# ALLOCATING GROUND WATER IN THE GREAT LAKES BASIN: AN ANAYLSIS OF INTERNATIONAL AND DOMESTIC LAW AND POLICY

by

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# Abstract

Ground water is a critical element of the ecosystem in the Great Lakes Basin. It is an integral component of a dynamic hydrological system that is the lifeblood for this region's remarkable natural diversity. It is also an important human resource. Unfortunately, intensive ground water withdrawals are resulting in negative consequences that are often hidden from view but which are causing social conflicts and environmental degradation.

This thesis considers the failure of courts and governments to implement laws for allocating ground water rights according to hydrological reality and the collective interests of affected communities. Legal mechanisms are rooted in the nineteenth and early twentieth centuries. Despite rapid growth and the considerable pressure now exerted on ground water resources, courts and governments continue to allow, and even encourage unrestricted ground water withdrawals.

The underlying ideology of state institutions within the Basin is contributing to the systematic undervaluation of environmental and long term interests of present and future generations. A reinvigorated concept of sustainability, one that is based on the ideals of deliberative democracy, would better represent these interests in decisions concerning the allocation of ground water.

Through the process of ground water allocation planning, decision-making can be guided into a preventative and community-oriented approach that more accurately reflects the long term interests of the Basin.

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# Chapter 1

# Introduction

With respect to water quantity issues in the Great Lakes Basin, attention continues to be focused on the topic of diversions. In the last thirty years, a number of proposals for large-scale water diversions to southern regions of the United States (and in one case to Asia) have generated a deep-seated fear that the Great Lakes will be drained. These fears are not completely unfounded. Arid regions in the United States and around the world would love to quench their thirst with the vast waters of the lakes. However, these fears direct attention away from many of the home truths that the Basin governments seem loath to face. One of these home truths, which is the subject of this thesis, is the unrestrained abstraction of ground water resources.

Ground water is a critical element of the ecosystem in the Great Lakes Basin. Total ground water supplies in the Basin equate to a volume of water approximately the size of Lake Michigan. Yet ground water is much more than an underground reservoir; it is an integral component of a dynamic hydrological system that is the lifeblood for this region's remarkable natural diversity. It is also an increasingly important human resource that is exploited for a wide variety of purposes including drinking water, irrigation and manufacturing processes. Unfortunately, intensive ground water withdrawals result in negative consequences that are often hidden from view but which result in social conflicts and environmental degradation.

This thesis considers the failure of courts and governments to implement laws for allocating ground water rights according to hydrological reality and the collective interests

of affected communities. The next chapter, Chapter 2, describes the importance of ground water in the Great Lakes Basin and illuminates the many hidden effects and detrimental impacts that ground water pumping can have at both local and regional scales.

The third chapter examines the role of domestic and international law in allocating ground water resources in the Basin. The conclusion is a rather striking one. Legal mechanisms are rooted in the nineteenth and early twentieth centuries. Despite rapid growth and the considerable pressure now exerted on ground water resources, courts and governments continue to allow, and even encourage unrestricted ground water withdrawals.

The fourth chapter analyzes the underlying ideology of state institutions within the Basin and concludes that this ideology is contributing to the systematic undervaluation of environmental and long term interests of present and future generations. The chapter concludes by suggesting that a reinvigorated concept of sustainability, one that is based on the ideals of deliberative democracy, would better represent these interests in decisions concerning the allocation of ground water.

The fifth chapter incorporates this concept of sustainability into practical suggestions for reform that are based on the foundations of sound science and stakeholder involvement. Through the process of ground water allocation planning, the writer asserts that decision-making can be guided into a preventative and community-oriented approach that more accurately reflects the long term interests of the Basin. The sixth chapter concludes the thesis with a final synopsis of the pertinent arguments and the writer's hopes for the future.

# CHAPTER 2

# The Problem: Ground Water Pumping in the Great Lakes Basin

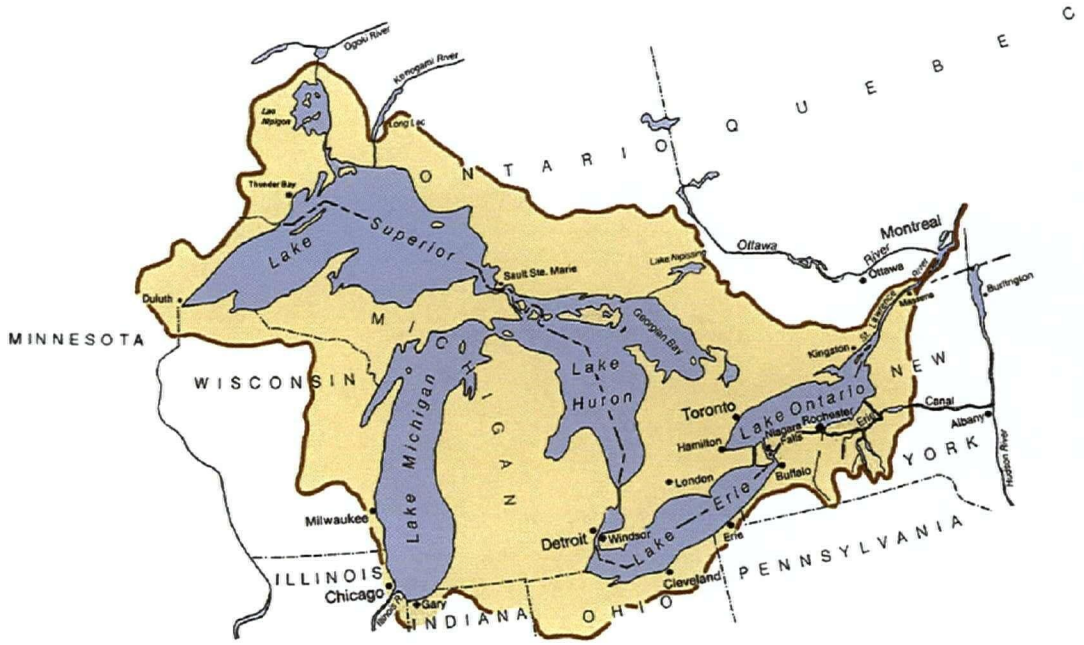


**Figure 1: The Great Lakes Basin**

Source: International Joint Commission, *Protection of the Waters of the Great Lakes – Final Report to the Governments of Canada and the United States* (February 2000)

The Great Lakes Basin ("the Basin") consists of the five Great Lakes, their connecting channels, and the international section of the St. Lawrence River, together with their tributaries. It also includes the reach of the St. Lawrence River immediately downstream from the international section of the river to the end of Lake St. Peter, excluding the tributaries of this downstream reach.[1]

[1] International Joint Commission, "Protection of the Waters of the Great Lakes – Final Report to the Governments of Canada and the United States" (February 2000).

The Great Lakes comprises the largest concentration of unfrozen fresh surface water in the western hemisphere,[2] about 5,500 cubic miles or 23,000 $km^3$ of water, a magnitude that is difficult to comprehend and which is estimated to be between 18-20% of the world's total fresh surface-water supply.[3] No other basin in the world consists of such a continuous chain of large lakes.[4] In addition to the Great Lakes, there are over 80,000 smaller lakes[5], thousands of rivers and streams that flow into the them, and a considerable ground water system, estimated to be roughly the size of Lake Michigan (more than 1,000 $mi^3$ of water).[6]

The Great Lakes were originally carved out by several glacial episodes (the last one occurring about 14,000 years ago) and as the glaciers retreated, they were filled by meltwater.[7] The original Great Lakes were once much larger bodies of water than they are today. The existing topography came into being only after the uplifting of land which followed the release of pressure once the glaciers had fully receded.

Although lake levels are highly variable, the total volume of water in the lakes is so vast that, on average, less than one percent of the waters of the Great Lakes is renewed annually by precipitation, surface water runoff, and inflow from ground water sources. As a consequence, the International Joint Commission has referred to the Great Lakes as "for the most part, a nonrenewable resource."[8]

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[2] Norman G. Grannemann et al., "The Importance of Ground Water in the Great Lakes" (2000) USGS Water Resources Investigations at 1.
[3] *The Great Lakes, An Environmental Atlas and Resource Book*, 3rd ed. (United States Environmental Agency and Government of Canada, 1995).
[4] Theodora E. Colborn et al., "Great Lakes, Great Legacy?" (The Conservation Foundation and the Institute for Research on Public Policy, 1990) at 1.
[5] These lakes cover an area about the size of Lake Erie (*Ibid* at 1).
[6] *Supra* note 2 at 1.
[7] See The Nature Conservancy, "Conservation of the Biodiversity in the Great Lakes Basin Ecosystem: Issues and Opportunities" (1994), online: U.S. Environmental Protection Agency <http://www.epa.gov/glnpo/ecopage/glbd/issues/index.html>
[8] *Supra* note 1.

## A) The Relationship between Ground Water and the Great Lakes Basin

*"[G]round water is an essential part of the Great Lakes Region water-supply system. It is a critical resource for maintaining human health and healthy ecosystems."*[9]

The following section begins with an overview of ground water hydrology and then considers the relationship between ground water and the various elements of the Basin's ecosystem. This relationship includes the seamless interaction between ground water and surface water, the significance of ground water for unique aquatic habitats, and its importance to the general biological viability of precious ecosystems. Further, as a result of direct and indirect discharge into the Great Lakes themselves, ground water is a significant factor in sustaining one of the largest fresh water ecosystems on the planet, and through its interaction with wetland environments, it supports a wonderful diversity of flora and fauna.

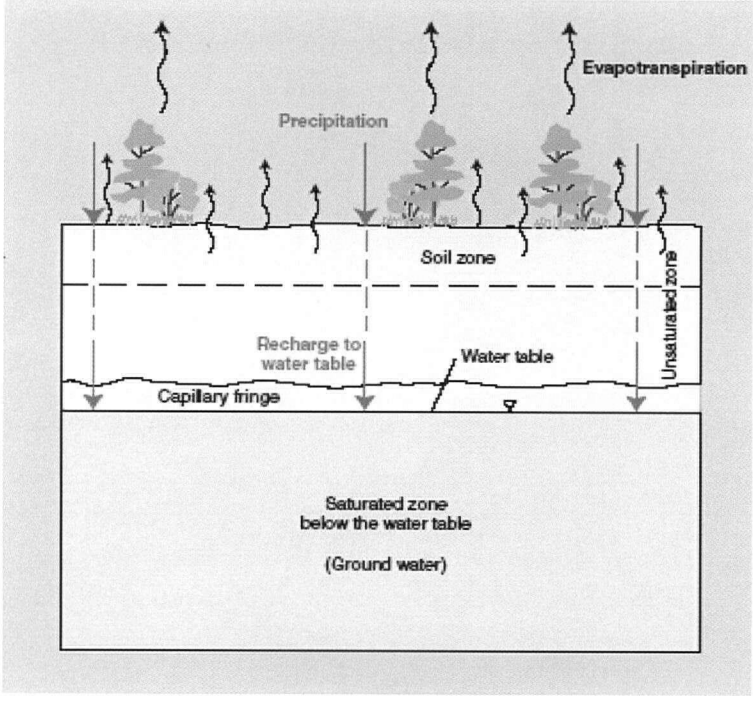
Finally, the section concludes by considering the vital role that ground water ground water plays in human development in the region. Ground water supplies drinking water to millions of residents, it irrigates the crops that feed the Basin's burgeoning population, and it is utilized by industry as a cheap and relatively clean alternative to lake water.

[9] *Supra* note 2 at 2.

## 1. What is Ground Water?

Water becomes part of the ground water system when it enters the saturated zone under the earth's surface through a process known as infiltration. Precipitation that has not evaporated or been intercepted by plants will either run off the land as surface water to

**Figure 2: The Occurrence of Ground Water**




Source: William M. Alley et al., "Sustainability of Ground-Water Resources" (1999) U.S. Geological Circular 1186

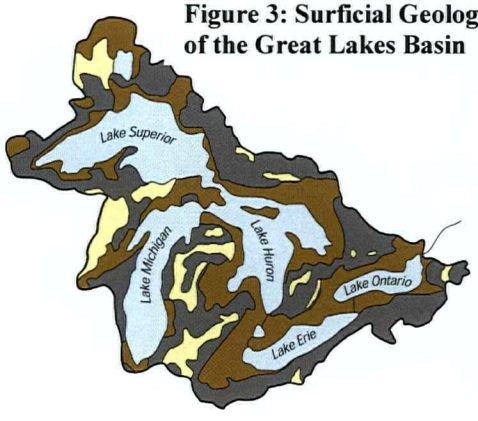
enter streams, lakes or the ocean. Alternatively, it will seep into the soil. This seepage is known as infiltration. Once infiltrated, the water is either taken up by the roots of plants or is drawn downwards by gravity through gaps or cracks in the soil ("percolation"). Usually, the gaps in the layer of soil directly beneath the earth's surface contain both water and air (the "unsaturated zone"). As the water is drawn further downwards, it will enter a zone where the gaps have become completely filled with water

(the "saturated zone"). The top level of the saturated zone is referred to as the "water table" (see Figure 2).

## 2. The Ground Water System in the Great Lakes Region

While it is accurate to say that the ground water system in the Basin contains roughly the same amount of water as Lake Michigan, it should not be assumed that the ground water system is simply one large, subsurface reservoir. The prevalence of ground water and its usefulness as a resource depends on geology. Rocks and sediments that are capable of bearing enough water to provide a productive supply for human purposes are known as "aquifers".

**Figure 3: Surficial Geology of the Great Lakes Basin**



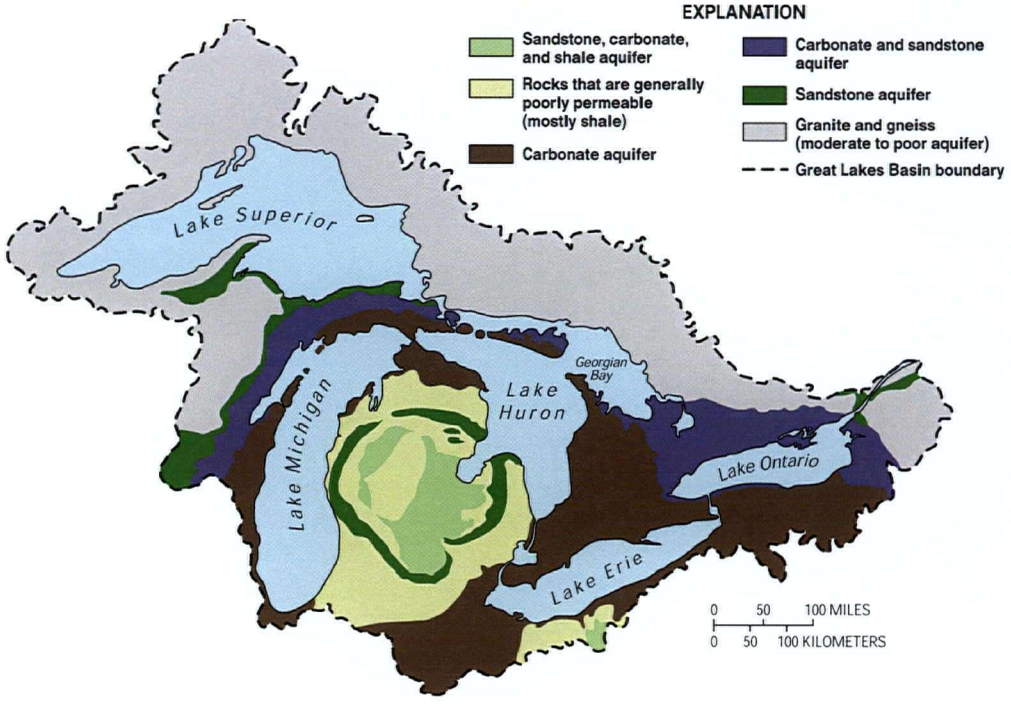

Source: *The Great Lakes, An Environmental Atlas and Resource Book*, 3rd ed. (United States Environmental Agency and Government of Canada, 1995).

Some of the most productive aquifers are those that have formed in unconsolidated material[10] deposited by glaciers after the last ice age (see Figure 3). This unconsolidated material is generally comprised of either a mixture of sand and gravel or silt and clay. Deposits of sand and gravel make excellent aquifers, while silt and clay are generally not as productive. Some of these deposits are very thick. For example, in some parts of Michigan these deposits are 1,200 feet thick.[11]

[10] Sediments that have not been transformed or "consolidated" into rock.
[11] *Supra* note 2 at 3.

Productive aquifers can also be found in much of the consolidated rock (commonly referred to as "bedrock") in the Great Lakes region.

**Figure 4: Bedrock aquifers of the Great Lakes Basin.**




Source: Norman G. Grannemann et al., "The Importance of Ground Water in the Great Lakes" (2000) USGS Water Resources Investigations Report 00-4009

Figure 4 shows the location of these bedrock aquifers. Carbonate rocks (limestone and dolomites) are sedimentary rocks[12] that are widespread in the southern parts of the Basin. Limestones and dolomites make excellent aquifers because as ground water moves through the rock's cracks and joints, it dissolves the rock, thereby enlarging the cracks and increasing the rock's permeability. Another sedimentary rock with highly productive capabilities is sandstone. It is found throughout the Great Lakes region,

[12] Sediments that have undergone a physicochemical change known as diagenesis that results from compaction by overlying material.

particularly the midwestern part of the Basin, where there is an extensive aquifer that extends under Lake Michigan.[13]

The northern part of the Basin contains fewer aquifers than the southern part because it is mostly comprised of igneous and metamorphic rocks that have poor aquifer properties. Areas with shale as their predominant geology (formed by the consolidation of clay and silt) also contain few aquifers.

## 3. The Flow of Ground Water in the Great Lakes Region

Once water has percolated into the ground water system it does not remain static. Ground water moves horizontally and vertically through the pores and cracks in the rock in a process that is referred to as "ground water flow." Ground water flow depends on a number of factors including whether the aquifer is confined or unconfined.

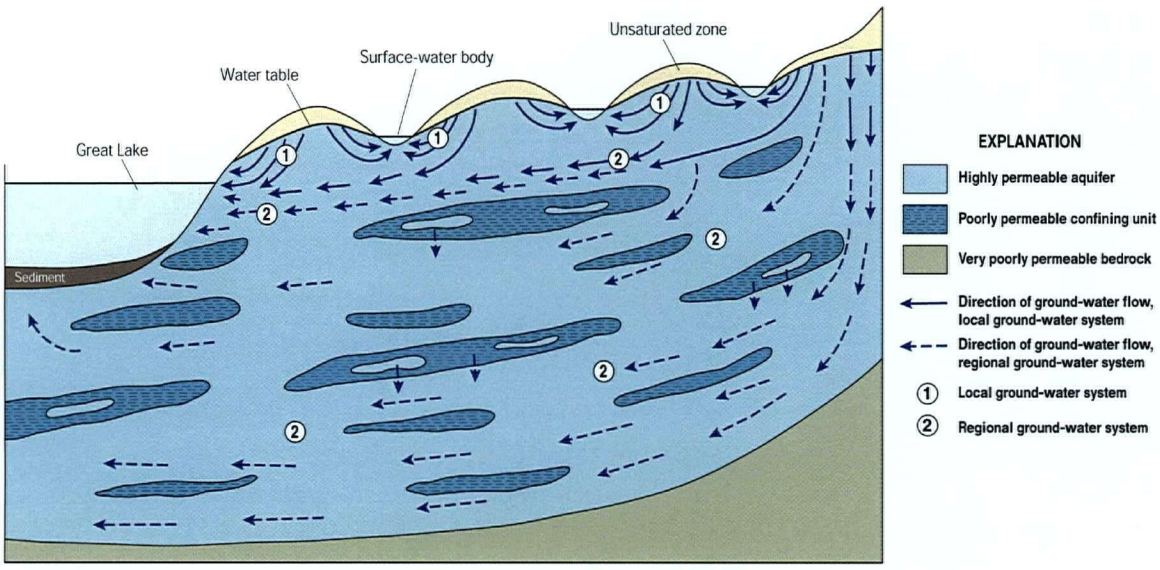
An unconfined aquifer has no impediment preventing direct recharge from waters percolating downwards, while a confined aquifer has an impermeable layer of rock or sediment that essentially blocks the path of water that percolates downwards. Confined aquifers may rely on horizontal ground water flow for recharge or if completely confined, may receive virtually no recharge at all and should be considered a non-renewable resource.

The water level of an unconfined aquifer corresponds with the water table. The water level of a confined aquifer is the level the water rises to if a tightly cased well is drilled

[13] *Supra* note 2 at 3.

into that aquifer. Unlike an unconfined aquifer, the water level of a confined aquifer is not the same as the water table. The reason for this is that confined aquifers are usually under considerable pressure from the above confining layer(s) and when a well is inserted, water may rise considerable distances above the top of the aquifer and sometimes even above the surface of the land. The surface of the level to which the water would rise (known as the "potentiometric surface") is what hydrologists refer to when they discuss the water level in confined aquifers.[14]

**Figure 5: Generalized local and regional ground-water flow systems in the Great Lakes Region**




Source: Norman G. Grannemann et al., "The Importance of Ground Water in the Great Lakes" (2000) USGS Water Resources Investigations Report 00-4009

Figure 5 shows an example of a local and regional ground water flow system in the Great Lakes region. The direction of shallow ground water flow is indicated by the gradient of the water table, which usually follows the prevailing surface topography.

[14] The water table in an unconfined aquifer is also a potentiometric surface.

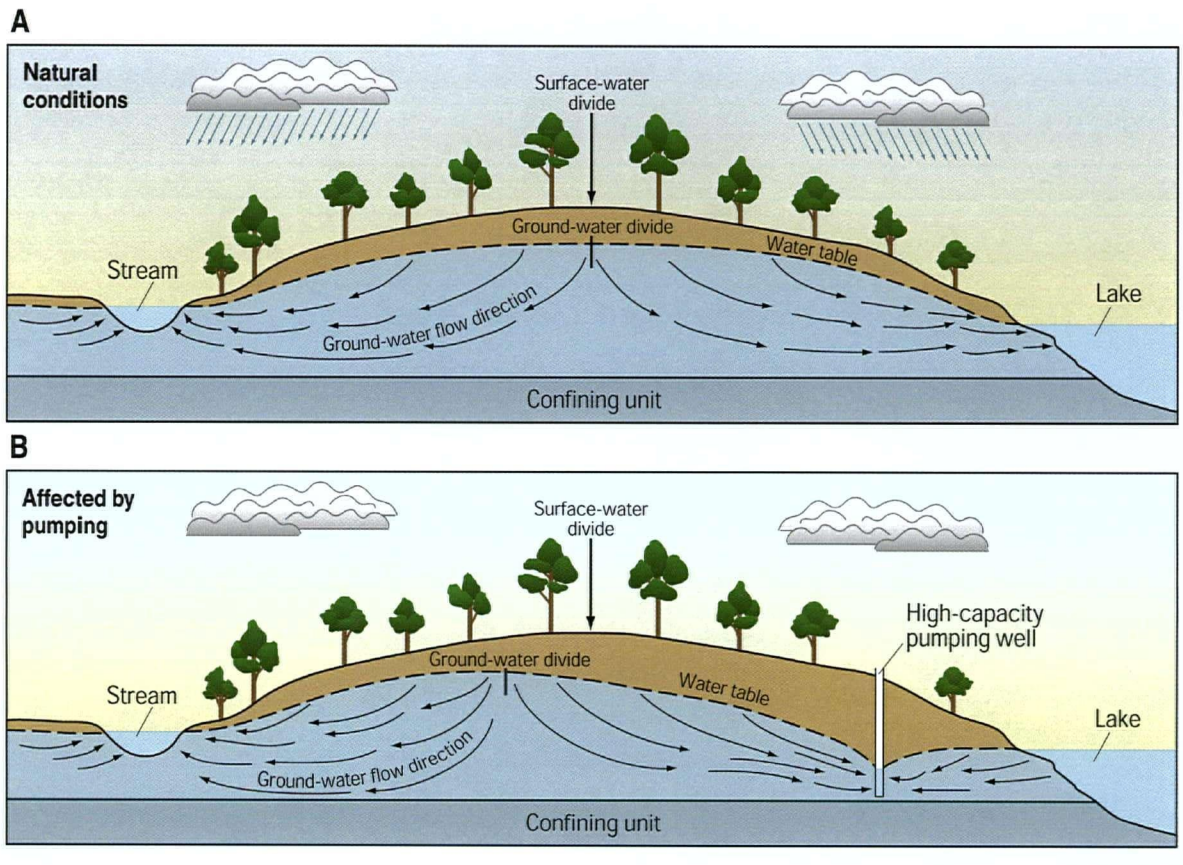
Much of the ground water in the Basin moves through unconfined aquifers in local flow systems near the surface. As this ground water is flowing close to the surface, it only has to travel relatively short distances (tens to hundreds of feet) before it intersects with a stream, lake or wetland. Still, depending on the permeability of the sediment or rock through which it is travelling, it may take days, years or even decades to flow that short distance.

Ground water that percolates to a deeper level will be too deep to intersect with many surface water bodies, and it may take hundreds or even thousands of years before it eventually enters a lake or river. This deeper ground water moves in a broader regional flow system and is often contained within confined aquifers (the confining layer preventing such flow from finding a faster path to a lake or stream). Ground water flow in confined aquifers is largely controlled by the potentiometric surface of the aquifer and is more subject to alteration by pumping. Although commonly restrained by a confining layer, regional ground water flow can also take place in thick unconfined aquifers.

As with surface water systems, one can identify the general direction of ground water flow by establishing the location of the ground water divide. This divide determines the discharge point toward which ground water will flow. Under natural conditions, the ground water divide will generally coincide with the surface water divide (which is determined by topography). However, whereas the surface water divide will remain unaffected by the exploitation of aquifers, the ground water divide will often move to one side or the other in response to ground water pumping. This can change the direction of ground water flow so that ground water that once flowed west into a river or lake now flows east (see Figure 6 below).

Figure 6 shows the effect of ground water pumping on a local ground water system. Regional ground water divides can also move in response to the large-scale withdrawal of ground water from deeper aquifers. For instance, the regional ground water divide has shifted ten miles west of its predevelopment position in southeastern Wisconsin, as a result of a significant increase in ground water pumping in the City of Waukesha.[15]

**Figure 6: Generalized ground-water flow (A) under natural conditions and (B) affected by pumping**




Source: Norman G. Grannemann et al., "The Importance of Ground Water in the Great Lakes" (2000) USGS Water Resources Investigations Report 00-4009

[15] See below at 29.

## 4. The Interaction between Ground Water and Surface Water

A distinction is often drawn between ground water and surface water but in reality this distinction is a misleading one. They are both part of a continuous and dynamic process in which ground water emerges to become surface water and surface water infiltrates to become ground water.

Ground water rarely rests in underground reservoirs; it moves along flow paths attempting to find its way to the surface, and when it discharges it appears as a spring or part of a stream or lake. Surface water, given the chance, is just as keen to enter the ground water system and percolate downwards as far as the soil and rock conditions will allow. Consequently, whenever one enjoys the presence of a sparkling spring, a meandering stream, or a tranquil lake, it should be recognized that much of the water within that entity has actually come from the ground. Rather than being treated as distinctive, the terms "ground water" and "surface water" should therefore be regarded as related, and to a large extent, interchangeable.[16]

Once the interactions between ground water and surface water are understood, the importance of ground water to the general health of the Basin's ecosystem becomes clearly evident.

[16] See Appendix I.

## 5. Ground Water as a Component of the Great Lakes Ecosystem

*The richness of the Great Lakes basin is inextricably tied to the integrity of its individual components, for no part of this ecosystem survives alone. Indeed, disturbances in one area can have unintended consequences elsewhere.*[17]

The Great Lakes' dramatic glacial history has shaped a unique landscape that boasts an incredible diversity and supports an ecosystem with remarkable biological richness:

> The Great Lakes are the only lakes of their size in a temperate climate. With the lakes' moderating effect on the climate, the ecosystem is able to provide habitat for a wide variety of species that otherwise might not survive. The Great Lakes - St. Lawrence River ecosystem features sand dunes, coastal marshes, rocky shorelines, lakeplain prairies, savannas, forests, fens, wetlands and other landscapes.[18]

The importance of ground water to this system has yet to be fully realized, but it is clear that it is a crucial element in many of the extraordinary ecologies that pervade the Basin.[19]

### a) Ground Water and the Great Lakes

Until recently, little focus was placed on the quantity of ground water flowing into the Great Lakes. Earlier studies concluded that direct ground water discharge into the Great

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[17] The Nature Conservancy Great Lakes Program, "Great Lakes in the Balance: Protecting Our Ecosystem's Rich Natural Legacy" (1997) The Nature Conservancy at 3, online: U.S. Environmental Protection Agency <http://www.epa.gov/glnpo/ecopage/glbe/glbal.pdf>.

[18] U.S. Army Corps. of Engineers & Great Lakes Commission, "Living with the Lakes: Understanding and Adapting to Great Lakes Water Level Changes" (1999) at 31, online: Great Lakes Commission: <http://www.glc.org/living/pdf/lakelevels.pdf>. See also a study conducted by the National Conservancy that found the Basin's ecosystem has 131 globally significant elements, including animal and plant species and over 30 natural communities. Some of these species and communities do not exist anywhere else in the world (*Supra* note 7).

[19] *Supra*, note 2 at 1.

Lakes was a mere drop in the pond. However, more recent research conducted by the United States Geological Survey ("USGS") has shown that ground water makes up a significant percentage of inflow to the Great Lakes. Ground water enters the Great Lakes both directly, through the banks and the base of the lakes ("direct ground water discharge"), and also indirectly through streams and rivers ("indirect ground water discharge").

The levels of the Great Lakes fluctuate depending on the amount of water they receive from the hydrological cycle. The fluctuation in water levels can be calculated through the use of a water budget, which takes into account both inflows (water going into the lake) and outflows (water leaving the lake).

For example, the water budget for Lake Michigan reveals that ground water makes up a large proportion of inflow.[20] Precipitation contributes the largest proportion of water (nearly 52% of inflow) but ground water flow is the second largest contributor. Nearly 34% of water entering Lake Michigan comes from direct and indirect ground water discharge, and ground water contributes about 80% of water flowing from the watershed into Lake Michigan.

b) Ground Water and Streams

While the Great Lakes themselves are at the heart of the Basin, the Basin's ecosystem is made up of innumerable components. Thousands of rivers and streams act like veins feeding life to these components before ending their journey at the Great Lakes. The

[20] See Appendix I.

blood running through these veins is supplied by the hydrological cycle and a critical, but commonly forgotten component of the hydrological cycle is ground water.

The rivers and streams of the Great Lakes provide habitats for a wide range of aquatic species, some of which are unique to the Great Lakes region. Flocks of migrating songbirds and schools of spawning fish rely on these streams as corridors guiding them to their various destinations. An excellent example of the ecological importance of streams in the Great Lakes region is Fish Creek, a stream feeding into the Maumee River in Indiana and Ohio. The Nature Conservancy has referred to this stream as an "oasis of biological diversity"[21] because it supports more than 70 species of fish and mussels and is the last refuge of the White Cat's Paw Pearly mussel, a subspecies found nowhere else in the world.[22]

On average, the rivers and streams of the Basin rely on ground water for approximately 67% of their streamflow.[23] This baseflow[24] is particularly important during times of low precipitation or drought. The reason for this is that surface run-off is a short-term, direct response to precipitation events, whereas ground water is water that has been stored following numerous precipitation events and thus provides a persistent long-term supply to streams long after the overland flow has ceased.

In addition to providing physical supply, ground water often possesses important bio-geochemical properties that maintain the integrity of the ecology within the streams and

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[21] *Supra* note 18 at 19.
[22] Although people may think that mussels are a relatively unimportant species, it should be borne in mind that great scientific interest surrounds the potential that mussels may reveal the secrets to a revolutionary surgical solvent.
[23] D. J. Holtschag and J. R. Nicholas, "Indirect Ground-Water Discharge to the Great Lakes" (1998) USGS Open-File Report 98-579 at 1.
[24] The portion of flow within a stream that has come from ground water.

allow for the survival of aquatic species. For example, ground water temperatures remain relatively constant throughout the year and when discharged into a stream, protect aquatic species from fluctuations of heat in the summer and cold in the winter. Ground water generally also contains a consistent concentration of dissolved oxygen, as well as important nutrients and minerals essential to the health of organisms living in a stream. [25]

c) Ground Water and Wetlands

Wetlands occur in any situation where the topography and hydrology allow for the retention of water and are typically an extremely productive and important part of any ecosystem. The Basin has many types of wetlands, including coastal marshes, alkaline wetlands, forested swamps, and peatland bogs and fens. Biologically speaking, the most productive wetlands within the Basin are the coastal marshes and the high-quality fens, which have both been accorded global significance by the Nature Conservancy because of the range of rare and unusual species they support.[26]

The coastal marshes serve the extremely important function of absorbing nutrients and organic material that would otherwise have a deleterious effect on the Great Lakes. These marshes also provide habitat to a great variety of plants and animals including migratory birds and spawning fish. These wetlands are formed and maintained mainly by lake processes such as waves, wind tides and especially seasonal flooding. However, ground water discharge also plays a role in the viability of coastal marshes by contributing water and nutrients.

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[25] Supra note 2 at 12.
[26] *Supra* note 7.

Fens and bogs are both peatland entities. Bogs are supplied mostly by precipitation and are relatively lifeless. Fens, on the other hand, are often thriving with life and are essentially a product of the ground water system. They rely on a continuous influx of mineral-rich water. This mineral rich water generally comes from ground water that has picked up the minerals of the rock or sediment through which it has flowed. The fens of the Basin are some of the most flourishing environments to be found anywhere in the world. They support a myriad of unusual trees, shrubs, and wildflowers and are also home to rare reptiles such as the Kirtland snake and an endangered butterfly known as Mitchell's satyr.[27]

## 6. Ground Water as a Resource

Despite the vast quantities of surface water contained within the Great Lakes, ground water has become an increasingly important resource in the Basin.

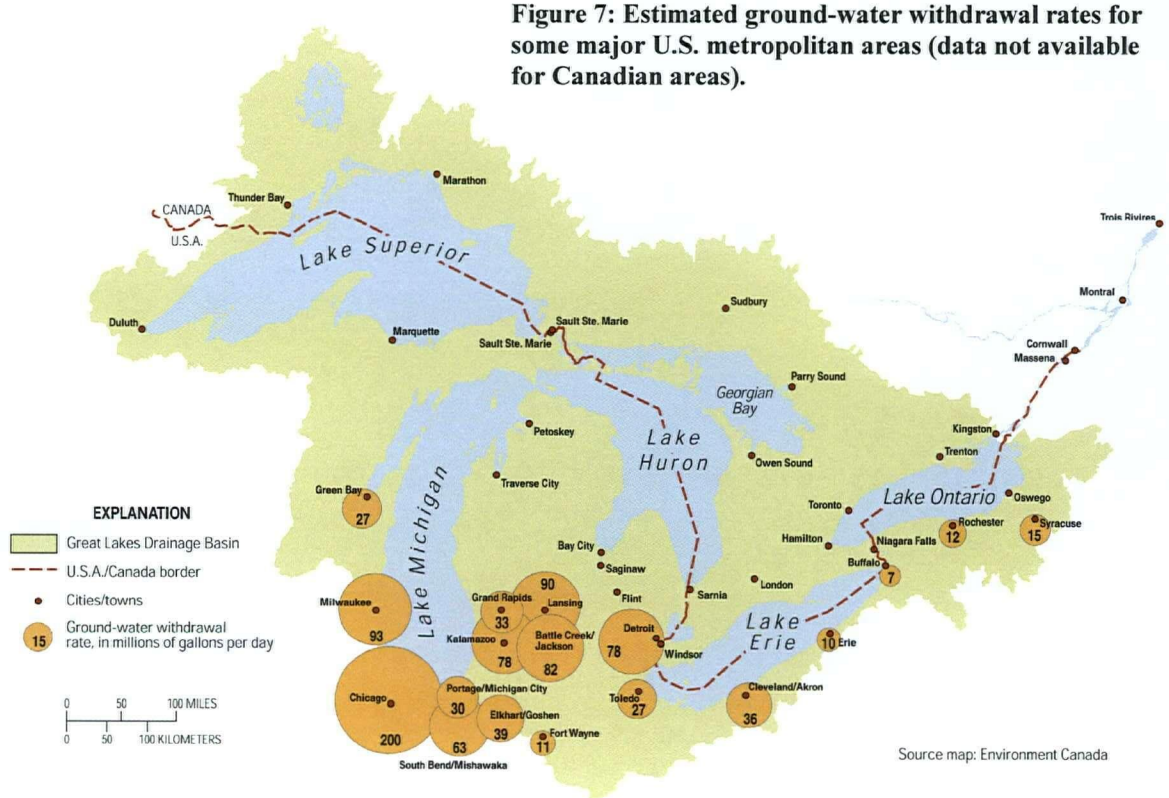
The Canadian provinces in the Basin contribute nearly 40% of the total agricultural production of Canada, while the American states that lie within the Basin account for nearly 20% of the United States production (measured in dollars).[28] Most farming takes place on the lakeplains away from the shoreline of the Great Lakes, where local aquifers provide a cheap and reliable water supply. Consequently, more than half of the fresh water utilized for irrigation and watering livestock comes from ground water.[29] Domestic use in rural areas also relies heavily on ground water, as municipal systems rarely

[27] *Supra* note 7.
[28] Jennifer Kramer Glynn, "Impacts of Agriculture on Water Quantity in the Great Lakes - St. Lawrence Basin: Executive Summary" (2002) Institute for Agriculture and Trade Policy at 5, online: Institute for Agriculture and Trade Policy <http://www.iatp.org/enviroag/publications.cfm>.
[29] *Ibid.*

extend beyond the edges of cities. Many of the 4.9 million people who supply their own water in the Basin use ground water from small, privately owned wells.[30] In certain areas the reliance on ground water for self-supplied domestic water is extremely high. For instance, Michigan is second only to California in the United States for the amount of ground water extracted per day for self-supplied domestic water.[31]

In addition to use by agriculture, ground water is the source of drinking water for about 8.2 million people (nearly 25% of the population in the Basin).[32]

**Figure 7: Estimated ground-water withdrawal rates for some major U.S. metropolitan areas (data not available for Canadian areas).**




Source: Norman G. Grannemann et al., "The Importance of Ground Water in the Great Lakes" (2000) USGS Water Resources Investigations Report 00-4009

[30] International Joint Commission, "Protection of the Waters of the Great Lakes – Interim Report to the Governments of Canada and the United States" (August 1999) at 7.
[31] Hutson et al., "Estimated Use of Water in the United States in 2000" (2004) USGS Circular at 16.
[32] *Supra* note 2 at 2.

Figure 7 shows the metropolitan areas in the United States portion of the Basin where large quantities of ground water are withdrawn. Although most large public water supplies in the Basin are obtained from the lakes themselves, it is notable that even those cities located on the shoreline of the Great Lakes are using large quantities of ground water. This can be attributed to the growth of suburban areas in these metropolitan regions.[33] It is often cheaper to supply residential areas erected on the edge of cities with ground water pumped locally than to pipe water from the Great Lakes. Further, industrial areas that now abound in the low-priced land on the outskirts of cities are using an increasing amount of ground water.[34]

Communities located further away from the Great Lakes also rely heavily on ground water for municipal and industrial supply. A good example is the Waterloo region in Ontario, an area that includes the cities of Cambridge, Kitchener, Waterloo, Elmira, St. Jacobs, Baden, and New Hamburg. These cities, which serve approximately 450,000 residents, rely on ground water for approximately 75% of their supply. As the population in this area continues to grow and expand, the pressure on ground water resources can be expected to increase.

[33] *Ibid.*
[34] *Ibid.*

## B) The Consequences of Ground Water Pumping

To effectively evaluate the consequences of ground water pumping, the following section of the paper borrows a distinction drawn by the Honourable Lawrence C. Root in a recent legal case concerning ground water pumping in Mecosta County, Michigan.[35] In that case, Judge Root undertook a considered and thoughtful examination of the consequences of ground water pumping and separated his findings into "effects" and "impacts". He stated:

> Effects ... are the physical consequences of a particular force. I use it essentially as a term of physics. On the other hand, impacts are the consequences of such effects, generally being in terms of a response in the ecosystem to the physical effects. For example, the effect of a lowering of groundwater may have the impact of causing a drop in a wetland area with further impacts on the plant life in that wetland.[36]

### 1. The Effects of Ground Water Pumping

Depending on whether the aquifer is in a local flow system or regional flow system, the effects of ground water pumping may be quite different.

[35] *Michigan Citizens for Water Conservation et al v. Nestlé Waters North America Inc.* (2003) Mecosta County Cir. Ct. No. 01-14563-CE
[36] *Ibid.* at 11.

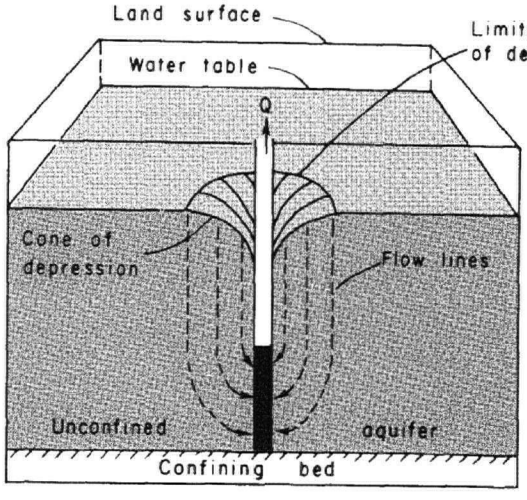



**Figure 8: Unconfined Aquifer – local ground water flow is typically found in unconfined aquifers**

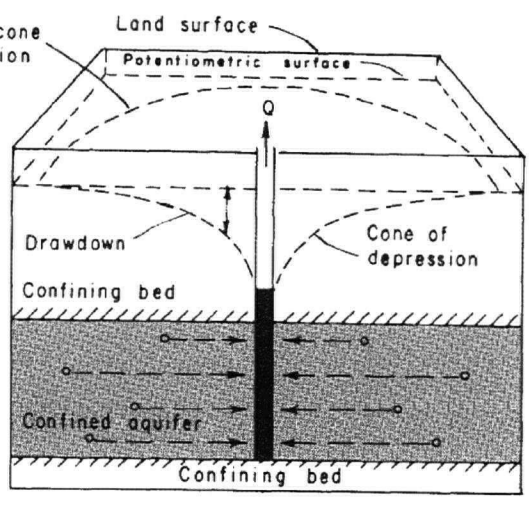



**Figure 9: Confined Aquifer – regional ground water flow often occurs in confined aquifers**

Source: Ralph C. Heath, "Basic Ground-Water Hydrology" (1987) US Geological Survey Water-Supply Paper 220

a) Local Flow System

The local flow system generally takes place in unconfined aquifers. Figure 8 the effects of pumping upon the hydrology of an unconfined aquifer. Initially, when a well is inserted into an unconfined aquifer, the level of water within the well (the "well head") will correspond with the level of the water table. However, once the pump is turned on, the well head will fall below the water table. The well will then draw in water from the surrounding aquifer.

In unconfined aquifers, the water is actually drained from the aquifer, so that the pores between grains of sediment or rock are no longer completely filled by water (a process known as "dewatering"). The movement of water from the aquifer into the well produces a cone of depression and results in a fall in the water table. This cone of depression will

continue to expand and the water table will decline until the rate of the flow into the well becomes equal to the rate of withdrawal.

b) Regional Flow System

The regional flow within the Basin generally takes place within confined aquifers. Confined aquifers react somewhat differently to withdrawals than unconfined aquifers.

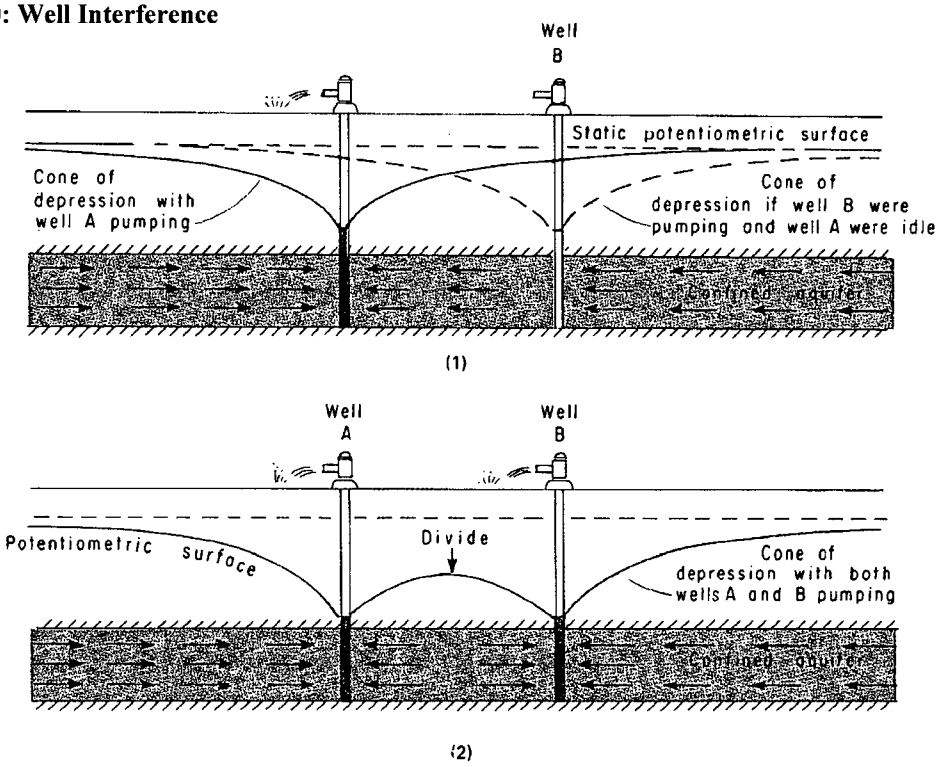
When water is pumped from a confined aquifer, the entire thickness of the aquifer will usually remain saturated and water will be obtained from the elastic storage of the aquifer rather than from gravity drainage.[37] Elastic storage results from the expansion and expulsion of water following a reduction in pressure. As water is pumped, the pressure within the aquifer decreases. This pressure loss causes the water within the aquifer to expand and also allows the confining layer to compress the aquifer. As the aquifer compacts, the pore spaces between the particles of rock shrink and water is forced out. The pressure loss also results in a drop in the potentiometric surface (or water level) of the aquifer. This is sometimes referred to as "drawdown" and it produces a cone of depression that can expand in extent and depth quite rapidly (see Figure 9 above).

c) Cumulative Effects of Ground Water Pumping

A situation that can occur in either confined or unconfined aquifers is referred to as "well interference" (see Figure 10 below).

[37] Dewatering of a confined aquifer will usually only occur where pumping is on a massive and persistent scale.

**Figure 10: Well Interference**



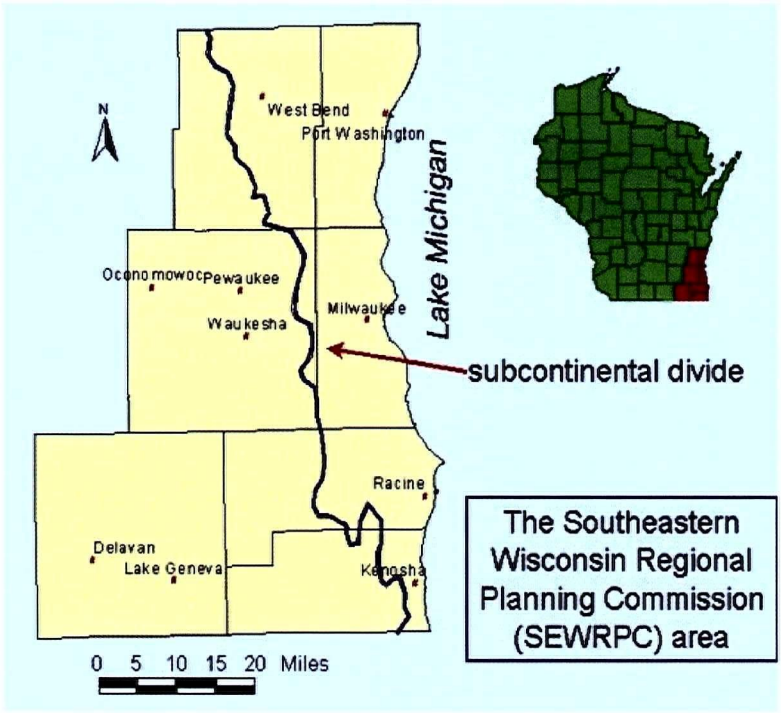

Source: Ralph C. Heath, "Basic Ground-Water Hydrology" (1987) US Geological Survey Water-Supply Paper 220

Well interference occurs in situations where wells are closely spaced. In this situation, the cone of depression from one well may intersect with the cone of depression from another well. The drawdown that occurs in both wells has an additive effect in that portion of the aquifer. It increases the decline in the water level and it increases the decline of each well head. If there are numerous closely spaced wells pumping from an aquifer and the cones of depression around each well intersect, the water level of the entire aquifer may decline. In this case, the depth of the ground water from which each well must pump is increased.

d) Example: The Effects of Ground Water Pumping in Southeastern Wisconsin

A case study currently being conducted by the United States Geological Survey (USGS) provides an excellent illustration of the effects of ground water pumping in the Basin.[38] The subject area of the case study is a seven county region in Wisconsin known as the Southeastern Wisconsin Regional Planning Commission (SEWRPC) area (see Figure 11).

**Figure 11: The Southeastern Wisconsin Regional Planning Commission Area**




Source: K.R. Bradbury , Wisconsin Geological & Natural History Survey

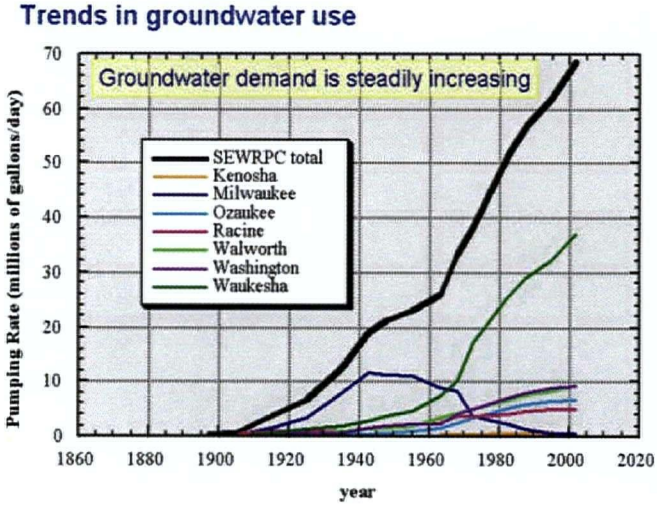
Four of the counties border on Lake Michigan, and the region contains two major urban centres, the City of Milwaukee and the City of Waukesha. These centres are separated by the subcontinental divide, which marks the edge of the Basin. Any water that collects

[38] "Ground water in the Great Lakes Basin: the case of southeastern Wisconsin" United States Geological Survey, online: USGS Water Resources of Wisconsin: <http://wi.water.usgs.gov/glpf/index.htm>.

east of this surface water divide flows towards the Great Lakes and any water that collects west flows toward the Mississippi basin.

This region has seen significant development and population growth in the last century, and although Lake Michigan is still the largest source of water, the demands placed upon the region's ground water supplies have been considerable and continue to grow (see Figure 12). Between 1985 and 1995 the use of ground water in the region increased by 29% while the use of surface water decreased by almost 12%.[39] Ground water serves over 68% of municipal systems in the region, as well as all of the 244 privately owned community systems, and it is the only source available to domestic users outside the municipal service areas.[40] The region's agricultural sector is also extremely reliant on ground water.

**Figure 12: Graph of pumping rates over time in counties within and adjoining southeastern Wisconsin**




Source: D. J. Hart, Wisconsin Geological and Natural History Survey

The substantial use of ground water supplies may seem surprising when one considers the proximity of much of this region to Lake Michigan. However, most cities that lie west of the subcontinental divide, such as the City of Waukesha, are legally prohibited from taking

[39] Southeastern Wisconsin Regional Planning Commission, "Groundwater Resources of Southeastern Wisconsin" (2002) Wisconsin Geological and Natural History Survey Technical Report No.37 at 67.
[40] *Ibid.* at 70.

water from the Great Lakes because they would be diverting it out of the Basin.[41] Even cities and communities that lie east of the Basin divide extract a considerable quantity of ground water. The reason for this is that it is a cleaner source than Lake Michigan and wells are easier and less expensive to install and maintain than inflow pipes from the lake, which become clogged by zebra mussels and other organisms.

i) Effects on Local Flow System

As described above, the effects of ground water pumping will be different depending on the type of aquifer and whether the flow is local or regional. Local ground water flow in the SEWRPC area occurs in two different types of geology. The first is an unconsolidated sand and gravel aquifer that lies near the surface of the land. The second is a relatively thin layer of fractured dolomite bedrock that lies just underneath the sand and gravel aquifer.

The effects of pumping from shallow aquifers have been most obvious in Ozaukee County (north of Milwaukee County) where developers have favoured extraction from the dolomite aquifer, rather than the deeper sandstone aquifer.[42] Ground water pumping in this county has lowered the water table and intercepted water that would otherwise have fed wetlands or rivers and streams that eventually flow into Lake Michigan.

[41] The Water Resources Development Act (WRDA) passed in 1986 and amended in 2000 is a federal law that prohibits any new diversions of water from any U.S. portion of the Great Lakes or their tributaries for use outside the Basin unless such diversion is approved by all Great Lakes governors. Chicago's Sanitary and Ship Canal is the only pre-existing major diversion out of the Great Lakes Basin. It was authorized by Congress (Act of July 3, 1930, ch. 847, 46 Stat. 918 (1930)) prior to the WRDA.

[42] *Supra* note 39.

Overall, it is estimated that the cumulative effects of pumping from shallow aquifers in the four counties that border Lake Michigan in this region (Ozaukee, Milwaukee, Racine, and Kenosha) has reduced direct ground water flow from these counties into Lake Michigan by 11.4% between 1964 and 2000 and indirect discharge into Lake Michigan by 8.5% between 1964 and 2000.[43] In some places, the flow of ground water has actually reversed so that water is flowing from Lake Michigan into the local ground water system as recharge. Although the reduction in flow to Lake Michigan is negligible when put into context,[44] the study is clear evidence that ground water pumping in shallow aquifers affects local surface water bodies such as streams, lakes and wetlands and, if extensive across the basin, could potentially lower water levels in the Great Lakes (particularly when combined with climate change).

ii) Effects on Regional Flow System

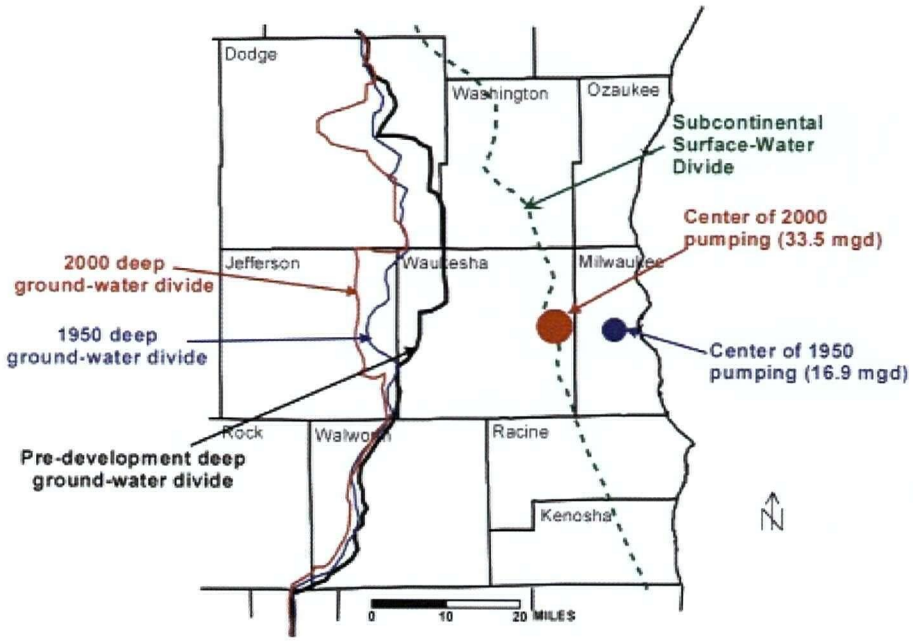
The shallow local flow system in the SEWRPC area is divided from a deeper sandstone aquifer by the Maquoketa Shale Aquitard. Large-scale cumulative pumping from this deep aquifer has had significant effects on regional ground water flow in the SEWPRC area.

Initially, the highest concentration of wells in this region was in the Milwaukee metropolitan area. At its natural level, the water level in this confined aquifer was measured at 186 feet above the surface of Lake Michigan.[45] By 1980, the

[43] *Ibid.*
[44] According to the USGS, the sum of direct and indirect discharge from this region into Lake Michigan is 224 cubic feet per second. This is compared to the total ground water discharge into Lake Michigan of 35,000 cubic feet per second (*supra* note 39).
[45] *Supra* note 2 at 7.

level had declined by 375 feet. More recently, Waukesha County has taken over as the biggest pump in the region, and since 1979 has increased its pumping by 25%.[46] The vast majority of the water used in the county is extracted from the deep sandstone aquifer, and as a consequence, water levels in Waukesha County have dropped some 500 feet since pumping began.

**Figure 13: Map showing location of pumping centers and ground-water divides in the deep sandstone aquifer for predevelopment, 1950, and 2000 conditions**




Source: J. T. Krohelski, U.S. Geological Survey

Waukesha County is intersected by the subcontinental surface water divide (subcontinental divide) that marks the western edge of the Basin. The City of Waukesha lies west of the subcontinental divide. As a result of large-scale pumping in the City of Waukesha, the centre of the large cone of depression that previously sat under the City of Milwaukee has moved west so that it now

[46] Lisa Gaumnitz *et al.*, "A growing thirst for ground water" (2004) Wisconsin Natural Resources Magazine, online: Wisconsin Natural Resources Magazine <http://www.wnrmag.com/stories/2004/jun04/ground.htm>

underlies the City of Waukesha (see Figure 13 above). The regional ground water divide has shifted with the cone of depression and has moved nearly ten miles west of its pre-development position and now lies some 27 miles west of the subcontinental divide. Consequently, ground water that would once have flowed into Lake Michigan or the tributaries that feed Lake Michigan is being intercepted by wells that lie west of the subcontinental divide. Following use, this ground water, that was previously part of the Basin, is now discharged as waste water into rivers and streams in the Mississippi basin. It is an unfortunate irony that legal rules prohibit the extraction of Lake Michigan water by Waukesha County to prevent the diversion of water from the Basin, while hydrologic reality shows that extraction of ground water by wells in Waukesha is having the same effect.

In addition to intercepting water that would eventually flow into in Lake Michigan, the USGS has found evidence that the pumping of regional aquifers in the SEWRPC region has increased the amount of shallow ground water that leaks into deep aquifers. This reduces the amount of ground water in the local flow system.[47]

As well, the expansive cone of depression under Waukesha is capturing ground water that has been stored underneath Lake Michigan for thousands of years, decreasing a potentially important future supply of ground water to other communities in the basin.[48]

[47] *Supra* note 39.
[48] *Ibid.*

Lastly, the drop in the potentiometric level has forced communities searching for drinking water to drill their wells deeper, and in the process, they have disturbed naturally occurring radium. Radium is a radioactive substance that can pose serious health risks if it is consumed consistently in high concentrations. Most rock contains some radium but the deep sandstone aquifer in southeastern Wisconsin contains a relatively high amount. This radium is dissolved by ground water as it travels through the rock. As regional ground water flow takes much longer to reach its destination than shallow ground water flow, the concentration of radium will reach higher levels in water extracted from lower depths in the sandstone aquifer.

It is clear from the SEWRPC case study that the effects of ground water pumping depend on a number of factors including the pumping rate, the type of aquifer, the concentration of wells, the proximity to surface water bodies, and the general properties of the aquifer (permeability, storage capacity, and the presence of harmful substances). The next section considers the economic, social and environmental impacts that can result from these effects and presents examples of the impacts that have already occurred in the Basin.

## 2. The Impacts of Ground Water Pumping

Ground water pumping produces a number of detrimental impacts for both human and environmental systems. These impacts include the economic costs of digging deeper wells and finding alternative water sources; the social costs produced by conflicts between farmers, self-supplied residents, municipalities and other users; and the

environmental costs of reduced stream flow, the destruction of aquatic habitats and the disappearance of wetlands.

a) Economic Costs

The economic cost of ground water pumping can be significant. The greater the drawdown, the deeper the well required and the larger the pump. This increases the amount of electricity required to operate the pump.

Further, the depletion of an aquifer at a rate that will eventually exhaust that resource will compel municipalities to change or supplement their water supply by using a more expensive source. This has occurred in the Milwaukee and Chicago metropolitan areas. Water from Lake Michigan is now being piped to these urban centres in order to preserve the viability of the underlying aquifer so that it can still be utilized as a water resource.

In the Waterloo region of Ontario, the Regional Municipality's Long Term Water Strategy anticipates that by 2035 large scale pumping will have depleted the underlying aquifer to such a level that the construction of a 120 kilometre pipeline will be required. This pipeline will remove 431 million litres of water per day from either Lake Huron or Lake Erie to supply all the major cities in the Waterloo region. Depending on the lake from which the water is extracted, this project will cost an estimated $432 million or $478 million.[49]

[49] "Council Report E-00-027.1" (2000) approving the Long Term Water Strategy of the Regional Municipality of Waterloo, online: Regional Municipality of Waterloo <http://www.region.waterloo.on.ca>.

b) Conflicts among Users

Ground water pumping creates conflicts between different users. Often, it is rural homeowners who are the first to feel the effects of ground water pumping. For example, in Saginaw, Michigan, ground water pumping of the glaciofluvial[50] and sandstone aquifers by the agricultural sector has resulted in drawdown and caused domestic residential wells to dry up.[51] The USGS notes that many residential wells use shallow jet pumps which can only operate to a depth of about 20 feet and that large volume irrigation wells up to 1.1 miles away may lower the water levels to depths at which these wells can no longer operate.[52]

In Monroe County, Michigan, the amount of water withdrawn by a process known as quarry dewatering[53] has doubled since 1991 and now makes up 75% of the total ground water withdrawn in the county. It is suspected that quarry dewatering has had similar impacts on domestic wells as extraction for irrigation in Saginaw.[54]

In Ontario, the granting of ground water permits to water bottling companies has angered many local citizens that live in townships affected by these operations. In their

[50] Material moved by glaciers and subsequently sorted and deposited by streams or the overland flow of water from melting ice.
[51] C.J. Hoard & D.B. Westjohn, "Simulated Effects of Pumping Irrigation Wells on Ground-Water Levels in Western Saginaw County, Michigan" (2001) US Geological Survey Water-Resources Investigation 01-4227, online: USGS Water Resources of Michigan <http://mi.water.usgs.gov/pubs/WRIR/WRIR014227/WRIR01-4227LW.php>.
[52] *Ibid.*
[53] Abstraction of ground water is necessary to either make the extraction of the mineral more efficient, as in the case of sand and gravel extraction, or, as in the case of permeable rocks such as limestone, to make the extraction possible.
[54] J. R. Nicholas *et al.*, "Comparison of Hydrologic Data from Monroe County, Michigan, 1991-2001" (2001) US Geological Survey Open File Report 01-498, online: USGS Water Resources of Michigan <http://mi.water.usgs.gov/pubs/OF/OF01-498/OF01-498LW.php>.

evaluation of Ontario's Permit to Take Water Program, Hoffmann and Mitchell present examples of the controversy created by the issuance of these permits:

> In the Township of Culross, residents of Formosa and the township displayed their anger regarding the *Clearly Canadian* operation through large and boisterous attendance at public meetings, writing letters to editors of local papers, preparing petitions, and erecting large protest signs... A majority of respondents were worried that groundwater supplies might decrease significantly due to commercial water taking.[55]

A recent dispute in Mecosta, Michigan, dealt with the impact that ground water pumping by a water bottling company would have on local residents' enjoyment of the stream running adjacent to their properties.[56]

c) Conflicts between Sectors

*"As communities encroach upon agricultural areas, conflicts between agricultural and other ground-water users will increase."*[57]

The "reasonable use rule," which is the inadequate common law doctrine now protecting ground water in many US states,[58] was established largely in response to disputes that arose between the agricultural and municipal sectors. At the turn of the last century, the rapid growth in urban areas forced municipalities to search outside their boundaries for aquifers to supply water to their burgeoning populations. Consequently, the municipalities began installing ground water pumping stations in rural areas. These high

[55] Nancy Hoffman & Bruce Mitchell, "Evolving Toward Participatory Water Management: The Permit to Take Water Program and Commercial Water Bottling in Ontario" (1995) 20:2 Canadian Water Resources Journal 91at 96.
[56] This dispute is discussed in greater detail below at 38 and in Chapter 3 at 88.
[57] *Supra* note 2 at 2.
[58] See Chapter 3.

capacity stations often produced a drop in regional water tables and this affected the ability of farmers to irrigate their crops. The agricultural sector responded angrily and the courts devised a rule that offered them some relief.

Today the operation of this rule has generally been circumvented by legislation that enables municipalities to intrude into rural regions without incurring liability for the impacts produced by the installation of high capacity wells.[59] Although the Basin has generally possessed ample water to supply both sectors, the increasing demand for ground water and a changing climate will inevitably produce a growing number of conflicts between the agricultural sector and municipal sectors.

d) Conflicts between States/Provinces

Conflicts over ground water pumping have even occurred between states. Throughout the last century Illinois was embroiled in a legal dispute with Wisconsin over the amount of water it was taking from Lake Michigan. Wisconsin's complaint concerned the large quantity of water that is withdrawn from Lake Michigan by the Chicago metropolitan area and the fact that this water is diverted out of the Basin into the Mississippi River basin via the Chicago Ship and Sanitary Canal. Wisconsin argued that the diversion could have serious impacts on lake levels, navigation, the operation of locks and ports, and hydroelectric power development. Consequently, a judicial decree was issued by the United States Supreme Court[60] limiting the withdrawal of water from Lake Michigan by

[59] See Chapter 3.
[60] Interstate disputes in the United States go to the Federal Supreme Court.

Illinois to 1,500 cubic feet per second.[61] This was later increased to 3,200 cubic feet per second in 1967 to account for the growth in the Chicago metropolitan area.[62]

In addition to exploiting Lake Michigan water, Chicago has also been tapping into the Cambrian-Ordovican aquifer, the same sandstone aquifer that underlies much of Wisconsin. In 1864, when the first well was drilled into this deep confined aquifer, the water level was measured at 130 feet above the surface of Lake Michigan. By 1980, the water level had plummeted by 900 feet. [63] The cone of depression produced by the massive pumping operations in the Chicago area extended 438 square miles into Wisconsin. As a result, the slope of the potentiometric surface changed and Wisconsin ground water drained into Illinois at a rate of 9.3 mgd (35,200 $m^3$/day).[64] Fetter estimates that in 1973 this was costing Wisconsin over 1.4 million dollars per year in lost accessible water. This figure did not include additional costs for the construction of deeper wells, larger pumps and the increased electrical usage.[65] In 1980, the United States Supreme Court amended the 1967 decree to make it clear that in return for access to Lake Michigan water, Illinois was expected to reduce its ground water withdrawals:

> [T]o the extent practicable allocations to new users of Lake Michigan water shall be made with the goal of reducing withdrawals from the Cambrian-Ordovician aquifer.[66]

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[61] *Wisconsin v. Illinois*, 281 U.S. 696 (1930).
[62] *Wisconsin v. Illinois*, 388 U.S. 426 (1967).
[63] *Supra* note 2 at 7.
[64] C. W. Fetter, "Interstate Conflict Over Ground Water: Wisconsin-Illinois" (1981) 19:2 GROUND WATER 201 at p.207.
[65] *Ibid.* at 211.
[66] *Wisconsin et al v. Illinois et al.* (1980) 449 U.S. 48; 101 S. Ct. 557; 66 L. Ed. 2d 253

According to Fetter, this effectively forced the State of Illinois to formally recognize the need to reduce pumping.[67] To a certain extent, Illinois has complied with the decree. By 1994, water withdrawals for public supply in Chicago had decreased and the ground water level had risen by as much as 250 feet in some parts of the metropolitan area. However, in other areas, particularly southwestern Chicago, levels continue to decline.[68]

e) Potential for International Disputes

The border that divides Canada and the United States bisects the Basin. So far, none of the water-related disputes that have arisen between these two countries have been caused directly by excessive ground water pumping.[69] However, it is quite conceivable that a dispute such as the one that occurred between Illinois and Wisconsin could arise between these two countries. As the demand for ground water increases, and the understanding of ground water flow in the Basin improves, it may become apparent that excessive ground water extraction on one side of the border is depriving the other side of important ground water resources or producing a decline in surface water levels.

f) Degradation of the Environment

*"Discharging groundwater is often a key factor in sustaining wetlands, streams, lakes, and vegetation systems through dry periods. Human overuse of groundwater can*

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[67] *Supra* note 66 at 212.
[68] *Supra* note 2 at 8.
[69] Examples of international disputes over water resources between Canada and the United States include the St. Mary-Milk River Dispute, the Birch Lake-Lake of the Woods Dispute, the Chicago Diversion Dispute, and the Columbia River Dispute. See Robert E. Beck, ed., *Waters and Water Rights* (Virginia: The Michie Company 1991) Vol.5 at 45-93.

*therefore adversely affect streams, rivers, and wetlands that depend on it for a significant portion of their flow."*[70]

In Mecosta County, Michigan, a high profile legal case highlighted the conflict between ground water pumping and the environment, and the enjoyment of that environment by local communities.[71] In 2001, John Engler, then governor of Michigan, attracted Perrier (the bottled-water company) to Mecosta county with $10 million dollars worth of tax incentives. Now part of Nestlé Waters North America Inc. (Nestlé), Perrier was granted access to the shallow unconfined aquifer in the Sanctuary Springs area of Mecosta County. This land had been zoned as agricultural but was rezoned to allow Nestlé to build its bottling plants. The wells that Nestlé drilled were designed for a maximum pumping capacity of 400 gallons per minute (gpm). The plant that bottles the water currently employs 155 local workers and promises to generate significant revenue for the local economy and also revenue for the government. However, a number of concerned local residents realized the economic gain was not worth the impact such extensive pumping would have on the local environment. These residents formed an organization called the Michigan Citizens for Water Conservation (MCWC), which initiated a lawsuit seeking an injunction against the continuation of Nestlé's operations.

The case essentially boiled down to a battle of credibility between the hydrological expert for Nestlé and the hydrological expert for MCWC. The Honourable Lawrence C. Root decided in favour of MCWC and held that Nestlé's pumping would have significant consequences for the local environment. At the rate of 400 gpm, the pumping would

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[70] *Supra* note 4 at 77.

[71] *Michigan Citizens for Water Conservation et al v. Nestlé Waters North America Inc.* (2003) Mecosta County Cir. Ct. No. 01-14563-CE.

cause a 29% loss in base flow to local streams, the water levels in nearby wetlands would decrease by up to one and a half feet, and lakes in the area would decline by up to six inches. Judge Root found the impacts of such effects to be considerable.

Regarding the streams, he noted that the reduced flow would raise temperatures and increase sedimentation, thereby narrowing channels and exposing areas that would normally be under water. This would have serious consequences for the aquatic species in the stream and impact on its recreational and aesthetic values.[72]

Before discussing the impacts on wetlands, Judge Root emphasized their importance in the area:

> [W]etlands serve as sort of a "kidney" for the waters in the ecosystem, filtering and purifying it as it wends its way to the groundwater or elsewhere as well as serving as a form of erosion control and flood control where such are concerns. They also serve as important habitats for various species of wildlife. According to Dr. Madsen, Michigan has lost 50-75% of its wetlands since the arrival of European settlers to human activities such as draining, filling or other forms of development. Those substantial losses make the remaining wetlands all that more precious, thus anything that serves to impair wetlands must be scrutinized carefully to avoid harm beyond the subject wetlands themselves.[73]

Judge Root accepted scientific evidence that pumping at less than the full capacity of Nestlé's wells was already affecting the wetland's hydroperiod.[74] The evidence showed that water levels in the wetlands were low during seasons when those levels should have been rising. The scientific expert concluded that an overall drop in water level of a mere

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[72] *Ibid.* at 33.
[73] *Ibid.*
[74] The hydroperiod of a wetland is essentially a measure of the amplitude and frequency of water-level fluctuations through changing seasons. Changes to the natural hydroperiod of a wetland can have devastating impacts on the wetland environment.

one to two inches would cause considerable harm to the wetlands including the drying out of the predominant plant characteristic, sedge tussocks, and the unnatural exposure of the underlying soil and peat. This exposure would encourage invasive plants species to displace the native plant ecology and impact the rich animal life that depend on the wetlands.[75]

Judge Root held that the environmental harm that would result from Nestlé's pumping would infringe the rights of local residents and also breach the standards of the Michigan Environmental Protection Act.[76] Consequently he awarded an injunction against Nestlé, preventing them from continuing their pumping operations in the Sanctuary Springs area.

Since the decision was issued in November 2003, government intervention has temporarily withdrawn the injunction and pumping has been allowed to continue until an upcoming appeal is heard. Although one can appreciate the government's desire to benefit the local economy, this decision is clearly compromising the local environment.[77]

g) Great Lakes Water Levels

The water budget for Lake Michigan indicates that ground water contributes 34% of inflow to the lake.[78] Hydrologists are now beginning to understand the important

[75] *Supra* note 72 at 34.
[76] Michigan Environmental Protection Act, M.C.L. §324.1701 is Part 17 of Natural Resources and Environmental Protection Act M.C.L. §324.101.
[77] It should be noted that there are other locations that Nestlé could pump without causing such substantial environmental harm Nestlé chose Sanctuary Springs because regulations of the U.S. Food and Drug Administration will only allow bottled water to be called spring water when it has come from an actual spring or from a well that takes water that would feed the spring. There are deep confined aquifers within the area that could be pumped with little impact on the environment or other users. However, the water removed from these aquifers would then have to be called "artesian" water, which is not as marketable as "spring" water.
[78] See Appendix I.

contribution that ground water makes to the overall water budget of the Great Lakes.[79] The large-scale withdrawal of ground water could therefore have serious effects on lake levels. For example, pumping in the Toledo/Ohio metropolitan area has lowered water levels in wells located near Lake Erie as much as 35 feet below the average level of Lake Erie. As a result, water from Lake Erie has been induced into the ground water system and the wells have intercepted water that would otherwise have discharged from the ground water system into Lake Erie. Effects such as these, in combination with climate change, could have numerous negative impacts for the region. Such impacts might include increased dredging costs, the need to redesign locks and ports, a loss in hydroelectric power production, less attractive views, and environmental damage to the rich coastal wetlands.[80]

## 3. The Compounding Effects of Climate Change

The impacts of ground water pumping will be compounded if scientists' predictions for climate change for the Basin are accurate. A recent bi-national study has compiled climate change data from a range of scientific sources. This data indicates that although total annual precipitation and snowfall has increased in most regions of Canada, the Basin has actually suffered a decline in annual precipitation and spring snowfall and this decline is predicted to continue.[81] Furthermore, studies in Kenora, Ontario, have shown that air temperature has increased in western Ontario and climate change scenarios suggest higher air temperatures for the entire Great Lakes region. Associated with higher air temperatures are increases in evaporation and evapotranspiration.[82] Clearly, a

[79] *Supra* note 2. See also *supra* note 24.
[80] *Supra* note 1.
[81] Mortsch et al., "Climate Change Impacts on the Hydrology of the Great Lakes-St. Lawrence System" (2002) 25:2 Canadian Water Resources Journal 153 at 160.
[82] *Ibid.* at 164.

decrease in precipitation and an increase in evaporation and evapotranspiration could have significant impacts on the water budget of the Basin, reducing both lake levels and stream flow and increasing the possibility of conflict:

> Most institutional arrangements for water resources management in the Great Lakes have focused on managing for an overabundance of supply. Climate change scenarios suggest that with declines in lake levels of 20cm to 2 m and annual runoff decreases of up to 50%, the paradigm may have to switch to managing under conditions of water scarcity (Mortsch and Quinn, 1996). ...
>
> If the significant declines in runoff and lake levels suggested by climate change scenarios are realized, there could be serious supply-demand mismatches and water allocation issues. Competition between water uses (eg. consumptive and non-consumptive), upstream and downstream users, rural and urban areas as well as interjurisdictional water concerns would increase.[83]

## C) The Growth of Ground Water Pumping

The negative impacts of ground water pumping in the Basin have only materialized in the last century, but they have been growing in size and frequency in recent times. This section explains the reasons for this growth and why these impacts will worsen unless governments take some positive steps to restrict the unrestrained exploitation of ground water resources.

[83] *Ibid.* at 173-174.

## 1. Technological Innovation

It was the dual inventions of the centrifugal pump and the internal combustion engine that paved the way for large-scale withdrawals of ground water. These two inventions came into existence at the turn of the previous century. Prior to their invention, ground water users, who were mostly farmers at that time, relied on hand pumps and windmills. Robert Glennon describes the impact of these inventions:

> The basic principle of the centrifugal pump can be illustrated by swinging a pail of water around in a circle at the end of a rope. If we made a small hole in the bottom of the pail, water would discharge through the hole at high speed. An airtight cover placed over the top of the pail creates a partial vacuum inside the pail as water is discharged through the hole. If we replace the rope with an intake pipe, the vacuum causes additional water to flow into the pail, replacing the water that flowed out the hole in the bottom. Centrifugal pumps greatly increased the capacity for pumping large quantities of water, but ranchers and farmers needed to find a source of power to drive the pumps. They experimented with steam power but found that it required constant oversight and maintenance. However, in the twentieth century, as Henry Ford prepared to market his Model T, modifications to the internal combustion engine allowed for its use as a power source to pump ground water.[84]

## 2. Population Growth

European settlers found their way to the Great Lakes in the early 17th century but it was not until the industrial revolution that this region saw real growth and development. Until this point, the Basin had been a battleground and it was only after the war of 1812 between the British and the Americans that territorial battles gave way to settlement, city-building, and industrial development.

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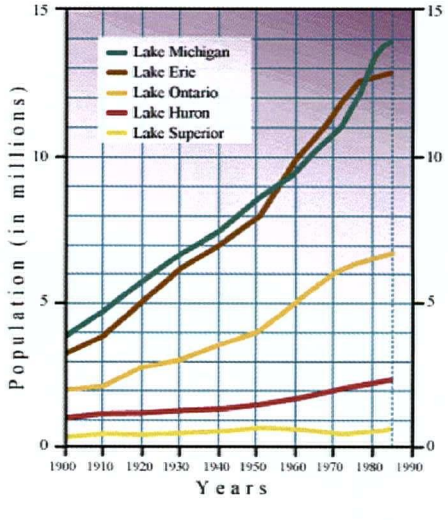
[84] Robert Glennon, *Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters* (Washington: Island Press 2002) at 25.

It was agriculture, and particularly the fertile soils of the southern part of the Basin, that drew the immigrant settlers to the area and in a short period of time much of the alluvial land that could support agricultural production was settled.

Industrialization followed in the footsteps of the agrarian revolution and was fueled by the vast quantities of water available for use in production and, most crucially, in transportation. The lakes were ideal for transporting iron ore, coal, and limestone from mines to steel factories and also for transporting agricultural production, especially grain, to larger markets. Large-scale logging and pulp and paper industries also developed on the lakes, as did commercial fisheries and a thriving recreational industry. Urbanization accompanied industrialization and the largest settlements developed on the major waterways. This enabled the transportation of goods and people and also offered a seemingly endless supply of freshwater for domestic and industrial use.

**Figure 14: Population Growth 1900-1990 in the Great Lakes Basin.**




Source: *The Great Lakes, An Environmental Atlas and Resource Book*, 3rd ed. (United States Environmental Agency and Government of Canada, 1995).

Today, more than 33 million people live in the Basin and with the development of metropolitan areas like Toronto, Chicago, Detroit and Cleveland, the Basin has become one of the world's foremost commercial and industrial areas (see Figure 5). As can be seen from Figure 14, which charts the population increase for each of the Great Lakes' watersheds from the turn of the last century to 1990, this growth has been rapid, particularly on Lakes Michigan, Erie, and Ontario. Further, the major metropolitan

areas have seen significant growth in the last decade. The population of the metropolitan area of Toronto grew by 9.8% between 1996 and 2001[85] as compared to a 4% increase in Canada generally. The metropolitan area of Chicago-Gary-Kenosha experienced an 11% population growth between 1990 and 2000, while the metropolitan area of Detroit-Ann Arbor-Flint grew by 5.2%. While these increases were less than the American average of 13.2%, they still represent a significant growth in an already highly developed region.[86] According to a recent report published by the International Joint Commission, the Great Lakes region can expect even more growth over the next twenty years:

> Population in these major centres is expected to increase steadily over the next 20 years. In Chicago, that growth is estimated at 7 percent between 2000 and 2010, slowing to 4 percent between 2010 and 2020; in Toronto, population is expected to increase by 16 percent between 2000 and 2011, with a further 10 percent between 2011 and 2021. Overall, GHK estimates that a further 3.3 million people will be added to the six case study cities by 2020.[87]

It is not just the large metropolitan areas that have seen significant growth. Smaller cities in the Basin have encouraged population growth through the creation of new residential subdivisions, edge-of-town shopping malls, and industrial parks. Growth has been particularly rapid on the Canadian side of the border.

Currently, 9.2 million Canadians (one-third of Canada's population) live in the Basin. Six of the nation's fastest growing municipalities between 1996 and 2001 were in the area

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[85] Statistics Canada, online: Statistics Canada <http://www.statcan.ca>.
[86] Chicago-Gary-Kenosha is the third most populous metropolitan area in the United States behind New York and Los Angeles and Detroit-Ann Arbor-Flint is the eighth most populous. See Marci J. Perry & Paul J. Mackun, "Population Change and Distribution, 1990-2000: Census Brief" (April 2001) online: U.S. Census Bureau <http://www.census.gov/prod/2001pubs/c2kbr01-2.pdf>.
[87] International Joint Commission, "Priorities 2001-2003: Priorities and Progress under the Great Lakes Water Quality Agreement" (September 2003) at 78.

known as the extended Golden Horseshoe. The extended Golden Horseshoe envelopes the western end of Lake Ontario and contains the urban centres of Oshawa, Toronto, Hamilton, St.Catherines, Kitchener, Guelph, and Barrie. This region accounted for 22% of the nation's population in 2001. The municipalities of Vaughan, Markham, Richmond Hill, Brampton and Barrie all experienced population growth in excess of 20% between 1996 and 2001. Much of the growth in these municipalities is attributed to immigration.[88]

To date, population growth has not been a major concern for politicians or planners in the Basin. In fact, most cities in the Basin are encouraging growth and this is particularly true of the American Basin states. These states are concerned that their growth is lagging behind the growth experienced in the southern United States. However, politicians and city planners in this area need to be aware of the pressure that population growth is placing on the ground water resources in the Basin. This is particularly important when one considers that the United States and Canada are the two nations with the highest per capita water consumption rates in the world.

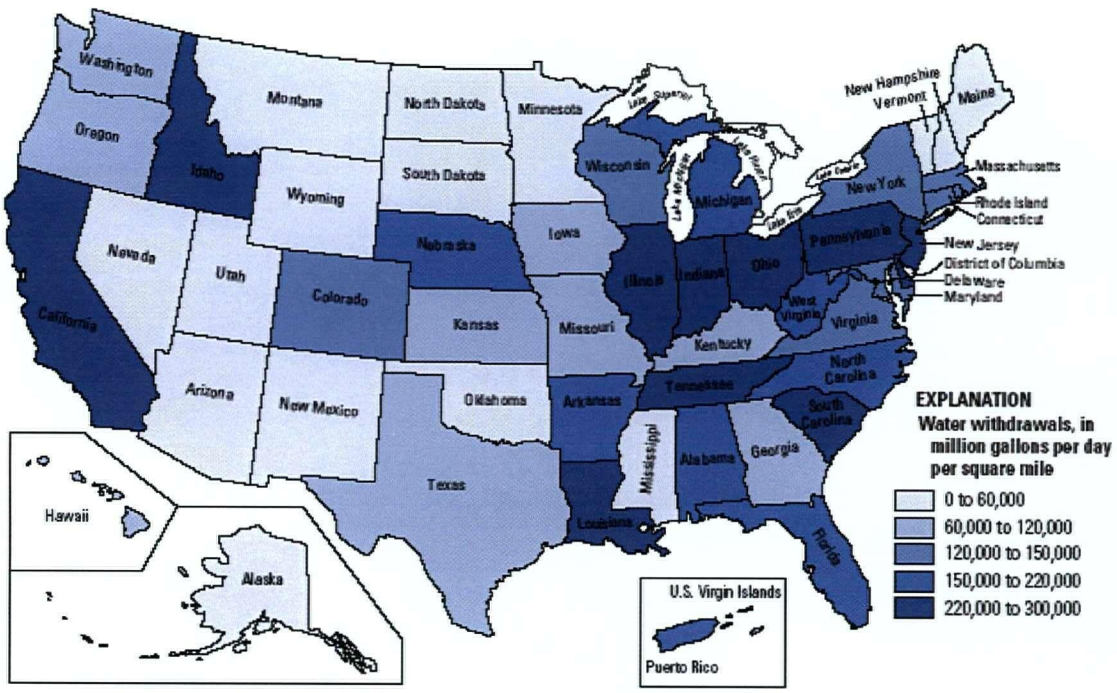
### 3. Water Use per Capita

Canada and the United States are the highest users of fresh water per capita in the world. Canada abstracted 1600 $m^3$ per capita between 1980 and 1999, while the United States abstracted 1870 $m^3$ per capita. To place this in perspective, Canada and the United States are using roughly three times the quantity of water per capita than the European average and about eight times as much as the United Kingdom.[89] Figure 15

[88] Statistics Canada, "A Profile of the Canadian Population: where we live" (March 2002) online: Statistics Canada <http://geodepot.statcan.ca/Diss/Highlights/Text_e.pdf>.
[89] OECD Environmental Data: Inland Waters (2002) at 8, online: OECD <http://www.oecd.org/dataoecd/8/19/2958157.pdf>.

shows the intensity of water withdrawals in the United States, measured in million gallons per day per square mile. With the exception of California and Idaho, the most intense water users are the eastern states, with the band of Great Lakes states withdrawing water at a higher rate than most of the rest of the country.

**Figure 15: Intensity of Freshwater Withdrawals in the United States**




Hutson et al., "Estimated Use of Water in the United States in 2000" (2004) U.S. Geological Survey Circular 1268

Water use trends in the United States also indicate that the amount of ground water being withdrawn has increased significantly. Whereas total fresh surface water withdrawals have decreased within the last five years, fresh ground water withdrawals have increased by nearly 10%,[90] suggesting a shift in the source of water extraction. Unfortunately, the recent water use data published by the USGS does not indicate the

[90] Hutson et al., "Estimated Use of Water in the United States in 2000" (2004) U.S. Geological Survey Circular 1268 at 40.

total amount of water withdrawn from the Basin for 2000. However, between 1990 and 1995 the total amount of surface withdrawals in the Basin decreased by 100 mgal/d (million gallons per day), a decrease of less than 1%, while ground water withdrawals increased by nearly 300 mgal/d, an increase of nearly 25%.[91] This would suggest that the Great Lakes region is more than matching the American national trend.

Ground water use has also been increasing in Canada. Between 1980 and 1990, ground water abstractions increased by 20%.[92]

## 4. Water Pricing

Related to the quantity of water use is the price of water. Water is extremely cheap in both Canada and the United States and this encourages wastefulness and overuse. Canadian households pay the lowest water prices of all OECD countries, while the United States is also in a low bracket.[93]

## 5. Agricultural Development

Water use for agriculture in the Great Lakes region has been increasing at a "staggering" rate, according to a report by the Institute of Agriculture and Trade Policy, with irrigated land increasing 25 fold in the period from 1949-1997.[94]

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[91] Solley et al., "Estimated Use of Water in the United States in 1990" (1993) USGS National Circular 1081, Solley et al., "Estimated Use of Water in the United States in 1995" (1998) U.S. Geological Survey Circular 1200.
[92] *Supra* note 90 at 8.
[93] OECD, *The Price of Water: Trends in OECD Countries* (1999d) at 79.
[94] Jennifer Kramer Glynn, "Impacts of Agriculture on Water Quantity in the Great Lakes - St. Lawrence Basin: Executive Summary" (2002) at 5, online: Institute for Agriculture and Trade Policy. <http://www.iatp.org/enviroag/publications.cfm>.

Furthermore, projections suggest significant increases, particularly in Canada by 2020.[95] While some of the water used for irrigation can be expected to return to the ground water system through infiltration, current irrigation practices in the Basin allow for much of the water (about 80%) to be lost to the system through evapotranspiration.[96] At this rate of efficiency, significant increases in irrigated land could prove disastrous for ground water levels. This threat has been recognized by the Institute for Agriculture and Trade Policy:

> As irrigation in the region continues to grow, reservoirs and groundwater levels will be reduced, leading to an increasing pressure on groundwater aquifers and potential conflicts with other water uses. Already there have been several instances of residential wells going dry during high withdrawal periods for municipal, industrial, and irrigation uses in Michigan.[97]

## 6. Land Use Changes

Land use changes that impact on ground water include the drainage of wetlands for agricultural and urban development, the removal of vegetation, the paving of land with impervious surfaces for road-building, and the use of storm water drains to take rainwater directly to rivers and streams.

The drainage of wetlands reduces the amount of seepage into the ground water system and increases surface run off. The USGS estimates that more than 50% of wetlands in

[95] *Supra* note 31 at 9.
[96] *Ibid.* at 7.
[97] *Supra* note 95.

the United States and up to 95% of wetlands in certain states have been destroyed, modified or converted to other uses since Europeans first settled in the basin.[98]

Recharge rates are highest in areas that receive a lot of precipitation and where the geology is most permeable. These conditions encourage efficient infiltration into the ground water system. Planners and developers who pave over these areas with impervious materials can seriously reduce the storage capabilities of an aquifer and accelerate the drawdown experienced following ground water pumping. Currently, only 7% of the Basin is classified as urban[99] but the USGS has recognized the threat that urbanization poses to the ground water system and the integrity of the basin as a whole:

> Because urban areas are rapidly expanding, however, it is important to continue to monitor the effects of urbanization on ground-water recharge rates. Other activities associated with urban expansion, such as increased ground-water pumping, along with reduced recharge rates may increase the drawdown of water levels caused by pumping.[100]

In Ontario, there was considerable concern that development in the northern Toronto area would encroach on a vital recharge area, known as the Oak Ridges Moraine. The Oak Ridges Moraine is one of Canada's largest moraines. It extends160 kilometres from the Niagara Escarpment in the east to the Trent River System in the west and it is an imposing presence, standing 150 metres tall in an otherwise flat landscape. As well as supporting its own unique environment, the moraine is also critical to the hydrology of the surrounding area. A coalition of 25 citizens' groups known as STORM (Save The Oak

[98] *Supra* note 2 at 11.
[99] *Ibid.* at 6.
[100] *Ibid.* at p.6.

Ridges Moraine) has highlighted the importance of the moraine to the local ground water system:

> It has been described as southern Ontario's rain barrel - its permeable sands and gravels absorb and collect precipitation, which slowly recharge the deep aquifers below the ground.
>
> These sand and gravel aquifers store, filter and release this groundwater to over 65 watercourses flowing north and south into Georgian Bay, Lakes Simcoe, Scugog, Rice and Ontario. At the same time, unprecedented human exploitation of this groundwater places the Moraine in a precarious ecological position.[101]

For a time, the coalition's fight against urban development on the moraine appeared to be in vain as both municipal and provincial governments continued to approve applications for residential subdivisions, parking lots, and road construction. These land uses began to infringe upon the moraine. STORM describes the dual effects of such land use changes:

> Water-taking, associated with these new land uses, further exacerbates the pressure on the resource. Not only is precipitation blocked from entering the ground but more water is being removed. Municipal water supplies, golf courses and commercial water-bottling companies have, by necessity, began to 'go deeper' into the Moraine to find adequate quantities of drinkable and usable water.[102]

After relentless campaigning, STORM successfully persuaded the provincial government to enact formal legislation protecting the moraine. The Oak Ridges Moraine Conservation Act was passed in December 2001 creating a comprehensive plan that

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[101] Debbe Crandall, "The Morain", online: <http://www.stormco.org/aspx/themoraine.aspx>.
[102] *Ibid.*

protects all aspects of the moraine's ecosystem including its ground water features and functions.

### 7. Climate Change

As indicated previously, climate change has the potential to significantly affect the quantity of water entering the ground water system thereby exacerbating the effects and impacts of ground water pumping. Scientists predict that climate change will produce a decline in annual precipitation and spring snowfall, while evaporation and evapotranspiration rates are expected to increase.[103]

## D) Summary

The importance of ground water in the Basin has been ignored (and if not ignored, certainly underestimated) by those living in the Basin and by their governing institutions. This chapter has demonstrated the reasons that Basin ground water is of great importance to both the human and natural worlds and has also indicated the far-reaching consequences ground water pumping can have at both local and regional scales.

In this context, it is useful to draw an important distinction. Technically, the term "consumptive use" refers to any situation where water is not returned to the source from where it was withdrawn. However, in the Basin, the term is usually only used to describe

[103] *Supra* note 82.

the situation that occurs when surface or ground water is lost to the entire Basin, the focus generally being on the impact of consumption on the levels of the Great Lakes.[104] Consumption in this sense can occur through evaporation, incorporation into manufactured products and crops, bottled water, or when water is diverted out of the Basin.

However, the term is rarely used to describe the situation where water is lost at a local scale, such as the sub-watershed or aquifer scale. When ground water is withdrawn from an aquifer it may take years for that water to return, if it returns at all. Many users who abstract ground water do not go to the trouble of ensuring that their wastewater is returned to the recharge area of the aquifer.[105] For example, a municipality will often remove water from an aquifer but discharge its wastewater into a river. This water has essentially been consumed because it is no longer available for human and environmental uses of that aquifer. Irrigation is often responsible for local scale conflicts. Much of the water used in irrigation is lost to that aquifer and the entire Basin through evaporation. Depending on the system's efficiency some water will also seep back into the earth.[106] However, if the ground water has been removed from a confined or a deep unconfined aquifer it may take years for that water to replenish the aquifer. Meanwhile, other users are forced to increase their rate of pumping or deepen their wells. This water has been temporarily consumed.

Therefore, a closer examination of the term "consumption" reveals that it can be applied to a multiplicity of situations and to simplify its use to a regional scale has potentially

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[104] *Supra* note 1.

[105] Ground water can be returned directly to the aquifer through well injection but this is not common practice for most ground water users.

[106] Efficient irrigation systems will deliver water straight to the roots of the plants and will attempt to minimize water loss to the ground water system.

dangerous ramifications. For these reasons, and to avoid confusion, the writer prefers to use the term "withdrawals." When reading the remaining chapters, the reader simply has to remember one thing when they see this term. Any withdrawal will have effects on an aquifer, no matter how small. The only question that needs to be asked is whether, in the circumstances and considering the importance of the use, the impacts produced by those effects are acceptable. As the growth of ground water pumping accelerates, it is becoming evident that more and more communities within the Basin are determining the answer to this question to be "no".

The following chapter considers how courts and governments are utilizing the legal system to respond to the needs of their communities and whether there are mechanisms in place that can prevent and resolve potential local, regional, and international scale disputes.

# Chapter 3

## The Allocation of Ground Water Rights in the Great Lakes Basin

Laws that allocate ground water rights can play an important role in controlling the quantity of ground water withdrawn from an aquifer. Unfortunately, the rights to withdraw ground water from the Great Lakes Basin are currently allocated by a complex and disjointed legal and institutional system. Allocation responsibility rests predominantly at the state and provincial level and each separate jurisdiction has adopted its own specific legal and institutional approach. These approaches have generally been formulated according to an underlying ideology of abundance and a desire to stimulate economic growth.

International legal developments have stimulated domestic legal reform in fields such as human rights, ozone depletion, and climate change. However, the predominant international water law instrument in the Basin, the Boundary Waters Treaty, was drafted prior to an adequate understanding of basin hydrology and is silent with respect to ground water. The treaty, in its current form, is unlikely to inspire changes at a domestic level and is poorly suited to the prevention or resolution of transnational disputes over shared ground water resources. If a formal dispute over ground water does arise, the parties may choose to rely on customary international ground water law, which is still in its infancy. Recent developments have indicated some progress towards a more accurate reflection of hydrological reality but unfortunately, the needs of development continue to be favoured over environmental needs.

## A) The International Legal Regime

The management of ground water resources is complicated by the fact that the Basin is bisected by an international boundary. As is stated in Chapter 2, it is quite foreseeable that large-scale ground water withdrawals on one side of the boundary could impact ground water levels and flow, surface water levels and flow, and water dependent environments on the other side. To prevent and resolve disputes over their shared *surface water* resources, Canada and the United States have relied on international law. This section considers the application of international law to *ground water* resources in the Basin.

The two most important sources of international law are international conventions and international customary law.[1] International conventions (or "treaties") generally provide a clearer statement of international law because they represent a specific and voluntary agreement between two or more states, whereas customary law is the less cogent representation of general state practice.[2] Frequently then, international conventions garner greater practical significance because they are easier to implement. This is the case with respect to international waters shared by Canada and the United States.

[1] In this section the use of the term "states" refers to countries, not the states of the United States.
[2] Article 38, Statute of the International Court of Justice.

## 1. The Boundary Waters Treaty[3]

Following a number of disputes over transboundary waters, the United States and Canada signed and ratified the Boundary Waters Treaty ("the Treaty") in 1909.[4] The Treaty is the primary statement of international law concerning the surface water resources that are shared by Canada and the United States. The purpose of the Treaty is:

> To prevent disputes regarding the use of boundary waters and to settle all questions which are now pending between the United States and the Dominion of Canada involving the rights, obligations, or interests of either in relation to the other or to the inhabitants of the other, along their common frontier, and to make provision for the adjustment and settlement of all such questions as may hereafter arise.[5]

However, the Treaty does not refer to ground water and this omission has been described as "problematic."[6] The reason for this is that if ground water withdrawals continue to increase in the Basin, the potential transnational impacts, particularly when combined with climate change and possible diversions, could be significant. Without an express statement including ground water in the Treaty, the considerable uncertainty that surrounds the applicable legal regime will undermine the ability of the two states to address these impacts.

The omission of ground water is not surprising considering the treaty was drafted nearly a century ago when the scientific knowledge of ground water was extremely limited.

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[3] *Treaty relating to Boundary Waters and Questions Arising between the United States and Canada*, United States and United Kingdom, 11 January 1909, 36 U.S. Stat. 2448, U.K.T.S. 1910 No. 23.
[4] See Robert E. Beck, ed., *Waters and Water Rights* (Virginia: The Michie Company 1991) Vol.5 at 45-57.
[5] *Supra*, note 3.
[6] Owen Saunders, "Law and the Management of the Great Lakes Basin" (2000) 25:2 Canadian Water Resources Journal 209 at 210.

Despite this omission, an argument can be made that the application of the Treaty to ground waters can be inferred. Ground waters are not expressly excluded from the Treaty and there is support for this inference from the actions of the International Joint Commission ("IJC"), an independent body established by the Treaty.[7] The IJC has already been given a mandate by the Canadian and U.S. governments to investigate certain ground water issues in relation to specific references under Article IX of the Treaty.[8] The IJC has also stated that it can consider impacts on ground water flows when deciding whether to approve a project under Articles III, IV and VIII of the Treaty.[9] If ground waters are an inferred subject of the Treaty, it is important to look at how the Treaty applies.

### a) Boundary Ground Waters

Boundary waters are defined in the preliminary article of the Treaty as:

> [T]he waters from main shore to main shore of the lakes and rivers and connecting waterways, or the portions thereof, *along which the international boundary between the United States and the Dominion of Canada passes*, including all bays, arms, and inlets thereof, but *not including tributary waters* which in their natural channels would flow into such lakes, rivers, and waterways, or waters flowing from such lakes, rivers, and waterways, or the *waters of rivers flowing across the boundary*. [Emphasis added][10]

[7] The IJC consists of six commissioners. Three are appointed by the President of the United States, with the advice and approval of the Senate, and three are appointed by the Governor in Council of Canada, on the advice of the Prime Minister. Under Article XII (*supra* note 3) each commissioner is required to subscribe a solemn declaration in writing that he/she act impartially in the performance of his/her duties.
[8] The Cabin Creek coal mine reference (International Joint Commission, 1988), Water Use reference (International Joint Commission, 1999).
[9] International Joint Commission, "Protection of the Waters of the Great Lakes: Review of the Recommendations in the February 2000 Report" (August 2004) at 17.
[10] Preliminary Article, *supra* note 3.

Therefore, the definition of boundary waters under the Treaty only includes waters straddling the boundary. This definition excludes all tributary surface waters, all transboundary surface waters which flow from upstream to downstream across the boundary (rather than along the boundary), and it would also appear to exclude Lake Michigan.[11]

Under Article VIII, Canada and the United States possess "equal and similar rights"[12] with respect to waters defined as boundary waters. The Treaty protects these waters from unequal treatment by requiring either country planning to divert, obstruct or use these waters in a manner that will affect the flow or level of boundary waters, to obtain the approval of the IJC. This is commonly referred to as the IJC's quasi-judicial power and it is granted under Article III:

> [N]o further or other uses or obstructions or diversions, whether temporary or permanent, of boundary waters on either side of the line, affecting the natural level or flow of boundary waters on the other side of the line shall be made except by authority of the United States or the Dominion of Canada within ... and with the approval, as hereinafter provided, of a joint commission, to be known as the an International Joint Commission.[13]

Article III goes on to state that ordinary uses for sanitary or domestic purposes do not require IJC approval.[14]

Extending the definition of boundary waters to ground water would mean that Canada and the United States would have equal and similar rights to aquifers that straddle the

[11] It is not clear from the treaty whether Lake Michigan is considered part of the boundary waters. The boundary does not pass through it but it may be considered part of the same hydrological unit as Lake Huron.
[12] Article VIII, *supra* note 3.
[13] Article III, *supra* note 3.
[14] *Ibid.*

boundary ("boundary aquifers") and underlie the boundary surface waters. Canada and the United States would be obliged to seek IJC approval when planning a project to abstract water from a boundary aquifer that would affect the flow or water level of the boundary aquifer in the other state, or affect the flow or water level of boundary surface waters.

Article VIII sets out the water use priorities that the IJC is required to follow when deciding whether or not to approve an application:

> The following order of precedence shall be observed among the various uses enumerated hereinafter for these waters, and no use shall be permitted which tends materially to conflict with or restrain any other use which is given preference over it in this order of precedence:
>
> 1. Uses for domestic and sanitary purposes;
> 2. Uses for navigation, including the service of canals for the purposes of navigation;
> 3. Uses for power and for irrigation purposes.
>
> The foregoing provisions shall not apply to or disturb any existing uses of boundary waters on either side of the boundary. [15]

The order of precedence reflects the issues of concern in 1909 and fails to account for some contemporary issues, particularly those relating to environmental uses of boundary waters such as instream flow for aquatic habitats or the Great Lakes coastal wetlands. It should be noted that although environmental uses are not explicitly listed as a water use priority, the IJC has stated that it does consider environmental impacts such as impacts to ground water flows.[16]

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[15] Article VIII, *supra* note 3.
[16] *Supra* note 9.

### b) Tributary or Transboundary Ground Waters

Under Article II of the Treaty, all waters other than boundary waters are under the "exclusive jurisdiction and control" of the country in which they lie.

> Each of the High Contracting Parties reserves to itself or to the several State Governments on the one side and the Dominion or Provincial Governments on the other as the case may be, subject to any treaty provisions now existing with respect thereto, the *exclusive jurisdiction and control over the use and diversion*... of all waters on its own side of the line which in their natural channels would flow across the boundary or into boundary waters;...[Emphasis Added][17]

If Article II were extended to ground waters, neither Canada nor the United States would require IJC approval prior to implementing projects that utilize tributary or transboundary ground waters within their own territories.[18]

By applying different legal principles to boundary and non-boundary waters, the Treaty disregards hydrological reality. The Great Lakes Basin is a single hydrological unit and boundary waters receive a considerable amount of water from tributary streams, rivers, and direct and indirect ground water discharge. To illustrate this, it is estimated that indirect ground water discharge (discharge into tributary rivers and lakes) contributes 42% of the total Basin water supply to Lake Ontario.[19] In southeastern Wisconsin, ground water pumping from shallow aquifers in four counties that border Lake Michigan reduced indirect ground water discharge from these counties into Lake Michigan by 8.5%

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[17] Article II, *supra* note 3.

[18] In the context of the Treaty, tributary ground waters could be understood as ground waters that either flow directly into boundary surface waters but which are not a component of a boundary aquifer, or where ground waters flow into a river or a lake that then flows into boundary waters. Transboundary ground waters could be understood as describing the situation where ground water flows from upstream to downstream across the boundary like a transboundary river and like a transboundary river it does not straddle the boundary.

[19] D. J. Holtschag and J. R. Nicholas, "Indirect Ground-Water Discharge to the Great Lakes" (1998) USGS Open-File Report 98-579 at 1.

between 1964 and 2000.[20] In its recent report to the governments of Canada and the United States, the IJC made it clear that the Treaty does not accurately reflect these hydrological interconnections:

> Groundwater's contribution to stream flow is significant as, among other things, it ultimately affects lake levels...
>
> In the Great Lakes Basin, the groundwater system is recharged mainly by infiltration and percolation of precipitation. Withdrawal of groundwater at rates greater than the recharge rate causes water levels in aquifers to decline. If the amount of decline is sufficient, water may be drawn from streams or lakes into the groundwater system, thus reducing the amount of water discharging to the Great Lakes. This is indicative of the inextricable link between ground and surface waters.[21]

As well as being hydrologically inaccurate, the position put forth in Article II is no longer tenable according to international customary law. It is based on a doctrine known as the "Harmon doctrine." The Harmon doctrine was formulated during a dispute between the United States and Mexico in 1895 and is named after a legal opinion submitted by the U.S. Attorney General, Judson Harmon. Its basic premise is that states should have "complete freedom of action with regard to the portion of an international watercourse that is situated within its territory, irrespective of any harmful consequences that may ensue for other riparian states."[22] This doctrine has since been discredited in international state practice (discussed below). In the Boundary Waters Treaty, the prevalence of the Harmon doctrine is somewhat tempered by the provision for legal recompense under the other state's domestic law:

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[20] The writer acknowledges that Lake Michigan may not be considered boundary waters but it is an excellent example of the effects of ground water pumping on tributary flow into the Great Lakes.
[21] Norman G. Grannemann et al., "The Importance of Ground Water in the Great Lakes" (2000) USGS Water Resources Investigations at 7.
[22] Stephen C. McCaffrey, *The Law of International Watercourses, Non-Navigational Uses* (New York: Oxford University Press, 2001) at 77 [McCaffrey, *The Law of International Watercourses*].

> [I]t is agreed that any interference with or diversion from their natural channel of such waters on either side of the boundary, resulting in any injury on the other side of the boundary, shall give rise to the same rights and *entitle the injured parties to the same legal remedies as if such injury took place in the country where such diversion or interference occurs*;...[Emphasis added][23]

However, this modification has limited practical significance, as it only takes effect once an injury has occurred. It is particularly ill-suited to dealing with transnational ground water issues because the injury often takes years to emerge, is generally difficult to prove, and is usually irreversible. In addition, the legal claim may also be subject to sovereign immunity and therefore unenforceable.[24]

### c) Ground Water References

Article IX establishes the investigative and advisory powers of the IJC:

> [A]ny other questions or matters of difference arising between them involving the rights, obligations, or interests of either in relation to the other or to the inhabitants of the other, along the common frontier between the United States and the Dominion of Canada, shall be referred from time to time to the International Joint Commission for examination and report, whenever either the Government of the United States or the Government of the Dominion of Canada shall request that such questions or matters of difference be so referred. ...[25]

This Article establishes the investigative and advisory powers of the IJC. Under this Article either country can submit references to the IJC in order to prevent or resolve disputes. The IJC is then required to investigate the particular question or matters of

[23] Article II, *supra* note 3.
[24] *Supra* note 4 at 58.
[25] Article IX *supra* note 3.

difference and deliver a report of its findings to both federal governments. However, its recommendations are not binding.[26]

> Such reports of the Commission shall not be regarded as decisions of the questions or matters so submitted either on the facts or the law, and shall in no way have the character of an arbitral award.[27]

In a recent reference the IJC was asked to consider the potential effects of water uses on shared aquifers in the Great Lakes Basin.[28] The IJC's recommendations only went so far as to urge the governments to undertake extensive ground water mapping and research.[29] It did not make any recommendations with respect to the current laws and policies as they relate to ground water. It is possible that a long term reference, such as was given to the IJC under the Great Lakes Water Quality Agreement, could provide the IJC with greater influence with respect to transboundary ground water law. This is considered in Chapter 5.[30]

## 2. Customary International Ground Water Law

If ground waters are not implicit in the Treaty, customary international law will govern any disputes that arise concerning transboundary effects caused by ground water pumping. Customary international law is often more dynamic than treaty law and it plays an important role filling in the gaps of out-dated treaties.

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[26] The IJC may be used by Canada and the United States as a binding arbitrator under Article X. This power, the strongest given to the IJC, has never been used.
[27] *Article IX, supra* note 3.
[28] Water Use reference (International Joint Commission, 1999).
[29] See Appendix II.
[30] See Chapter 5 at 206.

> [S]tates sharing an international river or drainage basin may be confronted with problems which are beyond the reach of existing agreements among them. Most international "river treaties" have tended, and will probably tend, to deal only with certain water use or management issues. As the utilization of the waters of international rivers or drainage basins increases in quantity and complexity, however, the rules agreed to in the "river treaties" in force may become inadequate or simply insufficient. In the absence of treaty coverage on such matters, recourse must be made to the unwritten rules, if any exist, governing the development, conservation, and use of shared rivers and drainage basins.[31]

### a) What is Customary International Law?

Customary international law is an amorphous concept that is more complex and uncertain than formal agreements such as treaties. A required element is *opinio juris*, which means states must believe that a certain practice is obligatory as a matter of law.[32] Other elements that require examination include whether a practice is widespread amongst a number of states, the length of time a practice has been followed, and the uniformity of that practice from country to country.[33]

Evidence of customary law comes from the process of claims and counterclaims between countries, the decisions by international courts or international arbitrators, and can also be derived from a widespread pattern of treaties or other international agreements.[34] Further, international law scholars suggest international treaties that have not been ratified and have yet to come into force may be considered customary law if

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[31] Dante A. Caponera, "The Role of Customary International Water Law" in Mohammed Ali et al. eds., *Water Resources Policy for Asia* (Rotterdam ; Boston : Balkema, 1987).
[32] *Asylum Case (Columbia v. Peru)* [1950] I.C.J. Rep. 266, the *Lotus Case (France v. Turkey)*(1927) P.C.I.J., Ser. A., No. 10, *North Sea Continental Shelf Cases (Federal Republic of Germany v. Denmark, Federal Republic of Germany v. Netherlands)* [1969] I.C.J. Rep. 3.
[33] *North Sea Continental Shelf Cases, ibid.*
[34] *Ibid.*

they are based on a codification of the law prepared by the International Law Commission (ILC).[35]

### b) State Practice and Codification

Although there is a rich body of state practice applicable to shared fresh surface water resources, there is a relative dearth of state practice applicable to shared ground water resources. Stephen McCaffrey, a leading international water law scholar, explains that this lack of state practice is a result of inadequate understanding with respect to the interconnections between ground water and surface water. He also suggests another reason is the association between ground water and a state's sovereign right to use its soil:

> State practice with respect to groundwater has lagged behind that concerning surface water. This appears to be the case in large part because states have until recently been largely unaware of the physical interrelationships to which I have referred. ...
>
> There is another important factor that bears upon international regulation of groundwater, and that is the notion of territorial sovereignty. Groundwater is, by definition, in the ground, and no one disputes that states are sovereign with respect to their soil. It may therefore be difficult for states to recognize that they are not absolutely

[35] Joseph W. Dellapenna, "The Evolving International Law of Transnational Aquifers" in Feitelson and Haddad eds., *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective* (Boston, Kluwer Academic, 2001) at 215-225, McCaffrey, *The Law of International Watercourses, supra* note 22, citing Judge ad hoc Sorensen (dissenting opinion) in the *North Sea Continental Shelf Cases*, ibid. at 244:

> [A] convention adopted as part of the combined process of codification and progressive development of international law may well constitute, or come to constitute the decisive evidence of generally accepted new rules of international law. ... The convention may serve as an authoritative guide for the practice of States faced with the relevant new legal problems, and its provisions thus become the nucleus around which a set of generally recognized legal rules may crystallise.

sovereign with respect to groundwater within their boarders, despite the fact that it is, in reality, shared in some way with other states.[36]

Although still in its infancy, state practice concerning ground water has matured to a certain extent in the last thirty years. Evidence of this state practice is derived less from state claims and counterclaims and the decisions of international courts,[37] than it is from international agreements, the work of non-governmental organizations, and perhaps must crucially the work of the ILC.

Examples of international agreements that consider the treatment of internationally shared ground water resources include the 1964 Treaty between Poland and the Soviet Union,[38] the 1968 African Convention on the Conservation of Nature and Natural Resources,[39] and the 1992 United Nations Economic Commission for Europe Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes.[40]

The lack of definitive state practice combined with the importance of transnational ground water resources led a number of organizations and groups of experts to prepare draft rules or agreements. These include the International Law Association (ILA) 1966 Helsinki Rules on the Uses of the Waters of International Rivers,[41] the 1986 ILA Seoul

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[36] Stephen McCaffrey, "International Groundwater Law: Evolution and Context" in Salman M.A. Salman ed., *Groundwater: Legal and Policy Perspectives* (Washington: The World Bank, 1999) World Bank Technical Paper No. 456, at p141 [McCaffrey, "International Groundwater Law"].

[37] Only two cases have examined international legal issues concerning shared ground water resources the *Donauversinkung Case*, (*Wurttemberg and Prussia v Baden*) German Staatsgerichstof, June 18, 1927, Annual Digest, years 1927-1928 (decided by the highest court of Germany) and the *Gabcikovo-Nagymaros Case* (*Hungary v. Slovakia*) 1997 I.C.J. 7 (the only ground water case decided in the International Court of Justice).

[38] *Treaty between Poland and the Soviet Union*, 1964, 552 UNTS 175, art. 2, para. 3.

[39] *African Convention on the Conservation of Nature and Natural Resources*, Algiers, 15 September 1968, art. 5, para. 2, Africa Treaties, Treaty No.1.

[40] *ECE Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes*, Helsinki, 17 March 1992, 31 ILM 1312 (1992).

[41] Report of 52nd Conf., Helsinki 1966.

Rule on International Groundwaters,[42] and the 1992 Bellagio Draft Treaty.[43] These draft instruments, which are not intended to be binding, have attempted to codify existing state practice and in some way develop and influence the status of ground water in customary international law.

The most recent effort to codify the law in this field was undertaken by the ILC. The international community has provided the United Nations General Assembly with the mandate to codify and progressively develop the rules and principles of international law, and the General Assembly has delegated this responsibility to the ILC under Article 13 of the United Nations Charter.[44] Pursuant to this mandate the ILC produced a set of draft articles on the law of the non-navigational uses of international watercourses.[45] These articles became the basis of negotiations in the United Nations and resulted in the adoption by the General Assembly of the 1997 UN Convention on the Non-Navigational Uses of International Watercourses ("the UN Convention").[46]

Although the UN Convention has yet to come into force and has not been signed or ratified by either Canada or the United States,[47] it is widely regarded by international water lawyers as the most authoritative statement of customary international law applying to both shared fresh surface water and ground water resources.[48]

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[42] Report of 62nd Conf., Seoul, 1986.
[43] Hayton and Utton, "Transboundary Ground waters: The Bellagio Draft Treaty" (1989) 29 Nat. Resources J. 663.
[44] UN Charter, art. 13(1), Statute of the International Law Commission, GA Res. 174(1), Nov. 21, 1947.
[45] Draft Articles on the Law of the Non-Navigational Uses of International Watercourses adopted by the ILC in 1994, [1994] Y.B. Int'l L. Comm'n Vol. 2, pt.2, p.89.
[46] *The Convention of the Law of the Non-Navigational Uses of International Watercourses*, 21 May 1997, UN Doc. A/RES/51/869, 21 May 1997, 36 ILM 700.
[47] To enter into force, the UN Convention needs to be ratified by 35 countries and this has yet to occur.
[48] The UN Convention is a strong authority on customary international water law for a number of reasons. First, it is based on the articles drafted by the ILC, an internationally recognized subsidiary body of the General Assembly responsible for the development and codification of international law. Second, international states were able to participate in the negotiations that led to the adoption of the Convention. Third, there was a significant majority vote that secured the adoption of the Convention (103 in favour, 27 abstained, only 3 voted against). Both Canada and the United States voted in favour. See McCaffrey, *The Law of International Watercourses*, *supra* note 22 at 315-317. See also Gabriel Eckstein & Yoram Eckstein, "A Hydrogeological Approach to Transboundary Ground Water Resources

### c) Definition of an International Watercourse

The first thing of note in the UN Convention is that the definition of international watercourse is much closer to hydrological reality than the definition of boundary waters in the Treaty. An international watercourse is defined as "a system of surface waters and *groundwaters* constituting by virtue of their physical relationship a unitary whole and normally flowing into a common terminus... parts of which are situated in different states."[49] [Emphasis Added]

This definition therefore supports the idea that a hydrological basin is a unitary whole and that ground water and surface water are interrelated. Under the designations of the Treaty, this definition would cover all boundary and tributary aquifers and would include transboundary aquifers that are connected to a transboundary surface water body. The one type of aquifer the UN Convention does not cover is the boundary or transboundary aquifer that has no relation to surface water.[50] However, the ILC has adopted the Resolution on Confined Transboundary Groundwater which "[c]ommends States to be guided by the principles contained in the draft articles...."[51] International water law scholars have therefore concluded that the customary international law principles that have applied to surface water are now equally applicable to ground water.[52] If this is the

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and International Law" (2003) 19 Amer. Univ. Int'l L.R. 201 at 229, and Joseph W. Dellapenna, "The Evolving International Law of Transnational Aquifers" in Feitelson and Haddad eds., *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective* (Boston, Kluwer Academic, 2001) 215-225.

[49] *Supra* note 46, Article 2,

[50] See Gabriel Eckstein & Yoram Eckstein, "A Hydrogeological Approach to Transboundary Ground Water Resources and International Law" (2003) 19 Amer. Univ. Int'l L.R. 201 at 235-248.

[51] International Law Commission, *Resolution on Confined Transboundary Groundwater* [1994] Y.B. Int'l. Comm'n, vol. 2, pt. 2, at 135.

[52] McCaffrey, *The Law of International Watercourses*, *supra* note 22 at 433. See also Gabriel Eckstein & Yoram Eckstein, "A Hydrogeological Approach to Transboundary Ground Water Resources and International Law" (2003) 19 Amer. Univ. Int'l L.R. 201 at 230, and Joseph W. Dellapenna, "The Evolving International Law of Transnational

case, the major principles of applicable customary law are "equitable and reasonable utilization," the "obligation to prevent significant harm," and the "duty to cooperate."

### d) Equitable and Reasonable Utilization

The prominence afforded to this principle in the UN Convention confirms that the doctrine of equitable utilization has become the guiding principle of international customary law with respect to shared water resources.[53] Stephen McCaffrey, a leading authority on the UN Convention, states that:

> Equitable utilization is the fundamental rule governing the use of international watercourses. It is much more than a rule, however. It is a dynamic process, which depends heavily upon active cooperation between states sharing freshwater resources.[54]

The principle of equitable utilization is a dynamic process because its interpretation depends on the particular circumstances of every case. The UN Convention assists in determining what is equitable by suggesting a list of relevant factors:

> (a) Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character;
> (b) The social and economic needs of the watercourse States concerned;
> (c) The population dependent on the watercourse in each watercourse State;
> (d) The effects of the use or uses of the watercourses in one watercourse State on other watercourse States;
> (e) Existing and potential uses of the watercourse;

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Aquifers" in Feitelson and Haddad eds., *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective* (Boston, Kluwer Academic, 2001) 215-225.

[53] McCaffrey, *The Law of International Watercourses*, *supra* note 22 at 325.

[54] *Ibid.* at 345. McCaffrey was a special rapporteur to the ILC while they were drafting the articles that formed the basis of the UN Convention.

(f) Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect;
(g) The availability of alternatives, of comparable value, to a particular planned or existing use.[55]

These factors are not prioritized and the list is not exhaustive; they are merely to be weighed off with each other (and with other factors that may be considered relevant) when determining what is equitable and reasonable in the circumstances. Consequently, the UN Convention does not establish concrete rules for the resolution of disputes over surface and ground water resources. Rather than being viewed as a substantive body of law, the UN Convention can be better viewed as encapsulating a process that encourages effective negotiation between states to prevent and resolve disputes.

It is important to note that equitable utilization is not the same as the obligation not to cause significant harm. Factors that may be used to justify significant harm to a neighbouring state (such as lowering ground water levels) include the social and economic needs of each particular state and the population dependent on the watercourse. If one state is less developed than the other state, it may be considered equitable for that state to cause harm to another state.[56] In the Great Lakes Basin, population is a factor that might be particularly relevant if customary international law were applied to ground waters. A much larger U.S. population is dependent upon the ground waters of the Basin and this factor could be the basis of an argument that transnational impacts of ground water pumping are equitable.

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[55] *Supra* note 46 at Article 6.
[56] This would be in accordance with general international environmental law principles that recognize the right of developing countries to pursue development. For instance, Principle 6 of the Rio Declaration states that "[t]he special situation and needs of developing countries, particularly the least developed and those most environmentally vulnerable,

### e) The Obligation to Prevent Significant Harm

The international legal requirement to prevent significant environmental harm to another state is a widely accepted principle of international environmental law[57] and has been incorporated as a substantive principle in the UN Convention.[58] However, in the field of international surface water law and in the UN Convention, the obligation to prevent significant harm has either been superseded by the equitable utilization principle or merely subsumed into the factors to be considered:

> [E]quitable utilization, not the prohibition of harm, has generally been considered the guiding principle in both domestic and international case law, which tend to treat harm as but one factor – albeit an important one – in the equitable utilization calculus.[59]

This statement would seem to be an accurate reflection of the development of international customary water law and is supported by the *Donauversinking* case[60] and the *Gabcikovo-Nagymaros* case,[61] two leading cases that applied this interpretation to disputes over international watercourses. The subordination of the principle of no significant harm would seem to leave the door open for states to argue that their right to develop or provide water to a growing population takes precedence over any environmental harm their actions might cause a neighbouring state. The UN Convention

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shall be given special priority." *Rio Declaration on Environment and Development*, June 13, UNECD Doc. A/CONF.151/5/Rev. 1, 31 I.L.M. 874.

[57] *Trail Smelter Arbitration* (USA v. Canada) (1941), 3 UNRIAA 1938 (1949), Corfu Channel Case (United Kingdom v. Albania), [1949] ICJ Rep. 4.
[58] *Supra* note 46 at Article 7.
[59] McCaffrey, *The Law of International Watercourses*, *supra* note 22 at 346.
[60] *Supra* note 37. In this case, the German Staatsgerichtshof affirmed the duty to cause substantial harm but stated that it is a flexible doctrine that must be governed by the circumstances of each particular case and that the "interests of the States in question must be *weighed in an equitable manner* against one another." [Emphasis Added] at p.131.
[61] *Supra* note 37. In this case the International Court of Justice strongly endorsed the dominance of the principle of equitable utilization over the no significant harm rule.

also provides that significant harm may be mitigated by the provision of compensation,[62] which would allow powerful, wealthy states to buy additional ground water use, despite the harm such use would cause to the environment.

### f) The Duty to Cooperate

Although it is effectively incorporated into the principle of equitable utilization, the UN Convention also establishes the duty to cooperate as its own separate principle.[63] The elements of this principle are delineated in the procedural section of the UN Convention and include the obligations to provide prior notification,[64] consult,[65] and exchange data and information.[66] In disputes over ground water resources, particular importance should be attached to these provisions because of the complexity of the information required to fully comprehend the impact of proposed developments.

> As far as prior notification and consultation concerning planned measures are concerned, states will obviously have to be much more careful in the case of groundwater to anticipate and assess the potential impacts of planned measures on those resources. Such impacts are likely to be far less obvious in the case of international groundwater than where surface water is concerned.[67]

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[62] *Supra* note 46 at Article 7.
[63] *Ibid.* at Article 8.
[64] *Ibid.* at Article 12.
[65] *Ibid.* The UN Convention refers to the duty to consult in a number of provisions including Article 3, Article 6, Article 7 and Article 17.
[66] *Ibid.*at Article 9.
[67] McCaffrey, *The Law of International Watercourses*, *supra* note 22 at 431.

The UN Convention envisions the creation of joint commissions to facilitate effective cooperation and cites the success of existing institutions (which presumably includes the IJC) as a reason for this.[68]

### g) Development vs. Environment

International customary water law has matured to the extent that it treats the international watercourse basin as a coherent whole and thereby recognizes that surface waters and ground waters are interconnected. However, the superiority of equitable utilization over the principle of no significant harm encourages development of surface and ground water resources at the expense of protecting the integrity of a basin's ecosystem.

> The international community has accepted the principle of equitable apportionment as the ground rule of international water allocation. The core idea of equal development opportunity is at the heart of the Convention and will be the basis for the argument that development has priority over aquatic ecosystem protection. The Convention's innovations are commendable, but the fact remains that the protection of a river system's ecological integrity remains secondary to the promotion of development.[69]

With the population of the Basin becoming increasingly dependent on ground water resources for continued development, it seems unlikely that customary international ground water law would provide the panacea to the transnational problems caused by ground water pumping in the Great Lakes Basin.

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[68] *Supra* note 46 at Article 8.
[69] A. Dan Tarlock, "How well can international water allocation regimes adapt to global climate change?" (2000) 15 J. Land Use & Envtl. Law 423 at 442.

## B) The Domestic Legal Regime

### 1. Constitutional Considerations

In the Great Lakes Basin, most laws relating to the allocation of ground water are determined at the state or provincial level. To date, the federal governments in both countries have shown little desire to involve themselves in this aspect of water management.

#### a) Canada

Under the Canadian constitution, both the federal government and the provincial government have powers relating to water management but it is the provincial governments that have the primary role in managing water resources. This role is derived from the provinces' proprietary rights over all lands belonging to them at the time of Confederation, including the watercourses and ground waters associated with these lands.[70]

Pursuant to its legislative powers, the federal government is able to exercise jurisdiction over surface water and ground water in certain situations.[71] One of the most significant federal powers relates to international agreements. Only the federal government has the

[70] See sections 109 and 117, *The Constitution Act (British North America Act)* (1867) 30 & 31 Victoria, c. 3.
[71] *Ibid.* Federal powers related to water include navigation and shipping (section 91(10)), sea coast and inland fisheries (section 91(12)), trade and commerce (section 91(2)), Indians and lands reserved for Indians (section 91(24)), agriculture (section 95), criminal law (section 91(27)), and undertakings (including canals) connecting or extending beyond the limits of provinces (section 92(10)(a).

power to enter international agreements but it must still rely on the cooperation of the provinces to implement these agreements.[72]

### b) United States

The powers of Congress with respect to water management are much broader than the Canadian federal powers. This is largely because of a provision in the United States constitution known as the "commerce clause" which allows Congress to regulate commerce with foreign nations and among the states. With respect to water, the commerce clause originally only applied to waters that were used for navigation. However, it has increased in scope over the years and it now applies to non-navigable waters, as well as navigable waters. In relation to the Great Lakes Basin, this means that "the powers of Congress to legislate extend not only to the Great Lakes themselves, but also to the surface flow of the tributaries and to tributary groundwater."[73] In an international watershed such as the Great Lakes Basin, other important federal powers include the power of Congress to enter into treaties, the power to approve interstate compacts, and the property power of Congress which grants water rights to Indian reservations.[74]

In the event of a conflict between state and federal law, laws passed by Congress would take precedence because the U.S. constitution provides that federal powers are superior to state law.[75] Despite the wide powers available to Congress, it has rarely exercised its

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[72] The federal government has the exclusive power to implement treaties concluded by the British Empire on Canada's behalf, *ibid.* at section 132. However, this power has not been extended to treaties concluded by Canada in its own right. This means the federal government must cooperate with the provinces to implement such treaties.
[73] *Supra* note 6 at 230.
[74] A. Dan Tarlock, *Law of Water Rights and Resources* (New York: Clark Boardman, 1988) at Chapter 9.
[75] The Supremacy Clause (U.S. Const. Art. VI, cl. 2) demands that state law yield to the exercise of an enumerated federal power.

full authority with respect to ground water quantity management.[76] Consequently, allocation of ground water within the Great Lakes Basin has largely been left to courts and legislatures of individual states.

Traditionally, these states have relied on common law principles to determine the allocation of ground water. These principles have provided property owners with virtually untrammeled rights to withdraw ground water beneath their land. However, some state authorities have sought to exercise greater control over ground water resources by passing legislation that requires state approval prior to withdraw ground water.[77] Frequently, when a state has enacted such legislation, the enactment has been challenged on the basis of constitutionality. Landowners claim that it is unconstitutional for the state to strip them of their vested property right to access ground water. These claims are often referred to as "takings" claims because claimants have essentially accused the state of taking their property. In the case of ground water, these claims have not held up in court.[78] Under the common law, a landowner does not possess a property right that guarantees them the *exclusive use* of ground water. The reason for this is that a landowner's use is susceptible to interference by a neighbour with a more powerful pump. Legislation that requires a permit to withdraw ground water has been held to be justifiable because it puts overlying landowners in a better position by providing the possibility of a more secure right.

> [G]roundwater claims were always inherently unstable because of the reciprocal external effects of pumping, and thus any expectations as to quantity and fixed pumping

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[76] *Supra* note 74 at 9-20.
[77] For example, Arizona, Florida, and Oklahoma have all passed legislation that regulates ground water withdrawals.
[78] Courts in Minnesota have upheld the legislative permit system as being constitutional. See *Crookston Cattle Co. v. Minnesota Dept. of Natural Resources* 300 N.W.2d 769 (1980). Courts in states outside the Basin have also upheld the constitutionality of permit systems. See *Lindsley v. Natural Carbonic Gas Co.*, 220 U.S. 61, 75-76, (1911), *Village of Tequesta v. Jupiter Inlet Corp.*, 371 So. 2s 663 (Fla.), *cert. denied*, 444 U.S. 965 (1979).

> levels were inherently speculative. Legislatures have long had the power to redefine property rights among common pool owners to *enhance* the protection of correlative rights, and under most legislative redefinitions of groundwater rights, pumpers as a class end up with more secure rights than they had before the regulation. This special characteristic of groundwater has been a sufficient basis for courts to conclude that there has been no taking.[79]

Despite the fact that state allocation of ground water rights is constitutional, only two states in the Great Lakes Basin (and the two Canadian provinces[80]) have introduced comprehensive permit systems. Further, even in these jurisdictions, ground water users who abstract less than a certain threshold are exempt from the permit requirement. Consequently, most ground water users within the Basin are governed by the common law rules of ground water allocation.

## 2. Common Law Allocation

### a) English Rule (Absolute Ownership)

Apart from Quebec,[81] all the jurisdictions within the Great Lakes Basin have their ground water laws founded in English common law which was devised at a time when there was very little scientific knowledge of ground water and prior to the introduction of high capacity pumps.

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[79] A. Dan Tarlock, "Supplemental Groundwater Irrigation Law: From Capture to Sharing" (1984) 73 Ky. L.J. 695 at 721.

[80] In Canada, the constitutionality of ground water regulation has never been questioned.

[81] Quebec is not a common law jurisdiction. Its ground water laws are derived from the Quebec Civil Code.

As a result of this lack of scientific understanding, an artificial legal distinction (which has been pervasive in the law ever since) was drawn between surface water and ground water.[82] Whereas rights to use surface water were restricted so that riparians (those who own land adjacent to a river or stream) could not alter the natural flow of the stream, the rights to use ground water were essentially limitless and became known as the doctrine of capture or the "absolute ownership rule."

A further arbitrary distinction created two categories of ground water. The first was underground water that seeped through the soil (known as "percolating water") and the second was water that flowed in a known and defined channel (an underground stream). If a property owner could establish that ground water under his land fell into this second category, the use of ground water by neighbouring landowners would be governed by the same laws that applied to riparian landowners. In reality, ground water rarely moves in underground streams and proving that this was the case was extremely difficult. Consequently, the courts adopted a "universal rule"[83] in presuming that ground water did not flow in an underground stream and it was a heavy burden to rebut that presumption.[84]

The earliest leading authority for the absolute ownership rule was *Acton v. Blundell*, decided in 1843.[85] In this case, the defendants sunk coal-pits on land they owned and drained away ground water that flowed under the plaintiff's property, approximately three-quarters of a mile away. This caused the well supplying water to the plaintiff's cotton mill to dry up. The Court of Exchequer Chamber drew a distinction between

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[82] *Dickinson v. The Grand Junction Canal Co.* 7 Ex. 282, 155 Eng. Rep. 953 (Ex. 1852).
[83] It was dubbed a "universal rule" by the Mississipi Supreme Court in *Board of Supvrs. v. Mississipi Lumber Co.*, 80 Miss. 535, 31 So. 905 (1902).
[84] Robert E. Beck, ed., *Waters and Water Rights* (Virginia: The Michie Company 1991) Vol. 3 at 91-95.
[85] *Acton v. Blundell* (1843) 152 E.R. 1223 (Ex. Ch.).

surface water and ground water because of the difficulty of determining the quantity of ground water that had been transmitted from adjoining lands. The court held that percolating ground water should be treated as part of the earth or soil, and in accordance with the property law maxim that *every man has the right to the natural advantages of his soil*, it could be utilized by the property owner without giving rise to a legal claim.[86]

The American and Canadian law courts of the mid-nineteenth century welcomed the absolute ownership rule. It had the effect of stimulating agricultural and urban development by encouraging uninhibited water consumption. This was particularly beneficial to the large farming operations and burgeoning cities that were emerging in an era of rapid growth. Moreover, because the technology for large-scale pumping had yet to develop there were relatively few ground water disputes.

### b) Ontario's Common Law

The Ontario courts followed the absolute ownership rule until 1977 and there is still some uncertainty as to whether it applies today. The rule appeared to be overruled in *Pugliese v. National Capital Commission*[87] when the Ontario Court of Appeal held that it could not construe the defendants' right to abstract ground water as an unlimited right.

In this case, the plaintiffs claimed that the ground water table below their properties was substantially lowered by the defendant's dewatering operations and had caused subsidence and serious property damage. The defendants argued that they were not

[86] *Ibid.* at 1235.
[87] *Pugliese v. National Capital Commission*, (1977) 79 D.L.R. 3d 592.

liable because the English common law rule gave them an absolute right to withdraw as much ground water as they wished. However, Howland J.A. held that:

> To conclude that those who abstract percolating water have an unbridled licence to wreak havoc on their neighbours would be harsh and entirely out of keeping with the law of tort as it exists today.[88]

The court went on to hold that the right to use ground water could be restricted by both negligence and nuisance principles.

Under negligence principles, a plaintiff is required to show that the actions of the defendant were unreasonable and that these actions resulted in damage. The plaintiff is not required to show that the damage was caused intentionally. In order to prove that the actions of the defendant were unreasonable, the plaintiff needs to establish three things. First, the defendant owed them a legal duty to take care; second, the defendant breached the standard of a reasonable person in those circumstances; and third, the breach caused the damage.[89]

A duty of care is owed to a person if there was a sufficiently proximate relationship between that person and the alleged wrongdoer and if it was reasonably foreseeable to the alleged wrongdoer that their actions would cause damage. In *Pugliese*, Howland J.A. held that the defendants owed a duty of care to the plaintiffs because:

> It would be difficult to conclude that the defendants should not reasonably have had the plaintiffs within their contemplation in the performance of their pumping operations. The

[88] *Ibid.* at para. 69.
[89] See *Donoghue v. Stevenson*, [1932] A.C. 562, *Hedley Byrne & Co. Ltd. v. Heller & Partners Ltd.*, [1964] A.C. 465, [1963] 2 All E.R. 575, and *Dorset Yacht Co. Ltd. v. Home Office*, [1970] A.C. 1004, [1970] 2 All E.R. 294.

> physical proximity of the plaintiffs' lands to the defendants' operations was such as to give rise to a foreseeable risk of harm from the negligence alleged, in pumping very large quantities of water over a period in excess of one year.[90]

Howland J.A. was not prepared to decide the remaining negligence issues, that is, the breach of the standard of a reasonable person and causation. He felt these determinations were better left to a trial judge with access to all the facts. However, he did suggest the parameters in which a breach of standard could be determined:

> If a reasonable person would have concluded that the damage caused by subsidence could have been avoided by expert advice and proper testing, or by use of an alternate method of controlling ground water conditions, or could have been minimized by ceasing operations when the subsidence commenced, then failure to do so would be negligence.[91]

Nuisance is the unreasonable interference with the use and enjoyment of land owned or occupied by another person. It is a separate field of tortious liability than negligence, although a negligent act may also give rise to nuisance. In deciding whether an act is a nuisance, the courts balance the rights of the occupier to do what he likes with his own property with the rights of a neighbour to use and enjoy his land without interference. In making this decision courts look at what is reasonable according to the ordinary uses of one's own land in that particular society. If an act exceeds those ordinary uses then it is an actionable nuisance and it does not matter if the defendant took all reasonable care.

In the *Pugilese* case, Howland J.A. once again left the determination of nuisance to the trial judge but made it clear that if the facts, as alleged, were established, he would

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[90] *Supra* note 87 at para. 74.
[91] *Ibid.* at para. 76.

consider the dewatering of the aquifer underlying the plaintiffs' properties to be a nuisance:

> In my opinion, the alleged conduct on the part of the defendants, if established at the trial, could constitute an excessive user of the lands of the NCC. I am of the opinion that interference with a right to the support of underground water can give rise to a cause of action in nuisance as well as in negligence.[92]

The decision of the Ontario Court of Appeal in *Pugliese* appears to place common law limits on the absolute right to abstract ground water. However, the case was appealed to the Supreme Court of Canada that made the final decision on the case according to statutory law. It was reluctant to affirm the common law analysis of the Ontario Court of Appeal. Instead, it held that the pumping was unreasonable because it exceeded the maximum amount of water that can be extracted without a permit under the Ontario Water Resources Act:

> In an action by an owner of land in negligence or nuisance from the pumping of ground water not flowing in a defined channel for any damage resulting from the abstraction of such water, no right of another owner to pump such water avails as a defence in respect of any pumping exceeding the quantity authorized under The Ontario Water Resources Act.[93]

Therefore, it is still not clear whether pumping that does not exceed this amount can give rise to a claim in negligence or nuisance in Ontario.[94] If the common law analysis of

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[92] *Ibid.* at para. 81

[93] *National Capital Commission et al. v. Pugliese* et al. [1979] 2 S.C.R. 104 at p.120.

[94] See Canadian Environmental Law Research Foundation, "An Overview of Canadian Water Law and Policy Governing Great Lakes Water Quantity Management" (1986) 18 Case W. Res. J. Int'l L. 114 at 114.

Howland J.A. is still the applicable law, Ontario would be governed by rules that closely resemble developments in American ground water law.[95]

### c) The American Rule (Reasonable Use)

Towards the end of the nineteenth century, the introduction of high capacity ground water pumps resulted in greater pressure being placed on ground water resources. The ensuing conflicts, which were predominantly between cities and farmers, provided the impetus for a modification to the absolute ownership rule.[96] In the majority of eastern American states, the modification took the form of the "reasonable use rule." One of the earliest cases that applied the reasonable use rule was *Forbell v. City of New York.*[97] In this case, large-scale pumping by a city pumping station located in a rural area caused a decline in the regional water table which resulted in crop failure for Forbell, a local farmer. The court held that the city's pumping was unreasonable, stating:

> We assert that the act of the defendant in establishing this pumping station for the purpose of drawing to itself all of the subsurface water in a given locality, situate in land which it does not own and in which it has no interest, or of such portion of the water as it chooses to take for its present or future needs, is not the exercise of a legal right, with which it became invested when it purchased the land.[98]

While the reasonable use rule that has emerged since this case is still grounded in the doctrine of capture,[99] the unqualified privilege to use that water is tempered by three

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[95] This is not coincidental. In the *Pugliese* case, Howland J.A. of the Ontario Court of Appeal discussed the approach to ground water rights in a number of jurisdictions, including the United States and specifically the American Law Institute's Restatement of the Law of Torts, which he considered as "indicative of the trend which the law is taking respecting the use of ground water." *Supra* note 87 at para. 34. The Restatement of the Law of Torts is discussed below at 86.

[96] *Supra* note 74 at 4-10.

[97] *Forbell v. City of New York* 61 N.Y.S. 1005 N.Y.A.D. 2 Dept. 1900.

[98] *Ibid.*

[99] *Supra* note 74 at 4-9.

constraints. First, the use has to be reasonable. This means the landowner cannot cause injury to other common users by maliciously diverting ground water or allowing it to be wasted during pumping.[100] Second, the use has to be for a beneficial purpose on overlying land, and third, the extraction of percolating water for use on non-overlying land is presumed unreasonable.[101] This third constraint places a *prima facie* prohibition on the diversion of water away from the land overlying the aquifer ("off-tract"), but the presumption can be rebutted if it is shown that no injury will be caused to other overlying landowners.

Although it is an improvement on the absolute ownership rule, the reasonable use rule for ground water is still less restrictive than the reasonable use rule applicable to surface water. Unlike the surface water rule, the ground water rule does not require the proportional sharing of water by common users and contains no preference for domestic use. The reason for this is that the ground water rule was essentially designed as a response to one particular type of conflict, namely disputes between small pumpers, particularly farmers, and large cities searching for water. As alluded to by Professor David Getches, the rule fails to deal adequately with competition between neighbouring overlying users:

> Traditionally, any beneficial use on the overlying land (short of actual waste) was considered reasonable and use off the land was considered unreasonable unless it was for the purposes incidental to the beneficial enjoyment of the land.... Although the common law reasonable use doctrine imposes a place-of-use restriction it, like the absolute doctrine, imposes little restriction on the nature and amount of use on overlying

[100] *Supra* note 84 at 299.
[101] *Supra* note 74 at 4-10.

land. Nor does it seek to balance the comparative utilities of the competing uses and the comparative hardships imposed on competing well-owners.[102]

As long as the use of ground water does not take place off tract and is not malicious or unnecessarily wasteful, the reasonable use rule will allow an overlying property owner to abstract as much water as that owner wants. This is the case even if such pumping may exhaust the aquifer or lower the water level to a point that other landowners cannot make use of it.

In the twentieth century, the rule of reasonable use became the predominant ground water law throughout the United States and was particularly prevalent in eastern states. In the Great Lakes Basin, the reasonable use rule was adopted by Michigan[103] and is still used in New York,[104] Pennsylvania,[105] and through statute in Illinois.[106]

### d) The Restatement of Torts (Section 858)

In an attempt to deal with the inherent limitations of the reasonable use rule, the American Law Institute modified the rule in 1978 in its second Restatement of Torts, Section 858, "Liability for Use of Groundwater."[107] Section 858 extends the ambit of the reasonable use rule to protect small pumpers from well interference problems caused by another overlying user. It also considers prior use as a factor in determining whether pumping is reasonable or not. Tarlock provides a succinct summary of the provisions of Section 858. He states:

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[102] David H. Getches, *Water Law in a Nutshell*, 2d ed. (St. Paul, Minn.: West Pub. Co., 1990) at 254, citing *Higday v. Nickolaus*, 469 S.W. 859 (Mo. App. 1971).
[103] *Schenk v. City of Ann Arbor*, 196 Mich. 75, 163 N.W. 109, L.R.A. 1917F 23, Ann. Cas. 1918E 267 (1917).
[104] *Forbell v. City of New York,* 61 N.Y.S. 1005 N.Y.A.D. 2 Dept. 1900.
[105] Rauthrauff v. Sinking Spring Water Co., 359 Pa. 129, 133, 14 A.2d 87 (1940).
[106] *Illinois Water Use Act* (1983) 525 ILCS 45.
[107] *Restatement (Second) Torts* § 858 (1979).

Section 858 provides that an overlying owner who withdraws groundwater for a beneficial purpose is not liable unless:

a) The withdrawal of groundwater unreasonably causes harm to a proprietor of neighbouring land through lowering the water table or reducing artesian pressure,
b) The withdrawal of groundwater exceeds the proprietor's reasonable share of the annual supply or total store of groundwater,
c) The withdrawal of groundwater has a direct and substantial effect upon a watercourse or lake and unreasonably causes harm to a person entitled to the use of its water.

Section 858 adopts a rule of capture among larger pumpers, but gives a remedy for prior smaller pumpers who have been injured by the subsequent entry of a larger overlying user to the basin. As the comments observe, 'the salient factor is not the place of withdrawal but the withdrawal of water in unprecedented quantities for purposes not common to the locality.'[108]

In the Great Lakes states, the adoption of the Restatement of Torts (Second) Section 858 was preferred over the reasonable use rule by courts in Ohio[109] and Wisconsin.[110] Michigan also appears to have adopted the modifications of the traditional reasonable use rule as set out in Section 858.[111]

### e) The Rule of Correlative Rights

The rule of correlative rights was first developed in arid California in response to the intensive use of the state's ground water resources.[112] Under this rule, which is

[108] *Supra* note 74 at 4-22.
[109] *Cline v. American Aggregates Corp.*, 15 Ohio St. 3d 384, 474 N.E.2d 324 (1984).
[110] *State v. Michels Pipeline Constr., Inc.*, 63 Wis. 2d 278, 292, 217 N. W.2d 339 (1974).
[111] *Maerz v. United States Steel Corp.*, 474 N.E.2d 339 (Wis. 1974).
[112] *Katz v. Walkinshaw* 141 Cal. 116, 74 P. 766 (1903).

essentially the application of the law pertaining to surface water rights, all overlying owners have correlative rights to an equitable share of a common aquifer. When the common supply is sufficient, each overlying landowner may take all he needs for use on his own or for use off tract. However, where there is not enough water in the aquifer to supply the full needs of all, each landowner may only extract a reasonable share relative to the other overlying owners. Reasonable share excludes any uses that occur off tract.[113]

Minnesota is the only state in the Great Lakes region to adopt the rule of correlative rights.[114] However, the legislature has since created a comprehensive permit system that has diminished the significance of this common law doctrine.[115]

The only state in the Basin that has not formally adopted a different rule to the absolute ownership rule is Indiana. The Indiana Supreme Court reaffirmed the status of the absolute ownership doctrine in *Wiggins v. Brazil Coal & Clay Co.*[116] However, it should be noted that the rule has been modified to a certain degree to prohibit pumping for malicious or wasteful purposes.[117]

### f) Ground Water and Surface Water Rights

A recent case in Michigan considered the relationship between ground water rights and surface water rights. In *Michigan Citizens for Water Conservation et al. v. Nestlé*

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[113] Robert E. Beck, ed., *Waters and Water Rights* (Virginia: The Michie Company 1991) Vol. 3 at 205 citing the traditional definition of the rule from CORPUS JURIS 840 Waters §256 (1934).
[114] *Erickson v. Crookston Water Works Power & Light Co.*, 105 Minn. 182, 117 N.W. 435 (1908)
[115] *Supra* note 84 at 233.
[116] *Wiggins v. Brazil Coal & Clay Co.* 452 N.E.2d 958, 964 (1983).
[117] *Supra* note 84 at 131.

*Waters North America*,[118] the defendant's water bottling operation was challenged on both common law and statutory law grounds. The common law argument concerned the impact that the defendant's ground water pumping would have on a nearby stream and the enjoyment of that stream by adjacent property owners. As discussed above, property owners who live adjacent to surface waters have riparian rights to the use and enjoyment of that stream. These protected rights include boating, fishing, swimming, domestic water use, and also general aesthetics. Following an analysis of the hydrological evidence, Judge Root found that ground water pumping by Nestlé could negatively impact the local ecosystem including the nearby stream and infringe the riparian rights of adjacent property owners.

In his analysis, Judge Root showed an unusually strong judicial understanding of the impact of large-scale ground water pumping on the local ecosystem.[119] Both the factual analysis and final result have been commended by environmental and community organizations. However, the legal analysis that produced the result is still somewhat troubling because it hinged on the pervasive legal distinction between surface water and ground water. Judge Root stated that:

> In cases where there is a groundwater use that is from a water source underground that is shown to have a hydrological connection to a surface water body to which riparian rights attach, the groundwater use is of inferior legal standing than the riparian rights.[120]

Underlying this distinction may have been a realization that applying a reasonableness test would not produce a fair result in the circumstances. However, in light of other

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[118] *Michigan Citizens for Water Conservation et al v. Nestlé Waters North America Inc.* (2003) Mecosta County Cir. Ct. No. 01-14563-CE.

[119] Judge Root's familiarity with the area and his appreciation of its environmental qualities perhaps explains his willingness to spend the time to grasp the hydrological realities that the common law has historically chosen to ignore.

[120] *Supra* note 118 at 48.

passages in the decision, this may be a generous concession. Prior to discussing the legal argument for superior riparian rights, Judge Root made it eminently clear that rights are a reflection of society's values:

> Also, in discussing riparian and other rights, such as groundwater uses, we need to recognize that the law's recognition and protection of such are a reflection of the value our society and culture places on the issue under analysis. Rights are a human concept. They belong to and are created by humans ... It is in the comparison of competing water-use rights that the law here needs to develop to reflect current social values. Thus, while I write regarding competing property rights, what I am really discussing is human values.[121]

Peculiarly, after saying that the law needs to develop to reflect current social values, Judge Root cited the nineteenth century English common law rule as support for his decision:

> In the groundwater realm, the traditional English rule was essentially 'first come, first served', essentially the prior appropriation rule. However, the English rule regarding surface waters is the natural-flow rule, indicating that England places a higher value on surface (riparian) waters than groundwater.[122]

Therefore, despite Judge Root's apparent appreciation of the interconnections between ground water and surface water, the legal principles he applied were still grounded in the nineteenth century. This decision exemplifies the legal baggage that continues to weigh down the common law allocation of ground water.

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[121] *Supra* note 118 at 44.
[122] *Supra* note 118 at 48.

### g) Limitations of Common Law

*Private litigation, relying on the happenstance of a motivated and financially able plaintiff, cannot replace the need for long-term planning processes. The costs of litigation may be prohibitive because attorney fees and the financial drain of securing witnesses. Private lawsuits tend to be reactive and adversarial with traditional legal requirements, such as the need for a property interest, often favouring defendants.*[123]

The historical roots of the common law rules for ground water allocation are instructive for two reasons. First, the uncertainty of scientific understanding has played a definitive role in the lack of strong laws protecting landowners from interference with their ground water supplies. Although scientific, and indeed judicial understanding of ground water hydrology has improved, the precedent-based common law affords excessive reverence to judicial determinations made in a time when understanding was limited.

Second, it is clear that courts have generally favoured the interests of short term economic development over environmental interests and the interests of those who may wish to use ground water in the future. Rather than taking a precautionary approach to the development of ground water resources, courts have been reluctant to restrict the uninhibited exploitation of ground water resources, and have only applied patch-up measures where needs have arisen.

Even if judicial decision-making develops a sensitivity to all the complex problems of excessive ground water withdrawals, the common law, which is reliant on private

[123] William Charles & David VanderZwaag, "Common Law and Environmental Protection: Legal Realities and Judicial Challenges" in Elaine Hughes et al., eds., *Environmental Law and Policy* 2nd Ed. (Toronto: Emond Montgomery, 1998) at 79.

litigation, will always be ill-equipped to prevent ground water resources from being over-exploited. A number of salient points elucidate the reasons for this:

- Common law systems are reactionary by design and are incapable of initiating long-term management plans to prevent the excessive exploitation of ground water resources.
- Due to the complexity of the science and the need for expert witnesses, litigation involving ground water is a particularly expensive and time-consuming process that requires motivated and financially secure litigants to bring it forward.
- Because the common law dealing with ground water pumping is based on property ownership, other parties with legitimate interests, such as environmental and community organizations, are effectively excluded from the process. Those litigants who are able to take action are generally representing their own narrow property interests and are rarely concerned with the broader social and environmental consequences of excessive ground water withdrawals.
- Many cases never make it to trial because the defendants (who are often the more powerful party financially) agree to a settlement with the plaintiff, either to deepen the plaintiff's well or provide financial compensation.
- If a case does come to trial, the advantage generally lies with the defendant because the plaintiff has the burden of proving damage, a particularly difficult proposition in ground water disputes.

## 3. Legislative Allocation

### a) The Context for Legislative Action

Until 1985, the government agencies in the states and provinces of the Great Lakes Basin largely took a back seat approach to managing the quantity of waters in the region. However, increasing public concern over the possibility of large-scale diversions of water out of the Basin led the governors and premiers of these jurisdictions to seek a regional commitment to make certain that the levels and flows of the Great Lakes were not unduly disrupted.[124] This commitment was formalized by the signing of the Great Lakes Charter.[125]

### b) The Great Lakes Charter

In 1985, the eight governors of the Basin states and the two premiers of the Canadian provinces signed the Great Lakes Charter ("the Charter"). The Charter is a non-binding regional agreement (as opposed to a binding international treaty) which recognizes that the waters of the Great Lakes Basin are interconnected and part of a complex ecosystem that supports human and environmental uses. As a consequence, the Charter applies equally to ground water and surface water and when it refers to the

[124] Between 1981 and 1984 there were three large-scale diversion proposals that prompted the signing of the Charter. The first was a proposal to construct a slurry pipe that would use water from Lake Superior to transport coal to Wyoming. The second was a proposal to build a canal that would divert water from Lake Superior into the Missouri River in South Dakota and the third was a proposal to pipe water from the Great Lakes to the High Plains states in the arid south-west of the United States. See Claire Farid, John Jackson & Karen Clark, "The Fate of the Great Lakes: Sustaining or Draining the Sweetwater Seas?" (1997) Canadian Environmental Law Association and Great Lakes United. Available at: http://www.glu.org/english/index.html.

[125] *The Great Lakes Charter: Principles for the Management of Great Lakes Water Resources* (February 1985) online: Council for Great Lakes Governors <http://www.cglg.org/1pdfs/GreatLakesCharter.pdf>.

"waters" or "water resources" of the Basin it is referring to both systems as a unified whole. The Charter has five major purposes:

- To conserve the levels and flows of the Great Lakes and their tributary and connecting waters;
- To protect and conserve the environmental balance of the Great Lakes basin ecosystem;
- To provide for cooperative programs and management of the water resources of the Great Lakes basin by the signatory States and Provinces;
- To make secure and protect present developments within the region; and
- To provide a secure foundation for future investment and development within the region.[126]

To further these purposes, the states and provinces agreed to establish a common database of information regarding the use and management of Basin water resources.[127] They also agreed that any state or province should consult with the other jurisdictions in the Basin prior to approving a new or increased diversion or consumptive use of Basin water that would exceed 5 million gallons per day (19 million litres per day) average in any 30 day period.[128]

However, a state's right to be consulted was made contingent upon two requirements. First, the independent jurisdictions must be able to provide accurate information on water withdrawals in excess of 100,000 gallons per day (380,000 litres per day) average in any

[126] *Ibid.* see "Purpose".
[127] *Ibid.* see "Common Base of Data".
[128] *Ibid.* see "Consultation Procedures".

30-day period.[129] Second, these jurisdictions must have the authority to regulate water withdrawals involving a diversion or consumptive use of water in excess of two million gallons (7.6 million litres) per day average in any 30-day period.[130] To ensure this information is available, the Charter requires states and provinces to enact legislation for the purpose of gathering this information.[131]

The Charter was an innovative example of regional cooperation. It was an important first step in instigating government action to protect the water resources of the Basin and spurred a number of legislative initiatives to meet the Charter's requirements for information collection. However, while the broad purposes of the Charter are admirable and display an understanding of the Basin's fragile and interdependent ecosystem, it should be recognized that the Charter has inherent limitations.

First, the Charter does not have the power of binding international law. Only the federal governments of Canada and the United States have the ability to sign binding international treaties.[132] The Charter therefore relies on the goodwill of the states and provinces to abide by its requirements. Second, the Basin states and provinces that signed the Charter never intended to surrender the exclusive right to manage and regulate the water resources within their own boundaries. Consequently, a commitment to allocate water more effectively within the Basin is absent from the Charter. Third, 5 million gallons per day is an excessively high trigger level for consultation.[133] Pumping of

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[129] *Ibid.* see "Progress Towards Implementation".
[130] *Ibid.*
[131] *Ibid.*
[132] Above at 75-77.
[133] Since the signing of the Charter, only one consumptive use or diversion proposal, the 1993 Mud Creek Irrigation District proposal was above the trigger point at which consultations are supposed to be carried out. *Supra* note 125 at 37.

ground water at a much lower level may have significant effects on regional water levels and the flow of ground and surface water.

In reality, the Great Lakes Charter is merely a good faith agreement for gathering information on the water resources of the Basin and for consultation prior to approving large-scale diversions. The Charter falls short of requiring the jurisdictions of the Great Lakes to implement practical measures to control and regulate "in-basin" withdrawals and consumption. As a first step, the Charter was a valuable commitment but it was signed in 1985, and as the next section shows, with respect to ground water, there has been very little progress since.

### c) Registration vs. Regulation

Conceptually, it is important to understand the difference between state registration systems and state regulatory systems. While these two systems are often grouped together as evidence of state action concerning water resources, they are in fact fundamentally different. Registration systems merely seek to monitor the use of a resource, whereas regulatory systems actually control the use of a resource.[134]

With respect to their management of ground water resources, most of the jurisdictions in the Basin have yet to move beyond collecting information on high capacity well owners, and still rely on the common law for ground water allocation. These jurisdictions have enacted legislation that requires high capacity well owners to register their withdrawals

[134] Paul G. Foran, "Survey of Eastern Water Law" (September 1995) A Report to the Illinois Department of Natural Resources, at 10-11, online: Illinois Department of Natural Resources <http://www.dnr.state.il.us/orep/c2000/water/REPORT.PDF>.

but they provide little or no authority to government agencies to control or restrict excessive ground water use. These can be classified as registration systems.

Regulatory systems require some, if not all ground water users (generally high capacity well owners) to obtain permits before they can withdraw ground water. Such systems allow government agencies to allocate ground water because they are able to restrict pumping if they believe the negative effects of such pumping outweigh the benefits to the user. However, as is evident in Ontario's permit program (which is discussed below), without a true commitment to the protection of water resources, these regulatory systems can prove to be as ineffective as registration systems.

### d) Registration Systems in the Great Lakes Basin

#### Michigan

Michigan, the only state that lies completely within the Basin, has no legislation restricting the quantity of ground water that can be withdrawn. Facilities that are capable of withdrawing over 100,000 gallons per day average from the Basin in any consecutive 30-day period must register with the Department of Natural Resources,[135] however, they do not need a permit. A recent bill, known as the *Water Legacy Bill*,[136] has been introduced that would require permits to withdraw more than two million gallons of water per day or more than 100 million gallons per year. However, there is strong opposition to the Bill from powerful business and agricultural lobbies. The Bill is currently

[135] Michigan Code § 324.32705.
[136] Senate Bill No.187 introduced on March 10, 2004.

floundering in the chambers of the state legislatures, which are reluctant to pass the Bill until more scientific information on ground water supplies is available.

**Illinois**

In Illinois, the Water Use Act of 1983 (as amended in 1987) adopted the doctrine of reasonable use.[137] It should be noted that this doctrine is the same as the common law reasonable use rule for surface water. Therefore, unlike the ground water reasonable use rule, well owners are limited to a proportional share of ground water resources (other than household uses which receive priority). The Act also requires all high-capacity wells in the state to be registered with the local Soil and Water Conservation District Office.[138] High capacity wells are defined as wells that abstract more than 100,000 gallons per day. While each well is subject to an impact analysis, the legislation does not provide for refusal or denial of permission to drill the well, even if it may cause a negative impact on other neighbouring wells. Consequently, the Water Use Act does not constitute a regulatory system, as users do not require a permit to pump ground water.

Restrictions on ground water use can be made in four counties which have been provided with special emergency restriction powers under the Water Use Act.[139] However, despite numerous complaints arising from drought conditions and heavy irrigation water use, emergency restrictions have rarely been imposed.

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[137] *Illinois Water Use Act* (1983) 525 ILCS 45 at Section 4.
[138] *Ibid.* at Section 5.1.
[139] *Ibid.* at Section 5.1.

## Ohio

Like Illinois, Ohio requires the registration and reporting of ground water withdrawals but does not require users to have permits.[140] Concerns over droughts in the late 1980s gave rise to ground water stress legislation, signed in April of 1990.[141] This legislation gives the Chief of the Division of Water the authority to designate an area as a ground water stress area and establish a threshold withdrawal capacity for the area. Any person in a water stress area who withdraws ground water at a greater rate than the specified threshold would be required to register the facility with the Chief of the Division of Water. However, the registration is not intended to regulate the use of ground water, it is only for information gathering purposes that may be used for resolving conflicts and guiding new users.[142]

## Indiana

No permits are required for the withdrawal of ground water in Indiana. A significant water withdrawal facility (one that withdraws over 100,000 gallons per day) must register and report annually to the Indiana Natural Resources Commission.[143] Additionally, a director of the Natural Resources Department may restrict ground water withdrawals if there is a ground water emergency. A ground water emergency can be declared on the basis of a complaint from the owner of a "nonsignificant" ground water withdrawal facility

[140] Section 1521.16 of the Ohio Revised code requires any owner of a facility, or combination of facilities, with the capacity to withdraw water at a quantity greater than 100,000 gallons per day (GPD) to register such facilities with the Ohio Department of Natural Resources (ODNR), Division of Water.
[141] Section 1521.16. Sub. H.B. 476.
[142] See section entitled "Withdrawal Registration" on the website for the Ohio Department of Natural Resources <http://www.dnr.state.oh.us/water/wwfr/aboutwwfr.htm>.
[143] Indiana Code Ann. §14-25-7.

(that withdraws under 100,000 gallons per day), or if there is reasonable evidence that withdrawals will exceed the recharge capability of an aquifer.[144]

**Pennsylvania**

In Pennsylvania, only public water systems require permits;[145] all other high capacity well owners merely have to register their withdrawals. In 2002, Pennsylvania adopted the *Water Resource Planning Act.*[146] The primary objective of this Act is the formulation of a "State Water Plan,"[147] and one of the required components of the plan is a review and analysis of water policies and regulations. However, this review has yet to occur and users are only required to register withdrawals (and only if they are greater than 10,000 gallons per day).[148]

**New York**

Under the *Great Lakes Water Conservation and Management Act* (1989), water users who withdraw more than 3 million gallons of surface or ground water during a consecutive 30-day period from the Great Lakes Basin must register their use. They do not need a permit.[149]

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[144] Indiana Code Ann. C §14-25-4.
[145] *Safe Drinking Water Act*, Act 35 §§ 721.1-721.17.
[146] Act 220, (2002).
[147] *Ibid.* at §3111.
[148] *Ibid.* at §3118.
[149] Environmental Conservation Law, §§ 3-0301 [2][m], 15-1609

### e) Regulatory Systems in the Great Lakes Basin

Despite increasing competition between users of ground water in the Great Lakes Basin, only four of the ten jurisdictions that lie within the Basin have implemented regulatory systems that allow government authorities to place restrictions on ground water withdrawals.

#### Ontario

The primary statute concerning the allocation of both ground water and surface water rights is the Ontario Water Resources Act ("OWRA"),[150] which was originally passed in 1961. Section 34 of this Act requires certain users to attain a permit if they are taking more than 50,000 litres per day (13,000 gallons) of surface or ground water. These users include those who take ground water for irrigation, public, municipal, commercial, industrial, recreational, and other miscellaneous purposes.

Permits are issued by Regional Directors of the Ontario Ministry of the Environment. These Directors exercise considerable discretion under the Act and have the authority to require a permit by any of the aforementioned users who are taking less than 50,000 litres per day if their taking is judged to interfere with a public or private interest in water.[151] An applicant who is denied a permit may appeal to the Environmental Review Tribunal and request that the decision be overturned.[152] If a permit is issued, the public

[150] *Ontario Water Resources Act* (1990), R.S.O. Chapter O 40.
[151] *Ibid.* at s.34(4).
[152] Environmental Commissioner of Ontario, "Ontario's Permit to Take Water Program and the Protection of Ontario's Water Resources, Brief to the Walkerton Inquiry" (January 2001) at 4.

can challenge the decision in certain circumstances under the Environmental Bill of Rights.[153]

Exempt users are those who take water for domestic purposes, livestock watering, and fire fighting. Users who installed a permanent system for water taking prior to the inception of the Act in 1961 are also *prima facie* exempt.

**Quebec**

Quebec's ground water laws are derived from the Quebec Civil Code, which provides for the unencumbered use of ground water under one's property, providing there is no legislation or regulation prohibiting that use.[154] Quebec implemented a water policy for the first time in 2002.[155] Among other things, the water policy calls for a revision of the legal framework pertaining to water[156] and accompanying the policy were a number of new or amended regulations in furtherance of this purpose. One of these regulations was the Groundwater Catchment Regulation which sets out rules that relate to the withdrawal of ground water and the use of ground water.[157] The object of the regulation is to:

> [G]overn groundwater catchment in order to prevent the catchment of that water by an owner or operator from causing abusive nuisance to its neighbours, in particular by lowering the phreatic water level or by reducing the artesian pressure, to prevent the drawing of water in excessive amounts considering its availability, and to minimize the

[153] Below at 112.
[154] Quebec Civil Code S.Q., 1991, c. 64.
[155] "Quebec Water Policy: Our Life, Our Future" (2002) online: Environment Quebec <http://www.menv.gouv.qc.ca/eau/politique/index-en.htm>.
[156] *Ibid.*
[157] *Groundwater Catchment Regulation* (2002) c. Q-2, r.1.3 online: Environment Quebec <http://www.menv.gouv.qc.ca/eau/inter_en.htm>.

> negative impacts from the catchment on watercourses and bodies of water, on the persons entitled to use them and on the ecosystems associated with those watercourses and bodies of water.[158]

The regulation seeks to meet this objective by providing that operations capable of withdrawing over 75 $m^3$ of ground water per day (75,000 litres or 19,500 gallons)[159] must first obtain authorization from the Ministry of the Environment.[160] Operations that withdraw less than 75 $m^3$ per day but which are intended for human consumption by more than 20 persons must also obtain an authorization, as must operations that intend to withdraw water from a ground water catchment area for the purpose of selling spring or mineral water.[161]

**Wisconsin**

Wisconsin recently introduced the Groundwater Protection Act. This Act requires high-capacity well owners to acquire approval from the Department of Natural Resources if they can pump more than 100,000 gallons per day.[162] Prior to the enactment of this law, the Department of Natural Resources could only deny an application for a permit to operate a high-capacity well if it adversely affected the public water supply. The new Act specifically provides standards that should be applied if the applicants' high capacity well is located near an outstanding water resource or trout stream, the ground water pumping will have a significant impact on a spring, or it would remove 95% of the water from the

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[158] *Ibid.* at s.1.
[159] This quantity refers to the maximum capacity of the pump and not to the water that is actually withdrawn. Therefore, even if ground water users do not use their wells, they still have to apply for authorization.
[160] *Supra* note 157 at s.31.
[161] *Ibid.*
[162] Wisconsin Act 310 (2003).

watershed.[163] The Act maintains the requirement that a high-capacity well must not interfere with public water supply.[164]

**Minnesota**

In Minnesota, a water use permit is required for uses of surface water or ground water withdrawing more than 10,000 gallons per day or 1 million gallons per year.[165] Exempt from this requirement are domestic uses serving less than 25 persons for general residential purposes.[166] Minnesota's permit system is a comprehensive science-based system that recognizes the interconnections between ground water and surface water. A permit can be limited or denied if the appropriation would have adverse impacts on surface waters[167] and the commissioner that reviews the permit application must consider, among other factors, the hydrology and hydraulics of the water resources:

> If the commissioner determines, based on substantial evidence, that a direct relationship of ground and surface waters exists such that there would be adverse impact on the surface waters through reduction of flows or levels below protected flows or protection elevations the amount and timing of the proposed appropriation from ground water shall be limited.[168]

Further, the commissioner is required to take into account the availability of hydrological data in deciding whether to issue a permit. The commissioner should deny or limit a permit if insufficient data is available to determine the effects of the proposed

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[163] *Ibid.*
[164] *Ibid.*
[165] Minn. Stat. 103G.271.
[166] *Ibid.*
[167] *Ibid.* at 103.315, subd. 5.
[168] Minn. R. §6115.0670, subp.3C9(2).

withdrawal.[169] The commissioner is also able to deny a permit if it does not adequately protect public safety or promote the public welfare. Permits must also be granted in accordance with approved state, regional and local planning.[170] When supplies are insufficient to assure water to all users and to protect instream uses, the commissioner is required to follow a list of six water use priorities.[171] The first priority is domestic uses, the second is water use that consumes[172] less than 10,000 gallons per day, the third is agricultural irrigation, the fourth is power production, the fifth and sixth priorities account for all other withdrawals over 10,000 gallons per day. In periods of drought, the fifth and sixth uses will be restricted first and domestic uses will be restricted last.

## 4. The Effectiveness of Legislative Allocation: Ontario's Permit to Take Water Program

As the following analysis of Ontario's existing permitting program demonstrates, the mere presence of a regulatory system does not guarantee adequate protection of ground water resources.[173]

Ontario allocates rights to use ground water through a combination of common law and statute law. As previously described, any ground water user who wishes to withdraw

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[169] *Ibid.* at §6115.0670, subp.3C(3).
[170] *Ibid.* at §6115.0670, subp. 3A(3) & (4).
[171] *Supra* note 165 at 103G.261.
[172] "Consumption" means water withdrawn from a supply that is lost for immediate further use in the area. *Ibid.*
[173] Following the Walkerton Tragedy (May 2000) and the recommendations of the O'Connor Report, released in 2002 (see Chapter 5 at 189), the Ontario government placed a moratorium on the issuance of new water permits on December 18, 2003. The moratorium lasted for a year and only applied to uses that removed water from the Basin such as water bottling companies, fruit or ready-mix canning and other manufacturing industries that incorporated more than 50,000 litres on any given day into products. The moratorium did not apply to water taken for agricultural purposes, use of municipalities, quarry dewatering or renewal of existing permits. The purpose of the moratorium was to prevent continued depletion of water resources during the period when new rules were being developed. Some of these rules are discussed in Chapter 5 at 189-195. See media backgrounder at Ontario Ministry of Environment online: <http://www.ene.gov.on.ca/envision/news/2003-1023/121801mb.htm>.

more than 50,000 litres per day for purposes other than domestic, livestock watering and fire fighting, must obtain a permit. [174] The permits are distributed according to Ontario's Permit to Take Water Program ("PTTWP"), which was established under the Ontario Water Resources Act ("OWRA").[175]

On a superficial level, the current PTTWP appears to be an adequate mechanism for protecting the province's water resources. However, a more detailed evaluation of its provisions and its actual operation reveal that the program is showing its age and is ill-suited to modern pressures on both surface and ground water.

### a) Lack of Data/Information

A recent assessment of the PTTWP has found that there is insufficient data available to the administrators of the program:

> Our research found that data on water use and water supply at a scale appropriate for decision-making varied but were generally poor. For the most part, data were either lacking or inconsistent in terms of surface water and groundwater availability and use by sectors.[176]

The consequences of issuing permits based on insufficient data were cogently expressed by Dr. Ken Howard of the University of Toronto in his expert testimony at the Inquiry into the Walkerton Water Tragedy:

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[174] Above at 101.
[175] *Supra* note 150.
[176] Kreutzwiser et al., "Water Allocation and the Permit to Take Water Program in Ontario: Challenges and Opportunities" (2004) 29:2 Canadian Water Resources Journal 135 at 138.

Most parts of the world which use groundwater extensively manage the water; in Ontario unfortunately we don't manage water, the degree of management extends simply to issuing permits to take water and to me issuing permits to take water is a little bit like me writing cheques on my bank account when I don't know how much money is coming in every month and how much is going out to pay... the other bills... [T]here's a big difference between issuing permits to take water and managing a resource and to manage a resource you really need to know how the system is working. There's absolutely no reason at all why we can't get to that stage, but I think we are a little bit behind the game certainly in Ontario.[177]

## b) Lack of Clarity in Allocation Rules

### i) Unclear Objectives

The OWRA fails to establish a clear statement that defines the goals or objectives of the Program. Considering much of the administration of section 34 is at the discretion of the Director, the failure to outline the underlining purpose of the OWRA should be regarded as problematic.[178]

### ii) Lack of Water Use Priorities

Other than naming domestic use, livestock watering, and fire fighting as exempt uses, the Act provides no instruction with respect to which of the other uses take priority. While the most recent policy manual does offer some guidance as to which uses should be given priority,[179] such guidance is only policy and with no

[177] Honourable Dennis R. O'Connor, *Report of the Walkerton Inquiry, The Events of May 2000 and Related Issues* (Ontario Ministry of the Attorney General: 2002) Part One, at 434.
[178] See H.J. Leadley and R.D. Kreutzwiser, "Rural Water Supply Allocation in Ontario: An Evaluation of Current Policy and Practice" (1909) 24:1 Canadian Water Resources Journal 1 at 5.
[179] Ontario Ministry of the Environment, "Permit to Take Water Program: Guidelines and Procedures Manual" (1999).

express legal support, the extent to which it is applied by the Directors is purely discretionary.[180]

iii) Excessive Discretion

The discretion granted to Directors under the OWRA allows for a considerable amount of flexibility but also creates a great deal of uncertainty. When an application for a permit is made, the decision to issue or reject is completely at the discretion of the Director. In addition, the Director has the discretion to attach terms and conditions of use to the permit, and these may be imposed even after the permit has been issued.[181] The legislation also allows a Director to revoke water-taking rights if there is interference with another user. However, the criteria on which these decisions should be based are not defined. From interviews conducted with water users in two townships in Ontario, Kreutzwiser found that the most frequently mentioned criticism of the PTTWP was that the rules of allocation were unclear.[182]

**c) Lack of Environmental Protection**

Another significant deficiency of the PTTWP is its failure to provide adequate protection for the environmental uses of ground water. The PTTWP was initially designed to allocate ground water between human users and although a recent amendment requires

[180] Kreutzwiser et al., "Agricultural and Rural Water Allocation in Ontario, A Report to the Agricultural Adaptation Council under the National Soil and Water Conservation Program" (1999) at 33.
[181] *Supra* note 150 s.34(6).
[182] *Supra* note 180 at 21.

Directors to consider environmental impacts,[183] in practice, decisions made by Directors indicate that such considerations are rarely given precedence. The reason for this is that both the regulation and the policy documents that guide the decisions of Directors lack specific criteria that would assist the application of an effective ecosystem approach:

> Based on the ECO's PTTW assessments, it seems doubtful that this [ecosystem] approach has been adopted fully and consistently in the PTTW program. Some of the inconsistency may be attributed to the incomplete revision of key PTTW guidance documents....
>
> Without this important regulatory direction incorporated into guidance documents, key ecosystem considerations such as the impact on the baseflow of rivers, habitat, exacerbation of droughts, turbidity and water body oxygen levels may not be incorporated into decision making.[184]

### d) Ignores Impacts of Cumulative Pumping

The PTTWP ignores the combined effects of a number of smaller pumps in close proximity. Neighbouring property owners within a small area may each possess a well. Each owner may pump less than 50,000 litres per day but cumulatively they may pump considerably in excess of 50,000 litres per day. Consequently, they may have the same impact or a greater impact than a single property owner who owns a large amount of land but operates a well or a series of wells that pump over 50,000 litres per day. The single landowner must obtain a permit but the neighboring property owners are not so compelled.

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[183] The most recent amendment to the PTTWP occurred in 1999 with Regulation 285/99 and it requires that Directors should consider the "natural functions of the ecosystem" when issuing a permit.
[184] Environmental Commissioner of Ontario "Ontario's Permit to Take Water Program and the Protection of Ontario's Water Resources, Brief to the Walkerton Inquiry" (January 2001) at 23.

### e) Lack of Co-ordination with Municipalities and Conservation Authorities

Local governments and Conservation Authorities play an important role in water management in Ontario. Under the Planning Act, municipalities have the authority to determine land use through official plans and zoning by-laws. In exercising this authority, they must take into account the protection of source water:

> The Minister, the council of a municipality, ... and the Municipal Board, in carrying out responsibilities under this Act, shall have regard to, among other matters, matters of provincial interest, such as,
> (a) the protection of ecological systems, including natural areas, features and functions
> ...
> (e) the supply, efficient use and conservation of ...water.[185]

Consequently, municipalities clearly have an interest in the allocation of water. However, the current PTTWP does not require consultation with municipalities prior to the issuance of a permit. This undermines the ability of municipalities to meet their responsibilities with respect to source water protection. The Association of Municipalities of Ontario has expressed its frustration at this state of affairs:

> [T]here is little connection between the water taking permit application process, and municipal planning policy with respect to water protection, including protection of sensitive areas and future water availability. Official plans, details on water demand based on growth projections, and other relevant policy are not necessarily included in the provincial technical assessment of cumulative impacts of water takings in specific regions.

[185] *Planning Act* (1990) R.S.O. s.2.

> These municipal documents are an important element of the overall assessment of the impacts of water takings, as they provide the context to understand the compatibility of surrounding land use with the water taking operation.[186]

As well, the tension between the Planning Act and the Ontario Water Resources Act has produced conflict when municipalities have tried to restrict commercial water bottling operations through planning instruments. Despite the fact that the Planning Act supersedes the OWRA,[187] municipal authority to prohibit or restrict commercial water bottling operations has been challenged because the Planning Act does not specifically identify water taking as a use of land. However, in a seminal legal decision, *Grey Association for Better Planning v. Artemesia Waters Ltd. et al.*,[188] the Ontario Divisional Court ruled that water taking was a recognized land use under the Planning Act. This decision is significant because it appears to grant municipalities the authority to prohibit the installation of a commercial water bottling operation even though a permit has been issued under the PTTWP.

Conservation Authorities also have a clear interest in the allocation of ground water as they are responsible, among other things, for establishing low flow augmentation, flood control and the protection of ecologically sensitive areas. However, the PTTWP does not require Directors to consult with conservation authorities before approving a permit.

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[186] Association of Municipalities of Ontario, Water Taking Taskforce "Proposed Improvements to Ontario's Water Taking Permitting Process, Recommendations to the Government of Ontario" (December, 2002) at 8.
[187] A recent Ontario Municipal Board decision held that Section 71 of the Planning Act establishes the precedence of the Planning Act. Section 71 states: "In the event of conflict between the provisions of this and any other general and any other general or special Act, the provisions of this Act prevail."
[188] Superior Court of Justice, Divisional Court (November 21, 2002) Court File No. 504/02.

This undermines the ability of Conservation Authorities to carry out their water management projects.[189]

Further, even if Conservation Authorities were consulted, the inadequacy of data collected by the PTTWP on water availability and water use would make accurate predictions of the impacts of ground water withdrawals extremely difficult. Consequently, some Conservation Authorities, such as the Credit Valley Conservation Authority, have taken it upon themselves to collect such data. Rather worryingly, after collecting the relevant data, the Authority found that if all the permits for water takings in their watershed were added together "there would not be adequate supplies of water to meet the demand."[190]

### f) Lack of Public Participation and Stakeholder Involvement

The Environmental Bill of Rights provides citizens of Ontario certain rights with respect to participation in environmental decision-making. Consequently, the Ministry of the Environment posts proposals for water takings on the Environmental Registry web site. These proposals are posted for a period of thirty days, during which time the public can respond with comments. Once this period is over, the Ministry of the Environment makes its decision and posts it on the Registry.

In a study conducted by the Environmental Commissioner of Ontario ("ECO"), a number of limitations with this process were highlighted. First, most municipal water takings, water takings for irrigation of crops, and takings of less than one year are not required to

[189] *Supra* note 185 at 4.
[190] Barron,Vicki, General Manager of the Credit Valley Conservation, "Water Report" (June 1999) Report to the Chairman and Members of the Board of Directors, Credit Valley Conservation.

be posted.[191] This means the Registry is an incomplete database of water takings and is misleading for the public and local water managers. It also means that these permits cannot be challenged under the appeal provisions of the Environmental Bill of Rights. Second, the registry notices that are posted are often inadequate:

> ECO found a significant number of inconsistencies and deficiencies in the descriptions of PTTWs posted on the Registry by MOE. For example, the public is routinely not given enough information in the Registry notices to allow informed comment, including the name of the person to whom they should direct their comments. Furthermore, inaccuracies appear at an unacceptable frequency in the information provided by Registry notices.[192]

Information is commonly reported inaccurately or inconsistently, including the quantity of water to be abstracted, the length of the permit, and the location of the taking.[193] Third, ECO also found that, in some cases, it takes the Ministry of the Environment months or even years to post a decision notice. This is a serious problem as it causes confusion and uncertainty for the public and water managers. As well, the public is only allowed to appeal a decision after the decision notice has been posted on the Registry for fifteen days. If it takes months for the Ministry of the Environment to post that notice, a water taker may be extracting ground water for a considerable period of time before the appeal is even heard.[194]

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[191] *Supra* note 184 at 5.
[192] *Ibid.* at 18.
[193] *Ibid.* at 21-22.
[194] *Ibid.* at 21.

### g) Failure to Monitor and Enforce

The PTTWP relies on a reactive method of enforcement. Rather than employing a comprehensive monitoring program, the Ministry of the Environment will only take action to enforce the conditions of a permit if it receives a complaint of water interference by another user. On the receipt of a complaint, the Ministry will investigate the water use and can lay charges or impose fines if they discover a breach of the PTTWP. However, according to Leadley and Kreutzwiser, this is seldom the action chosen:

> The Ministry often prefers to encourage voluntary compliance to the recommended reduction in water taking rather than pursue the time consuming and costly avenue of legal prosecution.[195]

In recent years, the ability of the Ministry of the Environment to adequately monitor and enforce the PTTWP has been further undermined by a lack of funding and staffing cutbacks.[196]

### h) Conclusions

Ontario's PTTWP is an example of a system that appears to control the quantity of ground water withdrawn by requiring well owners who withdraw large quantities of water to obtain a permit. However, because permits are rarely denied, the PTTWP operates more like a system for the registration of withdrawals rather than one for the regulation of withdrawals.

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[195] *Supra* note 178 at 9.
[196] *Ibid.* at 9.

> In practice, water-taking permits are routinely issued with almost no opportunity for the public to scrutinize these decisions. There is seldom serious consideration of the implications of issuing such permits either individually or their cumulative effect. Moreover, there is little effort to keep track of the number and location of all of the permits. Essentially, permits are free for the asking. There is no guarantee that the ecosystem functions of water will be sustained under this system. Nor is there any reason to believe that water is being used for its best use.[197]

Serious consequences await Ontario if it does not reform its strategy for the allocation of ground water. In 2000, Gord Miller, the Environmental Commissioner of Ontario highlighted the growing risks of inaction in a special report submitted to the legislative assembly of Ontario:

> Ontario is in urgent need of a groundwater protection and management strategy, as evidenced by the demands being placed on Ontario's groundwater resources and the fragmented management of groundwater. A key element of this strategy is the need to protect groundwater supplies. There will be several negative consequences if the ministries fail to develop a groundwater strategy, including a growing number of conflicts over groundwater throughout rural Ontario and in urban areas that rely on groundwater for municipal and industrial purposes. There is a significant risk that many water taking permits will be granted and land use planning decisions made without adequate knowledge of groundwater availability. Furthermore, decisions about groundwater will not be made in a transparent and publicly accountable manner, contrary to the goals of the EBR.[198]

[197] McCulloch and Muldoon "A Sustainable Strategy for Ontario" (1999) Canadian Environmental Law Association Publication No. 367 at p.29.
[198] Gord Miller, Environmental Commissioner of Ontario, "The Protection of Ontario's Groundwater and Intensive Farming "(July 27, 2000) Special Report to the Legislative Assembly of Ontario at 8.

## C) Annex 2001: A Push for Regional Reform?

### 1. Background

Annex 2001 is a supplement to the Great Lakes Charter and like the Charter, it was drafted in response to the fear of bulk water exports to foreign countries and diversions to the southern United States.

In 1998, the Nova Group of Sault Ste. Marie, Ontario, applied to the province for a permit to remove 60 million gallons of water per year from Lake Superior for shipment to Asia in supertankers. The province approved the permit and was greeted with public condemnation and alarm by the other Great Lakes jurisdictions. Ontario withdrew the permit but the controversy sparked a review of bulk water removals by the International Joint Commission (IJC) which recommended the adoption of stringent standards to protect the Great Lakes from potentially damaging diversions.[199]

In response to these recommendations, the premiers and governors of the Basin signed Annex 2001 on June 18, 2001.[200] The document signed on this date is a non-binding

[199] The IJC recommended that no new removals of water from the Basin should be allowed unless the proponent could show that a) there are no practical alternatives for obtaining the water; b) full consideration has been given to the potential cumulative impacts of the proposed removal, taking into account the possibility of similar proposals in the foreseeable future; c) effective conservation practices will be implemented in the place to which the water would be sent; d) sound planning practices will be applied with respect to the proposed removal, and e) there is no net loss to the area from which the water is taken; in any event, there is no greater than a 5 percent loss (the average loss of all consumptive uses within the Great Lakes Basin); and the water is returned in a condition that, using the best available technology, protects the quality of and prevents the introduction of alien invasive species into the waters of the Great Lakes. See International Joint Commission, *Protection of the Waters of the Great Lakes – Final Report to the Governments of Canada and the United States* (February 2000), "Recommendation I. Removals".

[200] *The Great Lakes Charter Annex, A Supplementary Agreement to the Great Lakes Charter* (June 18, 2001).

commitment that seeks to reaffirm the principles of the Great Lakes Charter by enhancing the water management system in the Basin.[201] It sets out a number of directives requiring the governors and the premiers to establish binding implementing agreements to protect the Great Lakes Basin.[202] Annex 2001 applies the same definition for waters of the Basin that was used in the Great Lakes Charter. This definition includes ground water.

On July 19, 2004, the draft implementing agreements were released for public comment. Whereas the Great Lakes Charter is a good-faith non-binding agreement, the implementing agreements of Annex 2001 are intended to have binding effect. However, in both the United States and Canada only the federal governments have the constitutional competence to enter into internationally binding agreements.[203] To get around this problem, the draft implementing agreements include one good-faith agreement between all the jurisdictions of the Basin[204] and an interstate compact that binds only the states.[205] It was intended that Quebec and Ontario would either draft a parallel agreement or incorporate the provisions of the good-faith agreement into their own domestic provincial law.

On November 16, 2004, the process of implementing Annex 2001 was dealt a blow when the Minister of Natural Resources for Ontario announced that the government was not prepared to sign the good-faith international agreement in its current form.[206]

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[201] *Ibid.* at "Purpose".
[202] *Ibid.*at "Directives".
[203] See above at 75-76.
[204] Draft Great Lakes Basin Sustainable Water Resources Agreement (July 19, 2004).
[205] Draft Great Lakes Basin Water Resources Compact (July 19, 2004).
[206] News Release, "Level of Protection in Draft Great Lakes Charter Annex Agreement Not High Enough, *Changes Needed Before Ontario Will Sign*" online: Ministry of Natural Resources, Ontario <http://www.mnr.gov.on.ca/MNR/csb/news/2004/nov15nr_04.html>.

Ontario's refusal to sign arose from concerns that the current implementing agreements would permit large-scale diversions to thirsty American cities located just outside the boundary of the Basin, such as Waukesha, Wisconsin. Consequently, the Minister for Natural Resources stated that Ontario would remain committed to its provincial law, which bans all diversions.[207] It was stated further that Ontario would only approve Annex 2001 if it provides for no diversions or for no net loss, which was the position proposed by the IJC.[208]

Although most of the controversy concerning Annex 2001 has surrounded the issue of diversions out-of-basin, Annex 2001 also contains provisions relevant to withdrawals of surface water and ground water that occur within the Basin. Ontario's provincial government has not expressly opposed these provisions and it is likely that if the implementing agreements are renegotiated, these provisions will not be changed. The following section considers the potential effectiveness of these provisions and the conclusions that can be drawn from the way they are drafted.

## 2. Provisions Applicable to Ground Water Withdrawals

The drafters of Annex 2001 were concerned that global and domestic trade laws would consider any standards applied solely to out-of-basin diversion proposals as

[207] *The Water Taking and Transfer Regulation* (1999) Ontario Regulation 285/99.

[208] For a more detailed discussion of the diversion issues the writer refers the reader to a recent article written by Andrew Nikiforuk, "Political Diversions: Annex 2001 and the Future of the Great Lakes" (June 2004) online: Program of Water Issues, Munk Centre for International Studies < http://www.powi.ca>, a number of publications available on the website of the Canadian Environmental Law Association <http://www.cela.ca>, and a legal position by Steven Shyrbman on behalf of the Council of Canadians, "Great Lakes Basin Sustainable Water Resources Compact and the Diversion of Great Lakes" Waters (October 2004) online: Council of Canadians < http://www.canadians.org/>.

discriminatory.[209] Therefore, the governors and premiers drafted Annex 2001 and its implementing agreements to apply to in-basin, as well as out-of-basin withdrawals.

In terms of in-basin withdrawals the draft implementing agreements require the following:

### a) Regional Review of Substantial Consumptive Uses

Any new or increased consumptive use[210] over 5 million gallons per day (19 million litres per day) during a 120 day period requires approval from a regional body, which is to be composed of the governors and premiers, or their representatives, from all the Great Lakes jurisdictions.[211]

### b) Jurisdictional Review of Large-scale Withdrawals

A new or increased withdrawal of greater than 100,000 gallons per day (379,000 litres per day) average in a 120 day period will be regulated by the individual states or provinces.[212]

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[209] In drafting Annex 2001 and its implementing agreements heavy reliance was placed on a legal memorandum written by James Lochhead and his team of Denver lawyers, Lochhead et al. "Report to the Council of the Great Lakes Governors: Governing Water Withdrawal of Water from the Great Lakes" (May 1999). Lochhead asserted that simply saying "no" to diversions would be potentially subject to challenge under the dormant commerce clause of the U.S. constitution and the prohibition against export controls under the General Agreement on Tariffs and Trade ( the GATT) of the World Trade Organization. He advocated the use of a common standard to govern out-of-basin and in-basin withdrawals in order to avoid discriminatory practices.

[210] Consumptive use is defined as any portion of water withdrawn or withheld from the Great Lakes Basin that is lost or otherwise not returned to the Great Lakes Basin due to evaporation, incorporation into products or other processes. *Supra* note 204.

[211] *Ibid.*at Article 201.

[212] *Ibid.*

### c) Compliance with Procedures Manual

Proposals to either the regional body or the individual jurisdictions are only considered consistent with Annex 2001 when the applicant is able to comply with the following standards established in the Procedures Manual:

i) The need for all or part of the withdrawal cannot be avoided through efficient use and conservation;

ii) The withdrawal will be limited to the quantities considered reasonable for the purposes proposed;

iii) All water withdrawn shall be returned to the Basin less an allowance for consumptive use for the applicable water sector. Water withdrawn from a Great Lake or the St. Lawrence River shall be returned to the watershed of that Great Lake or the St. Lawrence River. Water that is withdrawn from a direct tributary of a Great Lake or the St. Lawrence River should preferably be returned to the watershed of that tributary;

iv) The withdrawal will not result in significant or cumulative adverse impacts for the quantity or quality of the waters in the Basin;

v) Environmentally sound and economically feasible water conservation measures will be implemented to minimize water withdrawals and or consumptive use.

The following requirements are only applicable to regional review:

vi) The withdrawal proposal shall incorporate a conservation plan;

vii) Accompanying a proposal for a consumptive use in excess of 5 million gallons per day must also be a proposal for a project that will improve the waters and the water-reliant ecosystem of the Basin. [213]

With respect to the allocation of ground water within the Basin, Annex 2001 builds on earlier commitments made in the Great Lakes Charter. The regional review requirement is a strengthened version of the consultation provision in the Charter (which required the other states and provinces to be consulted prior to the approval of a permit for 5 million gallons per day).[214] Whereas the consent of the other jurisdictions was advocated in the Charter, it is now obligatory under Annex 2001. The jurisdictional review requirement compels all the states and provinces within the Great Lakes Basin to establish regulatory permit systems for large-scale water withdrawals, including withdrawals of ground water. If it has the desired effect, the six jurisdictions only requiring registration of ground water withdrawals will enact legislation that requires permits from large-scale ground water users. However, a word of caution is needed. While the progression from registration to regulation can be an important step, it does not necessarily secure the effective protection of ground water resources. This is clearly evident from the above analysis of Ontario's permit program.

## 3. Limitations of the Draft Implementing Agreements

During the drafting process, powerful industrial and agricultural lobbies applied considerable pressure to the governors and premiers. These lobbies are content with the *status quo*. Large-scale diversions out of the Great Lakes Basin to southern regions

[213] *Ibid.*at Appendix 1.
[214] *Supra* note 128.

are essentially prohibited at this time[215] and restrictions on water use (particularly ground water use) within the Basin are virtually non-existent. This provides these sectors with a competitive advantage over their southern counterparts. The lobbies were extremely concerned that in-basin regulations would put the Basin at an economic disadvantage to other regions:

> Our overall concern with the progress toward a binding implementation agreement is that the resulting regulatory framework, under which control is sought, **MUST NOT** place Basin water users at a disadvantage over those operating elsewhere. Exposing new withdrawal proposals to protracted, uncertain, and expensive permitting processes and existing users to new water conservation requirements cannot be supported by CGLI regardless of our desires to see Basin jurisdictions retain control of water resource decision-making authority.[216]

An analysis of the provisions in the draft agreements (as previously stated above) would suggest that the governors and premiers were cognizant of these fears.

a) Permit Trigger Levels

i) Regional Review

The provisions essentially create a permit system by which trigger levels determine the requirement for regional or jurisdictional review. Under the

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[215] Water Resource and Development Act 1986 (amended 2000) WRDA is a U.S. federal law that prohibits any new or increased diversion of water from any U.S. portion of the Great Lakes or their tributaries for use outside the basin unless the governors of all the Great Lakes states approve such diversion. The federal government of Canada passed an amendment to the Boundary Waters Act to prohibit further diversions and both Canadian provinces have also introduced legislation that prohibits diversions.

[216] Council of Great Lakes Industries "Presentation by George H. Kuper at the International Joint Commission's Great Lakes Conference Workshop, Great Lakes Water Uses: Annex 2001 and Beyond" (2003) online: Council of Great Lakes Industries <http://www.cgli.org/annex/LakeLinksarticle.doc>.

regional review provision the trigger level is the *consumptive use* of 5 million gallons per day over a period of 120 days. This is an extremely high trigger level. Under the consultation procedures of the Great Lakes Charter, only one consumptive use proposal has been above 5 million gallons per day since its signing in 1985.[217] For this reason, it seems unlikely that the regional body will have to consider more than a handful of proposals. Moreover, although the impacts of consumptive use are equivalent to the impacts of diversion (and actually worse if the diversion project is returning water), the trigger level for regional review of diversions is 1 million gallons per day.[218] The absurdity of this distinction was evident in comments made on the draft agreements by a group of environmental organizations:

> The proposed system could lead to very large disparities of treatment and very widely divergent end results for certain pairs of water withdrawal proposals that are in fact quite similar in their potential ecosystem impact. For example, a consumptive loss of 4.5 million gallons per day averaged over 120 days 1) avoids Regional Review and multi-jurisdictional vote, 2) makes no improvement to the basin ecosystem, and 3) carries out mere unspecified "conservation measures." At the same time, a diversion of 1.5 million gallons per day, which entails one-third the water loss and therefore, considered generically, one-third the ecosystem impact, must by comparison 1) suffer the scrutiny of ten jurisdictions and the executive power of eight, 2) implement a much more rigorous "conservation plan," and 3) make an improvement. The generically much smaller ecological impact in this scenario generates much more rigorous treatment.[219]

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[217] *Supra* note 133.
[218] *Supra* 204 at Article 201.
[219] "Environmental Groups Comments on the Proposed International 'Great Lakes Basin Sustainable Resources Agreement Water Resources Agreement'" (October 2004) CELA Publication 484b, online: Canadian Environmental Law Association <http://www.cela.ca> at 6.

The environmental group found the potential disparity between the two *types* of withdrawals even more troubling than this *numerical* disparity. The reason is that water "consumption" usually entails a substantially larger amount of water to be withdrawn than is actually consumed. The group provided the following illustration to demonstrate their concern:

> For another, much more problematic example, efficient municipal supply systems that lose just 10 percent and return 90 percent of withdrawn water would be treated exactly inversely to their likely ecological impact. An out-of-basin municipal applicant of this type would be subject to eight-state, two province Regional Review when proposing a diversion of 1 million gallons per day, but an in-basin applicant of the same type would be subject to Regional Review only at the level of 50 million gallons per day, because it would take that much withdrawal to lose 5 million gallons at a loss rate of 10 percent. Yet in the former case the ecological insult to the basin is a loss of 100,000 gallons per day, while in the latter, 5 million gallons per day.
>
> This is to say, the agreement's currently proposed system allows the possibility of a fifty-to-one disparity in potential ecological impact before finally triggering similar treatment of like proposals.[220]

As well, it should be noted that this disparity in treatment could jeopardize the legality of Annex 2001 because it could possibly be considered discriminatory under international trade law.[221]

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[220] *Ibid.*
[221] *Ibid.* at 7.

ii) Jurisdictional Review

Under the jurisdictional review process, the trigger level is set at withdrawals over 100,000 gallons per day over a 120-day period. This is an arbitrary level that is excessively high.

Three of the four jurisdictions that have existing legislation to regulate withdrawals of ground water have established much lower trigger levels. Minnesota's permit legislation requires any user withdrawing more than 10,000 gallons per day to get state approval; Ontario requires permits from any user withdrawing more than 13,000 gallons per day; and Quebec sets its threshold for provincial approval at 19,500 gallons per day.

Depending on the predominant hydrology and the sensitivity of the local ecosystem, the pumping of ground water at much lower quantities than 100,000 gallons per day can have a significant impact, particularly if the impact is in addition to the impacts of other nearby wells.

> Withdrawal amounts below the 100,000-gallon level account for a relatively small portion of total basin withdrawals, but, when they take place from headwaters or other small water sources, they have the potential to have disproportionately significant impacts on the ecosystem.
>
> Minnesota and Ontario permit at the 13,800- and 10,000-gallon-per-day range (50,000 and 38,000 litre range), and the international agreement should do so as well.
>
> Awareness of the locations and basic types of smaller withdrawals is essential to evaluating the cumulative effects of such withdrawals on sensitive

> ecosystems, especially in the context of larger withdrawals that may be proposed or already taking place nearby.[222]

Prior to the production of the draft agreements, the environmental group published a report that recommended a trigger level of 1 million gallons per day for regional approval and 13,000 gallons per day for independent state or provincial approval.[223]

Also problematic is the length of the averaging period used to determine the volume of proposed use. In Annex 2001 the average period is 120 days for both regional and individual jurisdiction review. In their comments on the proposed draft agreements, the environmental group stated:

> Using a 120-day averaging period completely undermines the threshold levels, particularly for agricultural irrigators who operate for only a month at a time and would be able to average that use over a four-month period.[224]

The environmental group states that 30 days is the appropriate averaging period. Interestingly, 30 days was the period used in the Great Lakes Charter for reporting and consultation requirements.[225] This may indicate that the drafters of the implementing agreements were concerned that keeping the 30 days average may unduly restrict the operations of large irrigators within the Basin.

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[222] *Ibid.* at 15.
[223] "Basin environmental groups' response to November 2002 Water Management Working Group materials" (January 2003) online: Canadian Environmental Law Association <http://www.cela.ca>.
[224] "Responses to Council of Great Lakes' Governors Issues for Public Comment" (October 2004), CELA Publication 484d, online: Canadian Environmental Law Association <http://www.cela.ca>.
[225] *Ibid.*

b) Improvement to the Waters of the Basin

For consumptive uses over 5 million gallons per day, the applicant must include a proposal for the improvement of the waters and the water dependent natural resources of the Basin. However, this is not a requirement for the withdrawals considered in the jurisdictional review process.[226] This omission undermines one of the core principles of the original Annex 2001 document.[227]

c) Conservation Plans

While conservation plans are a required element of an application to the regional body, they are not required for an application to jurisdictional review.[228] The provisions for jurisdictional review require that an applicant need only show that they will implement environmentally sound and economically feasible water conservation measures. Under the definition section of the drafting agreements, the meaning given to conservation measures appears to only compel applicants to implement such measures where the benefits outweigh the economic costs.[229]

d) Return Flow

Water must be returned to the Great Lake watershed from which it was removed but it does not have to be returned to the same tributary watershed.[230] The implementing

[226] *Supra* note 213.
[227] *Supra* note 200 at Directive 3.
[228] *Supra* note 213.
[229] *Supra* note 204 at Article 103.
[230] Watersheds are nested within one another. The Great Lakes Basin is a massive watershed. Within the Basin each Great Lake has its own watershed, still on a very large-scale. Within these are direct tributary watersheds (such as the Grand River watershed in Ontario) and within these watersheds are even smaller tributary watersheds.

agreements indicate that this is preferable but do not require it.[231] This fails to account for the local scale impacts of water removals. Furthermore, there is no mention of the need to return ground water to the recharge area from which it was abstracted. This is noteworthy because aquifers and their connected surface waters are impacted whenever water is withdrawn and the impacts are compounded if the removed water is never returned as recharge to that aquifer.

e) Public Participation

The implementing agreements advocate only minimal public involvement in decision-making.[232] In the regional review process, the regional body is required to notify the public of water taking proposals and will receive comment from the public.[233] In the jurisdictional process, the states and provinces are merely *encouraged* to provide an opportunity for public input and comments on a proposal.[234] These agreements are therefore designed to initiate centralized, top-down approaches to water allocation. It would be left to the individual states or provinces to voluntarily include meaningful public participation in the decisions relating to permits.

## 4. What Impact Will Annex 2001 Have on Ground Water Withdrawals?

Some broad conclusions emerge from an analysis of the substantive provisions in the current Annex 2001 implementing agreements. Annex 2001 is really a political

[231] *Supra* note 213.
[232] *Supra* note 204 at Article 503.
[233] Ibid.
[234] Ibid.

document aimed at securing short term growth in the region at the potential expense of the long term economic and environmental viability of the Great Lakes Basin.

> To date, Annex 2001 has been driven by political concerns about getting water to thirsty communities such as Waukesha without inviting the world to a free water party.[235]

Provisions concerning withdrawals were only included to avoid claims of discrimination in international trade law. Even with this purpose they were still drafted unequally in comparison to provisions applicable to diversions. It is clear from the withdrawal and consumption provisions that the concerns of industrial and agricultural lobbies have taken precedence over the concerns of environmentalists and local communities. If the drafters were serious about reducing the environmental impacts of water withdrawals in the Basin, they would have made the threshold for jurisdictional and regional review much lower and left the averaging period at 30 days. They would also have accounted for the cumulative impacts of small and mid-size water withdrawals and encouraged much greater public participation in the decision-making process. Instead, they adopted standards for review that were drafted in such a way that they can be interpreted by state and provincial governments in favour of continued economic growth. These provisions therefore lack the necessary teeth required to prevent the excessive exploitation of ground water resources in the Basin.

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[235] Andrew Nikiforuk, "Political Diversions: Annex 2001 and the Future of the Great Lakes" (June 2004) online: Program of Water Issues, Munk Centre for International Studies < http://www.powi.ca> at 21.

## D) Summary

The laws that allocate ground water in the Basin are archaic. They were established at a time when scientific understanding of ground water hydrology was extremely limited. Since that time, scientific understanding has substantially improved but the rules that govern the use of ground water are still situated in the nineteenth century.[236]

In six of the ten jurisdictions of the Basin, common law determines the allocation of ground water. In light of the problems arising from ground water pumping (described in Chapter 2), this is no longer tenable. Common law systems were designed to resolve disputes between property owners, but not to allocate limited resources. In common law systems, the protection of property rights is considered paramount over the needs of the environment. As they were founded at a time when natural resources seemed inexhaustible, these systems were never designed to deal with the complex problems produced by the excessive exploitation of natural resources.

However, it is clear from the study of Ontario's legislative permit program that simply making ground water utilization subject to government approval does not guarantee the protection of ground water resources. In the permit program, the lack of investment in scientific data combined with a lack of stakeholder involvement seriously undermines the ability of government officials to consider the interests of all parties affected by their decisions. As a result, more permits to withdraw ground water have been granted than is hydrologically appropriate.

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[236] It is true to say that more information is needed concerning ground water withdrawals and their impacts on the Basin (see Chapter 5 at 174 and Appendix II). However, this is not due to the shortcomings of science but can be contributed to the failure of governments to invest in studies that would produce this information. In other words, it is a political failure rather than a scientific failure and the uncertain science that hampered the courts of the nineteenth century is no longer a reasonable excuse for legal inadequacies.

International law in the Basin is suffering from the same problems as domestic law. The Basin's international surface waters are governed by a treaty that was forged in 1909 when there was no notion that ground water withdrawals could have international impacts. Today, no one knows whether the international treaty or international customary law would be applied to a dispute concerning ground water. The lack of clear international obligations for the responsible management of the Basin's ground water resources is detrimental to the long term economic and environmental interests of the residents of the Basin. It also makes the prospect of transnational disputes over ground water more likely. Thus, the absence of a formal transnational commitment to the responsible management of ground water resources is placing the Basin in a precarious position.

The regional framework proposed by the Basin's governors and premiers is unlikely to resolve the legal inadequacies arising from these other systems. The underlying purposes of Annex 2001 and the implementing agreements are not to secure the long term health of the Basin, but to ensure the short term economic growth of industry and agriculture in the entire region, including the parts of the Basin states that lie outside the Basin. The regional framework is essentially blind to local and non-economic interests and although it is presented as an instrument for "protecting, conserving, restoring, and improving the Great Lakes,"[237] it is really an illustration of what Andrew Nikiforuk describes as the "illusion of regional solutions":

> For starters any regional agency making a decision about a resource, whether it be water or oil, tends to belittle local concerns. A citizen participating in a Great Lakes debate, say, about groundwater mining, has five times the impact in a town of 20,000

[237] *Supra* note 200 at "Findings."

> than in a city of 100,000 and virtually none in a region of 45-million people. In other words regional bodies often diminish the authority of local decision makers. Second, most solutions offered by the regional authority are usually designed to accommodate past and predicted growth. As a consequence they foster and encourage growth (and more water takings) rather than limiting such behaviour.[238]

It seems clear that courts, governments and regional institutions are aware that unrestrained ground water pumping poses a significant threat to the integrity of the Basin. However, these authorities are reluctant to make the reforms necessary to provide for the long term economic and environmental prosperity of the region. The following chapter examines the ideology that underlies this reluctance.

[238] *Supra* note 235 at 18.

# Chapter 4

# Theoretical Underpinnings of Unregulated Ground Water Withdrawals

In Chapter 2, the writer describes the increasing number of conflicts that are occurring over the use of ground water throughout the Great Lakes Basin and the detrimental impacts of ground water pumping on the Basin's ecosystem. In Chapter 3, the writer concludes that the out-dated laws that allocate ground water within the Basin are incapable of responding to these contemporary ground water problems.

This chapter posits that a closer examination of the predominant liberal ideology in both Canada and the United States reveals a systematic undervaluation of environmental interests and the long term interests of present and future generations in decisions relating to the use of natural resources. When applied to ground water, it is evident that this underlying ideology has inhibited the adoption of legal mechanisms that would adequately balance the use of ground water with the needs of the ecosystem. Accordingly, it has limited the freedom and autonomy of present and future generations to utilize ground water resources and interact with their local environment.

The final part of this chapter presents an alternative approach to our understanding of "sustainability." Sustainability is an idea that has promised to change the way we manage our resources, but has yet to deliver this promise. It is the writer's contention that framing sustainability as a "process of political discourse," rather than as a term of science or an economic model, presents a very real opportunity to change the context of

the relationship between communities and their natural surroundings. Accordingly, such an understanding of sustainability would provide the foundations for an effective management strategy for the ground water resources in the Basin.

## A) The Green Critique of Liberal Democracy

When it comes to managing natural resources, the current manifestation of liberal democracy in both Canada and the United States[1] has a number of inherent weaknesses that undermine its ability to prevent environmental degradation.

### 1. The Importance of Property and The Prominence of Material Consumption

*Though the Water running in the Fountain be every ones, yet who can doubt, but that in the Pitcher is his only who drew it out. His labour hath taken it out of the hands of Nature, where it was common, and belong'd equally to all her Children, and hath thereby appropriated it to himself.*[2]

John Locke, the grandfather of classical liberalism, whose theories of individualism and property are still influential in today's Anglo-American liberal democracy, believed that well-being was derived from the ownership of property.

[1] The writer refers to the current manifestation of liberal democracy in Canada and the United States as "Anglo-American liberal democracy." In the United States, the term "liberal" or "liberalism" has taken on many meanings and is now completely dislocated from its original meaning which is the "classical liberalism" discussed in this chapter. However, "classical liberalism" is now an integral part of the fabric of U.S. society and its mainstream politics.
[2] John Locke, *Second Treatise of Government* (1690) at Chapter V.

> In Lockean liberal political theory there is an implicit conception of happiness and the good life. Analyzing Locke's *Second Treatise*, one can find that happiness and the good life are primarily defined in terms of material gratification and property rights.[3]

Locke believed that God gave nature to man and while it remained undisturbed it belonged to all men to be held in common. However, if a person went to the effort of physically removing an element from nature, that person effectively transferred something of his own body into that element and could justifiably claim it as his private property.

> "Though the earth and all inferior creatures be common to all men, yet every man has a "property" in his own "person." This nobody has any right to but himself. The "labour" of his body and the "work" of his hands, we may say, are properly his. Whatsoever, then, he removes out of the state that Nature hath provided and left it in, he hath mixed his labour with it, and joined to it something that is his own, and thereby makes it his property. It being by him removed from the common state Nature placed it in, it hath by this labour something annexed to it that excludes the common right of other men."[4]

Once an element of nature became private property, the rights of others over that element were lost. This notion of untrammeled private property rights is still at the forefront of liberal thought today and the accumulation of property is still considered by many as the determinant of well-being. Hence, in order to achieve happiness, people in a liberal democracy are encouraged to acquire as much property as possible. As Marius de Geus suggests, this encourages a virtually unrestrained consumption of natural goods and results in serious consequences for the environment:

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[3] Marius de Geus, "Sustainability, Liberal Democracy, Liberalism" in John Barry & Marcel Wissenburg, *Sustaining Liberal Democracy: Ecological Challenges and Opportunities* (New York: Palgrave, 2001) at 30.
[4] *Supra* note 2.

> Such happiness appears to depend strongly on achieving the highest possible level of consumption. The aim of the good life seems to be reduced to material progress and a broadening of property and consumer options. Status and well-being are primarily measured by the amount of property rights and consumer goods that people have. The consequence is that society rushes in the direction of continual expansion of needs and a ceaseless satisfaction of consumer desires.
>
> A high level of consumption and a materialistic lifestyle, however, have far reaching consequences; the deterioration of nature together with adverse effects on the human environment.[5]

State institutions in Anglo-American liberal democracies are reluctant to place any limits on the accumulation of property because this may be perceived as restricting the freedom of citizens to pursue well-being. This reluctance is reflected in the legal mechanisms employed by legislatures and courts.

> This is reflected in the general reluctance by legislatures and courts to impose any restrictions on property rights in the absence of clear proof of harm to others, and the fear of having to pay compensation whenever private property is acquired or "taken" for public purposes. In Anglo-American liberal democracies any harm flowing from the use of property rights has traditionally been regulated by the common law, such as the law of contract and particularly the law of torts, which have placed the onus on those suffering ecological harm or contractual damage to prove damage, causation, and dereliction of legal duty.[6]

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[5] *Supra* note 3 at 30.
[6] Robyn Eckersley, *The Green State: Rethinking Democracy and Sovereignty* (Massachusetts: The MIT Press, 2004) at 100.

## 2. The Undervaluation of Environmental Interests in the Political Arena

The broad principles of liberalism are autonomy and justice, autonomy in the sense that individuals should have the right to determine their own affairs, and justice in the sense that this right is accorded to each and every individual.[7]

Generally speaking, liberals believe the only way people can be truly autonomous is to allow them the ability to pursue their own self-interests with as little interference from the state as possible. Liberal democratic states therefore seek to mediate these interests without invoking any formal processes that might influence or change these interests. Consequently, liberal democracy can be understood as:

> [T]he political theory that holds that many conflicting and even incommensurable conceptions of the good may be fully compatible with free, autonomous, and rational action.[8]

Such a theory could be considered fair if all players are fully aware of their choices and if all interests are equally represented in the political mediation. Unfortunately, in Anglo-American liberal democracies, this is not the case. Social structures have been moulded around the idea that well-being is derived from the accumulation of property and material consumption. As a result, individuals have a preset bias towards these interests, ahead of other less-entrenched values such as their relationships with the environment. Liberal democracy ignores the influence of social structures on individuals by assuming that all values and interests are derived from a position of independent thought.

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[7] Robyn Eckersley, "Greening Liberal Democracy: The rights recourse revisited" in Doherty & de Geus, eds. *Democracy and Green Political Thought* (London and New York: Routledge,1996) at 222.
[8] Mark Sagoff, *The Economy of the Earth: Philosophy, Law and the Environment* (1988) (Cambridge: Cambridge University Press) at 151.

> [A]ll citizens/consumers are considered equally free and unencumbered agents and therefore equally capable of making independent choices, *all individuals are fully formed prior to making choices*, and all such choices should be accepted at face value. Liberal theorists typically make the *rational choice assumption* that political preferences are preformed and given, prior to economic exchange or political negotiation. [Emphasis Added][9]

Believing that it should not interfere with the freedom of individuals to make rational choices, the state does little to facilitate deliberative forums in which preformed interests could be challenged. As a result, individuals have very little exposure to peripheral or relatively new interests (such as environmental protection), that could make them question their preset interests (property and wealth). As individuals do not have exposure to all the possible choices, it is questionable whether they can really be considered "free and unencumbered agents" or rather merely products of a particular social structure. Eckersley states that:

> [I]t is here that green democratic theorists have argued that policy making in liberal democracies reveals a systematic bias against the protection of public environmental interests and in favour of certain private interests. In other words, the liberal democratic state (and the liberal culture that it both reflects and shapes) is not impartial in the way it prioritizes certain freedoms over others. The upshot is that the liberal democratic state can only guarantee formal rather than substantive freedom for all to determine their own conception of the good.[10]

As environmental interests are unable to permeate social structures, they are largely dependent on the influence of environmental organizations to represent these interests in the political process. A significant amount of contemporary policy-making in Canada

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[9] *Supra* note 6 at 97.
[10] *Ibid.*

and the United Sates involves negotiations between interest groups and government. However, environmental organizations are often unable to compete against larger or more influential political interest groups.

> [I]n the political bargaining over who gets what, when, and how in liberal democracies, political actors who are better resourced, better informed, and strategically located vis-à-vis the centres of policy making invariably have a distinct advantage over socially and economically marginalized groups and classes in the lobbying and bargaining stakes. ... The diffuse notion of the public interest is always at a disadvantage when dealing with a small number of well-organized interest groups with a direct material or financial stake in policy outcomes.[11]

This disparity has led one prominent political theorist to say that "in no respect can liberal democracy and environmental concerns be so much at odds as where liberty is concerned."[12]

## 3. Dominating Nature: Technological Solutions to Resource Management

Anglo-American liberal democracy was founded upon the basic belief that the environment can be dominated and controlled by mankind. Locke viewed the Earth as something that was "given to men for the support and comfort of their being..."[13] and which only became valuable once Man had mixed his labour with it.

> God, when he gave the World in common to all Mankind, commanded Man also to labour, and the penury of his Condition required it of him. God and his Reason commanded him to subdue the earth, i.e. improve it for the benefit of Life, and therein lay out something upon it that was his own, his labour. He that in Obedience to this

[11] *Ibid at 98.*
[12] Marcel Wissenburg, *Green Liberalism: The Free and the Green Society* (London: UCL Press 1998) at 33.
[13] *Supra* note 2.

> Command of God, subdued, tilled and sowed any part of it, thereby annexed to it something that was his Property, which another had no Title to, nor could without injury take from him.[14]

To Locke, there was no dependency on the Earth in its natural state; it was merely a resource to be exploited and transformed into property for the pleasure of Man. Marcel Wissenburg summarizes this Lockean attitude towards nature:

> Nature has two roles to play in liberal thought: physically, it was an inexhaustible source of resources, intellectually, it was the incarnation of the laws of nature over which humankind had triumphed, which it had transcended.[15]

Susan Leeson has cogently expressed the impact of Locke's theory on contemporary Anglo-American liberal society:

> Lockean thought legitimated virtually endless accumulation of material goods; helped equate the process of accumulation with liberty and the pursuit of happiness; helped implant the idea that with ingenuity *man can go beyond the fixed laws of nature*, adhering only to whatever temporary laws he establishes for himself in the process of pursuing happiness; and helped instill the notion that the "commons" is served best through each man's pursuit of private gain, *because there will always be enough for those who are willing to work*. [Emphasis added][16]

Today, the attitude that "man can go beyond fixed laws of nature" is still prevalent and continues to be based on the notion that "there will always be enough for those who are

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[14] *Ibid.*
[15] *Supra* note 12 at 74.
[16] Susan Leeson, "Philosophic implications of the ecological crisis: The authoritarian challenge to liberalism" (1979) 11 Polity at 305-306.

willing to work." This attitude, originating from Locke's premise, is simplistic and outdated. Eckersley points out the absurdity of maintaining these seventeenth century beliefs in a modern society:

> [M]any contemporary liberal philosophers still seem to forget that their liberal forebears forged their political ideals in a bygone world that know nothing of the horrors of bioaccumulation, threats of nuclear war, Chernoybl and Bhopal, mad cow disease and global warming. Moreover liberal values were born in an emerging market society that assumed an expanding resource base and a continually rising stock of wealth. Liberalism, along with its great rival Marxism, fully absorbed the Enlightenment idea of progress, assuming that scientific progress and technological domination of nature would provide plenty for all. These views might have made more sense in the seventeenth and eighteenth centuries, when it seemed more reasonable to suppose that everything about the world was potentially (and soon to be) knowable, available, and rationally controllable.[17]

## 4. Reactive Governments in Liberal Democracies

Governments in liberal democratic states are reactive because they do not anticipate environmental problems before they occur. Even after these problems have been identified, governments often ignore them until they have reached a state of crisis. The reason for this reactive approach is that governments' horizons generally only extend as far as the next election. Perceiving that citizens are most concerned with economic gain, governing institutions are reluctant to invest in resolving environmental problems because this investment produces no obvious short term material benefit. Their primary focus is on insuring the short term economic prosperity of their jurisdiction in order to facilitate their re-election. This often means providing incentives to commercial sectors

[17] *Supra* note 6 at 108.

to boost short term economic growth, even though these incentives may be at the expense of environmental protection.

## B) Applying the Green Critique to Ground Water in the Great Lakes Basin

In Anglo-American liberal democracies, the environmental and long term interests of present and future generations are effectively left voiceless in the political process. The traditional prominence of property rights and failure to inform citizens of environmental concerns relegate environmental interests to the outer edges of the political spectrum where they are unable to compete with more powerful short term economic interests. Consequently, liberal democracy can be understood as leading to a "systematic undervaluation of ecological interests."[18] This undervaluation has been clearly evident with respect to ground water in the Great Lakes Basin.

### 1. Excessive Ground Water Use

As described in Chapter 2, the citizens of the Basin are some of the highest water users per capita on the planet and their ground water use has increased significantly in recent years.[19] Ground water is used directly by residents in their dishwashers, in their high-pressure showers, to water their lawns, and to wash their vehicles. Residents also use ground water in an indirect fashion when they purchase material goods in which ground water has been an integral part of the manufacturing process, and when they purchase

[18] *Supra* note 3 at 21.
[19] See Chapter 2 at 46.

food products that have been grown using ground water irrigation schemes. An additional problem is the increasing use of ground water for bottled water that is sold commercially to residents within and outside the Basin.

The high consumption of water that accompanies a materialistic lifestyle is taking its toll on ground water levels, contributing to conflicts between users, and leading to the degradation of local ecosystems.

## 2. The Protection of Property Rights

The sanctity of property rights is clearly evident with respect to ground water in the Basin. Historically, ground water has been tied to the ownership of property. Under the "absolute ownership rule," ground water was treated as if it was part of the soil and therefore as though it was private property as opposed to common property.[20] Although current scientific knowledge clearly shows that ground water is mobile and one user's pumping can affect another's access to ground water, courts and government institutions have been reluctant to interfere with these traditional property rights.

As outlined in Chapter 3, most users in the Basin are only required to comply with the common law rule of reasonable use, and most high-capacity well-owners only need to register their withdrawals. The majority of jurisdictions in the Basin do not require large-scale ground water users to obtain permits from the state, and as the Ontario case study demonstrates, permit requirements do not necessarily translate into restricted ground water withdrawals.[21] Consequently, common law developments and legislative action

[20] See Chapter 3 at 78.
[21] See Chapter 3 at 105.

have done little to restrain property owners from abstracting unlimited quantities of ground water.

### 3. Inequality in Bargaining Power

Although there are numerous interest groups that are concerned with the problems caused by ground water pumping, in decisions relating to the use of ground water, these groups generally lose out to organizations with financial interests. For example, in Ontario and Michigan, despite fervent opposition from environmental and community organizations, commercial water-bottling operations have been established with the help of tax incentives provided by the respective governments. The water-bottling operations withdraw huge quantities of ground water and threaten the integrity of local environments and the continued operation of shallow domestic wells. The governments actively encouraged these operations because of perceived economic benefits.[22]

Furthermore, in Michigan, powerful industrial and agricultural lobbies have blocked the implementation of state ground water legislation for many years. This is in spite of committed support for legislation from environmental organizations. The influence of industrial and agricultural lobbies is also evident in the Annex 2001 draft implementing agreements that are discussed in Chapter 3. Once again, in spite of committed lobbying by environmental groups, the needs of the Basin's fragile ecosystem were compromised for the needs of short term economic growth.

[22] See Chapter 2 at 33 and 38.

## 4. The Supply-Oriented Approach

The belief that the Earth has endless supplies of resources is certainly evident in the management of ground water in the Basin. The attitude that nature can be subdued by technology and controlled for the material benefit of mankind has resulted in a supply-oriented approach towards the management of all water resources in the Basin, particularly regarding ground water. In the last century, if wells went dry, technological innovations were developed that allowed users to drill deeper wells and install larger pumps.

The short-sightedness of this approach is steadily becoming apparent as conflicts over ground water use in the Basin are increasing, and evidence of the negative impact of ground water pumping on local ecosystems is becoming apparent.[23] The danger of a supply-oriented approach is already evident in the management of ground water resources in other regions of the United States. Unless attitudes change, these regions may be predictors of things to come in the Basin. In *Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters*, Robert Glennon lucidly illustrates the failure of courts and governments to acknowledge hydrological realities and the disastrous consequences this ignorance has had for watercourses, local ecologies, and future economic stability.[24]

> Most states have failed to eliminate the gap between law and science. In lieu of legal reform, Americans have shown limitless ingenuity in devising technological fixes for water supply problems by altering the hydrological cycle to sustain existing usage. ... Each solution reflects our belief that we can control nature, even as we ignore reality.

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[23] See Chapter 2.
[24] Robert Glennon, *Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters* (Washington D.C.: Island Press 2002).

> Each proposal offers an immediate yet temporary fix to a larger problem. These alternatives are band-aids that may prevent an infection from getting worse, but they are not the cures for the disease. They instead allow us to ignore the inescapable reality that our uses of water are not sustainable over the long term.[25]

## 5. The Danger of Reactive Governance to Ground Water Problems

Governments cannot afford to be reactive to problems caused by ground water pumping in the Basin. The impacts of ground water pumping are often slow to manifest and may well be irreversible by the time they become apparent. Therefore, many of the consequences of contemporary ground water pumping will be dealt with by future generations that have no input into the way the current generation manages its water resources.

> Because groundwater moves so slowly, it may take years or even decades of groundwater pumping to affect rivers, streams, creeks, springs, wetlands, lakes, and estuaries. The hidden tragedy and irremediable fact is that groundwater pumping that has already occurred will cause environmental damage in the future.[26]

It is vital that governing institutions in the Basin learn from the expensive lessons of other regions in both Canada and the United States. In Arizona, for example, the failure to implement long term planning for ground water abstraction has had devastating impacts on local environments. Tarlock states that:

> No arid state is more dependent on diminishing groundwater supplies than Arizona, and until the 1980s no state, with the possible exception of Texas, so steadfastly refused to

[25] *Ibid.* at 211.
[26] *Ibid.* at 212.

> conserve its supplies. Arizona was a classic example of non-management, and Arizona's agricultural use of groundwater, especially for cotton production, has long been considered economically irrational.[27]

According to Glennon, groundwater pumping has dried up or degraded 90 percent of Arizona's once perennial desert streams, rivers, and riparian habitats.[28] This is an astonishing statistic that clearly illustrates the danger of reactive ground water management. The state now has one of the most comprehensive ground water management statutes in the United States, but it is unlikely that such impacts can ever be fully reversed.[29]

From a socio-economic standpoint, the most dramatic example of the failure of long term planning is the Ogallala aquifer in the southern United States. It is the largest aquifer in North America and it is crucial to the entire country because it supports 20% of total agricultural production in the United States.[30] The Ogallala aquifer receives very little recharge and is essentially non-renewable. Sadly, courts and governments have ignored this hydrological fact and have continued to allow the water levels of this underground reservoir to be consistently drawn down by massive irrigation operations and rapidly expanding cities. As a result, it is very likely that large portions of this aquifer will run out of accessible ground water in the near future. In a region that has become so reliant on this resource, exhaustion of the aquifer will almost certainly lead to the large-scale collapse of industry, agriculture, and communities within the region. It could also have serious consequences for the rest of the United States.

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[27] A. Dan Tarlock, *Law of Water Rights and Resources* (New York: Clark Boardman, 1988) at 6-21.
[28] *Supra* note 24 at 46.
[29] *Supra* note 27 at.6-23.
[30] The Ogallala underlies 580,000 square kilometres of a region known as the Great Plains in the southern United States, including portions of Texas, Oklahoma, New Mexico, Kansas, Colorado, Nebraska and South Dakota. See Marq de Villiers, *Water: The Fate of Our Most Precious Resource* 2nd Ed. (Toronto: Studdart, 2003) at 178-185.

## C) Reinvigorating the Concept of Sustainability with an Ethical Discourse

*Nowadays, sustainability expresses a politically correct intention: it constitutes an adequate cloak under which the most varied political compromises can be achieved, but no longer induces radical and stringent environmental measures. Because of this change, sustainability has become one of the most 'polluted' concepts of the last two decades. At this point in time, it seems vital to restrict the meaning and give concrete form to the concept again, to make it viable once more as a starting point for action and to ascertain that it can be used as a useful guide to policy-making.*[31]

Currently, in political discussions pertaining to the use of natural resources (including ground water), the environmental and long term interests of present and future generations are subordinate to economic interests. A concept that has promised to elevate these interests to greater prominence is "sustainability," but so far this concept has not lived up to expectations.

Sustainability can no longer be understood as a single concept. Over the years, it has been given many different meanings and has been subsumed into the current liberal democratic framework through the concept of "sustainable development." The widely accepted definition of sustainable development was established by the Bruntland Commission as:

[31] *Supra* note 3 at 20.

> Development which meets the needs of the present without compromising the ability of future generations to meet their own needs.[32]

The Bruntland Commission's definition of sustainable development has been embraced by governments and politicians in western liberal democracies because of its perceived ability to appease constituents from both economic and environmental sectors. However, the ambiguity that allows for this broad appeal has ultimately undermined its effectiveness.[33]

> The definition of sustainable development given to us by the Bruntland Commission ... is often criticized as hopelessly vague, or in the language of experts, non-operationalizable.[34]

In general, policy decisions that have incorporated sustainable development have focused more on pursuing continued development than protecting resources. They have often been guided by approaches that take either a scientific or an economic approach to managing resources. With respect to ground water in the Basin, these approaches are unlikely to resolve the complex issues that surround the management of this critical resource.

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[32] World Commission on Environment and Development, *Our Common Future* (Oxford University Press: 1987).
[33] See Michael Redclift, "The Meaning of Sustainable Development" (1992) 23 Geoforum 395; Tim O'Riordan, "The Politics of Sustainability" in R. Kerry Turner ed., *Sustainable Environmental Management: Principles and Practice* (London: Belhaven, 1988)
[34] Simon Dresner, *The Principles of Sustainability* (London: Earthscan, 2002) at 64.

## 1. Science and Sustainability

*Water resources sustainability is not a purely scientific concept, but rather should be viewed as a perspective that can frame scientific analysis.*[35]

Science is an important component of sustainability but it should not be treated as the sole basis for decision-making. Most decisions that relate to the use of our natural resources involve an "extrascientific (moral) dimension."[36] Robert Phaelke uses the example of the risk of developing nuclear power. He suggests that although science can tell us the probability of a nuclear meltdown occurring, the decision to determine if the risk is worth taking has a profoundly moral element.

> Science can say very little about whether or not that risk is a risk worth taking. That conclusion has more to do with how highly one values the economic and social activities that are (or might be) met through the use of nuclear energy, how one imagines the long-term human future, and what other (most often, less catastrophic but virtually certain) risks one is prepared to endure via alternative means of generation to avoid the (perhaps) remote risk of an extreme nuclear catastrophe. Science can inform such a decision, but cannot make it.[37]

Likewise, decisions concerning ground water can never be purely based on science. Science is a critical element in these decisions, but even if we fully understand the consequences of ground water pumping in a particular location, the decision to allow continued pumping requires an assessment of risk. For example, the assessment may involve deciding whether the potential for environmental degradation, well interference,

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[35] Alley & Leake, "The Journey from Safe Yield to Sustainability" (2004) 42 Ground Water at 14.
[36] Robert Phaelke, "Science is No Substitute for Moral Principle" in John Martin Gillroy & Joe Bowersox eds., *The Moral Austerity of Environmental Decision Making* (Durham & London: Duke University Press: 2002) at 31.
[37] *Ibid.* at 32.

and increased economic costs are risks worth taking in light of perceived benefits. These are moral or value-laden considerations. Another example related to ground water use would be decisions that determine which users have priority over limited ground water supplies. In a recent report, the United States Geological Survey presents a broad-based test for ground water sustainability that recognizes this moral element. Rather than applying a purely scientific approach the USGS makes it clear that sustainability requires considerations that are subjective and therefore, outside the realm of scientific analysis:

> [W]e define ground-water sustainability as development and use of ground water in a manner that can be maintained for an indefinite time without causing unacceptable environmental, economic, or social consequences. The definition of "unacceptable consequences" is largely subjective and may involve a large number of criteria.[38]

The danger of ignoring this extrascientific dimension has been demonstrated by the previous attempts of politicians and courts to incorporate the concept of sustainability into their ground water decisions. In seeking a purely scientific answer to the problem of allocating ground water resources, these decision-makers have tended to apply an overly simplistic interpretation of a scientific concept known as "safe yield." Although originally intended to include a consideration of socio-economic values, the safe yield of an aquifer has generally been calculated by simply balancing the rate of withdrawal with the rate of recharge over a given period of time.[39] This calculation rests on the construction of a pre-development water budget which quantifies the amount of ground water that can be safely abstracted. However, leading hydrologists have essentially discredited this characterization of safe yield.

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[38] Alley et al., "Sustainability of Ground-Water Resources" (1999) U.S. Geological Survey Circular 1186, at 2.
[39] *Ibid.* at 12.

> Some hydrologists believe that a pre-development water budget for a ground-water system (that is, a water budget for the natural conditions before humans used the water) can be used to calculate the amount of water available for consumption (or the safe yield). In this case, the development of a ground-water system is considered to be "safe" if the rate of ground-water withdrawal does not exceed the rate of natural recharge. This concept has been referred to as the "Water-Budget Myth" (Bredehoeft and others, 1982). It is a myth because it is an oversymplification of the information that it is needed to understand the effects of developing a ground-water system.[40]

While water budgets are useful, and can measure specific effects of pumping such as water level declines, they cannot accurately predict the impact of ground water withdrawals on surface water systems and local environments.

> [W]hat may be established as an acceptable rate of ground-water withdrawal with respect to changes in ground-water levels may reduce the availability of surface water to an unacceptable level.[41]

In the hands of politicians and judges, science can be misunderstood and sometimes deliberately mishandled. Perhaps the most troubling aspect of decision-making based purely on science is that its complexity is often cited as a reason to exclude public scrutiny. As Phaelke states, this is a disservice to democracy.

> The disservice to democracy exists because those with power prefer, of course, that issues be publicly perceived to be technical questions whose answers are beyond political contestation (and lie within the territory where the views of small numbers of people are determining outcomes). It is bad science because more is claimed than in fact follows from scientific findings.[42]

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[40] *Ibid.* at 15. See also John Bredehoeft, "Safe Yield and the Water Budget Myth" (1997) 35 Ground Water at 929.
[41] *Supra* note 38 at 2.
[42] *Supra* note 36 at 31.

## 2. Economics and Sustainability

*[O]nce one considers the object of concern to be capital – natural or otherwise – the economic camel has its nose under the edge of the tent of social values, and it is inevitable that it will occupy the whole tent.* [43]

In the eyes of economists, sustainability is about ensuring future generations have the same opportunity for economic prosperity as we have today. Economists frequently disagree with each other with respect to the way society can achieve this goal and also about how such prosperity can be accurately measured. However, their central premise remains the same.

Within this central premise is a spectrum of economic theory; the two ends of this spectrum are referred to as "weak form sustainability" and "strong form sustainability." The debate that occurs along this spectrum concerns the quantity and type of "natural capital"[44] that needs to be preserved to allow continued economic prosperity.

Weak form economists, such as Robert Solow,[45] believe that resources, whether human-made or natural, can substitute for one another in a way that does not diminish the aggregate stock of capital. This means that present generations are under no obligation to preserve specific aspects of the environment because adequate investment in other resources will compensate for any loss. Solow states:

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[43] Bryan Norton, "Sustainability: Descriptive or Performative?" in John Martin Gillroy & Joe Bowersox (eds.), *The Moral Austerity of Environmental Decision Making* (Durham & London: Duke University Press 2002) at 55.

[44] Natural capital refers to the stock of natural resources that produce a flow of goods and services that are useful for human livelihoods. For example a forest is a stock of natural capital that produces a flow of goods in the production of new trees and provides services such as carbon sequestration, erosion control and habitat.

[45] Robert Solow is one of the major figures of Neo-Keynesian macroeconomics. Together with Paul Samuelson he formed the core of the M.I.T. economics department which has been widely viewed as *the* "mainstream" of the post-war period. In 1987, he was awarded the Nobel prize for his contribution to growth economics.

> *To talk about sustainability in that way is not at all empty.* It attracts your attention, first, to what history tells us is an important fact, that goods and services can be substituted for one another. If you don't eat one species of fish, you can eat another species of fish. Resources are, to use a favorite word of economists, fungible in a certain sense. They can take the place of each other. That is extremely important because it suggests that we do not owe to the future any particular thing. There is no specific object that the goal of sustainability, the obligation of sustainability, requires us to leave untouched.[46]

Under Solow's sustainability, the only obligation for our present generation is to ensure we devise an adequate investment policy that will allow future generations the capacity to be as well off as we are.[47]

> Sustainability, within this complex of principles and assumptions, is a matter of balancing consumption with adequate investment so that the future faces a nondeclining stock of total capital.[48]

Strong form economists, such as Herman Daly and John Cobb,[49] challenge weak form sustainability on the basis that not all forms of capital can be aggregated together, and that human-made capital cannot adequately substitute the services provided by ecological systems. Strong form economists prefer to consider human-made capital and natural capital as complimentary and recognize that the destruction of natural capital will have a detrimental impact on the income of future generations. The reason they give is that human-made capital cannot replace essential services performed by the

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[46] Robert M. Solow, "Sustainability: An Economist's Perspective" in Dorfman and Dorfman eds., *Economics of the Environment: Selected Readings,* 3rd Ed. (New York: W.W. Norton, 1993) at 181.
[47] *Ibid.* at 181.
[48] *Supra* note 43 at 53.
[49] Herman Daly was senior economist in the environmental department of the World Bank and is a recipient of the Honorary Right Livelihood Award (Sweden's equivalent of the Nobel Prize) and John Cobb is an eminent Professor of theology. Their seminal book, *For the Common Good* (Boston: Beacon Press, 1989), received the Grawemeyer Award for ideas for improving World Order.

environment such as waste absorption, the protection provided by the ozone layer, and climate regulation. However, Daly and Cobb are unable to provide any clear guidance on how to decide what elements of nature should be saved for the future in order to prevent a reduction in income. Instead, they propose the use of a "green" accounting system that requires the establishment of a trust fund to compensate future generations for the loss of income brought about by the destruction of natural capital.[50]

This inability to step outside the boundaries of economic theory is a significant hurdle to the operational effectiveness of sustainability. It also exposes Daly and Cobb's visualization to the same inherent criticisms that plague Solow's theories:

> Daly and Cobb, no less than Solow, see the problem of sustainability – being fair to the future – as a matter of comparing measurable amounts of a descriptive variable across time. On this approach, our ability to say anything specific about what to save in the present to support future welfare requires knowledge of what people in the future will want. If we cannot know this, then we are reduced, as are Daly and Cobb and Solow, to insisting on some form of compensation package for the future. Whether we specify that package through the models of growth theory, requiring nondeclining wealth, as does Solow, or by measuring income losses due to losses of natural capital, as do Daly and Cobb compensation will be considered a morally acceptable "substitute" for specific elements of natural capital. Neither line of reasoning, apparently, can identify some resources or processes that are so important that, if lost, people in the future will be worse off, even if their level of consumption is no lower that that of future generations.[51]

It would therefore appear that economists, whether they advocate weak or strong form sustainability, are unable to design a model of sustainability that adequately considers important community values that cannot be reduced to economic measures. These include intrinsic, aesthetic, moral, and spiritual values. It is these "existence" or

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[50] Herman Daly and John Cobb Jr., *For the Common Good,* 1st ed. (Boston: Beacon Press, 1989).
[51] *Supra* note 43 at 54.

"nonuse"[52] values that cause people and their communities to care about environmental protection even though they receive no direct or indirect economic benefit from such protection.[53]

With respect to ground water in the Basin, it is easy to visualize pro-development policies that are justifiable on economic sustainability grounds but which ignore the existence values just mentioned. For instance, ground water pumping may have no impact on the ability of future generations to satisfy their consumptive needs if policy makers simultaneously invest in accessing alternative, substitutable sources. In the Basin, the answer for many cities that are already depleting their ground water resources is not to seek ways to reduce water consumption, but to build pipelines to one of the nearby Great Lakes, which are essentially massive reservoirs that are relatively untapped at present. These measures are potentially sustainable under economic theory if they can continue to provide material well-being for the residents of the Basin. However, such policies ignore the non-economic values of the ecological systems supported by ground water. For instance, the depletion of ground water resources impacts streams and wetlands that provide habitats to many different species of plant and animal life. The aesthetic and spiritual values derived from these species are non-economic values that are not adequately represented in economic models.

It is only by including these non-economic values that the needs of future generations can be properly represented and it is only through communities, not economists and not scientists, that we can find expressions of these values.

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[52] Mark Sagoff, "Are Environmental Values All Instrumental?" in John Martin Gillroy & Joe Bowersox eds., The *Moral Austerity of Environmental Decision Making* (Durham & London: Duke University Press 2002) at 62-71.
[53] *Ibid.*

## 3. Sustainability as a Process of Discourse

*To the extent that a community and its members see the creation of a legacy for the future as a contribution to an ongoing dialectic between their culture and its natural context, and to the extent that they accept responsibility for their legacy to the future, they have embraced a commitment that gives meaning and continuity to their lives, that, in some deep sense, affects their sense of self and community (see Holland and Rawls 1993, 14-19; Ariansen 1997). I believe that that commitment, not the ciphers of economists and other scientists, must ultimately represent the core idea expressed by the terms sustainable and sustainable development.*[54]

A better approach to sustainability is the one described by Bryan Norton in the above quote. This approach does not view sustainability as a subset of science or economics, but as a political process. Scientists provide important information, but it is value-neutral and should not determine the outcome of decisions requiring moral or ethical choices. Economists make assumptions about future welfare needs. The problem with these assumptions is that no one can know what welfare will mean to later generations, and economic models fail to adequately account for the possibility that non-economic values may be just as important to these future generations as economic values.

To properly represent their own long term interests and the interests of future generations, community members need a process through which they can engage in mutual discourse to determine the core values that define their community. These core

[54] *Supra* note 43 at 61.

values, not the short term materialism fostered by the current understanding of liberal democracy, are the lenses through which members can identify what features of their community they wish to bequeath to their children and grand-children.

> The question at issue is a question about the present; it is a question of whether the community will or will not take responsibility for the long-term impacts of its actions, and whether the community has the collective moral will to create a community that represents a distinct expression of the nature-culture dialectic as it emerges in a place. We do not then ask what the future will want or need; we ask by what process a community might specify its legacy for the future.[55]

The exploration of common values and the reconciliation of differences are at the core of a political theory that is often referred to as "deliberative" or "collaborative" democracy. Deliberative democracy does not require the participation of all citizens, which is often impractical, but it does envisage the establishment of forums in which the various voices of a community have the opportunity to present their views and challenge the views of others. Joshua Cohen provides a useful definition of deliberative democracy:

> The notion of a deliberative democracy is rooted in the intuitive ideal of a democratic association in which the justification of the terms and conditions of association proceeds through public argument and reasoning among equal citizens. Citizens in such an order share a commitment to the resolution of problems of collective choice through public reasoning, and regard their basic institutions as legitimate in so far as they establish the framework for free public deliberation.[56]

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[55] *Ibid.* at 60.
[56] Joshua Cohen, "Deliberation and Democratic Legitimacy" in Hamlin and Pettit eds., *The Good Polity* (Oxford: Blackwell, 1989) at 21.

Those who advocate deliberative democracy emphasize the superiority of decisions based on expressions of common values that have been achieved through a process of argument and deliberation.

> The primary appeal of deliberative democracy is that it eschews the liberal paradigm of strategic bargaining or power trading among self-interested actors in the marketplace in favour of the paradigm of unconstrained egalitarian deliberation over questions of value and common purpose in the public sphere.[57]

The very nature of deliberative democracy makes it more conducive to the proper representation of environmental interests in the political dialectic. The reason for this is that all interests come to the discursive table with equal standing. This is not the case in contemporary liberal democracy in which environmental interests are consistently underrepresented. Further, once at the table, dialogue between the various community voices is unconstrained and participants are open to change and transformation. As Connelly and Smith point out, this provides an opportunity for advocates of environmental interests to educate other representatives and increase the community's collective understanding of its relationship with the natural world:

> Deliberative processes provide a conducive arena in which to expose citizens to alternative ways of conceptualising relations between human and non-human worlds.[58]

This openness has another benefit. It makes deliberative institutions more adaptable to changing circumstances, something that is particularly important in natural resource problems, where the parameters of the problems are continually changing and evolving:

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[57] *Supra* note 6 at 115.
[58] Connelly and Smith, *Politics and the Environment: From Theory to Practice,* 2nd Edition (London; New York: Routledge, 2003) at 73.

> This is why deliberative democracy is defended as a better candidate than purely aggregative models of democracy (e.g., voting or opinion polling) for enabling reflexive or ecological modernization. Insofar as the latter model merely entails the adding up of individual preferences without any communication or debate between preference holders, it carries less potential for reflexive learning.[59]

It is important to realize that in a normative sense, the goals of both liberalism and democracy are not inconsistent with this concept of sustainability. As natural resources, such as ground water become further depleted, unrestrained utilization will increasingly interfere with the freedom of society to use and enjoy these resources, and conflicts between common users will become increasingly prevalent.

> On the basis of mounting environmental evidence, we can argue that untrammelled freedom of human action and the destruction of the environment infringe upon the welfare – the rights, and the actual, implied or potential needs and choices – of present and future generations of humans and present and future non-human species. Defending generalisable ecological values and rights against narrow anthropocentric concerns therefore may be regarded as a profound expression of liberal democratic principles, in which liberal democracy and green concerns are linked through the expansion of the constituency to which the notion of welfare refers.[60]

In light of contemporary considerations it is necessary to reevaluate our understanding of liberalism and democracy and it should be recognized that restrictions on utilization are necessary to prevent social upheaval and environmental devastation. However, these restrictions should be guided by community processes that encapsulate the characterization of "sustainability" described above.

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[59] *Supra* note 6 at 117.
[60] Peter Christoff, Ecological Citizens and Ecologically Guided Democracy, in Doherty & de Geus, eds. *Democracy and Green Political Thought* (London and New York: Routledge,1996) at 164.

## D) Summary

*Given that liberal democratic ground rules were developed in earlier cornucopian times that no longer hold today, then perhaps it is time to re-evaluate and reframe notions of human autonomy and justice in ways that reflect our changed ecological setting and understanding.*[61]

In order to allocate ground water in a manner that is conducive to the long term protection of this valuable resource, governments need to commit to providing forums that can determine the needs of present and future generations. At the core of these institutions should be the concept of deliberation. It is only when consensus can be achieved among all affected interests that ground water can be allocated in a manner that can be considered "sustainable."

> So, we face the prior task – and I admit it is a difficult and complex one – of developing community processes by which democratic communities can, through the voices of their members, explore their common values and their differences and choose which places and traditions will be saved, achieving as much consensus as possible and continuing debate to resolve differences. These commitments, made by earlier generations, represent the voluntary, morally motivated contribution of the earlier generation to the ongoing community.[62]

[61] *Supra* note 7 at p. 213.
[62] *Supra* note 43 at 60.

# Chapter 5

# Directions for Reform

*In many cases institutions that have served us well in the past have outlived their intended missions and, in some cases, usefulness (Wilkinson, 1992). This is not to say these organizations and the laws they support were not sensible when they were created, during an area when resources were believed to be inexhaustible, but rather that societal values and needs have changed. The institutions responsible for managing our natural resources may well be the most significant barriers to the adoption of new, more integrated approaches to management (Kessler, 1992, 1994; Slocombe, 1993; and Grumbine, 1994).*[1]

In the case of ground water allocation, common law institutions have outlived their useful purpose. Courts have protected private property rights to encourage growth and material wealth in the Great Lakes Basin, but this has compromised the economic and non-economic needs of contemporary and future generations. Continuing on this course will lead to more frequent local and regional scale conflicts and will further degrade the Basin's ecology. A new course must be adopted to ensure the long term protection of this critical resource and to allow the present generation an opportunity to articulate its collective legacy to the future.

The first step on this new course requires governments to assert control over ground water resources and enable a transfer from private rights to public property. Less than

[1] National Research Council, *New Strategies for America's Watersheds* (Washington D.C.: National Academy Press, 1999) at 204.

half of the governments within the Basin are currently exercising control over their ground water resources. The remaining jurisdictions are relying on common law institutions. If the Basin is to maintain its long term prosperity and ecological integrity, it is essential that all ten governments assert control over this precious resource.

However, this is only the initial step. Leaving control of ground water allocation solely in the hands of a centralized bureaucracy will generally result in little or no change to the manner in which resources are allocated. As described in the previous chapter, governments are subject to the trappings of liberal ideology and are reluctant to place restrictions on the pursuit of material happiness. In ground water allocation decisions, the ears of government tend to be sensitive to the voices of large financial interests and mute to important community and environmental interests. Citizens should mobilize to encourage governments to vest planning authority in institutions that provide an open forum to all affected interests. These planning institutions should be responsible for designing the policy vision that will guide the implementation of formal allocation instruments and ensure that government decisions reflect the "morally motivated contribution of the earlier generation to the ongoing community."[2]

[2] Bryan Norton, "Sustainability: Descriptive or Performative?" in John Martin Gillroy & Joe Bowersox eds., *The Moral Austerity of Environmental Decision Making* (Durham & London: Duke University Press 2002) at 60.

## A. The Importance of Planning

### 1. Learning from Ontario's Experience

*MOE [Ministry of the Environment], other review agencies, and water users are now frequently called upon to make allocation decisions in the absence of essential spatial and temporal information on surface and ground water availability, on current levels of use, and on future demands.*[3]

The importance of planning before making allocation decisions is demonstrated by the ineffectiveness of the current permitting system in Ontario (discussed in detail in Chapter 3). The clearest indication that Ontario needs a planning mechanism is provided by the Credit Valley Conservation Authority which discovered that the Ministry had issued so many permits in their watershed that if they were all utilized "there would not be adequate supplies to meet the demand."[4]

With regards to Ontario's Permit to Take Water Program, permits are granted at the discretion of Directors (government officials responsible for issuing permits). Unfortunately, these Directors have insufficient information available to them when making their decisions. The reasons for this are:

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[3] Conservation Ontario, "A Framework for Local Water-Use: Decision-Making on a Watershed Basis" (May 2003) at 69, online: Conservation Ontario <http://conservation-ontario.on.ca/projects/watershed.htm>.

[4] Barron,Vicki, General Manager of the Credit Valley Conservation, "Water Report" (June 1999) Report to the Chairman and Members of the Board of Directors, Credit Valley Conservation.

- The scientific data is inadequate; there is a lack of consistent mapping of aquifers, limited data on the available water supplies, and an incomplete database of withdrawals.
- The policy manuals intended to guide their decisions are out-dated and fail to provide specific criteria on environmental considerations and cumulative impacts.
- There is no coordination with municipalities or conservation authorities, so Directors are not aware of situations where permit approvals might conflict with land-use planning or water management projects.

As well, rather than taking a risk-averse approach by denying or limiting permits when information is insufficient, these Directors tend to err on the side of appeasing business or agricultural interests. As a result, permits are rarely denied.

Moreover, since decisions often lack transparency and there is limited opportunity for public input, the permitting process is generally treated with suspicion by the public. This suspicion makes enforcement of permit conditions more challenging. It is especially problematic in Ontario, where the Ministry of the Environment relies on voluntary compliance.

The Ontario government provides the illusion of exercising control over their ground water resources but in reality, the permit program offers little more protection against unrestrained ground water abstraction than existed under the common law. Ontario is a clear example to the rest of the Basin that a regulatory framework for allocating ground water requires direction from an effective planning process. To be effective, this process should identify all the relevant hydrological information and represent the needs of affected communities. Before discussing the elements of effective planning further, it

should be noted that the Ontario government has recognized that there are deficiencies in their permit program and the province appears to be moving towards reform. These potential reforms are discussed later in the chapter.[5]

## 2. Elements of Effective Planning

The effectiveness of planning for ground water allocation is dependent on three factors: scale, science and collaboration.

### a) Scale

Scale has two aspects: First, it is important that the planning institution is able to plan according to the most practical hydrological unit. Second, it is important that the jurisdiction of the planning institution matches the size of the problem. If it is a local problem, the problem should come within the authority of a local institution; if it is a regional problem, the problem should come within the oversight powers of a regional institution.

The first aspect of scale relates to determining the most practical geographical unit for planning. In the case of ground water, the three most obvious units for planning are political regions, aquifers and watersheds.[6]

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[5] Below at 188.

[6] Watershed refers to the area that drains into a particular surface water body such as a lake or a river and is determined by topography.

Political regions, such as counties, municipalities, states and provinces, are poorly suited to planning for ground water allocation because they are rarely delineated according to natural hydrological boundaries. As a result, ground water pumping within one political region may produce impacts in another region that are not detected by the region carrying out the pumping. To illustrate this, if large-scale pumping in region A produces a cone of depression that extends outside its boundary, it may interfere with wells in region B. Or, if ground water pumping in region A reduces ground water discharge into a stream that flows into region B, the resultant decline in water levels may adversely affect riparian industries or aquatic habitats in B. Both situations are inequitable because region B has no control over the ground water pumping in region A.

Another impracticality of ground water planning according to political boundaries is the fact that recharge areas may exist outside a given region. This is important because that region has no control over land-use decisions that may impede precipitation into the ground water system, resulting in a decrease in recharge of the aquifers under its territory.

Aquifers and watersheds are both delineated according to natural hydrological boundaries. Both units are suitable for allocation planning because at the hydrological level it is much easier to recognize the interconnections between ground water, surface water, water-dependent ecosystems and the interconnections between water quantity and water quality. Further, planning for ground water allocation at a hydrological scale can be integrated with surface water allocation, land use planning, and other water management practices such as conservation and demand management.

> Watersheds are an ecologically practical unit for managing water. This is the level at which impacts to water resources are integrated, and individual impacts that might not be significant in and of themselves combine to create cumulative stresses that may become evident on a watershed level.[7]

Watershed units are generally more practical for ground water allocation planning than aquifer units simply because their boundaries (known as "surface water divides") are easier to identify. It may take substantial scientific investment to accurately identify the boundaries of an aquifer ("ground water divides").

In the situation where aquifer boundaries are unknown, the best approach is to begin with the watershed as the basic unit for planning. As the scientific knowledge becomes available, the boundaries can be adjusted to account for any ground water divides that extend beyond the watershed.[8] In the situation where surface and ground water divides are some distance apart, this may prove politically difficult. In this situation, it is vital that active cooperation is sought between the two neighbouring watershed authorities to ensure that actions within one watershed do not impair ground water supply or quality in the other watershed.

The second aspect of scale relates to the size of the problem. Ground water pumping can have both local and regional effects so the impacts of ground water pumping may be felt relatively close to the location of the well or considerable distances away.[9] It is crucial that the planning institution's jurisdiction is matched with the extent of the problem.

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[7] Honourable Dennis R. O'Connor, *Report of the Walkerton Inquiry, The Events of May 2000 and Related Issues* (Ontario Ministry of the Attorney General: 2002) Part Two, at 94.
[8] Ground water pumping may affect the location of a ground water divide. In southeastern Wisconsin the ground water divide has moved ten miles further away from the watershed boundary of the Great Lakes Basin. See Chapter 2 at 29.
[9] See Chapter 2.

Local institutions alone should not address the regional consequences of ground water pumping because they will fail to account for the effects and impacts that occur outside their area of jurisdiction.

> If the decisionmaking body has authority over an area that is smaller than the watershed at issue, its policies will probably fail to take account the impact that local decisions can have downstream. ...[10]

Conversely, regional institutions should not be solely responsible for the local consequences of ground water problems because they lack sensitivity to the importance of local interests.

> If, on the other hand, a decisionmaking body has authority over an area that is too large or is dominated by federal interests, it will likely fail to take into account local interests that in the end must bear many of the ramifications of the decisions.[11]

**b) Science**

*Improving the interface between science and policy and between scientists and politicians remains one of the major challenges to watershed management.*[12]

Science is a critical component in the allocation planning process. As many of the problems of ground water pumping are underground and therefore not readily apparent, scientific understanding is the only medium through which planners can visualize these

[10] *Supra* note 1 at 233.
[11] *Supra* note 1 at 201.
[12] *Ibid.*

problems. Without accurate scientific information, one can only guess the extent of a problem. This can pose a significant risk that the planning institution's jurisdiction will not match the problem.

In addition to identifying problems, science is an integral part of devising solutions to these problems because it informs planners of the potential hydrological and ecological consequences of particular actions. This scientific knowledge then allows the planning institution to make educated trade-offs between different approaches to specific problems.

Equally important as identifying what we know about the consequences of certain actions is determining what we do not know. Scientific input can help to clarify the limits of our knowledge concerning a particular problem.

> Planning on a watershed basis demands robust, interdisciplinary scientific inputs that not only answer key questions, but offer insights into the limitations of our understanding of watershed processes. Acknowledgement that knowledge is incomplete establishes the need for continuing scientific inputs in an adaptive, or recursive, planning process.[13]

As the above quote suggests, the complexity of ground water hydrology makes the acknowledgement of limited understanding a vital aspect of effective planning. However, scientific uncertainty should not lead to complete paralysis in the planning process. Instead of leaving problems until all the scientific information is known, planning institutions should adopt an adaptive management approach.

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[13] *Ibid.* at 264.

Adaptive management accepts that there are things we do not know about a given situation but actively encourages the attainment of new knowledge to more fully inform the planning process. It incorporates a "precautionary approach" by avoiding decisions that involve too much risk or uncertainty, and by revisiting planning decisions as new information becomes available. The National Research Council of the United States provides a useful definition of adaptive management in their study of the "risk decision process":

> Adaptive management is fundamentally a problem-driven approach. It begins with explicit objectives...; takes a long-term perspective, recognizes that long-term achievement of environmental goals affects and is affected by the societal context; and adopts a policy strategy of making interim decisions, monitoring consequences, and altering decisions as conditions warrant. It relies on analyses that are interdisciplinary (especially across boundaries between natural and social sciences) that focus on reducing uncertainties. It also relies on deliberation, beginning with efforts to develop a shared vision or problem formulation that might be accepted by many affected parties.[14]

From this definition it is evident that adaptive management is not just about responding to new scientific findings; it is also about responding to the needs of society. Science is important, but as stated in the previous chapter, it cannot by itself define a sustainable strategy for the allocation of ground water. This strategy must come from the outcome of deliberative processes between affected interests.

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[14] National Research Council, *Understanding Risk, Informing Decisions in a Democratic Society* (Washington D.C.: National Academy Press, 1996) at 176.

### c) Deliberation (or "Collaboration")

*Perhaps the greatest contemporary concern is to provide meaningful public involvement in the process, because experience has shown that top-down planning can create a variety of implementation barriers grounded in the lack of public involvement at key points in the planning process.*[15]

The theoretical advantages of deliberation are discussed in the previous chapter. Incorporating these processes into the planning institution is a key to the overall success of ground water allocation decisions. The traditional government approach to natural resource regulation is a centralized or "top-down" approach. As the Ontario example demonstrates, this approach ignores the importance of stakeholder involvement in the decision-making process and decision making suffers as a result. To enhance the quality of decisions relating to ground water allocation, a combination of scientific knowledge and stakeholder involvement should be utilized. On these foundations, ground water can be allocated in a way that accurately reflects hydrological realities and at the same time represents the collective vision of all the related interests.

> [C]ritiques of top-down planning note that more extensive public involvement better captures the collective wisdom of society. Thus effective stakeholder involvement helps ensure that problems are addressed more comprehensively and that the solutions better address the needs of affected parties.[16]

[15] *Supra* note 1 at 232.
[16] *Ibid.* at 250.

As well, the increased transparency and accountability that is derived from stakeholder involvement reduces the level of suspicion exhibited by the public towards centralized decision-making.

> For instance, the public may oppose environmental regulations that are perceived to be unjust or ineffective... Although public concerns are often justified, at times they are rooted in the lack of accurate knowledge and lack of involvement in the analysis and decisionmaking process.[17]

If all stakeholders are fairly represented, they are more likely to adopt a sense of ownership relating to decisions on which they had input, which subsequently increases the likelihood of their compliance with those decisions. This is confirmed by the experience of other regions that have employed the use of watershed planning.

> Recent water legislation tends to promote the participation of groundwater users in decisions affecting their rights and expectations. Such participation is at the root of a better understanding of the problems arising in connection with the overexploitation of groundwater, leading to the acceptance of measures and restrictions that would otherwise be unpopular.[18]

Therefore, stakeholder involvement can be considered important on a number of levels. As discussed in the previous chapter, it is important in a normative sense because it better fulfils the requirements of liberty and democracy. It is important in a substantive sense because deliberative processes between parties with divergent interests enhance

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[17] *Ibid.* at 232.

[18] S. Burchi & M. Nanni, "How groundwater ownership and rights influence groundwater intensive use management" in Ramon Llamas & Emilio Custodio eds., *Intensive Use of Groundwater: Challenges and Opportunities* (The Netherlands: A. A. Balkema Publishers, 2001) at 227.

the quality of decision-making. Lastly, it is important in an instrumental sense because decisions based on extensive stakeholder input are more acceptable to the public, and thus easier to enforce, than decisions from a centralized government agency. As a consequence "[a] major focus of the next decade should be to design the institutions of collaboration.[19]"

## 3. Improving the Scientific Understanding of Ground Water in the Basin

There are major scientific gaps in relation to the understanding of ground water resources in the Great Lakes Basin and unless they are addressed, these gaps will raise substantial barriers to effective decision-making. These scientific gaps relate to the location of aquifers, the quantity of water withdrawn from aquifers, the amount of recharge to aquifers, patterns of ground water flow and the interactions between ground water, surface water and the ecosystem.[20] In light of these gaps, the International Joint Commission has urged the governments of the Basin to "immediately take steps to enhance groundwater research in order to better understand the role of groundwater in the Great Lakes Basin."[21]

Improving the scientific understanding of ground water hydrology in the Basin would have a direct impact on the effectiveness of the following proposed models for reform. However, a lack of scientific knowledge should not be used as an excuse to delay their implementation.

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[19] *Ibid.* at 241.
[20] These gaps are delineated at greater length in Appendix II.
[21] International Joint Commission, "Protection of the Waters of the Great Lakes – Final Report to the Governments of Canada and the United States" (February 2000) Recommendation VI.

## B) Local Watershed Planning

This section which is divided into four parts, considers the form that local planning institutions in the Great Lakes Basin might adopt to allow for more effective ground water allocation. The first part presents the framework of allocation planning in France and New South Wales, Australia as potential models for allocation planning in the Great Lakes Basin. In the second part, the writer suggests that the concept of allocation planning is already emerging in some jurisdictions of the Basin. The third part identifies a number of regulatory tools that can be used to implement these allocation plans, and the fourth part identifies limitations to local watershed planning.

### 1. International Experience with Planning for Ground Water Allocation

*Groundwater legislation of recent vintage seeks to enhance the quality and effectiveness of governmental permit determinations and of relevant prescriptions and restrictions through groundwater planning mechanisms and users' participation in groundwater extraction decision-making and policing.*[22]

In other regions of the world, planning for water resources allocation is becoming a critical component in overall water management strategy. Frequently, planning institutions in these regions are created according to local watershed boundaries, and generally represent all stakeholders affected by allocation decisions. Two leading

[22] *Supra* note 18 at 239.

examples of watershed planning for the allocation of ground water and surface water are France and New South Wales, Australia. The French example is instructive because it represents a larger trend that is occurring throughout Europe in countries such as Spain, Italy and Germany.[23] The experience of New South Wales is also instructive because it illustrates an example of a region in which a number of ground water systems have been overexploited or are at risk of being overexploited.[24] The state government in New South Wales has responded by establishing a comprehensive planning process to guide water allocation decisions and prevent conflicts among competing demands.

a) France

*The evolution of French water policy in the last 30 years fits into the general European evolution towards complex water services structures and water resource management. Both at the level of public services provision and water rights, the ancient policy structure contrasting 'public' and 'private' is giving way to a more 'community-based' approach.*[25]

Under legislation passed in 1964, a decentralized system for water resources management was established in France.[26] The legislation divided France into six separate water management districts, which were designated according to the boundaries of the major surface water basin. The Water Act of 1992 introduced a complex water resource planning approach that reaffirmed and expanded this process of

[23] *Ibid.* at 233. See also Stefan Burchi, "Current Developments and Trends in the Law and Administration of Water Resources – A Comparative State-of-the-Art Appraisal" (1991) 3:1 Journal of Environmental Law 69.
[24] *Ibid.* at 236.
[25] Bernard Barraque, "Assessing the efficiency of economic instruments: reforming the Frend Agences de l'Eau" in Mikael Skou Anderson & Rolf-Ulrich Sprenger, eds., *Market-based Instruments for Environmental Management: Politics and Institutions* (Cheltenham, Northampton: Edward Elgar, 2000) at 226.
[26] Law No. 64-1245 of 16th December, 1964 (1964).

decentralization. [27] Under this Act, the basin committees that oversee the six water management districts are responsible for composing a Master Water Development and Management Plan (Schémas directeurs d'aménagement et de gestion des eaux--SDAGE) that establishes basic guidelines for the use of water resources within the basin. The SDAGEs also delineate the subwatersheds in which local commissions are to be established. These local commissions are responsible for formulating more detailed Water Development and Management Plans (Schémas d'aménagement et de gestion des eaux--SAGE).

The Water Act requires that local commissions be composed as follows: 50% are to be representatives of the territorial authorities and local public corporations, from among whom its chairman shall be elected; 25% are to be representatives of the relevant users including riparian landowners, professional organizations and associations; and 25% are to be representatives of the State and its public corporations.[28]

The SAGE that is formulated by the local commissions is required by the Water Act to:

- Set forth objectives for general use, value enhancement and quantity and quality protection of surface and groundwater resources, aquatic ecosystems as well as the preservation of wetlands;
- Record the conditions of the water resources and the aquatic environment;
- Establish the current water uses;
- List the priorities of water use required to achieve the objectives;
- Assess the financial needs required for its implementation;[29]

[27] French Water Act (1992) Law No. 92-3 of January 3, 1992.
[28] *Ibid.* at Article 5.
[29] *Ibid.*

Once formulated, the SAGE is sent to the basin committee that will ensure its harmonisation with the other SAGEs in the basin. The SAGE is then made available for public consultation for a period of two months before its final approval.[30]

Regulation of water abstractions occurs at the state administrative level. However, permits must be granted in accordance with the relevant SAGE and SDAGE.[31] These management plans are therefore legally binding on the authorities that allocate surface and ground water. An allocation that conflicts with either type of plan can be challenged; this has already occurred. Stefano Burchi illustrates:

> [I]f a groundwater extraction permit is granted by Government which is at variance with the determinations of a SAGE or also of a SDAGE, it can be challenged in the courts of law and quashed. This has actually been done in connection with the grant of a permit for the extraction of groundwater for industrial use from an industrial use from an aquifer which the relevant SDAGE (for the Seine-Normandie region) had reserved for drinking water use. The decision was quashed by the court and the permit withdrawn.[32]

The French planning process incorporates all the elements of effective planning described above and is considered a central component in the protection of ground water resources.

> As a French commentator has put it, the planning instruments available under the French legislation constitute the 'best tool for the conservation and protection of aquifers which is available under French law.'[33]

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[30] *Ibid.*
[31] *Ibid.*
[32] Stefano Burchi, "National Regulations for Groundwater: Options, Issues and Best Practices in Salman M. A. Salman, ed. *Groundwater: Legal and Policy Perspectives* (Washington: World Bank, 1999) World Bank Technical Paper No. 456 at 63.
[33] *Ibid.*

b) New South Wales, Australia

*The object of the Water Management Act 2000 is the sustainable and integrated management of the State's water for the benefit of both present and future generations.*[34]

The Water Management Act,[35] which was passed in December 2000, provides local water management committees with the authority to devise statutorily binding water management plans.[36] Management plans can include any aspect of water management but it is the '"water sharing plans" that are directly relevant to ground water allocation. The Minister of the Department of Infrastructure, Planning and Natural Resources (DIPNR) formally constitutes water management committees and defines their water management areas.[37] These may be delineated according to surface water or ground water boundaries, depending on the prevailing hydrology. Currently, there are 31 water sharing plans in New South Wales and the licences in these water sharing plan areas account for 80% of the water extraction in New South Wales.[38] The water sharing plans formed by the local commissions last for a ten-year period. These plans can be changed during this period to respond to altered conditions, but compensation may be claimed if changes impact users.

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[34] NSW Department of Land and Water Conservation, "Water Management Act 2000, What it means for NSW: Government and the community working together to share and manage water wisely" (2001), online: Department of Land and Water Conservation <www.dlwc.nsw.gov.au>.
[35] Water Management Act (2000) No.92.
[36] *Ibid.* at s.15.
[37] *Ibid.* at s.11.
[38] Mark Hamstead & Jan Gill, "Implementing the Water Management Act 2000" (2004) online: Water Management Division, Department of Infrastructure, Planning and Natural Resources <http://www.dipnr.nsw.gov.au/water/legal/pdf/law_soc_conf.pdf>.

The Act defines the membership structure of the committees in order to achieve a fair and balanced composition. Committees must include at least 12, but no more than 20 members, and must consist of representatives from the following groups: environmental protection groups, water users, catchment management authorities, local councils, the Aboriginal community, DIPNR, and the Ministry of the Environment.[39] All members are considered equal partners and the committees operate on a consensus decision-making basis. In addition, the committees are required to consult with the wider community during preparation of the plan.

The following identifies and uses the New South Wales' Water Policy Advisory Notes to comment on the major provisions required in all water sharing plans:

- *The establishment of environmental water provisions to protect water sources and dependent ecosystems.*[40] Under the principles that guide the water sharing plans, the first priority of any plan should be the water source and its dependent ecosystems. For aquifers, this includes reservation of the storage component of the aquifer plus a portion of the average annual recharge for environmental purposes.[41] As well, water sharing plans may identify buffer zones around dependent ecosystems where ground water extractions are prohibited or limited.[42]

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[39] *Supra* note 35 at s.13.
[40] *Ibid.* at s.20.
[41] Department of Infrastructure, Planning and Natural Resources, "Water Policy Advisory Notes: Groundwater Quantity Management" online: Department of Infrastructure, Planning and Natural Resources < http://www.dipnr.nsw.gov.au/water/sharing/policy.shtml>.
[42] Department of Infrastructure, Planning and Natural Resources, "Water Policy Advisory Notes: Groundwater Dependent Ecosystems" online: Department of Infrastructure, Planning and Natural Resources < http://www.dipnr.nsw.gov.au/water/sharing/policy.shtml>.

- *The Identification of requirements for water within the area, or from the water source, to satisfy basic landholder rights.*[43] Water can be extracted from a river or an aquifer in order to meet basic domestic and stock water needs without an access licence. These landholder rights can be restricted in special circumstances.[44]

- *The Identification of requirements for water for extraction under access licences.*[45]

- *The establishment of access licence dealing rules for the area or water source.*[46] The Act splits the right to the water (the water access licence) from the land title making it easier to trade licensed water access rights. Water sharing plans stipulate the rules that apply to water dealings.

- *The establishment of a bulk access regime for the extraction of water under access licences, having regard to the rules designed under the provisions above.*[47] Once the above provisions have been carried out, the water management committee must formulate the bulk access regime. The Act stipulates both mandatory and optional considerations for the regime. The regime:

i) *MUST recognize and be consistent with the limits to the availability of water resources established in the above provisions;*

[43] *Supra* note 35 at s.20.
[44] *Supra* note 41.
[45] *Supra* note 35 at s.20.
[46] *Ibid.*
[47] *Ibid.*

ii) *MUST establish rules according to which access licences are to be granted and managed, and available water determinations are to be made;*

iii) *MUST recognize the effect of climate variability on the availability of water;*

iv) *MAY establish priorities according to which water allocations are to be adjusted as a consequence of any reduction in the availability of water;*

v) *MAY contain provisions that apply mandatory conditions to access licences in certain defined circumstances, including share and extraction components.*[48]

Once the draft water sharing plan is complete,[49] it is submitted to the DIPNR and is placed on public display for comment and submission for a 40-day period. The comments received are used to assist the preparation of the final plan which is adopted by the Minister following affirmation by the Ministry of the Environment.

Like the French system, regulation of the licensing process in New South Wales is the responsibility of a state authority, but it is statutorily bound to exercise its powers in accordance with the water sharing plans. Section 48 of the Water Management Act states:

[48] *Ibid.*
[49] A summary chart of an actual Water Sharing Plan is provided in Appendix III.

> When exercising functions under this Act, the Minister must take all reasonable steps to give effect to the provisions of any management plan and, in particular, to ensure that any environmental water rules established by the plan are observed.[50]

Water sharing plans and ground water allocation are therefore intimately linked in both France and New South Wales.

After analyzing the planning instruments in France and New South Wales, a number of key components can be identified as forming the basis of an effective ground water allocation plan. These are: scientific knowledge, including information on the available supply and the role of the aquifer in the watershed (location of aquifers and models of ground water flow); an inventory of ground water withdrawals; an impact assessment, which identifies situations of well interference and the impacts of withdrawals on water quality, surface waters and dependent environments; an assessment of future demands including economic, social and environmental demands; and, the identification of policies and objectives based on consensus from deliberations amongst the affected stakeholders. These policies and objectives should establish, among other things, priorities for future use, restrictions on existing use and potential tools for implementing the plan.

[50] *Supra* note 35 at s.48.

## 2. An Emerging Concept in the Great Lakes Basin

In the Great Lakes Basin, there are signs that the concept of planning for ground water allocation may be emerging in proactive jurisdictions concerned about doing more to protect their ground water resources.

Although Minnesota is the only jurisdiction in the Basin to incorporate a planning process in its ground water allocation regulation, both Canadian provinces are examining reforms that could introduce such processes. However, it should be recognized that six out of the ten jurisdictions in the Basin still have no government regulation of ground water allocation.

### a) Minnesota

Under Minnesota's comprehensive water allocation legislation, the commissioner is expected to establish "water appropriation and use management plans" for certain areas that are water-stressed or have the potential to become water-stressed.[51]

To assist with the plan, the commissioner is required to establish a "planning team" that consists of representatives of the government, water users, as well as any other interested, concerned or involved government or citizen group. This team then provides input on the preparation of the plan, which under the legislation must include the following:

[51] Minn. R. §6115.0810.

i) An evaluation of the amount and dependability of information on the hydrologic systems of the area;

ii) An evaluation of data on stream quality and flows, lake water quality and levels, groundwater quality and levels, and climatic factors;

iii) An evaluation of present and anticipated future use of waters and lands and the amounts and distribution of use within the area;

iv) An evaluation of the problems and concerns relating to use of the waters within the area;

v) Water conservation alternatives and methods and procedures for dealing with water shortages or excesses during periods of deficient or excess water;

vi) Considerations of the relationship of the water appropriation and use management plan to other water resources programs of the state, such as floodplain management, shoreland management, water surface use management, water quality management, soil and water conservation management, and agricultural land management.[52]

Although Minnesota's planning process is not applied consistently throughout the state (it is only required for water-stressed areas), it is the only example of allocation planning that currently exists within the Basin.

[52] *Ibid.* at Subp 3.

b) Quebec

In 2002, Quebec published its first comprehensive water policy document entitled, "Water. Our Life. Our Future."[53] The first commitment outlined in the policy is the reformation of water governance which includes the gradual implementation of a watershed approach to respond to the failures of the current institutional approach.

> In Québec, as in many countries, it is being increasingly recognized that existing water-management practices have reached the limits of their effectiveness in solving certain problems. ... It is therefore necessary to make adjustments to the intervention methods at all levels: local, regional, and national in order to adapt them to watersheds in general.
>
> Integrated watershed-based management of water, which offers the best alternative to sectoral management of water, constitutes a major course of action in this Policy on Water.[54]

The policy foresees the initial creation of 33 watershed agencies, predominantly in the St. Lawrence plain, where the greatest conflicts over water use occur. The role of these agencies will be to act as "planning and consultation tables."[55] Each watershed agency will have the mandate to draft a Master Plan for Water (MPW). The MPW should contain a description of the watershed and its problems, a statement of the prioritization of the relevant issues, and an action plan that specifies the desired outcomes and proposes the strategies to achieve those outcomes. The MPW is to be received by the Minister of State and the Environment as an "expression of the vision and priorities of water users

[53] "Quebec Water Policy: Our Life, Our Future" (2002) online: Environment Quebec <http://www.menv.gouv.qc.ca/eau/politique/index-en.htm>.
[54] *Ibid.* at 17.
[55] *Ibid.* at 19.

and water-management players with respect to the future of their watershed,"[56] and it is to be the basis for the negotiation of a Watershed Agreement. The Watershed Agreement is essentially a tool to ensure the implementation of the MPW. It includes a detailed description of the actions to be taken by the watershed agency, a time-line for implementation, a follow-up mechanism that evaluates the results, and a financial plan.

The watershed agencies are to consist of representatives from citizen groups (such as environmental groups, recreation associations, and tourist associations), designated officials from the municipalities, and water user groups (such as members of the industrial, agricultural, and forestry sectors). Provincial government officials are also to have seats on the agencies. They are required to report to the other stakeholders on their responsibilities for water management and regarding their enforcement of the laws and regulations applicable to the watershed. Although these officials are not permitted to vote, they are required to contribute possible solutions (within their scope of responsibilities) to the problems that have been identified.

It is not clear from the Water Policy document whether the MPWs will be binding on the provincial authorities responsible for regulating ground water withdrawals. However, it seems implicit within the Water Policy that any actions taken at the provincial level should be in accordance with the priorities and desired outcomes identified within the MPWs. In addition to requiring provincial officials to be accountable to and assist the watershed agencies, the Water Policy also calls for a reexamination of the current instruments governing water use, "particularly with regard to the essential needs of the

[56] *Ibid.* at 21.

community."[57] The essential needs of the community are surely delineated in the priorities outlined in the MPWs.

c) Ontario

*Ontario is favourably positioned to implement a watershed-based approach to managing water takings and water use.*[58]

- Low Water Response

In the spring and summer of 1999, southwestern Ontario and eastern Ontario experienced a period of low rainfall and high temperatures that resulted in low water levels and drought conditions. As a result of the water shortage and water use conflicts that arose, Ontario developed the Ontario Law Water Response Plan (OLWRP). The OLWRP is implemented under existing legislation, such as the Municipal Act, the Lakes and Rivers Improvement Act, and the Ontario Water Resources Act.

The province and local watershed commissions, known as "Watershed Response Teams" (WRT), work as partners to alleviate the impact of drought conditions. The province is responsible for collecting and analyzing information on water levels across the province while the WRTs are responsible for identifying the actions needed to manage the drought or low water conditions and for coordinating the implementation of these actions.

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[57] *Ibid.* at 17.
[58] Conservation Ontario, "A Framework for Local Water-Use: Decision-Making on a Watershed Basis" (May 2003) at 63, online: Conservation Ontario <http://conservation-ontario.on.ca/projects/watershed.htm>.

Water Response teams are based on watershed boundaries and are required to include staff from provincial, municipal and Conservation Authorities, representatives of local interests, and users. (Sectors to be considered as users are: agriculture, rural private industry and business, recreation, resource management, and First Nations). Each member of the WRT is given equal opportunity for input, sharing information and being accountable.

The OLWRP defines three levels of drought or low water conditions.[59] The first level focuses on voluntary conservation measures to alleviate demand pressures. The WRT is responsible for communicating the need for conservation to all the relevant water sectors in the watershed. If conditions worsen to the second level, the WRT can supplement conservation measures by adding restrictions to new permit approvals, enforce municipal water restrictions by-laws and consider restricting existing permit holders. At the third level, WRTs establish priorities for water sectors through a consensus building process. The Ministry of the Environment can then restrict existing permit holders according to these priorities. At this level, water allocations are stringently enforced. During all three levels of low water conditions, constant monitoring is required to allow the WRTs to adapt effectively to changes in conditions.

- Possible Reforms in Source Water Protection

Following the Walkerton Tragedy (May 2000), in which seven people died from drinking contaminated ground water, a comprehensive inquiry into Ontario's drinking water

[59] Indicators of conditions include rainfall, streamflow, soil moisture, and water in storage.

management was undertaken. In the Report of the Walkerton Inquiry ("the Walkerton Report"), the Honourable Dennis R. O'Connor made a number of proposals for reform to the current Ontario water management process.[60] The basic structure for reforms was referred to as the "multi-barrier" approach, and the first barrier in this approach was identified as source water protection. The report takes a broad view of source water protection but at the heart of its recommendations are watershed-based source protection plans. It states that:

> In this chapter, I recommend a source protection system that begins with a strong planning component. I also recommend that source protection planning must be carried out on an ecologically meaningful scale – that is, at the watershed level. [61]

Source protection plans are comprehensive preventative measures that implement a systematic land-use management approach to prevent the release of pollutants into drinking water sources. Source protection plans also address ground water allocation, which is an important component of drinking water protection. Ground water allocation is relevant from both a quantity and quality perspective. Excessive allocation will lower water levels and impact the ability of municipal or domestic wells to supply an adequate quantity of water to residents. Further, excessive allocation of ground water can also impact water quality by releasing contaminants from rocks[62] and reducing the assimilative capacity of aquifers. The Walkerton Report recognized that Ontario's current permit system was not adequately considering the impacts of water allocation on drinking water sources.

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[60] *Supra* note 7.
[61] *Supra* note 7 at 89.
[62] In Wisconsin, large-scale ground water pumping has resulted in radium being released into the drinking water supply. See Chapter 2 at 31.

As the source protection plans are based on a watershed approach, the report recommends that Conservation Authorities (bodies already existing that are defined according to watershed boundaries) should be responsible for their coordination. Currently, the Conservation Authorities are generally only responsible for water management projects such as low flow augmentation, flood control, and protecting environmentally sensitive areas. However, their statutory mandate is much broader than their current responsibilities:

> The objects of an authority are to establish and undertake, in the area over which it has jurisdiction, a program designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals.[63]

As they already exist and have a legal mandate to carry out such responsibilities, the Conservation Authorities seem the most logical authorities to coordinate source protection plans. Since aquifers sometimes straddle watershed boundaries, the Walkerton Report states that the Conservation Authorities should ensure that source protection plans are coordinated between watersheds so that these ground water systems are not overlooked.[64]

The report also recognized that a vital component of this watershed planning approach is the effective representation of local community interests in the planning process:

> The involvement of a broad range of affected groups in the watershed-based source protection planning process will be key to its success. The process must be seen to be broadly and fairly inclusive of the interests that will be affected. The province should

[63] Conservation Authorities Act, R.S.O. c. C.27, s.20(1).
[64] *Supra* note 7 at 95.

> involve affected groups not only to ensure the fairness of the process, but more importantly to improve it. Involving a broad cross-section of water users in the planning process will both help to ensure that all issues are considered in the planning process and bring new perspectives into the process. Affected groups and the interested public have played an essential role in this Inquiry. They have provided insights and have greatly assisted in my understanding of the issues. I am certain that watershed-based source protection planning can benefit from the same type of experience and expertise that was available to me.[65]

Conservation Authorities do not involve all affected groups in their decisions as they consist solely of representatives from the municipalities within the watershed. In order to be inclusive of all the interests affected by the process, the Walkerton Report recommends that the Conservation Authorities should establish committees to develop the draft watershed-based source protection plan. These committees should consist of representatives of municipalities, various provincial ministries (Environment, Agriculture, Food and Rural Affairs, Municipal Affairs and Housing, Natural Resources, Consumer and Business Services), non-governmental organizations, other affected groups including First Nations, and representatives from federal agencies. The report emphasizes the importance of meaningful participation by all affected groups for the implementation of the plan:

> Without extensive consultation, watershed plans are likely to suffer from a lack of commitment from affected groups and are less likely to be successful. Conservation authorities that have undertaken this type of planning exercise have found that when all affected parties gather to determine a management model, a sense of fairness tends to take hold, and solutions are created that are acceptable to all participants.[66]

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[65] *Supra* note 7 at 107.
[66] *Ibid.* at 109.

In addition to land-use planning, the Walkerton Report recommends that the source protection plan should also address water allocation. The Report therefore suggests that the plans should include:

- A water budget for the watershed, or a plan for developing a water budget where sufficient data are not yet available;
- The identification of all significant withdrawals, including municipal intakes;
- Land use maps for the watershed;
- The identification of wellhead areas;
- Maps of areas of groundwater vulnerability that include characteristics such as depth to bedrock, depth to water table, the extent of aquifers, and recharge rates;
- A model that describes the fate of pollutants in the watershed.

This information would used to develop operational limits concerning acceptable levels of water withdrawals. The Walkerton Report recommends that these limits should be binding on the Ministry of the Environment when it considers applications for permits to take water. By making these limits binding, the Report asserts that the major criticisms of the permit program could be addressed:

> This approach will force a consideration of the cumulative ecological impacts of all actions in the watershed before a PTTW or Certificate of Approval is granted, rather than allowing such permits or certificates to be granted strictly on the basis of the individual application.
>
> It will also answer the concerns of the many Part 2 parties who stated that a new approach to the granting of PPTW is needed. Their criticism was that the current approach does not sufficiently involve affected local groups in the decision and does not

> embrace an ecosystem approach. I agree that these are valid concerns and think that the best approach will be to make the granting of provincial PTTW and Certificates of Approval subject to the wider source protection plan, which includes a watershed approach to managing water sources.[67]

If the demands for water exceed the available supply, the Report advocates allocation through a process of local negotiations rather than a unilateral decision imposed by the Ministry of the Environment:

> Where it is shown through the planning process that the demand for PTTW or Certificates of Approval may exceed available supply or the system's assimilative capacity (i.e., its ability to absorb pollutants), all those desiring or holding PTTW or Certificates of Approval should participate in a corollary process that should attempt to negotiate a mutually acceptable agreement concerning water use or contaminant release allocation. If such an agreement can be produced and is acceptable to the MOE, then PTTW and Certificates of Approval granted by the MOE should follow the agreement. If the participants cannot agree on allocations, the MOE should itself determine the distribution of rights. Under neither of these circumstances should the total amount of water allocated or the total loading of pollutants under the combined PTTW or Certificates of Approval exceed the amount of water sustainably available or the system's assimilative capacity according to the watershed-based source protection plan.[68]

In April 2003, an Advisory Committee established by the Ministry of the Environment reported to the government on an appropriate framework for watershed-based source protection planning. The Committee's proposed framework was largely informed by the recommendations of Justice O'Connor in the section of his Report discussed above. In February 2004, the government issued a White Paper on Watershed-based Source Protection Planning and in June 2004, it posted a Draft Drinking Water Source

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[67] *Ibid.* at 112.
[68] *Ibid.* at 105.

Protection Act on the web site of the Environmental Bill of Rights for public consultation. However, not all the recommendations made by Justice O'Connor or the Advisory Committee were incorporated in the White Paper or the Draft Act. One of the most noticeable omissions is a clause that requires the Ministry of the Environment to issue permits in accordance with the source protection plan. Considerable pressure is now being applied to have this provision included. In its response to the White Paper, the Canadian Environmental Law Association (CELA) which was one of the members of the Advisory Committee stated:

> CELA strongly recommends that there must be an explicit legislative linkage between source water protection planning and the MOE's permit to take water ("PTTW") program. In our view, source water protection plans should be the "engine" that drives or governs the PTTW program, and decisions to issue PTTWs must be consistent with such plans.[69]

Expanding on the recommendations made in the Walkerton Report, CELA suggested that the source protection plan should include a "comprehensive water allocation plan" which must be subject to periodic review and revision.[70]

### 3. Implementing Ground Water Allocation Plans

There are a number of best practices and innovations that provide useful tools for implementing the provisions of ground water allocation plans. These include:

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[69] Rick Lingdren et al. "Final Submissions of the Canadian Environmental Law Association to the Ministry of the Environment Regarding the White Paper on Watershed-Based Source Protection Planning" (April 2004) at 15, online: Canadian Environmental Law Association <http://www.cela.ca/coreprograms/detail.shtml?x=1437>.
[70] *Ibid.*

a) Permit Threshold

Depending on the size of the jurisdiction and the population reliant on ground water resources, it may be impractical to require all users to obtain permits. If this is the case, permit thresholds should be set at a level that does not exclude ground water withdrawals that interfere with other wells or result in detrimental impacts for the environment. The writer submits that the threshold should be no higher than in Ontario, which is 50,000 litres (13,000 gallons) per day.[71] This threshold was intended to capture small to mid-sized farms. Minnesota's threshold of 10,000 gallons per day is the best practice in the Basin.[72] In addition, the permit threshold should be based on potential pumping capacity rather than measured over a given period, as is often the case currently. This is the requirement under the Groundwater Catchment Regulation in Quebec.[73] As well, provisions that take the cumulative effects of ground water pumping into account should be made, so that permits can be required even for wells that are pumping less than this amount.

b) Water Use Priorities

The ecological integrity of the relevant watershed should be the first priority in ground water allocation. Once this has been accounted for, permits should be issued according to priorities designated in the allocation plan. Priorities should be designated in the plan (rather than through legislation) because the plans are more flexible to local needs. This is the situation in New South Wales where water sharing plans give initial priority to the

[71] *Ontario Water Resources Act* (1990), R.S.O. Chapter O 40 at s.34.
[72] Minn. Stat. 103G.271.
[73] *Groundwater Catchment Regulation* (2002) c. Q-2, r.1.3 online: Environment Quebec <http://www.menv.gouv.qc.ca/eau/inter_en.htm>.

needs of the dependent ecosystem, and then prioritize for human need in the bulk access regime.[74] The water sharing plans in New South Wales also take into consideration the potential impact of climate variability.[75]

c) Well-spacing

Cumulative impacts of ground water pumping by closely spaced wells can be mitigated by attaching well-spacing requirements to the issuance of permits. These well-spacing requirements should be calculated to prevent well interference.

d) Buffer Zones

Ground water allocation plans should identify surface water bodies that are sensitive to the effects of ground water pumping; this can be done by using test wells. The plans, or the government agency responsible for implementing the plans, should identify buffer zones next to designated sensitive surface water bodies, and no permits, or at least very limited permits for ground water pumping should be approved for these areas. Under Minnesota's water allocation legislation, commissioners must consider the impact of pumping on surface waters and are required to limit or deny a permit if the abstraction would adversely impact surface water flows or levels.[76] Further, if there is insufficient hydrological data available, the commissioner is instructed to limit or deny a permit. Wisconsin's new Groundwater Protection Act creates "ground water protection areas" which are areas within 1,200 feet of an outstanding water resource or any trout stream.[77]

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[74] Above at 181.
[75] *Ibid.*
[76] *Ibid.* at 103.315, subd. 5.
[77] Wisconsin Act 310 (2003).

The Act requires the Department of Natural Resources to undertake an environmental review of any proposals for high capacity wells in these areas.

e) Low Water Response

It is important that allocation decisions respond to conditions of drought or low water. Ontario's Low Water Response Plan, described earlier in the chapter, provides a useful model for how this can be done.[78]

f) Conservation Measures

The issuance of permits should be dependent upon the applicant providing a comprehensive outline of conservation measures they intend to put into place.

## 4. Limitations of Local Watershed Planning–Problems of Scale

Many of the problems that arise from ground water pumping are local in nature, therefore, it is at the local watershed scale that these problems should be assessed and a plan for sustainable allocation determined.

However, ground water pumping can also produce problems at much larger scales. Extensive ground water pumping from regional ground water flow systems can have far-reaching consequences. For example, ground water pumping of the deep

[78] Above at 188.

sandstone aquifer underlying southeastern Wisconsin and northeastern Illinois has already resulted in significant regional impacts. In 1973, ground water pumping in Chicago was draining water from Wisconsin at a rate of 9.3 million gallons per day and costing Wisconsin 1.4 million dollars per year in lost accessible water.[79] More troubling is the fact that recent studies in Wisconsin have discovered that large-scale ground water pumping from regional ground water flow systems may have negative impacts on the Great Lakes as a result of reduced direct and indirect discharge into the lakes. Consequently, this discovery indicates that large-scale pumping from regional ground water flow systems can result in international impacts.[80] Therefore, local scale planning simply cannot be relied upon to address impacts of this magnitude.

## C) Regional Watershed Planning

Regional institutions must be designed so that they can properly address the regional and international impacts of ground water pumping.

Two competing institutional frameworks have the potential to offer regional oversight of ground water withdrawals in the Basin. The first already exists under the provisions of the Boundary Waters Treaty,[81] but it has yet to be applied to ground water. The second

[79] See Chapter 2 at 36.
[80] *Ibid.* at 30.
[81] *Treaty relating to Boundary Waters and Questions Arising between the United States and Canada*, United States and United Kingdom, 11 January 1909, 36 U.S. Stat. 2448, U.K.T.S. 1910 No. 23.

is the regional framework proposed by the Basin governors and premiers through the auspices of Annex 2001 and its draft implementing agreements.[82]

Both these frameworks are considered in Chapter 3 with respect to their potential effectiveness in dealing with problems arising from ground water withdrawals. As discussed, both frameworks have significant flaws. A brief synopsis of these deficiencies is necessary to provide the context for the following section, which considers the most appropriate framework for dealing with regional ground water problems.

If applied to ground water, the Boundary Waters Treaty would only require the approval of the International Joint Commission ("IJC") for projects planning to utilize boundary ground waters and that might affect the flow/water level of boundary ground waters, or boundary surface waters. Tributary ground waters would continue to be regulated under the exclusive jurisdiction of Canada or the United States. Further, the IJC has no powers of initiation, which means it would be unable to consider regional scale ground water problems unless these problems are referred to it by a federal government.

Conversely, the regional framework proposed under the draft agreements of Annex 2001 would extend to tributary ground waters and the regional body would have the power to examine all major consumptive uses of groundwater in the Basin. In addition, the decisions of the regional body would be legally binding. However, an examination of the draft implementing provisions relating to consumptive uses and withdrawals reveals some troubling indications that this framework would give undue weight to short term growth at the expense of the Basin's long term prosperity and environmental health.

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[82] *The Great Lakes Charter Annex, A Supplementary Agreement to the Great Lakes Charter* (June 18, 2001), Draft Great Lakes Basin Sustainable Water Resources Agreement (July 19, 2004), Draft Great Lakes Basin Water Resources Compact (July 19, 2004).

## 1. Annex 2001 Regional Framework

The weight given to short term growth over long term concerns is not surprising when one considers the institutional design of the regional framework. The regional framework was devised by politicians (the governors and premiers of the Basin states and provinces). There was no independent or impartial representation in the drafting process, there would be no independent representation in the regional body or in the jurisdictional review and only minimal public participation has so far been suggested.

The writer refers to independence and impartiality in the sense that all interests that will be affected by a decision, or by a structure for making decisions, are considered equally. In the case of ground water withdrawals, this includes present day and long term economic, social, and environmental interests. As the writer discusses in Chapter 4, state and provincial governments are not prone to being impartial advocates for all these interests. These governments are preoccupied with securing short term economic prosperity for their respective jurisdictions[83] and are often blind to the long term consequences of following policies solely grounded in the interests of growth. Additional pressure for growth is felt by the Basin states because of the desire to keep pace with the rapid development occurring in the south and the fear of losing their prominent position in America.

[83] The reasons for this are discussed in Chapter 4 and include: i) the assumption that economic interests are the sum of their constituents' interests ii) the disproportionate influence of powerful business lobbies, and iii) the importance of securing the next election.

The pressures of ensuring continued growth in the Basin resulted in a draft regional framework that is focused on restricting long distance diversions of Basin water, while securing additional supply for thirsty cities lying within areas of the Basin states but which are *outside* the Basin (such as Waukesha). Fear of triggering anti-discrimination trade laws is likely the only reason the framework includes any provisions concerning in-basin withdrawals. Moreover, to avoid restricting the short term industrial and agricultural growth within the Basin, these provisions were drafted in such a way that they will actually have very little impact on the effectiveness of the laws that allocate ground water.[84]

There is considerable concern, particularly on the Canadian side of the border, that the draft implementing agreements (if approved in their current form) would weaken the authority of the IJC and essentially relegate the Boundary Waters Treaty to a secondary legal instrument in the Basin. In a legal opinion written on behalf of the Council of Canadians, Steven Shrybman states that:

> By establishing an entirely independent approvals regime, which is to be based on procedures and standards that are extraneous to those of the Treaty, the scheme of the Compact[85] reduces the IJC to a secondary role, if it is to play any role at all.[86]

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[84] As an interesting side-note it should be recognized that the rapid growth experienced in the southern United States is based on excessive exploitation of limited water resources (particularly ground water resources) and much of the industry and agriculture may well be diverted to the Great Lakes region once these resources run out.

[85] Shrybman is referring to the implementing agreement that takes the form of a state compact between the Great Lakes states.

[86] Steven Shrybman, "Great Lakes Basin Sustainable Water Resources Compact and the Diversion of Great Lakes" Waters (October 2004) Legal opinion on behalf of the Council of Canadians, online: Council of Canadians <http://www.canadians.org/>.

This would be an extremely unfortunate situation since the IJC presents a much better opportunity of securing the long term protection of ground water resources within the Basin.

## 2. Boundary Waters Treaty International Framework

The IJC would be a more suitable institution for providing regional oversight of large-scale ground water problems for a number of reasons. These reasons include its independence, its reputation for joint fact finding based on high level science, its willingness to engage in deliberative processes, and its flexibility to changing circumstances.

### a) Independence

The IJC has existed for over 95 years. During that time, it has established an excellent reputation as an independent and impartial voice in the Basin. Commissioners regard themselves as representing the Commission and the interests of the Basin rather than the interests of either country.[87]

### b) Joint Fact Finding and High Level Science

The cornerstone of the IJC is joint fact finding, which normally takes place within advisory Boards, task forces, other committees whose members are leading scientists, and between experts drawn from both countries. It is this joint fact finding exercise that

[87] Article XII of the Boundary Waters Treaty requires commissioners to make a solemn declaration in writing that they will faithfully, and impartially, perform their duties under the Treaty.

facilitates consensus within the Commission and which provides the IJC with the credibility it needs to persuade the national governments to implement its recommendations. The ability to access the highest levels of scientific knowledge also means the IJC is capable of responding effectively to complex ecosystem issues, the complexity of which is amplified at a regional scale.

c) Deliberative Processes

The IJC has shown that it is a responsible collaborator. It seeks input from all stakeholders affected by its recommendations. This includes all levels of government (national to municipal), environmental organizations, industrial and agricultural organizations, aboriginal groups, and the general public. The IJC encourages public participation through web-based consultation, public meetings, and formal and informal public hearings. In the edited proceedings of a workshop at Simon Fraser University in British Columbia, the current secretary of the IJC, Murray Clamen, comments on the importance of public participation in the processes of the IJC:

> This is really the hallmark of the Commission; in everything we do, the public has expectations and we try to meet these expectations by getting out and hearing what they have to say. Frankly, the recipe is very simple; we create a group of experts and we take the knowledge out to the public. We listen to them and then we put it all together and come up with recommendations from the IJC. The role of the public is central to this.[88]

[88] Murray Clamen, "Avoiding Conflict by Managing Water Through Cooperation" in edited proceedings of "Water and the future of life on earth" (2002) Workshop and Think Tank at Chapter 21.

d) Flexibility to Changing Circumstances

The IJC is also a flexible institution. It can evolve to deal with contemporary problems. The most obvious example of the flexibility of the IJC is its expanded role in dealing with water quality issues in the Great Lakes. The Boundary Waters Treaty is vague with respect to water quality and in the 1950s it became clear that the quality of the waters of the Great Lakes was depreciating rapidly and needed to be addressed.[89] Responding to recommendations made by the IJC, Canada and the United States implemented the Great Lakes Water Quality Agreements of 1972 and 1978.[90]

The 1972 agreement mainly focused on reducing phosphorus levels in Lake Erie and Lake Ontario. The agreement was renewed in 1978 and its scope was significantly enlarged. The 1978 agreement expanded the application of the first agreement to include all five Great Lakes and also introduced the notion of an "ecosystem approach." The ecosystem approach recognized that water quality in the boundary waters was dependent upon the interaction of the entire basin-wide ecosystem including air, land, water, and the activities of living organisms (including human beings). The 1978 agreement also introduced more stringent and wide-ranging qualitative and quantitative standards for water quality throughout the Basin than the first agreement.

The IJC's mandate under the agreements was created through a long term reference pursuant to Article IX of the Boundary Waters Treaty.[91] This mandate includes collecting information on the quality of the boundary waters and the pollution that enters the

[89] *Supra* note 81.
[90] Great Lakes Water Quality Agreement (1978) International Joint Commission United States and Canada
[91] *Supra* note 81

boundary waters from tributaries and other sources, submitting recommendations on appropriate actions to the two countries and the states and provinces, and monitoring and assessing the progress of the two countries in achieving the agreement objectives and on reporting this progress biennially. To assist the IJC with these responsibilities, the agreement created two Boards: the Great Lakes Water Quality Board (the principal advisor to the Commission) and the Great Lakes Science Advisory Board (essentially a scientific research institution).

In 1987, Canada and the United States revised the agreement and following the advice of the IJC created 43 "Areas of Concern" (AOC) and both countries have committed to preparing Remedial Action Plans (RAP) designed to clean up these problem areas. The IJC was given authority to review the RAPs.

## 3. Proposal for Reform: Great Lakes Watershed Board

If the IJC is to fulfil its potential with respect to ground water issues in the Basin, it must be assigned the type of mandate it was provided to address water quality issues.

A concept that would furnish this mandate has been devised by the IJC itself. Responding to a reference submitted to it by the governments of Canada and the United States,[92] the IJC suggested that the Canadian and U.S. governments present it with a reference to establish "International Watershed Boards" from coast to coast.[93] The IJC

[92] International Joint Commission, "Response of the IJC to a Request by the Governments of Canada and the United States for Proposals on How to Best Assist Them to Meet the Environmental Challenges of the 21st Century" (1997).
[93] *Ibid.*

stated that these Boards would be given the responsibility of adopting a basin-wide ecosystem approach, akin to that adopted by the 1978 Great Lakes Water Quality Agreement. This approach would be applied to all water-related issues within the Basin, including the quality and quantity of surface and ground waters.

In the Basin, the IJC envisaged expanding the mandate of the Great Lakes Water Quality Board to an International Watershed Board that would be called the Great Lakes Watershed Board (GLWB). Broadly speaking, it would be responsible for the:

> [E]ffective coordination of government institutions at various levels, acquisition and fostering of expertise, knowledge and information about the ecosystem of the watershed, consultation with and involvement of the full range of interests concerned, including the public, and above all the flexibility to identify and deal with unforeseen developments.[94]

Under this broad mandate, the GLWB would have new authority relating to ground water withdrawals, including the impacts of ground water withdrawals on tributary ground water flow and surface water flow. The writer suggests the following practices as appropriate uses of this authority:

a) Establish and Maintain a Comprehensive Inventory of Ground Water Resources

The GWLB could coordinate with all levels of government and scientific experts from both countries to establish a comprehensive and unified inventory of all ground water resources in the Basin. This inventory would include detailed mapping of all the major

[94] *Ibid.*

aquifers in the Basin, information pertaining to the quantity and quality of storage, water levels, recharge rates, direction of flow, and interaction with surface waters.

b) Establish and Maintain a Database of Ground Water Withdrawals

The GWLB could coordinate with all levels of government to maintain a regularly updated database of all ground water withdrawals in the Basin.

c) Identification of Critical Ground Water Areas

The IJC could be given the authority to designate "critical ground water areas." These would be areas where ground water withdrawals are already, or are threatening to impair the quality or quantity of boundary waters (boundary waters defined as any surface water body or aquifer that is intersected by the boundary). This authority would be exercised in a similar way to the identification of "areas of concern" under the Great Lakes Water Quality Agreement.[95]

The critical ground water area would not be limited to the area overlying a boundary aquifer. The area could be above an aquifer that is interconnected with the boundary waters or with waters that are tributary to the boundary waters. Areas such as Ohio/Toldeo (where ground water pumping is known to be impacting on the water levels of Lake Erie) or Milwaukee/Waukesha (where ground water is intercepting surface and ground flow to Lake Michigan)[96] could be designated as critical ground water areas.[97]

[95] A similar provision is also included in the Bellagio Draft Treaty (Article VII), a model treaty composed by leading international experts for transboundary groundwater. See Hayton and Utton, "Transboundary Ground waters: The Bellagio Draft Treaty" (1989) 29 Nat. Resources J. 663 at 692.
[96] Lake Michigan should be considered boundary waters as it was in the Great Lakes Water Quality Agreement.

Once the critical ground water area is designated, a ground water management council could be formed, comprised of representatives of all the relevant stakeholders in that area. This Board could be given the responsibility of devising a detailed recovery plan. This plan could include proposed rules for the allocation and reallocation of ground water access rights. After it is completed, this plan could be reviewed by the GWLB. Either the ground water management council or an appropriate provincial or state authority could be responsible for regulating ground water withdrawals in accordance with this plan.[98]

d) Monitor Ground Water Management Approaches and make Recommendations for Improvements in Biennial Reports

The GLWB could also be given the responsibility of monitoring the efforts of the jurisdictions within the Basin with respect to ground water management (including ground water allocation laws) and making recommendations on best practices.

The IJC has shown itself to be a very flexible organization when given the opportunity. It is this flexibility that makes it particularly suited to dealing with contemporary problems such as ground water pumping. However, it must be entrusted with that authority by the respective federal governments.

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[97] The Waukesha example raises some interesting questions because technically Waukesha is outside the subcontinental divide that marks the edge of the Great Lakes Basin. However, it is inside the Great Lakes ground water basin. The writer suggests that the definition of the Great Lakes Basin should be modified to reflect hydrological accuracy and therefore include the very outer edges of whichever basin, surface water or ground water extends the furthest.

[98] Legislation recently enacted by Wisconsin has established a similar process at a state level. So far, two ground water management areas have been designated (southeastern Wisconsin and Lower Fox Valley). In these areas special committees are to be established and these committees are to be made up of representatives from the state, local governments, regional planning committees, and public and private users. These committees will recommend to the state legislature how best to manage the water resources of these areas.

> The very flexibility of the Boundary Waters Treaty and of the Commission itself has enabled the IJC to respond to changing times. The Commission sees the creation of international watershed boards as a refinement that can assist the parties greatly in addressing new challenges. The Commission urges the parties to capitalize on the full potential of the IJC and its institutions to assist them in preparing for the transboundary environmental challenges of the 21st century. The Commission can help the parties only to the extent that they want that help and make it possible for the Commission to provide it through the consideration they give to the Commission's advice and the resources they make available for the Commission to carry out its work.[99]

The writer sees the creation of an International Watershed Board as the most effective institution for managing regional scale ground water problems.

## D) Summary

*[W]here some may have believed in the past that the irresponsible actions of citizens had to be remedied by governments, we now have to recognize that collaborative effort among many partners, both public and private must be directed not just to rectifying past mistakes, but also to implementing sustainable solutions to avoid their reoccurrence. Where once resource and environmental policy may have relied on technocratic control and analysis and was viewed, as government's to impose, we now have to recognize that policies require the informed consent of stakeholders, who will themselves be instrumental in their implementation.*[100]

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[99] *Supra* note 92.

[100] Galloway, Gerald & Pentland, Ralph, Managing Groundwater Resources in the Great Lakes Baisn: Securing Our Future (2003) online: Program of Water Issues, Munk Centre for International Studies < http://www.powi.ca> at 22.

Governments should allocate ground water in accordance with hydrological realities and the interests of present and future communities. This can be achieved through ground water allocation planning which should begin at the local watershed scale. It is at this scale that all the various interests affected by localized problems of ground water pumping can be effectively addressed, and decisions guided by planning at this scale will more accurately reflect community needs. The experiences of other regions in the world that have implemented such planning processes (such as France and New South Wales, Australia) may provide useful models for the Basin states and provinces to follow.

Regional, even international impacts, must also be considered. Since the Basin is an extensive area, problems caused by ground water pumping span local watershed boundaries and can have large-scale consequences. In addition to local watershed planning, it is important that an institution be given the responsibility of regional oversight to identify these problems and coordinate management between relevant authorities.

An appropriate institution to handle these responsibilities, and oversee local and regional scale problems could be created under the current Boundary Waters Treaty framework.

# Chapter 6

# Conclusion

The laws that allocate ground water in the Basin are out-dated and incapable of addressing the contemporary challenges presented by ground water pumping. These laws were established in the nineteenth century, and have failed to develop to changing human demands and hydrological realities.

Underlying this failure is an ideology that values short term economic interests over the long term interests of present and future generations. This ideology purports to represent the objectives of liberalism and democracy, but it is grounded in a bygone era when resources seemed inexhaustible and the problems of our modern world were unforeseeable. As a result, the unrestrained utilization of ground water resources is interfering with society's freedom to use and enjoy these resources, and conflicts over use are becoming increasingly common.

Modern societies must take contemporary concerns into consideration and recognize that restrictions on the use of natural resources are compatible with liberalism if these restrictions prevent social upheaval and environmental destruction. These restrictions will also be compatible with principles of democracy providing they have been determined in a forum that represents the collective understanding of all the community interests affected. It is only through these deliberative forums that the long term needs of present and future generations can be ascertained and true meaning given to the concept of "sustainability."

It is therefore the responsibility of governments within the Basin to assert control over ground water resources that are presently buried under private property rights, and in turn, vest the responsibility of designing these restrictions in the hands of local planning institutions. These institutions should be defined according to hydrological, not political boundaries and should involve all stakeholders that could be potentially impacted by allocation decisions. To ensure their success, governments should invest in accumulating a sound base of scientific knowledge that is readily accessible to the planners.

Once formulated, ground water allocation plans should be implemented through government regulation. Both the quality and legitimacy of these regulations will be enhanced through the direction provided by the planning institutions. Restrictions on use should be more acceptable to communities if they feel their interests were represented at the planning stage.

The allocation of ground water resources is an important aspect of overall water management strategy. In the Great Lakes Basin, this aspect has been ignored for far too long. Contemporary pumping activities may already be leaving a high-priced legacy for our children and grandchildren. It is therefore critical that citizens and governments take action now to allocate ground water in a more sustainable manner. The future of the Basin depends on the decisions of today.

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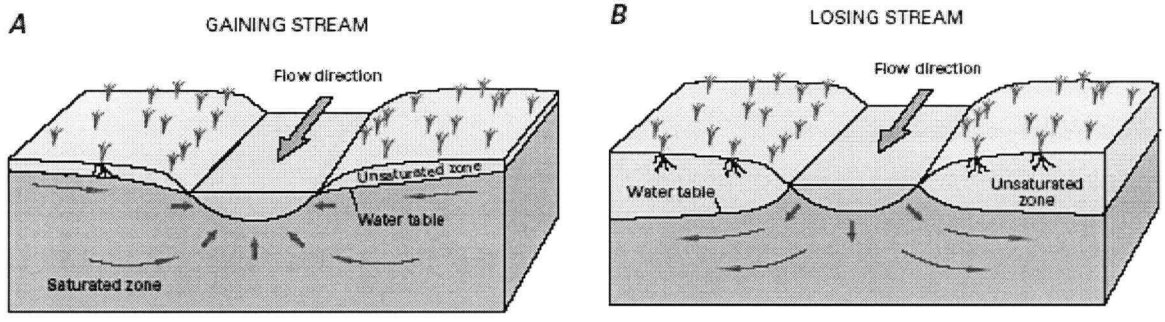
# Appendix I

### Interaction of Streams and Ground Water

Source: Alley et al., "Sustainability of Ground-Water Resources" (1999) U.S. Geological Survey Circular 1186




The above diagrams show the interaction between streams and ground water. In Diagram A ("Gaining Stream"), the water table of the unconfined aquifer is above the surface water level of the stream. In this situation, ground water discharges into the stream. In Diagram B ("Losing Stream"), the water table of the unconfined aquifer is lower than the surface water level of the stream. In this situation, surface water seeps through the bed and banks of the stream and recharges the ground water system.

These diagrams illustrate the potential impact of ground water pumping. Prior to large-scale pumping, ground water flow may discharge into a stream, as is occurring in Diagram A. However, large-scale ground water pumping could lower the water table of an unconfined aquifer so that the stream recharges the ground water system, which is occurring in Diagram B.

### Water Budget for Lake Michigan[1]

| Inflow | | Outflow | |
|---|---|---|---|
| Precipitation | 53,000 $ft^3/s$ | Evaporation from the Lake surface | 41,000 $ft^3/s$ |
| Surface Run-off | 8,800 $ft^3/s$ | To Lake Huron | 52,000 $ft^3/s$ |
| **Direct Ground Water Discharge** | **2,700 $ft^3/s$** | Surface Water Withdrawals from the Lake | 7,500 $ft^3/s$ |
| **Indirect Ground Water Discharge** | **32,000 $ft^3/s$** | Ground Water Withdrawals from the Watershed | 2,100 $ft^3/s$ |
| Diversions Into the Lake | 50 $ft^3/s$ | | |
| Return flows into the Lake from Users | 6,000 $ft^3/s$ | | |
| Total | 102,550 | | 102,600 |

[1] The figures for the table were obtained from: N.G. Grannemann et al., The Importance of Ground Water in the Great Lakes (2000) USGS Water Resources Investigations Report 00-4009

# Appendix II

## Gaps in Scientific Understanding of Ground Water in the Great Lakes Basin[1]

**1) No consistent mapping of ground water flow systems.**

i) There is no consistent mapping of local ground water flow systems. To improve the understanding of shallow unconfined aquifers, new geologic maps need to be produced that show the extent, thickness, and boundaries of these aquifers.

ii) Although some studies have been done on specific regional ground water flow systems, such as the USGS study in southeastern Wisconsin, there is no consistent mapping of regional ground water flow systems including boundary and transboundary hydrogeological units.

**b) Lack of knowledge with respect to how much water is withdrawn from aquifers and how much water is lost to the particular aquifer, the watershed or the entire Basin.**

i) The amount of ground water being pumped from aquifers in the Basin needs to be accurately quantified at both local and regional scales.

ii) There is not enough information describing the location of withdrawn ground water once it has been used. Once ground water has been withdrawn, is it leaving the recharge area of the aquifer? Is it leaving the sub-watershed, the larger watershed or even the Basin? This information

is needed to accurately predict the effects of ground water withdrawals at both local and regional scales.

**c) No accurate information available on recharge rates.**

i) There is no systematic estimation of natural recharge areas. Studies need to be conducted at a local level to determine the rate of recharge to local flow systems.

ii) Although ground water recharge rates estimated in previous studies have provided an approximate range of recharge in the Basin, a comprehensive study is needed to completely determine the importance of ground water in the hydrologic budget of the Great Lakes.

**d) No comprehensive description of the role of groundwater in supporting local ecosystems.**

i) There is inadequate information on groundwater discharge to surface water bodies and the role that ground water plays in sustaining aquatic ecosystems and the habitats on river banks and lake shorelines.

ii) The understanding of the relationship between ground water and the Basin's wetlands is not well known.

**e) The relationship between ground water flow and the Great Lakes is not well understood.**

i) Comprehensive estimates of indirect ground water discharge to the Great Lakes is required.

ii) More work needs to be done to define and quantify the interactions between regional ground water flow and ground water discharge to the Great Lakes.

**f) Estimates are needed of the effects of land-use changes and population growth on groundwater availability and quality.**

**g) There needs to be more regional and local scale analyses of changes in ground water quality as a result of ground water pumping.**

[1] This list has been compiled from two reports. Many of the regional scale deficiencies are highlighted by the International Joint Commission in their report to the governments of Canada and the United States, International Joint Commission, "Protection of the Waters of the Great Lakes – Final Report to the Governments of Canada and the United States" (February 2000). The need for local scale scientific studies is emphasized to a greater extent by the United States Geological Survey in Norman G. Grannemann et al., "The Importance of Ground Water in the Great Lakes" (2000) USGS Water Resources Investigations.

# Appendix III

## Summary of a Water Sharing Plan in New South Wales[1]

**STEP 1 – SET UP FLOW CLASSES AND DEFINE THE RECHARGE**
Based on historical river flow records, divide river flows into ranges, ie flow classes, as a basis for sharing surface water. In Dorrigo Plateau, there are four flow classes: very low flows, low flows, medium and high flows. Based on historical records of rainfall, surface water/groundwater linkages and hydrogeology, assess the amount of recharge to the groundwater source on a long-term average annual basis.

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**STEP 2 – PROVIDE WATER FOR THE ENVIRONMENT**
Reserve a portion of water within each river flow class for the environment.
Reserve groundwater storage component and a portion of the recharge for the environment.

↓

**STEP 3 – PROVIDE WATER FOR BASIC LANDHOLDER RIGHTS**
Estimate total requirements for domestic and stock rights and native title rights in each water source.

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**STEP 4 – DETERMINE REQUIREMENTS FOR WATER EXTRACTION**
Assess the total requirements of all access licences and rules for granting additional access licences.

↓

**STEP 5 – SET LIMITS ON WATER FOR EXTRACTION AND SHARE THAT BETWEEN DIFFERENT WATER USERS**
Set both annual and daily limits for extraction of surface water and an annual limit for groundwater, and share the water available under these limits between all access licences. Set rules for managing within these limits. Provide for other local limits if necessary to protect groundwater supplies and dependent ecosystems.

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**STEP 6 – PROVIDE FLEXIBILITY FOR ACCESS LICENCE HOLDERS**
Set rules to provide flexibility in how water allocation accounts are managed, and define the dealing rules.

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**STEP 7 – PROVIDE CLEAR LICENSED RIGHTS**
Translate Steps 5 and 6 into mandatory conditions on individual access licences and approvals, and specify if and how a plan rule can be amended.

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**STEP 8 – MONITOR PLAN**
Review the implementation of the Plan each year and audit performance of the Plan mid-term (Year 5).

[1] Modified version of chart summarizing the Water Sharing Plan for the Dorrigo Plateau Surface Water Source and the Dorrigo Basalt Groundwater Source (May 2003). For original see "Summary Guide" online: Department of Infrastructure, Planning and Resources <http://www.dipnr.nsw.gov.au/water/sharing/>.