



Towards a Vision and Strategy for Water Management in Canada



**Final Report of the Water Policy in Canada:
National Workshop Series**

April 2007

POLLUTION PROBE is a non-profit charitable organization that works in partnership with all sectors of society to protect health by promoting clean air and clean water. Pollution Probe was established in 1969 following a gathering of 240 students and professors at the University of Toronto campus to discuss a series of disquieting pesticide-related stories that had appeared in the media. Early issues tackled by Pollution Probe included urging the Canadian government to ban DDT for almost all uses and campaigning for the clean-up of the Don River in Toronto. We encouraged curbside recycling in 140 Ontario communities and supported the development of the Blue Box programme. Pollution Probe has published several books, including *Profit from Pollution Prevention*, *The Canadian Green Consumer Guide* (of which more than 225,000 copies were sold across Canada) and *Additive Alert!*

In the 1990s, Pollution Probe focused its programmes on issues related to air pollution, water pollution, climate change and human health, including a major programme to remove human sources of mercury from the environment. Pollution Probe's scope has since expanded to include new concerns, such as the unique risks that environmental contaminants pose to children, the health risks related to exposures within indoor environments, and the development of innovative tools for promoting responsible environmental behaviour.

Since 1993, as part of our ongoing commitment to improving air quality, Pollution Probe has held an annual Clean Air Campaign during the month of June to raise awareness of the inter-relationships among vehicle emissions, smog, climate change and human respiratory problems. The Clean Air Campaign helped the Ontario Ministry of the Environment develop a mandatory vehicle emissions testing programme, called Drive Clean.

Pollution Probe offers innovative and practical solutions to environmental issues pertaining to air and water pollution. In defining environmental problems and advocating practical solutions, we draw upon sound science and technology, mobilize scientists and other experts, and build partnerships with industry, governments and communities.

Acknowledgements

Pollution Probe extends its appreciation to the *Water Policy in Canada: National Workshop Series* Advisory Committee and its sponsors and partners, all of which are listed below. Almost 70 speakers contributed their expertise to the series (see Appendix I) and their contributions are also appreciated. Pollution Probe gratefully acknowledges the assistance of Paul Griss of Boldon Group Incorporated who played a key role in helping to organize the workshop series and was instrumental in developing this “living document” through the course of the project.

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Introduction

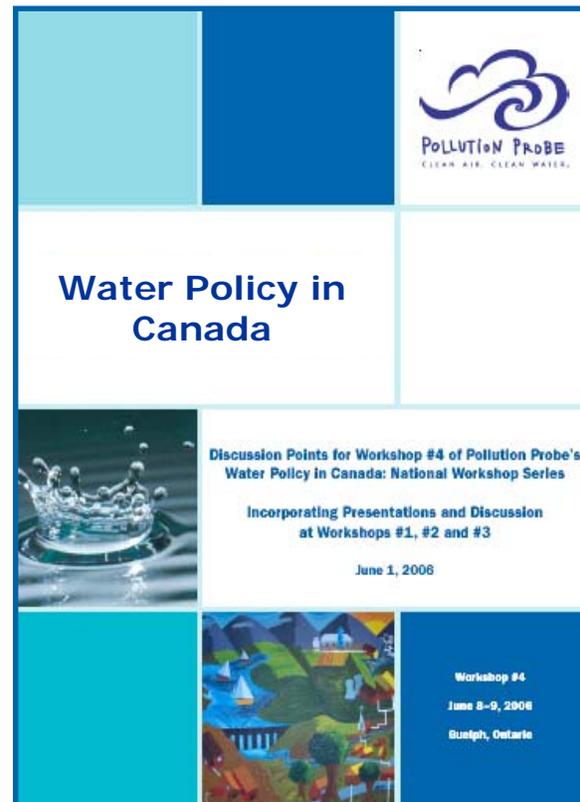
The *Water Policy in Canada: National Workshop Series* was a progressive series of five by-invitation-only national workshops for decision makers, experts and key influencers. The series was organized by Pollution Probe in conjunction with a wide range of government and non-governmental partners. The workshops took place in Winnipeg (February 2006), Lethbridge (March 2006), Wolfville (April 2006), Guelph (June 2006) and Moncton (October 2006), benefiting from almost 70 expert presentations and the input of several hundred participants in total.

This report began as a background document for the first workshop and was updated following every workshop to reflect the presentations and debates so as to seed the subsequent workshop. It gathers the collective wisdom and experience of hundreds of water policy professionals to provide a foundation for moving forward with a common vision and strategy for water policy in Canada.

Why should we act? Canada's rivers, lakes, snow and ice are part of our national identity. Isn't Canada a country blessed with plenty of water and a small population? Well, we were. But things are changing. Across much of Canada, water tends to be where most of the people aren't. As our population grows and pressure for industrial and agricultural uses of water increases, our water supplies are becoming more and more vulnerable to contamination and overuse. Climate change increases the pressure and the risks. Canada needs to be prepared for the serious water policy challenges that are coming. That flies in the face of our history and image of ourselves, but the dramatic consequences of failing to prepare can be seen in many places around the world.

By and large, there is little awareness of the challenges we face beyond those actively engaged in managing our water resources.

Figure 1. One of Five Workshop Background Documents Developed for the Water Policy in Canada: National Workshop Series



Source: Pollution Probe. *Water Policy in Canada: National Workshop Series*. Guelph, Ontario. June 8-9, 2006.

Public opinion on water tends to focus on two issues: the safety of drinking water and the potential for water transfers or exports to the US. While there are valid reasons for concern in both areas, neither of these emerged as major issues in the workshop series. Rather, the emphasis throughout was on scarcity and allocation of water due to changes in the availability of water and increasing competition for it.

As a result of these pressures, a new approach to the management of our water resources is

slowly beginning to emerge in Canada. It involves a shift from top-down planning to an inclusive, watershed-based approach. It is a transition from command-and-control to shared decision making. And it is a shift from managing supply to addressing demand or the need for using water at all. This transition, while necessary, brings its own challenges, and much of the workshop series focused on the demonstrated need for policy and infrastructure to catch up with the way decisions are currently being made.

So, what were the issues? The following six topics generated most of the discussion among participants:

- water issues on the Prairies loom large due to increases in demand and restrictions in supply; water will be the defining issue in Alberta, Saskatchewan and Manitoba in the coming years
- the impacts of climate change, which are expected to differ across Canada, need to be better understood and factored into water policy and watershed management
- water resources need to be valued from both an ecological and economic point of view
- the current state of information and understanding is inadequate to the task at hand, and better integration of science and policy is required
- as responsibility for water management is pushed down to the community level and shared with a wide range of partners, those partners face a capacity crisis in terms of human, financial and technical support
- communication and information exchange is a significant issue; although there are a multitude of agencies, non-governmental organizations and other partners in water policy, there is no standing forum, political or otherwise, to debate and prioritise issues or coordinate actions.

A tremendous amount of information was put forward in the workshop series. Not all of this information pertained to water policy directly and the range of information presented also

As our population grows and pressure for industrial and agricultural uses of water increases, our water supplies are becoming more and more vulnerable to contamination and overuse.

varied widely. Some information was national or international in scope, while other inputs were regional, provincial or local. Many participants identified problems in implementing existing policies, trouble securing financial or technical resources to address issues, or other capacity-related issues. The workshop series was thus able to explore themes and issues from a wide variety of angles and perspectives.

This report summarizes the discussions that took place during the workshop series. It is not a comprehensive review of each of the topics presented, and the content of the report should not be taken to represent consensus among the participants, except where noted.

Section A discusses water policy in general and explores the pros and cons of a national water policy or strategy. The remaining sections explore the seven major themes of the workshop series. Section B addresses watershed management, which was considered an overarching construct within which other themes could best be addressed. Section C discusses water governance. Section D explores water research, while Sections E, F and G respectively examine the issues of water quality, water quantity and water conservation. Section H reviews the final theme of the workshop, which is the international dimensions of water policy. The report concludes with consideration of the actions that need to be taken to develop and implement a vision and strategy for water policy in Canada.

A. Water Policy in Canada

Virtually all recent reports relating to water policy or management in Canada begin with statements to the effect that freshwater in Canada is not as plentiful as people think, and that its quantity and quality are taken for granted. Most also bemoan the lack of policy, resources, information, policy coordination and leadership with respect to water. The clear implication is that, if we don't get more serious about water, Canada is heading for a catastrophe. But are we?

A consistent theme across all five workshops in this series was that greater action is required by Canada on water issues; yet, articulating the required actions proved difficult. A failure in water management can be disastrous for local economies or human health, but a common lament was the lack of political attention to water issues. Considerable debate occurred around the scale of event necessary to place water on the political agenda. It was argued that we ought not to wait for the dam to burst through a single event and that too high a threshold is being set on the compelling reasons for action. Rather, a consistent pattern of smaller, local events across Canada — from boil water advisories and water use restrictions to growing water requirements for industrial facilities — in aggregate suggests a myriad of small holes in the dam that will ultimately lead to failure.

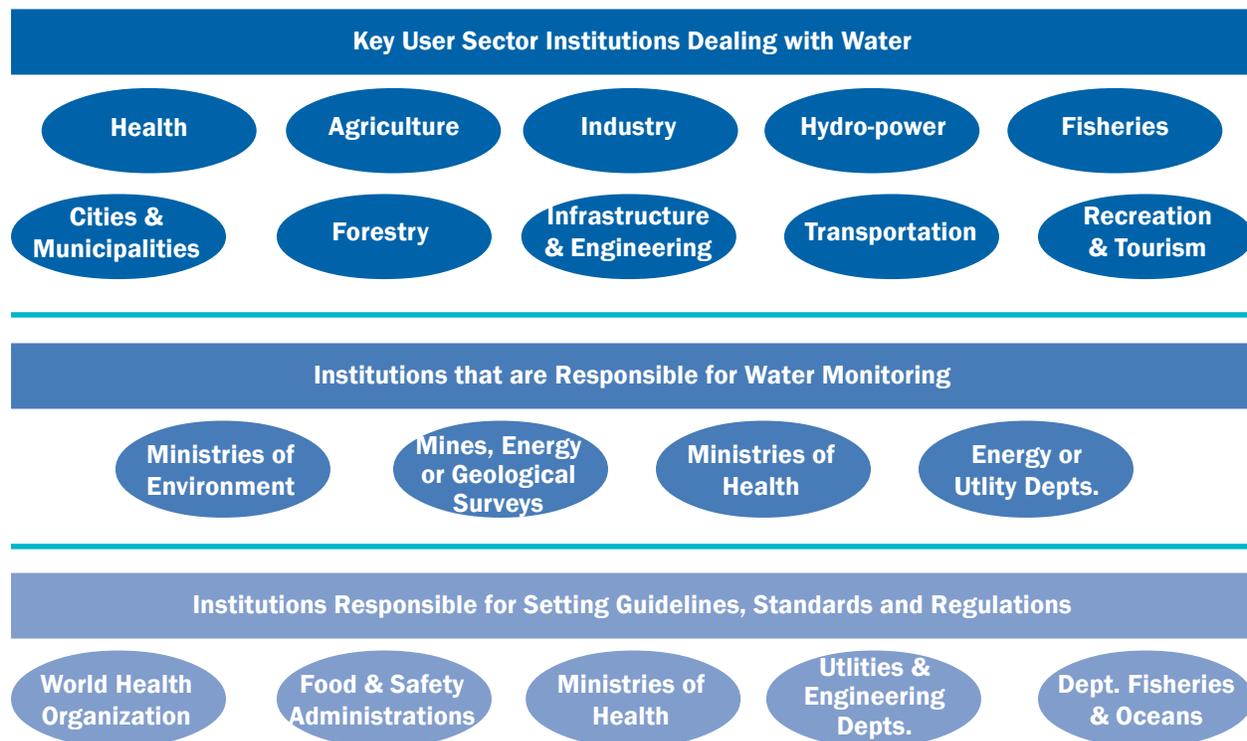
A failure in water management can be disastrous... we ought not wait for the dam to burst.

A.1 Current Policy Context

Decision makers are recognizing the need for change in the way we manage and allocate water resources. In the past five years, virtually all provincial governments have revised policies, strategies and regulations for the management of their water resources. Initiatives include *Water for Life: Alberta's Strategy for Sustainability* (2003), *Green and Growing, Building a Prosperous Future for Manitoba Families* (2005), Ontario's *Clean Water Act* (2006), British Columbia's *Drinking Water Protection Act* (2003), the establishment of the Saskatchewan Watershed Authority (2002), the *Nova Scotia Drinking Water Strategy* (2002), New Brunswick's Water Classification and Watershed Protection regulations, Newfoundland's *Water Resources Act* (2002), and Québec's *Politique Nationale de l'Eau* (2002).

Welcome as these initiatives are, the ubiquity of water issues and the importance of secure and safe supplies lead to the question of whether enough is being done. Are these approaches sufficiently robust to enable Canada to address the challenges that will face us in the future? It's not surprising, then, that a telling point from the Winnipeg workshop was when participants were asked why we are still trying to answer questions that were raised 20 years ago. Does this mean the "problems" weren't really problems, or that things are getting worse due to insufficient action?

The range and diversity of water issues also means that leadership in addressing these issues is diffuse and centralized action is extremely difficult. Many workshop participants believe that addressing historic and present concerns could be facilitated by developing a national policy or strategy for water management in Canada. In the absence of this, there is no mechanism for consistent and coordinated action on current and future

Figure 2. Selection of Institutions Involved with Water Management Issues

Source: Schreier, H. *Water Policy in Canada: National Workshop Series*. Lethbridge, Alberta. March 15–16, 2006.

challenges across the country. Sections A.2 and I discuss this in more detail. It was clear that many elements of a national approach are already in place, but aren't fully applied.

The *Canada Water Act* (CWA), for example, was passed in 1970; while it is still on the books, it is rarely used. Speakers at the Wolfville workshop stated that the CWA is very flexible, addresses the role of the provinces and includes provisions for federal–provincial cooperation, adopting an ecosystem approach and securing public participation. As a result, it could still provide the basis for addressing many current problems.

Federally, the most recent omnibus statement is the Federal Water Policy tabled in the House of Commons in 1987. The directorate that led the development of this policy was disbanded shortly thereafter and funding for implementation of the policy was eliminated.

This is not to say that the federal government has not taken policy decisions with respect to water since then, merely that decisions have been made on a case-by-case basis without any overarching framework or guidance. Several speakers at the Winnipeg workshop suggested that the 1987 policy has stood the test of time well and simply requires updating (for example, it is based on the polluter pays principle, rather than on pollution prevention, and there is no reference to aquatic ecosystem health).

One speaker in Lethbridge suggested that, 20 years later, at the national level, the gangster maxim of public policy is being applied to water: "Nobody moves and nobody gets hurt." A parallel was drawn to the past century when visionary leaders laid the foundation of the national parks system. The suggestion was made that similar vision and leadership is needed today on water issues. A common thread through all of the workshops was the

...virtually all provincial governments have revised policies, strategies and regulations for the management of their water resources.

need to find a way to generate the collective will to take action, and that leadership is needed to accomplish this.

Can we do better? There is a tremendous amount of activity in water policy across Canada, with many examples of innovation and leadership. As one participant in the Guelph workshop said, "If we took everything apart and put it back together, what would be different?" How close does existing water policy across Canada mesh with sustainability objectives and how good a platform does it provide to resolve current and future issues? Where are the policy gaps and how can they be filled? Which problems are the highest priorities for action? What are the most promising strategies and opportunities for improvement, and which ones can be embraced, given that neither the quality nor quantity of water can be risked while new approaches are evaluated? Is there a need for a comprehensive and integrated approach to water policy and management that engages all responsible agencies, water users and those whose actions affect water quality and quantity? Should this occur locally, regionally, provincially or nationally? Is there a need for one overarching national policy or strategy to coordinate actions and improve decision making in this area? And who should lead, as all land uses and human activities affect the water cycle? These are some of the questions explored by Pollution Probe's *Water Policy in Canada: National Workshop Series*.

A.2 Can There Be National Coordination?

If Canada, as a whole, is to do better with respect to water policy, then a mechanism for addressing the issues identified in the workshop series needs to be found. While not debated directly, presentations and discussions at the workshop series centred on four different approaches:

- Is a national water policy or strategy necessary, and can a policy statement address all of the identified problems effectively?
- If there is no need for a national water policy (or policies), are there some areas of water policy in which national leadership and coordination is required?
- Alternatively, could there be a national framework for action within which all jurisdictions could nest their own policies and strategies?
- Is there some other mechanism for ensuring effective water management across Canada?

While the workshop series did not come to a clear conclusion as to how to proceed, much debate centred on the need for a national water policy. It was argued that a national water policy would enable Canada to

- articulate a common Canadian vision for water
- transcend jurisdictional fragmentation
- provide a better game plan to do more with what it has
- address standard issues in water policy across the country (e.g., capacity, financing, technical support)
- include a wider range of stakeholders in water policy
- improve accountability at all levels
- facilitate a public policy debate on new governance models with respect to water.

Many issues relating to a national water policy or strategy were raised and debated in the workshop series. Based on these discussions it was generally agreed that a national policy or strategy should

- provide leadership and support for watershed-based planning
- recognize that effective water policies and strategies require effective land use policies and strategies
- balance the dominant land uses around the country (e.g., watershed protection on the Eastern slopes of the Rockies)
- value natural capital
- address the ecological demand for water
- consider the social dimension of water policy (who will be most impacted)
- enable the federal government to bring all aspects of water policy together and work with all levels of government
- be regionally sensitive without getting into jurisdictional issues (e.g., information, measurement, brokering dialogue)
- provide a framework to support regional initiatives

The range and diversity of water issues also means that leadership in addressing these issues is diffuse and centralized action is extremely difficult.

- incorporate better crisis management procedures (e.g., cooperation similar to the Heavy Urban Search and Rescue program)
- take advantage of opportunities for innovation (e.g., as presented by an ageing infrastructure)
- strengthen existing institutions before creating new ones
- have sufficient resources attached to it to avoid overpromising and underdelivering.

B. Watershed Management: We're All in this Together

In Canada, water issues are increasingly being viewed from a watershed perspective. Rather than managing all water quality and quantity problems at the delivery end, greater attention is being paid to protecting water at source and to integrating activities along the path from source to delivery. An effective watershed approach requires significant intergovernmental and interagency cooperation, as well as partnerships with industrial users and landowners. It also fosters life cycle thinking about water by attempting to integrate and address all factors that affect water quality and quantity throughout the watershed. The appeal of watershed management to decision makers is summarized in Box #1. Watershed management emerged through the *Water Policy in Canada: National Workshop Series* as a framework for addressing all other themes.

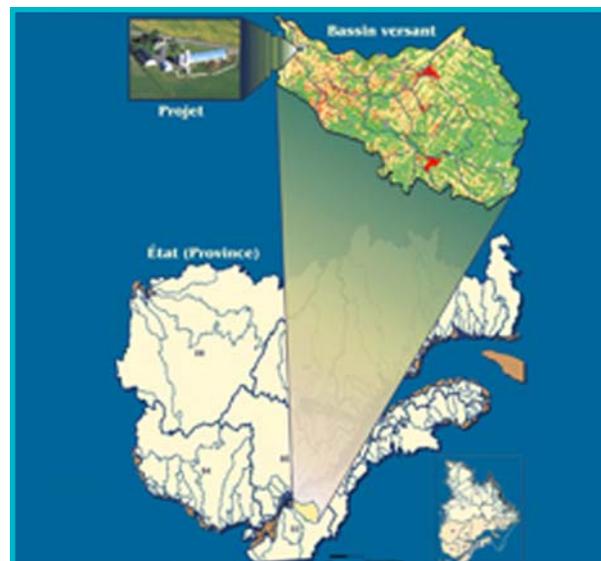
The reality of water is that multiple issues are addressed at multiple levels. It was suggested that a “nested watershed” approach would provide a framework for national or regional action on water in which policy development is retained at a high level, but implementation is delegated to the level most appropriate to addressing the issue. It was pointed out that the decision to establish conservation authorities in Ontario in 1946 helped to better manage water by implementing policy at the watershed level, and that sharing responsibility in this way could be an effective way of solving other problems. Indeed, many provinces have already moved to a watershed approach through the establishment of conservation authorities, watershed authorities or basin councils. As can be imagined, this is tremendously complex and, while the intention to take a watershed approach to issues is there, the landscape of decision makers is so fragmented and variable that implementation is challenging.

Box #1: Why Management on a Watershed Basis?

- An ecologically practical unit for managing water (the scale at which cumulative stresses and impacts become evident).
- Ensures decision-makers recognize the impacts of upstream activities on downstream water sources.
- Balances the need for local decision making and the need for consistency of approach between localities.
- Promotes planning at a watershed level, but with the full participation of municipalities, stakeholders, First Nations and the public.

Source: Dave de Launay, Assistant Deputy Minister, Ontario Ministry of Natural Resources

Figure 3. Nested Watershed Approach is Recommended for Addressing Issues at Multiple Levels



Source: Maranda, Y. *Water Policy in Canada: National Workshop Series*. Moncton, New Brunswick. October 4–5, 2006.

“In Canada water issues are increasingly being viewed from a watershed perspective.”

This is certainly true on the Prairies where Alberta, Saskatchewan and Manitoba have all enshrined the watershed approach in policy and legislation. However, only a limited number of watershed plans have actually been completed within the prairie water basin, and

even fewer have been implemented. Barriers to progress identified by the International Institute for Sustainable Development include

- a lack of formal mechanisms to learn from one another
- no consensus and no clear direction on how to meet capacity requirements for local watershed planning
- lack of agreement on the role and type of decision support tools and the degree of process transparency
- little uptake of economic instruments and ecological goods and services concepts.

Subsequent sections will discuss many of the challenges entailed in implementing watershed management in Canada. Box #2 is a summary of the Canadian experience, which receives further elaboration in the text.

Box #2: Some Factors for Success in Watershed Management

We know that watershed management is enabled by (in no particular order)

- resources (human, financial, technical)
- communication among stakeholders at all levels
- opportunities for learning from successes and failures
- data and knowledge
- valuation of water for human socio-economic uses, and for ecosystem functions
- patience and time
- commitment at all pertinent levels (local, provincial, federal)
- clarity in roles and responsibilities
- shared understanding of objectives and outcomes
- common indicators to measure achievement of objectives and outcomes
- leadership (especially at the local level)
- institutions that facilitate watershed management
- institutions that facilitate integration of watershed management with related realms, such as land use planning
- awareness of issues, interests, problems and solutions
- partnerships among agencies and organizations
- networks for sharing knowledge, skills, resources and staff
- involvement of the general public, pertinent agencies and key interest groups
- respect for enduring implementation challenges (including competing interests, changing interests, participant fatigue, institutional turbulence, financial insecurity)
- flexibility and adaptability (to respond to new threats, to take advantage of new opportunities)
- processes for building and maintaining trust
- stewardship/sustainability ethic that promotes wise use, integration and so on
- respect for local context, history and issues (and understanding that one size does not fit all)

Unfortunately, based on our track record, we don't seem to be able to put it all together consistently.

Source: Rob de Loe, University of Guelph, from presentations at the Canadian Water Resources Association's annual meeting in Toronto, Ontario (June 4–7, 2006).

B.1 Protecting Ecosystem Integrity

Human demands for water need to be placed in an ecosystem context. To maintain ecosystem integrity, human demands should not encroach upon or compromise the needs of the ecosystem (e.g., balancing increasing water withdrawal needs against the need to maintain streamflows). Unfortunately, there is little knowledge of how much water is actually used by humans, let alone how much can be safely removed from a watershed without compromising its integrity.

An advantage of watershed management is that the approach can contribute to ecosystem integrity by bringing out values that may not have been considered before and integrating them into planning (see Box #3). For example, there is a public demand, and hence a value, for the ecological role of water — water in the lake, over the waterfall, and so on — that can be harnessed in watershed management. The methodologies for doing this are being developed, based on metrics for valuing ecological services, and will be important tools

in ensuring that the benefits of healthy ecosystems are factored into decision making.

The International Institute for Sustainable Development (IISD) said that the foremost recommendation of the Millennium Ecosystem Assessment with respect to water was to implement watershed-based payments for ecological services. According to IISD, this entails

- ensuring that the value of all the ecosystem services provided by watersheds (e.g., soil conservation, flood control), not just those bought and sold in the market, are taken into account when making decisions
- removing subsidies to agriculture, fisheries and energy that cause harm to people and the environment
- introducing payments to landowners in return for managing their lands in ways that protect ecosystem services, such as water quality and carbon storage, that are of value to society
- establishing market mechanisms to reduce nutrient releases and carbon emissions in the most cost-effective way.

Table 1. A Cross-section of Ecological Goods and Services

Natural Capital	Goods and Services Provided
Forest	Carbon storage and sequestration, soil formation, waste treatment, biological control, air quality, genetic resources
Grasslands, rangelands	Carbon storage and sequestration, water regulation, erosion control, waste treatment
Wetlands	Water supply, water treatment, food production, recreation, habitat/refuge disturbance regulation
Lakes, rivers, riparian zones	Water supply, waste treatment, food production, recreation, total ecosystem
Cropland	Food production, habitat/refuge, scenic
Undeveloped land	Scenic

Source: Duffy, T. *Water Policy in Canada: National Workshop Series*. Moncton, New Brunswick. October 4–5, 2006.

Box #3: The Net Gain Approach

One of the advantages afforded by taking a “bottom-up” watershed-based approach to measuring, monitoring and managing water quality and quantity in the broadest sense is that it provides the opportunity to develop innovative approaches that touch a number of goals. One such approach is to set an overall policy goal of seeking a “Net Gain” in the ecological services that are provided within a watershed. In other words, a proposed development, activity or change happening in a watershed should proceed only if the proponent or responsible authority can be satisfied that the activity or change would result in an improvement or a net gain in terms of the ecological services already available in the watershed. In order to achieve development that is “sustainable” we will need to actually seek a net gain or improvement – a “no net loss” approach will no longer assure us that we will be better off in the future.

Such an approach would require that work needs to be done to find ways to value water resource-based assets in ecosystem-based units of some kind of currency (e.g., hydrologic, areal extent, time). Both water quality and quantity needs should be considered in this process of “valuation.” This ecological valuation needs to take place at the same time that we set priorities and make decisions on the kinds of physical measures (e.g., protect a wetland, restore a streamflow, make decisions about water allocation) that would be needed to protect and improve a watershed including the costs in economic terms of taking that action. In other words, we need to find systematic ways to achieve the greatest ecological return with the greatest efficiency and least cost from an economic point of view that everyone can see and understand.

Source: Erik Veldman, Programme Manager, Pollution Probe

It was also noted that it is easy to complicate payment for ecological goods and services, and there is thus a need to find ways to address the issue creatively.

B.2 Establishing Watersheds as a Sense of Place

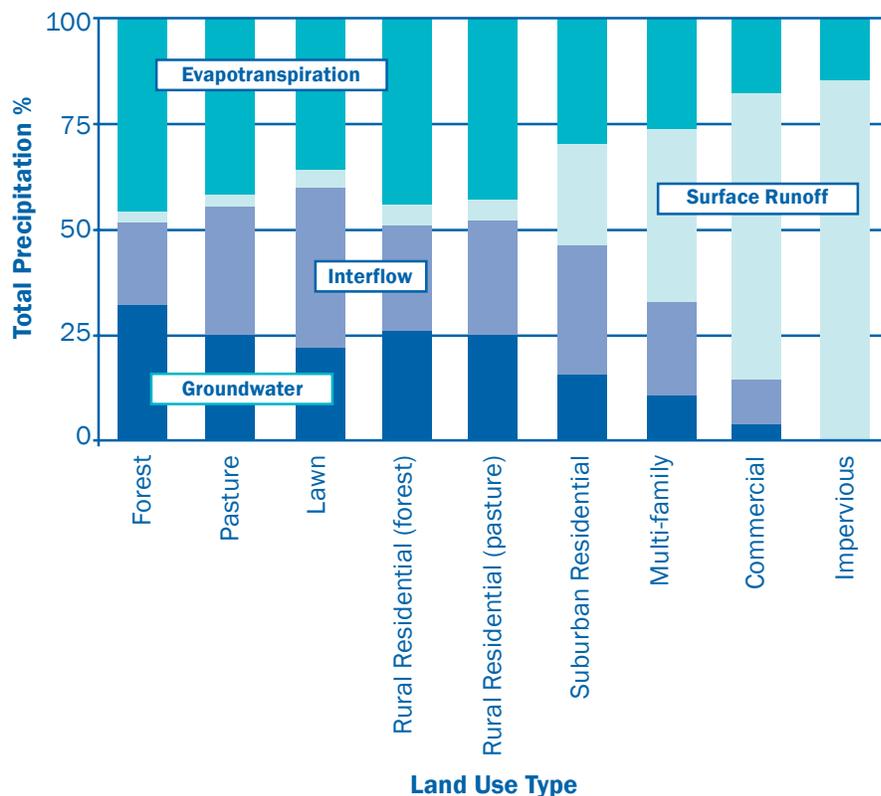
Few Canadians can identify the watershed within which they live, or even the source of their drinking water, making it difficult for them to understand the interconnectedness of activities. It was argued that a better “so what?” is needed when explaining water issues to non-experts. Watersheds provide a framework within which to emphasize the importance of issues. Sense of place is often determined by political boundaries, but creating identity or a sense of belonging around a watershed can assist in creating a stewardship ethic. While activities may not need to be politically organized along watershed boundaries, the context watersheds provide for decision making and securing public support is extremely important. People need to know that what happens “over there” affects what happens “here.” The scale of the defined watershed is thus important as people need to feel connected to others in the watershed.

...the linkage between people upstream and people downstream, as well as between urban and rural dwellers, needs to be strengthened...

This does not preclude a macro approach; rather, the concept of nested watersheds, discussed earlier, means that connectedness and a sense of place is important on a larger scale, and that different people and institutions may identify with the larger watershed than with the local ones nested within it. For example, the Great Lakes watershed is a unique and diverse ecosystem that is truly of global importance and faces enormous challenges. In the Great Lakes Basin, eight million Canadian and 35 million American residents live and are stewards of 20 per cent of the world's fresh surface water. The sustainability of the Great Lakes Basin will thus require a sense of shared responsibility and coordinated action at all levels.

In particular, the linkage between people upstream and people downstream, as well as between urban and rural dwellers, needs to be strengthened, because as people become more removed from the source of an issue their incentive to participate in resolving it diminishes. This is especially important given the disparities that may arise; for example, four out of five rural residents live in a watershed where they are outnumbered by the urban population, yet private landowners often bear disproportionate costs for contributing to downstream water quantity and quality. While their stewardship ethic is often strong, there is a limit to what can be asked or expected. Further, managing increased demand in situations in which available resources are

Figure 4. Hydrological Implications of Different Land Uses



Source: Schreier, H. *Water Policy in Canada: National Workshop Series*. Lethbridge, Alberta. March 15–16, 2006.

...creating identity or a sense of belonging around a watershed can assist in creating a stewardship ethic.

fully allocated will create winners and losers. Maintaining provincial standards in agriculture, for example, may be made more difficult or costly depending on where in the watershed a farm is located. Understanding the watershed and the pressure it faces can thus help people to understand and accept the actions that they are being asked to take.

B.3 Integrating Water with Land Use and Other Strategies

Effective water policy requires integration with all other activities on the landscape. Land use activities, such as forestry or mining, can impact the hydrology of a region. Other activities, such as agriculture and road construction, can contribute to erosion. Large water withdrawals for industrial plants or new subdivisions can also compromise other values

if they aren't integrated into a broader strategy. And climate change will affect everything and may exacerbate the impacts of these activities. Therefore, water policy can not be dealt with in isolation or as an afterthought. It must be integrated with all other policies and strategies that influence land use in the watershed.

B.4 Recognizing Diffuse Leadership

Even if watershed management is placed in an ecosystem context, people identify with the issues and the actions required, and all policies and strategies that affect water are integrated, implementation is messy due to the diverse interests and jurisdictions involved. Policy implementation was thus revisited frequently in the workshop series.

Leadership may come from a variety of sources within the watershed. Implementing watershed management requires cooperation and coordination among a wide range of users, some of whom may never be directly exposed to one another. The circumstances under which decision making can be distributed within the watershed must be clearly understood, and methods for overcoming the extent and complexity of activities and authorities within a watershed need to be developed. All of these need to be sensitive to the local context.

C. Water Governance: You Go First

As with most natural resources, governments are responsible for conserving and allocating water. Jurisdiction over water is incredibly complicated, even within a single level of government. Principal responsibility for water rests with provincial governments, and most govern differently. Alberta, for example, has a Water for Life strategy to which all relevant government agencies are expected to contribute in a coordinated manner, whereas Manitoba has established a Ministry of Water Stewardship that centralizes responsibility for water within one department.

The federal government can influence watershed management at the provincial level through the application of the *Fisheries Act* and other legislation. The federal government is also expected to provide leadership in water policy nationally; however, some 22 federal departments sharing budgets of approximately \$750 million per year have some responsibility for, or interest in, water. The multiple federal agencies and multiple federal roles (police officer, diplomat, and so on) increase complexity. Further, the institutional capacity of federal departments and agencies to work together is limited (it is still done on a case-by-case basis without any consistent guidance regarding circumstances that warrant cooperation, processes for decision making, and tools to support the initiatives).

Municipal governments also have significant responsibility for ensuring water quantity and water quality. Many land use and development decisions are made at the municipal level where development and growth can have major hydrological implications, from storm water management and protection to loss of natural water courses. Decision making is increasingly being pushed down to the municipal government level where the necessary resources and expertise may not always be available. It was pointed out,

though, that competitiveness across municipal boundaries can be a great motivation for action at the watershed level (i.e., communities “challenging” one another to improve water conservation).

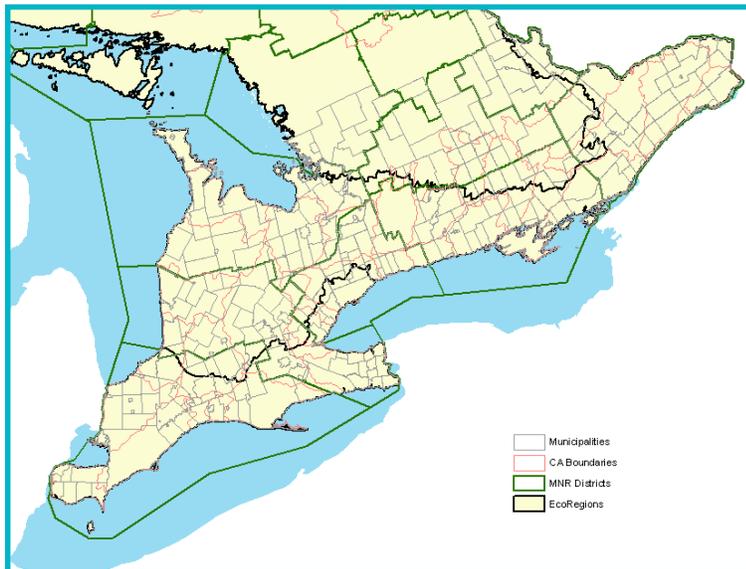
And there are still others with a role in water governance. The role of First Nations needs clarification as there has never been a case to test indigenous water rights in Canada, or a situation in which water rights have been clearly extinguished. The private sector is also increasingly involved in managing and delivering water in Canada.

Addressing the complex institutional mechanisms governing water is thus a significant and central challenge in achieving policy aimed at managing water sustainably. A particular concern with fragmented decision making is the barrier it presents to understanding and addressing cumulative threats to the watershed.

C.1 Overlapping Ecological and Jurisdictional Boundaries

A significant impediment to effective watershed management is that it is virtually impossible to segregate a discrete unit of governance. Watersheds overlay groundwater aquifers that may extend beyond the watershed. Surface water and groundwater may be treated differently legally, yet they are interconnected. Federal political boundaries do not match provincial political boundaries. Provinces, municipalities, townships, forest management licences, wildlife management zones and so on may overlap and straddle more than one watershed. For example, in Manitoba, only one conservation district’s boundaries align with a watershed, despite the fact that all are required to be doing integrated water resource management.

Figure 5. Overlapping Political and Ecological Boundaries in Ontario



Source: Rosolen, S. *Water Policy in Canada: National Workshop Series*. Guelph, Ontario. June 8–9, 2006.

Sorting out who does what, when and where is complex. It is extremely difficult to ensure consistency of outcomes when a wide variety of players may be operating under different legal, policy and institutional arrangements. It was observed, for example, that the same legislation and policy is implemented differently in different parts of Ontario due to the particular interests of local people, and much water legislation is ignored due to confusion about responsibilities.

In smaller provinces, such as New Brunswick, senior government officials interact frequently due to proximity, but in other jurisdictions interaction among senior officials, even in the same department, may be infrequent. Integrating all of the “stovepipes” into one process is prohibitive, and a higher-order sustainability policy or agreement may be a more effective method of getting all jurisdictions to ensure that activities within their jurisdictions contribute to the broader objective.

Clear roles and responsibilities for governance within the watershed are required. The mantra

of “jurisdiction best placed” was repeated often in the workshop series, but there may be differing opinions on which jurisdiction is in the best position to address an issue. It was observed that responsibilities for ensuring water quality are often off-loaded to the jurisdiction least likely to be able to deal with them effectively due to lack of human, technical or financial resources. It was also stated that increasing demands in fully allocated watersheds may lead to jurisdictional challenges. Having clear roles and responsibilities may mitigate that risk.

A significant impediment to effective watershed governance is that it is virtually impossible to segregate a discrete unit of governance.

C.2 Interjurisdictional Cooperation

Participants questioned the level of interest in a national approach to water management through federal-provincial-territorial collaboration in light of the diversity of needs and priorities. They emphasized that cooperation may be necessary in some instances, but not all. For example, the universal adoption of standard monitoring and reporting protocols, as well as data dissemination and sharing practices, can be achieved without compromising the ability of jurisdictions to pursue other water policy issues independently.

It was pointed out that there are existing mechanisms for interjurisdictional cooperation where the need is demonstrated. Examples are the Prairie Provinces Water Board, the Lake Winnipeg Federal/Provincial Implementation Committee, a memorandum between British Columbia and Alberta, agreements between Québec and Ontario and between Québec and New Brunswick, and an agreement between New Brunswick and the State of Maine. Nationally, there is a Federal–Provincial–Territorial Committee on Drinking Water (CDW) as well as some working groups of the Canadian Council of Ministers of the Environment (CCME), such as the Committee on Health and the Environment, that address water, but it was questioned whether CCME was the best vehicle for dealing with water policy nationally, given that water is an issue of particular interest to many sectors, in addition to the environment. There is no place for the integration or coordination of water efforts among jurisdictions and agencies nationally.

Interjurisdictional cooperation on water also has a century-long shared history in Canada and the US in terms of co-management of the Great Lakes. The *Boundary Waters Treaty* of 1909 and almost a century of evolved Great Lakes agreements and institutions under it constitute a model of cooperation that is respected worldwide. These agreements and

As the water management focus moves to local, watershed-based approaches, the role of the federal government will differ from that played in areas where it has clear authority and responsibility.

institutions will need to continue to evolve to address the shared challenges both countries will face in the future. The flexible, objective-orientated nature of the *Boundary Waters Treaty* has been identified as the basis of its acceptance, usefulness and longevity.

C.3 Clarifying the Federal Role in Watershed Management

The role of the federal government in watershed management was a frequently visited topic in the workshop series. While recognizing the regulatory authority of the federal government in certain areas, most saw the federal government to be more of a partner and facilitator. The federal government can transcend local jurisdictional conflicts and promote the adherence to higher level principles. Further, the federal government can lead the development of standards and can address the needs of people who live in the watershed. A parallel was drawn to the Prairie Farm Rehabilitation Administration, which acts as a facilitator and motivator and as a source of technical expertise and funding. There is a strong federal role related to the information base — establishing standards for data collection and reporting, identifying and coordinating water research, and assisting in the development of tools for watershed management. The federal government is in a unique position to address the patchwork quilt of regulations, standards and approaches that

exist at the watershed level, and support a more coherent and integrated approach across the country.

Currently, there are 22 federal departments and agencies that are directly or indirectly implicated in water policy and management, although it was pointed out that the 20/80 rule applies (i.e., all departments and agencies are not equally engaged). While there are some one-off federal initiatives, there is no coordinated federal perspective on water policy or science issues. For example, Canada's ocean strategy, which promotes integrated water resource management, falls under the jurisdiction of Fisheries and Oceans Canada, which (as a resource-based agency) may not be the best department to lead the issue. Further, the *Canada Water Act* and the 1987 *Federal Water Policy* are rarely referred to, and federal bodies, such as the Interdepartmental Water Committee, are dormant.

As the water management focus moves to local, watershed-based approaches, the role of the federal government will differ from that played in areas where it has clear authority and responsibility. Some workshop participants suggested that the federal government could make the following contributions to watershed management:

- “letting it happen” and being available to play a support role
- providing financial and technical assistance and supporting capacity building
- undertaking and coordinating research and facilitating technology transfer
- contributing to data and information needs
- coordinating and facilitating networks
- participating in policy development at the watershed level
- acting as a stakeholder in integrated water and resources management initiatives.

C.4 Flexibility in Approach and Consistency in Outcome

Due to the complexity and variability of water issues, there is no “cookie cutter” solution that can be applied across Canada to bring all those with governance responsibilities together. Even within regions flexibility may be required from place to place or issue to issue in order to ensure consistency in results, rather than consistency in process. For example, the approach needed to regulate point source emitters of specific chemicals is much more straightforward than that needed to influence the behaviour of individuals or a multitude of non-point sources of pollution. Watershed solutions need to reflect regional realities (e.g., there is a big difference between Atlantic Canada Action Plan groups and conservation authorities in Ontario, which have a legislative mandate) and therefore any national policy process must be sufficiently flexible to allow for variation across the country. A key issue is how to make dynamic processes work, as opposed to having strong centralized control or a “one size fits all” approach.

Further, institutions established to implement water policy must themselves embrace greater flexibility to anticipate and respond to future problems. While enforcement of current laws and regulations is seen as an area that can be improved, government should not get so tied up in inflexible regulations that it is unable to

Watershed solutions need to reflect regional realities...

respond to innovation. And as a broader range of partners is engaged in watershed management, compliance enforcement needs to be flexible to secure the support of those to be regulated (i.e., everyone can't be made non-compliant with a new policy or regulation, and provision needs to be made to encourage adaptation and adoption of alternative technologies). Moreover, it was suggested that, if regulations and policies are results-based rather than prescriptive, they can stimulate innovation by encouraging people to provide more effective or efficient solutions.

C.5 Letting Go: The Changing Role of Government

Shared responsibility for watershed management is a virtual certainty as no single authority can have jurisdiction over all aspects of water policy. The issues and solutions are evolving from traditional engineering solutions and science-based approaches to community engagement; such evolution enables the incorporation of societal values and social and economic considerations. Alberta, for example, is transitioning from process to outcomes, from water management to watershed management, from regulating to shared responsibility, and from government to governance.

It is important to distinguish responsibility from accountability. Governments must retain accountability for achieving desired outcomes, but in pursuing those results they may find it more effective to delegate some responsibility to others. Sharing responsibility, though, means sharing power and this challenges the traditional role of government in decision making. A strong regulatory agency, coupled with strong public involvement, can be achieved if approached correctly. New Brunswick's *Watershed Classification Regulation* illustrates this point. The regulation establishes

Sharing responsibility, though, means sharing power and this challenges the traditional role of government in decision making.

ambient aquatic water quality standards for watersheds and is designed to set the framework for designation of these standards throughout the watershed. The choice of the standard to be attained (outside of designated drinking water supplies), however, resides with the communities in the watershed and is facilitated through a strong consultative component led by community-based watershed groups.

There is no doubt that this changing role may be perceived to be risky to governments and to government employees with regulatory responsibilities. Government may need to evolve from managing a top-down approach to being more of an enabler/facilitator for the actions of others (see Box #4). More and more, governments are required to address the behaviour of individuals and non-point sources of pollution. This will require different skill sets than those needed by a government regulator dealing with industrial point sources. It may also call for differentiation within government (i.e., it is difficult for the same agencies or employees to be both regulators and facilitators). As no two watersheds are alike, government regulators may need to "let go" a bit and be prepared to adjust according to local realities by finding ways to share some responsibility and risk with local watershed managers.

Box #4: Alberta's Water for Life Approach

Alberta's Water for Life strategy challenges the traditional approach of government. Some observations on the strategy and its implementation include the following:

- The right to plan at the basin level is enshrined in the statutes, which set standards but allow others to work out solutions, as long as they don't offend a third party (including the environment). Government is the only organization that can identify all of the third parties.
- The Alberta Water Council, with 40 members and chaired by the Deputy Minister of Alberta Environment, assesses progress.
- Basin councils in each river basin focus on issues closer to home, advise on basin plans and are significant players, but do not make decisions (decisions are the responsibility of the Province and are signed off by the Lieutenant-Governor)
- Consequences outside of the basin are a factor due to the extent of government review necessary to get signoff.
- Basin councils decide where they are going to focus, dependent on the issues in the basin. They should never become decision makers or they will lose their ability to interact with communities.
- Decision makers need to be connected to the community, but at the same time can't be seen to be influencing the decision.
- Stewardship groups are important in placing peer pressure on others – some very informally.
- Progress on the landscape will be made by the people on the landscape (by copying their neighbours), as opposed to "in spite of" the people on the landscape.
- Ad hoc "operational" groups in the watershed (addressing drought, flood, spills and so on) may arise and then disappear (e.g., a "water share" group arranged equitable distribution of water across southern Alberta during a period when only 60 per cent of supply was available). These are public groups that come together to address specific issues.

Adapted from Dave McGee, District Approvals Manager, Alberta Environment

C.6 Building Partnerships

Watershed management was seen to be less of a technology issue than a stewardship issue. One speaker stated that, to engage people effectively, water management should be based on social values but with a regulatory backstop. It is difficult to deal with pollution or contamination without engaging the people causing the pollution. A clean water ethic can be cultivated if people identify with the broader value of water and with their watershed as an important sense of place.

There are hundreds of organizations across Canada with the potential to be partners in watershed management. Mechanisms need to be found to engage them effectively in watershed governance to develop and implement policy, secure public support and generate the political will to take action. Partnerships take a long time to build and are often frustrated by a lack of patience for the policy processes on the part of others. This is exacerbated when roles and responsibilities for managing the watershed are unclear. It was pointed out that a clear and universal commitment to watershed management will ensure that all watershed-based organizations can succeed. After all, decisions from above require acceptance by communities, as well as changes in people's behaviour, if they are to be implemented effectively.

C.6.1 Engaging Communities

Community involvement in watershed management was strongly endorsed in the workshop series, but caution was expressed that there are many "communities" and care needs to be taken to ensure that the right people are engaged in the right way. Self-selection of participants, for example, may not be appropriate as community leaders and stakeholders may not be the same people.

Community engagement also works better in some areas than others as it is influenced by the characters of participants and government employees. Some national guidance may be required on how to engage communities effectively at the watershed level. There are some excellent examples of how community commitment can leverage public funding (e.g., the community-based monitoring programs discussed in Section D.3).

Major impediments to community engagement include a lack of trust and unrealistic expectations. In terms of the latter, it was observed that governments tend to lead with responsibility and lag with resources. That is, groups are engaged in an issue and expectations are placed on them, but they are not provided with the resources needed to deliver results. If trust is to be built and partnerships are to prosper, it was suggested that this pattern of approach ought to be reversed. Government should lead with resources (training, equipment, funding), recognizing the value and potential of communities to address issues. As long as government retains accountability (see Section C.5) the capacity and responsibility of partners can be enhanced over time.

It was pointed out that the major factors contributing to the success and longevity of the Clean Annapolis River Project (CARP) include the recognition of water quality as a common priority for both the community and government, CARP's ability to bring multiple stakeholders together to address shared interests, the on-going commitment of the CARP Board of Directors, the commitment of volunteers, and the cost-effectiveness of the program.

C.6.2 First Nations

There are significant watershed governance issues relating to First Nations. As indicated earlier, the issue of rights to water has yet to be resolved in Canada. Further, First Nations' are not well served by water infrastructure. Manitoba for example estimates that the province faces a \$500 million deficit in providing sewer and water services to First Nations. Gaps in jurisdiction (self-government), regulations (water quality and quantity), policy (management goals, approaches and tools) and capacity challenges make it difficult for First Nations to participate in a national water policy dialogue.

Box #5: Basin Committees under the Québec Water Policy

In implementing its Water Policy, Québec is taking a flexible approach that is oriented towards achieving results. The approach is based on adaptive management and recognizes the differing social, economic and environmental characteristics of each watershed. To assist in this, Québec has established basin committees in 33 priority watersheds within the province. These are non-profit organizations with balanced representation from all stakeholders. Basin committees are responsible for implementing integrated water management within each watershed, including developing a management plan, determining roles and responsibilities for its implementation, and ensuring accountability.

Each basin committee receives \$65,000 per year from the government for core operations, which it can augment through other means. The Québec government also provides technical and financial support to stakeholders, including technical assistance, geographic information system (GIS) tools, information kits, a water atlas, and so on.

Source: Yvon Maranda, Québec Ministry of Sustainable Development, Environment and Parks

Partnerships take a long time to build and are often frustrated by a lack of patience for the policy processes on the part of others. This is exacerbated when roles and responsibilities for managing the watershed are unclear.

C.6.3 Role of the Private Sector

Watershed management often requires private landowners (e.g., farmers) or land users (e.g., forest companies) upstream of a major centre of population to undertake activities that, for example, provide source protection for drinking water, often at their own expense. Further, private landowners or land users are expected to protect riparian habitats and wetlands for conservation purposes, contributing to a public good, again often at their own cost. While there are many initiatives underway in Canada to explore ways to reconcile the need to manage public resources with the rights of private landowners and land users, there is currently a lack of mechanisms for doing so, or even for valuating the services they provide.

Many landowners have proven their willingness to engage in stewardship activities — Alberta's Partners in Habitat program, which sees farmers provide their own water for wildlife, is oversubscribed — but the prime motivation for action is the local impact. What happens downstream is usually of secondary concern, and securing greater landowner support to address downstream issues may require incentives. The Ontario *Clean Water Act* takes a comprehensive regulatory approach to

securing source water protection, but it may also require incentives to avoid having an adverse effect on landowner stewardship.

The private sector is also playing an increasing role in the delivery of water infrastructure and services. Privatization or commoditisation of water remains controversial (see Section I), but there is increasing private sector participation, including public-private partnerships (P3). Some benefits of private sector participation include

- the availability of resources and expertise to communities that the public sector may not be able to effectively supply
- the potential for alternative service delivery methods
- the opportunity for the private sector to share costs and risks while maintaining a public interest in vital services.

Throughout the workshop series, participants expressed the concern that private sector participation be placed within an appropriate, and perhaps strengthened, regulatory framework.

C.7 Building Capacity

Québec's experience with *Zone d'intervention prioritaire* (ZIP) committees illustrates what happens when responsibility and accountability outpace resources. Fourteen committees were incorporated independently within the *Stratégie St. Lawrence*, and each provided with \$75,000 from the Province of Québec for coordination. Each ZIP committee evolved on its own and developed its own dynamics. A ZIP Commission provided a framework for networking among ZIPs so that they could learn from one another. As the committees became established and successful, they faced two major challenges: Some were placed in the position of challenging the provincial government that authorized and funded them on local issues. In other cases, the growing expectations of the public

exceeded the financial resources available to the ZIP committees. The result is that the ZIP committees have not realized their full potential.

Similar stories can be found across Canada, in which the lack of investment in watershed organizations led government to lose a significant amount of leverage. Stories were told of watershed organizations in Alberta holding bake sales to raise funds for their work. Throughout the workshop series, the lack of recognition of the power that exists in small or regional organizations and what can be done to enable them to be more effective was presented as a major gap to be addressed in watershed management.

Government policies with respect to watershed management need to contribute to the development of human, technical and

financial capacity. The most important thing is first to have the right idea or opportunity; then the right people and organizations can be identified, and finally the resources need to come. In terms of human resources, in most cases success relies on a small number of people or organizations that have the patience and persistence to keep the ball rolling (Box #6 suggests some ways of attracting and retaining these leaders). It was pointed out that government often hires these people once they have been trained through their volunteer involvement. On the financial side, the capacity to manage environment and sustainability issues over the long term needs to be established — not just by committing dollars, but also by ensuring that funds are managed effectively and assigned according to priorities. Financial capacity can be enhanced by looking at more effective ways of doing things with the resources available.

Box #6: Lessons for Engaging Volunteers and Communities

It was noted that every new policy iteration leads government to “reinvent the wheel” at a local level. What is often missed, though, is that this process builds up the capacity to do it well. Solutions can’t be imported from elsewhere; they have to be developed locally with the participation of experienced volunteers.

Some learnings include the following:

- volunteering is not a way of life — potential volunteers must learn to participate
- with a new watershed process, special interests and newcomers may attempt to take control
- if volunteers are initially placed in smaller processes, they will not become a risk when they graduate to larger decision-making bodies
- experience in participation decreases non-democratic tendencies.

Sound decision making by volunteers requires

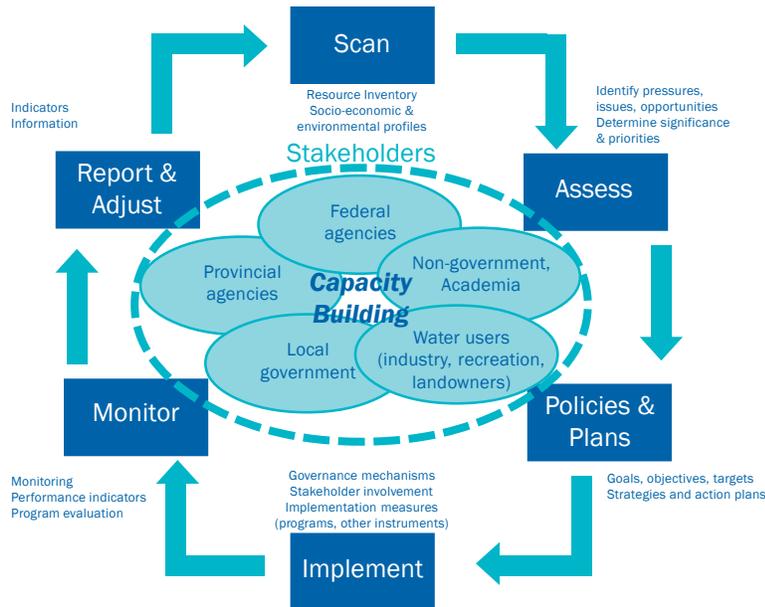
- good understanding, proper education and experience
- control over the planning process
- defined budget/operating/regulatory parameters
- trust of other decision makers/staff (which takes time to develop).

Communication is more important than science:

- recommendations are implemented through people and their relationships, not through a flowchart
- relationships are established through common language (technical, geographical, cultural)
- professionals must use words that mean something to the local people
- shared understanding lays the foundation for collective action.

Source: Dennis O’Grady, South Nation Conservation Authority, and Rob de Loë, University of Guelph

Figure 6. Building Capacity is Central to Water Management



Source: Locke, S. *Water Policy in Canada: National Workshop Series*. Moncton, New Brunswick. October 4–5, 2006.

D. Water Research: What Do We Know, What Do We Need To Know, and Who Knows It?

The state of knowledge of water in Canada was the subject of sufficient discussion in the first four workshops of the series to add it as a specific theme. In many ways, the development of water policy in Canada faces a significant paradox. On the one hand, there is a great deal of conviction that Canada faces serious water problems or threats and that the situation is likely to get worse, especially with new threats that are believed to be emerging. At the same time, there is an acknowledgement that we have very little information on what is actually happening, and that the availability, currency and quality of water data are far below what is required.

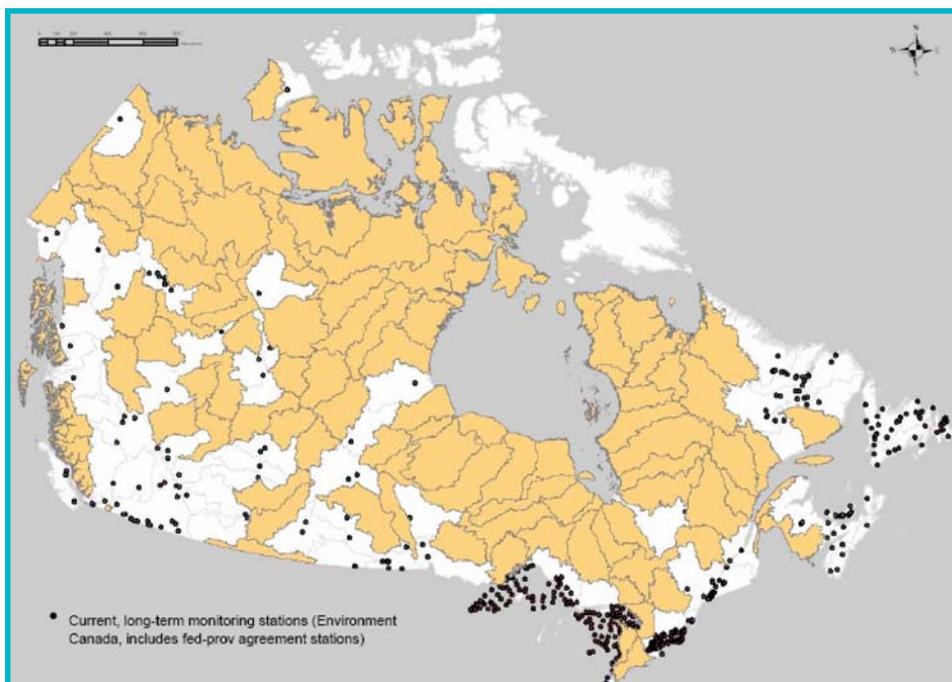
Further, due to the nature of water and water issues, effective integration of existing scientific information into policy is made extremely difficult by the range of social,

environmental and economic factors that are affected by policy decisions. Strong knowledge-brokering mechanisms and science-policy linkages are essential to ensure that important scientific knowledge regularly informs the decision-making process, and that the research agenda is responsive to policy priorities and needs.

Recent reports and presentations at the workshop series have suggested that there is

- little current knowledge about how and where water is used, fostering a lot of misconceptions and making it difficult to implement demand-side management
- very little information available to create credible water quality or quantity indicators nationally
- inadequate knowledge of biogeochemical and hydrological cycles to predict the

Figure 7. Sub-Basins without Long-term Ongoing Water Quality Monitoring



Source: Kent, R. *Water Policy in Canada: National Workshop Series*. Wolfville, Nova Scotia. April 26–27, 2006.

- effects of land use changes arising from forestry and agriculture
- insufficient information about groundwater
- lack of information on the ecological services provided by water
- little knowledge of sources, occurrences, concentrations, survival and transport of microorganisms
- little knowledge of seasonal trends in concentration and production of algal toxins
- little knowledge of potential health effects of consumption, skin contact or inhalation of taste and odour compounds
- lack of a coordinated interjurisdictional system for monitoring pesticides, and no connection between the pesticides actually used in Canada and those included in federal guidelines
- a need to be able to better link chemical measurements of persistent organic pollutants with their biological effects
- a need for better knowledge of low dose exposure to endocrine disruptors, as well as better risk assessment and risk management techniques
- difficulty in assessing cumulative environmental impacts, due to a lack of reporting.

The Senate Committee on Energy, Environment and Natural Resources has called for the establishment of a standard methodology for collecting and reporting data (including a centralized depository), a substantial increase in the federal contribution to water research and to the National Water Research Institute and Prairie Farm Rehabilitation Administration, and a National Water Council to identify priority issues for action.

For these reasons, a clear conclusion of the *Water Policy in Canada: National Workshop Series* is that there is a need to strengthen Canada's science and information capacity pertaining to

water, particularly at the federal level, and that improved methods for integrating science and policy are required. This could include establishing a national water research science agenda and perhaps creating a National Water Council, both of which could be mirrored at the provincial level.

D.1 Research and Monitoring Capacity

Canada's capacity to undertake water research and monitoring has been considerably eroded in the past decade and must be restored. Not only does this mean that much basic information is lacking, it also impacts on policy development. In the past, a manager responsible for a water-related issue was allowed to either conduct or sponsor monitoring or research according to the resources available, but the increasing complexity of governance arrangements may make that less viable today and in the future. Further, water policy is increasingly horizontal (i.e., involving multiple departments and jurisdictions) and various policy analysts may be using different, limited, or inappropriate science inputs.

Currently, there is a lack of baseline data on water use in Canada (or even agreement on what constitutes "use"). Estimates are based on models and coefficients that may no longer be appropriate. There is an imbalance between water quality and water quantity data. The national water quantity (hydrometric) network has 2,931 sites and, while the federal government used to monitor 4,000 sites, that number has declined to 2,500 sites and is still dropping. There is also no standardization and integration of data among jurisdictions. A lot of data are being gathered at the watershed level, often using differing data collection protocols, but the federal government has little knowledge of what is happening, who is doing what, or what the quality of information is.

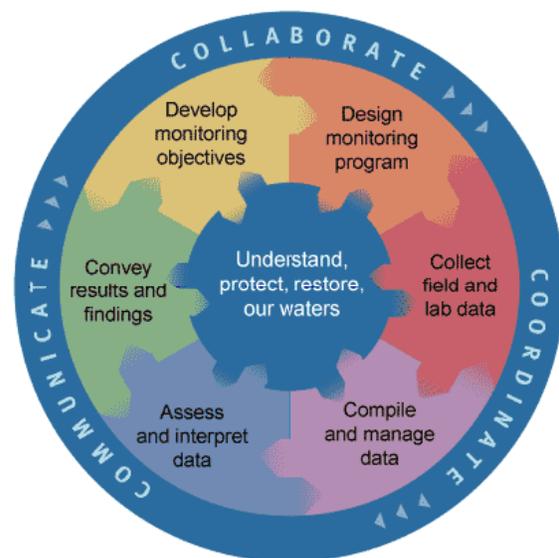
...there is an acknowledgement that we have very little information on what is actually happening, and that the availability, currency and quality of water data are far below what is required.

Demographics also pose a challenge, due to the retirement of many experienced staff. The need to retain, or replace, that experience is an issue in most jurisdictions. One method of addressing capacity issues is through partnerships and collaboration. For example, 80 per cent of Environment Canada's water research is partnered with others. The Canadian Water Network (one of Canada's Networks of Centres of Excellence) plays an important and growing role in directly supporting water research in Canada, and in networking partnerships among universities, governments and industries. Additional institutional mechanisms are needed that facilitate collaborations (e.g., NSERC/SSHRC eligibility) and processes are required to help researchers understand the fields of the new people with whom they need to collaborate. Greater efficiencies also need to be found. For example, where the presence pesticides and nitrates in water often go hand-in-hand, the less expensive test for nitrates can provide some insight regarding the presence of pesticides. In addition, there is a need for better understanding of the linkages between what are believed to be best management practices and the science of what is actually happening.

D.2 Setting Research Priorities

Given the lack of research capacity, there is significant controversy over where limited research efforts ought to be applied. An example is provided by groundwater mapping. The Senate Committee on Energy, Environment and Natural Resources called on the federal government to commit to do whatever it takes to map major aquifers by 2010, and to develop a national groundwater databank. It was pointed out by one researcher that Alberta and Saskatchewan had some of the best groundwater mapping programs in the world, and additional research would consume significant funds for incremental information. It was suggested that it may be more important to address the needs of people consuming groundwater known to be contaminated than to invest the resources in additional mapping.

Figure 8. Linking Monitoring with Adaptive Management



Source: Kent, R. *Water Policy in Canada: National Workshop Series*. Wolfville, Nova Scotia. April 26–27, 2006. Originally from US National Water Quality Monitoring Council Framework. 2002.

It was further suggested that a coarse framework for determining research priorities could be provided by distinguishing between resolved and unresolved water quality issues. Resolved issues are ones in which toxicological and multispecies data are available, there are both wildlife and human data, causality/ temporality and mechanisms are well understood, and risk assessment can be done with a high degree of certainty (e.g., organochlorine pesticides, acid rain, phosphorous, sewage, metals, dioxins and furans). Unresolved issues are ones in which the analytical methods for detection are not available or are prohibitively expensive, toxicological data are incomplete, there are only partial data on effects (cause-effect relationships are not established), causality/ temporality and mechanisms aren't well documented, few species have been investigated, and dose-response studies are incomplete; thus, risk assessment is difficult or has a high degree of uncertainty. Some existing issues are still unresolved (e.g., some pesticides, selenium), but there are a number of new issues (endocrine disruptors, pharmaceuticals and some personal care products) that need to be understood better to avoid future problems. It was also recognized that there will always be unresolved emerging issues as well as the challenge of understanding cumulative effects.

CBM fills gaps left by federal and provincial governments, is cost-effective, has the ability to produce valid monitoring results, increases levels of environmental education, and increases citizen engagement and participation.

D.3 Community-based Monitoring

As government water research has stagnated, there has been a proliferation of groups across Canada engaged in community-based monitoring (CBM). They have proven to be a valuable complement to existing monitoring programs. Monitoring is one of the major activities of groups engaged in watershed management (see Section C.6.1). CBM fills gaps left by federal and provincial governments, is cost-effective, has the ability to produce valid monitoring results, increases levels of environmental education, and increases citizen engagement and participation. Forty groups are undertaking CBM in Nova Scotia, for example, due to reduced government funding for ecological monitoring, increasing mistrust of government's care of the environment, continual rise in environment consciousness, and lack of a provincial watershed management framework.

The full extent of CBM in Canada is unknown, and the RésEau program of Environment Canada (<http://map.ns.ec.gc.ca/reseau/en/>) is attempting to identify, link and support groups involved in this activity. CBM can be enhanced by supporting new groups (networks/ mentoring), increasing their ability to collect valid data (QA/QC procedures using standard data collection protocols), sharing data (via standard geospatial data management infrastructures), engaging members of the public (showing that data are being used), providing resources to CBM (both financial and material), and creating opportunities to participate in watershed management. It is especially important that outputs generated by volunteers lead to change, or be used in decision making. Such outcomes acknowledge volunteers' efforts and encourage them to continue to contribute their time.

D.4 Standardized Monitoring and Data Availability

It was argued during the workshop series that the current situation regarding water research and monitoring provides the opportunity to establish a monitoring network designed around the information that is most needed. The information currently available may not be what is most required. A consistent framework for monitoring and data collection is required; in its absence, government agencies, community groups, and monitoring and data gatherers lack consistent protocols and are struggling for resources. There are problems with data storage and consistency, and aggregating data is difficult. Widely accepted standards for data collection, data storage and handling, metadata, and GIS-based mapping applications are available and should be applied. These international standards have been adapted specifically for Canadian applications by the GeoConnections secretariat of Natural Resources Canada. The Canadian Geospatial Data Infrastructure (CGDI) standards are available online (<http://www.geoconnections.ca>).

Despite the decline in the amount of monitoring, it was pointed out that far more people are engaged in gathering and organizing data than are involved in analyzing and understanding the data. The problem is

A consistent framework for monitoring and data collection is required...

compounded by “information silos;” for example, it was claimed that 60–70 per cent of data in the Atlantic region are unavailable (i.e., locked away). Provincial databases may be appropriate, but there is a need to appropriately integrate environmental monitoring programs that are confidential with those that are public. Finally, public reporting is key to building support for decisions. The comprehensive federal State of the Environment (SOE) reports produced in the past supported a mandate to keep the data current. Terminating SOE reporting led to a narrower range of information being available, reductions in research funding and scientific capacity, and a decrease in public awareness. British Columbia’s water quality status reports were presented as a good example of the information that needs to be published.

E. Water Quality: Will That Be Tap or Bottled?

Canadians have been shocked out of their complacency about water quality by instances of serious illnesses or fatalities due to contaminated water (North Battleford, Walkerton), evacuations and boil water advisories (Kashechewan, Kelowna), and beach closures and warnings (Lake Winnipeg, Hamilton and Toronto). Demographics change and affect demand and expectations. New threats emerge, and new and better technologies are developed. For water policy to contribute to sustainability it has to be robust enough to address future challenges which may or may not be the ones we expect.

Water quality issues identified in recent reports include the following:

- waterborne pathogens and algal toxins are increasing threats to drinking water, recreational activities and source water for agriculture
- the frequency of taste and odour problems in drinking water is increasing
- mercury intake above tolerable levels has been associated with high fish consumption in Great Lakes and Arctic communities
- endocrine disruptors are emerging as a little known and potentially serious contaminant
- nitrate drinking water guidelines are exceeded in groundwater in some parts of Canada
- there is continued aquatic acidification, despite the better regulation of SO₂ emissions, and the impacts of air pollution on water are not well understood
- thousands of abandoned mine sites are leaching contaminants into surface water and groundwater; two sites in particular have been identified by the Commissioner for Environment and Sustainable Development as posing a significant threat of flooding or leaking into major rivers in the North
- industrial point source discharges, while better regulated, may be increasing in volume (as industrial activity increases) or in concentration (as plants become more efficient in using water); it was noted that only two sectors are required by the federal government to monitor the impacts of their releases on receiving waters
- while industrial pollution has been reduced in the Great Lakes, the impacts of municipal effluent, agricultural waste and pesticides are growing
- there is a high natural occurrence of trace element contaminants in source water in some parts of Canada
- intensification of groundwater and surface water contamination by pesticides is expected
- the impacts of the increasing use of genetically modified organisms are unknown
- continued population growth and urbanization will lead to an increase in the volume of municipal wastewater effluent
- increasingly intensive livestock/poultry production will exacerbate problems with manure management and waterborne pathogens
- high-intensity rains are increasing in frequency and intensity in parts of Canada; in addition to contributing to erosion, this is usually a precursor to health problems due to the inability of municipal wastewater systems to handle storm surges
- there is higher residual chlorine than necessary where distribution systems are not well maintained (compared to the Netherlands, for example)
- climate change can be expected to compound issues with combined sewer overflows.

E.1 Setting Standards

Nationally consistent drinking water standards were seen by many participants to be an important component of drinking water quality management. Standards also help ensure appropriate and effective drinking water treatment technologies. The current Canadian Environmental Quality Guidelines also provide helpful guidance to water managers considering recreational, aquatic life and agricultural use of water. It was suggested that the federal government expends considerable effort to ensure food safety, but does not give water the same level of attention.

Barriers to the implementation and effectiveness of national standards are as follows:

- it can take many years to determine acceptable levels for the presence of one particular chemical in drinking water
- the desire for small-scale sources of supply and ultra-efficient approaches to demand management increases risk, as it is difficult to maintain standards across a multitude of small distributed facilities. Eighty per cent of facilities in Nova Scotia, for example, service 20 per cent of the population, and the absence of economies of scale makes it difficult to attain standards affordably
- the major gaps in improving drinking water quality are the lack of human resources, the inability to replace infrastructure, and the limited financial capacity to set new standards
- it is challenging to apply standards fairly across watersheds, even within the same jurisdiction, in the absence of a strong central authority.

E.2 Rebuilding Public Trust

There is a significant number of boil water advisories (BWA) in Canada (e.g., more than 1,000 in 2004–5), but many of these are in small communities and largely result from decisions to not treat water. BWAs are not always a sign that there is a problem, and may simply be a due diligence issue, although that is not the perception. Publicity over these incidents, plus the more serious contamination incidents identified earlier, have shaken public confidence in tap water, with many people willing to pay a premium for bottled water. The increasing availability and popularity of bottled water reinforces a subtle erosion in confidence in the public provision of safe water in favour of private sources. There is a need to rebuild public trust as the current pricing of public water doesn't send a message commensurate with the value being provided.

E.3 Water Treatment

Current approaches to water treatment were challenged during the workshop series. It was suggested that if all wastewater discharges occurred upstream of drinking water intakes, it would place water treatment in a more appropriate context. It was stated that wastewater should be treated as close to source as possible. It was pointed out that the City of Okotoks treats its water so well that the water it returns to the Sheep River is of higher

Nationally consistent drinking water standards were seen by many participants to be an important component of drinking water quality management.

Box #7: Source Water Protection

Source water protection is

- the first barrier in a multi-barrier approach to protecting drinking water
- a watershed-based, locally driven program that uses scientific methods for assessing risks to drinking water
- an approach to decision making that emphasizes information sharing, consultation and involvement by interested members in the watershed communities.

Source: Dave de Launay, Assistant Deputy Minister, Ontario Ministry of Natural Resources

quality than the water it withdraws, thus benefiting downstream communities.

In relation to the setting of national standards discussed in Section E.1, there was a call in the workshop series for water treatment facilities to be licensed to ensure proper training. This may be one way to address the issue of quality control for small distributed systems. A key barrier to licensing, though, is the current lack of human resource capacity to deal with scientific and regulatory requirements (including number of personnel, retention rates, recruitment challenges, establishing qualifications, etc.) and the ability of facilities to respond to future human resource challenges.

E.4 Source Water Protection

Source water protection (see Box #7) is being promoted by many jurisdictions across Canada as a means of safeguarding water quality and reducing treatment costs. New Brunswick, for example, has regulated source water protection for surface supplies since 2001, and instituted a risk-based groundwater source protection program for municipal wellfields beginning in 2000. New Brunswick's *Watershed Classification Regulation* sets aquatic standards for all lakes,

rivers and streams in the province. Local groups are engaged on a watershed basis to undertake the work. The classification is negotiated by local communities, depending on their economic priorities and the restrictions they are prepared to accept. Although the classification standards are province wide, there is flexibility in recognizing the unique circumstances of each community (e.g., a gravel pit in one community may be necessary and accepted; in an adjacent community it may be unwanted). The province is working with 19 watershed groups currently engaged in the watershed classification program.

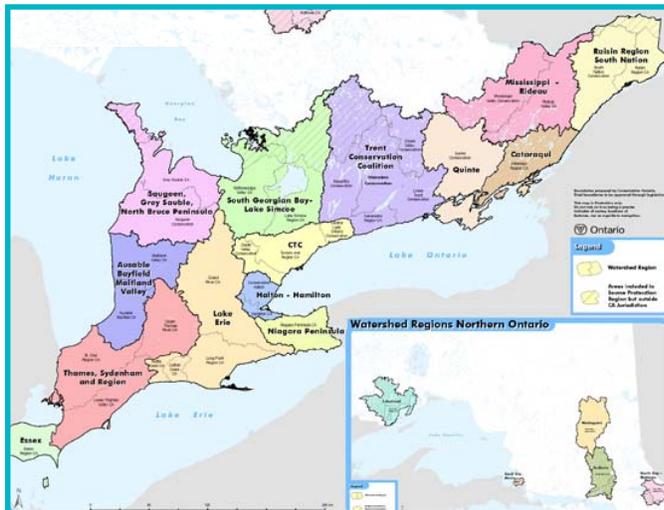
In both urban and rural environments, underground water can be contaminated by spills, leaking fuel tanks, leaking sewer and water lines, salt spread on roads, and garden and lawn care products. The New Brunswick Department of Environment wellfield protection program provides for a series of generally concentric zones, based on contaminant risks and their aquifer travel times. These zones are verified by a wellfield study. The department establishes land use and contaminant standards for each zone. The program does not allow high risk activities, such as locating oil tanks and chemical storage, in areas close to wellheads but recognizes the need for some flexibility in establishing the zones; therefore, a phased implementation to meet standards or remove high risk uses is employed. Public education is a key component and educational materials are used to show the risks and problems posed by various activities in the wellfield.

A number of cautions in implementing source water protection programs were raised, including the need to

- exercise care in importing solutions from other jurisdictions (for example, the US best practices imposed as a result of the regulatory failure of coal bed methane in Wyoming are already either common practice or regulatory requirements in Alberta)

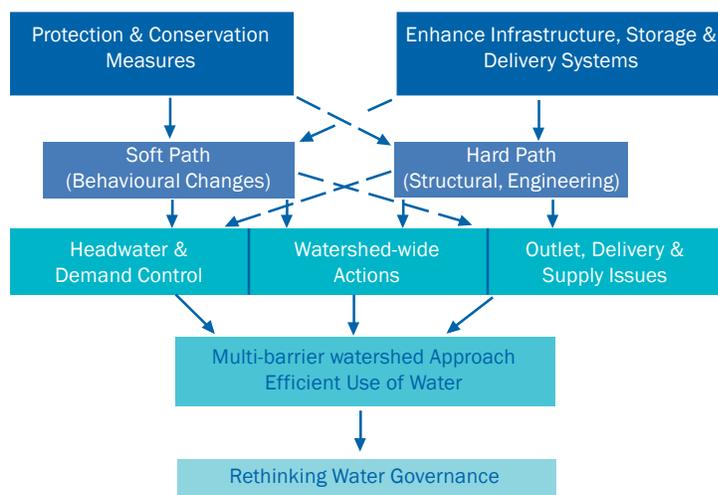
- provide farmers with more guidance and support, especially those operating smaller farms
- harmonize regulations and guidelines for waste disposal among all levels of government
- complete cumulative effects assessments
- recognise that voluntary practices, no matter how well done, may not be appropriate in vulnerable settings, and that a time frame for assessment of best management practices is required.

Figure 9. Ontario's Source Water Protection Regions



Source: de Launay, D. *Water Policy in Canada: National Workshop Series*. Guelph, Ontario. June 8–9, 2006.

Figure 10. The Multi-Barrier Approach to Drinking Water Protection



Source: Schreier, H. *Water Policy in Canada: National Workshop Series*. Lethbridge, Alberta. March 15–16, 2006.

F. Water Quantity: I Was Here First

It has been pointed out that, while Canada has huge quantities of water, our water supplies aren't always located conveniently for human use. About three-quarters of Canadians get their water supply from surface water and one-quarter from groundwater; 28 per cent of residents in Ontario and Québec rely on aquifers that are poorly understood. In some parts of Canada, citizens are becoming accustomed to seasonal restrictions on water use (e.g., bans on watering lawns) due to limitations of supply. Some industrial processes use massive amounts of water, with oil sands development in northern Alberta being a notable example. As Canada's population and level of industrial activity increases, the ability of watersheds to supply required quantities of water on demand will be tested. While this will be exacerbated by the impacts of climate change in some areas, presently most current water supply issues across Canada are allocation issues rather than scarcity issues.

F.1 Water Distribution

Although not specifically addressed in the workshop series, there was widespread recognition of the need to upgrade Canada's ageing infrastructure for delivering water. It was pointed out that the conventional supply-driven approach to securing additional water has been to build dams and pipelines, or to dig deeper. A call was made for pilot projects to demonstrate alternative approaches that can be pursued as the "big pipe" approach gets more expensive. A major challenge is bringing new design solutions and standards into action (e.g., tinkering with the imperviousness of road surfaces once the built environment is created will have little impact compared to factoring it in at the outset).

The entrenchment of senior water rights makes it difficult to respond to changes in availability, use and demand. Further, policies on allocation, particularly when there are shortages, are not always clear.

F.2 Water Allocations

Across Canada, there have been an increasing number of incidents of regional scarcities of water supply, which have led to restrictions on non-essential uses of water. All commercial use of water in Tofino, British Columbia, for example, was banned during one of the busiest weekends of the summer in 2006. Surface water in Nova Scotia is heavily overused, and the Cornwallis River is one of the ten most polluted in Canada. Some southern Alberta watersheds are fully allocated, meaning that anyone who wants to undertake new development activity has to buy an allocation from an existing user. (The point was made that the St. Mary River was 118 per cent allocated before a management plan was created.) Water allocations, though, are often driven by historical rights and needs, rather than availability.

The entrenchment of senior water rights makes it difficult to respond to changes in availability, use and demand. Further, policies on allocation, particularly when there are shortages, are not always clear. The First in Time, First in Right approach generally followed in western Canada is not universally

supported as it doesn't respect changes in supply and demand. Thus, water allocation becomes a big challenge. It can be difficult to get users to change their allocations based on what may be seen to be abstract scientific information (e.g., historical tree ring data), but this is starting to happen in the US. Regulating water consumption can also be difficult. For example, limiting the water available to agricultural producers can cause problems in a globally competitive environment.

Concerns were expressed by workshop participants that allocations based on historical rights of users do not foster conservation for other uses, nor do they reflect the actual cost of water as an ecological service. While it was recognized that the approach to water allocations needs to reflect local laws, circumstances and history, methods for addressing scarcity need to be developed before crises occur. It is possible to buy back rights, but this can be difficult and expensive. Another approach might be to issue water rights with a staged reduction in water use or a sunset clause. No matter how allocations are handled, public confidence in the system is essential. People need to know where to go if they feel something isn't right or fair, and an appeals system is required.

F.3 Energy Development

The issue of water requirements by the energy industry, particularly for oil sands development, received considerable attention in the workshop series. Sixty per cent (i.e., 915 000 bbls/day) of Alberta's oil production is water-assisted, and the upstream oil and gas industry is using 57.1 million m³ of its 713 million m³ allocation from surface and groundwater, forty million m³ of which was from non-saline sources (2004). It takes 2–4.5 m³ of water to produce 1 m³ of bitumen from oil sands mining. Currently, oil sands development is licensed to divert 518 million m³ of water (surface water, surface runoff and groundwater), with 359 million m³ of this

Concern was expressed that the cumulative effects of oil sands developments are poorly understood...

coming from the Athabasca River. This exceeds 10 per cent of the river's low flow regime. By comparison, the City of Calgary used 174 million m³ of water in 2003 (Griffiths, M. Lethbridge, Alberta. March 15–16, 2006). The instream water flow needs of the Athabasca River are unknown, though, and quantifying the impacts of oil sands development on wetlands is not possible. In addition to the withdrawals, an increase in oil sands production will have unknown impacts on waters receiving contaminated process waters. About 6 m³ of tailings are created for every 1 m³ of bitumen produced from oil sands mining. Tailings ponds currently cover an area of more than 50 km² and are contaminated with naphthenic acids, bitumen, and so on. Syncrude's Sand Storage Facility is the largest dam in the world, based on the volume of material used in its construction. Suncor is the only oil sands company that recycles tailings water for *in situ* use. Clear expectations for tailings management and reclamation in oil sands development are needed and may require a regulatory approach.

Concern was expressed that the cumulative effects of oil sands developments are poorly understood, particularly in terms of protecting the ecological integrity of the Athabasca watershed. There was a suggestion that Environmental Impact Assessments (EIA) of future oil sands developments should contain a full review of cumulative impacts, and that regional management of cumulative effects is needed before allowing further mining. Coal

bed methane development also has the potential to affect water quality and quantity.

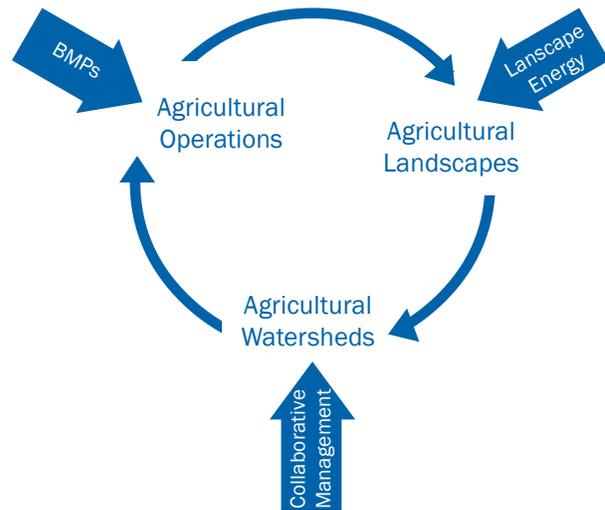
F.4 Agriculture

During the workshop series, conflicts between agriculture and other users for water were described. It was noted that 50 per cent of all irrigated lands in Canada are located near Lethbridge, and that irrigation efforts in the South Saskatchewan River Basin have improved efficiency; however, efficiencies do not always translate into net water savings as they make more water available for growth. This is a particular problem in the region, as the population of the South Saskatchewan River Basin is expected to double by 2046 and it is not clear where the water to support those people will come from. Alberta’s agricultural



Source: Hill, D. *Water Policy in Canada: National Workshop Series*. Lethbridge, Alberta. March 15–16, 2006.

Figure 11. Sustainable Agricultural Practices



Source: Ferreyra, C. *Water Policy in Canada: National Workshop Series*. Guelph, Ontario. June 8–9, 2006.

production goal of \$20 billion processed and \$10 billion primary by 2010, compared to \$10 billion processed and \$8 billion primary at present, will have significant implications for water in western Canada.

In other areas, increased competition for potable water, particularly close to urban areas, could impose high prices on agriculture in the future. In Nova Scotia, agriculture is changing to products that demand clean water at a time when surface water is fully allocated or polluted, so the province is tapping into poorly understood groundwater sources.

F.5 Municipalities

As Canada’s population grows, many municipalities are faced with the challenge of providing a secure water supply. Increasing demand, often based on rapid suburban growth and sprawl, is making it more difficult for municipalities to meet the needs of public and private consumers. There is an increasing tendency for large municipalities to seek future water supplies through diversions and inter-

basin transfers. It was suggested that constraints may prompt cities to look for new sources of water (e.g., rain, storm and grey water).

Municipalities will also need to be increasingly sensitive to watershed-based water management approaches and the fact that municipal boundaries rarely coincide with watershed boundaries. One watershed may include more than one municipal level of government, and any municipality may cross more than one watershed, and often do cross several. Managing shared watersheds wisely and efficiently means that municipal leaders and watershed managers will need a shared management framework that provides consistency and clarity in terms of roles and responsibilities. Which authority gathers water resource data, and how data are shared among decision makers and the public, needs to be clearly understood.

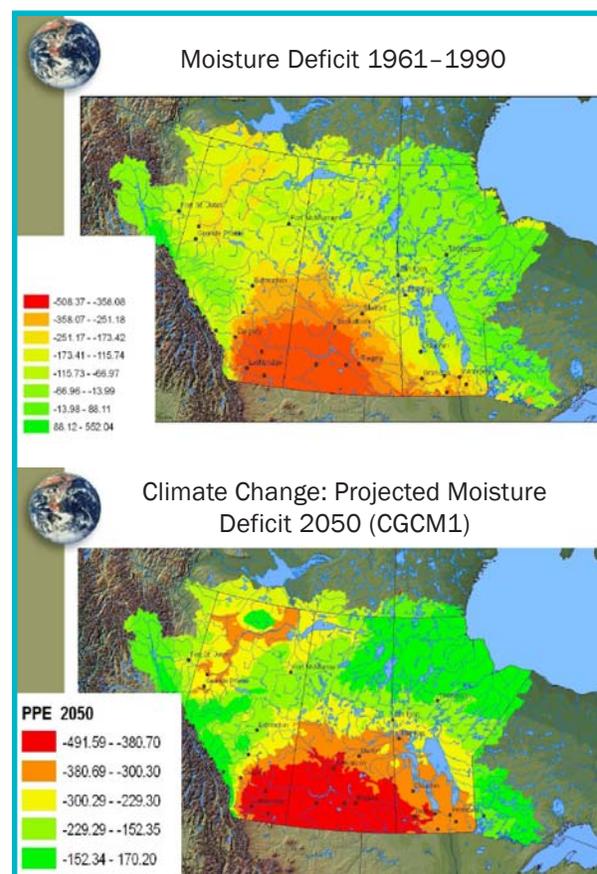
F.6 Adapting to Climate Change

Climate change is “the elephant in the room” with respect to water quantity and allocations. It was pointed out that glacier cover has decreased rapidly in recent years. It now approaches the smallest extent that has been identified in the past 10,000 years. A phase of increased stream flow from global warming has passed, and basins have entered a potentially long-term trend of declining flows. This will be felt in many ways. A decline in

Managing shared watersheds wisely and efficiently means that municipal leaders and watershed managers will need a shared management framework...

water quantity could increase allocation conflicts, and reduced runoff may have implications for the adaptive capacity of downstream systems, potentially increasing the concentration of substances of concern. In other areas, climate change could increase the demand for water. In Atlantic Canada, although water reductions are predicted, the problem may be that there is too much water at the wrong time of year and, conversely, that late summer will be drier and winters will be milder and wetter. As a result, watershed management must incorporate the adaptation measures needed to respond to climate change. Many adaptive actions (e.g., demand

Figure 12. Climate Change and Moisture Deficit



Source: Venema, H. *Water Policy in Canada: National Workshop Series*. Moncton, New Brunswick. October 4-5, 2006.

management) may make sense for other reasons. In Ontario, for example, now that watershed-based source water protection planning is a requirement under the *Clean Water Act*, responsible authorities devising watershed-based source water protection plans have an opportunity to “mainstream” consideration of climate change impacts in current and subsequent plans as data gaps become filled and knowledge and experience are gained.

...watershed management must incorporate the adaptation measures needed to respond to climate change.

G. Water Conservation: Why Save Unless I Have To?

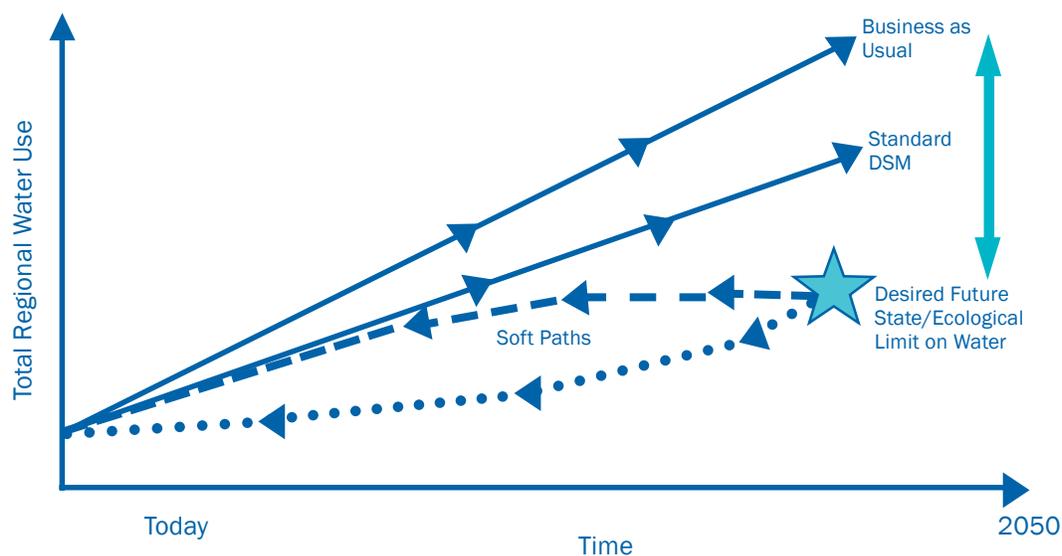
Canada's current approach to water management is supply-oriented — as more water is needed, more is withdrawn from existing sources, or new sources are located. Water is usually very inexpensive to access, and its cost to the provider, as passed on to the consumer, bears no relation to its true value. Further, treated water is used to meet most non-industrial demands, even when treatment is not necessary, because all of the water is supplied by the same system. There is little incentive to conserve water, to ensure that available water is put to the best possible use, or to ensure that the quality of water is matched to its use. As pressure on Canada's water supplies increases, greater attention is being paid to managing demand, with some water experts and officials arguing that water should be provided as a service, rather than a good. Some advocates are also going beyond demand side management (DSM) to promote a "soft path" to water, in which all of the ways in which society uses water are questioned. DSM, for example, asks how to do something with less

water, whereas the soft path approach begins with questioning why water is used at all.

G.1 Incentive to Conserve

Canada has the second highest per capita consumption of water in the world (more than double that of Europe). One toilet flush in Canada equals a day's supply of water in much of the developing world. Urban dwellers do not perceive a water supply problem, due to the availability of cheap and plentiful water from municipal services. This is reflected in the difficulty in getting people to comply with seasonal water restrictions. While many Canadians are concerned about water, there is a disconnect between what people say is important and the actions they are prepared to take. This is perhaps based on a lack of awareness, unavailability of alternatives, and an unequal sharing of the burden. The absence of incentives to support water conservation efforts exists across the board, including

Figure 13. Soft Path for Water Conservation



Source: Brooks, D. *Water Policy in Canada: National Workshop Series*. Wolfville, Nova Scotia. April 26–27, 2006.

domestic, industrial and agricultural uses. Regulations can sometimes also be a perverse incentive (e.g., encouraging the use of more water to dilute effluent to meet concentration targets for water quality).

Due to the jurisdictional issues described throughout the workshop series, incentives are easier to deliver via political boundaries than watershed boundaries. The question that needs to be asked regarding the lack of incentives for conservation is, "What is the incentive to provide incentives?" Incentives could spur demand management (see Section G.2) and some stakeholders argue that full-cost pricing of water (see Section G.3) would in itself be an incentive for conservation; however, decision makers have yet to be convinced that the case has been made for either demand management or full-cost pricing. While there will always be segments of society who conserve for the sake of conserving, the reasons for greater conservation need to be communicated more effectively to decision makers.

G.2 Demand Management/Efficiency

There are increasing calls for water providers to evolve from supply management to DSM; however, a challenge faced by proponents of DSM is to prove that there is a need to reduce consumption. Many jurisdictions have adequate or too much water, although they might not have enough of the right quality at the right time, and it is hard to provide incentives to or penalize users (e.g., industry) when there is not an immediate problem.

Nevertheless, conservation and enhanced efficiency do convey advantages over the long term and conservation is often claimed to be the best source of "new" water. It is easier to address increased demand when a conservation ethic is in place than to try and impose one when a crisis occurs.

Municipal planning, with related standards, can play a much stronger role in water

There is little incentive to conserve water ... or to ensure that the quality of water is matched to its use.

conservation than it has done to date. It has strong educational and leadership potential as well. In water conservation and efficiency programs, municipalities need to anticipate changing demands and lifestyles (e.g., demands for large mansions, gardening, irrigation and golf courses), and they need to target systems, technology and behaviour. Sophisticated education and communication programs, such as social marketing, environmental education and public participation, are also required.

One essential component is educating consumers on the impact they have on water quality and quantity. Conserving water, or reducing demand, requires knowledge of how much water is being used and what it is being used for. As indicated in Section D, information in this area is currently scarce in Canada. One reason for this is the lack of metering. Metering of actual water use is a straightforward method of improving the knowledge base and raising the awareness of users of the impacts of their actions. For example, all new homes in Calgary, and old homes that change hands, now have to be metered. The aim is for the city to be 100 per cent metered by 2014.

Changing human behaviour is one thing, but enhancing technology is another. Conservation gains can be made by addressing infrastructure. For example, it is estimated that 30–40 per cent of treated water never makes it to the consumer due to leakage in distribution.

Only 10 per cent of the 30,000 new houses built in British Columbia in 2005 had low-flush toilets. Mandating “no new water” in fast-growing areas, such as the 905 belt in southern Ontario, can be achieved by minimizing water use outside of the home, xeriscaping, and changing the plumbing code (poorly working low-flow toilets undermine water efficiency campaigns), so that water efficiency is moving in line with population growth. Improved infrastructure, revisions to building codes to encourage a shift to efficient buildings (e.g., LEED certification), and incentive programmes for new technologies are methods of reducing demand without trying to fundamentally change consumer behaviour.

On the industrial side, Alberta’s Water for Life strategy recognizes that there is a wide spectrum of industry users of water, and that some sectors and companies have significant sophistication and capacity on the issue and are taking water conservation actions. The knowledge level is mostly based on the amount of water used, as well as how it is used. Alberta tries to help identify risk

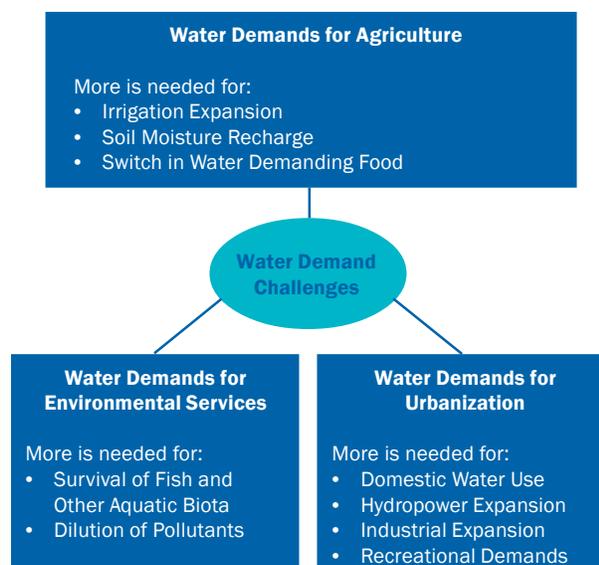
exposure and create a sense of short- to long-term urgency based on the argument that water is fundamental to a prosperous economy and the quality of life of Albertans. For many companies or sectors, the issue and the challenge must be framed as a way to improve the bottom line (i.e., conserving water or implementing conservation technologies can save money and have a reasonable payback). Information needs to be provided about technologies and best practices. The success of groups that advocate water conservation and technology development with industry (e.g., WaterSMART) needs to be supported.

G.3 Pricing

Considerable debate in the workshop series centred on the price of water, with most participants expressing the view that water was not priced appropriately. Pricing is seen to be a necessary economic instrument that has the potential to drive efficiencies, but for this to be the case there would need to be a transparent and non-manipulative marketplace. Each watershed needs unique solutions, and the blanket application of economic instruments may not be appropriate; the same instrument applied in different watersheds may send different price signals. There is also a need to distinguish between pricing water as a product and as a service.

While some advocated full-cost pricing of water, others questioned what this would entail (e.g., should it include the cost of infrastructure, peak pricing mechanisms, or the consideration of externalities?). From a private sector perspective, in terms of delivering water, the Full Cost Recovery Model requires a clear, rule-based regulatory regime that works in tandem with municipal and private sector players. It was argued that rates that do not reflect full costs can lead to a gap between expected delivery and actual delivery of water unless there are ongoing subsidies. Full-cost pricing sends appropriate signals and allows for ongoing maintenance of infrastructure.

Figure 14. Water Demand Challenges



Source: Schreier, H. *Water Policy in Canada: National Workshop Series*. Lethbridge, Alberta. March 15–16, 2006.

H. International Concerns: Is Our Water for Sale or for the Taking?

Canadians are expressing a significant amount of anxiety about the interests of the US in solving its water supply problems by accessing supplies from Canada, whether through interbasin transfers or bulk water exports, especially as the US population is expected to grow by one-third in the next 35 years. Most large aquifers on which Canada depends are shared with the US and activities on one side of the Canada–US border may pose problems for those on the other side (e.g., the ongoing Devil’s Lake issue). Canada and the US have a long history of transboundary cooperation with respect to the management of shared waters. For example, the recent *Great Lakes Basin Sustainable Water Resources Agreement* and the upcoming *Review of the Great Lakes Water Quality Agreement* provide mechanisms for increased accountability and cooperation.

the one hand, this means that Canadian interests may be “outweighed” in terms of their capacity to deal with transboundary issues, and may require federal government support. On the other, the increasing number of provincial/state agreements and the growing assertiveness of the provinces on international issues may pose problems for federal agencies, such as the International Joint Commission (IJC). The IJC currently has little technical capacity and is finding it difficult to recruit effective teams to address issues.

Not all transboundary issues are IJC issues. Further, while federal authority on transboundary issues is clear in principle, it can’t be exercised in isolation from the provinces. The approach to issues should be tailored to local circumstances, and the federal government does not always have to be the lead.

H.1 Transboundary Issues

A challenge in dealing with transboundary issues is that there is strong, centralized control over water in the US compared to a regional approach in Canada. This means that powerful US agencies are often negotiating directly with provinces or local interests. On

The capacity for Canada to represent broad interests under international agreements is diminishing, and the federal government lacks the capacity to fully support existing treaties and agreements. In this context ensuring environmental security (e.g., protection against long-range transport of air pollutants

Figure 15. Transboundary Watershed and IJC Boards



Source: www.ijc.org/php/publications/pdf/ID1596.pdf

and resolution of water-based disputes) cannot be assured.

H.2 Interbasin Transfers and Bulk Water Exports

The two major public fears with respect to the US include the potential for interbasin transfers and bulk water exports. In terms of the former, there are currently three transboundary apportionment agreements in western Canada based on the percentage of natural flows. A current controversy deals with the interbasin transfer of water from Devil's Lake, North Dakota. There are fears that the use of the President's Council on Environmental Quality, instead of the IJC, to mediate the Devil's Lake issue may be a sign of things to come.

Water exports are a different issue. It is not certain what would trigger a crisis with respect to water exports. No well-financed initiative has appeared yet, although many seem to think it is only a matter of time and that preliminary work may be under way. While Canada has a position on bulk water exports, there is no strategy for dealing with the issue, and Canada's policy against water exports may be vulnerable to provincial challenge. There is considerable and continued confusion as to whether water can be considered a good under NAFTA. In many ways, it is treated like a good in Canada, and the principle of sale through a third party is established, so it will not be clear whether a different standard can be applied internationally until a case is brought forward.

I. Towards a Vision and Strategy for Water Policy in Canada: A New Approach to Water Management

There was unanimity among participants in the workshop series that better planning and coordination of water policy is required within and among all levels of government, and between governments and stakeholders. Institutionally, water policy is orphaned in most jurisdictions. The simplest question may be the most complex to answer: What guides water management in Canada? Currently, there is no single rallying point for taking action on water, and the country has a patchwork of policies, strategies, accords, legislation and regulations. Integrating all of these existing mechanisms and initiatives, and getting them to point in the same general direction, is going to require leadership and commitment at all levels.

In examining water policy issues on the Prairies, the IISD has stated the need to harness self-organizing capacity locally, build resilience for the future, and respect history. It has compared the challenge to the development of rural electricity and telecommunications services, which were expensive and massively decentralized undertakings that took decades to establish using a vast array of government/community co-management and co-financing options. A similar concerted, coordinated, innovative and long-term approach is required on water policy issues in Canada.

Based on the discussions in the workshop series, increased action needs to take place in the areas discussed below.

I.1 Defining the Problem

As stated in Section A, there is no single clearly defined crisis in water policy in Canada. Rather, there is a plethora of issues, mostly local or regional, that cumulatively call into question how well Canada is managing its water resources. Waiting for a national crisis to trigger public concern and political action will result in more issues and wider gaps between the issues and their solutions. This growing patchwork of issues is gathering into a compelling argument for action. The key is to identify what issues need to be addressed, at what level, and with what instruments. That degree of detail was beyond the scope of the workshop series, but the decision matrix illustrated in Box #8 was presented as a methodology for taking the next steps in issue prioritization.

I.2 Political Commitment

A concern frequently expressed during the workshop was the limited attention given to water by politicians at all levels. In terms of accountability, water is everywhere, and nowhere, and there is no single ministerial forum for discussions of national significance. The last time federal and provincial ministers sat down to talk about water may have been in the late 1990s around the issues of municipal wastewater and bulk water exports. There is also no mechanism to facilitate that type of discussion in Canada (e.g., there is no parallel to the Canadian Council of Forest Ministers). It was argued that improved policy coordination does not necessarily mean harmonization, and it is better to think of a coordinating body as a clearinghouse or think tank that can vet policy issues for their significance. Australia's National Water

Box #8: Matrix for Assessing Water Policy Priorities (Adapted from Gulf of Maine Council)

During the workshop series, the decision matrix employed by the Gulf of Maine Council on the Marine Environment was offered by New Brunswick as a template for assessing water policy issues. This template has been adapted to fit the scope of the workshop series. Applying the matrix to all issues was beyond the scope of the workshop series; nevertheless, it provides a useful coarse filter for assessing policy gaps and opportunities and for identifying the elements of a vision and strategy for water policy in Canada.

Scope of Issue	Approach Required		
	Leadership <i>One actor has primary responsibility or is the best placed to initiate greater attention to the issue</i>	Partnership <i>Many actors may be involved in the issue, but are acting in isolation or are poorly coordinated and collaboration is required</i>	Support <i>Appropriate processes or institutions may be in place, but lack the resources or support required to address the issue effectively</i>
National <i>Requires or significantly benefits from collaboration among a number of jurisdictions</i>	The issue is national in scope or significance and leadership is required at that level	The issue is national in scope or significance and would benefit from better coordination	The issue is national in scope or significance and greater support or resources are required
Common to most jurisdictions <i>Can be addressed at the jurisdiction level, but leadership and coordination may be necessary</i>	The issue is common to a number of jurisdictions and leadership at the national or regional level is required	The issue is common to a number of jurisdictions, but better coordination is required	The issue is common to a number of jurisdictions, but would benefit from greater support or resources
Common to some jurisdictions <i>Would benefit from cooperation among a few jurisdictions</i>	The issue is found in some jurisdictions and leadership at that level is required	The issue is found in some jurisdictions and better coordination is required	The issue is found in some jurisdictions and would benefit from greater support or resources
Isolated <i>Occurs in a few places and can be dealt with on a case-by-case or site-specific basis</i>	The issue is site- or region-specific and leadership at that level is required	The issue is site- or region-specific and better coordination is required at that level	The issue is site- or region-specific and would benefit from greater support or resources

Source: Kinney, K. *Water Policy in Canada: National Workshop Series*. Wolfville, Nova Scotia. April 26–27, 2006.

Initiative was suggested as a model (www.pmc.gov.au/nwi/index.cfm#about).

Once the problem is defined, then, there is a need to create a mechanism to coordinate action. Some options suggested included

- creating a water forum that would meet periodically around Canada (similar to the National Forest Congress) that could allow bottom-up initiatives to evolve into a more formal structure
- negotiating a First Ministers Sustainable Water Resources Agreement on broad objectives and a short list of national priorities (regional or bilateral priorities could be added in due course)
- expanding the CCME working groups on water quality, quantity and monitoring to address priority issues
- establishing a Canada Water Council or a domestic equivalent to the IJC.

I.3 Articulate a Vision

Any coordinated effort requires a clear vision and guiding principles, which all participants can interpret according to their local realities. For example, Manitoba Water Stewardship aims to leave water in better shape than they found it, and Calgary's goal is to accommodate future population growth with the same amount of water the city's residents use today. Box #9 illustrates the guiding principles of Québec's water policy. The Great Lakes Futures Roundtable has developed a Vision for the Great Lakes that includes environmental, economic and social goals. What is Canada's vision?

I.4 Get the House in Order

All levels of government need to review the management of water within their jurisdictions and clarify both their own roles and the roles of those departments or agencies with some responsibility for water. For example, it was pointed out that one arm of

Box #9: Guiding Principles of the Québec Water Policy

- Water is part of Québec society's heritage.
- The protection, restoration, and development of water demand a commitment from society as a whole.
- The precautionary principle must guide society's initiatives in respect of water.
- Every Quebecer must have access to high-quality, affordable drinking water.
- Users must be accountable for the use and deterioration of water, according to the user-pays and polluter-pays approach.
- Water must be managed in a sustainable and integrated manner, with a view to efficiency, fairness, and openness.
- The acquisition and dissemination of information on the state of water and on the pressures to which it is subject are an essential component of integrated water management.

Source: Yvon Maranda, Chief, Watershed Management, Ministry of Sustainable Development, Environment and Parks, Government of Québec

Environment Canada advocates water conservation while another is concerned with reducing toxicity, and the two can send conflicting messages to an industrial facility.

Further, it was suggested that existing policies and laws need to be implemented and enforced. Enforcement encourages good management and investment in management systems. Those delivering water are rarely held accountable for failing to meet regulatory requirements or for damage to public health and the environment. This can be problematic in situations in which strict enforcement could require expensive upgrades where provinces provide capital grants to municipalities for publicly run facilities.

An important step, then, in moving towards a more integrated and coordinated approach is

to ensure that consistent and supportive messages are being sent through existing government programs. A “whole of government” approach to water that is inclusive, identifies all interests up front, and integrates rather than isolates is required.

I.5 Improved Communications

While there is no single mechanism for communicating water issues nationally there are a multitude of organizations, including professional associations, that address water issues; while each has its own focus and clientele none comprehensively covers water policy issues. Improving links among them is essential. The first phase of any national initiative may thus be to build a strong communications network of knowledge, experience and expertise. The Canadian Water Network, among others, is making a promising start at developing and expanding such a network.

I.6 Enhanced Science and Information Capacity

A constant theme of the workshop series, evidenced by its inclusion as an actual theme (Section D), was the state of science and information on water in Canada. It was clear that a much more focussed science and policy effort than has occurred to date is required to fill gaps in our understanding and answer basic questions around supply and demand. Canada-wide data sets and information holdings on water are sparse, with some exceptions (e.g., hydrometric gauging station data), and need to be enhanced. Mechanisms for ensuring quality control over data gathering at the watershed level, and for aggregating up this information, need to be developed. Further, the ability to integrate scientific information with policy development needs to be substantially enhanced.

I.7 Build on Strengths

Reflecting on the question posed in Section A — “If we took everything apart and put it back together, what would be different?” — there was general agreement throughout the series that there are a lot of good policies, laws and initiatives in place across Canada, but they aren’t always being implemented or provided with the resources they need to come to full fruition. Reinforcing these existing mechanisms could provide a strong foundation on which to build. Points of convergence from existing provincial policies can provide a basic foundation on which to build a broader strategy. This will enable a visionary approach that is highly focused on implementation in the short term, converging on a small number of common priorities and delivering high-level outcomes.

Further, there is a need to be inclusive and transparent in developing common policy goals. While integrated water resource management is the mantra at the watershed level, industrial sectors (mining, forestry, energy and so on) are not fully engaged. Harnessing the energies of industry, municipalities and non-governmental organizations towards common goals can take advantage of the strengths that each brings to the table.

I.8 Recognize Regional Diversity

Even if the core of a coordinated national approach is built on common themes and identified strengths, there is a need to recognize regional diversity both across Canada and within regions. While common principles and goals may be expressed, the way those goals are interpreted, and the manner in which initiatives are implemented, may vary according to local circumstances. Flexibility in implementation is thus required if broad support for a nationally coordinated approach to water is to be achieved.

I.9 Innovate and Demonstrate

The multitude of governmental and non-governmental entities involved in watershed management, and the diversity of interest groups at the watershed level across Canada, provides a terrific opportunity for taking innovative approaches to watershed management, including experimenting with new governance models. As stated, though, where responsibility is to be delegated to partners it should be supported by the resources necessary to deliver effectively on expectations. Further, pursuing the “Net Gain” in ecological assets described in Box # 3 can lead to innovation in developing the common metrics that individual Canadians can agree on in order to chart progress and measure performance within a watershed.

One successful approach to innovation and demonstration in a related field has been Canada’s Model Forest Program and its sister initiative the International Model Forest Network. Some Canadian model forests are already doing work on a watershed basis. The potential exists to establish a national network of model watersheds that could provide opportunities to experiment with new partnerships and programs.

I.10 Commit Resources

Finally, success in any coordinated national initiative will only be assured if the processes put in place receive sufficient human, technical and financial resources to enable them to deliver on their objectives. Stable funding arrangements are essential to provide ongoing support for the development of effective programs at the watershed level.

Appendix I – Water Policy in Canada: National Workshop Series Presentations

Pollution Probe greatly appreciates the expertise of the following individuals who gave presentations at individual workshops in the series. All their available PowerPoint presentations can be accessed at www.pollutionprobe.org/whatwedo

Paul Allen, Assistant Director Freshwater, Natural Resources Canada
 The Honourable Steve Ashton, Minister of Water Stewardship, Government of Manitoba
 Karen Bakker, Assistant Professor, Environmental Geography, University of British Columbia
 Senator Tommy Banks, Chair, Senate Committee on Energy, the Environment and Natural Resources
 Alex Bielak, Acting Director General, Science and Technology Strategies, Environment Canada
 Henning Bjornlund, Canada Research Chair on Water and the Economy, University of Lethbridge
 Bill Borland, Director Environmental Affairs, J.D. Irving Ltd.
 David Brooks, Director of Research, Friends of the Earth Canada
 James Bruce, Soil and Water Conservation Society
 Edith Callaghan, Fred C. Manning School of Business Administration, Acadia University
 Ian Campbell, Acting Executive Director, Policy Research Initiative
 John Carey, Director General, Water Science and Technology, Environment Canada
 Murray Clamen, Secretary, Canadian Section, International Joint Commission
 John Cooper, Director's Office, Water Quality and Health, Health Canada
 Graham Daborn, Director, Arthur Irving Academy for the Environment, Acadia University
 David de Launay, Assistant Deputy Minister, Ontario Ministry of Natural Resources

Rob de Loë, Canada Research Chair in Water Management, University of Guelph
 Tom Duffy, Manager, Atlantic Operations, Ducks Unlimited Canada
 Cecilia Ferreyra, Guelph Water Management Group, University of Guelph
 Rick Findlay, Director Water Programme, Pollution Probe
 Johanne Gélinas, Commissioner of Environment and Sustainable Development, Government of Canada
 Mary Griffiths, Environmental Policy Analyst, Pembina Institute for Appropriate Development
 Mark Haxby, Manager, Sustainable Economy, Alberta Economic Development
 Kevin Heffernan, Director, Project Development, Trident Exploration
 James Hendry, CAMECO-NSERC Research Chair, Department of Geological Sciences, University of Saskatchewan
 Tom Hewitt, Senior Public Policy and Regulatory Affairs Advisor, Imperial Oil
 David Hill, Executive Director, Alberta Irrigation Projects Association
 Alice Hontela, Canada Research Chair in Ecotoxicology, University of Lethbridge
 Marc Hudon, Commission Eau, Nature Québec
 Kim Hughes, Director, Sustainable Planning Branch, Department of Environment, Government of New Brunswick
 Paul Hunt, Vice-President, Climate Change Central
 Leland Jackson, Chair of Ecology, Faculty of Biological Science, University of Calgary
 Rob Kent, Manager, National Water Quality Monitoring, Environment Canada
 Kenton Kinney, Sustainable Planning Branch, Department of Environment, Government of New Brunswick
 John Kolk, Chair, Alberta's Environmentally Sustainable Agriculture Council

- Gail Krantzberg, Director of the Centre for Engineering and Public Policy, McMaster University
- Lynn Kriwoken, Director, Innovation and Planning, Water Stewardship Division, Ministry of Environment, Government of British Columbia
- Steve Locke, Director, Ag-Water, Prairie Farm Rehabilitation Administration, Agriculture and Agri-Food Canada
- Judy MacDonald, Supervisor, Drinking Water Management, Nova Scotia Environment and Labour
- Yvon Maranda, Chief, Watershed Management, Ministry of Sustainable Development, Environment and Parks, Government of Québec
- Elizabeth May, Executive Director, Sierra Club of Canada
- Senator Elaine McCoy, President, Macleod Institute for Environmental Analysis
- Dave McGee, District Approvals Manager, Alberta Environment
- Jim McKenzie, Office of the Commissioner for Environment and Sustainable Development, Government of Canada
- Gregg Morrison, Director, Operational Services, Town of Wolfville
- Paul Muldoon, Executive Director, Canadian Environmental Law Association
- Dennis O'Grady, General Manager, South Nation Conservation Authority
- Beatrice Olivastri, Chief Executive Officer, Friends of the Earth Canada
- Don Pearson, General Manager, Conservation Ontario
- Brian Petri, Senior Research Scientist, Trojan Technologies
- Merrell-Ann Phare, Executive Director, Centre for Indigenous Environmental Resources
- Mike Price, former General Manager Water and Wastewater, City of Toronto
- Ellen Reynolds, POLIS Project on Ecological Governance, University of Victoria
- Stewart Rood, Scientific Co-director, Alberta Ingenuity Centre for Water Research
- Sarah Rosolen, Executive Director, Centre for Sustainable Watersheds
- Robert Sandford, UN Water for Life Decade
- Dave Sauchyn, Prairie Adaptation Research Collaborative, University of Regina
- Hans Schreier, Institute for Resources, Environment and Sustainability, University of British Columbia
- K. Gregory Senda, Peterson and Purvis LLP
- Andy Sharpe, Science Coordinator, Clean Annapolis River Project
- Nancy Stalker, Senior Resource Analyst, City of Calgary
- Clayton Tiedemann, Vice-President Operations, EPCOR Water Services
- Allen Tyrchniewicz, President, Tyrchniewicz Consulting
- Erik Veldman, Senior Project Manager, Pollution Probe
- Henry Venema, Director, Sustainable Natural Resources Management, International Institute for Sustainable Development
- Paul Weeks, Chair, Water Task Group, Canadian Association of Petroleum Producers
- Barry Worbets, Senior Fellow, Canada West Foundation
- Bev Yee, Assistant Deputy Minister, Alberta Environment

Appendix II – Approach of Water Policy in Canada: National Workshop Series

Water Policy in Canada: National Workshop Series was a progressive consultation and engagement process that evolved according to new information. Originally, the five workshops were sequenced as follows:

- *Current Status (Workshop #1)*
- *Future Challenges (Workshop #2)*
- *Policy Gaps and Barriers (Workshop #3)*
- *Innovative Strategies and Solutions (Workshop #4)*
- *The Need for Integration (Workshop #5)*

Within the sequence described above, the following six themes were originally proposed to be addressed, directly or indirectly, at all five workshops in the series. These were

- water quality
- water quantity
- water conservation
- watershed management
- water governance
- international concerns.

As the workshop series unfolded, this approach was modified to reflect the information presented in the various sessions. For example, water-related research, and data collection and availability, were repeatedly identified as cross-cutting issues. Due to the importance placed on them by speakers and participants, a new theme was created to better address these issues. After the third workshop it also became clear that watershed management presented an overarching theme that integrated many of the other issues. As a result, the fourth workshop was devoted solely to the challenges of watershed management, which is now presented in the workshop report series as an umbrella under which current water policy issues can be addressed.

The final flow of the series, then, was as follows:

- *Current Status (Workshop #1)*
- *Future Challenges (Workshop #2)*
- *Policy Gaps and Barriers (Workshop #3)*
- *Empowering Watershed Management (Workshop #4)*
- *Towards a Vision and Strategy for Water Policy in Canada (Workshop #5)*

The information in this workshop series report is presented in the context of watershed management and addresses

- water quality
- water quantity
- water research and data
- water conservation
- water governance
- international concerns.

Appendix III – References

This report began as a seed document for the first workshop in Pollution Probe's *Water Policy in Canada: National Workshops Series*. The document was rewritten following each workshop to reflect the presentations and debates. The following list of references is not intended to be comprehensive; it is merely a selection of recent reports relevant to the themes of the workshop series that were used in the development of the original seed document.

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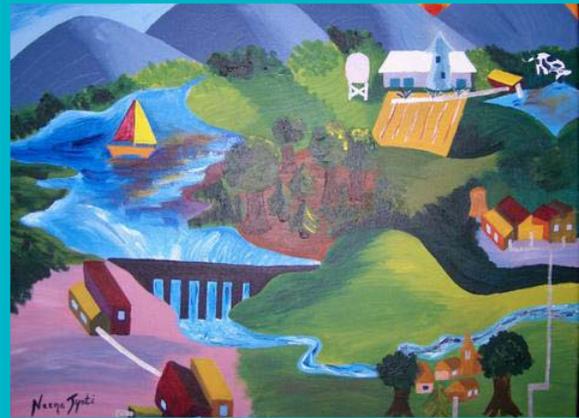
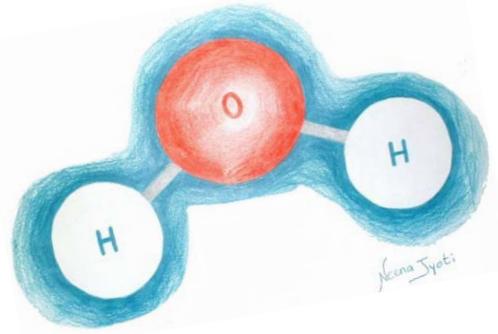
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