



**Potential Problems with Cross-Border Water Issues:  
The U.S. and Canada in the 21<sup>st</sup> Century  
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The harmonious relations between the United States and Canada have been a source of pride for both countries. The U.S. is Canada's largest trading partner, constituting 85% of our two-way trade with other countries. It is estimated that over \$400 billion per year is traded across our borders. In recent years, Canada has even become the largest supplier of energy to the U.S., surpassing the Middle East. Supplies include uranium and hydroelectric power, as well as oil and natural gas (Grafstein 2004). As a result, the countries have had to set up a number of mechanisms to solve cross-boundary environmental issues including air, water and migratory wildlife.

Policies on water have been one of the best examples of cooperative environmental management. The International Joint Commission has provided a mechanism for cooperative management of the St. Lawrence Great Lakes and other cross-border waters. The Great Lakes Water Quality Agreement and the Boundary Waters Treaty of 1909 are two binational agreements that have provided focus for IJC activity.

There are recent signs of strain in the harmonious trade and environmental relations between the two countries. Disagreements on softwood lumber exports from Canada to the U.S. have had to be taken to arbitration under the North American Free Trade Agreement. Two rounds of resolution, generally favoring Canada, have been challenged by the Americans, and are still not resolved. The closure of U.S. borders to Canadian animals resulting from the BSE crisis is another example. In September 2004, the U.S. announced that it would proceed with the Devils Lake diversion (described below), which has been opposed by Canadians as a threat to Canadian aquatic ecosystems. In short, the U.S. has become increasingly aggressive and nationalistic in its relations with Canada. As a result, conflicts over water will likely increase in the years ahead.

**A summary of current and potential areas of conflict over water**

The Great Lakes and St. Lawrence River are the world's single largest source of freshwater. They supply drinking water to 45 million people, and sustain half of U.S.-Canada trade. Most of Canada's manufacturing and 25% of its agriculture occur in the watershed of the Great Lakes. Ships transport \$80 billion worth of goods annually through the lakes via the St. Lawrence Seaway. While the waters of the Great Lakes are vast, they are also heavily used. There is growing demand on the Ontario side of the Great Lakes, as the result of increased population and industrial growth. In particular, immigration from parts of the world where water is very scarce (Somalia, Sudan, China and India) is fueling population growth in southern Ontario.

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The Great Lakes Water Quality Agreement is up for review. Theoretically, this is an opportunity for improving management of the Great Lakes, but given the emergence of the U.S. as the world's only superpower and its aggressive behaviour on international matters, there will be pressure to skew the agreement in favor of the U.S. For example, a draft agreement called Annex 2001, initiated by the Council of Great Lakes Governors, representing the eight U.S. states in the Great Lakes basin, is in a 90-day period for public comment, which began July 19, 2004. This agreement would be a supplement to the Great Lakes Charter. It would set a common standard for water diversion by both states and provinces. On the surface, the Annex appears to protect the Great Lakes. In fact, it is a thinly veiled effort for permitting the export of Great Lakes water, as we shall discuss below. In particular, there is no indication of how the Annex might affect water movement via the Chicago diversion, which already conducts Great Lakes water to the Mississippi drainage.

#### *Other areas of current and potential water conflict*

There are several areas of ongoing and potential conflict over water, or trade that is dependent on water. New hydroelectric developments in James Bay, designed to supply clients in the northeastern U.S., are threatening another large piece of aboriginal territory in northern Canada. Large quantities of sulfur and nitrogen oxides still spew across the border from American industrial centers and acidify Canadian freshwaters and soils. While the emissions of pollutants have declined slowly over time, current emissions are still keeping many lakes acidic, and causing a small proportion to acidify even more. Soils are becoming leached of essential nutrients for forest growth, which in turn will decrease their ability to buffer waters from acidification.

There is currently concern for the state of Lake Winnipeg, which is developing increasingly massive algal blooms. A large proportion of the nutrients causing this problem originate in the Red River drainage, which extends into the fertile farming country of the U.S. The cities of Fargo, Grand Forks, Moorhead and Winnipeg discharge sewage to the Red River, which drains to Lake Winnipeg. Also in North Dakota, the U.S. has recently decided to divert Devil's Lake into the Sheyenne River, a tributary to the Red River, in order to keep the lake from flooding surrounding lands. The U.S. Army Corps of Engineers has also proposed to connect Devil's Lake to the Missouri River, to stabilize and freshen the lake. This would connect the Mississippi-Missouri river system with the Nelson River, which drains Canadian waters from the Rockies to north-central Ontario. The potential for invasion of alien species that could disrupt natural food webs and the valuable fishery of Lake Winnipeg is enormous. The total annual value of the commercial and sport fisheries of Lake Winnipeg and the Red River is almost \$50 million.

Complex agreements already exist for sharing the water of the Souris River, which flows from Saskatchewan to North Dakota, then to Manitoba, have been renegotiated several times since the original agreement in 1958.

Farther west still, in arid southern Alberta and northern Montana, there is competition for the scarce waters of the Milk and St. Mary's rivers, a source for livestock and irrigation in both countries. A 1921 agreement apportioned the waters more or less equally between Alberta and Montana. However, Montana has recently asked the IJC to review the agreement, claiming that it should be entitled to more of the rivers' water, even though Montana's irrigation is the least efficient of any U.S. state. Following hearings in summer of 2003, the IJC must now decide whether Montana's complaint deserves further exploration.

In British Columbia, the Columbia River originates in Canada but eventually flows to the U.S. The 1964 Columbia River Treaty required Canada to build three dams on the upper Columbia to control flooding and maximize power production in the U.S. part of the watershed. Half the power generated was to have been Canada's. But the B.C. government negotiated a lump payment of \$254 million instead. This sum did not even pay for dam construction. The anadromous salmon runs on the Canadian portion of the Columbia have been totally blocked by hydro dams. There was also considerable damage to Canadian agricultural lands, social disruption and forests, which were not considered in the treaty. It is critical that the Columbia River Treaty be revisited with a view to equalizing benefits.

### **Increasing pressure on freshwater supplies in the future**

There is little doubt that many areas of the U.S., and a few parts of Canada are already suffering from water scarcity. Reasons include increasing populations and industry, climate warming, poor agricultural practices, and poor prevention of water pollution and watershed modification in the past.

#### *Climate warming*

The effects of climate warming will cause all existing trans-boundary water agreements, including inter-provincial ones, to be subject to scrutiny.

Climate warming has already increased the pressure on water supplies in arid areas like the Great Plains and populous areas like the Great Lakes and Greater Puget Sound area. The U.S. Global Change Research Program recently reported in a regional paper "Rocky Mountain/Great Basin Region (water resources): "There will be increasing competition for already limited water supplies and all water-using sectors."

The Great Plains of the western U.S. and Canada are semi-arid at the best of times. They lie in the rain shadow of the Rocky Mountains. Annual average precipitation in this area ranges from less than 300mm to as much as 500mm. In many areas, average evaporation equals or exceeds precipitation, so there is little or no net water generated to flow from the area. Fortunately, some of the area receives flow from rivers or aquifers that originate in the Rockies, where precipitation is higher. Economically important rivers that originate in the snowpacks and glaciers of the Rockies include the Colorado, the Missouri and the Platte rivers in the U.S. and the Saskatchewan, Athabasca and Peace rivers in Canada. In the 20<sup>th</sup> century, the Great Plains have come to rely on these mountain flows. Cities like Denver and Calgary and surrounding agriculture rely on these mountain "water towers."

Much of the Great Plains has already warmed by from 1 to 3 degrees C. Evaporation has increased in proportion. Recent paleoecology studies have shown that intense droughts lasting for a decade or more were common in the Great Plains before the 20<sup>th</sup> century, which was unusually wet. Even the "dirty 30s," widely referenced as an example of the hardships of drought on the prairies, was a minor drought compared to earlier centuries. Of course, there were few humans of European descent to witness the effects of these earlier droughts (but see Palliser 1859). The relatively few aboriginal inhabitants of the Great Plains were nomadic, simply moving during times of drought. But even such well-adapted peoples were sometimes eradicated from large areas by drought conditions.

These earlier droughts occurred under much cooler climatic conditions than we have today, or than we expect in the decades ahead (IPCC 2001). With the large numbers of European

settlers, huge populations of livestock, and vast areas of croplands that we have today, the economies of the Great Plains are much more vulnerable to drought.

Mountain water supplies are also affected by the warming. Glaciers supply relatively small proportions of the total downstream flow in most rivers, but the water is released during the critical midsummer period when annual snowpacks have melted, evaporation is at its highest, fish and other organisms are stressed by high temperatures and oxygen deficits at lower elevations, and irrigators are in greatest need.

Some glaciers have supplied increasing flows during the warming years of the late 20<sup>th</sup> century, compensating to some degree for drought and increasing evaporation downstream. But some glaciers have already melted so far that their contributions are dwindling. Many will have disappeared by 2100 or before. Once gone, they will not return, at least not until the next ice age.

Annual spring snowmelt in western Canada is also contributing less to river flow than it used to. An increasing proportion of winter precipitation in the mountains and foothills is falling as rain rather than snow, and periodic winter melts are increasingly allowing winter snowfalls to seep away gradually, so that they are not available to recharge rivers in the spring.

Altogether, climate warming will cause the already scarce waters of the Great Plains to dwindle.

Climate will have somewhat different effects on the St. Lawrence Great Lakes. Many naively consider the Great Lakes to be nearly inexhaustible sources of freshwater. But the apparent vast water supply of the Great Lakes is deceiving. The waters are not renewed very rapidly. The average water renewal time (the time it would take to refill the lakes if they were drained) is estimated at 100 years. In other words, an average of only one percent of the water is renewed each year. Lake Superior, the headwater for the system, is even longer with water renewal times estimated at 200-300 years. In short, only a small proportion of Great Lakes water can be used sustainably, and climate warming (generally already a degree or two at various places in the basin) will gradually reduce that available for sustainable use. Some climate models suggest lake levels could drop by as much as a meter, and outflows could be reduced by 30% in the next half century.

In the past, there have been many schemes proposed to export Great Lakes water, divert it to arid areas, and otherwise squander it. Even small reductions to lake levels and outflows can cause millions of lost dollars to shipping and hydroelectric production. There are some who believe that dredging should be employed to deepen shallow shipping channels, as expensive and ecologically destructive as this might be. Dredging in the St. Clair and Detroit rivers has already lowered the levels of lakes Michigan and Huron by more than 30 cm.

### *Vandalizing nature's plumbing*

From 50 to 70% of wetlands in the prairies and Great Lakes basin have been filled, drained or otherwise destroyed. Rivers have been channelized, dammed and their riparian areas destroyed. Lakes have been dammed or their levels regulated for human convenience rather than for ecosystem health. In short, the natural systems that once kept water from snowmelt and large rainstorms on the landscape, releasing it slowly to recharge rivers and aquifers, are all but gone. This mismanagement of natural drainages amplifies flooding, land erosion, and many other problems. It will exacerbate the adverse effects of climate warming and increasing human demand.

### *Human demand*

Human demand for water is increasing greatly in the areas described above, where water is in increasingly short supply. Both urban and suburban populations are growing rapidly in the northern U.S. and southern Canada. Intra-country migration has amplified problems in some areas. For example, there has been a massive migration of people from the “rust belt” states of the Great Lakes, where heavy industry once employed many, to the still relatively pristine areas of the eastern slopes of the Rockies and the adjacent Great Plains. In Canada, there has been a similar migration from eastern provinces where jobs are scarce to wealthy Alberta, where jobs in the oil industry and construction are plentiful. Calgary, already 1,000,000 people, is expanding in area at almost 5% per year. Canmore, at the very gateway to Banff National Park, is growing at a similar rate. If current growth rates continue, in 50 years, there will be some huge urban footprints disrupting water flows, paving over water recharge areas, and placing demands on scarce water resources.

In addition, on the U.S. side, there are huge populations of humans and industrial water demands just outside the Great Lakes basin, for example in Ohio, Michigan and Wisconsin. . Many of these have already exceeded sustainable water uses, or have polluted their surface and ground waters too much to use for drinking water. Some of these have actually reversed the direction of flow of groundwater, so that water that used to flow to the Great Lakes now flows away from it (Nikiforuk 2004).

### **Water diversion schemes**

#### *NAWAPA and GRAND: Schemes from another era*

In the past, there were massive schemes proposed to move water from the large rivers and lakes of the Canadian north to areas of the U.S. where water is scarce (reviewed by Bocking 1987). Today, such schemes are given little credibility. Costs of the necessary dams and diversions have increased rapidly, and several studies have unmasked dams and diversions of past, smaller projects as being unsustainable. Many of the areas proposed to become reservoirs are now occupied by humans. It seems likely that any attempts to divert Canadian water south will be more surreptitious, and less grandiose.

#### *Annex 2001*

As we mentioned briefly above, as currently drafted, Annex 2001 could be a “Trojan Horse” scheme that could quietly remove Great Lakes water to the U.S. The Annex proposes to regulate the removal of water from the watershed of the Great Lakes. It is proposed that a proponent for water removal must meet only seven conditions: He must prove that there is no reasonable alternative, that there is no significant impact, guarantee a return flow (of unspecified proportions), prepare water conservation plans, meet all acceptable laws, request a reasonable quantity of water, and agree to “resource improvement,” a vaguely defined notion at best. The decision process is somewhat vague, but it appears that a simple majority of states would be sufficient to allow a diversion to proceed, regardless of the opinion of Canadian provinces. There is no plan that would restrict the total amount of water allocated for removal, or to tie removal to needs of the Great Lakes. In short, it puts water needs of humans outside the basin ahead of in-basin needs and the health of the Great Lakes ecosystem (Nikiforuk 2004). Annex 2001 is a fundamentally flawed agreement. If passed in anything close to its present form, it could do great damage to Canadian environmental and economic interests.

### *Alien species*

There are great differences between the biotas of northern vs. southern watersheds. There are many species that are endemic to the Mississippi and Colorado systems that never reached the Saskatchewan-Nelson, the St. Lawrence, or the Athabasca-Peace-Slave Mackenzie drainages. It is simply not known what mixing of the continent's aquatic fauna and flora would do to the ecological integrity of a given aquatic drainage. There are enough examples to know that the probability is high that at least a few alien invaders will harm the native species of any ecosystem. The sea lamprey, zebra mussels, opossum shrimp, common carp, Eurasian milfoil, tamarisk are some examples of enormously costly aquatic invasions. Understanding and management of freshwater systems is increasingly difficult with successive waves of alien invasions.

Alien species have been one area of failure in preventing harm to the Great Lakes. It is estimated that there are at least 160 species in the lakes that have invaded from other parts of the world, often via ballast water in ships (Mills et al. 1994). Zebra mussels and lampreys have caused huge, costly and irreparable damage. They and other species have invaded ecosystems that are adjacent to the Great Lakes, often via bait buckets, contaminated boats and fishing equipment.

### *Cost*

Costs of engineering projects have increased manifold in the past half-century. There is not enough water in southern Canada alone to satisfy U.S. demands, so that northern rivers would have to be tapped. Huge diversion channels, many dams, and other infrastructure necessary to transfer huge volumes of water for thousands of kilometres would make the costs prohibitive unless heavily subsidized. Today, few would regard the benefits as worth the economic or ecological costs.

### **The North American Free Trade Agreement**

Before the signing of the North American Free Trade Agreement, Canada came close to protecting its freshwater supplies. In 1988, the governing Conservative Party introduced the Canada Water Preservation Act to prevent large-scale diversions and exports of water. The legislation was not passed, thanks to an election call, and it was never reintroduced. Even so, it seems reasonable to expect that a clause exempting water could have been inserted in the Free Trade Agreement when it was being drafted. This was not done, for reasons that have never been clearly explained. As a result of these ambiguities, there is still considerable controversy over whether or not water exports are subject to NAFTA regulations. (Boyd 2003).

As Boyd (2003) points out, there are already water uses that benefit the U.S. that would be subject to regulation under NAFTA. One is the generation of hydroelectric power, much of which is sold to customers in the U.S. If we wished to reduce exports to the U.S. of electricity, NAFTA would require proportional cuts in our own power consumption.

Even before NAFTA, there were bargains struck that greatly favored the U.S. The Columbia River was dammed to supply power largely to the lower portion of the basin in the U.S. Much of the cost of construction of the necessary infrastructure in Canada was paid for by Canadians. No compensation was ever negotiated for the huge runs of anadromous salmon that once swarmed into Canada via the river. These have been lost forever, as long as the dams on the system remain. Much of the hydroelectric power generated within Canada is also shipped to the

U.S. The enormous damage to rivers, lakes and aboriginal society has been considered as an “externality” in these arrangements to ship “virtual water.”

To satisfy this American hunger for cheap hydro power, Canadians have already made more inter-basin transfers of water than any other nation. It seems somewhat hypocritical that what is unacceptable between nations because of great ecological damage (i.e. the Souris or Great Lakes) should be rendered acceptable simply by the fact that it occurs entirely within Canadian boundaries, especially when Americans are the primary beneficiaries.

Other possibilities seem to fit. Consider the export of cattle or other agricultural commodities raised in Canada, on irrigation water. Such exports of “virtual water” have in many cases greatly harmed Canadian ecosystems. Over 60% of the energy from Alberta’s oil sands is exported to the U.S. Again, cutting exports would require treating Canadian customers in proportion. Extracting oil from the oil sands currently uses six barrels of water for every barrel of oil produced. It is another “virtual water” export that is causing great harm to Canadian ecosystems.

## **Political temptations**

### *Profits to Canadians*

In the years ahead, there appear to be many ambiguous areas. It is clear that Canadian governments of both parties have chosen to avoid legislation specifically preventing the export of freshwater. Could this be deliberate? It is clear that the Canadian economy is largely based on the export of raw materials. In that respect, it is almost unique among nations that enjoy a first-world lifestyle, equalled only by a few oil exporters from the Middle East. There has been little emphasis on creating industries to use these raw materials within Canada to produce goods for export. Most of these industries are in other countries, where cheap Canadian raw materials make it possible to reap profits from secondary industries. It is clear that our supplies of conventional oil, gas, and forest products are declining. Agricultural exports are limited by climate and the availability of land. As we deplete or saturate those resources, there will be a great temptation to politicians to sell more hydropower, or even water to rich American customers.

### *Water security*

Recent actions by the U.S. indicate that it is willing to risk international scorn or condemnation to get its way. The invasion of Iraq without UN support is an example. It is still defended by the U.S. administration, despite being described as an “illegal act” by U.N. Secretary General Kofi Annan. It is increasing evidence that the U.S. invasion was not because Iraq owned “weapons of mass destruction,” but to secure American oil supplies.

Recently, George W. Bush has exhorted Canada to pipe its seemingly-plentiful water to the southwestern U.S. One must ask just how far the U.S. is likely to go to get its way in future water disputes with Canada.. Will the U.S. act aggressively to ensure its water security?like Will Canada respond aggressively to protect its limited water supplies and watersheds?

In 1970, Canada passed the Canada Water Act, largely devoted to federal-provincial management and monitoring of water. At the same time, new programs in Environment Canada (including what would later become Fisheries and Oceans) placed Canada at the forefront of freshwater research. Water appeared to rise in priority for the next 20 years, culminating in the Inquiry on Federal Water Policy in 1984, which was to propose a framework for federal water policies for the future. The final report of the Inquiry had 55 recommendations for more coherent

federal water policies and administration. Issues treated ranged from drinking water safety and water export to research support and intergovernmental arrangements. In 1987, a Federal Water Policy was tabled in Parliament. It was never fully implemented, for reasons that remain obscure. Since that time, water has been de-emphasized in Canadian environmental policy, under both Liberal and Conservative parties. Research has also been severely cut in both the Department of Environment and the Department of Fisheries and Oceans. The Inland Waters Directorate of Environment Canada, which was to implement most of the new policy, was disbanded in the early 1990s. Even funding for the old Canada Water Act was cut to a few percent of expenditures in the 1970s and 1980s (Pearse and Quinn 1996). In view of the now-recognized problems with drinking water and the impending international problems outlined above, these actions appear to be dangerously short-sighted. Clearly, Canada's water protection capabilities are adrift, as pointed out by the Auditor-General of Canada in her 2001 report.

### **Canada's position on boundary waters needs to be strengthened**

In recent years, the federal government appears to be stepping away from some of its Canada-U.S. water responsibilities. The Annex 2001 process is a good example. The issue of diversions from boundary waters is clearly one of federal responsibility. The public comment period concerning the proposed Annex Agreements is almost over and the Canadian Government has failed to make formal comment.. In practical terms these proposed agreements would weaken Canada's capability to protect Canadian interests under the Boundary Waters Treaty of 1909. This is clearly a case where Canadian interests would have been better served with federal negotiations, using the Boundary Waters Treaty provisions regarding diversions as leverage. Similarly, responsibility for water, now spread among several federal and provincial agencies, needs consolidating into coherent and uniform policies for research and management.

#### *MOTION*

*"This Conference requests that the Commissioner of the Environment and Sustainable Development, of the Office of the Auditor General of Canada:*

- revisit and follow up on recommendations made in the major work done in 2001 on water issues in the Great Lakes,*
- expand the geographic coverage to all transboundary waters and issues,*
- report to Parliament and Canadians within one year on the status of implementation of her recommendations and the state of water policy in Canada, and*
- make further recommendations for improvement as necessary."*

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