

Archived Content

Information identified as archived on the Web is for reference, research or record-keeping purposes. It has not been altered or updated after the date of archiving. Web pages that are archived on the Web are not subject to the Government of Canada Web Standards.

As per the [Communications Policy of the Government of Canada](#), you can request alternate formats on the "[Contact Us](#)" page.

Information archivée dans le Web

Information archivée dans le Web à des fins de consultation, de recherche ou de tenue de documents. Cette dernière n'a aucunement été modifiée ni mise à jour depuis sa date de mise en archive. Les pages archivées dans le Web ne sont pas assujetties aux normes qui s'appliquent aux sites Web du gouvernement du Canada.

Conformément à la [Politique de communication du gouvernement du Canada](#), vous pouvez demander de recevoir cette information dans tout autre format de rechange à la page « [Contactez-nous](#) ».

CANADIAN FORCES COLLEGE / COLLÈGE DES FORCES CANADIENNES
CSC 27 / CCEM 27

EXERCISE/EXERCICE NEW HORIZONS -

IS GLOBAL WATER SHORTAGE A THREAT TO CANADIAN WATER?

A REQUIREMENT FOR A NATIONAL WATER POLICY

By /par LCdr P Kavanagh

April 2000

This paper was written by a student attending the Canadian Forces College in fulfilment of one of the requirements of the Course of Studies. The paper is a scholastic document, and thus contains facts and opinions which the author alone considered appropriate and correct for the subject. It does not necessarily reflect the policy or the opinion of any agency, including the Government of Canada and the Canadian Department of National Defence. This paper may not be released, quoted or copied except with the express permission of the Canadian Department of National Defence.

La présente étude a été rédigée par un stagiaire du Collège des Forces canadiennes pour satisfaire à l'une des exigences du cours. L'étude est un document qui se rapporte au cours et contient donc des faits et des opinions que seul l'auteur considère appropriés et convenables au sujet. Elle ne reflète pas nécessairement la politique ou l'opinion d'un organisme quelconque, y compris le gouvernement du Canada et le ministère de la Défense nationale du Canada. Il est défendu de diffuser, de citer ou de reproduire cette étude sans la permission expresse du ministère de la Défense nationale.

CANADIAN FORCES COLLEGE / COLLÈGE DES FORCES CANADIENNES
CSC 27 / CCEM 27

ABSTRACT

Water scarcity is emerging as one of the most important global issues today. As many countries experience water shortage and consume their resource at unsustainable levels, water is increasingly becoming a vital and strategic issue. Canada is a water rich nation and must maintain control of its water supply. Some regions of the United States are facing future water shortages and there has been concern that the United States could look to Canadian water as a solution. An examination of the history of water as an issue between Canada and the United States and the options available to the U.S. reveals that there is not an immediate pressure to allow diversion of Canadian water. However, the demand for more water in the U.S. West and Southwest continues to grow and this could result in future American demands for Canadian water. Canada needs a national water policy that will ensure continued control of this resource. To date, Canadian water legislation has been reactive rather than proactive and is not characterized by a long term national vision. A proper legislative and administrative framework must be put in place to allow development and implementation of a national strategy if this resource is to be protected and under Canadian control.

INTRODUCTION

Water is the world's most essential resource. Without it there can be no life. It determines population settlements, is necessary to produce food and is essential for the continued existence of any population. In recent years, as the world's population expands and water supplies continue to be used up, water scarcity has become a major global issue. Canada, as a water rich country, does not face future water shortages; however, in the last several decades there has been growing pressure to allow export of water to other areas of the world. These pressures have resulted in significant national debate over the need to control and manage this vital resource. For most Canadians, the biggest and most immediate threat to our water resource comes from the United States. Although an analysis of their situation today indicates this threat is not imminent, it can not be completely dismissed. These are issues and challenges that will not disappear in the future. To properly face these challenges, and ensure the security of our own water supply, Canada needs a national water policy. This paper will review the current global water situation with particular emphasis on the United States. A summary of Canada's water resources will be provided, followed by an examination of water as an issue between Canada and the U.S. including an assessment of the contention that the U.S. needs Canadian water. Finally, a review of the current government organization for dealing with water issues will support the contention that a new policy is needed.

GLOBAL WATER SCARCITY

The hydrologic cycle moves the water on this planet through a continuous cycle. The heat of the sun evaporates water into the atmosphere. As the air cools, the water condenses and falls to the surface as precipitation. It then percolates into underground aquifers or runs off into

lakes and rivers, eventually draining into the oceans. But the total amount of water never changes. The best estimate of the amount of water on this planet is approximately 1.4 billion km³ (cubic kilometres).¹ Fresh water is only 2.5% of the total amount and two thirds of this is locked away in icecaps and snow.² Underground aquifers hold some of this supply, but about half of that is too deep to retrieve. Runoff, or the renewable part of the global water resource (the amount of water that falls as precipitation and can be taken for use without causing a net loss from the supply), is approximately 34,000 km³ per year.³ Humans use about 35% of the global renewable water run off – the rest of it runs freely into the oceans.⁴ It would appear, therefore, that there is plenty of water for everyone. The problem, however, is that water resources are not evenly distributed throughout the world, and water scarcity is becoming a significant global issue.⁵

Between 1950 and 1990 the world demand for water quadrupled and is expected to double again by the year 2030.⁶ Signs of unsustainable water use are already evident in many parts of the world. The water level in the Dead Sea (a major source for Israel) is down ten metres this century.⁷ In India, annual water consumption is 104 billion cubic metres more than nature replaces, and this consumption continues to increase.⁸ In China, which has 22% of the world's population but only 6% of its fresh water, severe water crisis is probable in the near

¹ M de Villiers, *Water* (Toronto: MacMillan of Canada, 1999), p 30.

² *Ibid*, p 30.

³ *Ibid*, p 32.

⁴ *Ibid*, p 32.

⁵ Water scarcity (or water shortage) is a condition defined by the UN as occurring when a population does not have access to basic drinking water and water for sanitation needs. The Swedish hydrologist, Malin Falkenmark has defined a country as water scarce if the supply is less than 1000 cubic meters per person, per year. A good discussion of water scarcity is found in de Villiers, *Water*, p 19.

⁶ De Villiers, *Water*, p 32.

⁷ *Ibid*, p 16.

⁸ Nicolaas van Rijn, "What We Have Is All There Is," *The Toronto Star*, 25 Sept 1999, First Edition, Specials Section.

future.⁹ Under the North China Plain (the country's breadbasket) the mining of the aquifer is so great that the water table is falling 1.5 metres annually.¹⁰ In 1997, the water of the Yellow River (used extensively to support the water needs of the population) was diverted and used for human consumption to such an extent that it did not reach the sea for 226 days.¹¹ The World Watch Organization predicts that China will soon have to restructure its economy in response to water supply and quality.¹²

Closer to home, water consumption in the United States today exceeds replacement rates by 29 billion cubic metres annually.¹³ But this water consumption is not uniform throughout the country. The water supply problems are almost exclusively isolated to the West and Southwest regions. In these areas, most of the water supply comes from two main sources: the Colorado River and the Ogallala aquifer.¹⁴

The Colorado River provides water to over 30 million people in seven states and Mexico.¹⁵ Today, virtually all of the water of the Colorado is diverted for human use. Only a small trickle of water reaches the ocean, with all the rest used to support the exploding population and irrigation activity of the West and Southwest. California, the biggest user, gets access to other states' unused allocations; however, as these states grow in population they are demanding it back. As early as 1963 the U.S. Supreme Court ordered California to give up some of the Colorado River water it was diverting due to increased demands in Arizona (which plans

⁹ M de Villiers, "To The Last Drop," *National Post*, 01 Apr 1999, National Edition, p 36.

¹⁰ Lester Brown & Brian Halweil, "Populations Outrunning Water Supply As World Hits 6 Billion," *World Watch News Release*, 23 Sept 1999, [<http://www.worldwatch.org/alerts/990923.html>] p 1.

¹¹ *Ibid*, p 1.

¹² Maude Barlow, "We Are Running Out Of Water," *The Ecologist*, May/June 1999 (Sturminster Newton: Ecosystems Limited, 1999), p 182.

¹³ Gar Smith, "Water Wars, Water Cures," *Earth Island Journal* (San Francisco: Earth Island Institute, 2000), p 31.

¹⁴ The Ogallala aquifer is located in the High Plains region of the U.S. and stretches through eight states: Texas, New Mexico, Oklahoma, Kansas, Colorado, Nebraska, Arizona and California.

¹⁵ De Villiers, *Water*, p 272. The states are Arizona, Colorado, New Mexico, Utah, Wyoming, Nevada and California.

to use its full allocation by 2025).¹⁶ The Metropolitan Water District of Southern California, which serves an estimated 16 million customers, projects that by 2010 the existing water supply will be able to meet only 43% of the demand.¹⁷ There is no more water to be had from the Colorado, and every river and lake within 1000 miles has already been dammed or diverted to feed the insatiable demands of this region.¹⁸

The Ogallala aquifer is another source that is being mined to depletion. This aquifer, spanning some 580,000 square kilometres of the Great Plains region, had enough water in it at the turn of the century to keep the Colorado River flowing for two hundred years.¹⁹ Today, it has been depleted by perhaps 60%.²⁰ Clearly, this is not sustainable and cannot last forever. Once the aquifer runs dry, this region of the United States will be without its major source of water unless other supplies are found.

The annual water deficit (that is, the amount of water consumed by humans in excess of the amount replaced by the hydrologic cycle) is estimated at 160 billion cubic metres.²¹ And water shortages have already led to great tragedy. The famine in Ethiopia in the early 1980's was caused not just by civil war, but also due to massive crop failures as a result of draught. The Red Cross estimates that drought killed 230,000 people in the 1970's and affected over 244 million.²² The United Nations predicts that within 25 years one in every five countries are likely

¹⁶ U.S. Water News Online, "Arizona Facing Water Crisis With Growth," [http://www.uswaternews.com/archives/arcsupply/tarifac7.html]. July 2000, p 1.

¹⁷ Senator Paul Simon, "The First World Water War?," [http://www.speakout.com/Content/ICArticle/3753]. 08 Apr 1999, p 2.

¹⁸ Witness, "Captured Rain," [http://www.tv.cbc.ca/witness/water/watsyn.htm]. March 2001.

¹⁹ Van Rijn, *What We Have....*, p 3.

²⁰ De Villiers, *Water*. p 51.

²¹ Gar Smith, *Water Wars....*, p 1.

²² Micheal Keating, *To The Last Drop: Canada And The World's Water Crisis* (Toronto: MacMillan of Canada, 1986), p 6.

to experience severe water shortage while the World Bank estimates that by the year 2025 three billion people will live in areas of severe water shortage.²³

The above statistics support the conclusion that humans are using up available water resources faster than nature can reproduce them. Global warming only makes the situation worse. The World Meteorological Organization predicts a further increase of the globe's annual mean temperature of 4.5 degrees Celsius by the year 2030.²⁴ Although no one knows definitively what will happen, most experts agree that, at a minimum, this will significantly effect the hydrologic cycle. As the icecap melts, sea levels are expected to rise. Although this will not effect rivers as a source of fresh water (beyond making them shorter as coastlines retreat inland), it will result in saltwater ingress into coastal fresh water aquifers. With increased temperatures, evaporation will also increase and water levels in lakes will drop. The overall effect of global warming then, will be to reduce the world's supply of available fresh water and to put regions of water scarcity in further distress.

WATER AS AN INTERNATIONAL ISSUE AND STRATEGIC RESOURCE

In recent years, water has become a major international issue for some countries. Fresh water sources often straddle international boundaries and must be managed accordingly. For example, India and Pakistan have to cooperate in sharing and managing the waters of the Punjab rivers. Turkey, Syria and Iraq must cooperate over the Tigris and Euphrates rivers, and Israel and Jordan have to manage the depletion of both the Golan heights aquifer and Jordan River, vital sources of water for each. In 1994, Mikhail Gorbachev, former leader of the U.S.S.R., got

²³ Simon, *The First World....*, p 1.

²⁴ Keating, *To The Last Drop....*, p 143.

the countries of the Middle East to formerly acknowledge that water scarcity in the Jordan River Basin is the region's foremost security threat.²⁵

Bullis and Mielke define a strategic resource using seventeen criteria, including degree of importance to the economy, the ease with which industry could substitute for it, and the extent of world wide competition for dwindling supplies. 2639473EMC/P.9/MCID 12 BDC BT/TT0 1 T0.00031 Tc -0.00031 12 0 0 12 288.60004 432. Water fits this definition. Although water is

often taken for granted by countries that do not face shortages, it is a strategic resource. In 1986 Noel Brown, the Director of the United Nations Environment Programme concluded that due to the world's expanding population and the acceleration of industrialization water would assume a strategic significance.²⁷ But water is even more than that. Thomas Neff captures its unique significance:

Water is the world's most essential resource. No other substance carries greater potential for conflict of disaster when scarce or poorly distributed... And where water is concerned, the problem is nothing less than survival.²⁸

The late King Hussein of Jordan was quoted

CANADA'S WATER

Canada has 5.6% of the world's fresh water supply, more than any other country except Brazil (20%) and China (5.7%).³¹ We have 500,000 square kilometres more volume of fresh water than the United States but only one tenth of the population.³² The amount of water discharged from our rivers into the ocean at any given time equates to one half the flow of the Amazon, the largest drainage system in the world.³³ 60% of this Canadian flow drains northward into the Arctic ocean or Hudson Bay, while approximately 15% drains westward to the Pacific and 25% east to the Atlantic. The daily per capita supply equates to 340,000 litres (as compared to 450 litres for the U.S.).³⁴ Seven percent of our water is used for domestic purposes (households, sewage systems etc), 23% by industry (cooling processes, manufacturing processes etc) and 70% for agriculture.³⁵ Canada takes less than 2% of its annual renewable flow and of that less than one tenth is consumed and not put back into the hydrologic cycle.³⁶ These statistics clearly support the contention that Canada is an extremely water rich country.

Given the emerging world water crisis discussed above, this Canadian resource becomes even more important. Most of our renewable fresh water flows into the oceans unused and remains largely untapped. To a water starved country, this might seem an incredible waste. To an entrepreneur, it might seem like a golden opportunity. And there have been several attempts in recent years to export Canadian water.³⁷ But bulk export of water is not at present economical

³¹ De Villiers, *Water*, p 34.

³² *Ibid*, p 59.

³³ H. Foster & W. Derrick-Sewell, *Water: The Emerging Crisis In Canada* (Toronto: James Lorimer & Company, 1981), p 7.

³⁴ *Ibid*, p 7.

³⁵ Keating, *To The Last....*, p 4.

³⁶ Peter Pearse, "Water Management In Canada: The Continuing Search For The Federal Role," *51st Annual Conference of the Canadian Water Resources Association at Victoria, June 10 1998* [<http://www.cwra.org/news/arts/pearse.html>]. p 1.

³⁷ Canada does export bottled water and other beverages made from water (i.e. beer), but this activity is considered small scale and has not been a subject of much debate. Plans to bulk export fresh water have met with fierce

(water is very heavy), so for the foreseeable future, Canadian water is relatively secure from foreign threats or attempts at acquisition from distant regions of the world. But this has not been the perceived threat to Canadian water, popularized by the press over the last twenty years. The perceived threat has been from the United States. There is an argument that the United States is water starved and will simply take Canadian water if it is not given to them.

DOES THE UNITED STATES NEED CANADIAN WATER?

What are the options facing the United States? If present rates of consumption in the West and Southwest are to be continued, additional water sources have to be identified. The Americans have not had difficulty in taking water from others in the past. Mark de Villiers notes in his study of water that “The United States has essentially stolen the Colorado from Mexico, much of it to irrigate the deserts of Arizona and California, but a good deal of it to fill swimming pools in Los Angeles and fountains in Las Vegas.”³⁸ In the 1930’s, the Americans routinely diverted water from the Rio Grande (a border river belonging as much to Mexico as the U.S.) to irrigate West Texas without consultation with Mexico. Given the abundant water resource in Canada, the question needs to be asked whether or not our resource is safe from American consumption. Indeed, it is not just Mexico that has a history of water as an issue with the United States. There has also been some discussion over the years that Canadian water could and should be diverted for use in the U.S.

resistance. The most recent example occurred March 1998 when a Canadian company, Nova Group, applied for and received a license from the Ontario government to collect 600 million litres a year of Lake Superior water and ship it for sale in Asia. There was such a public outcry that the permit was withdrawn. A similar case occurred in B.C. in 1988 when a Canadian company and an American partner received a permit to bulk export B.C. water. This permit was also withdrawn, and for the last seven years the American company, Sunbelt Water Inc. has been trying to sue the B.C. government for lost potential revenue.

³⁸ De Villiers, *Water*, p 20.

The first major proposal from the U.S. for diversion of Canadian water was proposed in 1964 as the North American Water and Power Alliance project (NAWAPA). This was an American scheme that would see the Yukon, Skeena, Fraser, Peace and Columbia Rivers of British Columbia dammed and diverted to create a huge reservoir 800km long in the Rocky Mountain Trench. This water would then be diverted to the American High Plains region and used for irrigation, re-supply of the Colorado River, the Great Lakes, and the Mississippi water basin. The plan included 240 reservoirs, 112 irrigation systems and 17 major canals. The American engineer who proposed this scheme did not address the economic or environmental consequences of putting 800 square kilometres of the Rocky Mountain Trench underwater, never mind the consequences of diverting most major rivers.

The other major water diversion scheme of note was the Great Replenishment and Northern Development Canal (GRAND Canal) plan. This proposal was put forward by a Canadian engineer and was actively promoted in the mid 1980's by then Quebec premier Robert Bourassa. This was an eastern version of the NAWAPA and entailed damming the mouth of James Bay and consequently turning it into a fresh water lake (by keeping the salt water of Hudson Bay out and collecting the fresh water from rivers feeding into James Bay). This water would then be pumped south to the Great Lakes where it would be stored and diverted as necessary to the dry regions of Canada and the U.S. through a floodway system created for that purpose. Unfortunately for its supporters, this project failed a Canadian Federal Environmental Impact Assessment and did not get off the ground.

There has also been much debate in recent years due to the North America Free Trade Agreement signed by Canada, Mexico and the U.S. in 1990. Many Americans have taken the position that water can and should be traded like any other resource and that nothing in the Free

Trade agreement protects or excludes it. Although water is not specifically excluded as a free trade commodity in the agreement, it does not appear that there is anything that would require Canada to allow export of fresh water.³⁹

Given this history and the documented American need for more water to sustain the population growth and economic expansion of the West and Southwest, it might be concluded that Canadian water is vulnerable. Former U.S. Senator Paul Simon believes water is a tradable product and that Canada has a moral imperative to share its water.⁴⁰ Several interest groups, including the Canadian Environmental Law Association and the Council of Canadians believe that Canada's water resource is threatened and vulnerable to U.S. greed. But is there merit in the argument that the United States needs our water and therefore is a threat to our control of this heritage?

The American politicians of the West and Southwest have often suggested that water from the Great Lakes be diverted into the Mississippi drainage basin for onward transportation to the areas that are water stressed. The draught of 1988 placed such a great strain on the western states that thirteen U.S. senators called for diversion of water from the Great Lakes into the Mississippi River system and onward transportation to their areas for irrigation and domestic use.⁴¹ Because the Great Lakes are a boundary drainage basin, this activity would obviously

³⁹ Water is not mentioned in the North American Free Trade Agreement (NAFTA); however, the treaty is based on the international trade regulations of the GATT (General Agreement on Trade and Tariffs) and the World Trade Organization. The GATT does classify water as a good however it also contains a provision allowing a country to restrict the export of a natural resource for reasons of environmental protection. The Canadian position is that fresh water in its natural state is part of the environment and can not be considered a commodity. Chap 11 of NAFTA does contain a "non-discretionary" clause, meaning that if a company from one country is allowed access to a resource for trade, then any company from the other countries of agreement must be given the same right without discrimination. Therefore, if a Canadian company is given a license to bulk export water (i.e. Nova Group) then any American or Mexican company has the same legal entitlement. As long as no one is issued a license (this would de facto classify bulk water as a commodity and therefore subject it to the NAFTA agreement), there is no regulation that allows other countries access to Canadian fresh water.

⁴⁰ Witness, *Captured Rain*, p 5.

⁴¹ Aruni de Silva, *The Sale of Canadian Water to the United States: A review of Proposals, Agreements and Policies Regarding Large Scale Interbasin Exports*, (Toronto: University of Toronto, 1997), p 3.

affect Canada. But the history of cooperation in water management of the Great Lakes between Canada and the U.S. is a good one (pollution is the exception but is not examined in this paper). The Boundary Waters Treaty, signed in 1909, created the International Joint Commission (IJC), a body made up of representatives from both countries with a mandate of approval or disapproval of all transboundary water issues. Its history has been one of cooperation and objectivity. Peter Pearse, the Chairman of the 1985 Canadian Federal Water Inquiry believes the IJC has been remarkable in safeguarding Canadian interests:

...If we had not had the Boundary Waters Treaty and the International Joint Commission to articulate our water interests during the past 75 years, we would almost certainly have had fewer cooperative projects, less consideration in unilateral developments and more strained relations with the United States. Its principle of equality is particularly important in view of the relative size and power of the two countries. In this respect it is superior to assurance afforded by international law.⁴²

Indeed, the U.S. Supreme Court has only authorized one diversion in contradiction to a Joint Commission ruling since the treaty was signed.⁴³

The other major agreement between the two countries concerning the Great Lakes is at the state/province level and is the Great Lakes Charter, signed in 1985 between the eight Great Lakes State Governors and the two Great Lake Provincial Premiers.⁴⁴ It is a pledge to manage the Great Lakes responsibly and environmentally and an agreement to oppose any diversion proposals. This is significant because it shows that Canada is not alone in trying to resist the diversion of Great Lake waters to the American West and Southwest. The Great Lake states are opposed to it as well. Only 1% of the waters contained in the Great Lakes is renewable and global warming has already started to reduce Great Lake water levels (The Lake Carriers

⁴² As quoted in Keating, *To The Last Drop....*, p 194.

⁴³ This was a canal built to dilute sewage from Chicago (Lake Michigan is the source for the municipal sewage system) and discharge it to the Mississippi.

⁴⁴ New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Ontario and Quebec.

Shipping Association reports that coal ships today can no longer carry a full load due to available water depth).⁴⁵ The economies of these states rely heavily on this water (domestic consumption, industry, tourism, etc) and the environmental damage that any diversion might cause is also of concern. These Great Lake States also have their eyes on the future and would like to lure industry back to the region if the Sunbelt does go dry. So it is not just Canada that has to resist diversions to the South. The Great Lake states are also firmly opposed to allowing diversion of one of their most precious resources. This reduces the risk of Americans simply taking Great Lake water because any such initiative would significantly affect U.S. domestic politics.

A further analysis of the water problem in the U.S. reveals that grabbing Canadian water might not be the easiest or most cost effective solution. The cost of the water supplied to the High Plains region of the mid West and the Sun Belt region of Southern California is heavily subsidized by the United States government.⁴⁶ This is due to the cost of construction and maintenance of the dams, canals and other components of the diversion systems necessary to bring the water in. Although municipal demands are increasing as population expands and further development takes place, by far the biggest user of this water is the agriculture industry. Most estimates agree that irrigated agriculture accounts for 80% of the consumption of water in the High Plains region and Southern California.⁴⁷ And because the federal government subsidizes the supply of the water to such a great degree, farmers pay only about 10% of the true cost of the water they use. This reality provides no incentive for more careful management practices or conservation initiatives. The water taken from the Ogallala aquifer is also used primarily in support of irrigated agriculture, but there are no regulations to control use or

⁴⁵ Joanne Laucius, "Great Lakes In Dire Straits," *The Ottawa Citizen*, 09 July 1999, Final Edition, p A1.

⁴⁶ Keating, *To The Last....*, p 181. Keating quotes a 1981 U.S. federal study of six federal irrigation projects that found that water rates for farmers were less than 10% of the cost of getting water to them.

promote conservation. As Richard Conniff of the National Geographic writes, “The thinking among farmers is that everybody has his straw in the same can of soda – if you don’t sip it, somebody else will.”⁴⁸

A massive diversion of Canadian water would solve the water shortages of these regions, however the cost of such a scheme would be gigantic and the environmental consequences would be enormous.⁴⁹ The agriculture lobbies of the U.S. Great Plains region and Southern California are also running up against opposition from other groups within the United States. The Denver Chamber of Commerce points out that while irrigated agriculture in Colorado is worth \$200 million annually, tourism and its spin-off industries are estimated to be worth \$5 billion.⁵⁰ Irrigated agriculture produces primarily non-essential foodstuffs and low value crops, such as cotton, corn and alfalfa. Only 17% of the food grown in America is produced using irrigation so the argument that this agricultural activity is essential to avoid a global food shortage is tenuous.⁵¹

More realistically, American farmers will have to be encouraged (or required through legislation) to institute more sustainable management practices and conservation techniques. This could include such moves as drip irrigation techniques and a shift to dry land farming.⁵² Perhaps the most effective measure will be to introduce realistic pricing for the water used. This would create an incentive to take conservation and the adoption of sustainable water

⁴⁷ United States Geological Survey Fact Sheet, *Water-Level Changes, 1980-1997, And Saturated Thickness, 1996-97, In The High Plains Aquifer*, [http://www-ne.cr.usgs.gov/highplains/hp97_web_report/fs-124-99.htm]. p 1.

⁴⁸ Richard Conniff, “Desrt In Disguise,” *National Geographic Special Edition* (Washington: National Geographic Society, 1993,) p 46.

⁴⁹ Mark de Villiers estimates that the cost of a NAWAPA type diversion would be in excess of half a trillion dollars. (p 289)

⁵⁰ de Villiers, *Water*, p 291.

⁵¹ *Ibid*, p 306.

⁵² Drip Irrigation is a process that uses very little water (literally, drops at a time) and delivers this water right to the root of the plant. Installation of a drip irrigation system has a high capital cost but no water is wasted. Dry land farming simply refers to farming using rainfall only – not an irrigation system.

management techniques seriously. The states of the High Plains region know these agriculture practices are unsustainable and most have already begun policies of buying out farmers, thus reducing the agricultural demands on their water resources.

Southern California also has more options to consider than just Canadian water. Although every river and lake within 1000 miles has already been dammed and diverted to feed the needs of the 33 million residences of this area (California already moves 53 trillion litres a year from north to south), other technologies exist or are being developed that can alleviate this situation.⁵³ Desalination (the process of transforming saltwater into fresh water) technology has come along way in recent years and new developments in this technology continue to reduce the cost of making fresh water. Reverse Osmosis Distillation, a process whereby seawater is put through a series of filters producing fresh water is already being used in some areas. Additional initiatives have also commenced to try and conserve the resource without further diversions from other regions. One technique is to use underground aquifers as a storage medium. The Los Posas project in Southern California collects water diverted from the north, but instead of being stored in reservoirs (and thus losing much of it to evaporation), the water is pumped into an underground aquifer. State legislation ensures that it will never extract more than it stores and by Jan 99 over 25 million acre feet of fresh water had been collected.⁵⁴ This type of initiative is considered far more cost effective than more diversion systems.⁵⁵ Just from an economic viewpoint, it would appear that the American threat to Canadian water (i.e. applying pressure on Canada to allow diversion to the south) is not as real as some have argued.

⁵³ De Villiers, *Water*, p 327.

⁵⁴ Barbara Wolcott, "Aquifer recharge: A Natural Solution," *Water Engineering & Management*, (Des Plaines: Scranton Gillette Communications, 1999), p 3.

⁵⁵ The Los Angeles water board estimates the annual cost of storing water in the Los Posas aquifer is about 10% of the cost of storing it using traditional damming and above ground reservoir techniques. There is no requirement for construction of holding reservoirs, maintenance, further diversionary systems etc. The only cost is the energy to pump the water in and then out when it is required.

What cannot be predicted, however, is the continuing expansion of the Sunbelt. What if the United States continues with unsustainable activities like farming in deserts? What if the technologies and techniques discussed above cannot meet the water supply requirements of further expansion? What if technology is developed that allows water to be transported more economically, thus making importation a cost-effective alternative to desalination?⁵⁶ Marc Reisner suggests in his study of the water shortages in these regions that the Sunbelt will continue to expand and, as soon as it has to, the United States will come looking for Canadian water.⁵⁷ Although there is no evidence that would support this conclusion, given the global water situation today and the potential for American pressure, it would seem prudent to ensure Canada maintains control of this resource. This supports the contention that a national water policy is required that would provide the federal government with the jurisdiction and power necessary to ensure our water is protected.

THE NEED FOR A CANADIAN NATIONAL WATER POLICY

The preceding arguments have concluded that while there is no immediate threat of being forced to allow export of Canadian water, this may not always be the case. The future is hard to predict; however, it is evident that we are now living in a world where water scarcity is becoming more important as an international issue. But despite this situation, Canadian attempts

⁵⁶ A Canadian, James Cran, is now designing a water bag 500 metres long, 150 metres wide and 22 metres deep (7 foot ball fields long and over one field wide) capable of containing 1,750,000 cubic metres of water. The concept is to tow this bladder to the destination country and then pipe the water ashore. If successful, this will mark a significant development in water transport technology. The biggest bladders in use today have a capacity of only 100,000 cubic metres and can only be used in calm seas such as the Mediterranean. For a good description of this technology, see de Villiers, *Water*, p 323.

⁵⁷ Marc Reisner, *Cadillac Desert: The American West and its Disappearing Water*, (Toronto: Penguin Books, 1993), p 493.

at water management have been more reactive than proactive and there is no national policy per se.⁵⁸

Today, the federal government has adopted a watershed approach in the protection of Canadian water from export. Its position is that water in its natural state (i.e. as part of the environment) is not a good or commodity and therefore is not subject to trade. In ensuring the protection of the Great Lakes water basin, it has introduced an amendment to the International Boundary Waters Treaty that bans the bulk removal of water for any reason, including export. For other Canadian water basins it is trying to negotiate with the provinces to encourage provincial legislation that would ban removal of water from basins within their jurisdictions.

re-assessing its position on bulk water export and was considering a policy that would support it. The environmental implications of fresh water removal have not been thoroughly studied and if provinces do commence bulk export, the Federal government's position (banning removal) could be undermined. The Federal government does not have the legislative authority to support a truly unified and national policy. It is difficult to envision the creation and implementation of a national strategy given the present legislative framework.

Another problem in Canada is that we do not understand the resource as some other countries do. The United States enjoys the support of several large organizations (i.e. the U.S. Army Corps of Engineers) that are mandated to study the resource, determine future needs and identify solutions. Canada does not have a government organization with this kind of mandate but rather many different ministries with only partial responsibilities. There are some 22 different federal departments that have some kind of responsibility for water issues, but no centre of knowledge or organization mandated to co-ordinate and develop a national policy that could include all the myriad aspects that make up a national water strategy.⁵⁹ Canada will be hard pressed to make the right decisions to manage and safeguard our water in future if we do not understand what we have, what our future need will be and what potential effects water projects will have on the environment.

This paper has dealt only with the issue of export as a potential threat to our water; however, a national policy is also required to m

for hydro-electricity are a few examples. The creation of a central Federal government organization dedicated to the study of all these water issues would support the formulation of a proactive national policy based on a deeper understanding of the resource and the potential threats to it.

CONCLUSION

Water scarcity is emerging as one of the most important global issues today. Many countries are water stressed and all predictions indicate that this situation will continue to worsen as humans consume more water than nature can produce. Water supplies therefore are going to become even more important and water, as an issue between countries, will be more evident than ever. Canada is a water rich country and does not face water stress; however, we can not ignore the potential of having to deal with international pressure to allow export of our water supplies, particularly from the United States. The history of water as an issue between Canada and the United States has been (and continues to be) one of co-operation. And an examination of the situation in the U.S. reveals that there are options other than Canadian water to address the shortages of the American West and Southwest. However, the future is hard to predict and the possibility that Canadian water will come under severe pressure for export can not be discounted. To face this challenge and ensure control over its own water supply, Canada needs a national water policy. This is not just a national water policy document or a series of reactive steps taken in response to immediate issues, but rather a proactive strategy developed and implemented through an appropriate organizational and legislative framework. This might require legislation giving the federal government more jurisdiction and a re-organization to create a centre of knowledge and policy development to meet the challenges of the future. It is only with a

proactive national policy and the legislative and institutional organizations to properly manage it, that the strategies necessary to ensure the safety of this vital Canadian resource can be identified and put in place.

BIBLIOGRAPHY

- Barlow, M. "We Are Running Out Of Water." *The Ecologist*. Sturminster Newton: Ecosystems Limited, May/June 1999.
- Brown, L. and Halweil, B. "Populations Outrunning Supply As World Hits 6 Billion." *World Watch News Release on Water Resources and Population Growth*. Sept 1999. [<http://www.worldwatch.org/alerts/990923.html>].
- Bullis, H. and Mielke, J. *Strategic And Critical Minerals*. Boulder: Westview Press, 1985.
- De Silva, A. *The Sale of Canadian Water to the United States: A Review of Proposals, Agreements and Policies Regarding Large Scale Inter basin Exports*. Toronto: University of Toronto, 1997.
- De Villiers, M. *Water*. Toronto: Stoddart Publishing Co Ltd., 1999.
- De Villiers, M. "To The Last Drop." *The National Post*. Toronto: National Post, 01 Apr 99.
- Foster, H and Derrick-Sewell, W. *Water: The Emerging Crisis In Canada*. Toronto: James Lorimer & Company, 1981.
- Keating, M. *To The Last Drop: Canada and The World's Water Crisis*. Toronto: Macmillan of Canada, 1986.
- Neff, T. "Water Scarcity, Resource Management, and Conflict In The Middle East." *Environmental Dimensions of Security: Proceedings From a AAAS Annual Meeting Symposium 9 Feb 92*. Washington: American Association For The Advancement of Science, 1992.
- Pearse, P. "Water Management In Canada: The Continuing Search For the Federal Role." *51st Annual Conference of the Canadian Water Resources Association June 10 1998*. [<http://www.cwra.org/news/arts/pearce.html>].
- Reisner, M. *Cadillac Desert: The American West and its Disappearing Water*. New York: Penguin Books, 1993.
- Simon, P. "The First World Water War?" 08 Apr 1999. [<http://www.speakout.com/content/ICArticle/3753>].
- Smith, G. "Water Wars, Water Cures." *Earth Island Journal*. San Francisco: Earth Island Institute, Spring 2000.
- Van Rijn, N. "What We Have Is All There Is." *Toronto Star*. Toronto: Toronto Star, 25 September 1999.

Wolcott, B. "Aquifer Recharge: A Natural Solution." *Water Engineering And Management*. Des Plaines: Scranton Gillette Communications Inc., 1999.

Canada, Ministry Of The Environment, *Currents of Change: Final Report of the Inquiry on Federal Water Policy*. Ottawa: Government of Canada, 1985.

National Post. "Quenching Our Thirst For Water." *The National Post*. Toronto: National Edition, 23 July 1999.

United States Geological Survey Fact Sheet FS-124-99. "Water Changes, 1980 to 1997, And Saturated Thickness, 1996-97, In The High Plains Aquifer." [http://www-ne.cr.usgs.gov/highplains/hp97_web_report/fs-124-99.htm].

United States Water News On Line. "Arizona Facing Water Crisis With Growth." July 2000. [<http://www.uswaternews.com/archives/arcsupply/tarifac7.html>].

Witness. "Captured Rain." March 2001. [<http://www.tv.cbc.ca/witness/water/watsyn.htm>].