutional).

[72] WATER MARKETING, *supra* note 66.

[73] Thorson, *None of the Old Rules Apply Anymore: Economics and Public Rights in the Allocation and Movement of Montana's Water*, W. NAT. RESOURCE LITIGATION DIG. 7,9 (Fall 1985).

[74] *See id.* for further discussion.

[75] *Id.* at 12.

[76] Basins included in the management package are those of the Clark, Fork, Kootenai, St. Mary, Little Missouri and Yellowstone Rivers and their tributaries.

would exceed 4000 acre-feet per year or 5.5 cfs.[77] Beneficial use has been defined as:

- a use of water for the benefit of the appropriator, other persons, or the public, including but not limited to agricultural (including stock water), domestic, fish and wildlife, industrial, irrigation, mining, municipal, power, and recreational uses; and
- a use of water appropriated by the department for the state water leasing program . . . and of water leased under a valid lease issued by the department . . . .[78]

The new policy allows some management of unappropriated water for both the present and future needs of the state. Under the new leasing program, the Department of Natural Resources and Conservation may now acquire rights to water for leasing by appropriate unowned water in its own name or by purchasing appropriated water from another holder. The focus of the leasing program is not on water from the Missouri River (an interstate resource subject to controversy) but rather on water from existing or future state or federal reservoirs, provided that there is an agreement with the federal government for revenue sharing. The Department may lease for a period of up to fifty years. If the applicant wishes to consume more than 4000 acre-feet per year an environmental impact statement must be prepared to assist in determining desirability of the project. In all cases, certain requirements must be met for a lease to be granted:

- there must be unappropriated water in the source of supply;
- the rights of a prior appropriator must not be adversely affected;
- the use must not conflict with existing demands on the state water supply; and
- the effect on the quantity and quality of water for existing beneficial uses in the source of supply must be considered.[79]

A lease does not constitute a permit for particular uses nor does it establish a right to appropriate water. The state remains the proprietor of the water it leases. The program also authorizes the Department to require any leases to make available up to twenty-five percent of the water leased for any beneficial use upon payment by another user of the costs of tapping into and removing water from the lessee's project.

This market approach provides a unique alternative to established state water quantity management processes. Unlike traditional approaches, the Montana plan provides flexibility for the future while assuring maximum constitutional authority of the state over the intra- and interstate movement of water. Proponents contend that a market system

77 MONT. CODE ANN. §85-2 (1985).

78 MONT. CODE ANN. §85-2-102, Definition (2) (1985).

79 MONT. CODE ANN. §85-2-311 (1985).

more efficiently determines the best uses of water and ensures a better response to changes in water needs than do traditional state management approaches. The market approach permits the reallocation of a scarce resource and thus does not lock-up unappropriated water.

Provisions for managing in-state needs are also included in the Montana water marketing strategy. It establishes a centralized water resources data system to identify existing uses and future development potential.

The Montana water marketing legislation is significant in that it recognizes and accommodates the ramifications of the *Sporhase v. Nebraska* decision while broadening the state's authority over water management. Rather than rely upon an existing water management framework to address diversion proposals as they arise, the legitimacy of the water marketing concept is acknowledged and a detailed state water leasing program instituted to address future proposals. As such, it constitutes a forward looking, proactive approach to addressing water quantity management issues. This initiative will warrant examination by the Great Lakes states and provinces as they explore various legislative responses to the provisions embodied in the Great Lakes Charter.

E. The GRAND Canal Project

Of direct relevance to the Great Lakes water quantity issue is the GRAND Canal proposal. First proposed in 1964 by T.W. Kierans, the massive Great Recycling and Northern Development (GRAND) Canal project is designed to divert the waters of James Bay into the Great Lakes Basin and then on to water-short areas of the southwest United States and central Canada. The proposed scheme involves construction of a 100-mile (160 kilometer) long dam to hydrologically separate James Bay from Hudson Bay. The dam would trap the run-off from the rivers that flow into James Bay, creating a sea level freshwater lake. Of the 400,000 cfs of water captured (equal to approximately twice that of the flow of the St. Lawrence River), about twenty percent would be pumped via Ontario and Quebec river systems to the Great Lakes.[80] This quantity would flow, with the assistance of pumps, through a series of stepped reservoirs lying in river valleys. Using eight such reservoirs over 165 miles (265 kilometers), the water would be raised 960 feet (292 meters) above sea level. It would then move downward by steps to Georgian Bay on Lake Huron at 580 feet (177 meters). Once stored in the Great Lakes, the water would be available for distribution to water short regions of Canada and the United States.

The GRAND Canal scheme has been proposed in Canada as a partial solution to the emerging water quantity problems faced by the semi-

[80] GRAND Canal Co., Introduction to Grand Co. (1985) (concept paper).

arid, agricultural Canadian and U.S. central plains. If constructed, it would be the largest water diversion project ever undertaken. While proponents claim the scheme would "recycle" freshwater resources, it is in fact a diversion which would annually divert up to twenty percent of James Bay runoff out of that basin. It therefore constitutes an interbasin transfer of a volume of water equaling approximately forty percent of the annual runoff of the Great Lakes Basin.

Estimates of costs for the GRAND Canal plan range from $50 billion to as high as $100 billion.[81] This does not, however, include construction of distribution systems once the James Bay-Great Lakes connection is made. Nor does it include the substantial annual operating costs associated with a project of this magnitude. Financing arrangements have not been explored in depth to date, nor is it clear as to what purchase arrangements might be made once the water transfer is effected.

The proponents of the diversion cite numerous benefits from the project, the principal one being a new supply of water to relieve water-short areas of Canada and the United States. The new 'lake' is also expected to stabilize the shoreline of James Bay, which has been altered due to natural post-glacial uplift. Other benefits claimed by proponents include:

- job creation (particularly in Quebec) over ten years of construction;
- additional hydroelectric power sources; and
- increased trade between the United States and Canada in terms of the buying and selling of water and energy.[82]

The GRAND Canal proposal has many implications for the Great Lakes. Its supporters point out that it would provide a mechanism for controlling and stabilizing flow in the Great Lakes, and in so doing yield transportation and water quality benefits. They note, too, that options for increased consumption and diversions would be greatly enhanced.

Opponents of the scheme have raised a plethora of questions concerning its possible adverse impacts. With respect to the northern environment, for example, scientists indicate that withholding freshwater flow into James Bay will eliminate fish spawning grounds, destroy migratory bird feeding grounds, and lead to extinction of some wildlife species. Further, climatological factors related to the variance in freezing points of salt and freshwater would be expected to reduce the water's weather moderating impact.

In addition to the environmental and economic impacts of the proposed scheme on the Great Lakes region, its binational nature raises a multitude of legal issues which demand resolution. For this reason, the

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[81] The $50 billion estimate was provided by Grand Co. in April 1985. For the $100 billion estimate see Scott, *Great Lakes Water Diversion*, Probe Post 9 (June 1985).

[82] GRAND Canal Co., *supra* note 80, at 2.

GRAND Canal proposal — even if it advances no further — provides a useful and relevant scenario for examining the Great Lakes water quantity management framework at the domestic and binational levels.

VI. Concluding Remarks

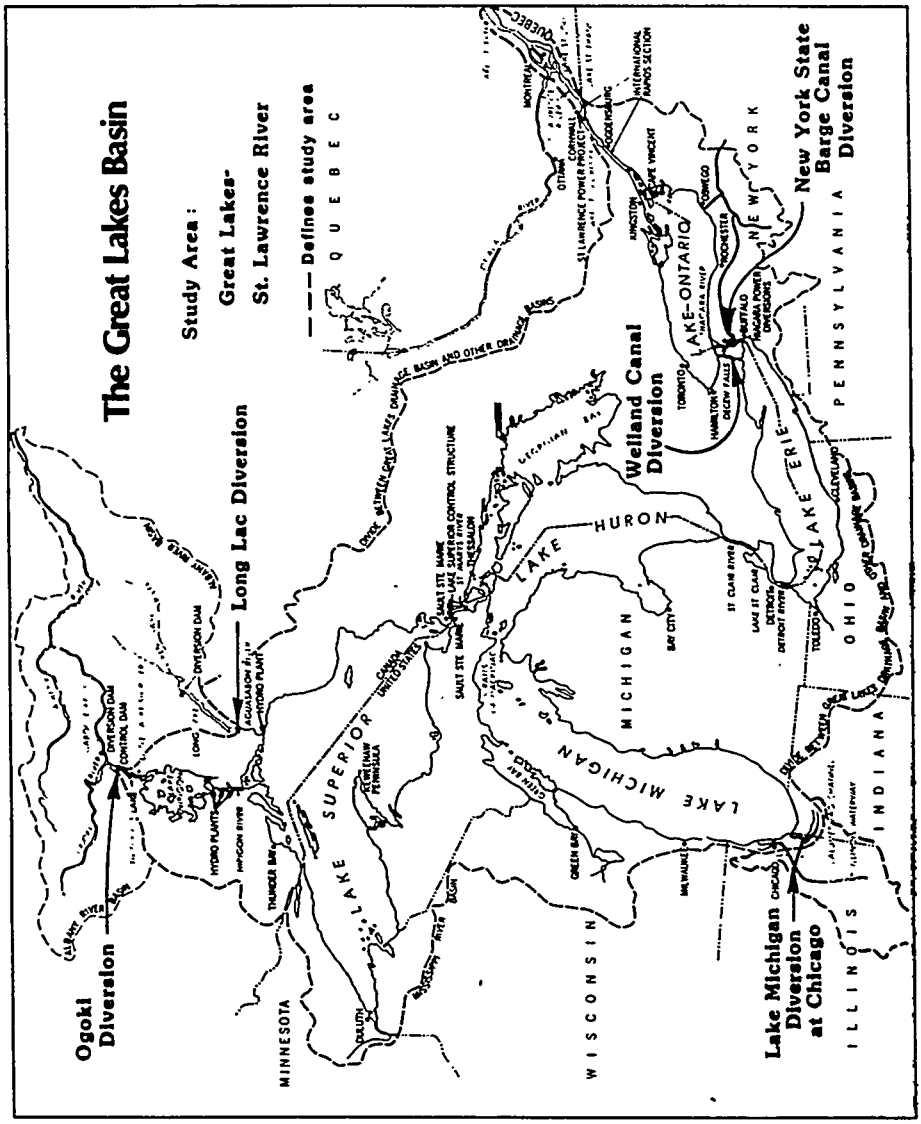
The preceding discussion provided a brief overview of the Great Lakes diversion and consumptive use issue and introduced the purpose and process of The Center for the Great Lakes' investigation of associated legal considerations. In so doing, four key considerations emerge:

- the extent to which water quantity management policies and programs influence the environmental and economic attributes of the Great Lakes region;
- the emergent water supply shortages in other regions and the growing interest in interbasin diversion as a means to address them;
- the extent of water management related policy and legislative activity — both within and outside the Great Lakes Basin — with implications for management of Great Lakes water resources; and
- the importance of a firm understanding of the legal framework for Great Lakes water quantity management, and the legal options available for strengthening it.

These considerations provide a useful perspective from which to examine the legal analyses prepared for the "Great Lakes Legal Seminar: Diversion and Consumptive Use."

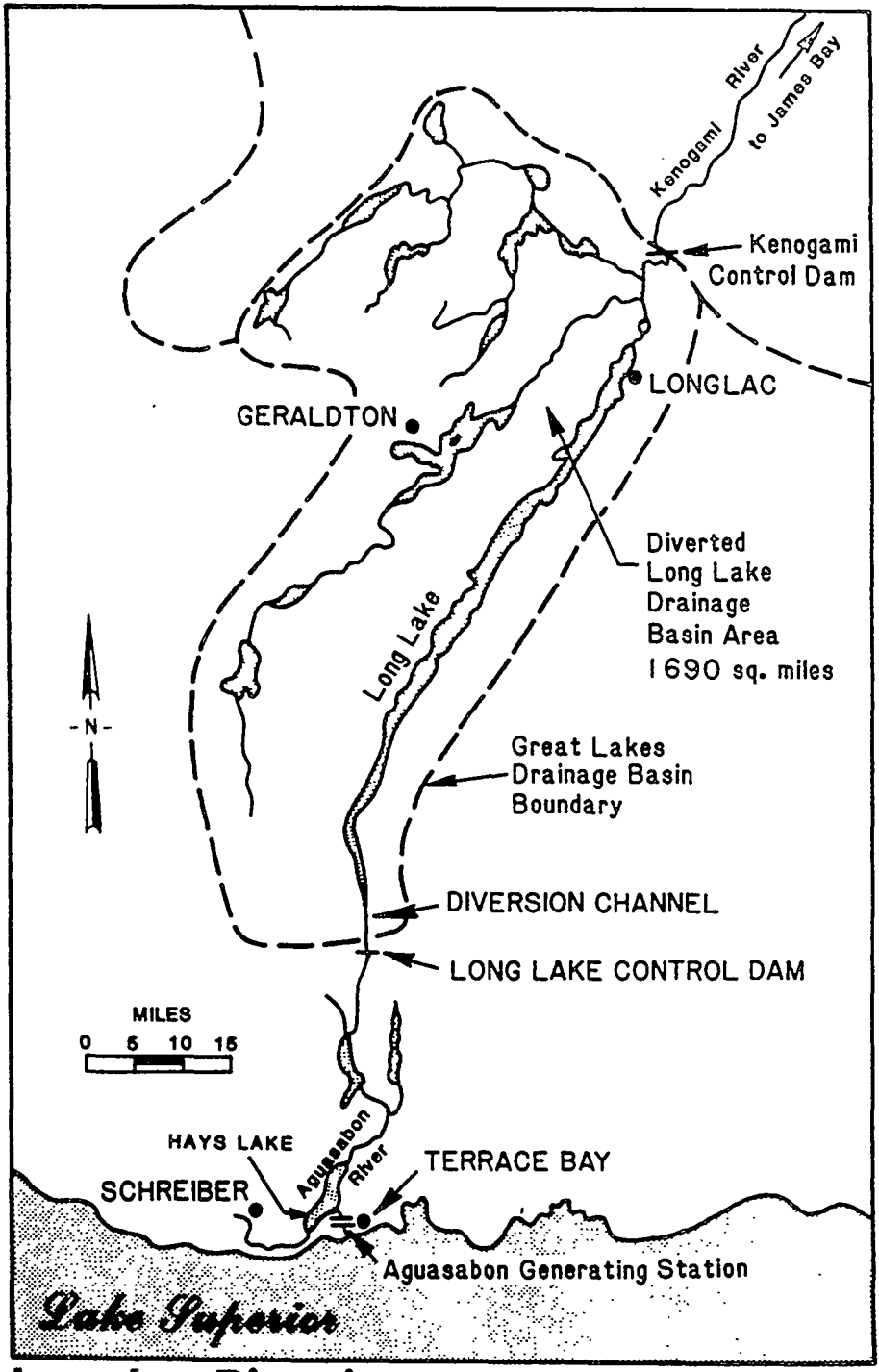
APPENDIX

Figure 1



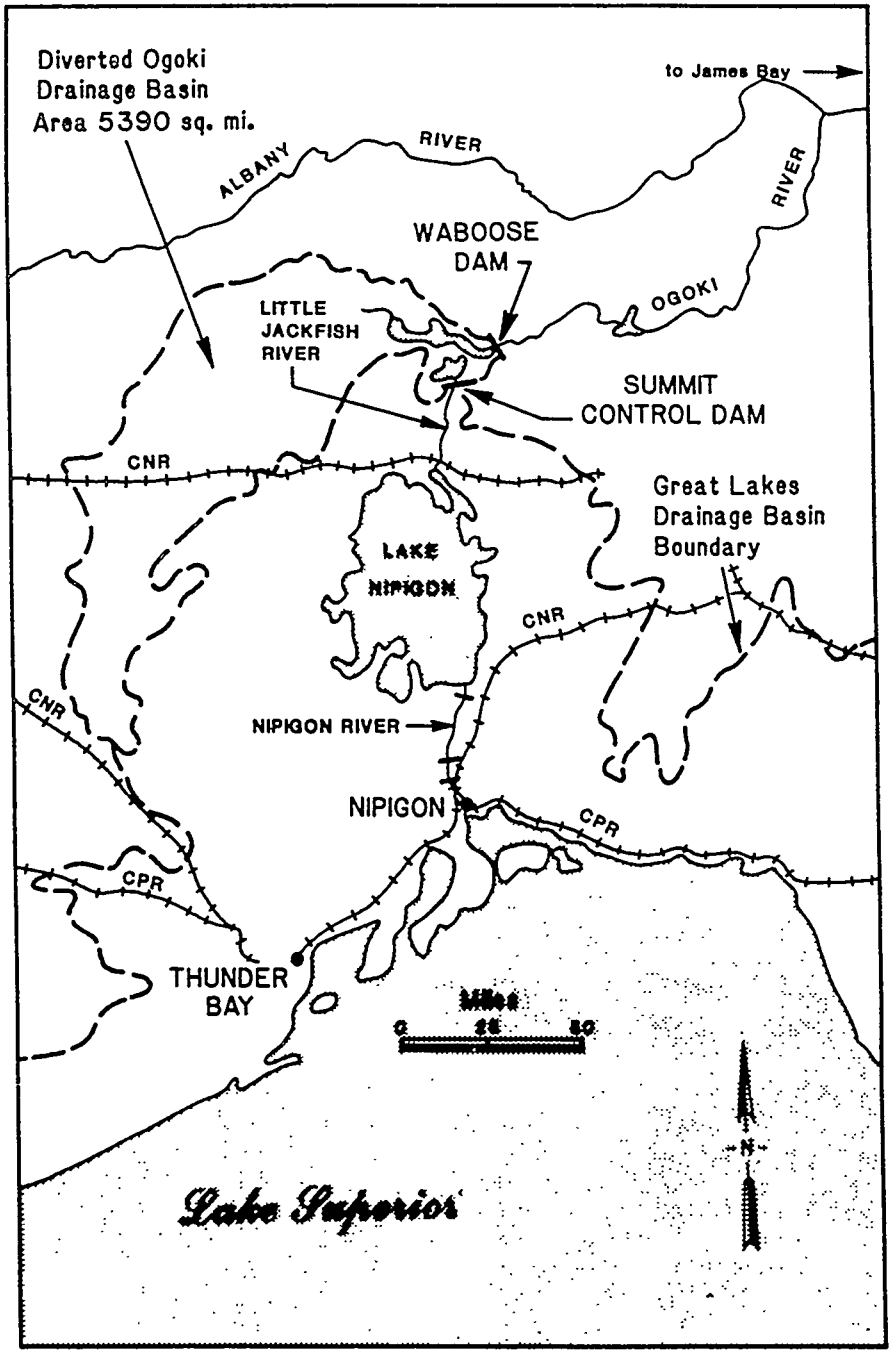
Note: Figures excerpted from: International Joint Commission (1985). *Great Lakes Diversions and Consumptive Uses.* A Report to the Governments of the United States and Canada under the 1977 Reference. January, 1985, p. 82.

Figure 2



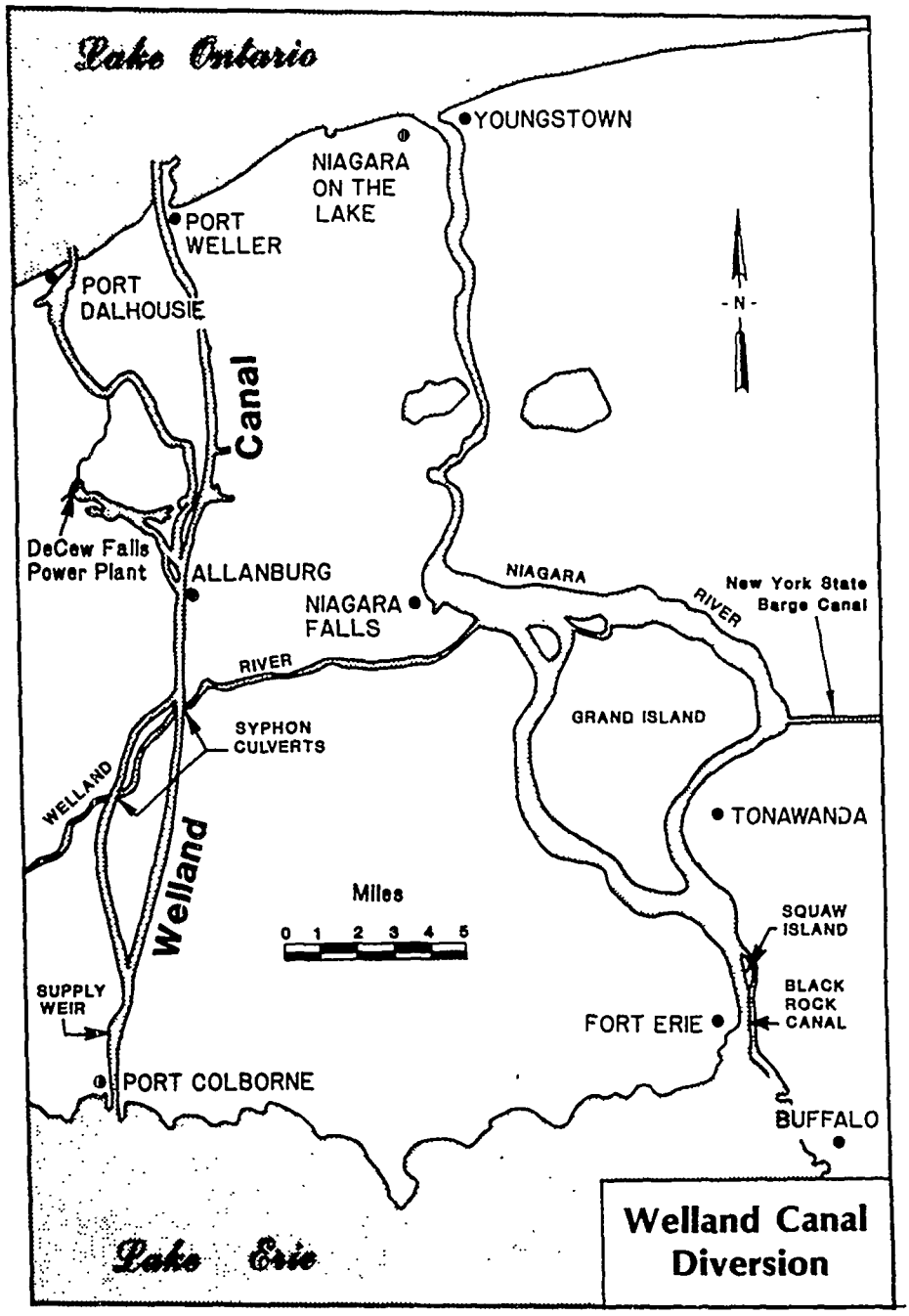
Long Lac Diversion

Figure 2-a



Ogoki Diversion

Figure 3


Lake Ontario
YOUNGSTOWN
NIAGARA ON THE LAKE
PORT WELLER
PORT DALHOUSIE
Welland Canal
DeCew Falls Power Plant
ALLANBURG
NIAGARA FALLS
NIAGARA RIVER
New York State Barge Canal
RIVER
GRAND ISLAND
SYPHON CULVERTS
WELLAND
Welland
TONAWANDA
Miles
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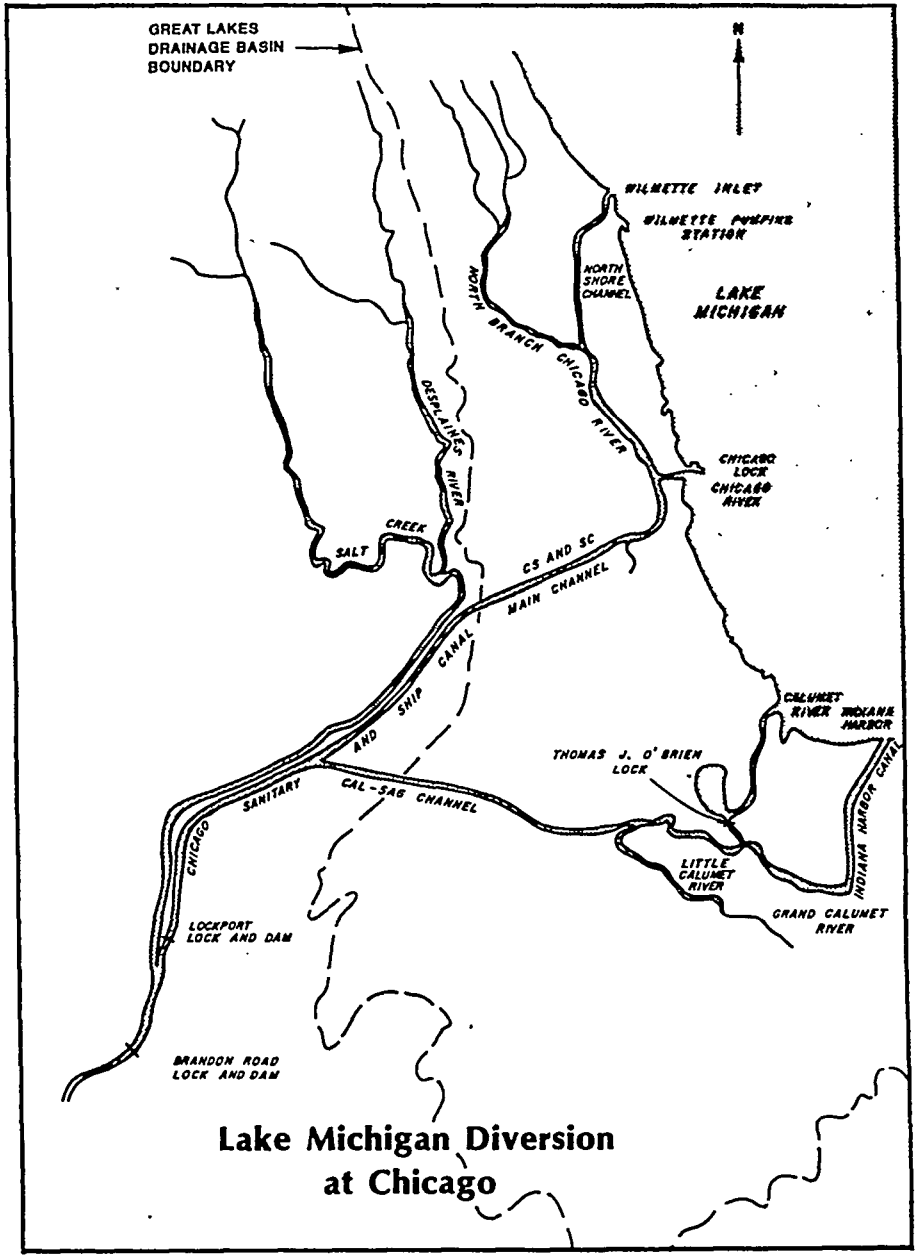
SQUAW ISLAND
BLACK ROCK CANAL
SUPPLY WEIR
FORT ERIE
PORT COLBORNE
BUFFALO
N
Lake Erie
Welland Canal Diversion

Figure 4


GREAT LAKES
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DESPLAINES RIVER
CHICAGO
LOCK
CHICAGO
RIVER
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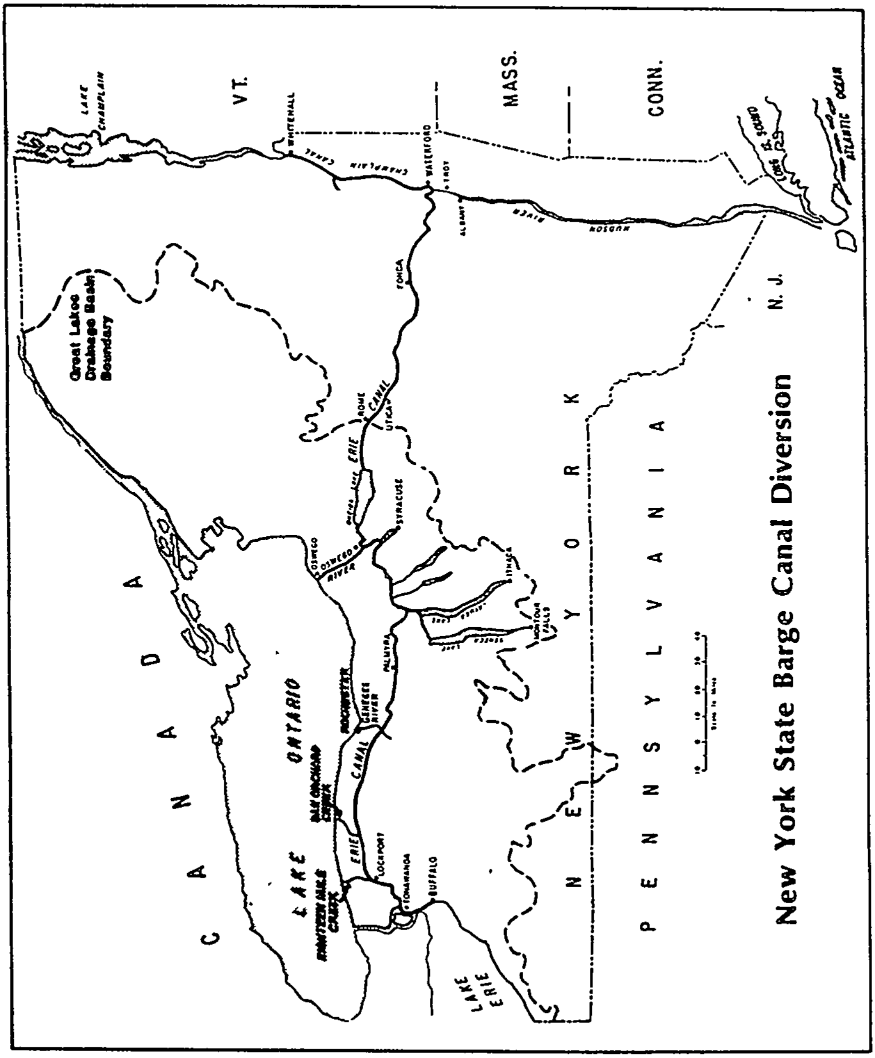
CS AND SC
MAIN CHANNEL
AND SHIP CANAL
CALUMET
RIVER
INDIANA
HARBOR
THOMAS J. O'BRIEN
LOCK
SANITARY
CAL-SAG CHANNEL
CHICAGO
INDIANA HARBOR CANAL
LITTLE
CALUMET
RIVER
GRAND CALUMET
RIVER
LOCKPORT
LOCK AND DAM
BRANDON ROAD
LOCK AND DAM
Lake Michigan Diversion
at Chicago

Figure 5


New York State Barge Canal Diversion
C A N A D A
N E W Y O R K
P E N N S Y L V A N I A
VT.
MASS.
CONN.
N. J.
LAKE ONTARIO
LAKE ERIE
LAKE CHAMPLAIN
Great Lakes Drainage Basin Boundary
ERIE CANAL
CHAMPLAIN CANAL
OSWEGO RIVER
GENESEE RIVER
HUDSON RIVER
ATLANTIC OCEAN
WHITEHALL
WATERFORD
TROY
ALBANY
ROME
UTICA
SYRACUSE
OSWEGO
ITHACA
ROCHESTER
PALMYRA
LOCKPORT
TONAWANDA
BUFFALO