



Symposium Report
May 21 and 22, 2009

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Background

In partnership with the Ontario Ministries of Natural Resources and Environment and Fisheries and Oceans Canada, Conservation Ontario hosted a two-day symposium on May 21 and 22, 2009 entitled *Integrated Watershed Management: Navigating Ontario's Future*. The Symposium examined global advances in the field of Integrated Watershed Management (IWM) and explored the evolution of a 'made-in-Ontario' approach to ensure that we have a safe, sustainable supply of water today and into the future. It was attended by 175 representatives from federal and provincial agencies, conservation authorities, municipalities, consulting firms and non-governmental organizations (NGOs). The agenda for the Symposium, supporting materials and the presentation slides are available at <http://www.iwmsymposium.ca/>.

The Plenary Sessions featured speakers from across Canada and around the world who presented information on governance in IWM, integrated water resource planning in Ontario, Alberta, Quebec, the European Union and Australia, adaptive environmental management and the role of NGOs in IWM. Concurrent sessions were more interactive, focused on the nuts and bolts of IWM, and covered such topics as climate change and IWM, social learning, economic considerations, setting targets, assessing watershed stressors, updating IWM plans, monitoring and integration.

This Symposium Report provides an overview of the Symposium's Plenary Sessions. It has been prepared by Joanna Kidd of Kidd Consulting. Any errors or omissions are the work of the author.

Presentations

Day One Opening Remarks

The Honourable Donna Cansfield, Minister of Natural Resources began her remarks by reflecting that when she was Minister of Transportation, she became very aware of the economic importance of the 'H₂O Highway' that allows goods to be shipped around the Great Lakes and internationally. She noted that Ontario is blessed with an abundance of fresh water in its four Great Lakes and in the 250,000 rivers, streams, lakes and supplies of groundwater that are fundamental to our well-being and quality of life. This symposium explores how "we can work together to meet the challenges of managing our water resources".

There are many agencies involved in managing the province's water resources. In Ontario, the responsibility for water management is shared by the Ministry of Natural Resources (MNR) and the Ministry of Environment (MOE). Together these ministries develop legislation and policy, carry out research, and provide funding for managing water. Support is also provided by the Ontario Ministry of Agriculture, Food and Rural Affairs. Conservation Authorities and municipalities play an integral role at the local level in delivering programs. The Province also works very closely with Environment Canada, Foreign Affairs, International Trade, and the Department of Fisheries and Oceans (DFO).

Minister Cansfield observed that “we have known for decades that planning based on watersheds is the best way to protect our water resources”. In the 1920s and 1930s, drought and deforestation led to extensive soil loss and flooding across the province. Accordingly in 1940, we changed how we managed water, adopting an approach based on watershed boundaries. This led to the creation of watershed-based Conservation Authorities. The Minister noted that in recent years we have acquired better science and information about watersheds, including the understanding that a healthy environment is necessary for sustainability. The number of international agreements that affect our work has grown substantially. This and our new understanding of watersheds give us the opportunity and the obligation to collaborate even more. Integrated Watershed Management (IWM) provides the approach we need and considers the whole watershed – the surface water, groundwater, land use and the social, cultural and economic issues that impact them.

Minister Cansfield defined IWM as “the process of managing human activities and natural resources in an area defined by watershed boundaries”. IWM operates as a framework within which we can address the very complex issues of water management at every level, from local to international. She noted that IWM is being used successfully around the world and the European Union and Australia have both adopted forms of IWM to address their water challenges.

Through the Great Lakes St. Lawrence River Sustainable Water Resources Agreement, Ontario collaborated with Quebec, the eight Great Lakes States, the federal government, municipalities and First Nations to forge a virtual ban on diversions, restrict transfers of water between basins, and apply tough new environmental standards for water withdrawals. Through the Agreement, we are also developing water conservation programs and integrating scientific knowledge from all jurisdictions to improve our understanding of our Great Lakes waters. Water management in Ontario is also part of broader strategies to address biodiversity, climate change and endangered species. Minister Cansfield noted that watershed management policies also need to address new priorities, such as the Integrated Watershed Plan for the Trent-Severn Waterway. New planning initiatives address regional planning issues such as the *Lake Simcoe Protection Act* and the Oak Ridges Moraine Plan.

We have known for decades that planning based on watersheds is the best way to protect our water resources.

As an example of collaboration, Minister Cansfield cited the Canada-Ontario Agreement (COA). Under COA, MNR has engaged more than 250 partners on more than 150 projects Basin-wide, focused on tributaries and coastal areas. These projects address invasive species, the restoration of Atlantic salmon and American eels in Lake Ontario, the improvement of aquatic habitat, the restoration of wetlands, stewardship, and other issues. Source Water Protection for drinking water is another good example of collaboration between MNR, MOE, Conservation Authorities, municipalities and others.

COA and the Ontario Source Water Protection Plan are excellent models of what we can accomplish within an Integrated Watershed Management framework. Minister Cansfield noted that we need to develop an Ontario framework for IWM that will enable ministries and other agencies to combine their efforts. Because all parties will share information, the planning process will be more transparent. By working together, we can encourage streamlined management, and an improved understanding of our water resources that will be available to all. The Province's goal is to coordinate the efforts of organizations within watersheds, across watersheds, and vertically from subwatersheds to the Great Lakes Basin. Another goal is to break down the barriers between disciplines. Our water resources are public resources and they should be planned and monitored closely and collectively.

Collaboration is the key concept that defines Integrated Watershed Management.

To summarize, Minister Cansfield said that any new IWM framework must address Source Water Protection, fisheries, habitat and species management, natural heritage features and values, flooding and erosion management, low water, emergency response, climate change adaptation and land use planning. We are just beginning to explore what kind of IWM framework should be used in Ontario, but collaboration is the key concept that defines IWM. Accordingly, she said, developing an IWM framework for Ontario must be an ongoing dialogue.

Integrated Watershed Management in Context

Don Pearson, General Manager of Conservation Ontario started his presentation, *The Evolution of Integrated Watershed Management in Ontario* by saying that he hoped the Symposium would help build a common understanding of Integrated Watershed Management for Ontario and provide direction on how it can be adapted to assist ministries, agencies, municipalities and other stakeholders who have a role to play in the management of water in the province. Ideally, the outputs of the Symposium will identify opportunities for increased collaboration in both the near and long-term and the barriers that must be overcome to move forward with the IWM concept.

Don noted that there are many definitions of IWM. One simple definition is “a coordinated approach to decision-making that includes social, economic and environmental issues, as well as community interests in order to manage water resources sustainably”. The concept is really that there is a suite of interconnected issues that are addressed within a process that gives voice to the community and results in sustainable outcomes. He suggested that IWM has been practised in Ontario for many decades, although we haven't always recognized it, and at times it has taken a back seat to our tendency to organize according to our own individual needs, whether that be mandates, legislative responsibilities, or other tools. IWM began with the passage of the *Conservation Authorities Act* in 1946 that was a response to the flooding and erosion problems experienced in the early twentieth century. The *Conservation Authorities Act* recognized that we needed a more integrated approach to managing watersheds, one that included land, water and people. When formed, the Province of Ontario provided each Conservation Authority with a report on the state of the watershed's resources. These reports

contained specific recommendations that provided direction for decades. Looking back, said Don, we can see that the Ontario Government recognized a problem and developed a response to it that was both an innovative and visionary approach to resource management – a partnership, watershed-based, locally driven approach. This was, in fact Integrated Watershed Management for its time.

In 1972, Don noted that the Ontario Government took another bold step forward: the Ministry of the Environment was forged out of the Ontario Water Resources Commission, and the Ministry of Natural Resources succeeded the Department of Lands and Forests. In an early joint project, the two Ministries examined issues of flooding and water quality in the Thames River watershed. At that time, the Thames was the ‘poster child’ for degraded water. The subsequent report laid the groundwork for the next two decades of watershed-based action in the Thames River watershed. The Thames River Implementation Committee was formed to oversee implementation of the Report’s 27 recommendations, which dealt with both point and non-point sources of pollution and included extensive stewardship programs involving landowners.

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By the early 1980s, Don recalled, the MNR was encouraging all Conservation Authorities to develop watershed plans as a way of defining the watershed’s characteristics and systematically addressing issues. This was further evidence that the emphasis was shifting from capital-intensive remedial engineering solutions to a more comprehensive watershed planning framework that anticipated issues and tried to avoid them through better land use planning. This led to the development of many watershed-based:

- Watershed Management Plans and Strategies;
- Valley and Stream Corridor Management Programs;
- Fisheries Management Plans;
- Terrestrial Natural Heritage Plans;
- Conservation Area Plans;
- Habitat Improvement Plans;
- Sustainable Development Plans;
- Greenspace Acquisition Strategies; and
- Community Action Sites.

Don observed that the watershed planning approach used to date is really better described as ‘comprehensive planning’ rather than ‘integrated planning’, and has been likened by TRCA’s Sonya Meek as resembling ‘integration by stapler’.

In the early 1990s, the Province produced the Watershed Planning ‘trilogy’ of guidance documents that described the use of an ecosystem approach to watershed and subwatershed planning and the integration of watershed planning into land use planning. By 2000, nearly 200

watershed and subwatershed plans had been developed in the province. These provided a framework for stormwater management plans and master servicing plans, but the emphasis of these plans was on water quantity and quality, and less so on terrestrial and aquatic ecosystems. In 1996, the Province carried out an evaluation of the success of those guidance documents and the resulting plans and identified a number of keys to success. These included:

- stakeholder support;
- proper scope;
- leadership and coordination;
- meaningful stakeholder involvement;
- volunteer process with Provincial funding;
- current and accessible data;
- clear provincial direction and expectation; and
- Provincial support to advance the science of watershed planning.

Don noted that watershed planning suffered a setback in the late 1990s as a consequence of the Common Sense Revolution that diminished resources in MNR, MOE, Conservation Authorities and other agencies. In the late 1990s, attention was focused by drought on the development of a framework for low water response. Low water wasn't the issue in May of 2000 when an unusually wet spring contributed to the contamination of a municipal drinking water supply in Walkerton. At the subsequent Inquiry, Conservation Authorities and others argued for the protection of sources of drinking water within a watershed planning framework, and Justice O'Connor's Part Two Report from the Walkerton Inquiry supported the principle. Many people are aware of the subsequent *Clean Water Act* and the investment of the Province in the development of Source Water Protection Plans.

A critical step ... is the development with partners of a common understanding of IWM.

Conservation Ontario adopted a Strategic Plan in 2006, and the first strategic action in the Plan is "to develop and promote a model comprehensive policy framework for Integrated Watershed Management in Ontario". A critical step in this is the development with partners of a common understanding of IWM through a collaborative review of various IWM models. Don noted that the IWM Symposium is a vital part of this process. The work on IWM, being carried out by Hazel Breton, has been made possible through a strategic partnership involving MNR, DFO and Conservation Ontario. He noted that Hazel's presentation will outline what we have learned globally, nationally and provincially, and will set the stage for the Symposium.

Don finished by suggesting that one of the measures of success for the Symposium will be increased collaboration on IWM, and expressed the hope that the Symposium would be a turning point in evolution of Integrated Watershed Planning in Ontario.

Current IWM Approaches

Hazel Breton, Water Management Project Manager for Conservation Ontario gave a presentation entitled *Setting the Stage: Current IWM Approaches*, which summarized the work she had been carrying out over the last nine months. She noted that she had spent considerable time looking at what other jurisdictions around the world were doing with respect to IWM. A number of fundamental shifts in water management in other countries became apparent. These included shifts from:

- a focus on process to a focus on multiple outcomes;
- water management to watershed management;
- regulation to shared responsibility and collaboration; and
- government to governance (the ability to pull people together).

Hazel noted that basin level water management has existed in Germany since 1899 and in Spain for over 75 years. A recent study found that 16 of 27 developed countries and 19 of 77 developing countries had fully or partially developed

The current major issues facing water managers across the globe are population growth, demographic change, economic development and climate change.

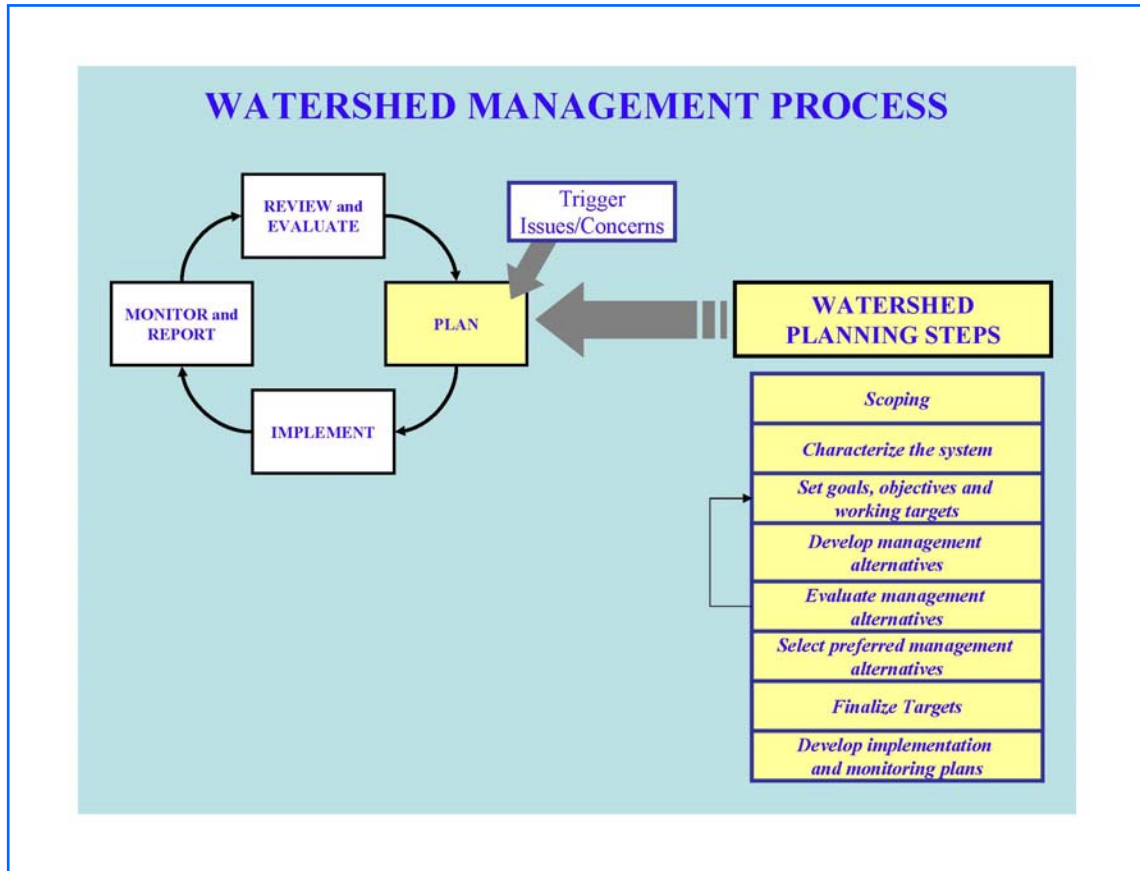
Integrated Water Resource Management Plans. She noted that many of these developing countries were very poor and were facing extreme drought conditions. The major issues currently facing water managers across the globe are population growth, demographic change, economic development and climate change. In 1977, the United Nations passed a resolution affirming that basin (or watershed) approaches to policy setting and planning led to more sustainable economic growth and more equitable development, while protecting the environment.

Moving to an Ontario perspective, Hazel presented a definition of IWM:

IWM is the **process** of managing human activities and natural resources in an area defined by watershed boundaries. It is an evolving and **continuous** process through which decisions are made for the sustainable use, development, restoration and protection of ecosystem features, functions and linkages. It addresses a **multiplicity of issues** and objectives and enables planning for **multiple outcomes**, which are needed given the complexity and **uncertainty** associated with the natural environment. It requires the **integration** of scientific components and the identification of agency and stakeholder responsibilities as part of the process, leading to social learning, which is key to sound implementation. IWM must account for spatial and temporal **scales** from its initiation, and results can therefore be applied at different scales, depending on the question and the need.

This definition has been discussed and refined with the multiagency Aquatic Resources Management Advisory Committee. Hazel noted that IWM can be (and has been) used to

address a host of issues, including the management of groundwater, water quality, sediment budget, channel morphology, fisheries, natural heritage systems, erosion, biodiversity, stormwater floodplains, land development and socio-economic issues. She described the classic process used for developing watershed plans in Ontario (see below).



Hazel noted that as part of the IWM process, the impacts of stressors such as urban growth and climate change are considered, along with alternative management approaches. This ultimately leads to better management decisions that help to set priorities, pool resources and increase efficiency and collaboration among stakeholders. IWM is used as a tool to link human activities to environmental impacts and to promote healthy environments, safety and a good quality of life, and it does this by:

- protecting and restoring natural infrastructure;
- linking land and water management;
- protecting aquatic and terrestrial ecosystems and biodiversity;
- protecting water quality and water supply; and
- promoting sound wastewater treatment.

Why IWM? Hazel noted that the IWM process allows for many types of integration to take place. It is used to establish targets, milestones and performance measures. It is a way of

dealing with uncertainty, evaluating current and future stressors, allows for the incorporation of new ideas and technologies, and provides a context (and rationale) for decision-making. The current drivers for IWM in Ontario include: an increasingly complex water resource management agenda, the need to link water management with land-based planning, population growth, infrastructure management, and the economic benefits of sustainable resource planning and climate change.

Hazel provided an overview of the results of a survey she had done involving 33 Conservation Authorities. She noted that the number of watershed or subwatershed plans being done has decreased since 2005, and that significant scientific gaps exist with respect to target setting, economic and social components, and in integration. Monitoring and evaluation and the updating of plans are considered weak, and stakeholder collaboration is limited. Only a third of Conservation Authorities consider Great Lakes issues. On the other hand, she noted that Ontario is a world leader in the integration of watershed sciences (i.e., the integration of surface water, groundwater, fisheries, geomorphology, etc.).

Survey results show that IWM is being used for many purposes: set workplan priorities and secure budgets for Conservation Authorities and municipalities, influence municipal Official Plans and Secondary Plans, influence Provincial direction, assess the use of Best Management Practices, and assess the impacts of stressors such as climate change.

For Conservation Authorities, the major barriers to the use of IWM include:

- lack of Conservation Authority staff capacity ;
- keeping up with ever-emerging Provincial legislation;
- data gaps;
- science gaps; and
- lack of public and political support.

Hazel suggested that the IWM concept should be evaluated with a view to updating and formally recognizing its role in Ontario. Moving forward with IWM will require the development of improved management instruments, an enabling environment; and an institutional framework. In other words, she said, “we need to take a look at governance”.

Ontario is a world leader in the integration of watershed sciences.

Hazel finished her remarks by talking briefly about ‘adaptive co-management’, the best examples of which are found in Canada. The concept of adaptive co-management recognizes that many agencies, stakeholders and NGOs are involved in water management and need to share information and responsibility to get the work done. Adaptive co-management is a flexible system for environmental and resource management that operates across multiple levels. It can be an important innovation for managing natural resources under conditions of change, uncertainty and complexity, which is the situation we are in. Implementation of adaptive co-management can take place in a phased

manner over a relatively short period of time. Hazel noted that this is important, given the need to deal with the imminent challenges facing Ontario.

The Challenges of Institutional Arrangements and Governance

Dr. Ken Genskow, Assistant Professor at the Department of Urban and Regional Planning at the University of Wisconsin-Madison began his presentation, *IWM: Challenges of Institutional Arrangements and Governance*, by noting that there is a rich and growing literature on Integrated Watershed Management, much of it originating from Ontario and Canada. He also stressed that his presentation was based on the assumption that integrated approaches are a net positive for society.

IWM is used to tackle a host of water resource issues, including the protection of water quality and water supply, the reduction of flood hazards, the protection of habitat, the maintenance of groundwater recharge and instream flows, the protection of habitat, etc. Using the example of a watershed in Wisconsin, Ken identified the complex (and interacting) set of stresses that relate to water quality, stresses that include dairy farming, urbanization, energy use, economic development, transportation and others. He noted that historically we have dealt with these issues singly or two at a time, but not in an integrated fashion, and often these issues have been dealt with in an adversarial manner. The integrated approach to water management views the watershed as a problem domain for solving any one of these issues, as an institutional nexus where multiple jurisdictions come together in a common spatial boundary, and a framework for integration.

Within a watershed, the functions of governance (such as data collection, information exchange, modelling and planning) are carried out in both a vertical manner (among local, state or provincial, national and international bodies) and horizontally across agencies, departments and Non-Governmental Agencies at any one level. Imposing the web of ecological issues over top of the nested governance structure leads to a maze that is challenging to navigate.

Ken noted that IWM is carried out in various ways, as a partnership, advisory body, task force, commission, authority or network. He

Governance is how rules are made and put into practice. Institutions are the social and legal structures that enable governance to take place.

suggested that establishing connections in such governance bodies is easier when those involved have complementary strengths, similar goals and enough resources to carry out the tasks involved. It is more challenging when parties have divergent perspectives, compete for budgets or constituents, have dissimilar organizational cultures, or when 'turf' is an issue. As an example, he described the opportunities and challenges involved when agencies work with universities.

In terms of governance, Ken began by defining terms. Governance, he noted is how rules are made and put into practice. Institutions are the social and legal structures that enable governance to take place. But institutional factors are often high up on the list of barriers that

prevent effective integrated resource planning. From a recent paper, he cited three of the top ten impediments to conjunctive water management programs in California. These were:

- an inability of local and regional water management governance entities to build trust, resolve differences (both internally and externally), and share control;
- a lack of state-wide leadership in the planning and development of conjunctive use programs as part of comprehensive water resource plans, while recognizing local, regional and other stakeholder interests; and
- risks that water stored cannot be used when needed because of politics and/or institutional contractual provisions.

Ken observed that too often institutional factors are treated as ‘black box’ short-hand for politics, government, legislation or regulatory policies, as ‘scapegoats’ for why wise planning or policy initiatives have not been adopted, or as ‘Deus ex machina’ mechanisms that can somehow miraculously save a situation.

‘Watershed governance’ has been characterized as “an effort to build, manage and maintain inter-organizational networks...in other words, develop an institutional ecosystem. ‘Adaptive governance’ involves the “evolution of new governance institutions capable of generating long-term, sustainable policy solutions to wicked problems through coordinated efforts involving previously independent systems of users, knowledge, authorities and organized interests”. The term ‘network governance’ has been coined to reflect the belief that “the idea of the sovereign state governing society top-down through comprehensive planning, programmed action and detailed regulation is losing its grip, and is being replaced by new ideas about a pluricentric governance based on interdependence, negotiations and trust.”

The governance challenge facing us is to develop coordination and decision-making frameworks that are resilient and allow for adaptation.

The governance challenge facing us, said Ken, is to develop coordination and decision-making frameworks that are **resilient** and allow for **adaptation**.

Ken posed seven questions that need to be addressed in any IWM initiative. These are:

1. What are the goals?
2. Who should be involved, and in what way?
3. What information will be used and how?
4. How will decisions be made?
5. How will decisions be implemented?
6. How will accomplishments be measured?
7. What provisions will be made for learning and adaptation?

Ken noted that there are many other important questions. How do we build trust and social capital? Given that climate change will lead to magnified stressors and differential impacts to

various stakeholders, how do we address it in IWM? How do we tie issues of water use and conservation to energy?

European Water Framework Directive

Nicole Kranz, Senior Fellow at Ecologic, the Institute for International and European Environmental Policy gave a presentation entitled *A Revolution in Europe: The Water Framework Directive and its Implementation 2000 – 2009*. She began by explaining that Ecologic is an independent policy think tank, based in Berlin, and is about 15 years old.

The ‘revolution’ in water management in Europe had its formal beginning in 2000, when the European Parliament voted in favour of the Water Framework Directive, which was several years in development through an open process. Nicole explained that a Directive is a law of the European Union (EU) that is binding in its objectives, but leaves Member States free to design policy and legislation to meet those objectives.

The Framework Directive pulls together other EU policies. The first Framework Directive developed by the EU, the WFD introduced a new

Much of what is in the Water Framework Directive is “good old common sense”.

transnational institution – the Water Directors – comprised of representatives of National water ministries. A Common Implementation Strategy was developed, which led to the development of a number of Guidance Documents on issues such as setting environmental objectives. Mechanisms were also developed for reporting and review.

Nicole noted that revolutions build on knowledge, trends and undercurrents, and they can usually be seen coming. Often revolutions don’t change much in the short term, and in fact, much of what is in the Water Framework Directive (WFD) is “good old common sense”, at least to those who are involved in water management issues.

The main concepts of the WFD are:

- an objective of ‘good status’ for all waters by 2015 (or as soon as possible thereafter);
- the placement of water bodies at the centre of water policies, rather than water uses or functions;
- the establishment of cyclical management aimed at continuous improvement of water bodies; and
- the definition of water quality for all waters (rivers, lakes groundwater and coastal waters) based on biology, chemistry and morphology.

Nicole observed that previously no member states had used all three criteria – biology, chemistry and morphology – to define water quality. For water managers, the WFD meant a shift to Integrated River Basin Management. This meant a shift in perspective from ‘lines’ to ‘areas’, a shift in focus from point to diffuse sources, and an administrative shift from territories to bio-regions. She noted the administrative challenges of the latter shift, with 27 member

nations, each of which is subdivided into states or counties. As an example, she cited the Danube River Basin, the most international river basin in the world, which includes parts of 19 countries, some of which are outside the EU. Other challenges include the need to integrate across sectors, integrate across fields of environmental policy, and integrate environment and nature conservation. New aspects to water management under the WFD are the inclusion of economics and a strong emphasis on public participation in decision-making.

Nicole noted that the WFD was expected to change the constitution of Europe. Its drafters felt that it would make the borders between member states less important, and would highlight the interdependence of member states and regions. However, she noted that the bio-regional approach is in conflict with traditional notions of national sovereignty and it might take a generation or two to achieve the implementation of a trans-national system of water policy implementation.

The Common Implementation Strategy was designed to help member states tackle the challenges together, define some of the WFD objectives, streamline implementation and both provide direction on and help with monitoring. Under the Common Implementation Strategy, Guidance Papers have been developed on the most pressing issues, Working Groups have been created, and Pilot River Basin Projects have been initiated. By 2005, member states had to report on the status of their water bodies with respect to use, water quality and other issues.

For some countries, this first step was a struggle, and the Water Directors realized that there would always be some countries that could not meet deadlines. River Basin Management Plans are due in 2009. These will contain an analysis of significant water management issues and a program of measures to address them. Public consultation on the Draft River Basin Management Plans will have taken place prior to 2009. Ecologic carried out a review on the processes to develop all the River Basin Plans, which allowed stakeholders to identify EU-wide what were the most important water issues, the most important drivers, and the most recommended remedial actions. Nicole gave examples of two important drivers – agriculture and hydromorphological alterations, along with the kinds of remedial measures proposed in River Basin Plans.

Implementation of the WFD is highly complex and costly. However, it has contributed greatly to increased cooperation among members states in water management.

The WFD provides for the possibility that some river basins may be exempt from the requirement to achieve good water status by 2015 because of exceedingly high costs, technical challenges that cannot be overcome, etc. In such cases, less stringent objectives may be used.

Nicole noted that in Europe climate change is expected to lead to a decrease in water availability, deterioration in water quality, increased flood risk, increased drought, reduced crop yields and a rise in sea level. Climate change is not being addressed by the WFD, except through the periodic review of River Basin Plans. Broad adaptation to climate change is being examined through other EU processes.

Nicole finished her presentation by observing that implementation of the WFD is highly complex and costly. However, it has contributed greatly to increased cooperation among members states in water management and has helped to improve governance, flexibility and resilience.

IWM in Alberta

David Trew, Executive Director of the North Saskatchewan Watershed Alliance gave a presentation on *Integrated Watershed Management Planning for the North Saskatchewan River Basin*. David began by noting that the original mandate for water management in Alberta was with the Department of the Environment, and before that, in the 1950s and 1960s, with the Department of Agriculture. The big issues for the Department of the Environment in the 1970s were hydrology, the construction of dams and irrigation canals, control of industrial pollution and wastewater treatment. Although there was much basic watershed science being done, the Department didn't see that it had a responsibility for watershed management until fairly recently. In the mid-1990s in Alberta, as elsewhere in Canada, there was significant downsizing to meet the economic challenges of the time. In the Department of Environment, this included the disbanding of the water planning division that had been set up on a water basin basis. The incidents in Walkerton and North Battleford, along with a prolonged drought triggered action to address what was perceived to be a water management crisis.

Key directions for Water for Life included knowledge and research, water conservation and partnerships for watershed management and stewardship.

Alberta's Water for Life policy was developed in 2003 and it provides a statement of intent for water management in the province. The policy contained two new ideas – the notion of managing on a watershed basis and the notion of Watershed Planning Advisory Councils (WPACs) that would develop Basin Management Plans. The goals of Water for Life were safe drinking water, healthy aquatic ecosystems and reliable water supplies. Key directions for Water for Life included knowledge and research, water conservation and partnerships for watershed management and stewardship. The Water for Life policy and the WPAC roles were reaffirmed in the fall of 2008. Water for Life also created other partnership groups – the multi-sector Alberta Water Council and Watershed Stewardship Groups.

David noted that recently, another Provincial department tabled the *Alberta Land Stewardship Act*, which will lead to regional land use plans that will be aligned with the major river basins in Alberta. The Act will amend 25 other pieces of legislation and allow integration of land and water planning.

There are currently 9 WPACs in Alberta. Their mandate is to develop State of the Environment Reports, Integrated Watershed Management Plans and collaborative approaches to watershed planning. The North Saskatchewan Watershed Alliance (NSWA) is a multi-stakeholder, non-profit organization. It was created in 1999 and appointed as a WPAC in 2005. The 14-member Board of Directors includes representatives from the federal and provincial governments, industry, urban and rural municipalities, NGOs, agricultural groups, First Nations and Métis.

(The Board has recently been expanded to 18 members to provide more seats for municipalities and headwater interests). NSWA has 6 staff, a budget in 2008 of under \$1 million, and receives operational and project support from the Alberta and federal governments, municipalities, industry and NGOs.

To date, the NSWA has developed:

- a North Saskatchewan River Guide;
- a Community Watershed Stewardship Toolkit;
- a Canadian Heritage Rivers Program;
- a State of the Environment Report; and
- a Municipal Resource Guide.

The NSWA's main job now is to develop the Integrated Watershed Management Plan for the North Saskatchewan. The organization is also developing a subwatershed plan for the Vermilion River and is engaged in a number of educational, communications and information exchange initiatives with watershed stakeholders.

David described the North Saskatchewan Basin. It covers an area of 57,000 km² and is home to 1.18 million people (most of whom live in Edmonton). It contains over 100 cities, towns and villages, 14 First Nations and Métis communities, two hydroelectric reservoirs, 4 large coal-fired power plants and a number of petrochemical industries. The headwaters area contains a lot of forestry, oil and gas exploration and national parks and farther downstream, it is dominated by agriculture.

The key to making the Watershed Plan work is collaboration.

A number of technical reports have been completed for the Integrated Watershed Management Plan. This includes reports on Inflow Stream Needs, Water Use and Demand, Water Supply Assessment and Climate Change Effects. Still to come are reports on Water Quality Targets, Future Basin Development Scenarios, Economic Analysis of Watershed Plan Concepts and others.

David noted that the key issues facing the North Saskatchewan Basin are:

- headwaters supply;
- reservoir operations;
- water withdrawals for energy production;
- drinking water source protection;
- urban impacts; and
- industrial development.

The key challenges for the NSWA are to:

- re-develop water resource and watershed planning capacity;
- address the differing planning priorities for the main stem of the North Saskatchewan, the sub-basins and the lakes;
- address the diverse range of water issues with the Basin;
- collaborate with a diverse range of sectors; and
- integrate the watershed Plan with ever-evolving provincial planning processes.

David finished by noting that the key to making the Watershed Plan work is collaboration.

IWM in Quebec

Steve Turgeon, from the Quebec Ministry of the Environment gave a presentation on *The Quebec Approach to Managing Water Resources*. He began by noting the many similarities between Quebec and Ontario including geographic scale and the large number of rivers and lakes. The Province shares transboundary watersheds with Ontario, New Brunswick, New York, Vermont, New Hampshire and Maine. Most of Quebec's population is located in the western part of the St. Lawrence River Valley. There are many bodies involved in water management including eight federal departments, eight provincial ministries and corporations, more than 1,000 municipalities and 87 regional councils. There are many laws and regulations. All this makes decision-making complicated and inefficient and led to the idea of reforming water governance in Quebec.

Steve noted that some of the triggers for this reform included the flooding in the Saguenay River in 1996, conflicts over groundwater, proposals to export water in bulk, the degradation of water quality, and public interest in having a role in decision-making on water management. There was a consensus that water management needed a better framework.

One of the five key thrusts of the Quebec Water Policy was the reform of water governance.

In 1997, the Province held a Water Expert Symposium that explored water use in the province and the mechanism for water management. In 1999, the Commission on Water Management held public hearings on water to gather opinion on water management. The Commission's subsequent report, issued in 2000, laid the groundwork for Quebec Water Policy of 2002. Steve noted that in the Quebec Water Policy there were three major issues on which there was consensus. These were:

- the recognition of water as part of the collective heritage of all Quebec residents;
- the need to protect public health and aquatic ecosystems; and
- the need to manage water in an integrated and sustainable manner.

One of the five key thrusts of the Quebec Water Policy was the reform of water governance. This was to be accomplished in a phased manner, through the establishment of 33 Watershed Organizations in the western end of the St. Lawrence River valley. The evolution of governance was to begin informally with a participatory approach, and then perhaps be codified through legislation.

The Quebec Water Policy provides a framework and a mechanism for implementing IWM. The framework includes use of a watershed unit for planning, use of a participatory approach to planning, and decision-making based on sound information.

Steve observed that the Watershed Organizations were the operating core of the new approach to water management. Prior to 2009, each of the 33 Watershed Organizations received \$65,000 annually, with supplementary funding from municipalities, grants and other stakeholders. They are non-profit organizations that include representatives of all public and private water users in the watershed. They function as consultative organizations and initiate and ensure dialogue amongst local stakeholders. They are also tasked with developing a vision for sustainable development of water resources in the watershed. The mandates of the Watershed Organizations include:

- preparing a Master Plan for Water using a participatory approach;
- signing watershed agreements with concerned parties;
- updating the Master Plan for Water as needed;
- informing stakeholders and the public; and
- participating in the implementation of the Integrated Management Plan for the St. Lawrence River.

The planning process for a Master Plan for Water follows the same cyclic process that is used to develop Watershed Plans in Ontario. Public consultation takes place at key points in the development of the Plan. When complete, each Master Plan for Water is analyzed by all ministries and approved by the Minister of the Environment. At this point, 10 Plans are complete and 7 are approved.

Steve observed that the blue-green algae crisis observed in many Quebec lakes in 2006 opened many eyes to the need for water management on a watershed basis. The release of the Province's Blue-Green Algae Action Plan in September 2007 was another step forward in the evolution of IWM in Quebec. The Action Plan undertook to redistribute southern Quebec into 'integrated water management districts' for the purpose of knowledge development, protection and governance. This has led to the creation of 40 watershed management districts that cover southern Quebec and the provision of increased funding. These districts are now being organized.

Bill 27... defines the rules for water governance including the primacy of the integrated watershed approach...

The most recent step in the evolution of IWM was the passage of Bill 27, which confirms the legal status of water as part of the heritage of Quebec residents, defines the rules for water

governance including the primacy of the integrated watershed approach and the need for municipalities to recognize Master Plans for Water, creates a knowledge-oriented office on water; establishes a new water withdrawal authorization scheme, and provides for Quebec's implementation of the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement.

In conclusion, Steve noted that there are 33 watershed agencies in existence in Quebec, and the Province is moving towards 40 watershed management districts. Mobilization and collaboration is developing within watersheds. The concept of IWM is beginning to emerge in other ministries, but there is work to be done at the national scale. IWM-related studies and research are underway, as is funding of IWM. He noted that there are still important questions to be answered:

- Is the voluntary approach to IWM sufficient? Does Quebec need the equivalent of Ontario's *Conservation Authorities Act*?
- How can watershed plans be harmonized with other plans including municipal land use plans?
- How can the management of the St. Lawrence River be integrated with that for the watersheds?
- What strategy is needed for the Ottawa River Basin?
- How will IWM incorporate the impacts of climate change?

Day Two Opening Remarks

Bob Lambe, Regional Director General, Central and Arctic Region of Fisheries and Oceans Canada opened Day Two of the IWM Symposium. He began by noting that the partnership with Ontario in the management of aquatic resources is an important one. He noted the Grand River Conservation Authority's Fisheries Management Plan that has just received a Recreational Fisheries Award from the Department.

In 2006, DFO's Central and Arctic Region completed a Strategic Review that led to the identification of 6 regional priorities, one of which is "co-leadership in advancing watershed management". Afterwards, a project team was established to help re-frame the Department's regulatory work and engage with partners in a shared vision for aquatic resource management.

There are connections between IWM and other processes such as cumulative effects management, regional environmental assessments and ecosystem-based management.

Bob noted that there are connections between IWM and other processes such as cumulative effects management, regional environmental assessments and ecosystem-based management. He noted that ecosystem-based management is based on bioregions and posed the question of whether this is not also IWM in terms of aquatic habitat. He noted that IWM is being applied in many places under different labels. A recent article on cumulative effects management noted how poorly the concept is

often applied in Canada and North America. The authors argued that regulators tended to focus on individual projects, not the cumulative effects of multiple projects in a particular ecosystem. As a regulator, DFO reviews thousands of projects a year and until recently did, and still does to some degree, focus on the individual project, not the big picture. Historically, DFO and the Province of Alberta used this approach in the Alberta oil sands, for example.

However, Bob noted that, Alberta is now moving towards regional or ‘zonal’ approach in which the province has been divided into 6 ecoregions, mostly based on watersheds. The Province will be developing land use plans for these regions, with a goal of having ecosystems that can survive and function in harmony with human development. He suggested that this is IWM and cumulative effects management in practise.

As part of its Oceans Action Plan, DFO has identified 5 sensitive ocean areas – or Large Ocean Management Areas (LOMAs) – in which it needs to develop an integrated approach to the use of the space. The LOMA will be an integrated plan that will clarify for all users how they need to conduct their business in order to ensure that the cumulative effect of activities will not adversely affect the ecosystem. One of the LOMAs is the Beaufort Sea, which covers 1.1 million km².

Governance, science and stakeholder engagement are key elements of the process to develop the Integrated Oceans Management Plan for the Beaufort Seas LOMA. In terms of governance, DFO created a Regional Coordination Committee that was co-chaired by a representative of the Inuit. Even though the process was driven by the *Oceans Act*, he stressed that DFO “never owned the process”, but it was in fact owned by local communities. He suggested that it is hard to overstate the important of science in the development of the Integrated Oceans Management Plan. Solid information is needed to (among other things) develop credible ‘environmental impact thresholds’. It is also very important to incorporate Traditional Environmental Knowledge into the process. With respect to stakeholder engagement, Bob suggested that it was vital to involve the users of the resource, and their future needs, so that cumulative effects can be predicted. It is advantageous for one group of users to hear first-hand from another group what their future interests are. This allows all groups to understand at the planning stage what the overall projected use of the area is, rather than finding out in the future what might be proposed by an individual group. This allows collaboration rather than contention. Regular quarterly meetings with the users are held in the Beaufort Sea LOMA to update them on the planning process and the rules that are being developed for users to ensure that environmental thresholds will not be exceeded.

It is hard to overstate the important of science in the development of the Integrated Oceans Management Plan.

Partway through the development of the Integrated Oceans Management Plan, a particular area was identified that was so sensitive that very little activity could take place in it. This area became a candidate for a Marine Protected Area, and when finalized later this year, will become the first Marine Protected Area in the Arctic. One can ask: Is the Beaufort Sea LOMA an example of IWM?

Bob noted that as a regulator and a Commissioner on the Great Lakes Fisheries Commission, he did not know of a more complex context within which we might attempt to implement integrated resource management than that which is found in the Great Lakes Basin. Management here involves eight US states, two Canadian provinces, two federal governments, and multiple agencies with overlapping responsibilities in a heavily populated and industrial area. He said that “we simply have no choice but to continue to work together and collaborate to break down all the barriers”. Bob noted the extent to which Lakewide Management Plans have broadened to tackle bi-national fisheries management, aquatic habitat restoration and other issues. In the recent Great Lakes Water Quality Agreement (GLWQA) Review, there was overwhelming support for broadening the scope beyond water quality to address the issues of the 21st century, such as invasive species and climate change. A revised GLWQA will be another tool to help advance IWM. On Severn Sound in Georgian Bay, efforts are almost complete to incorporate the Shoreline Management Plan with the municipality’s Official Plan. This is a good example of IWM.

Bob finished by observing that there are very significant challenges in moving to IWM, but with continued collaboration, innovation and persistence we will make progress and we will prevail.

Planning for Uncertainty: Adaptive Environmental Management

Dr. John Fitzgibbon, Professor of Rural Planning and Development at the University of Guelph gave a presentation on *Adaptive Watershed Management*. He began by observing that adaptive management is not a new concept. Circa 450 BC, Sophocles wrote “One must learn by doing: for you think you know it, you have no certainty until you try”. He defined the term adaptive environmental management as “a process that integrates project design, management and monitoring to provide a framework for testing assumptions, adaptation and learning”. Often, he noted, we put a lot of emphasis on the adaptation part, and less on the management.

Dr. Fitzgibbon suggested that we tend to use the ecosystem approach and aim for sustainability of the watershed as an objective of management. Adaptation provides the basis for integration as we learn more about both the ecosystem approach and sustainability. Today we are facing a host of wicked problems – problems that are not easily solved. These include ensuring that we provide enough water for the environment (i.e., instream flows), water for human health, non-point source pollution, climate change, endangered species and biodiversity, economic growth and technological change, population growth, and the spatial and temporal patterns of change. Today’s watershed problems represent a complex set of often conflicting issues which require balancing environmental, economic and social needs, addressing public and private interests, dealing with rights, changing values and perceptions of risk.

One must learn by doing: for you think you know it,
you have no certainty until you try.

Dr. Fitzgibbon defined uncertainty as “the state of knowledge with respect to the possible occurrence of an event”. Risk is the probability of occurrence of an event. Vulnerability is the

degree to which a system is susceptible to the effects of an event. Sensitivity is the magnitude of the response of a system to a disturbance.

In terms of coping with uncertainty, Dr. Fitzgibbon suggested that there are five options:

- ignore it;
- postpone decisions until better information is available;
- assume the worst (precaution);
- assume the best (naive optimism); and
- learn by doing (adaptation).

The two major dominant approaches to coping with uncertainty are the Precautionary Approach and the Adaptive Management Approach. He noted that we tend to use the Precautionary Approach if an activity poses a risk to human health or the environment and, despite lack of complete knowledge, we are not prepared to tolerate the risk. We tend to use the Adaptive Approach if an activity poses a risk to human health or the environment and the harm done will either occur incrementally over a long period of time or will be reversible.

Adaptive Management can be thought of as a ‘purposeful’ experiment. Dr. Fitzgibbon noted that the use of an Adaptive Management approach may be an issue if the expected change is not reversible, when there is no opportunity for changing management actions, when there is no learning (i.e., no effective monitoring), or if the changes take place so quickly that there is not enough time to learn and adjust. In such situations, managers should consider: the scope and severity of the potential harm, use of the Precautionary approach, adjusting the process to provide the necessary opportunities for adaptation to take place, or use of a combination of precaution and adaption.

Adaptive Management can be thought of as a ‘purposeful’ experiment.

In contrast, Dr. Fitzgibbon suggested that Adaptive Management can be used if:

- implementation can be treated as a purposeful experiment;
- all parties are committed to or are required to participate in the experiment;
- all parties accept that the rules and requirements can change;
- the risk of not experimenting is greater than the risk of the experiment; and
- when there is a progress of development over time and the opportunity to intervene as we learn more about the problem and the solutions.

He also suggested that Adaptive Management should be used if:

- there are no simple cause and effect relationships;
- there are no universal stability regimes;
- there is no easy way out;
- there can be no neat packaging of problems in time and space; and

- the impacts of the experiment can be reversed.

Dr. Fitzgibbon went on to show how Adaptive Management can be applied to the development of policies, the management of programs, the management of projects, and decision-making.

The Role of NGOs in IWM

Dianne Ramage, Salmon Programs Coordinator at the Pacific Salmon Foundation gave a presentation on *Exploring the Role of Non-Governmental Organizations in Integrated Watershed Management*. She began by noting that the Foundation is a non-profit conservation foundation, founded in 1989. The Foundation’s mission is to conserve and rebuild Pacific salmon populations through strategic and focused efforts aimed at bringing people and resources together to achieve common goals. In BC, Dianne noted, the words ‘Pacific salmon’ can be replaced with ‘watersheds’ and the term ‘strategic and focussed efforts’ can be replaced with ‘Integrated Watershed Management’. Simply put, she said, in BC “salmon in the stream means a sustainable watershed”.

Dianne suggested that IWM is critically important, and goes beyond water to aim for sustainable ecosystems. IWM is important worldwide: climate change is leading to changes in precipitation patterns that are affecting ecosystems. Human migration in response to these impacts is just beginning. The 2009 UN report, “Water in a Changing World” predicted that “Before 2030, water scarcity in some arid and semi-arid places will displace between 24 and 700 million people”.

Successful IWM requires an integrated decision-making process, with the engagement of all levels of government, stakeholders and the community. Decisions on development objectives and allocation of natural, human and financial resources need to be made or influenced by all. IWM and the achievement of sustainable ecosystems requires self-determination of communities.

Dianne noted that there are many Canadian reports that acknowledge the gradual loss of ecosystem function in watersheds as a result of uncoordinated decision-making and fragmented governance. Canada’s Policy Research Initiative report “Advancing Sustainable Development in Canada: Policy Issues and Research Needs” identified seven key areas as vital for policy research. Number one was “how to implement integrated management of freshwater”.

Successful IWM requires an integrated decision-making process, with the engagement of all levels of government, stakeholders and the community.

Dianne noted that significant work has been done in British Columbia and the province is on the cusp of change with respect to IWM. There is a shift in governance culture as the Province moves to implement its Living Water policy. NGOs and communities have a significant interest in IWM, and a desire to embark in participatory watershed management processes in order to reduce the cumulative impacts of human activities on watershed. The Province has indicated

that it is interested in doing things differently, and sees population growth, water use and climate change as major drivers for change. The 100-year old *Water Act*, the primary water management legislation, is under review and the government that has made the commitment to change the Act has a new five-year mandate. There is also an outstanding law suit against the Province under NAFTA for not allowing the export of bulk water.

Despite reductions in annual mean streamflows between 1947 and 1996, BC is not in a crisis situation for water supply. Diane suggested that there is a general understanding, however, that ‘tweaking’ the system will not get the province where it needs to be. Rather, a fundamental change is needed in how water is managed. In June 2008, the Province released “Living Water Smart,” a blueprint for protecting BC’s water. It includes a number of

BC has hundreds of committed, well-informed NGOs, stewards and community groups that have a variety of relationships with all levels of government and with their watersheds.

recommendations including that by 2012, water laws will improve the protection of ecological values, provide for community involvement, and provide incentives to be ‘water smart’. Canada’s Policy for the Conservation of Wild Pacific Salmon, released in 2005, includes a recommendation that open and inclusive decision-making processes be used that consider social, economic and biological consequences. The recent BC Pacific Salmon Forum Final Report recommends the development by 2012 of an effective BC water and land agency responsible for making all resource decisions in watersheds and marine systems. Dianne noted that BC has hundreds of committed, well-informed NGOs, stewards and community groups that have a variety of relationships with all levels of government and with their watersheds. In part this is a legacy of 30 years of DFO funding: there are now 30,000 volunteers working on habitat alone. Over 1 million students have participated in the Stream to Sea Program in which they learn about humans, wildlife and how they interact on the landscape. BC has 8,600 salmon-bearing streams, over 5,000 salmon stocks, and the Fraser River – the longest undammed river in the world.

Dianne described the challenges facing the implementation of IWM in BC. These include:

- scale (time, scope and spatial);
- jurisdictional silos and lack of interagency coordination;
- lack of meaningful accountability, transparency and inclusiveness;
- lack of data and information to inform decision-making;
- community values and uncertainties;
- commitment to change;
- lack of measures of success; and
- caution.

The opportunities for IWM include:

- the wealth of community continuity, local experience, and local and traditional knowledge;
- government commitment and new leadership;
- funding and other resources;
- community values; and
- political will.

Dianne stressed that participation of NGOs and the broad community is necessary to make IWM work. NGOs and communities bring credibility, accountability, resources, knowledge, support and a broad perspective to planning and management exercises. However, she noted, in order to participate effectively NGOs and the community need consistent support in terms of funding, information, understanding and respect.

Dianne listed a number of watershed planning and related processes that are underway in BC. These include watershed planning processes in Cowichan Lake, and in the Okanagan, Nicola and Somass watersheds, each of which have sprung up independently. A number of Watershed Governance Workshops were held leading up to the Living Water Smart initiative. In 2008, the Pacific Salmon Foundation, the Fraser Basin Council and the BC Conservation Foundation initiated a Collaborative Watershed Governance project to establish a framework for collaborative watershed governance in BC. Diane finished her presentation by noting that “BC is moving towards Integrated Watershed Management by building on our past experiences, and those of other jurisdictions”.

Australian Case Study: The Murray Darling Basin

Dr. Fraser MacLeod, Executive Director, Natural Resources Management. Murray-Darling Basin Authority gave his presentation, *The Murray Darling Basin: An Australian Case Study* by video. He began by describing the Basin. Located in the southeast portion of the continent, it is more than 1 million km² in size and represents 14% of Australia’s land mass. It contains 23 river valleys, is home to 3 million people, and feeds some 20 million people. It also possesses significant environmental values – containing 16 RAMSAR wetlands, World Heritage Convention Listings, International Biosphere Reserves and 19,000 wetlands of environmental significance. Eleven of the Basin’s 35 native species of fish are threatened, along with 35 endangered bird species and 16 endangered mammal species.

Dr. MacLeod observed that all this might suggest the Basin has plenty of water, but Australia is in fact the driest continent on earth. Average rainfall in the Murray-Darling Basin is 530,618 GL a year. However, about 92% of this evaporates, 2% drains into the ground, and 4% ends up as runoff. The greatest rainfall is found in the southeast coastal part of the Basin and more than 50% of all Basin inflows comes from only 5% of the catchment.

The Basin supports fully 70% of Australia’s irrigated agriculture, contains 40% of the nation’s farmers, and generates 39% of the national agricultural income. Major agricultural products include cereals, fruit, cattle, sheep and pigs.

Dr. MacLeod characterized the Basin as “an exotic river”. It flows through varied terrain, from mountains to rain forests to arid zones. It covers a large area, but has relatively little water. The Amazon has greater flows in one day than the Murray-Darling does in one day. It is highly variable, highly developed and highly vulnerable to the impacts of change, whether those changes are natural or human-induced.

Drought is nothing new in Australia, but records of Basin inflows over 100 years show that this drought is unprecedented in its length and depth.

The drought currently being experienced in Australia is being hard felt in the Murray-Darling Basin. Some of the water storage facilities in the Basin are at levels as low as 4% of capacity. In 2006-2007, the Basin saw a dramatic reduction in rainfall – the lowest rainfall on record. This has led to greatly reduced inflows to the system and outflows to the sea. Dr. MacLeod stressed that the relationships are not simple. In the lower portion of the Basin, a mean rainfall reduction of 13% over the last decade has led to a mean runoff reduction of 39%. But at the same time, the climate in southeastern Australia has been changing, and the maximum temperature in the winter and spring has increased by 1 degree C over the last 50 years. This temperature change by itself has reduced streamflow by about 15%.

Dr. MacLeod noted that drought is nothing new in Australia, but records of Basin inflows over 100 years show that this drought is unprecedented in its length and depth. Increased irrigation was carried out, particularly from the 1960s to the 1980s, which was a relatively wet period. The consequences of this expansion are now being felt. In the 1970s, significant development took place in the Basin, resulting in greater diversion of surface water. A cap on water diversions was introduced in 1995, effectively limiting development to the level found in 1994. New development is only possible by purchasing water entitlements from existing license holders.

The Basin is now into its third year of record low inflows. Water storage levels, which have been declining for about eight years, are now at record low levels. There is not physically enough water to carry out all of the productive activities that were being carried out 10 years ago. Dr. MacLeod noted that extensive water trading is now being carried out, with water going to the most highly valued uses.

The challenge now, he said, is to bring the Murray-Darling Basin back into sustainability. To do this requires changing how the water resources are managed, to “promote the use and management of the Basin water resources in a way that optimises economic, social and environmental outcomes”. Australia’s *Water Act* of 2007 established a new water management regime that is a departure from the historical approaches. Until December 2008, the water resources in the Murray-Darling Basin were managed by five state governments working together with the federal government. Arrangements were based on a series of agreements and administered by the Murray-Darling Basin Commission. The *Water Act* enables the federal

government, in conjunction with the Basin states, to manage the Basin water resources in the national interest. In the words of Dr. MacLeod, “we are moving away from a Basin that was split across five jurisdictions to a Basin one that is managed as an integrated whole”. He noted “and with that, comes a whole series of new challenges”.

The changes under the *Water Act* are supported by the Australian government’s Water for the Future Program, which a \$12.9 billion (Australian) investment in water over ten years. The *Water Act* established the Murray-Darling Basin Authority (MDBA) and conferred additional functions on a number of existing agencies. The role of the MDBA is to:

- prepare an integrated Basin Plan;
- accredit water resource plans,
- establish a water rights information service;
- measure and monitor water use and conditions;
- engage the community; and
- take over the responsibilities of the former Basin Commission.

Dr. MacLeod observed that the Basin Plan is central to bringing the Murray-Darling Basin back into sustainability. The Plan, to be developed by mid-2011, will be a legislative instrument. It will include a description of the surface and groundwater resources and how they are currently used. (This will be the first time that surface and groundwater have been brought together at a basin scale). The Plan will set environmentally sustainable diversion limits on the amount of water that can be withdrawn, and will make provision for temporary diversions to allow for the transition to the new regime. It will identify risks to water resources and develop strategies to manage those risks. It will include objectives and desired outcomes, and include a monitoring and evaluation program.

The MDBA has to determine the amount of water available and determine the environmental assets that they are attempting to protect, and then will be able to determine the environmental water requirements. Only then, said Dr. MacLeod, will the Authority be able to determine how much water remains for other uses. The Plan development process will use the best available scientific information and socioeconomic analysis. “Quite clearly”, he noted, “the new regime will be different from the old, and there will be consequences for the 3 million people who live and work in the Basin”. The Draft Basin Plan will be prepared by mid-2010, after which the MDBA will move into an extensive consultation phase. The Authority is expecting a significant amount of public interest, and will have to post all comments and their replies to the comments on the Internet.

The Basin Plan is central to bringing the Murray-Darling Basin back into sustainability.

Under the former Basin Commission, each state had differing approaches for water allocation. Some aspects of the new Basin Plan (such as the Salinity Management Plan) will apply Basin-wide, and there will be flexibility in some areas to address historical differences. The Australian

government will set the Basin-wide Strategy, which will then be reflected in each state's Water Resource Plan that will be subject to review every ten years. This will drive data consistency and transparency across the Basin. Some of the questions to be answered include: Where does the Basin Plan stop and Water Resource Plans begin? How detailed can a Basin Plan be? How detailed should a Basin Plan be? These will be worked out in the next year.

Dr. MacLeod noted that the MDBA has already learned a lot about how integration can be done – across time, across space, and across jurisdictions. By example, he provided information on The Living Murray Program, Salinity Management, and the Sustainable Rivers Audit.

He finished by noting that it is difficult to predict the future, much as no one could have predicted the unforeseen situation in which the Murray-Darling Basin now finds itself. There are significant opportunities for the MDBA, opportunities that build on the experience of the past and the generation of new ideas to achieve integrated outcomes – to meet economic, social and environmental objectives. The major difference for the MDBA is that their roles are now clearly articulated with integrated accountability. The *Water Act* has changed the environment that the Authority operates within, and as a result, there is reason for optimism for the future.