The Canadian wilderness was white with snow. From Lake Superior northward the evergreen trees wore hoods and coats of white. A heavy blanket of cloud hung low across the hills. There was no sound. Nothing moved ...

So begins Holling Clancy Holling’s classic children’s book, *Paddle to the Sea*, which describes the voyage of a small carved canoe, beginning on a river entering Lake Superior and travelling through each of the five Great Lakes to the St. Lawrence River and eventually to the Atlantic Ocean (Holling 1941). The book, written and illustrated by an American, was first published in 1941 and remains in print. A film of the same title based on Holling’s book was produced by the National Film Board of Canada in 1966 and directed by the famous Canadian naturalist and author, Bill Mason. *Paddle to the Sea* is a fitting introduction to this chapter: the book and the film have educated generations of children on both sides of the border about the physical, economic, and cultural dimensions of a distinct place known as the Great Lakes. Like the Great Lakes, *Paddle to the Sea* is both Canadian and American, and has helped to produce a unique history and culture. The unfolding of that history, in turn, has influenced the Great Lakes, contributing to a process where nature and society have evolved in relation to one another (Linton 2010, 24–44). In this respect, this chapter is different from the others in Part II of this volume: rather than seeing it as a “flashpoint,” we see the Great Lakes as a transboundary success story. For the most part, the lakes have given Canadians and Americans opportunities to collaborate.

The Great Lakes continue to be significant in different ways to Americans and Canadians. The lakes constantly present both countries with new challenges, and they have sometimes acted as a source of contention between the
two countries. However, the thesis argued in this chapter is that these challenges have been rendered into opportunities for cooperation and collaboration: the constant emergence of new problems and issues is balanced by a history of commitment to overcoming such challenges together. Figure 11.1 shows a map of the Great Lakes Basin.

**Physical and Cultural Background**

The size of the Great Lakes is such that they invite ready comparison with the sea, and indeed, they are often described as “inland seas” and as forming the “third (or fourth) coast.” The size of the Great Lakes alone makes them a pivotal player in the continent’s history. They contain more than 80 per cent of North America’s surface water, and together, they comprise the largest readily available source of freshwater on Earth, boasting 21 per cent of the world’s surface...
water (Environmental Protection Agency 2011b). The surface area of all five lakes nearly equals that of the United Kingdom, and their combined shoreline measures over 17,000 km (10,500 miles), nearly half the circumference of the Earth (Grady 2007, 21). These lakes are also incredibly ecologically diverse, providing habitat for more than 350 species of fish and 3,500 species of plants and animals (International Joint Commission 2006, iv).

The Great Lakes and St. Lawrence River form a single hydrological system linking the interior of North America with the Atlantic Ocean. Starting with a river flowing south into Lake Superior from the Nipigon region, this system is described by Holling as follows:

The river flows into the Great Lakes, the biggest lakes in the world. They are set like bowls on a gentle slope. The water from our river flows into the top one, drops into the next, and on to the others. Then it makes a river again, a river that flows to the Big Salt Water. (Holling 1941, 3)

At the upper end of the system, the surface of Lake Superior averages about seven metres (24 feet) above that of Lakes Huron and Michigan, which form a single hydrological unit. While the water level in Lake Erie is only a few metres lower than in Lakes Huron – Michigan, the drop from Lake Erie to Lake Ontario (over the Niagara Escarpment at Niagara Falls) is almost 100 metres. The amount of water flowing through this system is a tiny proportion of the total volume of the lakes themselves: less than 1 per cent per year. The hydrology of the Great Lakes has important social implications. For example, since the lakes form a single hydrological system, in some respects, the whole system needs to be managed in an integrated fashion. The outflow of the lakes also has social implications. Outflow is so small that pollutants entering the system tend to persist and become more concentrated with time (Environmental Protection Agency 2011b). In addition, the relatively small proportion of renewable water flowing in the system means that little or no “surplus” water is available for removal from the basin. The various jurisdictions sharing these waters have therefore need to work together to protect the Great Lakes from excessive consumptive uses (International Joint Commission 2000).

The Great Lakes have both separated and joined the United States and Canada, serving as a foundation for international trade, as well as cultural contact and exchange. In the early seventeenth century, during initial European exploration of the region, the lakes were bordered by two major linguistic groups (Algonquian and Iroquoian) and dozens of distinct nations (Heidenreich and Wright 1987). Today, the international significance of the Great Lakes is suggested by the fact that they define a large portion – about a third – of the border
between the United States and Canada. The border itself bisects Lakes Superior, Huron, Erie, and Ontario. Lake Michigan is the only Great Lake that is entirely within the boundary of one country: the United States. The province of Ontario occupies the entire Canadian side of this border, and the US side includes eight states: Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania, and New York. When combined with the hydrological imperative of integrated management, the international and interjurisdictional complexity of the region presents governance challenges that people living in the basin have had to overcome.

The Great Lakes basin is small relative to the size of the lakes themselves; nevertheless, it occupies an area approximately the size of France and the UK combined. Some 40 million people live in the Great Lakes basin, the vast majority of which reside in the southern area around Lakes Erie and Ontario, and the southern portions of Lakes Michigan and Huron (Grady 2007, 32). Americans make up about three-quarters of this population with roughly 30 million people, and Canadians comprise about 10 million. Despite the immense capacity and historical resilience of the Great Lakes, excessive withdrawals and prolonged consumptive use by these 40 million human inhabitants could negatively impact water levels and the environment. However, despite recent population growth, total water withdrawals from the Great Lakes have decreased or increased only slightly most years since 1990, most likely due to conservation and more efficient water use (Reeves 2011, 28–9). The most significant anthropogenic uses of water in the basin, in order of volumes withdrawn, are as follows: cooling thermoelectric power plants, providing public water supply, industrial use, and irrigation. Along this portion of the shared border, roughly 23 million people depend on the Great Lakes for their drinking water (Sproule-Jones 2002, 3).

Perhaps drinking from the same source of water produces a kind of conviviality among people. In any case, citizens living along the shores and in the basin of the Great Lakes evidently share elements of a common culture. This common culture is reflected in the colourful title of Ted McClelland’s popular 2008 book, The Third Coast: Sailors, Strippers, Fishermen, Folksingers, Long-Haired Ojibway Painters, and God-Save-the-Queen Monarchists of the Great Lakes. McClelland sets the scene for his stories of people living in the basin by declaring: “The Great Lakes are the North’s most remarkable natural feature ... They also comprise a nation within North America, as surely as the South. I call it the Freshwater Nation” (McClelland 2008, xiii).

This “Freshwater Nation” nevertheless has different histories and inhabitants on either side of the international border experience it somewhat differently, a dynamic that is explored in the following two sections.
The Great Lakes in Canadian History, Economy, and Culture

The article on the Great Lakes in *The Canadian Encyclopedia* frames the subject in the following terms: “[The] Great Lakes are the largest group in a chain of large lakes (including Winnipeg, Athabasca, Great Slave and Great Bear) that lies along the southern boundary of the Canadian Shield” (Marsh 1985, 934). While geologically correct, this framing reflects the rather proprietary attitude that many Canadians take toward the Great Lakes. From a Canadian perspective, it is something of an inconvenience to share the lakes with their US neighbours. Indeed, an early Canadian geography textbook found it necessary to point out, “Only part of the Great Lakes belongs to Canada” (Morrison 1930, 493).

This Canadian sense of ownership of the Great Lakes is partly explained by their relative importance in Canada’s history. The Great Lakes figure in the founding stories of Canadian nationhood, beginning with the travels of Samuel de Champlain in the early seventeenth century and continuing with the continental expansion of the St. Lawrence fur trade over the following two centuries. Traders used the lakes as means of transport, sites for trading, and entrepôts, eventually fanning out from the Great Lakes to bring much of the continent into a system of trade. In the nineteenth century, the development of Canada as a nation and a national economy along an east-west axis hinged on the Great Lakes and the St. Lawrence River. This hydrological system served as a commercial artery and communications system linking the Atlantic provinces with Manitoba, Saskatchewan, Alberta, and eventually British Columbia on the Pacific Coast (Easterbrook and Aitken 1956).

As Canada’s economic centre of power shifted westward from Montreal to Toronto during the course of the twentieth century, the Great Lakes region assumed increasing national importance. To the extent that the “view from Toronto” has attained a measure of hegemony in defining and shaping Canadian identity, the Great Lakes have assumed a central place in that identity. Today, the population of the Great Lakes basin is comprised of one third of Canada’s population, compared with just 10 per cent of the US population.

The Great Lakes also figure prominently in the Canadian arts. Thomas Cary’s “Abraham’s Plains,” one of the earliest and most anthologized poems written in Canada, put the Great Lakes at the centre of the Canadian landscape (Bentley n.d.). Gordon Lightfoot’s 1976 hit, “The Wreck of the Edmund Fitzgerald,” commemorated the famous 1975 sinking of the iron-ore carrier of that name on Lake Superior and has been described as “perhaps the most well known Canadian song about water” (Environment Canada 2001). This demonstrates the importance of the Great Lakes in Canadian music, as does the current
popularity of the indie-pop group called Great Lake Swimmers and adoptive Canadian composer Hennie Bekker’s _Great Lakes Suite_. These lakes have an important place in the visual arts, too: Lauren Harris’s iconic paintings of the north shore of Lake Superior contribute to the oeuvre of the Group of Seven, whose distinctive early-twentieth-century style was inspired by the landscapes of the Great Lakes basin, especially Georgian Bay, Muskoka, Algoma, and Algonquin Park.

The Canadian public’s deep concerns about exporting water in bulk are partly a reflection of the sense of ownership and importance of the Great Lakes to Canadian identity. The prospect of bulk water exports is a longstanding issue of concern to Canadians (e.g., Bocking 1972; Holm 1988; Pentland and Hurley 2007), but this apprehension is never greater than when the water in question comes from the Great Lakes. Indeed, when the issue of exporting Great Lakes water has been raised, the Canadian public tends to consider it a largely Canadian issue. For example, in 1998, the government of Ontario issued a license to remove water by tanker from Lake Superior for export to an unspecified destination in Asia. The ensuing outcry was indicative of the importance of the Great Lakes – and of water in general – to Canadian identity. As Owen Saunders and Michael Wenig (2007) point out:

> Although the amount of water in question was not large, and although even a cursory analysis of the proposal would have made it plain that the costs involved were such as to make it virtually impossible for the scheme ever to go forward on a profitable basis, the very fact that such a license could be granted served to act as a touchstone for lingering concerns as to the security of Canada’s water resources. (133)

Following publicity of this issue, Canada’s federal government took action by attempting to negotiate a moratorium on water exports with each of the provinces and by amending federal legislation to preclude water exports from boundary waters. The government also acknowledged that this was more than just a Canadian issue: in 2000, it made a joint reference with its US counterpart to the International Joint Commission (IJC) to investigate and make recommendations on the broader question of water uses in the Great Lakes (International Joint Commission 2000). This incident reflects the degree of ambivalence that Canadians have with respect to the Great Lakes. On one hand, the lakes are thought of as a largely Canadian resource. On the other hand, Canadians know that management and protection of this resource requires a high degree of collaboration and cooperation with their neighbours to the south.
The Great Lakes in US History, Economy, and Culture

The citizens of the United States living within the Great Lakes watershed share their Canadian neighbours’ sense of ownership over the lakes. Although the present era of Great Lakes may be characterized by cooperation fuelled by common attachment, the Great Lakes were perennially a theatre of conflict throughout the course of early US history. The common desire to share and protect this beautiful and irreplaceable natural landscape came about more recently, succeeding a past fraught with strife.

During the peace negotiations that brought the American Revolutionary War to a close, Benjamin Franklin suggested that Great Britain cede the entirety of the Great Lakes to the newly formed United States of America (Mansfield 1899, 124). When this proposal was rejected, the two sides eventually settled on a boundary line “through Lake Superior northward of the isles Royal and Philippeaux to the Long Lake” (Mansfield 1899, 124). The Great Lakes became the boundary between the new United States and British North America (Environmental Protection Agency 2011a).

The Great Lakes would again become central to conflict between the United States, Great Britain, and Canada during the War of 1812, in which one of the primary objectives of the US forces was expanding into and developing the area around the Great Lakes (Environmental Protection Agency 2011a). During the war, the lakes were the field of numerous battles and the site of a race for naval supremacy between the United States and Great Britain (Mansfield 1899, 154). When ambassadors from the United States and Great Britain met in Ghent in 1814, all of the diplomats had been instructed to negotiate a treaty that excluded the other side from the basin (Mansfield 1899, 181). However, the final treaty once again drew the boundary line through the midst of the Great Lakes (Mansfield 1899, 181).

Despite this bloody early history, the Great Lakes have inspired some of the United States’ most enduring and significant political, cultural, and artistic works. The Northwest Ordinance of 1787, which numbers among the most important documents of the early United States (after the Declaration of Independence and the Constitution), set the standard for the admission of states into the union – a standard that was initially crafted for the Northwest Territories surrounding the Great Lakes (Duffey 1995, 929–30). The Northwest Ordinance prohibited slavery, provided for religious tolerance, and promoted education (Duffey 1995, 929–30).

The Great Lakes have also contributed to US culture as a source of inspiration to poets and other artists. During the region’s early history, poets and explorers elegized the lakes’ “sweet seas,” “bold shores,” and the “riches of the soil.
and the natural beauty of the country” (Sproule-Jones 2002, 21). The American poet Henry Wadsworth Longfellow immortalized the region, and Lake Superior in particular, in his *Song of Hiawatha*.

Some of the most ambitious engineering feats in the history of the United States have taken place in the Great Lakes basin. The Mackinac Bridge, for example, is the third longest suspension bridge in the world. To construct the bridge (which opened in 1957), its engineers assembled the largest construction fleet that the world had ever seen (Mackinac Bridge Authority 2011). Between 1889 and 1910, by constructing a system of locks and canals, engineers reversed the flow of the Chicago River to end the dumping of untreated waste into Lake Michigan (Nilon 2004; Egan 2010). Despite unforeseen and significant environmental implications, the integration of Chicago’s waterways to spur urban growth and trade on the Great Lakes was crucial to the historical development of this area as an industrial region (Cain 1998, 153).

In addition to being the site of numerous technological feats, the Great Lakes region fostered industry and the growth of urban centres within its watershed. Chicago grew because it sat astride the “gateway of commerce” (Cain 1998, 153). Detroit famously gave birth to the automotive industry when steamers carried steel and coal across the Great Lakes, and assembly lines churned out the automobiles that would so profoundly affect the US landscape and lifestyle across the continent (Henry Ford Museum 2003). Despite recent hardship in the Midwest, the Great Lakes continue to provide for the citizens of the Great Lakes states. A recent study by the Michigan Sea Grant at the University of Michigan found that 1.5 million jobs are directly connected to the Great Lakes, and $62 billion (USD) in wages are generated each year (Michigan Sea Grant 2011).

Consequently, US residents of Great Lakes states are fiercely protective of the water that shaped the entire history of their homeland, much like their Canadian neighbours to the north are protective of their history (Lasserre and Forest, in this volume). As described in detail in chapter 5, several proposals have been made to divert Great Lakes water to drier regions of North America. Americans and Canadians living within the Great Lakes watershed are strongly opposed to such proposals and have made protections against trans-basin diversions a priority in their cooperative water management policies.

**The Great Lakes as a Site of International Cooperation**

In his now classic article on conflict and cooperation along international waterways, Aaron Wolf affirmed that “shared interests along a waterway seem to consistently outweigh water’s conflict-inducing characteristics” (Wolf 1998, 251).
The Great Lakes provide a good example of this rule, forming the site of a rich history of international cooperation over a shared waterway. Over the years, new and unforeseen developments in the political, technological, economic, and environmental sectors have presented themselves, requiring new forms of cooperation between the two countries to find resolution. We can trace this history of international cooperation as far back as the conclusion of the 1817 Rush-Bagot Agreement between Britain and the United States, which followed the hostilities of the War of 1812. This agreement drastically limited the naval force that each power could maintain on the lakes, effectively demilitarizing the space to allow for growth of international trade and facilitate commercial navigation and fishing.

A new suite of issues arose toward the end of the nineteenth century, including the question of financing capital improvements that would benefit both parties and concerns about the effects of diversions (such as that which took place in Chicago) on navigation, hydroelectric development, and water levels. Such issues gave rise to the creation of the International Waterways Commission in 1895 and were of central importance to the negotiation of the Boundary Waters Treaty of 1909 (BWT, or Treaty), which is discussed in detail below (Sproule-Jones 2002, 24). Around this time, technological developments, such as the invention of alternating current and improvements in the efficiency of turbines, allowed for the commercial exploitation of hydroelectricity, enabling the water of the Great Lakes, especially at Niagara Falls, to present itself as a new kind of resource. However, such developments also presented challenges that demanded international cooperation for resolution. For example, the prospect of both countries diverting water from the Niagara River to generate electricity produced an agreement by both parties “to limit the diversion of waters from the Niagara River so that the level of Lake Erie and the flow of the stream shall not be appreciably affected” (Boundary Waters Treaty, Article V). These provisions were later modified to accommodate changing circumstances. For instance, in 1941, allowance was made for increased hydropower generation on both sides of the border to help boost the war effort. A further joint revision in 1950 allowed for greater minimum flow over the falls, recognizing that protecting the “scenic beauty of this great heritage of the two countries” was the primary obligation of both countries (Wolf 1998, 260).

Opportunities for improved navigation of the Great Lakes have also provided an impulse for enhanced international cooperation. Proposals to enlarge and consolidate the separate canal systems in the Canadian and US sides of the border were discussed in the late nineteenth century. In 1921, the International Joint Commission recommended joint development of an enlarged navigation system on the upper St. Lawrence River. Finally, in the 1950s, parallel
legislation passed by both federal governments allowed for construction of the St. Lawrence Seaway, a deep waterway that extends from the head of Lake Superior to the Atlantic Ocean (Easterbrook and Aitken 1956, 555).

Conservation and environmental concerns have also been a catalyst for international cooperation to protect the Great Lakes. Concerns about the depletion of commercial fish stocks helped give rise to the Inland Fisheries Agreement in 1908, through which Canada and the United States made an initial attempt to establish coordinated fisheries policies on the Great Lakes (Sproule-Jones 2002, 28). The invasion of the upper lakes by the parasitic sea lamprey in the mid-twentieth century, which resulted in decimation of commercial fish stocks, was the immediate reason for establishment of the binational Great Lakes Fisheries Commission in 1955. More broadly, this commission represents a joint effort to sustain commercial fisheries on the Great Lakes by helping inform coordinated regulations and fisheries policy (Sproule-Jones 2002, 28–9).

Water quality issues in the Great Lakes have prompted coordinated binational investigation and action to address emerging concerns over water pollution. In response to the overloading of the lower lakes, especially Lake Erie, by nutrients from urban wastewater and other sources in the 1960s, the first Great Lakes Water Quality Agreement was negotiated between the two countries in 1972. This agreement was highly successful in limiting inputs in the lakes of phosphorus – which had been identified as the most harmful nutrient – and was amended in 1978 to reflect emerging concerns about the effects in the basin of persistent toxic substances on ecosystem and human health. In 1987, Canada and the United States signed a protocol allowing for Remedial Action Plans to be put in place for 43 “Areas of Concern” around the Great Lakes that suffered particularly acute forms of pollution. The 1987 protocol also made provisions for “Lakewide Management Plans” to focus on critical pollutants and improve water quality in all five lakes.

Among the various water-related issues affecting the Great Lakes, the prospect of diverting water out of the basin has perhaps the greatest potential for dividing the interests of the two countries that share this resource. Here, Canada’s longstanding concerns about exporting water come into play, since virtually all of the pressure – putative or real – to divert more water from the Great Lakes comes from south of the basin. As Ralph Pentland and Adèle Hurley (2007) have pointed out, “In the Great Lakes states ..., where population is more heavily concentrated than it is in Canada, inter-basin diversion possibilities are attracting the attention of several communities lying just outside or straddling the Great Lakes Basin divide” (166–7). Nevertheless, the threat of such diversions is felt by Americans living in the basin as well. Consequently, as with the other issues described in this section, the possibility of extra-basin diversions
arguably has served to bring Canadians and Americans living in the basin closer together. The question is whether the combined interests of the basin will prevail over those outside the basin that might now, or in the future, covet water from the Great Lakes.

Along with threats to water quality, concerns about extra-basin diversions catalyzed the formation of Great Lakes United. This widely based environmental coalition is concerned with protecting the Great Lakes and St. Lawrence River ecosystem; it has offices on both sides of the border in Buffalo, Ottawa, and Montreal (Great Lakes United 2009). In 1985, the governors of the eight Great Lakes states and premiers of the two Canadian provinces signed the Great Lakes Charter, a nonbinding agreement that created a notice and consultation process for any significant new use, or increased diversion or consumption of Great Lakes water (Lasserre 2007, 156). Recognizing the need for a more effective mechanism, the Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement (2005) was signed by the same parties. As described in greater detail below, its main provision bans exports and diversions of water out of the Great Lakes – St. Lawrence River basin and prohibits new or increased withdrawals, unless strict criteria are met. Although still not legally binding, this agreement constitutes “a real political commitment to thwarting water export projects ... thus alleviating most concerns expressed by Canadians, specifically those living in Quebec and Ontario” (Lasserre 2007, 159).

The Current Situation – Policies and Governance

Managing Great Lakes water is necessarily an exercise in cooperation among multiple jurisdictions and levels of government. This transboundary challenge has produced a rich history of laws and policies that continues to develop today, and it demonstrates the cooperative culture in the Great Lakes region.

The Boundary Waters Treaty of 1909 and the International Joint Commission

As discussed in text boxes 1.1 and 1.2, the Boundary Waters Treaty of 1909 has foundational for the development of transboundary Canadian-US water management for more than a century. Since the region was relatively undeveloped until the late nineteenth century, there was little pressure on Great Lakes water resources and no need for international legal rules. By the turn of the century, both countries saw a need to avoid conflicts over use of the shared waters. The United States and Canada first established the International Waterways Commission in 1903 to address potentially conflicting rights in the countries’ shared
waterways (Woodward 1988, 326). The International Waterways Commission recommended that the two countries adopt legal principles of shared water use and form an international body to protect boundary waters. This recommendation led to the 1909 BWT, the first article of which provides for joint management and cooperation between the United States and Canada over boundary waters.

While navigation and access to boundary waters was the principle concern in 1909, the first draft included a provision forbidding water pollution with transboundary consequences, to be enforced by an international commission vested with “police powers” (Jordan 1971, 66–7). Thus, Article IV of the BWT provides: “... the waters herein defined as boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other.” This provision establishes a clear standard regarding pollution of shared waters. Such pollution is just one form of transboundary water pollution, since contaminants often follow indirect paths of tributaries and different media, such as airborne pollution that is deposited into water bodies through precipitation. The underlying legal principle of Article IV, that one country’s pollution should not harm another country, provides a foundation for Canadian-US international environmental law (Hall 2007).

The BWT also addresses the taking and diversion of boundary waters. Article III provides that neither party may use or divert boundary waters “affecting the natural level or flow of boundary waters on the other side of the [border]” without the authority of the International Joint Commission (IJC, or the Commission). The IJC is a six-member investigative and adjudicative body, with the United States and Canada equally represented by political appointees. It is well respected in both countries and is often commended for its objectivity and leadership on environmental issues (Hall 2007, 706). This Commission’s reports rely on the best available science and are free of nationalistic biases, making it an important source of information for the public and decision makers (Hall 2007, 707). Scores of issues have been referred to the IJC for nonbinding investigative reports and studies pursuant to Article IX. The Treaty only requires a reference from one of the countries to invoke this process, but as a matter of custom, this has always been done with the support of both countries (Hall 2007, 706–7). This bilateral approach has strengthened the credibility of the IJC’s nonbinding reports and recommendations, and ensured sufficient funding for its efforts. These reports and their objective recommendations have enabled diplomatic resolution of numerous transboundary water disputes, as well as the crafting of new water-protection policies.

In recent decades, the Commission has played a critically important role in studying potential threats to the waters of the Great Lakes and informing both the
public and decision makers in the United States and Canada. However, over the past several years, the role of the IJC in areas such as overseeing the Great Lakes Water Quality Agreement has been somewhat reduced (see below and Pentland, this volume). This Commission is also severely limited in its ultimate adjudicative power (Sadler 1986, 370–2). Together with the narrow scope of the Boundary Waters Treaty, this limitation has necessitated additional protections and joint-management programs for the shared water resources of the Great Lakes. We limit our discussion in the following sections to two of the most salient examples.

The Great Lakes Water Quality Agreement

In the 1960s, citizens and scientists became increasingly alarmed about water pollution in the Great Lakes. The United States and Canada therefore referred the pollution issue to the Commission in 1964. The IJC’s 1970 report recommended new water-quality control programs and a new agreement on cooperation concerning pollution issues. In 1972, Prime Minister Pierre Trudeau and President Richard Nixon signed the Great Lakes Water Quality Agreement (GLWQA). This agreement recognized the grave deterioration of Great Lakes water quality, set forth general and specific water-quality objectives, provided for programs and other measures to help achieve these objectives, and redefined the powers, responsibilities, and functions of the IJC. Primary responsibility for implementation was left with the two federal governments, specifically the US Environmental Protection Agency and Environment Canada.

The 1972 agreement focused on phosphorous pollution. Sewage treatment was improved, and both countries adopted phosphate detergent bans. This success was tempered by new scientific discoveries and resulting public pressure to address persistent organic chemicals that “were already affecting the health of wildlife and could be a threat to human health” (Botts and Muldoon 2005, 27). The United States and Canada amended the GLWQA in 1978 (Article II) with a new purpose:

[T]o restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem. In order to achieve this purpose ... it is the policy of the Parties that [t]he discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated.

The parties signed another protocol in 1987 to add provisions for “Remedial Action Plans” for “Areas of Concern” and “Lakewide Management Plans” focusing on critical pollutants and drawing upon community involvement,
focused on specific locations within the region. In 2006, the two countries and the IJC began conducting another comprehensive review of the GLWQA to address emerging threats to the health of the Great Lakes.

The GLWQA and its amendments have also given citizens an increased role in shaping pollution policy in the Great Lakes. Before the 1972 agreement, the Commission held public hearings on specific topics, but essentially conducted its business in private. Under increased citizen pressure about the environment, the GLWQA changed this custom and opened the Commission up to the public. The International Joint Commission (1998) affirmed its commitment to public participation in its Ninth Biennial Report: “The public’s right and ability to participate in governmental processes and environmental decisions that affect it must be sustained and nurtured .... The Commission ... has come to expect, and to provide opportunities to be held publicly accountable for their work under the Agreement.”

With increased public participation comes increased accountability for the two federal governments, and this informed and engaged citizenry has led to improved binational protection of the Great Lakes. An important element in public participation under this agreement is the Science Advisory Board, which is composed of scientists, citizens, and industry representatives. Originally called the Research Advisory Board, this body has a direct line of communication to advise the Commission. Despite its name, the Science Advisory Board has not limited itself to technical matters, and its work has led to many policy accomplishments (Botts and Muldoon 2005, 184–8).

The Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement and Great Lakes – St. Lawrence River Basin Water Resource Compact

Shortened to “The Great Lakes Agreement” (2005) and “The Great Lakes Compact” (2008), these developments represent an advance in substantive legal rules for water use and cooperative management among the states and provinces sharing the Great Lakes basin. This section focuses on the Great Lakes Compact as a new model for interstate water management and the Great Lakes Agreement as a new model for sub-treaty international cooperation. The foundation of these interstate and international management structures is the development of common standards for new or increased water withdrawals. These standards, which apply on both sides of the border, ensure the following: that water is used within the watershed, that individual and cumulative adverse environmental impacts are prevented, and that water use is reasonable and incorporates water-conservation measures.
The Great Lakes Compact establishes basin-wide common standards for water use and is recognized as an effective procedure for citizen participation on both sides of the border. Nevertheless, for constitutional and political reasons, this compact only includes the US states. Given the need for comanagement of the Great Lakes as discussed above, state-provincial cooperation has been a regional goal for decades, but raises fundamental legal and political concerns. The Compact Clause of the US Constitution prohibits states from entering into a “treaty, alliance, or confederation” with a foreign government. In an attempt to meet the goal of state-provincial cooperation without running afoul of constitutional treaty limitations, the Great Lakes governors and premiers developed the Great Lakes Agreement (2005) as a nonbinding, good faith agreement that includes the provinces of Ontario and Quebec. This dual structure creates a legally and politically acceptable mechanism for cooperation with Canadian provinces.

The Great Lakes Compact incorporates the provinces through the Great Lakes Agreement’s “Regional Body,” which includes representatives from each state and province charged with conducting the “Regional Review” procedure. Although the Regional Body’s authority is procedural rather than substantive, all parties consider it effective because it gives Canadian provinces and Canadian citizens a clear procedure for participating in major water-use decisions. The Regional Review process avoids infringing on federal treaty powers, but still gives the provinces an evaluative and procedural role that may prove useful for them. As noted above, despite the Great Lakes Agreement’s nonbinding status, Canadian officials and environmental agencies are generally pleased with the Great Lakes Compact and the Great Lakes Agreement. Canadians are primarily concerned that the United States, with significant population growth in regions such as the south and southwest that are far from the Great Lakes basin, will look to divert Great Lakes water to other parts of the country. Thus, Canadians welcome any legal limitations of Great Lakes diversions within the United States.

Looking Forward – Challenges and Opportunities

While the Great Lakes region has a relative abundance of water, as well as numerous policies and institutions for cooperative protection and management, some significant challenges loom on the horizon. As Pentland outlines in chapter 6, climate change, invasive species, energy development, and water pollution appear to be the most significant environmental challenges. Further, there is strong opposition to water commoditization and exports on both sides of the border. Given the region’s strong history of cooperation, these challenges will
likely be met with new agreements, policies, and institutions that build on the political, legal, and cultural foundation already established.

**Climate Change**

Climate change is expected to stress water resources and human communities globally, and the Great Lakes region won’t be immune to these changes. While water levels in the Great Lakes have always fluctuated, the changes in levels have not been radical. Naturally fluctuating lake levels are critical for ecosystem function, but can be disruptive to human needs and economic development. Most climate models predict that water levels in the Great Lakes will drop during the next century, below historically fluctuating lows, by as much as 1.38 metres in Lake Michigan and Lake Huron due to changing precipitation, as well as increased air temperature and evapotranspiration (Hall 2010a, 249).

Scientists also expect air and water temperatures in the Great Lakes region to rise two to four degrees (C) by the end of the century. Lower lake levels and rising air and water temperatures will significantly impact fisheries, wildlife, wetlands, shoreline habitat, and water quality in the Great Lakes region. Economically, tourism and shipping are critically important to the region, and both industries are extremely vulnerable to the impacts that climate change is likely to have on water resources.

The increased variability in timing, intensity, and duration of precipitation will likely lead to increased frequency of droughts and floods in the Great Lakes region. The IJC estimates that stream runoff is expected to decrease, and baseflow (the contribution of groundwater to streamflow) could drop by nearly 20 per cent by 2030 (International Joint Commission 2003, 45).

Managing the Great Lakes under the conditions of hydrological uncertainty associated with climate change will pose a definite challenge for current agreements and processes of governance. However, the aforementioned Great Lakes Compact could be an ideal policy to help the region adapt to these conditions. While climate change will negatively impact the Great Lakes through deterioration of water quality, habitat, shorelines, and fisheries, as well as lower lake levels, the total available water supply will not be drastically reduced. The region’s population and water usage are also not increasing significantly (in fact, in some locations and sectors they are actually decreasing), and freshwater is relatively abundant. The Great Lakes Compact is the most modern interstate water compact and was developed in recognition of the risks of climate change. It does not rely on fixed estimates of water supply to make definitive allocations; instead, it ensures sustainable water use by requiring states to comprehensively regulate water use to meet water conservation, ecosystem protection, and other standards.
Energy Development

Energy development in the Great Lakes also presents risks to freshwater. The Great Lakes have significant oil and gas resources that are economically and technologically accessible with modern drilling techniques. In a 2006 study, the United States Geological Survey (USGS) estimated that the US portion of the Great Lakes contains 312 million barrels of undiscovered, technically recoverable oil, as well as 5.2 trillion cubic feet of natural gas (Coleman 2006, 1–4). There are no comprehensive studies or estimates of oil and gas resources in this region under Canadian jurisdiction. The best information available is from the Ontario Ministry of Natural Resources, which estimates that the province’s portion of the Great Lakes contains approximately 153 million barrels of recoverable oil and 1.5 trillion cubic feet of natural gas. Oil and gas production on the Canadian side of the Great Lakes dates back almost a century, with commercially produced natural gas taken from under the bed of Lake Erie as early as 1913.

Drilling for these oil and gas resources would create risks and potential impacts for the freshwater of the Great Lakes. In 2005, the US Army Corps of Engineers released a report to Congress titled, “Known and Potential Environmental Effects of Oil and Gas Drilling Activity in the Great Lakes.” The report summarized that oil drilling and infrastructure would potentially “directly impact fish and wildlife habitats by clearing land areas or disturbing lake bottoms,” and “the visual intrusion of oil and gas developments could reduce the desirability of these areas for tourism and other recreational uses” (Department of the Army – US Army Corps of Engineers Chicago District 2005, E-2).

The United States federal government, and most US states, have recently banned oil and gas drilling in the Great Lakes due to the environmental risks associated with these activities (Hall 2010b, 309–10). Canada, however, has not yet banned drilling in the Great Lakes. Ontario, the only province with significant Great Lakes jurisdiction, allows offshore gas wells and directional drilling of oil wells in this region (Hall 2010b, 310). Consistent with the cooperative and proactive nature of environmental policy-making in the Great Lakes, there is already an effort to enlist the IJC to study the issue and make policy recommendations. In the summer of 2010, more than 20 members of the US house of representatives from the Great Lakes states sent a letter to President Barack Obama, Canadian Prime Minister Stephen Harper, and the International Joint Commission. The letter urged the federal governments, in coordination with the IJC, to “undertake a review of oil and gas drilling by Canada in the Great Lakes, particularly in regard to safety, environmental impact and oil spill response plans” (Hall 2010b, 312–13).
Thanks in large part to the Great Lakes Water Quality Agreement and other bi-national initiatives described above, the Great Lakes have exhibited significant improvements in water quality since the 1970s. Reductions in nutrient loadings (especially phosphorus) and in contamination by persistent, bioaccumulative toxic substances have been particularly noteworthy. General reductions in phosphorus loadings, for example, have prevented the recurrence of eutrophication in Lake Erie, which became a cause célèbre in the late 1960s. Reductions in persistent toxic substances have been accompanied by reductions in contaminant levels found in fish and wildlife in the basin. These substances no longer limit the reproduction of fish, birds, and mammals as they did in previous decades. Nevertheless, the Great Lakes continue to receive toxic contaminants from a wide variety of sources, including municipal and industrial wastewater, air pollution, contaminated sediments, runoff, and groundwater. Atmospheric deposition of toxic compounds is expected to continue well into the future and appears to be concentrated in urban areas around the lakes (Environment Canada and the United States Environmental Protection Agency 2009).

Despite the general reductions in nutrient loading after the 1972 Great Lakes Water Quality Agreement, phosphorus input to the lakes remains a concern, and in some locations, appears to be increasing because of agricultural and urban runoff, among other factors. An increasing proportion of this pollutant is found in a dissolved form that feeds near-shore algal blooms (Environment Canada and the United States Environmental Protection Agency 2009). In addition, invasive zebra and quagga mussels impact this issue by clarifying the water column, which allows deeper penetration of sunlight. When combined with the impact of increased sunlight, the continuing presence of phosphorus is considered a major contributor to algal blooms of nuisance proportions in nearshore waters, especially in Lakes Michigan, Erie, and Ontario (Environment Canada and the United States Environmental Protection Agency 2009, 11, 13).

Increasing concentrations of several “substances of emerging concern” in the lakes have also been observed in recent years. These substances include flame retardants, plasticizers, pharmaceuticals, and personal-care products that make their way into the lakes. They are of concern because they may pose a risk to the health of fish, wildlife, and humans. Flame retardants known as polybrominated diphenyl ethers (PBDEs) are found in many consumer products and have recently been added to the list of contaminants monitored in fish in Canada and the United States (Environment Canada and the United States Environmental Protection Agency 2009, 4). Citizens on both sides of the border have an interest in ensuring that the current review of the Great Lakes Water Quality Agreement results in continued improvements in water quality.
Agreement will adequately address these emerging threats and that the binational citizens organization Great Lakes United actively informs and engages citizens of both countries on this issue.

**Biological Stresses: Invasive Species**

The 1996 State of the Lakes Ecosystem Conference hosted by the US Environmental Agency and Environment Canada identified invasive species as among the greatest threats facing nearshore waters in the Great Lakes. At that time, 166 documented nonindigenous invasive species were inhabiting the waters of the lakes. Between 1996 and 2008, 19 additional invasions were reported (Environment Canada and the United States Environmental Protection Agency 2009, 12). A nonindigenous species is considered invasive when it is shown to negatively impact ecosystem health. The devastation wrought by species like the sea lamprey and the zebra mussel, as well as the threat posed by menaces such as the Asian carp, are obvious. However, all invasive species, including the smallest microflora and fauna, can affect ecosystem processes in unpredictable and harmful ways. Nonnative species have been linked to various problems in the Great Lakes, including increases in fish and waterfowl diseases, excessive algal growth, and the decline of important species at the bottom of the aquatic food chain (Environment Canada and the United States Environmental Protection Agency 2009, 2–3). Shipping, particularly the exchange of ballast waters, is considered the main vector for the introduction of invasive species in the lakes, but canals, online purchase of aquatic plants, and the aquarium and fish-bait industries are also sources of this problem. According to the 2009 State of the Lakes Report, “the Great Lakes ecosystem has been, and will continue to be, extremely vulnerable to introductions of new invasive species because the region is a significant receptor of global trade and travel. The vulnerability of the ecosystem to invasive species is elevated by factors such as climate change, development and previous introductions.”

**Conclusions**

Environment Canada’s web page on the Great Lakes makes the following, rather stark statement:

> The sustainability of the Great Lakes ecosystem is threatened. The ecosystem continues to experience ongoing biological, physical and chemical stresses, as well as new and emerging challenges like invasive alien species, new chemical contaminants and the impacts of climate change. (Environment Canada 2011)
At the same time, the agency recognizes that people living in the basin of the Great Lakes, as well as the governmental and nongovernmental organizations that represent them, are rising to the challenges presented by these and other threats:

Many governments, organizations, groups and individuals are contributing to the restoration and protection of the Great Lakes. Work is being done at the local, regional, lakewide and basinwide scales, and all of these efforts help to restore and protect the Great Lakes. There are many success stories to be told but there is still work to be done. (Environment Canada 2011)

In this chapter, we have shown how the Great Lakes have presented a series of emerging challenges over the years, the resolutions of which have required a high degree of cooperation and collaboration among people on both sides of the international border. As previously suggested, there is every reason to expect that more complex challenges will continue to present themselves and that these issues will demand ever-higher degrees of cooperation within the region and between the two countries. While disagreements sometimes emerge, overall the citizens and political leaders in the Great Lakes continue to address freshwater issues with a culture of transboundary cooperation that helps create a model of Canada-US freshwater governance.

NOTE

1 For over a century, water has been removed from the Great Lakes basin via the so-called Chicago Diversion, a canal built in 1900 to reverse the flow of the Chicago River and move water from Lake Michigan into the Mississippi River basin. At 91 cubic metres per second, the Chicago Diversion is the largest extra-basin diversion from the Great Lakes; however, it is more than compensated for by a diversion of water from the Hudson Bay drainage basin into Lake Superior at Long Lac and Ogoki in Northern Ontario (Sproule-Jones 2002, 29–30).

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