

PROTECTED AREAS AND WATERSHED PLANNING WITH SPECIAL REFERENCE TO THE GRAND RIVER

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Abstract

A new approach to water management, based upon the integration of engineering and technical water expertise with the use of protected areas, is gaining the attention of resource managers in North America. This approach aims to meet both the ecological and human water needs through the protection of source water areas such as rivers and aquifers. The following report explores the current application of this integrated approach to the Grand River in Ontario, Canada. The Grand River Watershed has been selected as a case study because the Regional Municipality of Waterloo and the Grand River Conservation Authority are two of Canada's leading water resource managers.

Context

The motivation for an integrated approach to water management originates from the tragic events of May 2000 in Walkerton, Ontario. The contamination of the town's drinking water with *E. Coli* bacteria resulted in many people being hospitalized and ultimately the death of seven people. In response, the Government of Ontario led an inquiry, headed by Justice Dennis O'Connor, to uncover the causes of the Walkerton tragedy and learn how it could be avoided in the future. Justice O'Connor has subsequently produced two reports outlining recommendations. While the first focuses on technical improvements to the process of maintaining water quality, the second report identifies a much broader need for a "source protection system that includes a strong planning component on an ecologically meaningful scale – that is, at the watershed level" (O'Connor, 2002b).

The Ontario government has since taken some action to address the recommendations of Judge O'Connor. For example, a Drinking Water Protection Regulation was passed in 2000, and in 2001 ten million dollars were committed to groundwater studies. In addition, the Ontario legislature has passed two acts entitled *Nutrient Management Act* and *Sustainable Water and Sewage Systems Act* (Ministry of the Attorney General, 2003). However, none of these initiatives deal with source protection areas. In January, 2003 articles appeared in the *Toronto Star* (2003) and *Kitchener-Waterloo Record* (2003) pointing out this omission and calling on the provincial government to ensure that source areas are protected by legislation, similar to the acts mentioned above.

This report will address the development of a framework for incorporating protected areas into watershed management. In order to attain this goal, the two divergent schools of thought for water management and protected areas must be combined. Water management has a long history focussed on the engineering and technical aspects of planning and man-

agement while protected areas have typically concentrated on nature conservation. A report published by the Grand River Conservation Authority indicates that "...the natural environment, highly dependent on water conditions, is rarely taken into consideration in water management and use decisions." (GRCA, 1997) Yet emerging orientation of the protected areas field focuses on envisioning protected areas in terms of comprehensive land uses and decision-making (Nelson *et al.*, 2003).

Case 1: Regional Municipality of Waterloo

Waterloo is the largest urban community in Canada to rely mainly upon groundwater sources to meet its water needs. Groundwater is supplemented by the Grand River (approximately 20%) to meet the demand from domestic, industrial and agricultural uses. As the population continues to grow and further development occurs within the region pressure and competition for water will rise accordingly. In response to this rising demand, the Region has recognized the need for a comprehensive water protection strategy.

Historically, the Region has acknowledged the importance of nature conservation through the establishment of Environmentally Sensitive Policy Areas (ESPAs) in 1976. The Region was the first municipality to do so in Ontario (Figure 1). These ESAs stressed the protection of rare and ecological species, habitats, biodiversity and other biological features and processes. Criteria for the establishment of ESPAs were revised in 1995; one addition involved a new criterion which recognizes areas that perform important hydrological functions such as water storage, discharge, or recharge areas. In addition, through funding provided by the Rural Water Quality Program and practical assistance from the GRCA, rural landowner volunteers are working to restore stream corridors (Gosselin, 2003).

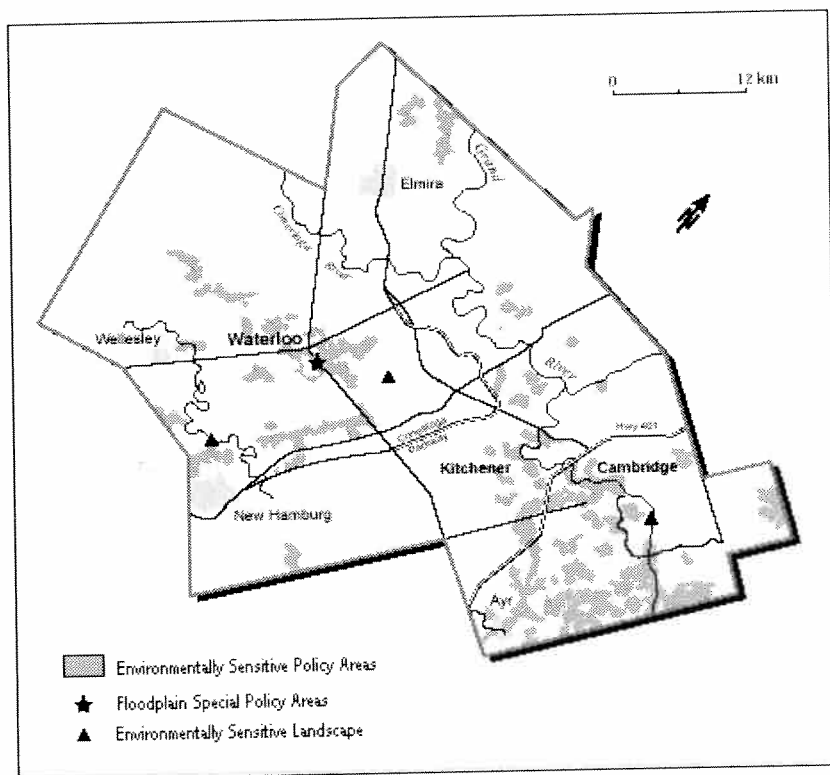
A water resources protection strategy was developed in 2000. The process began with a review of actions taken by other jurisdictions, the most notable located in southwestern United States, where arid climate conditions have forced governments to strictly regulate water use. These communities typically focused on aquifer protection from contaminant threats and the establishment of protected areas on lands adjacent to wellheads. The Region concluded that a combination of these two approaches was needed to produce a comprehensive strategy.

The region also completed the identification and mapping of Water Resources Protection Areas (WRPA). Different zones surrounding the wellhead were delineated; areas closest to the well were guaranteed more protection than areas further away. The zones are designated by the time of travel principle resulting in four zones. The greater the time of travel, the less the control of development in each zone. Area one has 0-2 years time of travel, area two has 2 to 10 years time of travel, area three has 10 or greater years time of travel and the last area consists of regional aquifer recharge areas.

The sensitivity of aquifers to different land-uses is dependent upon the vulnerability of groundwater to contamination and the potential consequences. Vulnerability can be eval-

uated through detailed geologic mapping to determine the geology above the aquifer, the depth of the water table, and the geologic setting. The number of people supplied by the well proportional to the volume and/or the availability of backup water allows for an assessment of potential consequences. In the Waterloo Region the Mannheim and Middleton wells and smaller rural wells were determined to have high potential impact if contamination occurred. The remainder of wells are of medium importance (Gray *et al.*, 2002).

Figure 1. Map of ESPAs in the Waterloo Region.



Case 2: Grand River Conservation Authority

In response to public concern about the exploitation of renewable resources by industrial development, the Government of Ontario established a system of corporate bodies to manage natural resources with the *Conservation Authorities Act* in 1946. The Grand River Conservation Authority (GRCA) was created in 1966 with the amalgamation of two previous institutions. Its broad mandate is to further the conservation and wise use of natural resources within its jurisdiction with the exception of gas, oil, coal, and minerals. As one of the largest and best resourced authorities in Ontario, the GRCA continues to play a key role in the management of the watershed through its various programs and functions.

In 1994 the Grand River was designated as a Canadian Heritage River and a broad management document *The Grand Strategy* has since been produced. This document has served as a critical push forward towards a more effective and sustainable water management process: "*The Grand Strategy has changed our attitudes, the way in which we interact with each other, and how we relate to our natural and human environments*" (Gray et al., 2001). Collaboration and communication is a fundamental concept that permeates the document. The GRCA has proven to be effective coordinators through the management process of issue identification, developing creative solutions, monitoring and evaluation. Ongoing involvement citizens, businesses, local organizations, First Nations, municipalities, provincial and federal governments has resulted in the Grand River being "*one of the healthiest river systems in North America in a heavily populated area*" (Gray et al., 2001).

Suggestions and Implications

So far I have outlined the need for and general concept of a new integrated approach to watershed management and explored the current application within the Grand River watershed. The next step required in developing this approach is the formation of a general framework or set of principles that can be used to guide its execution. Obviously, this report alone cannot accomplish this task. However, I will offer some considerations to facilitate further discussion on this topic. An important step in the application of protected areas in water management is determining which sites require protection. Some suggested appropriate protected areas in the Grand River watershed include:

- Head water source regions (e.g., moraines, sandplains, drumlins, aquifers, Eskers: Luther Lake and marsh, Keldon Esker, Riverstown Esker Twins, Waterloo Hills (Moraine);
- Other aquifers and source regions: Rothsay Drumlins, Guelph Drumlin Field, Eramosa Esker Channel, Arkell Meltwater Channel, Drayton meltwater system, Ingersol Moraine;
- Recharge areas (e.g., Wetlands): Blue Springs Creek Wetlands, Puslinch Lake Bog and Wetlands;
- Floodplains and hazardlands;
- Waste disposal and restoration areas;
- Well heads and other small scale sites;
- River mouths and deltas: Port Maitland Marsh, Dunnville Grand River Alluvial Marshes;
- Significant lakes and water bodies: Rockwood Conservation Area; and,
- Underground channels and features.

The use of protected areas within the context of water management is a relatively new concept being explored by both professionals and academics. Further research and discourse is needed in order to develop a comprehensive framework for the implementation of this new approach. Such additional investigation will provide additional insights and factors to be considered during the formation of a comprehensive new management approach.

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