Abstract

This paper researches the impact of diversions of water from the Great Lakes Basin and on the Great Lakes Region and its ecosystem. It examines the historical diversions that linked the region with ports in the eastern United States and St. Lawrence River in Canada. These diversions played an integral role in the economic growth and prosperity of Great Lakes Region. The paper then chronicles a series of large-scale diversions, proposed between 1959 and 1982, that would have transported Great Lakes water more arid regions of North America to support their growing populations and continued economic development.

The Governors of the Great Lakes States and the Premiers of Ontario and Quebec saw the impending threat of these large-scale diversions and joined forces to develop a cooperative, regional Great Lakes water management structure that allows them to work together as stewards of the Great Lakes ecosystem and its water resources. This system has developed over its 15-year life and is an effective instrument in evaluating Great Lakes diversion proposals although there are gaps in its implementation. The paper investigates the issue of water as a commodity, followed by an analysis of the economics of bulk removals of Great Lakes water and a study of the impacts of diversions from the Great Lakes and other water bodies around the world to identify their impacts on the ecosystem. This is followed by a projection of possible diversion issues facing the region in the short- and long-term.

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1 The information contained herein was assembled as part of a basic fact-finding effort in support of the International Joint Commission Reference on Consumption, Diversion and Removal of Great Lakes Water. The views expressed are those of the authors, and do not necessarily represent the opinions of either the Commission or its Study Team.
A HISTORY OF GREAT LAKES DIVERSIONS

Diversions from the Great Lakes have taken place since the early 1800s when it became more feasible to engineer the inter- and intra-basin diversions. The economic and population growth of the United States and Canada led to a demand for connecting waterways linking the upper Great Lakes to markets in the eastern U.S. and Canada, and thus created a need for diversions. The first diversions were engineered primarily to cement these linkages by making waters more navigable. Later, they were used to help power the industrial revolution through the use of hydropower.

Plans were proposed between 1959 and 1983 to divert water in greater volume and for greater distance than had occurred previously. These proposed “grand” diversion projects would not have just transported goods and increased the region’s hydropower, they would have transported the water across the continent to areas that needed water to support their growing populations and industry. The threat of such projects created a demand for a new policy structure to help the jurisdictions in the region to protect the Great Lakes ecosystem more effectively.

CONNECTING THE REGIONAL ECONOMY AND LINKING TO THE WORLD

The diversion of Great Lakes water began in the early 1800s at a time when people in the United States wanted to link the country more closely. There was no cost-effective overland route for moving crops from the center of the continent to the markets of the east and to move finished goods from the ports of the east to the center of the continent. Water transportation was by far the least expensive mode of transportation, but the most direct Great Lakes route east was blocked by Niagara Falls between Lakes Erie and Ontario.

With the opening of the Erie (later the New York State Barge Canal) and Welland Canals in the 1820s, the western Great Lakes had more cost-effective routes to the ports in the eastern U.S. and Canada. The Illinois and Michigan (I & M) Canal, built in 1848, linked Lake Michigan at Chicago with the Mississippi River system and the Gulf of Mexico. The opening of the I & M Canal made it possible to ship goods from the northeast to the Gulf of Mexico through the Great Lakes and all points in between. This increased the movement of goods and people along this corridor and helped spur growth of both the agricultural and manufacturing economies.

These and later diversions, such as the Ogoki and Long Lake diversions, helped power the growth of manufacturing in the region as they served as the source of hydropower for many areas along the lakes. The lakes not only provided the means of transporting goods, helped power the growth of the region’s economy.
1.1.1 *New York State Barge Canal – 1825, modified in 1918*

The New York State Barge Canal began its existence as the Erie Canal, the very first diversion of Great Lakes water. The first Erie Canal was constructed between 1817 and 1825, a time of development of so-called “internal improvements” that helped to link the growing United States. It provided an outlet for agricultural goods from the upper Great Lakes to New York City and the rest of the world, and allowed the movement of finished goods from the Northeastern United States and Europe to the markets of the Midwest. The alternative was to try to move goods in both directions over underdeveloped roads and trails and the Appalachian Mountains.

The current Canal, completed in 1918 provides irrigation, hydropower, navigation, and recreation. The Canal takes water from the Niagara River at Tonawanda, New York and returns it all to Lake Ontario through several tributaries and the Oswego Canal. Throughout the Canal’s region, waters and wildlife have negatively impacted.

There have been plans studied over the years to divert Great Lakes water to New York City through the Canal by routing water through the eastern portion of the Canal and down the Hudson River, but none has ever been recommended. This does not eliminate the possibility of

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4 IJC, 1985 p. 20.
proposals coming in the future as the largest city in the U.S. will likely face increasing needs for fresh water. The Great Lakes are a plentiful source that New York City may want to tap into some day.

### Great Lakes Diversions

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<tr>
<th>Existing Interbasin</th>
<th>Date Operational</th>
<th>Average Annual Flow: CMS</th>
<th>Average Annual Flow: CFS</th>
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<td>1939</td>
<td>+45</td>
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<td>1943</td>
<td>+113</td>
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<td>(1848) 1900</td>
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<td>1860</td>
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<tr>
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<td>Akron (out of and into the Lake Erie basin)</td>
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<td>Welland Canal</td>
<td>(1829) 1932</td>
<td>260</td>
<td>9200</td>
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<tr>
<td>Detroit</td>
<td>1975</td>
<td>4</td>
<td>145</td>
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<td>London</td>
<td>1967</td>
<td>3</td>
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<td>Raisin River</td>
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<td>Chicago Expanded</td>
<td>1988</td>
<td>273</td>
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<td>1981</td>
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<td>1989</td>
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<td>Large</td>
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<td>Southern Ontario Pipelines</td>
<td>1965-96</td>
<td>Small</td>
<td>Small</td>
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2 The City of Hamilton, Ontario, which draws its municipal water from Lake Ontario, supplies a small portion of its treated supply, 0.1 cms (2 cfs), to three small communities on the Grand River in the neighboring Regional Municipality of Haldimand. The Grand, in turn, discharges into Lake Erie.
1.1.2 Welland Canal – 1829, modified in 1913 and 1932

Like the New York State Barge Canal, the Welland Canal was built to create a navigable waterway to link the western Great Lakes to the east. The Welland Canal was built to compete with the Erie Canal. It provides a navigable route between Lakes Erie and Ontario that links the western Great Lakes to the ports of the St. Lawrence River. The Canal was used as a deep draft navigational waterway initially and, by about 1900, also for power generation. In addition, the diversion today supplies water for industrial and municipal use and hydropower. The Welland Canal diverts water from Lake Erie at Port Colburn across the Niagara Peninsula to Lake Ontario at Port Weller, bypassing the Niagara River and Niagara Falls.

The Canal was originally built in 1829, but it has been realigned and lengthened several times. The present Welland Canal is a modified version of that built between 1913 and 1932. Since 1959 the St. Lawrence Seaway Authority, a Canadian Crown corporation, has operated the Canal as an integral part of the St. Lawrence Seaway system. Additionally, increases of flows through the Welland Canal have been due to the installation of additional power generation capacity.

The diversion of water through the Welland Canal increases the outflow capacity of Lake Erie. As such, it lowers the level of Lake Erie and the rest of the Great Lakes upstream of the Canal. The Canal provides significant benefits to shipping on the Great Lakes by linking Lake Ontario and St. Lawrence ports to the upstream Great Lakes and provides a very good navigable waterway to link all of the Great Lakes to the rest of the world. The presence of the Canal has, however, increased the influx of exotic species to the Great Lakes that would not otherwise have entered the system, by providing a navigable waterway for aquatic nuisance species from the oceans and other parts of the world where ships take on ballast. The infusion of sea lamprey into the Great Lakes virtually wiped out the lake trout of the upper three Great Lakes.

Forestport Diversion - 1820s

The New York State Barge Canal is considered an intrabasin diversion, in that all water withdrawn from the Niagara River which is not consumed in various uses finds its way back through tributaries to Lake Ontario. However, this canal continues eastward beyond the Great Lakes basin. Near Rome, NY, waters from the upper reaches of the Black River which naturally flow north from the Adirondacks into Lake Ontario were diverted southward at Forestport in the 1820s into a section of the canal and carried eastward into the Hudson River basin.
flows of roughly 1 cms (40 cfs) are taken most of the time, rising to a maximum of 5 cms (180 cfs) in drought periods. Recreation is the primary beneficiary in this century."}

1.1.3 Chicago Diversion – 1848, modified in 1900

Water has been diverted from the Great Lakes Basin via the Lake Michigan diversion at Chicago (Chicago diversion) since the completion of the Illinois and Michigan (I&M) Canal in 1848. The original purpose of the Canal was to provide navigation from the Great Lakes to the Mississippi River and the Gulf of Mexico.11

In 1900, the city completed the Chicago Sanitary and Ship Canal, a much larger channel that met the greater sanitary and shipping needs of the time. The Chicago River's flow was reversed, causing the Lake to flow into the river, flushing the raw sewage down the new canal with the Great Lakes water and preventing the pollution from entering the Great Lakes system.12

The Chicago diversion, at 90 cubic meters per second, is by far, the largest diversion of water out of the Great Lakes Basin. Since 1980, Illinois has been allocating its diversion of domestic water to a larger number of communities in areas just outside the Basin. In order to obtain access to Lake Michigan water, these communities must implement strict regulations set by the State of Illinois and agreed to by the other Great Lakes States to ensure the conservation of the lake water.13

The diversion of water through the Illinois waterway to the Mississippi River is primarily for water supply, sewage disposal and navigation. The State of Illinois has jurisdiction over the diversion, which is governed by the U.S. Supreme Court Consent Decrees (1967 and 1980).14 In 1994, several Great Lakes States registered their belief that Illinois violated these Consent Decrees by diverting more water than is allowed. In 1996, the eight Great Lakes States, the Metropolitan Water Reclamation District (MWRD) of Greater Chicago and the United States entered into a Memorandum of Understanding (MOU) to settle the dispute. The State of Illinois agreed to reduce its diversion over the next several years to place it back in compliance with the Consent Decrees, repair the leakage at the Chicago Controlling Works where Lake Michigan and the Chicago River meet, and pump any future leakage back into Lake Michigan by 1999. The U.S. Army Corps of Engineers also agreed that it would repair the leak at the Chicago Locks at the junction of the River and the Lake.15

Portage Canal - 1860s

12 IJC, 1985, p. 15.
13 Interview with Illinois Department of Natural Resources staff.
14 IJC, 1985, p. 15.
This canal constitutes an *interbasin* connection, diverting flow from the Wisconsin River, of the Mississippi basin, into the Fox River that empties into Lake Michigan. Like the Forestport diversion, the Portage diversion is small, carrying little more than 1 cms (50 cfs), and is used today primarily for recreation\(^{16}\).

1.1.4
1.1.5 Long Lake and Ogoki Diversions – 1941 and 1943

The Long Lake and Ogoki diversions of 1941 and 1943, respectively are unique among Great Lakes diversions. They divert water into the Great Lakes Basin. In fact, because of these two diversions, more water is diverted into the Basin than is diverted out. The Long Lake and Ogoki diversions are but are often viewed as a single diversion because they are both intended to increase the flow of water into through the Great Lakes to increase Canadian hydropower capacity to power industries critical to providing materials for fighting World War II. The water that is diverted into the lakes would otherwise flow from Long Lake and the Ogoki River into the saltwater of James Bay.\(^{17}\) The two diversions also provide more water to the Great Lakes than is diverted out by all diversions from the lakes combined. If the diversions were ceased, it would adversely impact hydropower production and likely lead to lower lake levels.

The diversions set the stage for future Great Lakes diversion proposals that went beyond providing the means for development for surrounding areas. These proposals, if adopted, would further develop hydropower, but also increase the James Bay diversions into the Great Lakes and transfer significantly larger amounts of water to more arid areas of the countries.

**Raisin River Diversion, 1968**

The Raisin River Conservation Authority received approval from the International Joint Commission to divert 0.7 cms (25 cfs) of water from the St. Lawrence River west of Cornwall, Ontario, a few kilometres northward to supplement low summer flows in its Raisin River tributary. The Raisin then discharges east of Cornwall into the St. Lawrence.\(^{18}\) The Authority agreed to compensate hydroelectric entities at Cornwall-Massena for this *intrabasin* diversion bypassing their generating plants.

**“GRAND” PROPOSALS**

Between 1959 and 1982, several diversion proposals were developed by private and federal government entities that, while they still sought to use the Great Lakes as a resource for

\(^{16}\) Farid et al., 1997.

\(^{17}\) IJC, 1977, pp. 10-15.

development, promoted the Lakes as a commodity, as opposed to a means for transporting goods or building the region’s economy. Two of these projects, the GRAND Canal and the Ogallala Aquifer regeneration project, proposed to stabilize the Great Lakes and help generate further economic development for the Region. They also proposed the physical transfer Great Lakes water to replenish overused water sources or create new sources of water for areas that need water. A third, the Wyoming Coal slurry project, proposed using Lake water to transport coal slurry in a pipeline. A final project proposed using Great Lakes water to help improve navigation on the Mississippi River in a period of drought.

These proposals were more far reaching than previous projects in that they would have moved water from the Great Lakes region to other regions of North America. One of the primary purposes of the diversion project was to stabilize the Great Lakes system and help economic development in the Region, but it also would have transferred the waters of the Great Lakes for the benefit of these other regions. Critics of these proposals were concerned about the environmental costs that would have resulted from the project both in the Great Lakes and in the James Bay Basin. It is likely that these negative environmental impacts would have exceeded any economic benefit to the region. The uncoordinated development of Great Lakes diversions combined with the concern that the region might be trading away its greatest competitive and environmental advantage helped to focus policy makers in the Great Lakes region to begin developing a regional system for managing the Great Lakes.

During this time period, heightened awareness of the vulnerability of the Great Lakes was ever present in the minds of the region’s leaders and citizens. The region was experiencing increased pollution in the lakes that had caused many to believe that the Great Lakes were dying. At the same time, the region’s economy was undergoing significant changes as manufacturing industries, the heart of the Great Lakes regions’ economy, were moving to the sunbelt of the south and southwestern United States. Many of the region’s residents did not want to see the region’s most important competitive advantage, the Great Lakes, transferred to these same areas where its industries were moving.

Great Recycling and Northern Development (GRAND) Canal - 1959

Like the Long Lake and Ogoki diversions, the GRAND Canal project, first proposed in 1959, was designed to divert water, that would otherwise flow into James Bay, into the Great Lakes Basin. Unlike those two diversions, one of the primary reasons for this project is to physically transfer James Bay and Great Lakes water to areas that are in need of more water in the southwestern areas of the U.S. and central Canada. Had this canal been constructed, James Bay would have been dammed and converted into a freshwater lake by preventing the mixture of freshwater runoff with the saltwater from Hudson Bay. The proposal involved the construction of a 100-mile long dam to hydrologically separate James Bay from Hudson Bay. Freshwater

\footnote{Great Lakes Governors Task Force on Water Diversion and Great Lakes Institutions, A Report to the Governors and Premiers of the Great Lakes States and Provinces, p. 4.}
would be pumped over the Arctic divide and transferred into the Great Lakes. The GRAND Canal scheme was proposed in Canada as a partial solution to the emerging water quantity problems faced by the semi-arid, agricultural Canadian and U.S. central plains.

Proponents of the diversion claimed that this project would transport the freshwater resources that would otherwise be deposited in James Bay. Proponents of the scheme note that this diversion would provide a mechanism for controlling and stabilizing flow in the Great Lakes; increasing transportation options and yielding water quality benefits. Furthermore, they believe that the diversion would bring in a new supply of water to relieve areas in Canada and the U.S. in need of water. Opponents of this diversion are concerned with various environmental and economic factors. In order for the development of the Canal to begin, $100 billion (Canadian) would need to be raised to construct it. It would also have required the support of the federal governments, the provincial governments of Quebec and Ontario, and the eight Great Lake States because of requirements of the Boundary Waters Treaty and federal laws in both countries.

1.1.6 Ogallala Aquifer Regeneration Investigations – 1976-1982

The U.S. and Canadian governments have never seriously considered the GRAND Canal proposal, but the U.S. government has sponsored studies that review ways of transporting water to replenish water systems that have been overdrawn. One such system is the Ogallala Aquifer. The Ogallala Aquifer is believed to be the largest underground reserve of fresh water in the world and it underlies land in eight States: Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming. The aquifer has been the primary source of water in this major agricultural area since the 1930’s, but due to overuse, the aquifer has been significantly depleted.

In 1982, the U.S. Army Corps of Engineers released a study on potential mechanisms to replenish the High Plains Ogallala Aquifer. One element of the study was the research of possible inter-basin transfers from “adjacent areas” if surplus waters existed. In addition, the study investigated whether or not it would be cost effective to import those waters for agricultural use in the High Plains area when shortages exist. The findings indicated that the “interstate water transfer” strategy from the Missouri River would be ill advised on both economic and environmental grounds because there would be insufficient flow from the Missouri River to support the River and adequately replenish the Aquifer. The study concluded that the only feasible water management strategy for reducing stress on the Ogallala Aquifer was a reduction in consumptive rates via a greater emphasis on conservation and efficient use.

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21 Muller, p. 164.
22 Muller, p. 164.
23 Muller, p. 166.
24 Great Lakes Governors Task Force on Water Diversion and Great Lakes Institutions, p. 4.
The study, however, raised concern because the Great Lakes was the nearest large source of water, they might be seen as a source for providing water to the western U.S. These fears were heightened by another proposal from Colorado which called for a canal or a pipeline to carry water from the Great Lakes to the rapidly growing economies in the Southwest U.S.

1.1.7 Wyoming Coal Slurry Proposal - 1981

Historically, the Great Lakes region considered itself immune to water availability and supply problems. New concern over this issue emerged in 1981 when a coal slurry pipeline company considered a plan to move high-grade coal from Wyoming to the Great Lakes region. One option involved transporting Lake Superior water to Wyoming via a pipeline system. This water would be used in the production of the coal slurry; and then, the slurry would then be transported back to the Great Lakes via a different pipeline. This plan was abandoned when Congress failed to pass legislation allowing the company to build the proposed pipeline over existing railroad rights-of-way.25

This proposal for the coal slurry pipeline, combined with the Ogallala Aquifer study, were the primary drivers for the Great Lakes Governors and Premiers in deciding to work together in developing a regional strategy to protect the Great Lakes. These two proposals, which were suggested during the recession of the early 1980s, led many to pursue ways to prevent the resources of the Lakes from being moved as businesses were moving.26

1.1.7.1.1 Chicago River/Army Corps of Engineers Proposal to Raise Mississippi River Levels - 1988

The concerns about the possibility of large-scale diversions had a direct impact on the creation of the Great Lakes Charter and the Water Resources Development Act of 1986 (WRDA). Under the Charter, the Great Lakes Governors and Premiers agreed to notify and consult each other regarding proposals to consume or divert Great Lakes water of over 5 million gallons per day (gpd). The WRDA requires that all Great Lakes Governors approve any proposal to divert water from the Great Lakes or their tributaries.27 As such, the Charter and the WRDA provide mechanisms to protect the Great Lakes from the development of uncoordinated, ill-conceived diversions that would have harmful effects on the Great Lakes ecosystem.

While the Charter and the WRDA do not prohibit large-scale diversions, they contain significant policy barriers that make it difficult for large-scale diversions to be approved. In 1988, the Midwestern U.S. suffered through a summer drought. The drought affected the flow of traffic on the Mississippi and Illinois Rivers, stranding barges and other river vessels on some portions of the rivers. The Army Corps of Engineers sought approval for a temporary diversion increase

25 Great Lakes Governors Task Force on Water Diversion and Great Lakes Institutions, p. 4.
26 Great Lakes Governors Task Force on Water Diversion and Great Lakes Institutions, p. 4.
27 U.S. Public Law 99-662 §1109.
from Lake Michigan. The increased diversion was intended to raise levels on the Mississippi River, easing the navigational crisis. Several Great Lakes Governors and Premiers immediately raised concerns about the impact of the proposal. After performing an impact analysis, the Army Corps of Engineers determined that the proposal would not have its desired effect and decided to withdraw it.28

While this proposal occurred after the passage of the WRDA and the Charter, it represents the last of the so-called “grand” proposals during this period. From the negative reactions to and rapid retraction of this proposal, it became clear that these larger proposals would not be taken as seriously under the new policy regime.

**BUILDING A COOPERATIVE BASIN MANAGEMENT SYSTEM**

The Charter and the WRDA created a new policy regime and framework for managing the Great Lakes water resources. The agreement and the statute provide a set of principles and fluid mechanisms for protecting this valuable resource. The process has not been without difficulties as the States and Provinces have developed a much more rigorous review process that requires more detailed study of the impacts of proposed diversions.29

The 1985 IJC report on diversions identified a series of recommendations for managing the Great Lakes more effectively. Among these were recommendations that the governments:

1. Establish a bilateral data committee to monitor all existing diversions and consumptive uses
2. Establish a bilateral task force on diversions and consumptive uses
3. Institute a cooperative review of current public policies at the federal and state and provincial levels
4. Consult on the status of waters diverted
5. Engage in a process of prior notice and consultation before additional new or changed diversions are approved30

The Great Lakes Governors and the Premiers of Ontario and Quebec implemented these recommendations one month after the IJC report was issued when they signed the Great Lakes Charter. The Charter established a Water Resources Management Committee that oversees a regional notice and consultation process for diversion and consumptive use proposals, created a Regional Water Use Database, and identified a series of principles that should govern Great Lakes water management decisions.31

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29 Council of Great Lakes Governors staff interviews.
30 International Joint Commission, p. ix.
31 The Great Lakes Charter was signed on February 11, 1985.
The types of diversion proposals reviewed using the prior notice and consultation process since the enactment of the Charter and the WRDA are much different in character from the large-scale diversions proposed between 1959 and 1982. They have more in common with intra-basin diversions that occurred during the same time period for London, Ontario and Detroit, Michigan. In 1967, the city of London constructed a 47 km pipeline from Lake Huron to serve London and 13 other communities. The pipeline has a 270 million liters per day (mld) (71 million gallons per day) capacity to sustain the communities' expanding water needs. In 1975, a similar intra-basin diversion was completed to provide water for the city of Detroit. As a result, Detroit’s domestic water supply system has withdrawn approximately 4 cms (145 cfs) from Lake Huron, the bulk of which is returned to the system via the lower Detroit River.32

The Charter and the WRDA vary in the way they deal with defining what a diversion is, and there remain unanswered issues regarding their implementation. The most prominent question is how to deal with groundwater under the WRDA, because it does not explicitly mention that the Governors must approve the diversion of groundwater. In addition, the Nova Group Ltd. proposal to export bulk water from the Great Lakes to Asian countries highlighted a perceived gap in how to handle potentially precedent setting issues that were unanticipated in the Charter.

1.1.8 The Impact of the Charter and the WRDA

The Great Lakes Charter and the WRDA are direct reactions to the threat that large-scale projects from outside the Great Lakes Basin. In particular, the proposed Wyoming Coal slurry pipeline diversion and the possibility of using Great Lakes water to replenish the Ogallala Aquifer caused the Great Lakes Governors and Premiers to identify cooperative mechanisms to manage the Great Lakes and to regulate diversions of Great Lakes water. The Charter is a voluntary agreement based on the premise that the Lakes must be managed to protect the bi-national water resource effectively. The Great Lakes Governors and Premiers must notify and consult each other on major water uses that will impact the entire ecosystem33. The WRDA effectively requires notice and consultation under the Charter for every U.S. diversion proposal because it requires Governors’ approval for all diversions regardless of size. The Governors and Premiers recognized this reality when they agreed to use the Charter process for all diversion proposals that fall under the authority of the WRDA.34

The Great Lakes Charter is a non-binding, good faith agreement under which the Great Lakes States and Provinces agree to cooperate in managing the Great Lakes resource. Under the Charter, diversion and consumptive use proposals of over 5 million gallons per day trigger a notice and consultation process under which Governors and Premiers may object to a proposed water use.35 Additionally, the States and Provinces agreed to develop a broader water resources

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32 Ontario Department of Natural Resources staff interviews.
management plan that would assist them in managing the water resources collectively.36 The WRDA is a binding federal law that requires the Great Lakes Governors to review and approve any proposed diversion of Great Lakes water within the United States.37

The Charter, however, has not been fully implemented. The lack of binding power of the agreement leaves provinces and states powerless if they object to a diversion or consumptive use in the other country. This is one of several criticisms of the Charter that include: data gathered for the regional database is sometimes incompatible and inconsistent; the trigger level for the Charter process is too high; it does not apply to existing diversions like the Chicago diversion; and the Water Resources Management Committee does not meet regularly.38

One of the main criticisms of the Charter has been that the Water Resources Management Plan agreed to by the States and Provinces has never been fully developed or implemented.39 This was the unintentional effect of the passage of the WRDA. It is possible that authority that was granted to the Great Lakes Governors under the WRDA to approve all diversion proposals shifted the focus from water management planning to managing diversion decisions and the diversion decision process. States spent time and effort in reviewing more detailed diversion proposals to determine if individual diversion proposals were appropriate uses of Great Lakes water rather than on in consulting and developing broader management policies for the Great Lakes resource as a whole.

The 1987 implementing resolutions for the Great Lakes Charter that were approved by the Great Lakes Governors and Premiers outlined a review process for diversion proposals.40 The process for reviewing and approving diversions pursuant to the Charter and the WRDA has evolved into a formalized, thorough process for reviewing the merits of any diversion proposal. Though it has not been codified, the requirement for extensive information before a diversion proposal can be approved has through custom and usage become the de facto process for determining whether a diversion from the Great Lakes Basin will be approved by the Great Lakes Governors and Premiers. The information requested for a diversion proposal review is listed in Appendix A.

DIVERSION AND REMOVAL PROPOSALS

The diversion and water use proposals that the Governors and the Premiers have reviewed to date have not been large-scale projects to transfer water to the southwestern United States or foreign countries as was predicted. All of the serious proposals reviewed since 1986 have been for small-scale diversions of water to communities just outside the Great Lakes Basin which were looking to replace contaminated groundwater or provide a high quality source of water to meet growing population projections.

38 The Fate of the Great Lakes, pp. 35-36.
39 The Fate of the Great Lakes, p. 35.
Over the lifetime of the Charter and the WRDA, it is apparent that diversion proposals that include a use and return of similar amounts of water have been looked upon more favorably. The Pleasant Prairie diversion set a precedent for returning the water to the Basin. The City of Akron diversion set a precedent in ensuring that water is returned to the Basin to minimize the impacts on the areas from which water is withdrawn.

**Pleasant Prairie, Wisconsin - 1988**

In February 1987, the Great Lakes Governors and Premiers approved a report, *Managing the Waters of the Great Lakes Basin*, that outlined how the review of diversion proposals should be handled for both the Charter and the WRDA. The report outlined a process through which all proposals would be reviewed under the auspices of the Charter and the WRDA. It also outlined the information on the planned diversion or consumptive use that must be included within a formal proposal to the Governors and Premiers.

Wisconsin made the first proposal for a diversion of Great Lakes water under the new policy regimes in 1987, with the final decision made in 1989. Pleasant Prairie, Wisconsin town officials and the Governor of Wisconsin requested that the town receive up to 3.2 million gallons of Lake Michigan water per day for domestic use in order to meet projected water needs.41

The city of Kenosha, Wisconsin had been providing approximately 100,000 gpd to Pleasant Prairie since the mid 1960s, but the proposed increase required approval because it was considered a new diversion due to the fact that the amount of water taken increased. Pleasant Prairie was growing in population and required a safe drinking water supply. The town’s water supply violated federal drinking water standards for combined radium and gross alpha activity.42 The proposed gallons per day diversion was below the trigger level outlined in the Charter, but because Pleasant Prairie is located outside the Basin, it required approval by all eight Great Lakes Governors under the WRDA.

A brief outline of the proposal was forwarded to all of the Great Lakes Governors and Premiers. It was agreed that a like amount of water would be returned to the Lake Michigan Basin by 2005. After 2005, the diversion would provide “no net loss” to Lake Michigan. There was no formal consultation meeting held to discuss the proposal, but State officials discussed the proposal directly with individual representatives from relevant state agencies and Governors’ offices and in late 1989, all eight Great Lakes Governors approved the Pleasant Prairie diversion.

**Lowell, Indiana – 1991-92**

41 Letter from Governor Tommy G. Thompson to Governor Richard Celeste, March 29, 1989.
42 Wisconsin Department of Natural Resources, Pleasant Prairie Diversion Fact Sheet, January 1992.
The process for reviewing the diversion proposal for Lowell, Indiana was critical in setting more formalized procedures for review under the Charter and the WRDA. It also helped Governors and Premiers identify exactly what information and in how much detail was required for submission to the Governors and Premiers so that they could make an informed decision in approving or denying a diversion proposal.

The town of Lowell, Indiana is located four miles from the Great Lakes Basin and 25 miles south of Lake Michigan. When the U.S. Environmental Protection Agency issued an order requiring the town to comply with federal fluoride standards because the town’s water supply had excessive fluoride levels, town officials requested the approval of a diversion of 3.8 million gpd from Lake Michigan in order to provide an adequate and safe water supply to the community’s residents. The 3.8 million gpd included an allocation for current and anticipated water uses. As part of the town’s proposal, the Gary-Hobart Water Utility, which is located entirely within the Great Lakes Basin, agreed to purchase the Lowell water utility and provide the town with water.43

Initially, town officials from Lowell, Indiana prepared a proposal that was similar to the one prepared by Pleasant Prairie. The Governors and Premiers requested more detailed information for the Lowell proposal than they had for the Pleasant Prairie proposal. Several also expressed concern that the amount of water requested by town officials was too high and would encourage over-development and sprawl. Town officials later reduced the requested amount to 1.7 million gpd, with a stipulation that the same amount of water would be returned to the Basin. The proposal also was expanded to include the Town’s adoption of strict conservation clauses.44 The purpose of this was to indicate that town residents would be responsible users of Great Lakes resources.

Town officials made efforts to show that the Great Lakes alternative was the best alternative. In its updated proposal, Lowell officials highlighted alternative water sources that had been investigated. The Town of Lowell could not take water from the oversubscribed Kankakee River nearby and officials felt that well water alternatives raised other similar contamination issues or did not meet the quality of the Lake Michigan alternative. Additionally, town officials showed survey results that, although purchasing Lake Michigan water would double water bills for town residents, an overwhelming majority of Lowell citizens favored purchasing Great Lakes water to meet their water needs.

These changes in the proposal did not help in obtaining the necessary Governors’ approval. Only six Governors formally approved the proposal. Michigan Governor John Engler, expressed his belief that a diversion should be approved only in the case of imminent danger to public health, safety, and welfare, and that there is no feasible alternative water supply. Governor Engler stated his belief that there were other alternative water supplies that the town could use.45 New York Governor Mario Cuomo neither approved nor rejected the proposal, although the New York

43 Fact Sheet for the Proposed Town of Lowell Diversion, October 31, 1990.
44 Letter from Governor Evan Bayh to Governor John Engler, December 13, 1991.
45 Letter from Governor John Engler to Governor Evan Bayh, May 8, 1992.
Department of Environmental Conservation recommended that he not approve it because the diversion proposal did not appear to be the most economically or environmentally feasible solution.\(^{46}\) Ontario Premier Bob Rae and Quebec premier Robert Bourassa both objected to the proposal under the Charter.

Ultimately, Lowell did find a replacement water supply. The town developed a well field to the southeast of the town.\(^{47}\) The water is drawn from shallow, sand-system wells that are regenerated primarily by rainfall. While these wells meet the current needs of the town, they are susceptible to contamination and the variances in precipitation from year to year.

\subsection{1.1.8.1.1 Akron, Ohio—1997-98}

The importance of the Lowell diversion review process was that it set a more concrete process in governing the review of proposals under the Charter and the WRDA. Several Governors expressed their concern that concerns that the review process was not sufficiently rigorous for Governors to make informed decisions. Additionally, it became evident that several Governors would require that all diversions include a provision that a comparable amount of water be returned to the Great Lakes Basin. Furthermore, Governors and Premiers agreed that all future indications of approval or non-approval under the WRDA and objection or non-objection under the Charter be made formally in writing.

Officials from the City of Akron, Ohio and the State of Ohio learned from the lessons of the Lowell process when they successfully received approval for a diversion of Great Lakes water to unincorporated townships just outside Akron that are also located outside the Great Lakes Basin. Under the proposal, the expanded water supply by the City of Akron provides a water service option for the unincorporated areas adjacent to the city through Joint Economic Development District (JEDD) agreements in exchange for income taxes from residents of the JEDDs.\(^ {48}\) City and State officials made sure that the initial proposal addressed the issues that had been raised in the Lowell process.

In July 1997, following a period of informal discussions with Great Lakes State and Provincial officials, Ohio Governor George V. Voinovich formally requested on the City of Akron's behalf that the Great Lakes Governors approve their diversion request of 3.44 million gallons of water per day from the Lake Erie Basin.\(^ {49}\) The proposal stated that there would be “no net loss” of water from the Great Lakes Basin as a similar amount of water would be returned to the Great Lakes Basin. Any water that is diverted from the Great Lakes Basin will be either returned to the watershed or replaced by water from another point within the Ohio River watershed.\(^ {50}\)

\(^{47}\) Interview with Indiana Department of Natural Resources staff.
\(^{50}\) Black and Veatch, p. iv.
Following review of the proposal and direct communications between the relevant state water agencies investigating the proposal, the eight Great Lakes Governors approved the diversion, but with several conditions. Individual Governors stated that there should be "no net loss" of water to the Great Lakes system and that the resource needs of municipalities using water along the Cuyahoga River system downstream of the diversion should be considered as long-term water resource development proceeds. Additionally, they required assurances that an adequate quantity and quality of both surface and groundwater be supplied to support in-stream needs of aquatic life in the river and the return flow of water to the Great Lakes Basin should meet water quality requirements as outlined in statutes. Ohio is ensuring that the environmental impacts of the movement of water across the Basin line are mitigated both in the Lake Erie and Ohio River Basins.  

1.1.8.1.2 Crandon Mine – 1997-98

The Great Lakes Governors and Premiers developed a firm process for reviewing proposed diversions of Great Lakes water under both the Charter and the WRDA. While the process is the same for both, there are some issues that have not been adequately resolved in reconciling the voluntary agreement with the U.S. federal statute. In particular, while it is clear that proposed diversions of groundwater of over 5 million gallons per day from the Great Lakes Basin require notice and consultation under the Charter, the WRDA is vague. This was evident in the case of the 1997-98 proposal to pump water from the Crandon Mine to the Wisconsin River.

The Crandon Mining Company (CMC) proposed to build a zinc, lead, and copper mine near Crandon, Wisconsin. To do so, groundwater needed to be hydraulically pumped from the mine, which clearly lies within the Great Lakes Basin, to the Wisconsin River, which lies within the Mississippi River Basin, through a 38-mile pipeline. The major issue for Wisconsin State officials and the U.S. Army Corps of Engineers was whether or not the groundwater in the mine is "tributary" to the surface water as defined in the WRDA, thus making this diversion subject to the Governors' approval under the WRDA.

Advocates of the project stated that stormwater runoff and groundwater does not fall within the definition of "Great Lakes tributary" under the WRDA because they are not the common and ordinary meaning of the word "tributary." It was argued that Congress did not intend to include "groundwater" in the legislation because the word is not specifically mentioned in the statute.

On the other hand, opponents argued that groundwater cannot be separated from the Great Lakes and tributaries. A significant portion of the water that enters the Great Lakes flows through underwater aquifers and other groundwater sources as it moves through the Great Lakes Basin.

51 Letter from Governor George V. Voinovich to Governor John Engler, January 12, 1998
system. As such, any diversion of water from groundwater within the Great Lakes Basin will have a direct effect on the tributaries and lakes downstream.

In light of these arguments, the Army Corps of Engineers granted a permit to the CMC to move forward with the project after it determined, for the purposes of permit evaluation, that groundwater diversions were not included in the WRDA prohibitions. However, recognizing the Governors' authority under the WRDA, in December 1997, the Corps requested comments from the Great Lakes Governors' regarding whether or not they believed this proposed groundwater diversion falls under the auspices of the WRDA. Michigan, Minnesota, and New York notified Wisconsin Governor Tommy Thompson that they believed that groundwater is covered under the WRDA. It should be noted that the Great Lakes Charter includes groundwater in its definition of Great Lakes waters, but the Crandon project did not reach the trigger level of 5 million gpd outlined in the notice and consultation procedures.

Whether or not this particular project fell under the auspices of the WRDA was never fully determined. Before the Governors could collectively address the question, the Nicolet Minerals Company bought CMC. Shortly thereafter, the Nicolet Company withdrew the request for a permit to discharge water into the Wisconsin River, citing their use of alternative technology that would pump less water out of the mine and thus eliminating the need to divert water to the Wisconsin River. By reducing water inflow, the Nicolet Company said that they could keep the remaining water on site after treatment, thus eliminating the need to pump it out of the Basin.

1.1.8.1.3 Nova Group, Ltd. Water Withdrawal Permit - 1998

In 1998, the Ontario Ministry of the Environment issued a permit to the Nova Group, Ltd. of Sault Ste. Marie, Ontario, to take water from Lake Superior for export to Asia. This proposal was not a diversion proposal, but rather a removal proposal. The amount of water allowed under the permit was below the trigger level set by the Charter and the Boundary Waters Treaty, but it would have set a precedent for future water withdrawals.

The permit application was reviewed as a simple water taking request in the regional office in Thunder Bay with impacts on the local area assessed. Using that criteria, the permit was approved. While the proposed water export did not meet the trigger level of 5 million gpd required under the Charter for notice and consultation, but the States and Provinces are not restricted to these trigger levels. The Ontario government cited this factor as a primary reason for revoking the permit.

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1.2 WATER AS COMMODITY

The Nova Group proposal seemed to raise a set of new issues related to water management because if water is exported in bulk, it is treated as a commodity subject to free trade provisions under the North American Free Trade Agreement (NAFTA) and the General Agreement on Tariffs and Trade (GATT). The fear is that exporting water once requires the bulk sale of water to other foreign countries in the future.

Bottled water is a premium product used almost exclusively for individual consumption and has seen an increase in sales over the last several years. According to the International Bottled Water Association, most bottled water comes from springs and groundwater wells; it is rarely drawn from surface waters. The amount of water used for bottled water is small relative to water takings by communities for domestic uses such as various household uses. Large beverage companies such as carbonated beverage bottlers and brewers tend to have wide-ranging bottling and distribution systems that use water from a local source near the bottling facility. This is done primarily to keep transportation costs low. Products do cross over lake and river Basin lines, but the volume transited is small relative to water used in communities.

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic Nonsparkling and Sparkling*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>1041.5</td>
</tr>
<tr>
<td>1986</td>
<td>1175.4</td>
</tr>
<tr>
<td>1987</td>
<td>1340.2</td>
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<tr>
<td>1988</td>
<td>1354</td>
</tr>
<tr>
<td>1989</td>
<td>1760.6</td>
</tr>
<tr>
<td>1990</td>
<td>1929.3</td>
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<tr>
<td>1991</td>
<td>1942.8</td>
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<tr>
<td>1992</td>
<td>2011.8</td>
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<td>1993</td>
<td>2165.2</td>
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<tr>
<td>1994</td>
<td>2389.3</td>
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<tr>
<td>1995</td>
<td>2594.4</td>
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<tr>
<td>1996</td>
<td>2828.6</td>
</tr>
<tr>
<td>1997</td>
<td>3101.7</td>
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<tr>
<td>1998</td>
<td>3446.6</td>
</tr>
</tbody>
</table>

* in millions of gallons

There is very little hard data or information on the movement of water via tanker truck outside the Great Lakes Basin. There is anecdotal evidence that water is supplied to individual homes by truck in many parts of the Great Lakes region, particularly in rural communities, but it does not appear to be a widespread occurrence. While it could not be confirmed, there is a sense that some bottlers ship Great Lakes Basin water or groundwater in trucks to bottling facilities around

the region. Whether this water crosses Basin lines is uncertain and this is a gap in information that needs to be further investigated.

The Nova Group proposal to export bulk water was not large in and of itself. The proposal to take Great Lakes water and ship it to Asia was the first formal proposal to move Great Lakes water to a foreign country by ship for profit. Great Lakes water, however, is already put into ships for transport, but not for sale, overseas. Ship operators take on water for ballast in ships so that the vessels can maintain stability when cargo holds are empty. There are no accurate figures available for the amount of water that is taken from the Great Lakes to fill ballast tanks. Inferences can be made, however, based on the number of ships that are carrying ballast out of the Great Lakes on the Lake Ontario-Montreal portion of the St. Lawrence River. The St. Lawrence Seaway Management Corporation keeps statistics on how many ships carry ballast on different portions of the St. Lawrence Seaway. The figures are based on the assumption that ballast vessels carry approximately 50 percent of their total cargo carrying capacity. Thus, on average, ballast vessels would carry about 12,000 tons of ballast water.

<table>
<thead>
<tr>
<th>Year</th>
<th>Ballast Water Brought Into the Great Lakes by Ocean-Going Vessels (in gallons)</th>
<th>Ballast Water Taken from the Great Lakes By Ocean-Going Vessels (in gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>144,000,000</td>
<td>559,000,000</td>
</tr>
<tr>
<td>1997</td>
<td>158,000,000</td>
<td>351,000,000</td>
</tr>
<tr>
<td>1996</td>
<td>97,000,000</td>
<td>455,000,000</td>
</tr>
<tr>
<td>1995</td>
<td>236,000,000</td>
<td>164,000,000</td>
</tr>
<tr>
<td>1994</td>
<td>95,000,000</td>
<td>103,000,000</td>
</tr>
<tr>
<td>1993</td>
<td>74,000,000</td>
<td>293,000,000</td>
</tr>
<tr>
<td>1992</td>
<td>270,000,000</td>
<td>201,000,000</td>
</tr>
<tr>
<td>1991</td>
<td>443,000,000</td>
<td>167,000,000</td>
</tr>
<tr>
<td>1990</td>
<td>322,000,000</td>
<td>242,000,000</td>
</tr>
</tbody>
</table>

The amount of water taken as ballast does not seem to follow a particular pattern from year to year. There was an average of 304 million gallons of water taken from the Great Lakes into ocean going vessels and 218 million gallons brought in. In reality this is not a significant amount of water taken from the Lakes. Both average out to less than one cubic foot per second. No evidence that ballast water taken from the Great Lakes is used for re-sale in foreign markets was found. Generally, that water is discharged from the ship at the next port at which a ship takes on cargo.

The “import” of ballast water does create environmental problems for the Great Lakes. Government officials, environmental organizations and citizens have expressed great concern about the introduction of aquatic nuisance species, such as zebra mussels and goby into the Great Lakes. Continued discharge of ballast without screening or treating ballast water will continue to introduce such species into the Great Lakes. Along the same lines, discharging Great Lakes

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56 Source: St. Lawrence Seaway Corporation. All calculations are based on water weighing 8.3 pounds per gallon meaning that there are 240 gallons per one ton. Each vessel carrying ballast would be assumed to be carrying approximately 2.88 million gallons of ballast water.
ballast water into foreign ports will likely introduce Great Lakes native and other non-indigenous species into other waters where they might cause significant environmental disruption.

**ECONOMICS OF WATER REMOVAL**

The population of the earth has increased dramatically over the last century leading to increased demands for fresh water supplies to serve these populations. Additionally, countries are more actively pursuing development policies that will increase their citizens water use. The Great Lakes, containing 20 percent of the world’s fresh water, will be a very attractive source of water for regions needing water both domestically and internationally.

The permit granted and later revoked by the Ontario Ministry of the Environment to the Nova Group was the first permit issued to a commercial entity for the purpose of exporting Great Lakes water but it is unlikely that it would have made a profit. Currently, it is more economical for most countries and communities to stretch their water supplies through conservation, desalinization and transport of water from geographically closer markets. If the cost of transporting water through bulk removal by ship or pipeline decreases significantly and the price of water increases pressures to export Great Lakes water will increase by countries that want to buy the water and companies that want to develop the resource for profit.

1.2.1.1.1.2 Bulk Water

The Great Lakes are relatively inaccessible to the outside world because there is no quick or easy outlet for a large number of smaller ships to transit through the narrow channel between the Great Lakes and the Atlantic Ocean. In addition, ships that can travel on the Great Lakes system are smaller relative to vessels that travel exclusively on the oceans. The largest Laker that can operate on the Great Lakes upstream of Buffalo holds approximately 7.2 million gallons of liquid product.57

Given these restrictions, the cost of operating those tankers, and the extended time it would take to transport the water to Asia, it is difficult to calculate how the Nova Group proposal would have been a money making venture. Typically, tankers can make the trip from the St. Lawrence River to the Middle East in roughly 15 days.58 Shipping water from Lake Superior, as the Nova Group proposed would add approximately 5 days on each side of the trip. Shipping costs alone for a Great Lakes tanker are estimated at between $30,000 and $50,000 per day.59 Operating costs for a round trip (estimated at between 25 and 30 days) would likely range between $750,000 and $1.5 million. This does not include planning, capital, maintenance or overhead.

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57 According to the Lake Carriers Association, the maximum size of a ship that can operate on the Great Lakes is 740 feet long, 78 feet wide and has a 26.3-foot draft. The largest vessel can hold approximately 30,000 tons of liquid product.
58 Interview with Mobil Oil Company staff.
59 Interview with Lake Carriers’ Association staff.
costs. A shipper could make a profit selling Great Lakes water, but the profit margin seems low, and there are much more profitable products that could be shipped. For the time being, it appears there is a greater profit margin for transporting bottled water or other products in a tanker. This could change as more countries try to find new water sources and the price of water increases.

Therefore, the economic feasibility of shipping bulk water to overseas markets in Asia or the Middle East is questionable at this time. The economics of shipping bottled water over bulk water indicates that there are cost incentives to ship water in bottles. Aquaroute, a Quebec-based shipping company has experience in transporting bulk water to the Bahamas, but not from the Great Lakes or other sources near the Great Lakes. Its bulk freshwater transport was profitable only because the water was transported from a nearby island that had surplus water. The President of Aquaroute noted that it is much more profitable to transport bottled water. In general, the company could charge C$3.25 per gallon for bottled water overseas, while it could charge only 30 cents per gallon for bulk water. Therefore, there is a greater financial incentive to export “processed,” rather than bulk water at this time.

**Alaska Water Sales**

To meet the growing demand for water, Alaska has established trade in bottled water and packages of ice, but has no long-term contracts for bulk sales of water. One company, Alaska Water Exports, is marketing glacier water that would otherwise runoff into the ocean as an alternative water supply for California markets. The main competitor for this “surplus water” is desalination. It contends that desalination requires too much energy to produce fresh water and that the Alaska water is of much higher quality. Alaska-based water is not seen as a replacement for current water sources, but is viewed as supplemental for use in times when there are water shortages. Alaska Water Exports has tested transporting bulk water using large bags pulled by tugboats. Whether this technology is viable for larger trade is uncertain at this time.

### 1.2.2 Desalination

The main competition for bulk water sales is constructing desalination plants. Oceans and saltwater seas are much more accessible to some areas of the world than are the Great Lakes. Although it requires a significant amount of energy to transform salt water into fresh water, desalination technology is becoming much more accessible around the world.

In 1990, the International Desalinization Association estimated that the operating costs for desalinizing brackish water ranges between $325 and $780 per acre-foot ($1 and $2.40 per 1000

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61 Presentation by Ric Davidge, President, Alaska Water Exports, IJC Water Removals Reference Experts' Workshop, Toronto, Ontario, March 31, 1999
gallons). The cost for seawater desalting is estimated at $1300 and $5200 per acre-foot ($4 to $16 per 1000 gallons).62

The city of Santa Barbara built a reverse osmosis desalination plant that began operating in 1995. The operating costs have been estimated at approximately $1500 per acre-foot ($25,000 gallons) of water produced, although the city admits that the relatively high variable costs for desalinization makes this supply the last to be utilized during water shortages. Because of the relatively higher operating costs, the facility is in stand-by mode and it is activated only when the demand for water cannot be met using other available supplies and technologies.63 Alaska Water Exports President Ric Davidge stated at the IJC Experts’ Workshop that that Santa Barbara is underreporting the cost of its desalination plant because the city is not factoring in the cost of the plant remaining idle most of the time. He also states that there are increased maintenance costs for the city water system as a whole because desalinized water corrodes pipes more quickly than fresh water.

### 1.2.3 Transporting Over Land

Transporting Great Lakes water over large distances will be very expensive and has significant environmental costs. The GRAND Canal proposal, detailed earlier, highlights the significant costs associated with transporting water long distances. One scenario of the GRAND Canal describes transporting water from Lake Superior to the Missouri River before it is transported to the Southwest U.S. Studies of the proposed GRAND Canal scheme from the early 1980s estimated the cost of building the pumping stations at between C$14 and C$55.5 billion depending upon the amount of water that would be diverted. This did not include the cost of energy to operate the stations, the cost of constructing channels or pipelines or other associated costs. Today, the project would cost much more.64

One of the major barriers to transporting water across the continent is the fact that it is difficult to transport water over the Rocky Mountains. This hurdle would require significant pumping capacity and energy to operate the pumps. Operating and maintenance costs are estimated at between C$2.0 and C$8.1 billion per year.65

A more likely scenario is one in which pipelines are constructed in order to move smaller amounts of water relatively short distances to communities just outside the Basin. The cost of building the 14-mile pipeline from Gary-Hobart to Lowell was estimated at $2.0 million.66 This would have doubled water rates for the citizens of Lowell. However, they were willing to pay higher costs for a better, more reliable water source.67

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62 Buros, O.K., The ABC’s of Desalting, p. 47.
63 City of Santa Barbara web page, City Water Supplies Sources, February 1998.
64 Muller, p. 165.
65 Muller, p. 166.
67 Lowell Consultation Transcript, p. 17.
Using existing pipelines that transport oil or other petroleum products is not cost-effective at this time. Pipeline companies make more profit moving petroleum through the existing structure than they would shipping water. It would also interfere with the current petroleum pipeline system, the likely result of which would be to cause distribution problems for these products and raise energy prices. In addition, the cost of cleaning the pipeline system is very high, and it is probable that people would not find the idea of transporting domestic water through former oil pipelines very appealing.

1.3 IMPACTS OF WATER REMOVALS

Over time, removals of Great Lakes water for use in other regions in North America and overseas may become more economically attractive, but it is important to factor in the environmental costs that may occur as a result. The possibility of the bulk export or diversion of Great Lakes water causes many to look more closely at the impacts of diversions from bodies of water around the world to identify lessons that will help protect the Great Lakes ecosystem.

Large-scale diversions are likely to have positive economic effects for the region selling bulk water when bulk water removals occur. However, the long-term negative environmental effects could be even greater. Large-scale diversions would harm both the Great Lakes ecosystem and areas to which the water is diverted because the area that receives the water becomes more reliant on the diverted water source. If the diversion is taken away, the area that receives the diversion will either have to obtain a new source of water or suffer the economic and environmental consequences of transforming to its natural state.

The economic and environmental impacts of water diversions and water takings have been significant both in North America and all over the world. Ecosystems have been negatively altered in order to provide some benefit to another area. How the issue is dealt with depends upon the level of cooperation among the jurisdictions surrounding the water body. Where there is little cooperation, the implications could be destructive to an ecosystem. There are some lessons that can be learned and applied in assessing and developing Great Lakes water management policies.

THE GREAT LAKES

The Great Lakes have experienced environmental problems as a result of diversions, but they have been relatively minor compared to other regions of the U.S. and the rest of the world. However, the negative effects have disrupted localized areas where the water is taken from and has lowered lake levels in many cases.

The New York State Barge Canal is an intra-basin diversion that transports water downstream, so the problems are fewer and localized than if it were an inter-basin diversion. In some parts of the
Canal system, fish have increased while in other parts reductions have occurred. Dams have blocked the passage of some fish species, and wetland-spawning areas have been eradicated by draining and dredging programs. Water quality in natural streams has deteriorated as a result of domestic, agricultural and industrial pollution. Lakes have been created and or modified by flood control projects, and engineering works have altered stream flows and temperature regimes.68

Like the New York State Barge Canal, the Welland Canal is an intra-basin diversion, but the water is not diverted as far as it is for the New York Canal. The Welland Canal lowers the mean level of Lake Erie by approximately 13 cm because it creates a second flow of water from Lake Erie to Lake Ontario. It also creates a channel through which non-indigenous, aquatic nuisance species can enter the Upper Great Lakes. Before the Canal was opened, there was no navigable channel through which these species could enter the Great Lakes and compete with native species.69

The Chicago diversion, unlike the diversions from Lake Erie, is an inter-basin diversion, but it has not had significant impacts on the Great Lakes ecosystem other than lowering the level of Lakes Michigan and Huron and the Great Lakes downstream. It has had a greater impact on the area that receives the diverted water. Water quality on the upper section of the Illinois waterway is much lower as a result of pollution from agricultural and industrial activities as well as treated sewage effluent. This negatively impacts the flora and fauna of the River system. There is also an increased risk of flooding on the Illinois River which can negatively impact homeowners who live along the waterway.70

Like the Chicago Diversion, The Long Lake and Ogoki Diversions are inter-basin diversions, but unlike the Chicago Diversion, the water flows into the Great Lakes. The effects of the Long Lake and Ogoki diversions have been numerous. While they increase the supply of water to the Great Lakes, they have a significant effect on the environment from which the water is taken. They negatively impact fish spawning and habitat as a result of the original construction and operation of diversion structures on the main stem rivers, the construction and alteration of diversion channels, the creation of reservoirs, and the use of waterways for log transportation.71

The diversions that were approved under the Charter are much smaller than the other diversions discussed earlier and are less likely to cause environmental harm, particularly given that water is returned to the Great Lakes system to make up for the diversion. To date, there have been no documented environmental impacts of the Pleasant Prairie and Akron diversions. Both Ohio and Wisconsin have been vigilant in working to ensure that levels and flows of water bodies are stabilized as close to natural as possible in mitigating the diversions’ impacts on both sides of the Basin line.

68 IJC, 1985, p. 20.
69 IJC, 1985, pp. 16-17.
70 IJC, 1985, p. 15.
1.3.1 It would be very difficult to mitigate the negative environmental effects of very large bulk removals of Great Lakes water. In discussing the possibility of bulk removals, some citizens have suggested that if water is shipped from the Great Lakes, it should be taken from the St. Lawrence River at the point just before where the fresh water intersects with the salt water. Initially, this may seem like a viable solution, but it ignores the impacts on the system defined by the interaction of fresh and salt waters. It would impact the aquatic life and spawning grounds for species that thrive in that environment. In addition, removing water at that point will reduce the flow of freshwater into the sea. This reduced flow allows the sea water to move further inland, moving the point where fresh water can be taken from the river upstream.

1.4 OUTSIDE THE GREAT LAKES REGION

There is a wide range of experience in diverting water outside the Great Lakes region. In some cases, the effects are small, but there are cases where the impacts of poorly managed diversions have been so great that ecosystems are injured so much that it would be difficult for them to recover to a more natural state.

Canada diverts a significant amount of water, primarily for hydropower production. In the United States, Southern California is often cited as an area that does not effectively anticipate and mitigate the impacts of water diversions that are made to support its large and increasing population. It has worked diligently over the years to obtain sufficient water supplies by building water viaducts and purchasing water from other nearby areas. Los Angeles has used its position and growing economic strength to advance its interests, sometimes at the expense of its neighbors such as those in Owens and Mono Valleys. There have been projects elsewhere; such as with the former Soviet Union’s Aral Sea, where the central government attempted to help one region develop by diverting water to it. This ultimately led to disastrous results for both the Aral Sea ecosystem and the area that once received the diverted water.

Canada’s Northern Diversions

Other countries divert water from where it is abundant to where it is scarce, or from where there are few people to where there are many. Neither of these patterns characterizes the Canadian model. In Canada, the largest water diversions are implemented to enhance hydroelectric power generation. It is thus electricity, not water, which most projects transmit to market. Canada is the largest producer and exporter of hydroelectricity in the world (CEA, 1998).

The total flow of water diverted between drainage basins in Canada is enormous -- 4,450 cms. No other country diverts nearly as much. The most recent are also the largest: the La Grande (James Bay) project in northern Quebec, the Churchill-Nelson diversion in northern Manitoba and the Churchill Falls project in Labrador. These three, incorporating 7 diversions, make up two-thirds of all water diverted within Canada.
The pace of megaproject construction began to slow in the 1980s, with only Quebec continuing actively into the 1990s. Elsewhere, projects struggled through controversy to completion or were shelved indefinitely; the era of major dam and diversion construction has almost drawn to a close. A combination of factors is responsible: The best sites on the most accessible river systems have already been developed; demand for more water and energy has slowed in an economy periodically in recession and seeking efficiencies in use as a less costly alternative; and public unrest has increased with more cases documented of the impacts of megaprojects on environmental processes and on those communities that have been displaced or otherwise disadvantaged.

One of the most serious problems discovered in 1980, while investigating the consequences of enlarging Southern Indian Lake to serve as a reservoir for the Churchill River diversion in Manitoba, was the conversion of mercury in flooded soils and vegetation to toxic methylmercury which accumulated in fish, making them unsafe for human consumption for years to come. Similar poisoning of fish was subsequently found in La Grande and other new reservoirs.

Dams have long been an obstacle for fish migration. Interbasin diversions occasionally work in the opposite direction, transferring undesirable fish and associated parasites, bacteria and viruses into drainage systems unprepared to resist them. Concern for protecting the commercial fishery in Lake Winnipeg from biotic invaders is the main reason why Canada insists the the Garrison diversion project in North Dakota not divert untreated water from the Missouri into the north-flowing Red River.

The burden of adjusting to the postwar era of dams and diversions has fallen on one group of Canadians more than on any other -- native peoples. Their communities can be found on every major drainage system across the country, and in much of the north they are the majority of the population. Stories about being flooded out, dried out and contaminated by changes in their river and lake regimes are rampant among Indian bands, who are finally receiving compensation, often decades after being dislocated. It was the Cree in northern Quebec who mustered the necessary international opposition in the early 1990s to stop the James Bay hydro program from expanding further.

By this time, governments in Canada were finding it burdensome to continue underwriting the economic and environmental costs of northern megaprojects. As a result of construction cost overruns, legal challenges and reduced growth of energy demands, provincial hydropower corporations carry high debt loads. Public values increasingly favor recreation, tourism and heritage protection.

*Canada’s Coastal Stream Removals*

Before the media spotlight focused on the Nova Group proposal to ship fresh water from the Great Lakes, western and eastern coastal provinces entertained similar ventures.
In 1986, the British Columbia government decided to permit entrepreneurs to export fresh water from its coastal streams by marine tanker, but not diversion from its interior rivers. Several applicants received licenses and proceeded to seek foreign markets. When the first of these, Snowcap, partnered with Sun Belt Corp. of the U.S. to supply 0.3 cums to Goleta, California, the province found itself embroiled in controversy. Environmentalists were alarmed because a flood of new export applications were triggered by the apparent success of Snowcap/Sun Belt, most wanting to draw water from the same coastal inlet. The possible precedent and cumulative effect led the province in 1991 to place a moratorium on all licensing. Four years later, a new government passed legislation, the Water Protection Act, prohibiting all bulk water export from the province or diversion between its major watersheds.

Subsequently, the Sun Belt Corporation has lodged a complaint under NAFTA that British Columbia and Canada have violated its rights, on grounds that the province settled on compensation with its Canadian partner but not with itself.

Meanwhile, a few entrepreneurs have been scouting coastal regions in Quebec and the Atlantic provinces. One of them prevailed upon the Newfoundland government that in 1996 agreed to a policy of exporting fresh water in bulk by ship, subject to conditions of environmental assessment and benefits to the provincial economy. A proposal to export water at a rate of up to 0.5 cums from Gisborne Lake is currently under review. At the same time, Newfoundland is under increasing pressure from the federal and other provincial governments not to create a precedent but to join in a national moratorium to restrict the movement of fresh water outside major watersheds. As far as anyone knows, the project sponsor has not found a market to buy water shipped from Gisborne Lake.

The Government of Quebec has refused to join a national strategy on water export, but current public hearings in that province reveal a similar hostility to export plans to what has existed for decades in the rest of Canada.

1.4.1 Owens Valley

In Southern California, the development of major water projects occurred in the early 1900s as the population of Los Angeles grew beyond the point where it could sustain its inhabitants. To continue to grow, Los Angeles required the development of a major water system that would bring supplies from outside areas to build up the economy and make it more competitive. One of the more prominent diversions that Los Angeles undertook began in 1913 when water was diverted from Owens Lake, a lake 250 miles east of the city. Once a burgeoning agricultural area, the Owens Valley became more arid and agricultural production virtually ceased. The San Fernando Valley, through which the water was transported, once suffering from desert-like conditions, bloomed with the water that once made the Owens Valley prosperous. Los Angeles also sank wells and began depleting the Owens Valley aquifers for use in the city. As result of

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72 Reisner, Marc, Cadillac Desert: The American West and Its Disappearing Water, p. 84.
73 Reisner, p. 87.
Los Angeles diversion, there are significant dust storms that originate on the lakebed of the
dewatered Owens Lake.\textsuperscript{74}

### 1.4.2 Mono Lake

Los Angeles continued to grow and need additional water supplies through the rest of the
century. In 1941, the Los Angeles Department of Water and Power began diverting Mono
Lake’s tributary streams 350 mile south in order to meet the growing demand for water in Los
Angeles. This caused Mono Lake, a lake, which had survived for 730,000 years, to become
deprived of its freshwater sources, and as a result, the volume of the lake halved, the salinity
doubled, and the ecosystem collapsed because of such a huge decrease in water supply.

Finally, in 1994, after roughly 50 years of systematic devastation, all parties concerned such as,
environmentalists, lawyers, landholders, and concerned citizens came before the government’s
judiciary panel with an agreeable solution. Los Angeles began returning water to Mono Lake as
well as the Owens River valley, leading to the renewed flowing of the river for the first time in
fifty years.\textsuperscript{75}

### 1.4.2.1.1 The Everglades\textsuperscript{76}

Covering almost 11,000 square miles, South Florida’s system of wetlands, uplands, bays and
reefs is connected by the flow of water. The Everglades was defined by a broad, slow moving
sheet of water nearly 50 miles wide and more than 100 miles long flowing south and southwest
from Lake Okeechobee to Florida Bay and the Gulf of Mexico. The natural systems of the
Everglades, Florida Bay and the Keys are vital to the survival of fish, wildlife, and the
recreational areas that support the region’s $13 billion annual tourist industry. Today almost 5
million people reside on the east coast of South Florida alone, and by 2050 the number is
expected to rise to 12 million. Over the past century, changes in land and water use, and the
creation of canals and levees have altered the flow and content of the fresh water that sustained
south Florida. These changes, along with urban sprawl and populations growth, have resulted in
numerous threats to the health of the Everglades, Florida Bay, coral reefs and other areas of
South Florida. Urban and suburban areas face daunting problems: crime, social and ethnic
tension, under employment, environmentally contaminated sites (brownfields) and recurring
water shortages. The enviable quality of life of South Florida is at risk.

\textsuperscript{75} Reisner, p. 513.
\textsuperscript{76} South Florida Ecosystem Restoration Task Force, Success in the Making: An Integrated Plan for South Florida
Ecosystem Restoration and Sustainability April 1998.
Early land developers viewed the Everglades and its related habitats as worthless swamps. Incremental filling and draining of the Everglades and water diversion projects started in the mid-1800s. Work started on the massive Central and Southern Florida Project (C&SF) in 1950 and resulted in almost 2000 miles of canals and levees, over 200 control and diversion structures, 25 navigational locks, and 56 railroad bridges. The C&SF Project's two main purposes were to provide water and flood protection for urban and agricultural lands and to ensure a water supply for Everglades National Park. The project opened the doors to unprecedented growth and also resulted in the alteration and, in some cases, the destruction of the region's hydropattern – the quantity, timing and distribution of water flow through the ecosystem.

The C&SF Project, the subsequent dramatic increase in populations and its allocated development greatly strained the natural system. Half of the original wetlands are gone and remaining of the remaining natural habitats are significantly altered and disconnected from each other by canals, roads and other manmade features. Urban stormwater and past agricultural practices have polluted Lake Okeechobee and disrupted the balance of nutrients in wetlands areas to the South. Areas that historically supported numerous tropical and neotropical plants and animals are not dominated by invasive, exotic species.

The State of Florida together with U.S. Federal governmental agencies are leading a coordinated effort in partnership with many other entities and interests to restore the South Florida ecosystem. The South Florida ecosystem restoration effort is developing strategies for further ecosystem restoration and protection based on the accepted premise that the current course in South Florida is not sustainable. The common vision for the restoration effort is "a landscape whose health, integrity, and beauty are restored, and are nurtured by its interrelationships with South Florida's human communities so that the ecosystem can recover and the residents of South Florida can live more within the limits of the ecosystem.

1.4.3 Aral Sea

The Everglades, Owens Lake, and Mono Lake are not the only bodies of water that need support in order to survive. Perhaps the most famous example of a diversion that was not successful is the Aral Sea, which lies on the border between Kazakhstan and Uzbekistan in south central Asia. The water of the Aral Sea has been used to irrigate the surrounding desert, and over the years, this has lead to enormous destructive ecological and socioeconomic consequences.

This operation started in the 1960s when Moscow's central planners decided that they would divert two of the Aral Sea's feeder rivers to support cotton production in Uzbekistan. Initially, the plan was successful and cotton production in Uzbekistan soared. However, it became apparent rather quickly that more water was being diverted from the Sea than could reasonably be regenerated by precipitation. As a result, the Aral Sea has shrunk from 66,000 kilometers in 1960 to roughly 37,000 kilometers in 1990. The area of the sea decreased by more than 40

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77 Postel, Sandra, Last Oasis: Facing Water Scarcity, p. 61.
percent and the volume shrunk by more than 75 percent. "Dust from the Aral’s dry bed, which makes up an estimated 10 percent of the world’s atmospheric sediment, melts glaciers as far away as the Himalayas and Greenland and coats its own region with toxic salt storms, poisoning thousands of acres of farmland."

The diversion caused many long-term consequences. For example, the sea became extremely salinized, there was major loss of fish life, agricultural production decreased, many species of animals and wildlife were lost, and there was a substantial decline in the health or residents surrounding the sea. All in all, the loss of the seashore led to the loss of all 24 species of fish in the sea, 20 of which were endemic to the Aral Sea.

In addition, there is no longer enough water that can be diverted to support the cotton producers, leading to an economic downturn for Uzbekistan and Kazakhstan. There were plans in the mid 1980s to replenish the Aral Sea using water from Rivers in Siberia, but the collapse of the Soviet Union put an end to that proposal.

The regions must find a solution to this evolving problem because further decline to the Aral Sea will produce climate changes. Additionally, the region experienced an increased need for medical services to accommodate deteriorating health problems. Further complicating matters has been the breakup of the Soviet Union, because republics that were once one nation now have to relate as separate governments. As a result, these nations both rely on and compete with each other agriculturally and economically.

1.5 Multi-Jurisdictional Water Management Structures

Extensive water uses and diversions have the potential to negatively impact an ecosystem. Effective management of ecosystems require the cooperation of jurisdictions to work together for the benefit of its citizens and the environment. It is complicated to manage water within a single country, as the States that have the Colorado River within its jurisdiction have found. It becomes even more difficult when two or more countries become involved managing a single ecosystem because of multiple national legal structures, governmental bodies and citizen needs and concerns. The Great Lakes Governors and Premiers of Ontario and Quebec have effectively developed a cooperative regional water management structure that allows them to work together as stewards of the Great Lakes. The Colorado River Compact is another example of a successful multi-jurisdictional agreement, but other regions around the world have not been as successful.

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Postel, p. 61.

Postel, p. 62.

Postel, p. 62.

Postel, p. 62.

Postel, p. 62.
The Colorado River Compact was initiated in 1922 to help manage the allocation of the waters of the Colorado River. Between 1918 to 1921, the upriver and downriver states of the Colorado River Basin were unable to resolve their differences over how to allocate the River’s water. Burgeoning growth meant increased water demand, and the other Colorado Basin states feared California would establish priority rights to Colorado River water. In late 1921, the Colorado River Commission was formed with representatives from each of the seven Basin States to resolve the dispute. Discussions were accelerated after June 1922 when the U.S. Supreme Court ruled that the law of prior appropriation applied regardless of state lines. A fast growing state such as California could then establish priority use of Colorado River water to the extreme disadvantage of slower growing states in the upper basin. Each State sought to establish its own limits on how much Colorado River water it would use.

The compact divides the Colorado River into the upper and lower Basins at Lee’s Ferry one mile below the Paria River in Arizona and enumerates the size of each member state’s diversion. Governors of the States must approve the movement of water rights from one state to another. The upper Basin consists of Colorado, New Mexico, Utah, and Wyoming, with a small portion of the Arizona tributary to the Colorado River. The lower Basin consists of Arizona, California, and Nevada, with small portions of New Mexico and Utah tributary to the Colorado River.

Development was the overriding concern of the 1922 compact. Its intent was "to secure the expeditious agricultural and industrial development of the Colorado Basin, the storage of its waters, and the protection of life and property from floods." Establishing Colorado River rights was a prerequisite to building flood control and storage projects, to better manage the river to serve human needs.

The compact assumed an average flow down the Colorado River at Lee’s Ferry of roughly 18 million acre-feet of water a year. Each Basin was allocated use of 7.5 million acre-feet and the States of each Basin were responsible for dividing the use of the apportioned water amongst them, but the Compact did not settle the issue of water management on the Colorado. Arizona did not sign until the 1940s and the signing did not settle the issue of allocating water among the lower Basin States. Lingering ill will prevented any agreement between Arizona and California and it took an 11 year to set the lower basin’s states’ allocations. A 1963 U.S. Supreme Court decision set the allocations and named the Secretary of the U.S. Department of the Interior to act as water master of the Lower Colorado River, to apportion future surpluses and shortages among the states and even among users within the states.

Dams and diversions on the Colorado combined with the use and reuse of water created conditions very unfavorable to native fish species. Dams block fish passages and reduce spring flows, trap silt, and alter water temperatures, all to the disadvantage of native species. Additionally, regulated flow destroys inner canyon beaches and is detrimental to spawning habits.

83 Reisner, p.124-25
85 Reisner, p. 125.
of native fish. The introduction of exotic fish posed a further threat to native fish. Four species of native fish are endangered in the Colorado River Basin.

There are significant environmental problems in Mexico resulting from the U.S. management of the Colorado River. Located in Mexico, the Colorado River delta once was lush with vegetation and wildlife. But the construction of 29 dams and numerous up-river diversion projects during the past 60 years has deprived the delta of natural water flow, with its vital supply of silt and nutrients. In addition, the low flow of water has increased the salinity level of the river in the delta area. As a result, the delta fell victim to Colorado River development. Delta wetlands now persist only where fed by agricultural drainage water or from groundwater seepage. The minimal Colorado River flow allocated to Mexico by the Law of the River is not sufficient to protect and preserve the delta.

1.5.1 Tigris and Euphrates River

The issue of water management among jurisdictions along the Colorado River is determined by formal procedures determined and overseen by affected States that are in agreement on how water should be allocated. This is not always true in other regions around the world.

Turkey has the benefits of containing the headwaters of the Tigris and Euphrates Rivers. This allows its leaders to oversee the development and exploitation of the Tigris and Euphrates Rivers before its downstream neighbors, Syria and Iraq. Syria is dependent on the rivers for domestic water supplies and irrigation. Iraq is dependent on both the Tigris and Euphrates Rivers for agriculture; but because of their geographic position downstream of the Turkish and Syrian agriculture, 50 percent of the water they receive is polluted with fertilizers and pesticides.

In the 1980’s, Turkey started the Grand Anatolian Project (GAP) with the goal of financing the development of roughly 500 projects. Of these projects, 22 are dams and 19 are hydroelectric plants. Turkey has had to finance the project on its own because multinational leaders (the World Bank among others) have turned away from the project because of the political and environmental problems that might arise from their construction and use.

Turkey estimates that irrigation projects will increase the amount of arable land by 40 percent and meet 25 percent of the country’s electric power needs. Officials hope that the GAP will raise the standard of living for its citizens by providing more development and jobs for its citizens. Increasing standards of living, it is thought, will pacify the Kurdish separatist movement and end the ongoing hostilities between the Kurds and Turks. While the projects are likely to create benefits, there is also the concern that they might reduce the flow of the Rivers by 35 percent,

86 Reisner, pp. 6-8.
88 Postel, p. 80.
severely impacting downstream countries. Turkey is not cooperating in establishing a permanent framework over water sharing issues with Syria and Iraq. By controlling the resource, the Turks could have a measure of control over their oil-rich neighbors.

1.5.2 Israel-The West Bank-Jordan

The political struggle in the Middle East is sometimes construed simply by outsiders in a religious context. This ignores the basic struggle for control of water resources. Water is one of the most critical components of any peace negotiation between Israel and its neighbors.

Historically, the Israeli-Jordanian water struggle has been at the core of the Israeli-Arab conflict. Mainly, the dispute concerned allocation quotas and the building of storage and diversion facilities on a shared river Basin. These disputes mainly concerned the utilization of the Jordan and Yarmouk Rivers because the waters cross through both countries. These Rivers are the single most important source of water for both Israel and Jordan and they account for more than one third of their national supplies. Disputes over water began when both countries initiated ambitious water development programs. Since the late 1960’s, Israel has virtually monopolized the waters of the Upper Jordan due to its downstream position and this has caused significant tension.

In 1993 at the beginning of their peace negotiations between Israel and Jordan, the Jordanian government demanded the redistribution of the region’s water resources. This has been its most contentious in the bilateral discussions with Israel. While control of the land in the West Bank is still uncertain, Israel and Jordan arranged an interim agreement on their relationship. This agreement states that until a permanent status on the territories is reached, Israel must help the Palestinians find alternative water sources so that their water allocation is not reduced during this time. However, earlier in 1999, Israel pulled back from this agreement, although with a new Israeli government, this situation may change.

1.6 ISSUES FACING THE GREAT LAKES REGION

Although the Nova Group, Ltd. permit proposal raised the specter of large-scale exports of Great Lakes water to foreign countries, the likelihood of these types of export projects occurring in the near-term is small. The same is true for other large-scale diversions to other areas in North America using other technologies. The Great Lakes are an abundant resource of water, but it is difficult and expensive to send water long distances without investing in extensive and expensive technology. This does not mean that the technology will not become economical within the next 20 years. Therefore, the threat of such an occurrence is possible. The question that remains is

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90 Postel, p. 81.
91 Postel, pp. 74-76.
what kind of policy regime should adequately and effectively protect the Great Lakes ecosystem in the future and meet the needs of the region’s inhabitants.

1.6.1 NEAR-TERM ISSUES

Small-scale diversions with a use and return component are the most likely issue for diversions within the next ten to twenty years. There are a large number of communities that either straddle the Basin, or are located just outside the Basin. The Lakes and their tributaries are cost-effective sources of water for the communities because they are a clean and nearby source of water that is more likely to remain uncontaminated unlike some groundwater water supplies. This was the primary attraction for the citizens of Lowell, Indiana who overwhelmingly approved the option of buying Great Lakes water because of this reason, although their request was ultimately not granted.

The issue of more communities in outlying areas wanting Great Lakes water is highlighted in how the State of Illinois manages its allocation of water for domestic use. There is a significant demand for Great Lakes water. Many suburban Chicago communities that do not receive water from the Chicago River diversion pay the higher cost of purchasing Lake Michigan water and implementing the required state conservation measures in order to be able to receive lake water.93

Since the construction of the Lake Huron pipeline to London, Ontario in 1964, a number of high growth areas in Southern Ontario such as Waterloo and the York region have been experiencing problems in meeting the expanding water demands of their growing communities. Their officials are seeking alternative long term water supply options. The same is true in the United States. Individual communities have been considering pipeline options to address their long-term water requirements. The Milwaukee and Cleveland areas are facing significant pressure to find additional water supplies in communities just outside the Basin. Aquifers that are the source of many communities’ water are being lowered quickly and these cities and towns will require new sources of water. It would not be difficult to extend pipelines to these communities from the Milwaukee and Cleveland water utilities as is done in the Chicago area, but approval by the Governors under the WRDA would be required.

While the Great Lakes States face pressures to divert water out of the Great Lakes Basin, Ontario will be facing pressures to divert from one Great Lakes Basin to another. These would need to be reviewed under the Charter, but any objections from Governors would be non-binding. London, a center of growth in southwestern Ontario, is considering further twinning of the Lake Huron pipeline and improvements to the Lake Erie line. It would augment this by instituting conservation measures to optimize current supplies. The Kitchener - Waterloo - Cambridge area, almost exclusively reliant on groundwater, has been addressing its water supply issues through options such as artificial groundwater recharge and storage of surplus surface flows within the

93 Interview with Illinois Department of Natural Resources staff.

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watershed, greater use of surface flows, conservation and consideration of a Great Lakes pipeline.

Alternative pipeline options to these growing regions of Southern Ontario have been proposed in many forms over the years, including consideration of a proposed private regional water pipeline of 50 - 60 million imperial gallons per day (59.5 - 71.4 mgd or 226 - 271 mld) from Georgian Bay to serve the regions surrounding the Greater Toronto Area and the Region of Waterloo.\textsuperscript{4} Pipeline options from Lake Erie and lower Lake Huron were also considered. This regional pipeline would have transferred water from Lake Huron, returning the wastewater to the Lake Ontario and Lake Erie watersheds, constituting an intra-basin diversion requiring formal review under the Great Lakes Charter.

It is expected that demand pressure on the water supplies of growing regions of southern Ontario and communities within the U.S. near the Lake Michigan, Lake Ontario and Lake Erie Basins will likely lead to proposals for increasing uses of Great Lakes water. In the case of Ontario, these proposals would be for transfer of water between Great Lakes sub-basins. In the U.S., it will likely lead to diversion proposals for communities with the large concentrations of populations near the Basin line.

One of the directions that may influence this projected increase is the consolidation of water utilities over a larger geographical area. A growing number of municipal water companies are being bought out by neighboring communities. This almost happened with the Lowell, Indiana diversion proposal under which the Gary-Hobart Water Company would have purchased the Lowell’s water company. This would give water companies that get their water supplies from the Great Lakes and their tributaries a foothold in communities outside the Basin. When this occurs, there will be increasing pressure to link the larger water system’s infrastructure inside and outside the Basin. At that point, there would have to be careful regulation of the system to ensure that the regional ecosystem is protected.

Future diversion projects will likely be required to not only implement strong conservation measures, but they will also likely require that the same amount of water diverted be returned. This is shown in the Pleasant Prairie and Akron projects. Akron City and Ohio Department of Natural Resource officials are taking these measures one step further as it attempts to mitigate any negative impact of a diversion both for the Great Lakes and Ohio River Basins. Future diverters will likely be expected to take similar measures.

1.6.2 LONG-TERM ISSUES

Transporting water through tankers, channels, pipelines or other means to other portions of the North American continent does not appear cost-effective at this time. Logistically, it would be difficult to transport water to the most water-short destination, the Southwestern U.S. The costs of constructing pipelines and necessary pumping stations over the Rocky Mountains would

\textsuperscript{4} Ontario Ministry of Natural Resources.
dwarf any revenues gained at current prices. However, if demand for water increases the pressures to divert Great Lakes water will increase and the relative price of constructing these large-scale diversion project will decrease.

As the world's population grows and pressures to develop grow in countries outside North America, calls for diversions of diversions of Great Lakes water to other countries will likely be made. This will drive the price of water up and increase the profit motive for potential water sellers. As such, it will become increasingly important that the Great Lakes region and the United States and Canada develop effective strategies, policies, and laws to ensure that the ecosystem that sustains the region's environment and economy be protected from these increasing pressures.

The United Nations estimates that 30 percent of the world's population could face water shortages by 2025. It is possible that, due to the increasing global water crisis, there could be calls for exports of water to countries for humanitarian reasons. While this will cause nations to use water more efficiently, it is possible that there could be requests for water for areas facing extreme crises.

The impact of climate change will also change the economics of water. This will have an accelerated effect upon Great Lakes tributaries and groundwater from which water is diverted because their shallower depth makes them more sensitive to changes in levels and flows. It is projected that tributaries will feel the impact of higher temperatures before lakes and thus suffer from decreased flow and levels. This will impact how much water can be consumed from these tributaries both within and outside the Basin. Climate change could also increase pressure for more diversions to counter the effects of climate change outside the Basin. Areas outside the Basin that become dependent on diversions of Great Lakes and tributary water may face the possibility that the tap will be turned off from the Great Lakes because of a lack of a surplus of water to draw from.

1.7 FINDINGS

1. Historic diversions have had positive impacts on the region's economic growth by providing an inexpensive means of transportation and hydropower during the region's early economic development. There have been negative impacts on the Great Lakes ecosystem, although most of these the impacts have been localized.

2. The Great Lakes Charter was implemented in 1985 one month after the IJC recommended many of its provisions. The Charter has been an effective tool in providing a management system for approving or denying diversions in both the United States and Canada, although

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95 The United Nations: Protecting the Global Environment, Published by the United Nations Department of Public Information -- DPI/1814/Rev.3 -- August 1997.
there are gaps in its implementation. In addition, the Charter and the WRDA have been critical in limiting the serious consideration of large-scale diversions of water from the Great Lakes ecosystem. The Charter has been less successful in developing a broader management plan as was originally outlined.

3. There is sufficient evidence that large-scale diversions have had significant negative impacts on the ecosystems where large-scale diversions have occurred throughout the world, particularly when little thought is given to the environmental consequences.

4. Exports of Great Lakes water using tanker ships are not economically feasible at the current time. It is possible that increases in the demand for water globally will eventually cause an increase in the price of fresh water that may make exports by ship more economical.

5. It is likely that there will be more requests for small-scale diversions of water to communities near the Great Lakes Basin line or between Great Lakes sub-Basins for the purpose of providing ample domestic water supplies. The Charter process is well developed to deal with this type of diversion proposal.

6. In the next two or three decades, it is likely that the pressure to divert large amounts of Great Lakes water will increase. It is unclear if the Charter, the WRDA or State and Provincial law are resilient or flexible enough to provide protections against large-scale diversions in light of free-trade law or judicial challenges to the management system.
Appendix A

PROCESS FOR REVIEWING DIVERSION PROPOSALS

The following is a guidance document for the Great Lakes Governors outlining information for entities requesting approval by the Great Lakes Governors of a diversion of Great Lakes water under Section 1109 of the Water Resource Development Act of 1986 (Public Law 99-662). Proposals should be written in narrative form with technical data included as appropriate. The level of technical analysis should be commensurate with the size of the proposed diversion. Not all of the information outlined below will be appropriate for every proposed diversion. Governors may request additional information not presently included on this list. States and local authorities proposing diversions are encouraged to work with the Great Lakes States before preparation of the official request to ensure that there is sufficient information and detail included in the official request.

General Information

1) Name of the local entity requesting the diversion
2) Location of the affected area (include map(s) that indicates the location of the entire outgoing pipeline, the returning pipeline if applicable, and the area actually receiving the water)
3) Nature of the need for Great Lakes water
   a) Intended purpose
4) Users, service type, service area
   a) Intended water recipients
   b) Intended water use
5) Description of current situation in general terms
   a) Participating agencies
   b) Factors making the project viable (potential benefits, cause/effect relationships)
6) Explanation of viability
   a) Factors within the natural environment that make a diversion necessary and/or conducive to the area
   b) Projected water use
   c) Monetary costs
   d) Proposal consistency with state plans, if applicable
7) The environmental setting
   a) Relevant characteristics of the natural environment (as applicable)
      i) Major surface waters (quality and location)
      ii) Climate
      iii) Topography

* Source: Council of Great Lakes Governors.
iv) Geology
v) Groundwater resources
vi) Soils

Site-Specific Information

1) Description of intake location and structure(s)
   a) Length and diameter of pipe(s)
   b) Water distribution system
   c) Duration and volume of withdrawal
   d) The number of days the withdrawal system will be operating (and whether it will be operating on a seasonal, year-round, etc. basis)
   e) Estimated starting date and ending date (if temporary)
   f) Description of daily management operations (include numerical estimations of the minimum/maximum withdrawal amounts per day)
   g) Minimum/maximum values for the size of the area receiving water, the amount of total water delivered, estimated losses, and projected operating system costs (include computations where possible)

2) System operation and water conservation
   a) How the distribution (amount and method of) will be determined
   b) How the withdrawal will be managed/supervised (on a daily and overall basis)
   c) Description of water conservation and demand management requirements for receiving area

3) Methods of withdrawal, distribution, and discharge flow measurement and reporting

4) Monitoring, reporting and enforcement plans

Environmental Effects

1) Influence on Great Lakes environment and resources
   a) Statement on the impact of proposed diversion on Great Lakes
   b) Impact on Great Lakes levels
   c) Impact on wildlife
   d) Impact on biota
   e) Returning treated water to the Great Lakes basin
   f) Influence on navigation
   g) Influence on recreation
   h) Hydropower industry
   i) Erosion
   j) Sedimentation
   k) Explanation of the type of analysis used
   l) Possible transport of non-indigenous species
   m) Compliance with permit requirements
   n) Minimizing construction effects on air quality
   o) Mitigation efforts (measures taken to avoid possible adverse environmental influence)
Comparative Analysis of Alternatives

1) General description of alternatives (i.e. groundwater, surface waters)
2) Costs of alternatives
3) Feasibility
4) Impact on public health
5) Impact on watersheds
6) Conservation measures
7) Existing and projected water rates
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