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Agricultural Participation in Integrated Water Resources Management (IWRM) in Canada: Four case studies

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List of Acronyms

AAFC	Agriculture and Agri-Food Canada
ACAAF	Advancing Canadian Agriculture and Agri-Food
ALR	Agricultural Land Reserve
BC ARDCorp	British Columbia Agricultural Research and Development Corporation
BCWWA	British Columbia Water and Wastewater Association
BMP	Beneficial management practices
CA	Conservation Authorities (Ontario)
CARP	Clean Annapolis River Project
CBVRA	Comité du bassin versant du ruisseau des Aulnages
CCAE	Clubs-conseils en Agroenvironnment
CD	Conservations Districts (Manitoba)
CDAQ	Conseil pour le développement de l'Agriculture du Québec
CP.E.I.NWP	Canada-Prince Edward Island National Water Program
DEEF	Department of Environment, Energy and Forestry
DFO	Department of Fisheries and Oceans
DUC	Ducks Unlimited Canada
EC	Environment Canada
EGS	Ecosystem goods and services
EFP	Environmental Farm Plan
IISD	International Institute for Sustainable Development
IWRM	Integrated Water Resources Management
LIDAR	Light Detection and Ranging
LSRWC	Lower Souris River Watershed Committee
MAPAQ	Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec
MCM	Million cubic metres
OBV	Organisations de Bassin Versant (Québec)
OBWB	Okanagan Basin Water Board
OWSC	Okanagan Water Stewardship Council
PADEA	Programme d'appui au développement des entreprises agricoles
PCAB	Provincial Council of ADD Boards
PDE	Plan directeur de l'eau
ALUS	Alternative Land Use Services
P.E.I. DEEF	Prince Edward Island Department of Environment, Energy and Forestry
P.E.I. DFARD	Prince Edward Island Department of Fisheries, Aquaculture and Rural Development

P.E.I. DOA	Prince Edward Island Department of Agriculture
P.E.I. DTPW	Prince Edward Island Department of Transportation and Public Works
P.E.I. EDA	Prince Edward Island Employment Development Agency
P.E.I. FOA	Prince Edward Island Federation of Agriculture
P.E.I. WPI	Prince Edward Island (P.E.I.) Watershed Planning Initiative
P.E.I. WSA	Prince Edward Island Watershed Alliance
P.E.I. UPSE	Prince Edward Island Union of Public Sector Employees
QWP	Quebec Water Policy
ROBVQ	Regroupement des organismes de bassins versants du Québec
SAB	Souris & Area Branch of the Prince Edward Island Wildlife Federation
SAF	Saskatchewan Agriculture and Food
SDWS	Safe Drinking Water Strategy (Saskatchewan)
SIR	Sterile Insect Release
SRW	Souris River Watershed
SRWMC	Souris River Watershed Management Committee
SWP	Source water protection
SWA	Saskatchewan Watershed Authority
UPA	Union Producteur Agricole
WAC	Watershed Advisory Committee (Saskatchewan)
WBM	Watershed-based management
WCQI	Water Conservation and Quality Improvement
WEBs	Watershed Evaluation of Beneficial Management Practices
WG	Watershed Group (P.E.I.)
WHIP	Wildlife Habitat Improvement Program
WMF	Watershed Management Fund
WPAC	Watershed Planning and Advisory Council (Alberta)
WSG	Watershed Stewardship Group (Alberta)
ZIP	Zones Interventions Prioritaires

1.0 Introduction and Background

Integrated Water Resources Management (IWRM) is defined by the Global Water Partnership as "a process that promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (Global Water Partnership, n.d.). Practitioners agree that this requires a highly consultative process, engaging the watershed communities as well as stakeholders.

In its essence, IWRM integrates land, water and resource management, integrates social and stakeholder input towards commonly acceptable and implementable goals, and integrates economic, social and environmental aspects of water management for long-term benefits.

Canada has a relative abundance of land and water. In spite of this, we are threatened by water shortages and floods, as well as water quality issues. Management experience has shown that supply is stressed in certain regions and at certain times of year. In addition, projected trends due to climate change indicate that some of these problems will be exacerbated in the long run through more droughts *as well as* more floods and more resultant water quality problems. As IWRM offers integrated solutions toward sustainable development, its application is extremely relevant in resource-based sectors where water supply and quality are critical, such as the agricultural sector.

1.1 Overview of IWRM in Canada

In a previous research project, *Integrated Water Resources Management in Canada: Recommendations for Agricultural Sector Participation,* IISD provided an overview of the role of the agricultural sector in IWRM initiatives in the various Canadian provinces.[1] Our research found dozens of IWRM institutions, activities and projects of note with low, medium and high levels of agricultural sector involvement. Based on our review, we found that the many IWRM-related efforts ranged from very small, local stewardship initiatives led by community volunteers; to more formal activities (often based on financial and planning partnerships among local government units) at the sub-watershed and regional watershed scales; to larger, basin-scale efforts comprised of multiple stakeholders (typically with members appointed by the provincial government and significant budgeting and technical support). The following provides a brief synthesis of the findings of that previous study and the case studies selected for this research project.

[1] The entire report is available at http://www.iisd.org/pdf/2009/iwrm_agriculture.pdf

British Columbia

British Columbia's Water Sustainability Action Plan recognizes the need to shift individual choices and behaviours toward more sustainable results, with cumulative benefits. The B.C. Water and Wastewater Association (BCWWA) was funded by the province to lead public awareness, communication and strategy coordination. One of the watersheds mobilized by the BCWWA as a key "community of interest" is the Okanagan Basin, which represents key agriculture-related interests. Other watershed initiatives in BC include the Fraser Basin Council, and the Georgia Basin Action Plan, both of which demonstrate limited involvement of the agricultural sector. **The Okanagan Basin is included as a detailed case study in this research paper.**

Alberta

Alberta has developed a "Water for Life" strategy that provides a framework for the formation of several Watershed Planning and Advisory Councils (WPACs) with substantial support from Alberta Environment. Alberta also acknowledges the key role of the local volunteer Watershed Stewardship Groups (WSGs) play in implementing IWRM solutions. A number of IWRM planning efforts are currently under way, many with active involvement of the agricultural sector. While Alberta's Irrigation Districts appear as members of several WPACs, decision-making on resource issues involving water allocation will likely not be a WPAC responsibility in the foreseeable future. IWRM programming by organizations such as Cows and Fish and supporting work by local government agricultural technicians represent some of the most effective agricultural efforts related to improved land, water and wildlife resources.

Saskatchewan

A severe cryptosporidium outbreak in Saskatchewan communities resulted in the development of the Safe Drinking Water Strategy and subsequently, the Saskatchewan Watershed Authority (SWA). The SWA oversees and supports the application of IWRM planning in priority watersheds across the province. Local Watershed Advisory Committees (WACs) have been formed among municipal government partners and other community stakeholders. Many Saskatchewan watersheds have now completed their source water protection (SWP) plans through combined efforts of the WACs and technical committees, with strong participation from the provincial agency. Most WACs have strong agricultural representation due to the high agricultural land use in the region. Many municipal representatives on the WACs are also farmers. The Lower Souris watershed is one of the watersheds in the region with a completed SWP. **The Lower Souris watershed is included as a detailed case study in this research paper.**

Manitoba

Manitoba developed a provincial Water Strategy and included the development of integrated watershed management plans (IWMPs) as part of this strategy. Manitoba Conservation Districts (CDs) have been assigned the task of developing comprehensive watershed management plans. Manitoba CDs demonstrate a commitment to local leadership and recognize the involvement of private agricultural landowners. Some CDs have completed their IWMPs, others are in developmental stages, and there is some uncertainty around where the resources for the implementation of these plans will come from.

Ontario

Ontario has instituted a Clean Water Act and established a formal and well-funded SWP planning and management process as part of this act. All SWP planning has occurred on a watershed basis, through partnerships of existing Conservation Authorities (CA) and with a high level of technical support provided by the Ontario government. Current planning indicates that a high level of agricultural participation is designed into the implementation of SWP plans with funds already committed under the Clean Water Act. Prominent Ontario IWRM initiatives that include agricultural sector support include the Grand River CA's Rural Water Program, the South Nation CA's Clean Water Program, and the Credit Valley CA's comprehensive watershed monitoring program.

Quebec

The Quebec Water Policy (QWP) is a comprehensive strategy that outlines the restructuring of water governance in the province and includes watershed-based management (WBM) as a central element of the new structure. As part of the QWP, 33 priority watersheds have been identified and watershed organizations or "Organisations de Bassin Versant" (OBVs) have been established. In locations where agricultural activities comprise a significant portion of watershed land use, the sector is well represented on the OBV. Les Clubs-Conseils en Agroenvironnment (CCAEs) are other relevant local organizations and more than 80 of these have been in operation for over 15 years, facilitating information exchange among producers, providing extension opportunities and supporting environmental farm planning. **The Yamaska River watershed is included as detailed a case study in this research paper.**

New Brunswick

New Brunswick's Surface Water Protection Program is encompassed within a legislative order under the province's Clean Water Act. High levels of interdepartmental planning and cooperation are evident in the administration of the Watershed Protected Area Designation Order that regulates development zoning within identified zones of a designated watershed. Agriculture and Agri-Food

Canada's (AAFC) Watershed Evaluation of Beneficial Management Practices (WEBs) in the Black Brook Watershed offers some guidance around much needed monitoring required for strengthening linkages between watershed management and agricultural sector involvement in the province.

Nova Scotia

The Nova Scotia Water for Life Strategy (2010) provides a framework for integrated water management in the province. This strategy commits the province to continuing to implement water quality, water quantity and ecosystem management objectives. As part of its commitment to watershed-based management, Nova Scotia has planned to integrate capacity building, share resources and information and establish a Nova Scotia Water Advisory Group. The Clean Annapolis River Project (CARP) may be Nova Scotia's leading IWRM initiative, focussing on science (including an extensive network of volunteer monitoring support) and representing a powerful foundation for the monitoring and evaluation of agricultural sustainability efforts, such as those related to the application of beneficial management practices (BMPs).

Newfoundland and Labrador

Integrated watershed planning is recommended under the Province's Management of Protected Water Supply Areas (2004). This plan promotes the development of long-term watershed management plans for designated areas to optimize resource utilization and protect water quality. Local watershed management committees are encouraged to form and participate in the preparation of watershed management plans. A Newfoundland example of IWRM is at Steady Brook, where a detailed water quality risk assessment and prioritization process was conducted with the coordination assistance of the Western Newfoundland Model Forest.

Prince Edward Island

The Prince Edward Island (P.E.I.) Watershed Planning Initiative (WPI) was initiated in response to concerns related to nitrate contamination from agriculture fertilizer use. Based on this strong connection between water management and agricultural land use, there is a high level of political commitment to the WPI and relevant departments of environment and agriculture are involved at the provincial level. The initiative builds on the volunteer initiative and work of the Watershed Groups (WGs) and there have been significant funding increases to support the IWRM efforts of the 30 local WGs. **The Souris River watershed is included as a detailed case study in this research paper.**

Northwest Territories

The Northwest Territories Water Stewardship Strategy supports the application of integrated watershed management and ecosystem-based management within watersheds. At the time of this study, there was no specific indication of strong agricultural sector participation in the development of watershed planning.

2.0 Canadian Case Studies

The following section provides four detailed case studies to identify current practice in agricultural involvement in IWRM processes in Canada. These four case studies are located in four distinct regions in Canada and highlight some different IWRM approaches and local agricultural contexts. Learning from these case studies may be applicable to other areas of country. We selected the following IWRM initiatives[2] to include in this detailed review:

1. **Okanagan Basin Project (BC):** This case is located in an irrigation-dependent region of Western Canada and provides some key insights into issues around economic dependence on stable water supplies, data collection and management, as well as water pricing and the potential establishment of an agricultural water reserve. This case illustrates the role of agricultural stakeholders in preparing and implementing the Okanagan Sustainable Water Strategy as well as in the participatory integrated assessment in the Okanagan Basin, conducted by the University of British Columbia with local stakeholders. Key informant interviews with the Okanagan Basin Water Board (Okanagan Water Stewardship Council), regional AAFC officials as well as University of British Columbia partners are identified to gain the relevant information for this case study.
2. **Lower Souris (SK):** This case is located in the dryland agricultural regions of Prairie Canada and builds on the use of agricultural beneficial management practices and innovative ecosystem goods and services incentives for agricultural producers. This case includes detailed interviews with key personnel at the Lower Souris River Watershed Committee, regional AAFC officials, the Saskatchewan Watershed Authority, and other contacts, as well as a field visit to develop key insights and get a broader sense of the resources and tools that are most relevant to watershed planners and managers.
3. **Organisme de Bassin Versant de la Yamaska (OBV-Yamaska) (QC)**: This case is located in the Quebec/Ontario region and provides insights into surface water agricultural contamination issues and coordinated, ecosystem-based responses. This case comprises interviews with key informants from OBV-Yamaska, regional AAFC officials, Quebec Department of Agriculture, Fisheries and Food (Ministère de Agriculture, Pêcheries et Alimentation [MAPAQ]), OBVs, and other identified stakeholders.
4. **Souris River Watershed (P.E.I.)**: This case study is located in Atlantic Canada and showcases provincial leadership and commitment to supporting a culture of watershed management through grassroots WGs. The management processes are strongly influenced by the impacts of agricultural development, with a strong focus on groundwater

[2] Note: Although we believe that these case studies are somewhat representative of these regions, the study of one watershed might not be representative of the entire region and all its issues.

contamination. Interviews conducted include representatives from the Department of Environment, Energy and Forestry (DEEF), regional AAFC officials, the Souris River Watershed Management Committee and the Hunter-Clyde WG.

2.1 Methodology

This review was conducted using a combination of desk research, detailed key informant interviews as well as a field visit (in the case of the Lower Souris Watershed in Saskatchewan).

Desk research was used to report on the characterization of the watershed and the IWRM planning and implementation processes, as well as to describe the institutional structures, resources and capacity that aids and prevents effective agricultural sector participation in IWRM processes.

A series of detailed interviews were conducted in each watershed, focussing on key personnel involved in the IWRM processes, as well as those from key agencies involved in agri-environmental programming.

Table 1: Interviews and representation in case studies

Watershed	Number of interviews	Representation
Okanagan Basin, B.C.	4	Okanagan Basin Water Board; Agricultural member of Okanagan Water Stewardship Council; AAFC-BC; B.C. Agriculture and Lands.
Lower Souris River Watershed, SK.	4 Also, a focus group workshop conducted with 6 participants	Lower Souris Watershed Committee-2; AAFC; Saskatchewan Watershed Authority.
Yamaska Watershed, QC.	5	Agro-environmental advisory club, MAPAQ, L'Institut de recherche et de développement en agroenvironnement, AAFC-QC, OBV.
Souris Watershed, P.E.I.	4	Hunter-Clyde Watershed Group, Souris River Watershed Management Committee, P.E.I. DEEF, AAFC- Atlantic Region

A draft template of the questionnaire that was used as a basis (and adapted) for the interviews is attached as Appendix A to this document.

The Lower Souris watershed in Saskatchewan involved a brief field visit with face-to-face interviews and a focus group workshop with six participants representing Lower Souris River Watershed Committee staff, board members and agricultural producers.

2.2 Detailed Case Studies

Each case study has the following structure:

- Watershed description:
  This section briefly describes relevant features of the watershed, including its location, area, population, land use and other relevant agricultural and water-related information. The section also provides a watershed map for reference.
- Main issues in watershed
  This section briefly describes the main problems/issues in the watershed, such as water quality, instream flows, nitrate contamination, etc.
- Description of IWRM initiative
  This section describes the existing IWRM process in the watershed and contains the following sub-sections based on available information:
  - Goals for the IWRM initiative
  - Institutional management structure for the IWRM initiative
  - Current stage of IWRM planning/implementation
  - Resources used for IWRM planning/Implementation: this includes a description of the prominent federal, provincial and other resources used in relation to agri-environmental management and IWRM in the watershed.
- Agricultural Sector Participation
  - Main drivers and barriers for Ag-sector participation: this section is based on various perspectives from our interviews with federal, provincial and local representatives
- Synthesis and Recommendations: This section provides a synthesis of the main findings and summarizes the implications for federal and provincial support in increasing agricultural sector participation for the particular case study.

3.0 Okanagan Basin Water Board, British Columbia

IWRM initiatives in the Okanagan Basin were chosen for case study consideration due to the fact that this basin is located in a region of relative water scarcity. Agricultural activities are fairly intensive and are dependent on irrigation. As such, it was felt the lessons and approach utilized in this region could be generally applicable to other areas of Canada where irrigated agriculture is common and where future climate change impacts are of significant concern. The basin is also an international transboundary watershed, offering comparative opportunities to other agricultural regions.

3.1 Watershed Description

The Okanagan Basin is located in south-central British Columbia. It is 8,000 square km in area, ranging from 20–40 km wide and stretching 200 km north from the US border (OBWB, 2011a). As the Okanagan River flows south into the United States, it is known as the Okanogan River, which ultimately drains into the Columbia River.

The basin has a population of about 350,000. Several lakes (primarily Okanagan Lake, but also Swan, Kalamalka, Wood, Skaha, Vaseux and Osoyoos) serve as the context and recreational areas focus for the main towns within the basin (Figure 1). Major cites include Kelowna, Penticton and Vernon (OurOkanagan, 2010).

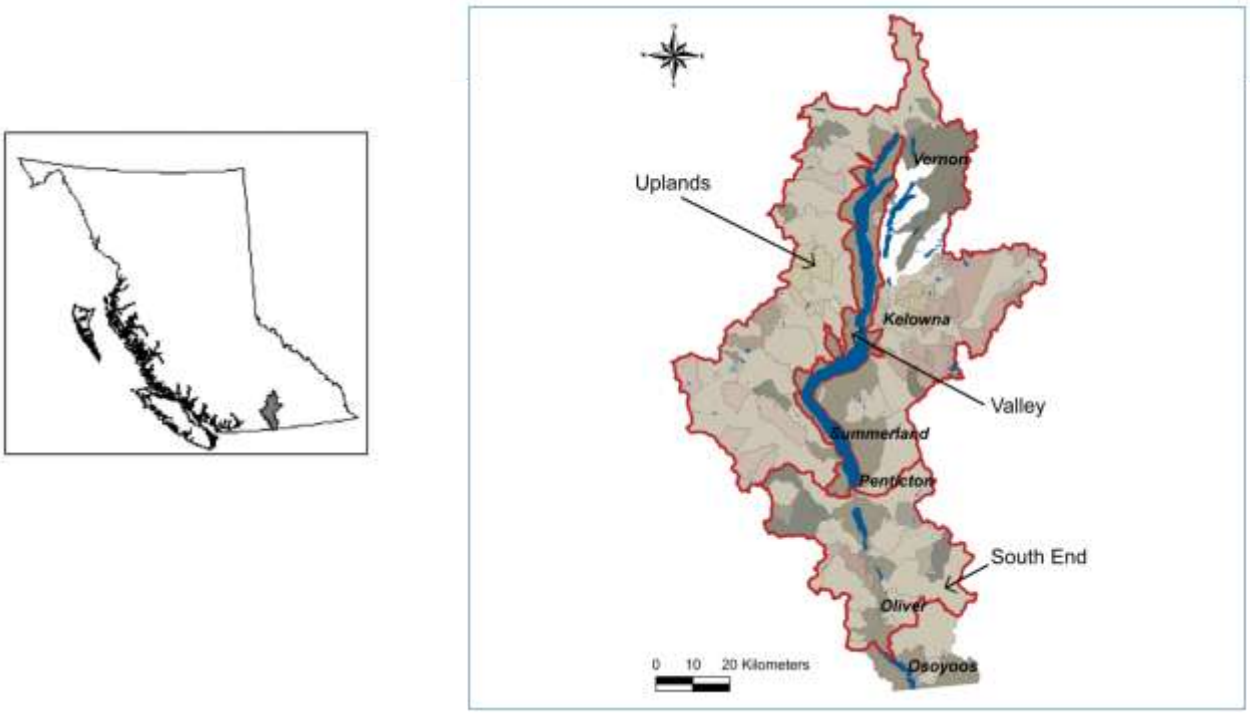

Figure 1: Okanagan Basin location
Source: Langsdale, et al. (2006).

The Okanagan Basin climate is sunny and relatively dry. The region receives about 2,000 hours of sunlight per year and 250–500 mm of precipitation, with most of the annual water flow coming in the form of snowmelt during the spring. The southern valley receives approximately 300 mm of precipitation and has desert-like climatic conditions, flora and fauna (Canadian Encyclopedia, 2010).

Land Use/Water Use

Land use in the valley is comprised of protected parkland, First Nations Reserves, forest management areas, agricultural land and urban areas. The series of images in Figure 2 outlines the extent of water (approximately 6 per cent) and non-Crown land parcels of agricultural, urban, and First Nations lands (approximately 32 per cent) within the Okanagan Basin (van der Gulik, Neilsen & Fretwell, 2010), including land parcel portions within the British Columbia Agricultural Land Reserve (ALR) (approximately 12 per cent). The ALR was established in 1973 under British Columbia's Provincial Land Commission Act as a means of protecting a clearly identified agricultural land base, family farms, agricultural communities and urban green belts (Pierce & Seguin in Hanna, 1997).

Farm Characterization

The Okanagan Basin contains a significant proportion of BC's prime agricultural land, with the region accounting for 25 per cent of the production value of BC's agriculture sector (Natural Resources Canada, 2008). Cattle ranching in the north and fruit crop production in the south are the predominant agricultural sectors in the basin. In 1986 the average farm size in the basin was reported to be between 41 and 59 ha (Reitsma, 1986; Regional District of Central Okanagan, 2006), while the BC average was 109 ha in 1981 and 143 ha in 2006. There were 5,679 farms in the Thompson-Okanagan region in 2001 (Statistics Canada, 2011) while 5,167 individual agricultural land parcels (individual units of privately held land, including agricultural land; this representation does not include crown lands) were identified in the Okanagan Basin (van der Gulik, Neilsen & Fretwell, 2010).

Figure 2: Okanagan Basin agricultural land use
Source: van der Gulik, Neilsen & Fretwell (2010)

3.2 Main Issues in the Watershed

With a generally dry climate and variable water availability, conflicting water use needs and desires among stakeholders are an ongoing and increasingly significant challenge. The main issues in the watershed are water allocation and future demand management. These are heightened by the fact that population growth in the Okanagan Basin has occurred rapidly since the 1970s (Okanagan Water Stewardship Council, 2008). Additional concerns over land use, water quality and invasive species led to the original formation of the Okanagan Basin Water Board (OBWB). While the basin is recognized to have the lowest per-capita availability of water in Canada, average daily residential

consumption of water is 675 litres per person, compared to the Canadian average of 329 litres (Statistics Canada, in Okanagan Water Stewardship Council [OWSC], 2008). Most of this water is used for outdoor landscape watering (OBWB, 2011d).

Water supply in the region is also highly variable, with recorded net inflows to Okanagan Lake ranging from 75 million cubic metres (MCM) to 1400 MCM since 1921 (Chapman, in OWSC, 2008). As such, both flooding and drought have been recurring challenges in the basin. Recent and devastating losses of forest cover due to mountain pine beetle infestations appear to have dramatically influenced the hydrology of the basin, and future precipitation scenarios under changing climate regimes indicate increased streamflow variability. Increasingly dry conditions have been linked to a growing risk of forest fires (OWSC, 2008). Additionally, the volumes and velocity of water flowing within the wetland and riverine ecosystems that connect the lakes of the Okanagan Basin can be expected to influence downstream water quality. With some 85 per cent of riparian and wetland areas lost or degraded since 1950, these are significant concerns moving forward (OWSC, 2008).

Agricultural production covers 70 per cent of all developed land within the basin (OWSC, 2008). These farmlands have been estimated to represent 64 per cent of outdoor water demand and 55 per cent of all water use (OBWB, 2011a) requiring approximately 132 MCM annually (van der Gulik, Neilsen & Fretwell, 2010). Of note is the fact that there are some 2,000 water impoundment structures owned by private landowners and/or other water utilities, representing an extremely complex water management regime. There are currently 101 water utilities operating in the Basin, each of which must plan for future growth and changing conditions (OBWB, 2011d). These include numerous local and municipal systems, as well as 18 irrigation districts, which also own groundwater pumping systems and infrastructure for the distribution of water to their members (Neilsen, et al., 2001). In 1990 77 per cent of total water use in the basin was for agricultural irrigation. This has been reduced through a move towards more efficient methods of irrigation, changes in crops grown (e.g., from apples to grapes, which require less water), and some agricultural land being lost to other forms of development, such as residential use and golf courses (OBWB, 2011a, van der Gulik, Neilsen & Fretwell, 2010). Agri-tourism in the fruit-growing and wine areas is becoming established as an important contribution to farm incomes (OWSC, 2008).

In terms of the general economic impact of tourism, another major driver for the regional IWRM initiative relates to the importance and focus on water. Some 25,000 people are employed through tourism, which depends heavily on water as an attraction and focus for many recreational activities. The development of lakeside resort destinations draws high-income visitors from around the world. The widespread availability of quality public recreation opportunities also represents an important contribution to the overall quality of life for residents in the region (Okanagan Partnership, 2004).

Increasing numbers of people visiting and moving to the Okanagan to live and work places continued pressure on the region's water resources through increased development, surface and groundwater withdrawals, surface runoff and wastewater treatment. Some 435,000 people are projected to be living in the basin by 2035. Currently, 350,000 are already located there—60,000 more than were earlier projected to live in the region by 2020 (BC Statistics, in OWCS, 2008). Current projections for 2035 may be low. In part due to a fear over losing access to water supplies in the future—as well as planning ahead for future growth—many water utilities have licenses for much more water that they current require, with the result that 90 per cent of all streams and waterways are currently at or beyond their individually licensed capacity for withdrawal (OWSC, 2008). This suggests there may be limited flexibility in managing future water allocation decisions, unless existing licenses can be renegotiated somehow. It is important to note that water availability is not evenly distributed; some areas have easy access to lake water, while low production aquifers supply locations further from large water bodies.

Projected climate change scenarios point to steadily increasing water demand due to population growth, as well as increased water use during drier periods, with dramatic increases in residential and agricultural demand (e.g., 60 per cent increases for agriculture) combined with reduced water flows (e.g., a 30 per cent decrease) in the coming decades (Merritt et al. 2006, Neilsen et al. 2006). These changes are projected to result in water supply deficiencies occurring in approximately one in six years by 2050, and one in three years by 2080 (Cohen & Neale, 2006).

3.3 Description of the IWRM Initiative

During the 1960s community leaders began a process that was to be the origin of IWRM efforts in the Okanagan Basin. Formation of the Okanagan Watershed Pollution Control Council in 1965 sought to address deteriorating lake conditions due to municipal wastewater effluent. Recognition of the need to address other watershed-related issues (e.g., drought, fish habitat, floodplain zoning) resulted in formal establishment of the OBWB under the Municipalities Enabling and Validating Act in 1969. Initiation of a federal/provincial Okanagan Basin study also occurred that year. In 1974 the study recommended a comprehensive basin-wide approach for addressing the region's challenges, including a proposal to reorganize governance of the region using the basin as its boundaries (Canada-British Columbia Consultative Board, 1974). However, political and administrative resistance to this comprehensive approach initially limited the focus of the OBWB to administering municipal sewage treatment grants and controlling Eurasian watermilfoil on the Okanagan lakes—viewed as the most significant challenges at the time (OBWB, 2011b, Canada-BC Consultative Board, 1974). Based on recommendations from the Okanagan Water Stewardship Council and through its legislated mandate, the board has recently developed an increasing focus on water

conservation, water quality improvement, water science and integrated watershed management planning (OBWB, 2010d).

3.3.1 Goals for the IWRM Initiative

As outlined within the Okanagan Water Sustainability Strategy (OWSC, 2008), the OBWB and its partners in the Okanagan Water Stewardship Council are focused on two broad areas (Protecting Water Bodies and Securing Water Supplies), encompassing several goals, as follow.

Protecting Water Bodies

The basin's lakes, rivers, wetlands, and aquifers will be protected through:

- **Source water protection,** which demonstrates the linkages between ecosystems and water quality in protecting both surface and groundwater sources; protects and restores riparian areas and wetlands; prevents the introduction and spread of invasive species; understands the potential groundwater impacts of geothermal energy development; and includes plans for review and assessment
- **Land-use planning,** which considers water in community design, provides for integrated stormwater management and includes land use policy tools to protect water resources
- **Wastewater management,** which removes nutrients at the treatment plant level, regulates sewage systems with appropriate regulations and addresses concerns associated with emerging contaminants (e.g., endocrine-disrupting chemicals, personal care products and pharmaceutical products)
- **Data collection,** which is focused on ecosystem mapping, incorporates long-term water quality monitoring and standardizes data collection and reporting.

Securing Water Supplies

The basin's water supplies will be secured through:

- **Water allocation,** which reserves water for appropriate uses (environment, agriculture, human needs, and economic development), and incorporates drought management and water-use planning
- **Water management,** which follows the principles of IWRM
- **Water conservation/efficiency,** which coordinates basin-wide efforts; reduces irrigation; includes universal metering; uses effective water pricing to stimulate increased conservation effort and achieve equitable domestic pricing; and maintain affordable agricultural water rates

- **Water storage,** which develops increased headwater capacity, plans for future costs through a reserve fund and ensures coordination in the management of the storage system by a single operator
- **Data collection,** which includes comprehensive surface water flow monitoring; accounts for significant levels of evapotranspiration and evaporation losses in the basin; and incorporates groundwater supply and demand.

3.3.2 Institutional Structure for the IWRM Initiative

The OBWB was established as a unit of local government under the BC Municipalities Enabling and Validating Act. OBWB funding is generated from taxation revenue collected through its members—the Regional Districts of Okanagan-Similkameen, Central Okanagan and North Okanagan. As outlined in Figure 2, each of these districts appoints three members to the board, while three additional members represent the Okanagan Nation Alliance (representing six First Nations in the basin), Water Supply Association of BC and the Okanagan Water Stewardship Council (OBWB, 2011c; OBWB, 2010b). The board has no regulatory powers. It is served by seven staff members (OBWB, 2010d). Annual revenue and expenses for the OBWB are in the range of $4 million, primarily through member regional district levies on property owners. A significant amount is also generated through government grants and contracts. The board maintains a healthy surplus in the range of $700,000. In 2010 the board's expenses were generally administered as follows (OBWB 2010d):

Sewage Facilities Grants:	$1.8 million
Aquatic Weed Control:	$0.5 million
Water(shed) Mgmt. and Grants:	$1.0 million (OWSC and WQCI Grants – see below)
Water Supply/Demand Research:	$0.6 million

Okanagan Basin Water Stewardship Council

In response to concerns arising from dramatic population growth and a 2003 drought causing serious water-use conflicts between agricultural producers and fisheries regulators, there was a growing realization that a more comprehensive approach to basin-wide water challenges was needed. Led by calls from the Okanagan Partnership (an association of business and advanced education leaders) for greater regional collaborative efforts in support of long-term sustainability (including water planning and management), the OBWB was tasked by its member regional districts to establish the Okanagan Basin Water Stewardship Council (the Council) in 2006 (OBWB, 2011b; Okanagan Partnership, 2004). The Council provides broad stakeholder input to the OBWB and is composed of volunteer representatives from agriculture, education, First Nations, health, industry

associations, conservation organizations, and local/provincial/federal government sectors. The OBWB may also refer issues or ideas to the Council for resolution or exploration. In 2008, the Council released the Okanagan Sustainable Water Strategy to guide the OBWB's efforts toward basin-wide responses. In many ways, the emergence of the Council reflects similar calls for integrated, basin-wide approaches to the region's water challenges (Canada-British Columbia Consultative Board, 1974). The Okanagan Sustainable Water Strategy represents the board's intentions and direction for IWRM (OBWB, 2011e).

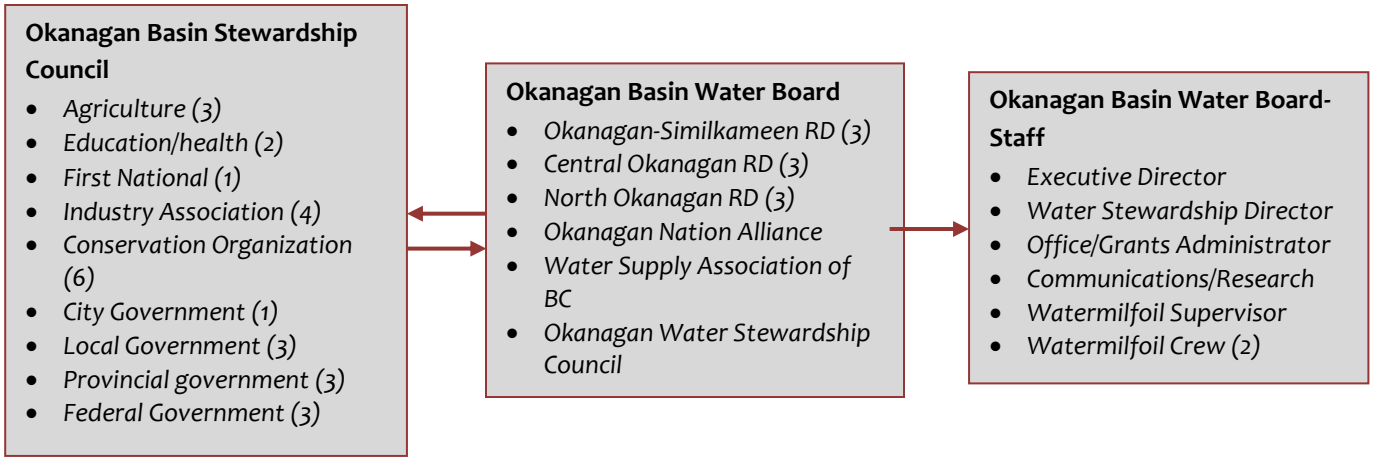

Figure 3: OBWB decision-making structure

3.3.3 *Current Stage of IWRM Planning/Implementation*

The Council released the Okanagan Sustainable Water Strategy in 2008. The strategy is intended to: 1) stimulate partner commitment for action; 2) position the OBWB as a basin champion to provide momentum; 3) build trust and collaboration among all stakeholders; and 4) secure required funding for partner implementation (OWSC, 2008).

The OBWB's IWRM activities are organized under its Water Management Program, which consists of four elements (OBWB 2011f):

1. Water Conservation and Quality Improvement (WCQI) Grants
2. Water Science and Research
3. Okanagan Water Stewardship Council
4. Outreach and Communication

The OBWB's WCQI grant program has been in operation since 2006 and currently administers funding of $300,000 to a variety of organizations focused on conservation activities, community

research, local water quality monitoring and communications. Most grants have been awarded to municipalities. A small amount of these (three of 17) in 2011 note agricultural producer participation related to riparian management for cattle and groundwater-based source water protection planning (OBWB, 2011j).

Beginning in 2001, with funding from Natural Resources Canada, a major research focus relating to climate change and future water use in the Okanagan Basin began under the coordination of Environment Canada and the University of British Columbia. Several comprehensive reports were produced including Cohen and Kulkarni (2001, on water management), Cohen, Neilsen & Welbourn (2004, on consultation) and Cohen and Neale (2006, on integrated assessment). Based largely on this work, with extensive support and funding from the BC Ministry of Agriculture and Lands and AAFC, the Water Supply and Demand Project: Phase 1 was initiated in 2005 to improve the understanding of existing water licensing patterns and availability at the basin level, while exploring future water demand under various climate change scenarios (van der Gulik, Neilsen & Fretwell 2010). An impressive level of information has been collected and data modelled, with key findings focused on surface, groundwater and in-stream flows. Detailed results are available and have been clearly interpreted for the agriculture sector, residential demand, local governments, water utilities and habitat conservation interests (OBWB, 2011g).

Continued work on this research project has resulted in the completion of a Phase 2 report, resulting in the development of an Okanagan-specific modelling tool for long-term planning, as well as a powerful communication vehicle (Okanagan Water Supply and Demand Viewer) for stakeholders to utilize (www.okanaganwater.ca). Research suggests that climate change-induced demand increases will result in greater competition for the basin's water resources. There are important opportunities for improved conservation and increased headwater storage. Greater coordination in the management of surface and groundwater will be needed, and current water licensing volumes may not satisfy growing residential and agricultural demand (van der Gulik, Neilsen & Fretwell 2010). Utilities depending on water storage reservoirs will be at greatest risk during drought conditions, and lake levels and in-stream flow levels will suffer (OBWB, 2011h).

The Okanagan Water Stewardship Council serves as the main vehicle for the OBWB's outreach initiatives to directly engage basin stakeholders. These efforts are supported through a range of communication activities by the OBWB to the public occurring through several media, including print distribution, radio advertising, presentations, video, and a comprehensive website, which features all aspects of the board's initiatives. Additional board-led outreach has occurred through workshops and webinars (OBWM, 2011d). A major awareness initiative focused on water conservation has been led by the OBWB since 2009 (www.okwaterwise). Most impressive are the related communications arising from the Water Supply and Demand Project, in which report results

are provided with clear interpretations for various stakeholders, including online agricultural irrigation calculators (developed by BC Agriculture and Lands) and the introduction of a Streamlined Water Use Reporting Tool for large water users (OBWB, 2011d).

3.3.4 Resources Used for IWRM Planning/Implementation

The OBWB expanded its focus to include basin-level issues through the OWSC in 2006. The IWRM initiative itself is fairly new and the involvement of the agricultural sector within it is low. Further, its major priority to date has focused on conducting comprehensive water supply and demand research. The OBWB is not responsible for coordinating the delivery of environmental farm planning or BMPs. Interviews revealed a significant amount of valuable contact with key personnel assisting with navigating government networks. These resources are discussed below and have been noted within two tables below.

Inventory of Federal Resources Accessed by the IWRM initiative

Table 2: Federal resources accessed by the OBWB

Technical	Financial	Institutional
AAFC Research staff support at Summerland Research Station	AAFC funding for Water Supply and Demand Project via Can-BC Water Supply Expansion Program	AAFC researcher on OWSC
AAFC and EC staff support on climate change research and water-use modelling	NR-Can and EC funding for Water Mgmt. and Climate Change Project (Climate Change Fund)	AAFC hydrologist on OWSC
In-kind support on Water Supply and Demand Project	FOC/DFO funding for Water Supply and Demand Project	EC on OWSC
AAFC/EC support in establishing 15 new groundwater monitoring wells	Additional AAFC funding helped support development of an ag-water demand model	AAFC staff provide valuable understanding and access to the federal system

In addition to federal participation on the Okanagan Water Stewardship Council, substantial federal support has been provided through the OBWB's Water Supply and Demand Project, which also included substantial provincial participation. Federal funding occurred through the Canada-British Columbia Water Supply Expansion Program, coordinated by AAFC. Additional support was provided from AAFC's Research Branch (A-Base funding and Sustainable Agriculture Environmental Systems program). Prior to this, extensive funding was provided by Natural Resources Canada, in support of extensive water management and climate change research coordinated by Agriculture and Agri-Food Canada, Environment Canada and the University of British Columbia. Technical information was gathered from federal research stations, provincial departments and industry, as well as some local producer cooperation, to develop comprehensive

water-use data and anticipate future demands based on various climate change scenarios. A comprehensive groundwater assessment occurred from 2005–09, coordinated by the Canadian Water Network.

The OBWB recognizes the valuable support and participation of AAFC in achieving its goals. In addition to financial support, AAFC staff has played a significant role in conducting research, building supportive networks and working relationships with other federal departments. The OBWB particularly values the stability and reliability associated with its relationship with AAFC. The GIS mapping, modeling, and analytical services of the Summerland Research Station are seen to be extremely valuable, along with active and regular contact and cooperation with several key staff.

Beyond funding, it was noted that, while AAFC provides very useful agronomic support related to crop production, pest management and water use efficiency. There may be need for a greater federal focus on water planning and management relating to future agricultural needs. While AAFC and the BC Ministry of Agriculture and Lands have a good working relationship, responsibility for agricultural water planning seems to be a responsibility left to the provincial government. Given the significance of future water demand concerns under various climate change scenarios, it would seem that additional federal resources to support agricultural water use adaptation would be warranted. This increased federal interest would be reflected through improved communication and transparency in federal/provincial program planning and more focused attention and response to innovative proposals related to regional water-use efficiency.

With support from AAFC and the BC Ministry of Agriculture and Lands, coordination of BC's Environmental Farm Planning (EFP) and BMP funding process occurs through the BC Agriculture Council's Agricultural Research and Development Corporation (BC ARDCorp). Interested producers are invited to contact an EFP planning advisor to begin the process, through which they will develop specific management plans that may require the application of certain BMPs. There does not appear to be an overt focus on watershed-based program delivery of EFP processes or BMPs (BC Ministry of Agriculture and Lands, 2011; BC ARDCorp. 2008).

Inventory of Other Resources Accessed by the IWRM Initiative

Table 3: Provincial resources accessed by the OBWB

Technical	Financial	Institutional
BC Ministry of Agriculture and Lands staff support with regard to irrigation water use	Prov. Gas Tax funding for Water Supply and Demand Project via Can-BC Water Supply Expansion Program.	OBWB projects and programs depend on partnership support from local governments.
In-kind support on Water Supply and Demand Project and irrigation manual design	OBWB is primarily funded by its member regional districts	OBWB projects and programs depend on partnership from the Okanagan Nation Alliance.
In-kind support from UBC, SFU, Water Supply Association of BC, and BC Agricultural Council	Fraser Basin Council administers NR Canada funding (Regional Adaptation Program)	Water Supply Assoc. of BC a key partner in OBWB activities, key for communicating. with utilities
BC Environment support in establishing 15 new groundwater monitoring wells	BC Environment support in establishing 15 new groundwater monitoring wells	Municipal water utilities are key program partners.
Some information sharing with U.S. water mgmt. colleagues (Osoyoos conference)	Support from International Joint Commission to explore Osoyoos water quality issues	$500,000 OBWB contribution for Water Research and Innovation Chair at UBC-Okanagan

The BC Ministry of Agriculture and Lands primarily provides research and technical/scientific support for OBWB projects such as the Water Supply and Demand Project. The rationale for provincial participation has been to ensure the long-term availability of agricultural water supplies in the face of competing demands and growing population in the Okanagan Basin.

Irrigation design manuals written by the BC Ministry of Agriculture and Lands are a valuable tool for area producers and industry organizations (e.g., BC Irrigation Industry Association). These are communicated with help from the Ministry through seminars and courses, course development, and a certification program.

Targeted research or other areas of government support can contribute significantly to the competitiveness of a particular agricultural sector. Continued research, development and application of water efficiency technology will likely become increasingly important for Canadian food security in the coming few decades. Of note is the fact that the OBWB is contributing $500,000 over five years in support of a Water Research and Innovation Chair at the University of British Columbia's Okanagan campus, an important example of the OBWB's ability to access powerful institutional resources. It has also utilized valuable technical support from other universities, particularly in relation to its water supply and demand planning efforts.

3.4 Agricultural Sector Participation

Agriculture participation in OBWB activities occurs primarily through the Okanagan Water Stewardship Council (OWSC), where three agricultural organizations are represented: the BC Cattlemen's Association, BC Fruit Growers Association and the BC Agriculture Council. AAFC and the BC Ministry of Agriculture and Lands are also members (OBWB, 2011i). The Okanagan Water Sustainability Strategy has been well-received by agricultural producers. The OBWB also participates in annual meetings and conferences organized by the agricultural community and its various associations in order to fully understand the interests and concerns of farmers, and to help establish OBWB policy and gauge the board's effectiveness in programming, as it may relate to farmers.

Several irrigation districts have received WCQI grants, while agricultural producers are identified as partners in several funded projects led by municipal and conservation organizations (OBWB, 2011j). It is primarily through the 18 irrigation districts operating within the basin that many agricultural producers are or will become engaged with the OBWB. They are beginning to do so via projects such as the Water Supply and Demand Project and the Streamlined Water Use Reporting Tool. There are no direct funding programs available through the OBWB for individual farmers to participate in; the OBWB does not administer BMP funding to producers.

The OBWB views itself as an advocate of the water-related concerns of the farm community, and attempts to ensure that any discussions relating to future possible changes to water allocation and licensing are fair and protect the continued ability for agricultural production to thrive in the region. There have been ongoing discussions at the provincial level with regard to future changes to the BC Water Act and how best to protect water access for agricultural landowners during periods of water scarcity under increasing competition for water use.

Basin farmers generally appreciate the work of the OBWB. Many producers are quite aware of growing public concern over the environmental implications of their agricultural operations. Many are consistently improving their practices and are open to exploring new options, particularly as this relates to water use and planning for climate change. Further, higher value crops typically require higher quality water supplies, so there is also a strong interest in water quality and quantity management among Okanagan Basin producers. There are important regional differences in terms of agricultural land use across the basin, suggesting that producer interests vary depending on landscape and crop types. For effective program development, a set of national-level BMPs may not be ideal and might need significant regional or local flexibility.

An identified strength of the OBWB is that they are not a regulatory body and therefore are able (and required) to approach the issues using suasion, which encourages participants to find creative

ways to engage in board programs. Such voluntary processes are viewed in a better light by agricultural producers.

3.4.1 Drivers and Barriers for Agricultural Sector Participation

The primary factor driving the participation of farmers in the application of improved practices, new technology, or decision-making approaches centres on the availability of project funding (or clear economic returns) associated with making these changes. Established producers are more likely to invest in expensive technology designed to improve irrigation efficiency, and programs which provide matching funds are the most successful. There is less interest in the use of financial incentives which stimulate increased conservation based on water price (i.e., the creation of water markets). There is a real fear that this approach (including the use of metering) could result in the loss of water allocations devoted to agricultural use, and lost forever to a golf course, residential use, or other form of higher-value development. It is also clear the First Nations communities in the Okanagan Basin have concerns about the creation of water markets.

Producers require the flexibility to alter their crop production and land-use practices based on changing market conditions. Loss of allocation eliminates this flexibility in the Okanagan Basin, where irrigation is required for crop production. Another simple deterrent is that participation in any partnership or project funding initiative takes time and farmers have busy schedules.

Environmental Farm Plans (with associated BMPs delivered by the BC Agriculture Council) have been the main vehicle for agricultural producers to participate with AAFC (and the BC Ministry of Agriculture and Lands) in support of agricultural sustainability objectives (and ostensibly, field-level IWRM planning and management efforts). While not a responsibility of the OBWB, it was noted that EFP and BMP funding no longer supports irrigation infrastructure upgrades—a critical requirement that previously supported the installation of improved water conserving technology by agricultural irrigators. It is recognized that such investments are expensive, but with water use being the major challenge facing the Okanagan Basin, this is seen as a significant shortcoming in current programming. There also seems to have been a reduction in ground-level field research and direct extension support to producers, a former AAFC service that producers valued, that has not been adequately fulfilled by others. A lack of extension further reduces the interest of producers in exploring and/or accepting new management practices and/or BMPs.

The decline of water monitoring services by Environment Canada is also an ongoing concern. Less than 50 per cent of the previous Water Survey of Canada stations in the Okanagan Basin exist today as did a decade ago. Accurate monitoring is critical to developing accurate models to plan for an increasingly uncertain future. AAFC and Environment Canada have been helpful in supporting the establishment of improved groundwater monitoring capacity.

A declining research focus at AAFC is also of concern. AAFC has long been known as an organization with a high level of research capacity, which has historically been supported with long-term funding and infrastructure. This resulted in a relatively unique ability to conduct "systems-level" research beyond what university researchers have been able to do. There is a sense that AAFC is moving away from this area, by reducing its research staff and supporting laboratory-level versus Farm- or watershed-level research. The WEBs program is an exception to this trend and offers some hope for systems research. The introduction of AAFC's Sustainable Agriculture Environmental Systems (SAGES) research program is another important development.

3.5 Synthesis and Recommendations

Instead of being dependent on federal, provincial or other sources of support, the OBWB is seen as a "hub of partnerships." This is typified by the Water Supply and Demand Project, which involved substantial levels of federal/provincial support, combined with extensive in-kind contributions from the university research sector, the OBWB's local government partners, the Okanagan Nation Alliance and dozens of water utilities operating across the basin. This partnership approach is now being expanded for other areas in the province. It is expected to result in significant improvements to water use efficiency by agricultural irrigators.

The OBWB's long-term relationships with its local government members and First Nations are a central feature of the Board's success. Many of the region's approximately 100 water utilities are operated by municipalities, while others are irrigation districts, or local improvement districts/cooperatives. Any efforts to reduce agricultural water demand in the future will depend on the willingness of these utilities to support the OBWB in promoting basin-wide efficiency improvements. For example, simply providing consistent reporting on water use requires extra work for a utility. Individual connections with local water managers are a key component of success. There are significant challenges associated with improving basin-wide planning, as there are many water utilities, each with different systems and often conflicting priorities (e.g., agricultural versus residential). Engaging Aboriginal communities in future water management decisions will be increasingly important, particularly as substantial amounts of remaining un-irrigated agricultural land is located on First Nations reserves.

There is a need for much greater levels of financial support for agricultural water-use technology if real progress on water efficiency is to be achieved at the basin level. Investments by water utilities and agricultural producers will be very expensive (e.g., to separate residential and agricultural systems and install conservation technology). However, local irrigation districts are not eligible for provincial funding. The Canada-BC Water Supply Expansion Program provided for infrastructure upgrades,

but major gaps remain in terms of moving irrigators to greater water-use efficiency. Maintaining agricultural irrigation is a key cultural component of the valley (while supplies decline and demands increase in the future) that will require innovative solutions that involve substantial financial investments.

Overall, many past efforts and resources from the federal government and particularly from AAFC in the Okanagan Basin have been well received, but some of these resources (e.g., extension support and project funding) appear to be decreasing at a time when all climate models and international trends are pointing to an increasing need for effective integration in water planning and management, particularly in the agriculture sector. There may be a need to explore some potentially innovative approaches proposed to address future agricultural water demand challenges, with either research or funding support. The application of water markets through the trading of water-use licenses is a possible management response that should be openly debated among all stakeholders; AAFC and other Okanagan Basin partners need to clearly articulate their positions on it and be open to exploring its potential application.

While agriculture is constitutionally a joint federal/provincial responsibility, a strong federal leadership is not perceived at the watershed level or by local producers. This is of some concern broadly, given that water-related challenges related to agriculture are increasingly being recognized as critical issues—locally, provincially, nationally and internationally. Stakeholders see the need for increased local participation and decision-making ability, but national regulations that are seen to be removed from local contexts are not perceived as representative of local needs that consider regional ecosystem differences. The value of a standard national strategy and agricultural policy is not well understood locally, although interviewees expressed support for a strong role for federal leadership in terms of policy direction, technical support and funding. An illustrative example relates to the need for improved water efficiency in agricultural irrigation. While this is an important policy goal, there is a need to support its implementation—both technically and financially.

There is a clear role for AAFC and other federal government departments to play in supporting (IWRM) initiatives such as those offered by the OBWB. The OBWB is financially sustainable in its own operations due to the existence of an annual budget derived from the municipal tax base. However, the OBWB and its partners (including agricultural producers and irrigation districts) would greatly benefit from more reliable, long-term financial support in the form of project grants focused on water conservation technology. A federal agency involved in infrastructure would also be useful in coordination around the move toward improved irrigation efficiency. There is a need for more basin-level organizations such as the OBWB to develop in other agricultural regions of the province. Future challenges related to water demand, agricultural land use, and the emerging issues associated with defining an Aboriginal title for water use will require the type of broad-based discussion afforded by basin-level organizations.

One major need relates to addressing agricultural producer perceptions related to their future potential loss of water allocations, in response to growing residential demand and high-value recreational use. There is a need for clear information and open discussion regarding the policy tools to be used to stimulate increased conservation, while providing assurance that agricultural water access will not be threatened. AAFC has a role to play in this area, working together with the province and other stakeholders, perhaps under the auspices of the OWSC/OBWB.

One recommendation echoed through the interviews was the possibility of developing safeguards for water allocations dedicated to agriculture. In concert with the existing Agricultural Land Reserve, corresponding agricultural water reserves would protect against future uncertainty related to climate change, changing market forces, and provide flexibility to producers who may wish to change their cropping plans (with different crops requiring different volumes of water). Such an approach would provide water security and contribute to increased food security for BC (and BC-dependent jurisdictions).

There is also a vital need for more dependable water monitoring, and the federal government could greatly assist in this area through the installation of equipment, management of generated data and continued support through research and modelling (as with the Water Supply and Demand Project).

The Summerland Research Station is greatly valued, and there are concerns over earlier proposals to have its operations taken over by a BC university. Stakeholders would like to see Summerland continue as it is (if not increase its research capacity around water). University researchers are seen to be more interested in potentially distractive research (versus the day-to-day provision of information that is highly valued by agricultural producers and water managers). There is a need for more research in plant science, water optimization based on soil and crop type, pest control, and other areas. Agricultural commodity groups are limited in how much they can support. AAFC could also help fill a major void in extension. There is currently a lack of field-level support available at the provincial level, while commodity associations are also limited in what they have been able to provide.

Also, while the value of the Summerland Research Station is known in the area, it is perceived as very fruit-tree specific, producing broad-based research not directly relating to producers and without direct producer involvement. There is some hope that a new station in Kamloops may work more closely with producers on programs, but is in early stages and does not yet have a lot of capacity.

AAFC is viewed by many as the strongest and most valuable federal government involvement in the basin. Agricultural producers would like to see AAFC get more directly involved in promoting food security for BC and Canada, and also help rationalize a role for irrigated agriculture. Further, recommendations included increasing AAFC support to agricultural commodity organizations active in the development of sustainable practice codes. Specifically, this could be in areas of certification and branding of Okanagan-based food products and could be linked to IWRM by using criteria from a local IWRM process.

4.0 Lower Souris River Watershed, Saskatchewan

IWRM in the Lower Souris River Watershed was chosen for case study consideration as this watershed is located in an agricultural area near the centre of the Canadian Prairies. As such, findings from this case study could be generally applicable to similar areas of Canada where dryland farming and cattle production are predominant land-use practices. The basin is both an interprovincial and international transboundary watershed, offering comparative opportunities to other agricultural regions.

4.1 Watershed Description

The Lower Souris River Watershed is located in southeastern Saskatchewan. It is approximately 6,800 square km in area and comprised of three subwatersheds: Pipestone Creek, Antler River and Four Creeks (Stony, Jackson, Graham, and Gainsborough). Pipestone Creek and the Four Creeks system drain into Manitoba, while Antler River drains into both Manitoba and North Dakota (Lower Souris River Watershed Committee [LSRWC], 2006).

Collectively, these subwatersheds represent a headwater portion of the Souris River Basin, a 46,000 square km drainage system located near the geographical centre of North America (Figures 4 & 5). The Souris River contributes significant flow volumes to the Assiniboine River, a major component of the Red River and Lake Winnipeg Basins (Wikipedia, 2011; International Joint Commission, 2011; Saskatchewan Watershed Authority [SWA], 2005).

Some 14,300 people live in the area (Saskatchewan Bureau of Statistics, in SWA, 2005), within 20 rural municipalities, 19 urban municipalities, and three First Nations communities (LSRWC, 2011a)

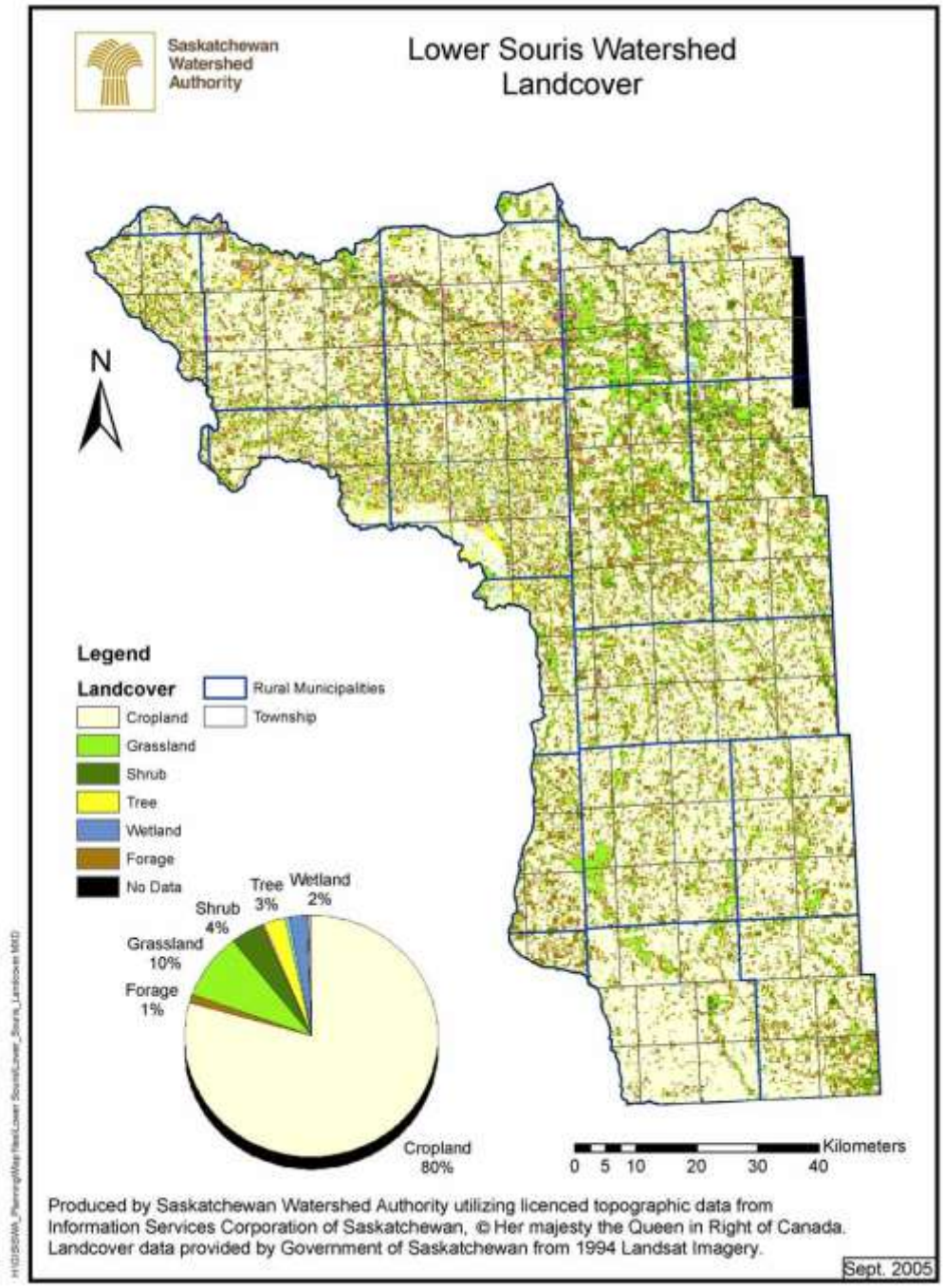

Figure 4: Lower Souris Watershed
Source: SWA 2006, LSRWC 2011.

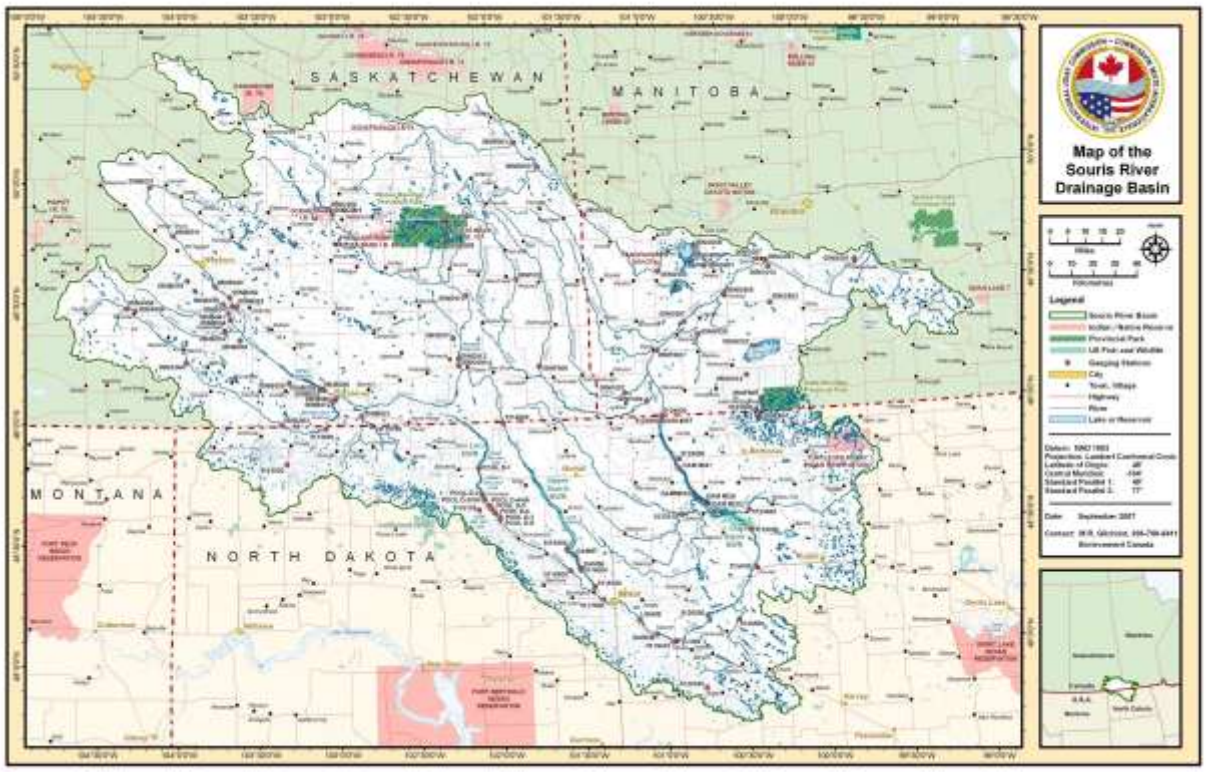

Figure 5: Souris River Basin Location.
Source: International Joint Committee, 2011; LSRWC 2011.

The Lower Souris River Watershed climate is sunny and arid. The region receives about 2,400 hours of sunlight per year and 400–500 mm of precipitation, with most of annual water flow coming in the form of spring rainstorms. The watershed's natural landscape is defined as Aspen Parkland, although it has been dramatically altered by agricultural development over the past 125 years. Eighty per cent of the watershed today is cropland (SWA, 2005; University of Regina, 2006).

Agriculture in the Lower Souris River Watershed is mixed—including annual crop production of oilseeds, cereals and pulses—along with many cow-calf livestock operations and significant levels of associated forage production. Agricultural production on First Nations lands is also substantial (SWA, 2005). In 2006 the average farm size in Saskatchewan was 586 ha (Saskatchewan Agriculture and Food, 2007), up from 519 ha in 2001 (Statistics Canada, 2003) and reflective of a long-term increase in farm size associated with a decrease in the number of total farm operations. There were 500 cattle farms located in the watershed in 1996 (Statistics Canada, in SWA, 2005).

4.2 Main Issues in the Watershed

The main environmental issues in the watershed relate to groundwater protection and quality, community water supplies, landfills and sewage lagoons, and the need for improved water quality monitoring and watershed education (LSRWC, 2006). Groundwater represents an important source of supply, particularly for agricultural operations. Rapid expansion of the oil and gas sector and potential groundwater impacts associated with exploration and drilling have also been identified (SWA, 2005; LSRWC 2006). These issues are heightened by general declines in farm income, particularly within the cattle sector, which saw prices decline by 26 per cent between 2000 and 2004, following the identification of Bovine Spongiform Encephalopathy in Canadian cattle herds (Statistics Canada, 2009; SWA, 2005).

4.3 Description of the IWRM Initiative

In the spring of 2001 at least 5,800 people were affected by a serious outbreak of gastrointestinal illness in the North Battleford area. The North Saskatchewan River water supply serving the city and some surrounding areas was contaminated by the parasite *Cryptosporidium parvum* (Laing, 2002). In response to the North Battleford outbreak, and the inquiry's findings calling for dramatic improvements to source water protection, Saskatchewan Environment initiated a sweeping Safe Drinking Water Strategy (Saskatchewan Environment, 2005).

A key element of the strategy saw the creation of the Saskatchewan Watershed Authority (SWA) in 2002 to better coordinate water source protection across the province by merging the existing watershed management responsibilities of SaskWater, Saskatchewan Environment and the Saskatchewan Wetland Conservation Corporation (Saskatchewan Environment, 2008).

Saskatchewan's Safe Drinking Water Strategy (SDWS) represents the province's policy direction on drinking water quality, with the SWA supporting its longer-term aspects—source water protection through watershed management and related water management goals primarily for the protection of human health. Upon its initiation in 2002, following the report of the Laing Inquiry into North Battleford water crisis in 2001, the SDWS has focused heavily on improving the capabilities of communities to provide safe drinking water supplies (Saskatchewan Environment, 2005).

The SDWS is one of the province's first key cross-government strategies to be developed in accordance with the Saskatchewan's Interdepartmental Planning Guidelines, which emerged as part of a major government-wide "managing-for-results" initiative (Saskatchewan Environment, 2006). Key cross-government strategies are deemed to have province-wide importance, "transcending the mandate of any one department and necessitating a collaborative effort among two or more departments and/or agencies to achieve more meaningful results." Key cross-government strategies

employ a decentralized accountability model, in which the responsibility for outcomes is shared among participating departments.

With its origins rooted in a government-wide response to a major public health crisis, it is clear that the main driver for the LSRWC's IWRM efforts is provincial leadership on water quality and health. Stemming from this direction, the main water management interests guiding the LSRWC's activities relate to water quality and water quantity, with specific concerns including: intensive livestock operations, water well decommissioning, water conservation, municipal wastewater treatment, landfill contamination of surface and groundwater. Additional noted concerns relate to climate change, wetland/riparian/upland retention, and the impacts of agricultural drainage (SWA, 2005).

4.3.1 Goals for the IWRM Initiative

As outlined within and/or interpreted from the Lower Souris River Watershed Source Water Protection Plan (LSRWC, 2006), the LSRWC and its partners are focused on source water protection, including a number of specific goals, as follow.

Protecting Source Water Quality and Quantity

The watershed's source water will be protected through:

- **Watershed education,** which increases watershed residents' knowledge and awareness of the intrinsic and economic value of water and how they can protect the quality of water
- **Groundwater Protection,** which determines groundwater threats and ensures these are addressed to reduce contamination risk
- **Community well water protection,** which develops a methodology to assess contamination risk associated with community well water supplies
- **Water quality monitoring,** which develops a source water quality monitoring plan and determines the cause of water quality decline in the Moosomin Reservoir
- **Landfill risk assessment,** which develops a database of all existing and abandoned landfills and determines their level of risk to water quality
- **Sewage lagoon assessment,** which determines the level of risk to water quality from municipal sewage lagoons
- **Agricultural impact management,** which minimizes the negative surface and groundwater impacts associated with agricultural activities and land drainage
- **Watershed management,** which improves the level of community participation and empowerment in local water management decisions, and which addresses community challenges related to agricultural drainage and wetland protection

- **Fisheries habitat management,** which increases the knowledge of fish habitat and migration, and which improves these conditions and addresses migration barriers.
- **Small community water supply provision,** which prepares a feasibility study for a rural pipeline system to be developed in the watershed
- **Reservoir management,** which determines a range of options related to the future of the Auburton Reservoir and a management plan for the Moosomin Dam
- **Water storage planning,** which provides for water storage and wetland restoration at key locations where surface water will be scarce during droughts.

4.3.2 Institutional structure for the IWRM initiative

The SWA is Saskatchewan's main implementing agency for watershed-planning and IWRM initiatives. The SWA's Stewardship Division provides three interrelated activities: watershed monitoring and assessment; watershed and aquifer planning support to communities; and stewardship programs. A total of 10 watershed planning processes have now been completed or are underway in areas initially identified as priority watersheds, as determined by the SWA's Social Priority and Watershed Health Ranking process (SWA, 2011a).

In accordance with the SWA's planning model, staff support is provided to a Watershed Advisory Committee towards multi-stakeholder discussion and consensus on water management goals and objectives. A local watershed advisory committee may contain municipal, First Nation, irrigation district, watershed association[3] and/or conservation area authority personnel, who are there to represent their constituents and other residents of the watershed (SWA, 2011b).

Support from a Technical Committee comprised of federal and provincial government personnel, SWA staff and other external agencies assist in the collection of detailed background information. This includes an analysis of issues and threats, recommendations for action, management options, responsibilities and accountability measures for plan implementation. Two SWA staff are assigned to coordinate watershed planning activities within each watershed identified as a provincial priority. Local watershed committees are encouraged to develop with community representation (SWA, 2011c).

An evaluation framework was completed in 2006 (SWA, 2011d), based upon a Stress Condition Response Model developed by the SWA. State of the Watershed reports have been produced for individual basins and/or groups of similar watersheds, such as the Lower Souris River area. SWA

[3] The Watershed Associations Act (1978) permits two or more cooperating organizations (typically municipalities) to facilitate planning and development of land and water management activities for multiple environmental, wildlife and recreational purposes. See: http://www.swa.ca/AboutUs/Legislation.asp.

Science, Information, and Monitoring staff compile data on each watershed/region using representative indicators to assess overall watershed sustainability, such as: healthy, stressed or impacted. The Lower Souris subwatersheds are currently rated as "stressed" (SWA, 2011e).

In the Lower Souris River Watershed, the LWSRC is governed by one representative from each of its local watershed committee members (Pipestone Creek, Antler River and Four Creeks), as well as a representative from Saskatchewan's Provincial Council of Agriculture Development and Diversification (ADD) Boards (PCAB). PCAB is non-profit organization supported by Saskatchewan's local governments in support of effective agricultural extension. It acts as a delivery agent for federal-provincial programs that facilitate environmental farm planning, stewardship programs and watershed awareness (LSRWC, 2011a; PCAB, 2011).

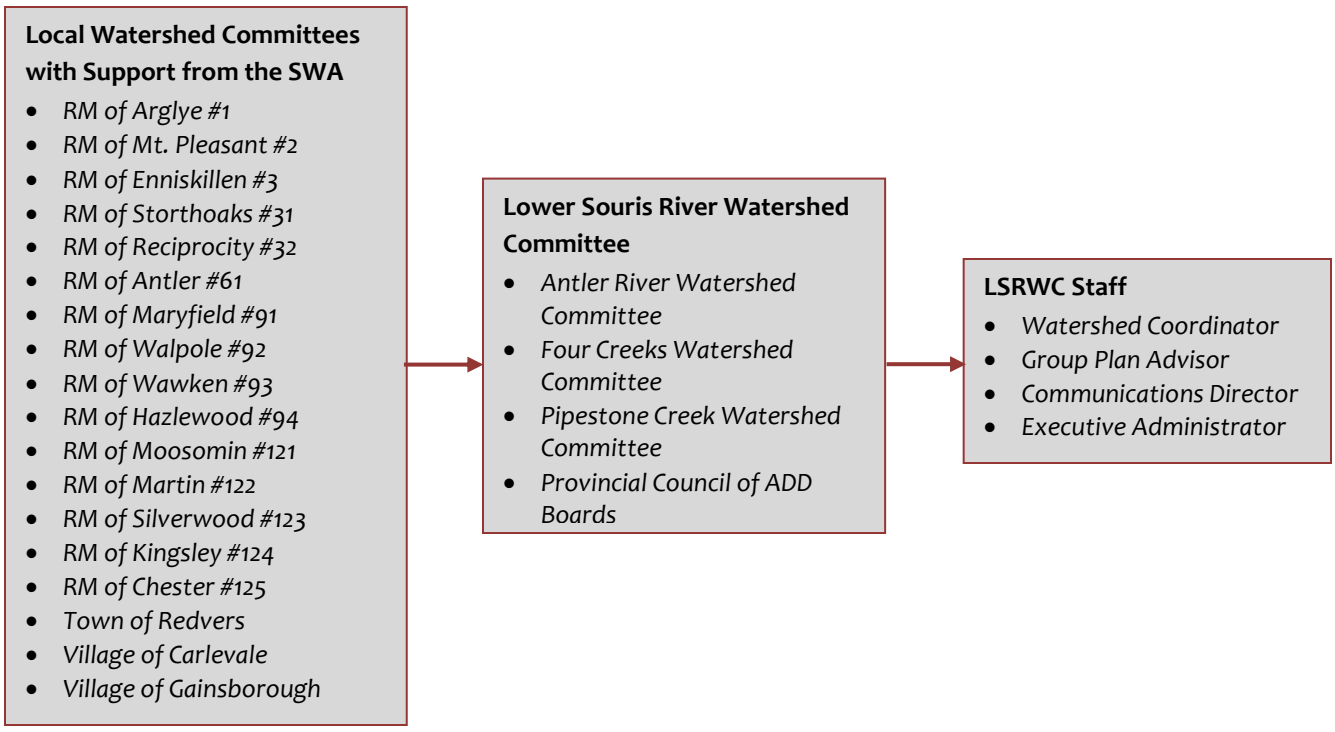

Figure 6: LSRWC Decision-Making Structure

LSRWC funding is generated from annual membership fees collected from its local government partners, an operating grant from the SWA, and project revenue secured through various government and NGO funding initiatives. As outlined in Figure 6, 18 local municipalities located within the Lower Souris River Watershed are participants in the LSRWC. As natural watershed boundaries straddle the relatively square boundaries of Saskatchewan's rural municipalities, many of these local governments participate in more than one local watershed committee.

The LSRWC has no regulatory powers. It is served by four staff members (LSRWC, 2011). Annual revenue and expenses for the LSRWC are in the range of $0.2 million, with most expenses devoted to coordination/program staff and steering committee support (LSRWC, 2011b).

4.3.3 Current Stage of IWRM Planning/Implementation

Three local watershed advisory committees have been coordinating their operations under the auspices of the LSRWC since 1999 (LSRWC, 2011a). Together with area municipalities, the LSRWC's member local watershed organizations (Pipestone Creek, Antler River and Four Creeks) have been supported by the SWA and its Watershed and Aquifer Planning Program. This has resulted in the completion of the LSRWC's Source Water Protection Plan (LSRWC, 2006; SWA, 2011a). While an annual reporting process is not yet in place to report progress against the plan, a number of important initiatives have been completed. These address several LSRWC goals as stated within the Source Water Protection Plan, including: Watershed Education, Groundwater Protection, Agricultural Impact Management, Water Quality Monitoring, Watershed Management, Reservoir Management and Water Storage Planning (LSRWC, 2011d).

For watershed education purposes, the LSRWC maintains a website and distributes a regular newsletter. The committee has also been an active promoter of agricultural BMPs in the areas of cropland management, rotational grazing and addressing water quality impacts of intensive livestock operations. A communications coordinator is on staff (LSRWC, 2011c; 2011d).

In addition to serving a watershed education function, the LSRWC supports its groundwater protection and agricultural impact management goals by providing funding for water well management, a BMP supported with federal/provincial funding (LSRWC, 2011d). In addition, the LSRWC operates a focused program on groundwater education, assessment and technical support for landowners with aging wells that need to be properly decommissioned (LSRWC, 2011e).

The LSRWC addresses its agricultural impact management goal through on-farm extension support available from a Group Plan Advisor. Based on the Lower Souris Agri-Environmental Group Plan, federal/provincial BMP funding is available to producers through PCAB. The LSRWC provides additional funding for specific BMPs supported by PCAB, including: #5: Farmyard Runoff Control; #6: Relocation of Livestock Confinement/Horticultural Facilities; and #9: Water Well Management (LSRWC, 2011d; PCAB, 2011).

Progress on LSRWC's water quality monitoring goals occurs through SWA's water quality monitoring of the Moosomin Reservoirs. Two reports have been prepared: 2003–2004 and 2005–2006 (LSRWC, 2011d). The SWA has also conducted detailed studies on Auburton Reservoir and Moosomin Dam (Reservoir Management).

The establishment of the LSRWC, the hiring of staff and delivery of programming demonstrate progress on the organization's watershed management goals.

Ducks Unlimited Canada (DUC) is a key program delivery partner with the LSRWC. Significant progress on LSRWC's Water Storage Planning goal occurs through DUC's ongoing extension and program support related to wetland conservation and upland habitat management through its forage and range programs (LSRWC, 2011d).

Another apparent LSRWC goal that was not articulated in its Source Water Protection Plan relates to policy research. With funding secured through AAFC's Advancing Canadian Agriculture and Agri-Food (ACAAF) Program and other partners in 2007, a policy research project was conducted by researchers from the University of Alberta and University of Saskatchewan. This work sought to determine how policy tools designed to support the provision of ecosystem services by private agricultural landowners could be utilized (LSRWC, 2011d). Focusing on three rural municipalities in the watershed, this research determined that substantial levels of ecosystem services could be maintained with annual payments ranging from $0.75 million to $2.0 million (LSRWC, 2011f). This study also reinforced the need for "landscape-based goals," in turn highlighting the role of the watershed as a viable unit for agri-environmental management. By emphasizing the role of co-management approaches, the project highlighted the value of collaborative planning and the need for connections between different land owners, including producers, in the watershed, thus complementing the IWRM framework. The study also highlighted the context-specific nature of environmental goods and services (EGS) programming and deemed that successful EGS programs would have to be based on detailed, spatially referenced information (LSRWC, 2011f).

4.3.4 *Resources Used for IWRM Planning/Implementation*

Inventory of Federal Resources Accessed by the IWRM Initiative

Table 4: Federal resources accessed by LSRWC

Technical	Financial	Institutional
Historical on-farm extension and technical support	AAFC funding for BMPs via PCAB (CAN-SK Agreement), including EFP and Agri-Environmental Group Planning	AAFC representative at most LSRWC meetings
Some engineering assistance provided by AAFC-Weyburn	AAFC funding of ecosystem services research (ACAAF)	AAFC staff support provided with Source Water Protection Plan
Some agrology support related to grazing management	EC funding of groundwater project (EcoAction)	EC staff support provided with Source Water Protection Plan
WEBs research project in Pipestone Creek Watershed	Past Greencover Technical Assistance Component (TAC) funding for soils/forage work (2004) was the driver for LSR Group Plan (this program is no longer operational)	DFO staff support provided with Source Water Protection Plan
Review of GIS, survey, and related data: editing of documents, translation	Farm and Ranch Water Infrastructure Program cost shared by AAFC and SK A&F	Advice on best ways to proceed with new initiatives and build federal support for them

AAFC support through the Greencover Canada TAC pilot project in 2004 was a key contribution to the early work of the LSRWC. From that initial work, the committee's proposal for an Agri-Environment Group Farm Plan was advanced. Since LSRWC establishment, there has been an ongoing presence by AAFC at the board level, with staff (initially from Weyburn and now from Regina) supporting the committee with feedback and guidance on their plans.

Historically, AAFC (previously Prairie Farm Rehabilitation Administration-PFRA, now Agri-Environmental Services Branch-AESB) has been very involved and very effective in supporting the land, water and biodiversity interests, and needs of producers. This support was present in force at the time of LSRWC establishment through the provision of valuable technical support and a strong on-farm presence in the community. AAFC's support in this area is recognized today through Environmental Farm Planning and BMP funding (a 60:40 federal/provincial split) provided through the Canada-Saskatchewan Growing Forward Agreement and particularly valuable programs such as the Farm and Ranch Water Infrastructure Program. The involvement of several federal departments in supporting the LSRWC's Source Water Protection Plan were appropriate, valuable, and appreciated.

The Agri-Environmental Group Farm Planning approach utilized in Saskatchewan (with 60:40 federal/provincial funding and administrative program delivery via PCAB) is generally appreciated. In addition, two tangible forms of AAFC support to the LSRWC that have shown promise are the recent ecosystem services policy project funded through the Advancing Canadian Agriculture and Agri-Food (ACAAF) program and the Watershed Evaluation of Beneficial Management Practices (WEBs) research project in the Pipestone Creek Watershed.

Inventory of Provincial Resources Accessed by the IWRM Initiative

Table 5: Provincial resources accessed by LSRWC

Technical	Financial	Institutional
SWA water quality monitoring support	SWA operating funding	SWA staff support provided with Source Water Protection Plan
SWA support on reviewing dam structures and operations	SWA project funding	SWA staff assist in coordinating provincial government contact
SWA communications support	SWA advises LSRWC on program funding opportunities	DUC staff support provided with Source Water Protection Plan
SWA range agrologist help	SK Agriculture and Food funding for producer BMPs through Canada- Saskatchewan Growing forward programs.	SK Agriculture & Food support with Source Water Protection Plan
SK Environment technical help for BMP implementation	Agri-Environmental Group Farm BMPs funding (fed/prov funding coordinated by PCAB)	SK Industry & Resources participation on Source Water Protection Plan
DUC extension for forage/range management and conservation easements (wetlands)	DUC funding to producers related to conservation easements, upland, forage	Regina Qu'Appele Heath Region participation on Source Water Protection Plan
DUC GIS work with ecosystem services policy project	18 municipalities provide annual funding to LSRWC	Oil industry participation on Source Water Protection Plan
University of Alberta, University of Saskatchewan support with ecosystem services policy	Support from local agricultural dealers on workshops/tours	MB Water Stewardship and West Souris River Conservation District participation on Source Water Plan to promote cross-boundary linkages

The supportive role of the SWA has been pivotal in the success of the LSRWC, including through the provision of core operating funding. While this has declined somewhat in recent years, annual operating support continues to be available from the SWA. Additionally, the SWA provides valuable technical assistance through the services of a range ecologist assigned to support the committee, communications support and water quality monitoring in the Moosomin Reservoir. The SWA also provides some stewardship funding (e.g., through its conservation easement, prairie restoration, and North American Waterfowl Management Plan activities). There is a sense among LSRWC members

that the SWA is often exploring new funding opportunities on the organization's behalf, and that SWA is committed to the LSRWC. This is evidenced by SWA's apparent leadership in coordinating the participation of multiple provincial departments and Ducks Unlimited Canada in supporting the needs and projects of LSRWC and other watershed organizations through an informal body known internally as the "Southeast Saskatchewan Team."

Saskatchewan Agriculture and Food (SAF) is also a source of funding (60:40 federal/provincial) for producer BMP projects through the Canada-Saskatchewan Growing Forward Agreement (via PCAB). Despite this provincial financial support, reduced levels of extension are a source of frustration. There is no direct on-farm extension available provided by the provincial government. Today, this support is only available via telephone through "Knowledge Centres," which farmers do not find particularly useful or effective. Agronomic extension is also available from private seed and chemical companies, but these are viewed as biased in primarily promoting their own products to selected producers over honest, independent advice for all producers. The involvement of PCAB is viewed as an additional level of bureaucracy that has only complicated the process for producers and watershed organizations to obtain support for agricultural sustainability projects.

Saskatchewan Environment provides technical assistance to the LSRWC, particularly relating to the regulatory aspects of establishing particular BMPs where there are significant environmental implications (e.g., corral movement). However, greater support in this area is needed, particularly with regard to on-farm and regional drainage and industrial livestock operations. More assistance related to education and communication regarding the value and impacts of certain BMPs would also be useful. The LSRWC wants to promote BMPs, which will be consistent with provincial environmental regulations. There is an expressed need for closer cooperation and communications between provincial agencies involved in BMP application (such as SAF and Saskatchewan Environment). There is frustration in the LSRWC around issues such as barriers to implementing an innovative community sewage lagoon, and this is perceived as resistance to unconventional projects that challenge the status quo.

Other

DUC is a key partner in supporting the work of the LSRWC. DUC has a relatively strong extension presence in the watershed and is seen as promoting land-use practices that are logical, potentially valuable to producers, and are consistent with DUC's habitat conservation goals.

4.4 Agricultural Sector Participation

Agricultural participation in LSRWC activities occurs primarily through the committee's three-member local watershed organizations (Pipestone Creek, Antler River and Four Creeks). Most rural municipal councillors participating on these committees are also agricultural producers. Additional identified participants representing the Saskatchewan Stock Growers Association and Holistic Ranchers group are local watershed association members (LSRWC, 2006).

The LSRWC Source Water Protection Plan was also supported by a Technical Committee, which included participation from AAFC and Saskatchewan Agriculture and Food (LSRWC, 2006).

It is clear the LSRWC is a strong advocate for the agriculture sector. Its range of programs—particularly those related to its goals of Groundwater Protection and Agricultural Impact Management—are very sensitive to the needs and economic realities of individual agricultural producers (LSRWC, 2011d).

Federal initiatives such as the ACAAF and the WEBs programs were seen generally positively by stakeholders in the watershed. However, there is a sense that each of these initiatives could have involved agricultural producers in more meaningful ways, through greater up-front communication regarding program objectives, research design and seeking practical advice relating to the economic realities of agricultural production. This would help to ensure that various scenarios proposed by the research would be more realistic and practical for participating producers. This, in turn, would help improve the applicability of future agricultural research, resulting in higher producer uptake of results.

The relationship with AAFC is viewed as positive, having significant potential value for supporting the LSRWC, its programming and the contributions of agricultural producers in assisting in the solution of agri-environmental concerns of interest to society at large. The LSRWC would like to hear more about how the ACAAF project results have been used and potential follow-up on that program.

4.4.1 Drivers and Barriers for Agricultural Sector Participation

Agricultural producers are involved with the LSRWC's IWRM and BMP initiatives for several reasons. Some have become interested in new approaches to land, water and biodiversity management, and want to have an influence on these growing changes before it is too late to affect them. Many also have a long-term interest in the viability of Canadian agriculture and want to do what they can to support it. There is growing consumer interest in the source of their food and a growing producer interest in responding to this. This is a trend that bodes well for the future in a

region where many agricultural landowners are making progressive changes regarding the environmental impacts of their operations.

A great deal of influence on the success of BMP program participation is directly attributed to the economic realities of agricultural production. The LSRWC is interested in contributing to a future vision of agriculture that is not only sustainable, but flourishing, and this means working as an organization to find, develop and promote BMPs that help producers improve their financial bottom line. It also means providing extension support in the field to work directly with producers, and in many cases it may also mean coordinating the administration and applications on behalf of producers. The LSRWC Agri-Environment Group Farm Plan has been successful for these reasons. This progress has gone beyond what anyone would have predicted, positioning the LSRWC as a prime vehicle for program delivery on a watershed basis. A simple analysis of the number of group farm plans implemented, number of pilot projects established, and level of partnership support secured would support this assessment.

Another factor influencing producer participation relates to impact of demonstration. When an agricultural producer sees a neighbour making positive changes on the landscape (and also seeing an economic return), this dramatically influences their interest in exploring an innovative BMP project. This phenomenon underscores the fundamental importance of on-farm extension in the BMP process.

The main barriers to producer participation in IWRM efforts and adopting BMPs are focused on the administrative details involved with applications and claim forms. The fact that the LSRWC handles much of the paperwork for many producers is one of the major reasons for the committee's high participation rates with the Agri-Environmental Group Farm Planning program. In fact, some producers would not otherwise participate.

Another participation barrier relates to the promotion of non-economically feasible BMPs that do not make business sense to a producer. From the producer's perspective, agriculture is a business, and as such, any land-use changes must result in a net positive economic impact through either greater returns and/or lower production costs. The LSRWC promotes only voluntary, cost-effective BMPs and other watershed management solutions.

BMPs and related watershed efforts will be limited in size, number and scale for three reasons: time, labour and required financial commitment. Many producers want to take on an innovative project, but they may run out of time or help/labour (there is not much down time on a farm), while larger projects can easily exceed the financial means of many producers to participate.

4.5 Synthesis and Recommendations

Economic value was deemed to be the primary driver for motivating the participation of agricultural producers in both IWRM and BMP planning. For the LSRWC and the producers in the watershed, solutions to regional issues must be economically feasible and practical. The LSRWC seeks to maximize economic value by pooling all resources from all logical partners (ideally with federal, provincial and local support). Institutional support is also appreciated if it can lead to technical or financial help.

Local stakeholders reinforced the value of the original forms of support provided by PFRA through its on-farm technical and extension-based agrology assistance to producers. PFRA was also viewed as respecting local needs and realities. The local level extension support provided by PFRA for much of its existence is still regarded to be a significant contribution in the development of this region. PFRA was successful in improving producer participation in agri-environmental management.

Today, there is a sense that AAFC is continually reducing its on-farm technical and extension-based agrology assistance, and this hands-on support is not being provided by anyone else (including the provincial government). Beyond its provision of BMP funding, AAFC's roles in supporting local communities to address the challenges of agricultural sustainability and water management (i.e., through integrated watershed organizations like the LSRWC) are not viewed as particularly effective. There is strong sense of AAFC's declining presence from the Lower Souris River region, and LSRWC members are convinced this is common across Saskatchewan.

The fact that most federal support available to the agricultural sector now flows through the provincial agricultural departments and/or a third party (e.g., PCAB) is not seen as an improvement. It is felt that many valuable agronomic and technical services once provided by AAFC are not being replaced by the SAF. With declining federal and provincial presence on the landscape and in rural communities, local institutions such as the LSRWC are becoming more relevant locally and are seen as the best source of information and support. LSRWC staff are assisting producers with program applications they are not directly involved with – filling the void in the absence of government staff. Their staff is present on the ground, visiting farms, providing direct contact, building relationships and building trust. It seems that the future role of the AAFC is to work more closely with local organizations such as this one, to provide the most relevant support to rebuild this local capacity.

There is a real need for flexibility, understanding, funding and technical support for local watershed organizations such as the LSRWC, organizations that are managing 150+ projects (involving greater than 50 per cent of all producers in the watershed). There is an opportunity for AAFC to support local agricultural watershed initiatives with a small but stable annual grant in support of core operating funding, to help replace declining levels of core provincial operating support. Securing 15–

25 per cent of *additional* core funding needs from AAFC would result in a major impact given the high degree of cost-effectiveness afforded by organizations like the LSRWC. There is also a need to vastly improve the time it takes AAFC to complete required financial transactions as part of any contribution agreements it makes. Longer-term project commitments (and greater flexibility for producers to participate in larger projects over time) would also be appreciated.

There is some sense in the local watershed management and producer community that the role of AAFC is changing and that it has outgrown the much-appreciated PFRA model. Some suggestions for a new role included more active involvement in agricultural innovation and research/development with more direct contact with producers to be locally relevant. Research focusing on the practical application of BMPs (which producers view as economically viable) would contribute significantly to IWRM objectives within agricultural landscapes. Local appreciation for AAFC projects such as ACAAF and WEBs demonstrates that there is clearly a need and opportunity for policy-relevant scientific research that can also be practical for agricultural producers. AAFC could build on its historically stellar research reputation (e.g., Dr. Keith Downey's work at AAFC with Dr. Baldur Stefansson at the University of Manitoba to develop canola in the 1970s) and link this to a renewed form of direct on-farm support, possibly working through local watershed organizations such as the LSRWC.

LSRWC members would like to see a systems approach developed to guide AAFC's future scientific research efforts. This would involve a long-term strategy with some sense of long-term priorities and resources that take into account some of the long-term challenges facing Canadian agriculture today.

AAFC could also help by promoting the ecosystem services agenda—both nationally and internationally—to help address the battles over business risk funding at the World Trade Organization. Using the ecosystem services agenda could be a very useful tool for landowners as well as for advancing important global discussions around food and trade. There seems to be a role for AAFC to play this advocacy role on behalf of Canadian farmers. The ACAAF project represented an exciting opportunity to advance this discussion, although the LSRWC is uncertain of the policy impact of this work.

A growing number of smaller, younger producers are entering the business of farming in the Lower Souris River Watershed. This may be related to the growing economic impact of the oil and gas sector in the area. Many producers envision an exciting future for agriculture, with growing consumer demand in many Asian countries. This reinforces the need for locally relevant information and extension support, which is not currently being provided by any entity.

The LSRWC has been successful due to its ability to build local interest and support for a common vision—a vision that recognizes the economic realities of agricultural producers. As one of many watershed organizations emerging in Canada, it seems there could be exciting opportunities for AAFC to dramatically enhance the effectiveness of these organizations. This may require significant exploration of the concept of a single, national framework for addressing to the agri-environmental challenges associated with a myriad of private landowners who face different challenges in different regions. Beyond the current province-level agreement structure, this suggests that more federal/provincial flexibility towards application of an even more focused approach may be warranted, one that uses watershed-based boundaries to target regional programming within provinces or even across provincial boundaries.

5.0 Yamaska Watershed, Quebec

IWRM initiatives in the Yamaska River Watershed were chosen for case study consideration as this watershed has a high degree of agricultural land use. Since similar activities are carried out under the same framework in key watersheds of Quebec (as detailed below), findings from this case study could be generally applicable to these watersheds. Some findings may also relate to similar areas of Canada, where similar levels of crop- and livestock-based agriculture exist.

5.1 Watershed Description

The Yamaska Watershed is located in southern Quebec, approximately 75 kilometres east of Montreal (see Figures 7 and 8). The Yamaska River flows out of Lac (Lake) Brome in the Eastern Townships, an area south of the St. Lawrence River and before the US border. From here, it flows through the plains of Quebec's Montérégie region and then spills into the St. Lawrence River, a major Canadian waterway which has seen increasing integrated water resources management (IWRM) in recent years.

Figure 7: Watershed Map
Source: OBV Yamasaka

Figure 8: Regional Map
Source: Kmusser, 2007

Agriculture is the dominant land use, with 52.4 per cent of the watershed's 4,784 square km being used for this purpose, primarily for cereals, corn, soy, hay, special cultures, pasture and fallow. In total, there are roughly 3,800 farms in the watershed, which cultivate more than 200,000 hectares and which support more than 300,000 animal units (54 per cent hogs, 32 per cent cattle, 12 per cent poultry). In addition, 42.8 per cent of the land is forest cover, 1.7 per cent is water cover and 3.1 per cent consists of urban areas and roads. The climate (tempered continental) is amenable to agriculture, being more mild than most of Quebec and providing an average of 1,121 mm of rain per year. The estimated population of the watershed is 250,000 people at a density of 52 people per square km (OBV-Yamaska 2010).

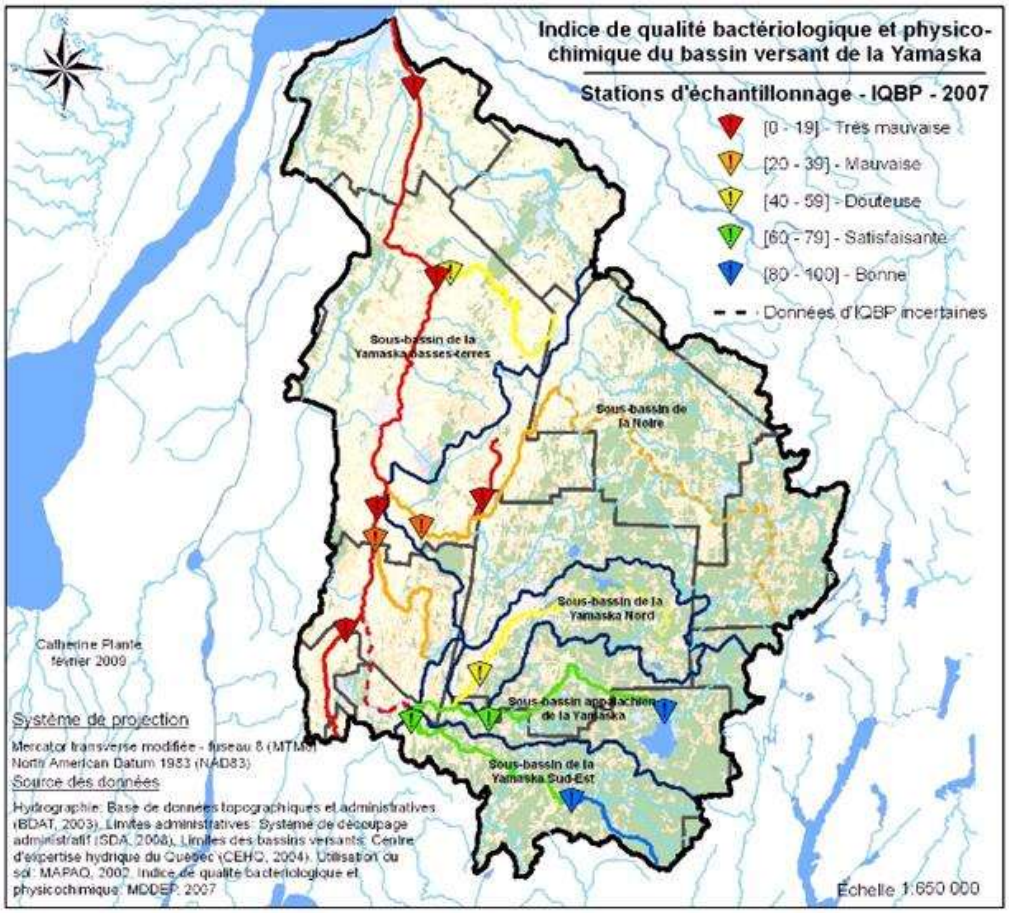

Figure 9: Water quality of the Yamaska River.
Source: OBV-Yamaska

5.2 Main Issues in the Watershed

Agricultural production is a significant contributor to one of the biggest water quality problems in the watershed: eutrophication (nutrient loading) of waterways. Other contributors include municipal wastewater, septic systems and natural sources (OBV-Yamaska, 2010). In 2001 approximately 76 per cent of phosphorous in the Yamaska watershed came from diffuse sources, 16 per cent from point sources and eight per cent from natural sources (OBV-Yamaska, 2007). The influx in nutrients had led to the Yamaska River gaining the dubious distinction of being the most polluted tributary of the St. Lawrence River. The provincial Ministry of Sustainable Development, Environment and Parks has rated the water quality as "bad" to "very bad" along nearly the entire length of the Yamaska (OBV-Yamaska, 2010) (see Figure 9).

Other water quality concerns include erosion—approximately 310,000 tonnes of sediment flow from the Yamaska into the St. Lawrence River every year—turbidity, pesticide loading to waterways, compromised aesthetic appeal and increased difficulty in water treatment. The effects of erosion and nutrient loading on agriculture are also a concern, as it is generally recognized that these processes reduce soil productivity (OBV-Yamaska, 2010).

5.3 Description of IWRM Initiative

IWRM planning and implementation occurs in a multi-level and fairly targeted fashion in the province of Quebec. In 2002 the Province created a *Politique nationale de l'eau* (Quebec Water Policy), which designated 33 priority watersheds in which it supports IWRM, one of which is the Yamaska Watershed. Factors considered in the selection of watersheds included: 1) existing environmental problems; 2) the pre-existence of a voluntary watershed organization;[4] and 3) the degree of engagement of local and regional actors (Gangbazo, 2006; Government of Quebec, 2002). Most of the priority watersheds are along the St. Lawrence seaway, an area with higher populations and considerable agricultural development. Each of these watersheds has an *Organisme de bassin versant* (watershed organization), commonly referred to as "OBV." In the Yamaska watershed, the organization is called the OBV-Yamaska. The 2010–2011 operating budget of the OBV-Yamaska is $126,000.

The OBV-Yamaska has seven employees, though only 2.5 are funded by this operating budget. The rest of the funding is from other sources. For instance, in the past year, the OBV received project money from cities to study water quality problems. The year before, funding came from MDDEP (the Department of Environment) to study groundwater.

[4] The Yamaska Watershed already had the Conseil de Gestion de Bassin Versant de la Yamaska (COGEBY), which formed in 2000.

A chief task of each OBV is the development of a *plan directeur de l'eau* (PDE) or "master plan for water," to consult with the population on this plan, and to coordinate its implementation. The PDE examines problems and potential solutions in the watershed, specifically through the lens of sustainable development; OBVs must integrate economic, environmental and social elements into the plan (Auger & Baudrand, 2004). Development of the PDE included public consultations in locations around the watershed, one set in 2004 to discuss problems in the basin, and another in 2009 to discuss a draft action plan. In addition, the *Politique nationale de l'eau* requires OBVs to consult with local and regional experts, which includes producer groups such as the *Union Producteur Agricole* (UPA). In addition, the OBV-Yamaska's 20-member board reserves three seats for agriculture and forestry, as well as one for the UPA. The Quebec Water Policy specifies that monitoring of progress must be part of the process, and declares that "an evaluation of the Policy's implementation will be carried out" (Government of Quebec, 2002, 86). Evaluation reports must be published every five years by the province. While these reports cover activities throughout the province, the individual OBVs are also held accountable, in part through the cycle by which IWRM is designed. As described in section 5.2.4, the OBVs go through a six-step cycle, many steps of which (e.g., issue identification) require public consultation. It is expected that several cycles of the IWRM process might be required before desired results are reached. In addition, documents from each step are made public as the OBV completes them. Therefore, the public can view these materials as they become available. The OBV-Yamaska is now only on step 5, implementation of the action plan. Step 6, evaluation, will provide documents on progress.

OBVs also receive logistical and technical support from the *Regroupement des organismes de bassins versants du Québec* (ROBVQ) (Coalition of Quebec Watersheds) (Government of Quebec, 2002). The main purpose of the ROBVQ is "to promote participative and integrated water resources management by watershed on the Quebec territory and to assemble and represent the watersheds organizations" (ROBVQ, 2010, Overview). Specific activities of the ROBVQ include the publication of a seasonal newsletter (*Tempo)*, which highlights member projects and provides IWRM information; a weekly comprehensive press review of coverage on IWRM, cyanobacteria, and other issues related to water, wetlands and aquatic ecosystems; the organization of workshops for OBVs three to four times per year on specific themes; the coordination of Opération Bleu Vert (detailed below); the coordination of tree planting along riparian areas by OBVs (nearly 1 million planted since 2007); and citizen/youth (18–35 years) engagement in international water management projects (ROBVQ, 2010, "Nos services").

The OBV-Yamaska also helps gather water quality data in partnership with the various universities (UQTR, UQAM), towns, municipalities and community groups. While the Quebec Water Policy and the resulting OBVs were a definitive turning point for IWRM in the province, there are many entities cooperatively involved in IWRM in the Yamaska watershed, as will be explained in the following sections. While the OBV-Yamaska acts at planning and consultation levels, sub-basin

entities work with farmers on a more regular and constant basis (the OBV-Yamaska works more with government Ministries, interest groups and municipalities) (See Figure 10). As explained by one interviewee, the OBVs were designed to work more at a "strategic" or middle level, rather than on-the-ground.

Foremost among these are *clubs-conseils* (agri-environmental advisory clubs), of which there are 83 in the province (seven in the Yamaska watershed). Funded by both provincial and federal levels of government, the clubs have cooperative structures in which farmers pay a fee (minimum of $300) to join and, therefore, access the services. The *clubs-conseils* are also receiving financial support from the governments of Canada and Quebec from 2009 to 2013. Under this agreement, Agriculture and Agri-Food Canada and the Ministry of Agriculture, Fisheries and Food of Quebec have each contributed $21 million from the Growing Forward agreement. Meanwhile, agricultural producers have invested more than $21 million in the clubs. Each club serves an average of 100 farmers, and has about four consultants to provide them with advisory and technical services that help protect waterways, improve fertilizer management, reduce pesticide usage and promote the adoption of conservation tillage (Clubs-conseils en agroenvironnement, n.d., "Portrait"). Specific activities include:

- phosphorus balance calculations
- drainage diagnosis
- agro-environmental fertilization plans
- sampling and characterization of manure
- support for conservation tillage adoption (e.g., rotation plans, direct seeding, drainage diagnosis, erosion diagnosis, geomatics work)
- management plans for riparian areas
- management plans for wind breaks
- GPS Surveying
- training
- demonstrations
- new technology/trials (Clubs-conseils en agroenvironnement, n.d., "La Vallière")

Interview respondents reported that the clubs are a good way to engage farmers in sustainable development. One interviewee who works with the Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec (MAPAQ) explains that agronomists work with farmers through the clubs to get BMPs in place on farms. The clubs also help farmers to access government funding programs such as Prime-Vert; the clubs help trouble-shoot problems in funding applications, such as confusion over paperwork.

The OBV-Yamaska works with these clubs rather than directly with farmers. Said one interviewee from the OBV, "it's easier to work with and reach six or seven clubs than with hundreds of farmers." She thinks that sometimes this arrangement works well; for instance, the OBV develops data and broad strategies around erosion and conveys this information to the clubs (e.g., the OBV might meet with club representatives), which then implement erosion reduction practices in the Environmental Farm Plans they develop. In that way, the PDE influences agricultural practices. However, she admitted that it is also sometimes difficult to have influence on a local scale when the OBV covers such a large area. She suggested that once all of the PDEs from all of the OBVs in the province are approved, common concerns across many watersheds could be identified. Then, the OBVs might be able to influence the ministries to take action (legislative, incentive or other) to address common problems.

Another initiative contributing to IWRM in the Yamaska watershed is the *Zones Interventions Prioritaires* (ZIP) initiative (Priority Intervention Zones). This initiative started in 1994, prior to the Quebec Water Policy, to manage lands along the St. Lawrence River and consequently improve water quality. There are roughly 50 ZIP areas in the province. There are five ZIPs in the Yamaska watershed. Funding from the federal (Environment Canada, AAFC) and provincial (Ministry of Sustainable Development, Environment and Parks, Ministry of Natural Resources) levels of government allows for the hiring of coordinators at the sub-watershed level, as well as for technical support.

ZIPs consult with communities, prepare Ecological Remedial Action Plans to determine what measures need to be taken, and identify priorities for the protection, restoration, conservation and enhancement of the St. Lawrence River and surrounding area, with a focus on the sustainable development of its resources (Stratégies Saint-Laurent, 2008). While they do consider the contributions of agricultural activities to water quality problems, their scope also includes other contributors, unlike the agro-environmental advisory clubs. As with the agro-environmental advisory clubs, the OBV-Yamaska maintains ties with the ZIPs to achieve action on the ground.

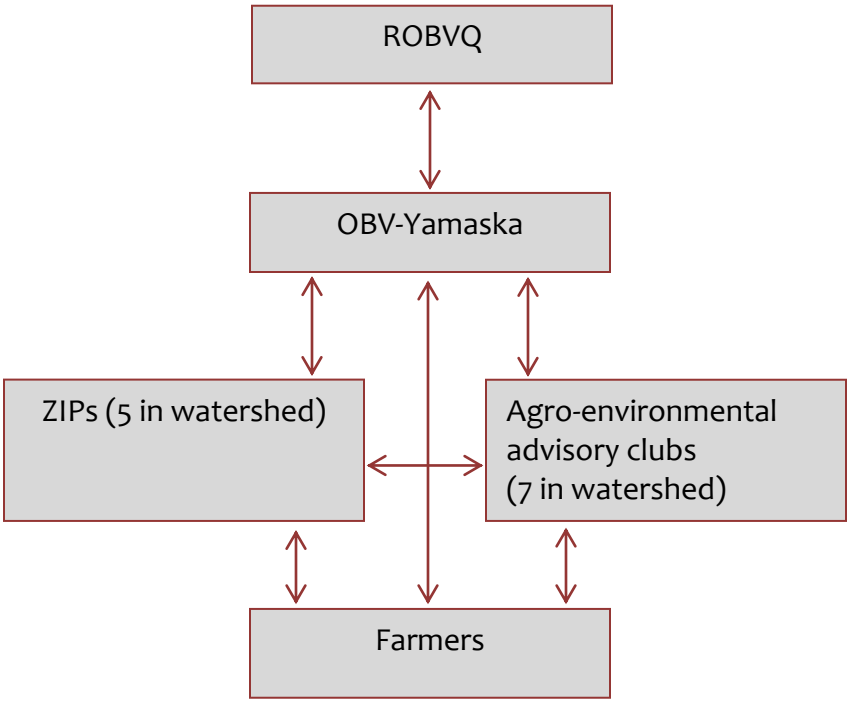

Figure 10: Visual representation of IWRM organizations in OBV-Yamaska

The government of Québec has been a key driver of IWRM in the province. The federal government has been a strong partner in initiatives, particularly through funding for implementation. The Government of Quebec articulates the rationale of its Water Policy in its 2002 publication outlining the initiative. Specifically, the policy framework, of which IWRM is a prominent factor, is driven by the following principles:

- "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 to 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*" (Government of Quebec, 2002, 7, emphasis added).

5.3.1 Goals for IWRM Initiative

The Master Plan for Water developed by the OBV-Yamaska includes quantifiable goals. While these goals are too many to name, the overall themes are to:

1. Decrease nonpoint source pollution
2. Decrease point source pollution
3. Practice sustainable water withdrawals
4. Strive for sustainable management of storm water
5. Maintain integrity of aquatic habitat
6. Rehabilitate degraded aquatic habitat

Examples of specific goals for the Yamaska River include:

1. Reductions by 12 per cent of suspended solids
2. Reductions in erosion marks by five per cent
3. Reductions in phosphorus in water by 12 per cent
4. Reductions in nitrogen of six per cent
5. Reductions in transported pesticides by 25 per cent
6. Reductions in pesticides applied to land by 15 per cent
7. Obtain specific improvements in treatment plants (e.g., maximum 0.5 mg/L of phosphorous)
8. Increase by 10 per cent the area of permeable surfaces (in order to slow water runoff)
9. Protect 20 per cent of wetlands
10. Restore 50 km of riparian areas

There are also goals at sub-basin levels, which indicates that there is planning for variability within the watershed (OBV-Yamaska, 2008).

Included in this plan are specifics related to agriculture. For instance, many of the sub-basin points specify the number of farmers (e.g., "meet with 76 farm enterprises of this sub-basin in order to inform them of the project and persuade them to participate" is a goal for the sub-basin of the Barbue River.) Activities under the plan that do not involve agriculture include various activities in cities and towns (e.g., the planting of buffers in towns), the creation of a certificate program for erosion control, improvements in road management, river bank clean-ups, wastewater improvements, doing an inventory of industrial effluents, addressing combined sewage system overflows, improving waste storage sites, rehabilitating wetlands and general water quality monitoring. These activities are not necessarily carried out by the OBV, but rather by partners noted in the plan. These partners vary and include cities, government departments, agricultural clubs and research institutions.

5.3.2 *Institutional Structure for the IWRM Initiative*

As described in section 5.2, the OBV-Yamaska receives guidance, including opportunities to network with and learn from other OBVs, from the ROBVQ. Members of OBVs include citizens, citizen groups, elected municipal officials, agricultural water users, industrial water users, hydro-electric representatives, commercial water users and institutional water users, as well as members from the provincial government (Government of Quebec, 2002). The OBV also works cooperatively with the agro-environmental advisory clubs and ZIPs. Therefore, there are many levels of cooperative IWRM activity in the watershed (see Figure 10).

5.3.3 *Current Stage of IWRM Planning/Implementation*

Under the framework of the Quebec Water Policy, all OBVs undergo a cyclical process that involves the following steps:

1. Watershed analysis (creation of a "watershed portrait")
2. Issue identification
3. Determination of objectives and choice of indicators
4. Elaboration of action plan
5. Implementation of action plan
6. Evaluation of action plan
7. Watershed analysis (return to step #1)

Thus far, the OBV-Yamaska has gone through steps one through four, and had their Master Plan for Water approved by the Ministry of Environment in late 2010. They are now in the process of plan implementation.

5.3.4 *Resources Used for IWRM Planning/Implementation*

Inventory of Federal Resources

Technical Resources

Resources from both the provincial and federal governments are primarily financial, not technical. However, a considerable amount of financial resources are marked specifically to support technical work, such as the hiring of consultants and agronomists to work with farmers to implement IWRM.

It should be noted that technical data, such as LIDAR (Light Detection and Ranging), is used to a great extent in the Yamaska Watershed to aid in planning and management. This type of data comes from a variety of sources, which, across the province, have included MAPAQ, the Ministry of

Natural Resources and Wildlife, the Ministry of Transport, the Ministry of Sustainable Development, Environment and Parks, the Institute for Research and Development and various regional county municipalities (MRCs) (Government of Quebec, 2011; Government of Quebec, 2010; Agriréseau, 2008). One provincial-level employee noted that this data could be improved upon. In particular, higher detail LIDAR information is necessary to appropriately manage flat lands, where elevation changes cannot be judged by the bare eye. In such cases, LIDAR data can help optimize drainage management.

Financial resources

The majority of resources that come from a federal level are managed through joint programs with the provincial government, primarily through MAPAQ and the related Conseil pour le développement de l'Agriculture du Québec (CDAQ).

The most significant program is the Programme Prime-Vert, managed by MAPAQ and CDAQ. Its goal is "to help farm producers and the agri-food sector meet the challenges of sound land stewardship, successful integrated land management, water quality, and the reduction or prevention of greenhouse gas emissions" including by the "introduction of technology and practices conducive to resource conservation [and] environmental protection" (Government of Quebec, 2009, 5). There are nine main components under the plan, many of which have the potential to improve water quality. Only some of the BMPs receive federal funding from AAFC based on identified provincial-level priorities, while others are funded completely by the provincial government (Ministère d'Agriculture, Pêcheries et Alimentation, n.d.) (see Appendix C for a list of all Prime-Vert projects that effect water). Federal funding supports:

- The purchase of manure spreading equipment (7.0)
- The development of agri-environmental support plans (8.1)
- The creation and coordination of agri-environmental advisory clubs (8.2 and 8.3)
- The use of measures to reduce non-point source pollution (10.1)
- The coordination of water management by watershed groups (10.3)

Therefore, federal support to Prime-Vert is financial, and is directed towards activities that provide knowledge to agricultural producers (i.e., through advisory clubs), provide them with technical help (e.g., support plans) and help them afford farm improvements (e.g., manure spreaders).

Each of the initiatives specifies the actions that it supports. Several interviewees stressed the prominence of component 10.1 in the Yamaska watershed, which focuses on measures to reduce non-point source pollution. It provides funding for:

- Carrying out of general and specialized on-farm agri-environmental scans (financial assistance for technical/advisory work);
- Erosion prevention through construction of soil conservation structures in riparian and non-riparian zones;
- Establishment of permanent grassy buffer strips that exceed the requirements of the *Protection Policy for Lakeshores, Riverbanks, Littoral Zones and Floodplains;*
- Establishment of treed or shrubby buffer strips of a minimum of 5 metres if recommended in an agri-environmental scan;
- Establishment of shelterbelts;
- Decommissioning of unused wells;
- Planting of winter cover crops;
- Permanent removal of annual crops from high-risk zones identified in a specialized agri-environment scan;
- Introduction of soil and water conservation practices;
- Riparian management and removal of livestock from watercourses.

Financial assistance for BMP adoption is provided for up to 90 per cent of the cost to a maximum of $50,000 per agricultural operation over the duration of the program. One provincial-level employee who works with Prime-Vert reported that in 2009–2010 there were 239 projects to control nonpoint source pollution, costing a total of roughly $1,426,0005 in the region of Montérégie-East, an area that includes the Yamaska watershed, as well as parts of two other watersheds. Also in 2009–2010, 44 environmental diagnostics were carried out for a total cost of $36,000 ($17,500 from AAFC) and 14 winter crop cover projects, for a total of $9,200 ($4,600 from AAFC). In this period, the region had the highest number of projects in Prime-Vert in all of Quebec, though the reasons for this high rate of success are not clear. Producer interest and awareness may play a role, and the fact that the Yamaska River has been recognized as the most polluted. One interviewee indicated public pressure as a reasons for BMP adoption. In areas such as this, where uptake of the Prime-Vert program has been enthusiastic, this level of funding per year may be normal. Another interviewee reported that roughly $1 million had been spent through Prime-Vert in the previous year on the neighbouring watershed of Pike River. This interviewee also praised Prime-Vert for its ability to encourage farmers to go beyond the protection measures that are required by legislation. For

[5] Approximately $642,000 (50 per cent) was from AAFC, while $570,400 (40 per cent) was from MAPAQ and $142,600 (10 per cent) was from farmers.

instance, Prime-Vert will provide funding for the "establishment of permanent grassy buffer strips that exceed the requirements of the Protection policy for lakeshores, riverbanks, littoral zones and floodplains" (Government of Quebec, 2009, 25). The policy requires that a vegetation strip of at least 3 metres wide be maintained above the high water mark along these waterways where the land is being used for agriculture. Prime-Vert funds protection above and beyond this 3-metre zone.

Another co-financed program is the *Programme d'appui au développement des entreprises agricoles* (PADEA) (Agricultural enterprise development support program), which provides agricultural producers with financial, technical and informational aid, some of it in the area of sustainable development. According to an information brochure on the program, it is "based on a multidisciplinary approach and aims for the sustainable development of agriculture" (Governments of Canada/Quebec, 2009, translated). PADEA funds 70 per cent of a diagnosis of operations, up to 60 per cent of the development of action plans (e.g., developing a plan for diversification), and up to 60 per cent in support and monitoring (see Table 6). PADEA does not provide any financial resources for the implementation of BMPs, but does provide some information and support for existing agri-environmental programming. Specific elements of PADEA include:

- An online information/resource site (www.agriconseils.qc.ca) (an informational resource)
- Aid in analysis of existing operations; identification of areas for improvement (a technical resource with financial support)
- Preparation of management plans (a technical resource with financial support)
- Help provided to new farmers to set up land with management plans in place (a technical resource with financial support)

The degree to which PADEA directly influences IWRM is not evident from the literature or the interviews. While it is not carried out specifically on a watershed basis, it is available in the Yamaska watershed, and provides an on-the-ground, accessible and consultative resource by which farmers can consider how to integrate sustainable development concepts into their operations. In essence, its goals have some overlap with the IWRM goals for the watershed and this does make it a relevant resource for IWRM planning in the region.

Table 6: PADEA funding

Service	Financial aid (per cent)	Maximum amount
Comprehensive diagnostic	70%	$1,500
Summary diagnostic	70%	$700
Action plan: operating plan	50%	$1,500
Action plan: business plan (to encourage major changes such as diversification)	50%	$5,000
Action plan: transfer plan (to a more multidisciplinary approach)	60%	$6,000
Action plan: start-up plan (for new farms)	60%	$6,000
Support and monitoring: operating plan	50%	$500
Support and monitoring: business plan	50%	$1,000
Support and monitoring: transfer plan or start-up plan	60%	$3,000

The clubs were key in implementing AAFC-funded (CDAQ-administered) environmental farm plans (known in Quebec as *Plans d'Accompagnement Agroenvironnemental,* or agri-environmental support plans) on 11,205 farms in Quebec from 2004–2009 (total cost was $23 million) for both club members and non-members. These plans covered many of the activities outlined above that are carried out by the clubs. The process involved:

1. Performing an agro-environmental appraisal of the farm, including phosphorus balance, practices to comply with regulatory requirements, and optimal agro-environmental practices;
2. Developing the environmental farm plan by researching and analyzing solutions and preparing the action plan;
3. Implementing the plan;
4. Evaluating the results obtained.

According to an interviewee from the OBV-Yamaska, the greater IWRM process is not directly considered in the environmental farm plans, though the *club-conseil* developing the plan will have had discussions with the OBV. In that respect, the goals of the PDE could filter through to the farm plans.

Finally, an influential pilot program in a neighbouring watershed is worth noting. Projet Lisière Vert was implemented in the Pike River Watershed from 2007 to 2009 and sought to engage farmers in the production of EGS on agricultural lands. With funding coming primarily from AAFC under the ACAAF program, the program paid 100 per cent of the costs for the implementation of such actions as the construction of 8-metre riparian buffer strips (beyond the 3-metre legislated requirement), grass-covered fields, runoff control structures, surface water inlets, stone-lined drop structures, riprap and sedimentation basins. In addition, financial incentives were created to compensate for the loss in revenues that could have been produced from lands (Coopérative de

Soliderité, 2009). Support to implement activities included one-on-one meetings between farmers and agronomists from agri-environmental advisory clubs, lasting from 1.5 to 3 hours each. Several interviewees involved in agriculture in the Yamaska Basin said that this nearby project has helped positively influence BMP adoption in other basins by providing an on-the-ground demonstration of an ambitious project that directly involved producers. The fact that producers in the Lisière Vert project found the management practices to be farm-friendly and not detrimental to their farms' bottom lines helped overcome feelings of resistance or hesitation amongst other farmers in the entire St. Lawrence region. One provincial interviewee said that a way to engage producers was to "show them it works." This project was one way in which that was achieved.

Inventory of Provincial/Other Resources

The majority of resources in the Yamaska watershed are co-financed by the provincial and federal governments and, as such, have been described above. These include:

1. The Prime-Vert program (some activities are funded only by the province; see Appendix C for full list)
2. Agro-environmental advisory clubs
3. PADEA
4. ZIPs

One program that remains only on a provincial scale is the *Plan d'intervention sur les algues bleu-vert* (Blue-Green Algae Intervention Plan). The plan was created in 2007 by multiple Quebec government ministries in response to growing eutrophication and blue-green algae events. The main agricultural component of this program is run by MAPAQ, and involves $145 million dispensed over ten years (2007–2017) to evaluate farms in watersheds afflicted by blue-green algae and to implement actions to reduce nonpoint phosphorous loading from farms. Part of the money flows through the Prime-Vert program (Government of Quebec, 2007).

The province also offers some technical support. In particular, MAPAQ employs agronomists who work with IWRM initiatives. However, the majority of technical consultation is done at a lower level than the province (e.g., agro-environmental advisory clubs); as already stated, both levels of government provide funding for these services.

Resource Analysis

BMP adoption in the Yamaska watershed has high farmer uptake through Prime-Vert, though the linkages to the larger IWRM process may not always be clear to those at the local level. All

interviewees for this document[6] reported positively on IWRM progress in the watershed, and suggested that the current model of IWRM in Quebec is suitably designed. In particular, they stressed the success of the somewhat nested approach to IWRM, in which the OBV-Yamaska plans for IWRM on a broader watershed level, but other groups, primarily agro-environmental advisory clubs and ZIPs, carry out IWRM on the sub-watershed level and work more directly with farmers. Given that all of these entities are fairly well-funded funded, the IWRM efforts are considerable.

Interviewees also emphasized the importance of local and grassroots action, rather than "top-town" directives. The fact that the federal and provincial governments primarily provide financial resources for work to be carried out at a local level (rather than providing technical resources themselves—though it should be emphasized that they do provide funding for technical work) was seen as a positive aspect of IWRM design in Quebec. In addition, the voluntary nature of the programs was viewed favourably; farmers can decide how much of the resources they wish to access, and are not compelled to undertake more management work than they wish.

Cooperation between the federal and provincial levels of government to fund the organizations and programs is also notable. Interviewees felt that this approach was functioning smoothly.

The Prime-Vert program is the initiative that supports IWRM the most, though other programs also provide IWRM support. Prime-Vert takes a fairly holistic view of farm management, considering important water quality issues (nutrient loading, erosion, pesticide contamination), as well as non-water issues, such as greenhouse gas emissions from operations. It is a strong example of a voluntary program for farmers that, through generous levels of funding that enable farmers to pay for only ten per cent of many BMP actions, has had strong uptake and, some interviewees argued, might perform better than regulations would. It should be noted that the Prime-Vert program is not directly linked to the IWRM process run by the OBV-Yamaska.

It should be noted that one provincial interviewee recommended that further research was needed to refine BMP implementation, noting that the optimal usages of some BMPS was not understood within the Quebec context (existing studies are generally from other areas, with different soils and climates). In addition, consultants with local-level groups rely heavily on satellite information (e.g., LIDAR) in their planning. This interviewee noted that higher-resolution data would aid in BMP planning, implementation and effectiveness. The federal government could increase its involvement in both applied research and satellite information provision.

[6] Five interviews were carried out for this research: one with an AAFC representative, one with a MAPAQ representative, one with a member of an agro-environmental advisory club, one with an OBV representative, and one with a non-governmental researcher.

5.4 Agricultural Sector Participation

In the Yamaska watershed, farmer participation in planning and implementation has been impressive. At a watershed level, farmers have become involved in planning through consultations carried out by the OBV-Yamaska in the development of the watershed plan. At a sub-watershed level, farmers may be involved in planning through more local entities, such as agro-environmental advisory clubs. Technical planning is also done by expert consultants hired by the clubs and accessed by the farmers who belong to the clubs. Farmers have been keen to implement IWRM actions on their farms, as indicated by the high uptake of the Prime-Vert program.

Two interviewees pointed to a small sub-watershed in the Yamaska watershed that has shown particular interest in IWRM. Farmers of the 30 square km watershed of the ruisseau des Aulnages (Aulnages creek), located off the Black River, a tributary of the Yamaska, have demonstrated early and eager adoption of IWRM. Here, nearly 90 per cent of land is used for some form of farming. The intensive land usage contributed to the rating of the ruisseau des Aulnages as having "very bad" water quality; on a scale from 0 (very bad) to 100 (good quality), the ruisseau des Aulnages rated a 4 in 2004 (Routhier, Poisson & Ruel, n.d.).

In response to water quality concerns, the Comité du bassin versant du ruisseau des Aulnages (CBVRA) was formed in the early 2000s by locals, and is run by a board of seven farmers, chiefly on a voluntary basis. While a great deal of the work is done voluntarily (e.g., farmers volunteer their own time to improve their land), the CBVRA has partnered with numerous entities in order to implement IWRM actions, including the OBV-Yamaska, various ministries, agro-environmental advisory clubs and DUC. In addition, the Prime-Vert program is accessed by area farmers. The CBVRA also accessed a source of funding not noted above: a grant from the Fondation de la Faune du Québec (Wildlife Foundation of Quebec), which allowed them to hire a technician from December 2003 to September 2004 to help farmers execute activities. The efforts led to 90 per cent of farmers in the watershed committing to creating buffer zones of at least three metres, a number of producers attending a training course on buffer zones and the creation of an annual bulletin by the CBVRA to help disseminate knowledge to farmers. The Prime-Vert Program has been widely used in the watershed for such activities as bank stabilization, conservation tillage, direct seeding and drainage improvements (Routhier, Poisson & Ruel, n.d.). The CBVRA is also vocal, writing to MAPAQ in 2008 to suggest improvements[7] to the Prime-Vert program (CBVRA, 2008).

[7] These suggestions included that funding be based on the size of farms, and that permanent funding be made available in order to ensure farm improvements are maintained. The CBVRA was concerned that, while farmers might agree to install a buffer zone, economic conditions could cause them to eliminate the buffer zone in the future. They appear to support an approach similar to Payment for Ecosystems Services in the EGS pilot project, Lisière Vert.

An interviewee who is a technician with an agro-environmental club suggested that a motivation to pursue IWRM in ruisseau des Aulnages includes farmer attachment to the land; many of the farms have been passed from generation to generation. As a result, they take particular pride in their land and water, and have been keen to improve upon the health of the watershed. Not only were they willing to spend their own money (some of the activities did not have funding), but farmers also donated considerable amounts to time to improve the watershed. In addition, the interviewee cites strong leadership by the CBVRA as a reason IWRM has had momentum in the sub-watershed.

5.4.1 Drivers and Barriers for Agricultural Sector Participation

Uptake of agricultural BMPs in the Yamaska watershed has been widespread; as noted above, there were more actions taken under the Prime-Vert program in this region than any other in Quebec. Several interviewees said the generous level of funding—often 90 per cent of costs—is the greatest reason why farmers implement IWRM practices. In general, farmers recognize that these actions also benefit their operations, and they desire to carry out farm improvements that benefit their farm (e.g., through soil retention and decreased flooding) and the watershed as a whole. Government programs give them a way to pursue IWRM actions in an affordable way, and many farmers have been receptive. In addition, one researcher with a research institution lauded the Quebec approach, and said that AAFC's role primarily as a funder (including of technical resources and work) is the best role it could play; he asserted that the federal government is too "distant" to be involved in day-to-day IWRM details (e.g., technical work on specific farms).

The cooperative approach through the agro-environmental advisory clubs also appears to be a motivating factor, as it gives the farmers a sense of ownership and control. Explained one interviewee: "You can give money to groups of farmers. They will be scrooges with it—they'll manage it well and spend carefully." This interviewee said leadership has to come from the grassroots. As a researcher, he says he "partners" with farmers, but does not "lead" them, and gets better engagement as a result. Consultation with farmers by the OBV-Yamaska in the development of the Master Plan for Water provides a similar benefit, in that farmers feel that their voices have been heard.

One MAPAQ employee who is involved in reimbursement of farmers for Prime-Vert actions also provided a simple way to increase participation: provide payment to farmers as soon as possible. This work endeavours to reimburse farmers within weeks of the submission of an invoice for an IWRM action. It can be a disincentive to participation if reimbursement takes a year.

Another motivation is the provision of proof to farmers that IWRM can benefit their farms and the watershed. Evidence collected through research, detailed farm diagnoses and remote sensing, which can detect problem areas on a farm, all serve to convince farmers of the benefits of participation. In

addition, pilot and demonstration projects, such as the Lisière Vert EGS pilot, can help persuade farmers that IWRM is beneficial and practical.

Finally, an interviewee who is a technician with an agro-environmental club said that public pressure can act as a motivator for participation.

While farmer participation in BMP implementation is quite high in the Yamaska watershed, interviewees were able to identify some factors that decrease participation. One MAPAQ employee reported that "bureaucracy" can be a deterrent to participation, particularly when government employees are overly stringent on paperwork (e.g., permits, reimbursements). He suggests that a better approach is to work with the farmers in filling out such materials properly; when possible, he himself helps farmers to do this task.

Another reality that might prevent farmer participation in IWRM is when they have not met all of the requirements for a funding program. For example, Prime-Vert funding requires that farmers have an Environmental Farm Plan completed; however, it is mostly members of agro-environmental advisory clubs who have Environmental Farm Plans (the clubs carry out the planning), and membership in these clubs is not mandatory. In addition, some farmers resist other requirements, including legislated ones, such as the law that livestock cannot have direct access to rivers and streams. If these conditions are not met, they will generally not be able to access the funding program.

Several interviewees also indicated that some farmers are resistant to being "told what to do" on their lands. Many of the programs involve a consultant studying a specific farm and suggesting actions; farmers do not always agree with the suggestions, or may desire funding for actions that the consultant does not deem necessary for IWRM. One provincial-level employee also admitted that some farmers simply do not wish to change their practices, as they have always managed their land in a certain way.

Another interviewee with a research institution also said that government could unwittingly create a barrier to farmer acceptance of IWRM if it regulates farmer actions. While IWRM action is primarily voluntary in the Yamaska watershed, not regulated, this interviewee stressed the need for all basins considering IWRM to consider the reality that "many farmers react negatively to regulations […]. They don't want to be compelled to do it, but most are willing to take part in activities that benefit the watershed." Some agricultural actions are still regulated in Quebec; for instance, regulations require that livestock be prevented from accessing streams, and also restrict the spreading of animal waste. Activities funded under Prime-Vert are less focused on these regulated actions, though other government funding may be available to help farmers meet these requirements.

5.5 Synthesis and Recommendations

The Yamaska watershed is a strong example of a large watershed (4,784 square km), which has pursued a nested approach to IWRM through the development of a larger organization, the OBV-Yamaska, and the engagement of existing smaller groups at a sub-watershed level, notably agri-environmental advisory clubs and ZIPs. These organizations then actively engage farmers. Both the provincial and federal (mostly AAFC) levels of government have been financially supportive of these groups. Therefore, an impressive network of organizations exists that work towards improved agricultural land management. Government funding for agricultural BMP implementation is generous—90 per cent through the Prime-Vert program. While the upfront cost to the government may appear high, the approach has proven to be a good way to persuade farmers to implement IWRM actions. Given the multiple benefits that can result (reduced algal blooms in downstream lakes, improved aquatic health, riverine habitat, soil retention, improved recreation possibilities, improved aesthetics), it can be argued that the funding is worthwhile (though no cost-benefit analysis was available for activities undertaken thus far). This approach also allows for action to occur without regulation.

Recommendations that can be drawn from this particular case study include:

- In large watersheds such as the Yamaska, the existence of smaller entities involved in land management is beneficial, in addition to a larger "umbrella" organization to oversee IWRM in the entire watershed.
- The existence of linkages between the groups provides for information sharing and learning—for instance, the ROBVQ links the individual OBVs.
- Closer linkages between the OBV and the sub-watershed entities (e.g., *clubs-conseils*) could be fostered. One way in which this could be done would be via annual meetings of all of the *clubs-conseils* with the OBV. Funding from government would be beneficial to such an effort. Other options could also be considered, such as online information sharing and discussion forums (not currently used in the Yamaska Watershed).
- Farmers appear to respond well to generous funding programs (90 per cent in the case of Prime-Vert) that encourage IWRM implementation. This incentive approach appears to be a feasible alternative to regulation, a method to which farmers are adverse.
- Payment for ecosystem services (i.e., incentive payments to maintain buffer zones, other improvements) may be worth considering. They can encourage farmers to surpass legislated requirements for management.
- Engagement and empowerment of farmers through *clubs-conseils* at a grassroots level appears to strengthen BMP adoption, though stronger ties could be made to the larger IWRM process.

- IWRM implementation could be strengthened by further applied research into BMP effectiveness, particularly at a localized level, as climate and geography vary.
- IWRM implementation could be strengthened by improved access (for farmers, consultants, IWRM groups) to and higher resolution of data that supports decision-making, such as LIDAR.

6.0 Souris River Watershed, Prince Edward Island

Souris River Watershed (SRW) is an agricultural area of P.E.I. in the Atlantic region of Canada. Findings from this case study could be generally applicable to similar areas in Canada where similar levels of forestry and crops such as potatoes and mixed-use farms exist.

6.1 Watershed Description

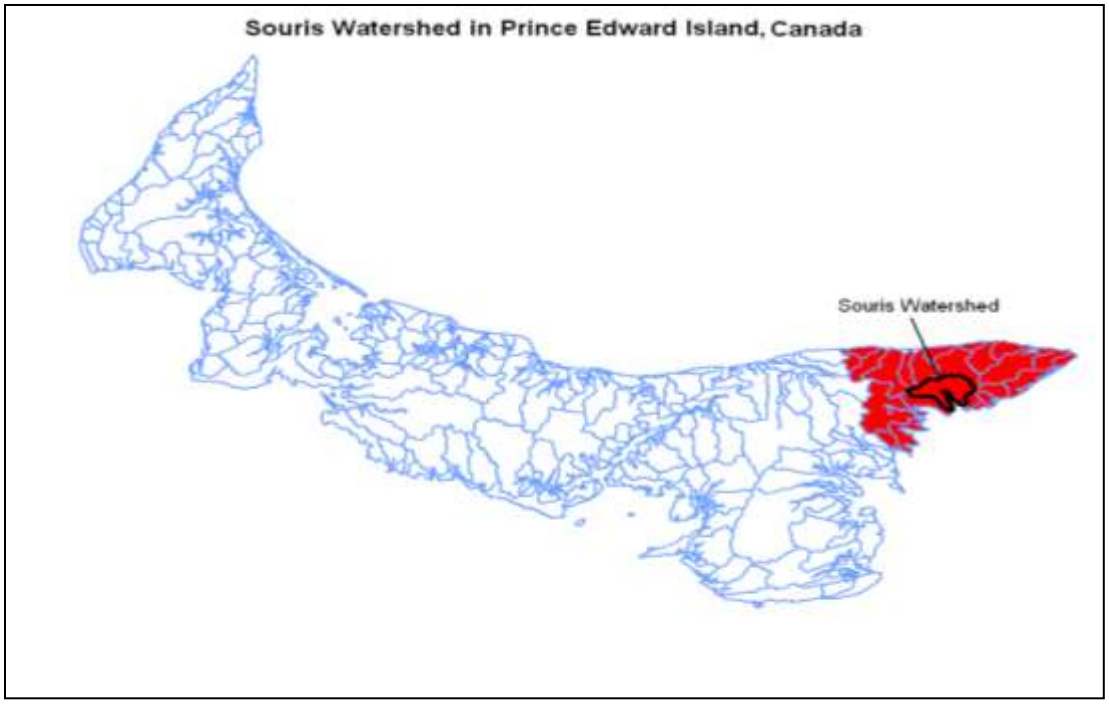

Figure 11: Souris River Watershed in Prince Edward Island. Image modified from Souris & Area Branch of the PEI Wildlife Federation Work Accomplishments. Source: Souris & Area Branch of the PEI Wildlife Federation, 2008.

The SRW is located on the east coast of Prince Edward Island (P.E.I.) in the Gulf of St. Lawrence, Canada (lat/long 46.392 -62.305) (Figure 11). The area of the watershed is approximately 58.71 square km, with a total stream length of 50 km draining into Colville Bay. For management purposes, a small watershed, Norris Pond, is included in the management regime. The SRW includes the communities of Bear River, Chepstow, Gowan Brae, Harmony Junction, New Zealand, Rollo Bay, Rollo Bay West, St. Catherines, Sheep Pond, Souris East, Souris Line Road, Souris River and Souris West, as well as the largest urban centre, the Town of Souris, with a population of approximately 1,300.

Generally the climate of P.E.I. is moderated by the Atlantic Ocean, with warm summers and mild winters with abundant snowfall. The mean annual temperature is approximately 5.5°C. The mean summer temperature is 15°C and the mean winter temperature is -3.5°C. The mean annual precipitation ranges from 900–1,150 mm. The well-developed sand-dune and beach systems in this ecozone gives P.E.I. the warmest summer ocean waters in Canada (Environment Canada, 2011).

The land use of the SRW is broken down into four main categories: approximately 39 per cent of the land is used for agriculture; approximately 46 per cent is forested; approximately 3 per cent is wetland; and approximately 12 per cent is classified as "other." The "other" category includes several woodlots, private residences and roads that are a mix of paved and clay. There are approximately 27 small-to-medium-sized farming operations in the SRW. Approximately 10 of the farms are potato, one dairy, and the rest are mixed farming operations. Most of the other economic activities in the watershed are resource-based, like fishing, forestry and tourism. SRW has a largely seasonal economy (Souris & Area Branch of the P.E.I. Wildlife Federation, 2006).

6.2 Main Issues in the Watershed

P.E.I. in general, and the SRW in particular, have a history of over-enrichment of surface and groundwater; the source is mainly fertilizer used in potato farming operations. The levels of nitrates in groundwater, the provinces only source of drinking water, have increased to alarming levels in recent years. Excessive growth of sea lettuce has affected the tourism and aquaculture industries (Souris & Area Branch of the P.E.I. Wildlife Federation, 2006).

Another issue in the watershed is fish mortality, usually resulting from either agriculture contamination or anoxic conditions. Only pesticide-related fish kills have been known to occur in the SRW, but there have been nutrient- or toxin-related fish kills in other areas of P.E.I. P.E.I. has developed regulations for the application of pesticides that define a buffer zone and to ban certain substances since approximately 2000, when two fish kills[8] were reported in the SRW (Souris & Area Branch of the P.E.I. Wildlife Federation, 2006). In addition, the Souris River has had several closures of shellfish harvesting seasons due to elevated fecal coliform levels. Tests are being conducted to understand the source of this contamination. It is possibly from farming operations, migratory birds or other human wastes from improper septic systems. This is a typical problem with many estuaries on P.E.I. (Souris & Area Branch of the P.E.I. Wildlife Federation, 2006).

[8] Fish kill is a term used for localized death of fish population. Fish kills can be caused by water temperature change, eutrophication, parasites, disease and other causes, such as toxicity.

Soil erosion is considered by many of the stakeholders to be the most serious environmental problem on P.E.I.. Sediment from numerous area developments and economic activities has negatively affected the SRW in a number of ways. Soil erosion has affected spawning areas, estuary depth, and has filled in springs, pools, ponds and shellfish beds. Soil loss also contributes to phosphorus from agricultural sources entering into waterways, adding to the already serious nutrient overloading issues (Souris & Area Branch of the P.E.I. Wildlife Federation, 2006).

6.3 Description of the IWRM Initiative

P.E.I. has a long history of volunteer-based watershed organizations and groups. These groups have evolved over time and are supported by the P.E.I. Department of Environment, Energy and Forestry (DEEF) as non-profit organizations at the watershed scale known provincially as Watershed Groups (WG).

In March 1987 the provincial government launched *A Conservation Strategy for Prince Edward Island.* This strategy included the Island Conservation Assistance Program to provide financial and technical resources to non-profit community watershed groups for stream restoration projects. A number of notable projects were carried out across the province and provided increasing evidence for the potential of grassroots efforts and the resulting environmental improvements. In the 1990s the province entered into a Cooperation Agreement on Sustainable Economic Development with the federal government. This included a Canada/P.E.I. Watershed Improvement/Recreational Fisheries Development Program. This program ran from 1992–1996 and included the hiring of a program coordinator, a program planner and six seasonally employed regional coordinators who provided support to watershed improvement and/or recreational fishery projects. At the end of this program, the province continued its support to community water projects and launched the Wildlife Habitat Improvement Program (WHIP), which ran from 1996–2002. During this time, Island conservation groups successfully lobbied for a Wildlife Conservation Fund, an annual fee from the sale of all angling and hunting licences in the province, to fund environmental projects. In 2002 the province made modifications to the program to focus more on water quality on a watershed basis.

In 2002 the province reorganized the Environment Department and the former WHIP was re-named the Watershed Management Fund. Simultaneously, a Watershed Management Section was established under the new Water Management Division.

The P.E.I. DEEF has changed the way that their environmental improvement programming and funding is directed. Funding for watershed-based planning emerged from other funds that were aimed at improving the quality of the environment, but were not watershed-based. The P.E.I. DEEF noted that many other jurisdictions in Canada and around the world were beginning to see

success with watershed planning, and have since directed funding towards that with the Watershed Management Fund (WMF) through the Watershed Planning Initiative (P.E.I. DEEF, 2010).

This funding and programming directly supports the WGs. The assistance supports WGs in their planning and implementation tasks by funding three provincially-employed watershed coordinators, who provide technical expertise and act as liaisons between the WGs and the P.E.I. government. There is also funding available to hire part-time WG Coordinators. The WMF provided $520,000 of support in 2008; $470,000 in 2007 and $120,000 in 2006. The P.E.I. Department of Agriculture (P.E.I. DOA) also provides a wide range of services and BMP funding that relates to the reduction of agricultural impacts on the environment (Roy, Oborne & Venema, 2009).

In this instance, the IWRM initiative has emerged not from a provincial priority, but from grassroots initiatives on watershed management, and has been supported through provincial resources and programming to accomplish a range of water resources benefits.

One of the prominent WGs in the province is the Souris and Area Branch of the Prince Edward Island Wildlife Federation (SAB) that has been active in the management of the Souris River watershed since the early 1970s and recognized the potential to become a model for other watershed initiatives. The SAB conducted watershed management in several watersheds in Northeastern Kings County P.E.I. and were early pioneers of stream enhancement on P.E.I. (P.E.I. DEEF, 2007). With a high level of local commitment and enthusiasm, it was evident that watershed management at the local level was the best vehicle for conserving and restoring degraded wetlands. It was also recognized that local, community-led projects were more likely to succeed than a government program and, given some support, would leverage local volunteers and resources towards management goals. Many of the non-profit WGs that are now formally supported by P.E.I. DEEF were created out of volunteer-led community initiatives in response to declining water quality.

In late 2004 the SAB received funding from the Canada-Prince Edward Island National Water Program (CP.E.I.NWP). The Souris River Watershed Management Committee (SRWMC) was formed in early 2005 as a sub-committee of the SAB with the objective of steering the watershed planning process, essentially an IWRM process. With this funding, three pilot projects were initiated: the Stanley-Hope River watershed (Trout River Environment Committee), the West River watershed (Central Queens Branch of the P.E.I. Wildlife Federation) and the SRW (Souris & Area Branch of the P.E.I. Wildlife Federation, 2006). The SRWMC is therefore the main implementation organization for the IWRM process in the watershed.

6.3.1 Goals of the IWRM Initiative

The IWRM process in the SRW is being implemented by the SRWMC. The goals of the IWRM process are driven by the stakeholders of the SRW, including producers, local business, residents, fishers, hunters, recreational users, University of P.E.I. students and staff, other WGs, and the SRW executive committee. Seven main goals have been established by the stakeholder group as the most pressing issues in the watershed and can be found in more detail in the SRW Management Plan (2006). They are:

1. Improve and Protect Water Quality (Ground and Surface)
   SRWMC is working to eliminate anoxic events, restore previous shellfish classifications, restore the streams to a gravel and rock substrate, eliminate red water events and enhance the quality of drinking water by using a variety of programs.
2. Restore and Protect Fish and Wildlife Habitat
   SRWMC hopes to have all riparian zones forested, beaver management and invasive species plans in place, protected and enhanced priority habitat areas and a developed and enhanced appreciation for fish and wildlife habitat using a variety of programs.
3. Preserve Sites of Environmental and Historical Significance
   There are several sites that have been identified by stakeholders as having historical and environmental significance. The preservation of these sites is important in the watershed.
4. Improve Active Living and Recreational Opportunities
   Maintaining and encouraging a healthy lifestyle is an important priority to the stakeholders of SRW.
5. Advocate and Reward Stewardship
   Stewardship of the watershed is important to the stakeholders and the watershed planning process.
6. Manage Watershed Resources through Compromise and Respect
   The variety of stakeholders in the watershed brings a variety of opinions, experiences and priorities. Treating others with respect when they try to minimize impact on the environment is essential to the planning and implementation process.
7. Enhance Communication and Educational Opportunities
   Enhanced communication and educational opportunities will aid in making informed watershed management decisions.

There are several projects underway in the SRW that address one or some of these goals.[9] There is an annual report that is released that showcases the many tentative, current and finished programs. The plan with these goals was released in 2006 and it is intended as an adaptive process that

[9] Please see Appendix D for a near-complete list of projects and support sources.

responds to changing needs and priorities over time (Souris & Area Branch of the P.E.I. Wildlife Federation, 2006).

6.3.2 *Institutional Structure for the IWRM Initiative*

Federal involvement in the IWRM process comes mainly from AAFC, and secondarily from the Department of Fisheries and Oceans (DFO) and Environment Canada. Other federal departments are not significant contributors to the IWRM process. The AAFC funds some programs jointly with P.E.I. DEEF and provides some technical support in the form of information-sharing and environmental quality testing. DFO and Environment Canada also provide some expert capacity for the IWRM planning process.

The P.E.I. DEEF provides direct core funding support for watershed coordinators in the province, technical expertise and technical information for the WGs. Other provincial departments provide WGs funding for seasonal/student positions, program-based funding, technical advice and in-kind equipment loans to IWRM planning and programming, but are less involved than the P.E.I. DEEF.

There are three advocate-based, grassroots, non-profit groups that are somewhat involved in the IWRM planning process for most of P.E.I.: the P.E.I. Watershed Alliance, P.E.I. Federation of Agriculture and the P.E.I. Wildlife Federation. The P.E.I. Watershed Alliance is a non-profit organization working in partnership with the P.E.I. DEEF to develop a Provincial Watershed Strategy. This group provides a formal mechanism for communication and funding applications for the more than 31 WGs on P.E.I. (P.E.I. Watershed Alliance, 2011). The P.E.I. Watershed Alliance is also a registered charity and can access funding opportunities available to registered charities that are currently not accessible to WGs.

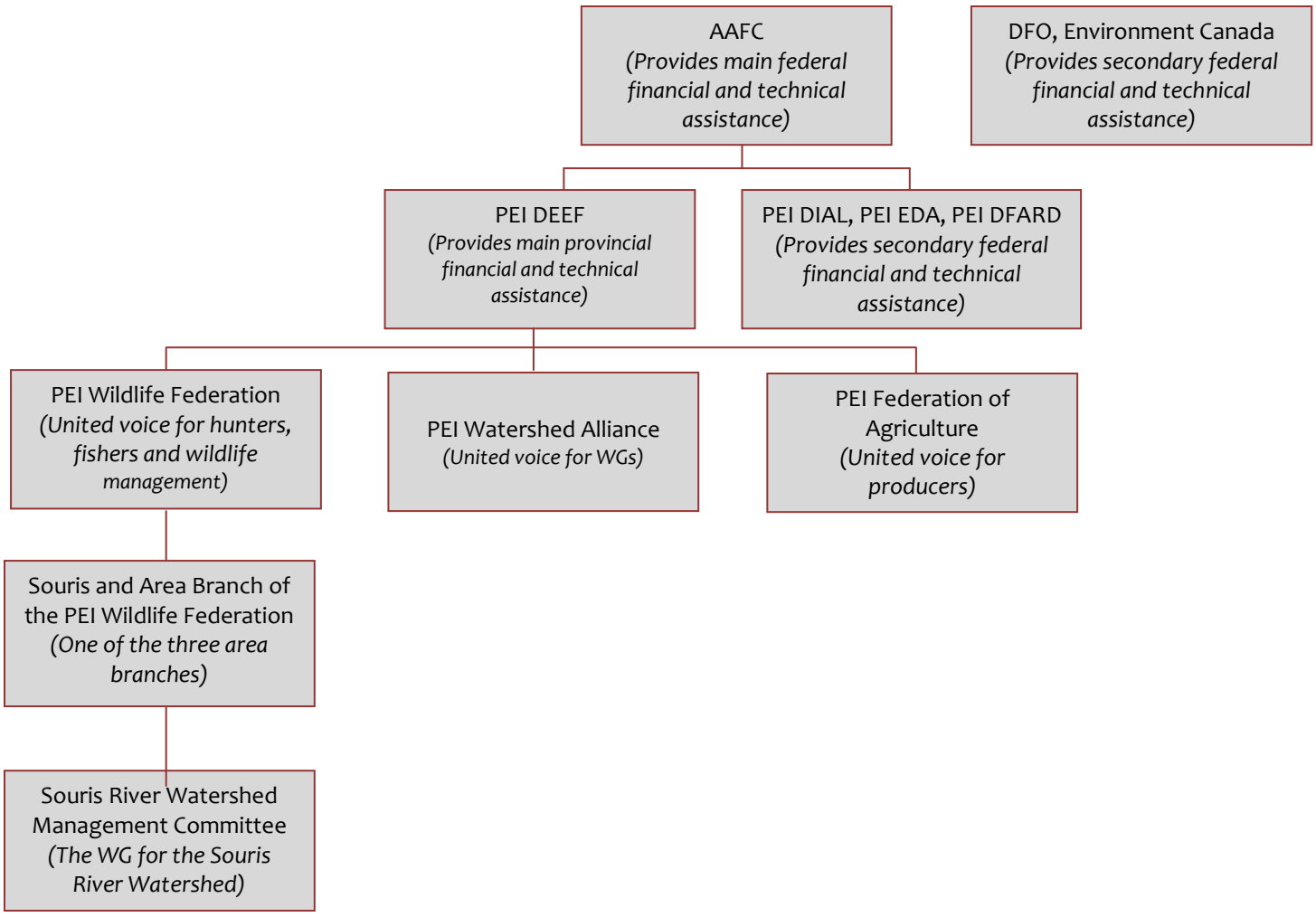

Figure 12: Overarching institutional framework for the Souris River Watershed

The P.E.I. Federation of Agriculture is a non-profit organization that primarily provides advocacy, policy review and the improvement of sustainable farm practices. They liaise between the producer and the province, actively lobbying for change to existing legislation, regulation and public policy to preserve the competitiveness and sustainability of the agricultural sector. They have several programs that involve producers, like creating Environmental Farm Plans and using BMPs. These programs in particular are of interest to the SRWMC and often producers that are involved with the P.E.I. Federation of Agriculture have ties with the SRWMC and SAB planning activities.

The P.E.I. Wildlife Federation, a non-profit organization that is a very active hunter/fisher/wildlife advocacy group, is the parent organization for the SAB (

Figure 13). The SAB is the parent group for the SRWMC, which is the group that plans and implements many of the programs within the SRW, and is the key organization for managing the IWRM process. Much of the programming for the SAB and SRWMC overlap because of the focus on environmental quality on a watershed basis. Many of the committee members, and some of the employees are shared as well; most are volunteer positions, or partially funded through various federal, provincial and other funding sources. Figures 12 and 13 illustrate the organizational framework within the SRW in general, and the structure of the SRWMC specifically.

The SRWMC is made up of a President, Vice-Chairperson, Recording Secretary and a Coordinator. There are several other positions that are filled on a part time, often seasonal, basis. These are usually labourers or researchers that are funded by project-based or seasonal programs. The budget for seasonal labourers or researchers that the SRWMC employ can vary greatly from year to year, as they are dependent on the number of individuals funded by the various work programs that the SRWMC accesses each year. Most of these employees are paid through their respective work programs, and not the SRWMC.

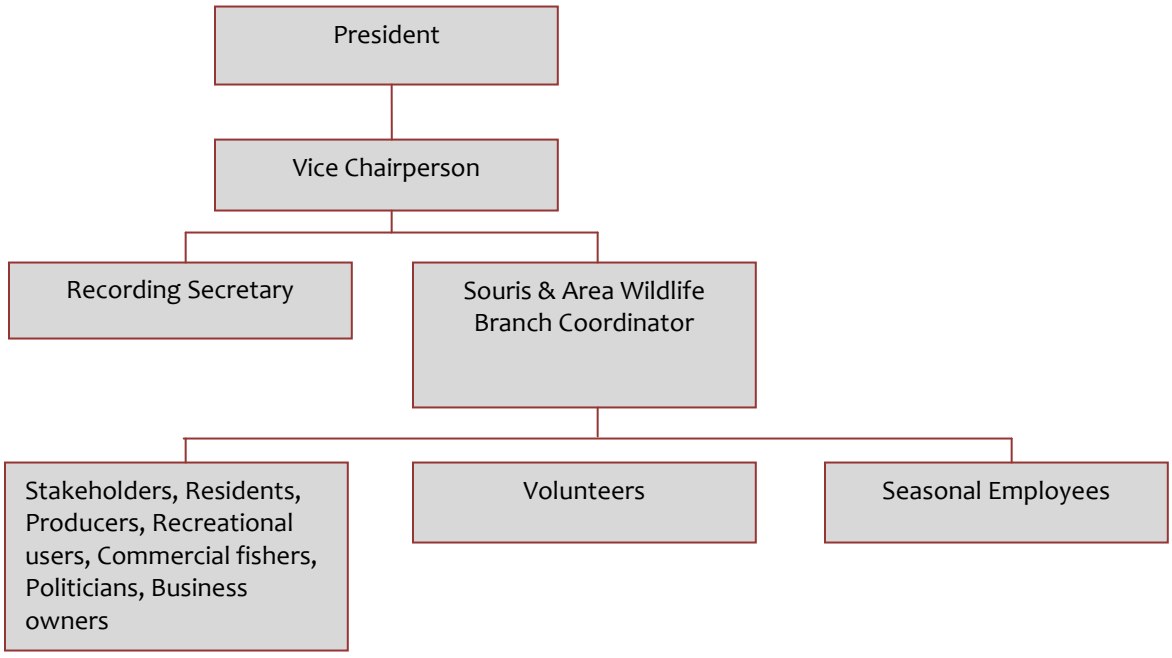

Figure 13: Organizational framework for the Souris River Watershed Management Committee

6.3.3 Current Stage of IWRM Planning

There is a high level of commitment from the provincial and federal governments towards the SRWMC and several other WGs, and funding priority is given to projects that take a watershed approach to funding and management (P.E.I. DEEF, 2010). This funding and programming directly supports the P.E.I. WGs in their planning and implementation tasks by funding three Provincial Watershed Coordinators, and by providing funding and technical expertise to part time WG Coordinators. The funding for this initiative has steadily increased to approximately $800,000 in 2010. The P.E.I. Department of Agriculture (P.E.I. DOA) also provides a wide range of services and BMP funding that relates to the reduction of agricultural impacts on the environment (Roy, Oborne & Venema, 2009).

The level of cooperation between the AAFC and DEEF is quite high, and much of their programming is jointly funded. However, it is the DEEF that is responsible for implementing many of the initiatives for the WGs. Funding for watershed planning activities is provided by both the federal and provincial governments, but is managed primarily by the P.E.I. DEEF. The funding and programs rarely overlap, but there are still many opportunities for improved cooperation. Several gaps and recommendations were identified by interviewees.

6.3.4 Inventory of Resources Used for IWRM

Inventory of Federal Resources

Federal funding addresses mainly project-specific funds that are delivered yearly. In the past, there has been direct funding from the federal government from the AAFC under the Canada-Prince Edward Island National Water Program for WG planning purposes, but this has since been discontinued (Souris & Area Branch of the P.E.I. Wildlife Federation, 2006).

Canada-P.E.I. Agricultural Stewardship Program

This program provides financial and technical support to help protect the quality of soil, water, air and biodiversity resources. This program assists producers in developing Environmental Farm Plans (EFPs) and with the adoption of BMPs pertaining to on-farm conservation projects. This program focuses on implementing practices that will improve and protect the environment, as well as make their operations sustainable and environmentally sound.

Canada-P.E.I. Enhanced Environmental Farm Plan Program

The Environmental Farm Program (EFP) program provides a voluntary, confidential self-assessment process for farmers to evaluate the environmental risks and strengths of their operations

and develop a plan to address those risks and strengths. Emphasis of the P.E.I. program is on group planning on a watershed basis to deal with high priority issues (nitrates). This helps build linkages with watershed priorities and its IWRM process.

ACAAF project

A P.E.I. EGS project was funded by the AAFC-ACAAF program in 2008. Costs were projected at $551,500 over two years, with a projected contribution of $354,000 from ACAAF funding (Lantz, et al., 2009). The pilot project had a pilot area with the Lily Ponds Farm in the SRW. Several types of areas have been set aside for the EGS program for payments according to the type of land. In year one, there was a total of $3,290.78 compensated to the producer; in year two, total compensation was $1,427.05. The differences in payments have been due to a change in the type of lands set aside (Eastern Canada Soil and Water Conservation Centre, 2009).

Watershed Evaluation of Beneficial Management Practices (WEBs)

The SRW is one of the nine sites across Canada that is involved in the Watershed Evaluation of Beneficial Management Practices (WEBs). This project measures the impacts of several BMPs. The practice being evaluated in the SRW is spring ploughing versus fall ploughing, and the resulting differences in nitrate levels in water systems in the vicinity. There are several project funding partners, including DUC, and the project is managed by local AAFC and WG staff with technical advice from several regional associations.

Canada Agri-Geomatics Programs and Services

This is an online technical resource for mapping and planning. There are also tools to plan for a sustainable agri-environment. The data collection and information hosting is provided by AAFC.

Land-Use Information and Mapping Services (In-Kind)

GIS maps, data and other useful information are collected by the Canadian Government (AAFC, Environment Canada) in order to provide an overview of land uses within a watershed. The information is also used to track changes in land use or management activities over time.

Equipment & Expertise Resources (In-Kind)

Many resources—like expertise, project materials and equipment loans—are provided to SRW and other WGs by various federal government departments.

Provincial Resources

P.E.I. DEEF provides core funding for three full-time positions for provincial watershed coordinators. Additionally, it provides funding for part-time WG Coordinators. The provincial Watershed Coordinators provide technical assistance to the various WG Coordinators throughout P.E.I.; the WG Coordinators plan and coordinate projects within the individual watersheds. Generally, P.E.I. DEEF and, to a lesser extent, other P.E.I. departments provide funding for a number of projects that are a one-time opportunity, or seasonal, such as funding for summer students. Most of the provincial funding for the SRW comes from the P.E.I. DEEF, and some comes from various other departments and programs.

P.E.I. Watershed Management Fund

The Watershed Management Fund provides direct core funding and technical resources for WGs to carry out their planning processes and programming under the P.E.I. Watershed Management Initiative. Under this initiative, a guide that outlines the watershed planning process for watershed organizations that would like to form has been developed by the P.E.I. DEEF. The Watershed Management Program employs three provincial Watershed Coordinators, one Watershed Monitoring Specialist and a Watershed Management Supervisor. They provide technical advice and assistance to watershed planning and projects.

P.E.I. Alternative Land Use Services (ALUS)

P.E.I. Alternative Land Use Services commenced in 2008 in P.E.I., and included a participating producer from the SRW. The program is administered by the P.E.I. Department of Agriculture and the P.E.I. DEEF, which jointly fund a provincial ALUS co-coordinator. The P.E.I. ALUS program is aimed at reducing soil erosion and siltation of watercourses and wetlands; improving water quality; improving and increasing wildlife habitat; and reducing the impacts of climate change.

P.E.I. Environmental Futures Program

This program provides training to high school and university summer students who would like to do environmental enhancement work. Crews are put together by the P.E.I. DEEF and these can be accessed by WGs across the province.

P.E.I. Greening Spaces Program

This program provides quality native tree and shrub seedlings, educational materials, technical advice and financial support for WGs and other organizations for the planting of trees. WGs often use this program to undertake activities that support the prevention of stream-bank erosion, the establishment of wind breaks and wind buffers, and the restoration of abandoned farm lands.

Special Projects Program

This program provides 100 per cent subsidy on labour for people employed from one or more disadvantaged groups; preference is given to projects that have a strong community development component.

Land-Use Information and Mapping Services (In-Kind)

GIS maps and data collected by the P.E.I. DEEF provide an overview of land uses within a watershed and other useful information. They are also used to track changes in land use or management activities over time.

Equipment Resources (In-Kind)

Many resources—like expertise, project materials and equipment loans—are provided by various departments of the P.E.I. government.

Other Funding and Technical Resources

Most of the "other" groups are non-profit or private organizations that fund specific projects. The funders often have a particular interest in the type of projects that they will fund. A lot of the assistance here is in-kind technical, in-kind information services.

P.E.I. Federation of Agriculture

Environmental farm planning in P.E.I. is delivered through the P.E.I. Federation of Agriculture, a non-profit organization that provides support to producers in the form of advocacy, policy review and the improvement of sustainable farm practises. They deliver several programs that involve producers, including developing Environmental Farm Plans and using BMPs.

Wildlife Conservation Fund

The Prince Edward Island Conservation Fund is for the protection and enhancement of wildlife and wildlife habitats. The money from this fund comes from hunting, trapping and fishing licenses.

Human Resources and Skills Development Canada (HRSDC)

This provides summer career placements for students to prepare for entry into the labour market. The HRSDC provides wage subsidies to public, private and non-profit employers.

Shell Environmental Fund

This fund provides financial support for grass-roots, action-oriented projects that improve and protect the Canadian Environment.

Tree Canada Foundation

This foundation works with groups in order to promote tree planting, the educational value of tree planting, and maintenance and tree inventory projects.

A detailed list of P.E.I. resources is attached in Appendix D of this report.

6.4 Agricultural Sector Participation

In the SRW, participation from the agricultural sector in agri-environmental programming is remarkable. The agricultural producers in the SRW are recognized as some of the most engaged in P.E.I., as demonstrated by their willingness to participate in numerous nutrient management and soil conservation projects. In addition, many of the area producers have recognized that there are problems in the watershed and have taken the initiative to solve them. Most of the SRW producers have been enthusiastic about being involved in community projects that help to improve the watershed. Strip cropping, terracing, and farmable berms are all ways in which area farmers have demonstrated the use of BMPs (Souris & Area Branch of the P.E.I. Wildlife Federation, 2006). Land has been donated by producers in the area for several pilot projects and initiatives. Producers in the SRW participate in watershed activities planning meetings, studies and other initiatives. There are numerous federally funded programs that include active participation from the SRW producers that could be highlighted.

The ACAAF project demonstrated the value of incentives for the realization of EGS. This pilot program has ended, but so far the feedback from participants is that they enjoyed being a part of it. A watershed coordinator stated that this program would really work well if there was more money to enable more producers to participate, and to provide producers with more financial compensation for their land. The idea of different types of land resulting in different payments is something that producers and watershed managers are generally content with.

While both the P.E.I. ALUS and ACAAF projects are essentially testing the concept of payments for EGS and have been implemented through agricultural BMPs, the main difference is the project objectives. The ACAAF pilot project included the delivery of a Comprehensive EGS Land Management Package, gauged the effectiveness of watershed communities as delivery agents and developed cost-benefit analyses for specific EGS (Lantz, et al, 2009). The ALUS program is aimed at

reducing soil erosion and siltation of streams, improve water quality and improve and increase wildlife habitat. The P.E.I. ALUS program is limited to the following BMPs: establishing native trees in buffer zones; retiring sensitive land by expanding buffer zones, establishing non-regulated grassed headlands or retiring high-sloped lands; taking land out of production to establish soil conservation structures; and maintaining livestock fences adjacent to watercourses and wetlands. Based on the design, the ACAAF project made a stronger link to watershed objectives and priorities.

The Canada-P.E.I. Environment Farm Plan program is of particular interest to the SRWMC and often producers that are involved with the P.E.I. Federation of Agriculture have ties with the SRWMC and SAB planning activities. These personal linkages form the informal basis of any connections between BMP management processes and IWRM processes. The SRW is also one of the nine sites across Canada that is involved in the WEBs program to measure the impacts of several BMPs on a watershed basis.

6.4.1 Drivers and Barriers for Agricultural Sector Participation

Drivers: Funding

The P.E.I. ACAAF pilot (now complete) and ALUS programs are considered by local producers to be steps in the right direction in providing support for behaviour change and for realizing the intangible EGS benefits of the environmentally sound management of land. However, receiving payments does not seem to be the main motivator behind participating in these types of projects. All of the interviewees agreed that while getting a fair price for land that is taken out of production is very important, it may not the main driver behind participation.

Broad-based core funding for local WGs, not limited to project deliverables, is recommended to increase producer participation by a number of our interviewees. The best way to support producer participation is to have a variety of programming delivered by WGs that can be tailored to the farming operations, industry and stakeholders in the watershed. This does not necessarily mean only financial-incentive programs, but also demonstrations, testing and awareness campaigns. This would expand the capacity that WGs have to plan programming and liaise with producers and other stakeholders in their watersheds. Funding could also expand programming to the specific needs of the WGs; those needs include testing, monitoring and more local research. Providing core funding would also help improve continuity and knowledge-base of the watershed.

Drivers: Technical

Technical support was something that was not emphasized as a driver for agriculture sector participation. There is little support provided through the SRWMC, although it acts as a liaison

between the provincial and federal resources that are available. The impression is that there is little government technical support available directly for producers applying for funding or wanting testing done on their lands. If these options were available to producers, they may be used. Currently there are some GIS mapping and web applications available from the AAFC, but the impression was that this is not necessarily the type of technical support that producers are looking for.

In the SRW, there was a P.E.I. DEEF-supported "nitrate testing days" program that was popular with local residents. These clinics took water samples from local residents and tested them for nitrate levels. This type of technical assistance could help producers gain valuable baseline information about their farming operations. The AAFC could step in and focus on filling the various data and monitoring gaps.

Drivers: Other

The main motivator identified by all interviewees was gaining social capital with neighbors and a genuine passion for environmental stewardship. Producers are interested in having a healthy community, healthy environment and a healthy agricultural sector. It is generally recognized that in order to achieve this, cooperation between all stakeholders, and especially producers, is needed.

Nitrate levels in groundwater are a very serious issue in all of P.E.I. SRW has elevated levels of nitrates in its groundwater (the only drinking water source on P.E.I.) but does not have the dangerous levels that are seen elsewhere in the province. The prevention of this issue is a significant driving force for the producers and all stakeholders in the SRW.

Deterrents: Funding

The main funding-related deterrents to participating in IWRM programming varies from program to program. The ALUS and EGS programs provide financial compensation for setting aside land for conservation purposes, but many programs do not. Many other programs and research activities cost producers time and income lost through land used for research that could otherwise be used to generate income. The absence of an honorarium to compensate for this loss of time and income is a deterrent. Research projects should include honoraria for such producers that donate time or land as far as possible.

Some producers fear that if they become involved with WGs that they may be very conservation-minded and heavy handed as well. They fear that it's possible that participating in a project might take some of their land out of production and may affect their incomes. According to the provincial representative and WG representatives, this is not the case and the WGs have a good understanding of the importance of keeping land productive.

Deterrents: Other

Some relationships between government representatives, environmental groups, stakeholders and producers have not been amicable. While this has not been a significant deterrent within the SRW and the Hunter-Clyde WGs, where representatives were interviewed, it was mentioned as a possible factor.

Regulations are typically formed and reinforced when there are problems. However, the watershed coordinators mentioned that fear of regulation can be a deterrent for producers to engage in programs. This fear also affects non-regulatory programs delivered by government agencies, and some producers feel that allowing any government officials on their lands would mean that they could enforce actions on their lands.

It was suggested by the WG representatives that some producers do not participate in IWRM planning and projects because they are simply at the end of their farming careers.

6.5 Synthesis and Recommendations

The core recommendation from all interviewees was the need for adequate funding to enable WGs to provide programming and liaise between producers, communities and government organizations. The discussion below will address increasing agricultural sector participation directly, and through the strengthening of the IWRM efforts of WGs.

Funding

P.E.I. DEEF offers core funding for the yearly planning and programming activities of WGs that can be used for a variety of projects within the broad confines of the P.E.I. DEEF funding regulations from the watershed. AAFC or other federal departments do not offer broad funding that is flexible to the needs of the producer or watershed. Most federal funding is project based, and does not allow for funding of core operations that support the planning and coordination efforts of the WGs, which is desperately needed. If there was non-project based funding available, WGs could use money for core operations, which would enable coordinators to tailor projects based on the needs of the watershed.

The P.E.I. Watershed Alliance (P.E.I. WSA) is a non-profit cooperative organization that works with the Province of P.E.I., but is funded by neither the government of P.E.I. or Canada. This organization was formed to liaise between WGs and stakeholders and to be able to apply for funding that is not accessible by the individual WGs. It was suggested by the provincial

representative and one of the WG representatives that federal funding could be used to support this organization, which can in turn support the WGs' efforts in planning, programming and rapport building with producers.

P.E.I. has consolidated their funding applications so that WGs can apply for funds from different pools and also from different P.E.I. government agencies. Funding for federal projects and planning related to IWRM activities is difficult to obtain for a number of reasons: 1) the time and effort to apply for funding; 2) the chances of receiving funding; 3) the restrictions on funding; and 4) the large amount of reporting at the end of the project. It was suggested by all interviewees that federal funding follow the P.E.I. government in streamlining applications so WGs and producers can access a variety of funds and agencies more efficiently. This would help applicants deterred by the level of paperwork and reporting for the little federal funding there seems to be available in the region.

For WG representatives, planning is made difficult by the short-term funding from governments. Many programs are annual, some last a few years. This makes it difficult for long-term planning and stability. As well, interviewees indicated that the the timing of the funding is difficult for WG representatives. The federal and provincial summer work program supports are approved too close to the summer work term, which makes it difficult to recruit employees and difficult to plan for how programs can be implemented and to what degree. According to one of the WG representatives, the amount of money that is given to summer employees for both of these programs is not adequate to employ university students, who would be able to support programming that is more technical, like soil testing, rather than labour-based projects like stream-bank enhancement.

Many of the people involved in SRW programming are volunteers. Providing money for a part-time volunteer coordinator or an honorarium for volunteers could go a long way. Much of the tree planting done in the Souris Watershed and other watershed organizations is by volunteers.

Technical

Monitoring of outcomes, changes and improvements from various programs is an area where federal agencies, particularly AAFC can assist. For instance, there is little information being gathered about nitrate levels, temperature and dissolved oxygen in water on P.E.I. Since 2007 there has been a nitrate monitoring clinic where local residents can bring in their water samples for testing, but this is only a recent program and is dependent on year-to-year funding. There is some monitoring done for nitrates in areas that are involved in a specific program. There is also some monitoring done by Environment Canada and DFO.

Other

The provincial representative expressed that most financial and technical programs are not duplicated, but are not as integrated and complementary as they could be. Improved networking systems and other linkages between the federal and provincial governments could go a long way towards reaching common goals and building programs that are tailored to the needs of the producers and the WGs in P.E.I. The provincial representative emphasized that joint planning efforts and an increase in communication would benefit IWRM planning.

The support for WGs and producers is perceived as a hodgepodge of support from federal, provincial and municipal governments, NGOs, private businesses and community volunteers. The provincial representative expressed that it would be ideal if there was a department that was dedicated to IWRM planning and programming at the provincial or federal level. It was also suggested by the provincial representative that more cross-departmental work would be beneficial to the efficacy of WGs.

6.5.1 Producer Participation Support and Recommendations

Funding

Producers in the SRW are enthusiastic about donating land for research or conservation purposes, but this does cost them money, as they are taking land out of production. An honorarium would help boost participation in programming that requires land to be taken out of production for demonstration sites, research or conservation.

The producers in many of the watersheds on P.E.I. own and manage the majority of the land. AAFC could provide additional funding for WGs to have full time coordinators in order to provide support and to build rapport with producers and deliver good quality programming that encourages participation. The provincial representative that was interviewed considered this suggestion to be essential to AAFC in how they can play a role in increasing producer participation. The primary reason for the success of the SRW IWRM process is a high level of rapport among stakeholders.

Technical

In 2005 a P.E.I.-based federal department agricultural researcher retired and was never replaced. Since then, the research that is used to provide the scientific basis for modelling and decision-making in P.E.I. is based outside of P.E.I. in similar watersheds. While this is a somewhat acceptable alternative, the provincial representative thinks that a local researcher providing local research is essential to making the best possible decisions. P.E.I. needs active research to contribute to the accuracy of information used for modelling and policy-making. The AAFC can step in with funding

for a researcher looking into crop science and technology that could help with the nitrate issues, at the federal, provincial or even university level, according to the provincial representative. The negative impacts of not having local research for modelling and planning are already being felt in the community.

7.0 Synthesis of Resources Identified in Four Regional Case Studies

A large range of resources were identified in our four case study areas. These are roughly categorized into financial resources and technical resources that include a large range of data, information, expertise and support. Specific examples of technical support are identified in our recommendations for each case study, as well as in our overall recommendations. The authors clarify that this is not an extensive list of resources available to the watershed groups. It is a list of resources that were considered significant by interviewees and in research sources.

Table 7: Summary of resources used at the watershed level related to IWRM

	Federal resources identified	Provincial resources identified	Other resources identified
Okanagan Basin Water Board, BC	**Financial resources:** Significant grant funding and research funding from AAFC noted; such as for environmental farm planning and irrigation management plans, the OBWB Water Supply and Demand Model, the National Water Supply Expansion Program (till 2009) **Technical resources:** From federal research stations; Summerland Research Station cited as significant positive source with regular active contact and cooperation. A climate model has cooperation with Environment Canada as well.	**Financial resources:** Co-funding federal provincial programming under Growing Forward; co-funding on the water supply-and-demand model; significant other research and technical funding. **Technical resources:** Provincial cooperation for data and accurate projections. A significant resource is the Real Time Climate Modeling/Irrigation scheduling calculator. **Institutional resources:** Administration of technical resources such as the Water Supply and Demand Model	**Financial resources:** Municipalities provide core operating budget. **Technical resources:** Industry and other local producer cooperation for data and accurate projections. Water Supply Association provides communication support and helps validate OBWB initiatives to advance water conservation efforts with basin water utilities. Universities of BC and SFU provided research on water supply and demand. **Institutional resources:** Okanagan Nation Alliance, a First Nations group, provides support institutionally. BC Agricultural Council's ARDCorp delivers EFP and BMP funds.
Lower Souris River Watershed, Saskatchewan (very preliminary)	**Financial resources:** AAFC funding for EFP and BMPs; AAFC funding of ecosystem services research (ACAAF); Greencover TAC funding for soils/forage work (2004) was the driver for LSR Group Plan; Farm and Ranch Water Infrastructure Program cost shared by AAFC and SK A&F; EcoAction Ground Water Project, funded through Environment Canada's EcoAction Community Funding Program **Technical resources:** Some engineering assistance provided by AAFC-Weyburn; AAFC staff support provided with Source Water Prot. Plan; WEBs research project in Pipestone Creek Watershed; Some agrology support related to grazing management.	**Financial resources:** SWA operating funds; SWA project funding; SK Agriculture and Food contribution to Growing Forward programs for producer BMPs including the Watershed Awareness Initiative delivered via PCAB. **Technical resources:** SWA range agrologist support; SK Environment technical help for BMP implementation **Institutional resources:** SWA, SAF and Saskatchewan Industry and Resources staff support provided with Source Water Prot. Plan; SWA Communications support	**Financial resources:** Watershed Awareness Initiative delivered through cost sharing with the provincial and federal government (Growing Forward); through the PCAB; 18 municipalities provide annual funding. **Technical resources:** Universities of Alberta and Saskatchewan provide useful research support. Ducks Unlimited Canada provides useful extension support and funding related to conservation easements, upland forage programs; local agricultural dealers on workshops/tours. **Institutional resources:** PCAB support of Agri-Env. Group Farm Planning BMPs (fed/prov fund coordination)

	Institutional resources: Historical on-farm extension and technical support; AAFC staff support provided with Source Water Prot. Plan; advice on best ways to proceed with new initiatives and build federal support for them; Develop and provide support for the group planning program.		
Yamaska River Watershed, Quebec	**Financial resources:** Programme Prime-Vert (shared with provincial government); Programme d'appui au developpement des enterprises agricoles (PADEA); *clubs-conseils*: an initiative funded partially by AAFC that has a cooperative structure; more than 80 in the province; CDAQ: provides financial and technical assistance for farmer self-reliance, market development and environment. CDAQ also includes the Canadian Agriculture Adaptation program and the EFP (completed in 2010) CDAQ also administers PRIME-VERT, a jointly-financed program that offers specialized consulting services and support for the adoption of better agro-environmental practices. ZIP: Approximately 50 ZIPs providing technical support, identifies priorities; Project Lisière Vert (AAFC Green Belt; EGS pilot) **Technical resources:** Programme Prime-Vert (mostly financial support often directed towards technical upgrades and capacity); ACAAF (implemented in neighbouring Pike River watershed)	**Financial resources:** OBV funding from the provincial government; Programme Prime-Vert (shared with federal government); *clubs-conseils* (one-third funding from province); CDAQ: shared with federal government, includes PRIME-VERT, a jointly funded program; ZIP: shared with federal government; PADEA: financial, technical and information resources provided to help agricultural producers develop integrated management plans and SD-based agriculture. Specific resources include: online information/resource site (www.agriconseils.qc.ca); analytical aid for existing operations and improvements; preparation of management planning and implementation; Blue-green Algae Intervention Plan: Multiple QC Ministries providing financial resources ($145M over 10 years) to be dispensed through the PRIME-VERT program **Technical resources:** Some provincial-level agronomists and other experts from MAPAQ work with farmers, though not to the same degree as consultants from the *clubs-conseils.*	**Institutional Resources:** The ROBVQ is a non-profit organization that was created in 2001 and helps with the implementation of IWRM in the province. Forty-one watershed organizations are members of the ROBVQ. The *clubs-conseils* are partly funded by federal and provincial government agencies and also raise their own funds through farmer participation fees. They provide information, technical services, diagnostics etc. for the member producers. L'Institut de recherche et de développement en agroenvironnement (IRDA) is a non-profit research corporation that conducts research, development and transfer activities for sustainable agriculture. **Financial Resources** Agricultural producers contribute to the *clubs-conseils* and have invested over $21 million into the clubs; various municipal governments have provided resources for LIDAR data in the province.

Souris Watershed, Prince Edward Island	**Financial resources:** P.E.I. EGS Pilot Program (Canada-P.E.I. Agricultural Stewardship Program; Canada-P.E.I. National Water Program (WGs); National Water Supply Expansion Program (NSWEP); P.E.I. WEBs project; Community Aquatic Monitoring Program (CAMP); Canada-P.E.I. enhanced EFP **Technical resources:** P.E.I. EGS Pilot Program (ALUS); Canada-P.E.I. National Water Program (WGs); National Water Supply Expansion Program (NSWEP); P.E.I. case in WEBs; Community Aquatic Monitoring Program (CAMP); Canada-P.E.I. enhanced EFP; Oceans Day; water quality testing; Canada geomatics programs and services; land-use information and mapping services (in-kind); equipment and expertise resources (in-kind)	**Financial resources:** P.E.I.-Watershed Management Fund; P.E.I. Wildlife Conservation Fund; P.E.I. Environmental Future Program; P.E.I. Green Spaces Program; Summer Employees (stream bank enhancements, beaver removal, tree planting); Green Cover Program (currently no active program); Environmental Future (Funding of summer students); Family Fishing Day; P.E.I. DEEF Nitrate Testing Clinic; Skills P.E.I.; Jobs for Youth Program; Special Projects Program **Technical resources:** P.E.I. EGS Pilot project; land-use Information and mapping services (in-kind); Wildlife Conservation Fund; Human Resources and Skills Development Canada; Variety of studies in Souris Watershed (fish stock counting (2007, 2008), invertebrate study (2010, 2011); equipment resources (in-kind); Oceans Day; A more comprehensive list of resources is provided in Appendix D to this report.	**Financial resources:** Shell Environmental Fund; Agri-industry support; Syngenta; Local grocers; SAB; The Atlantic Salmon Conservation fund; Eastern Kings Community Council; **Technical resources:** Trout River Environmental Committee on EGS project; University of NB on EGS project; DUC in EGS project; SAB;

8.0 Conclusions: Agricultural Participation in IWRM Initiatives

We conducted detailed case studies in four watersheds in distinct geographic and agricultural regions of Canada. We selected the Okanagan River Basin in Western Canada, the Lower Souris River Water from the Canadian Prairies, the Yamaska River watershed from the Ontario-Quebec region and the Souris River watershed from Atlantic Canada. Perhaps more important was the fact that each watershed also represented distinct contexts, cultures and agri-environmental challenges that affect the IWRM goals and processes. This section synthesizes key findings that emerged in more than one case study, making them relevant for regions across geographic and jurisdictional boundaries in Canada. More context-specific summaries and recommendations are included within the text of each case study.

While we found common themes that indicate that a consistent nation-wide policy response is appropriate and convenient, it is important to note that the case studies reinforced the fact that each watershed has region-specific issues, needs and responses. An approach that builds on local strengths and addresses local and regional barriers is increasingly relevant for effective federal programming. All case studies made a strong case for focusing on local goals and using local implementation. Local geopolitical context, local social capital and motivation, and region-specific climate and hydrological data are key inputs into any agri-environment initiative development requiring federal support. Any nation-wide federal program will need to be adapted to region-specific needs to effectively address key agri-environmental issues and address the needs of producers within particular watersheds.

A range of financial and technical information and support is provided to agricultural communities for activities related in part to watershed processes. A scan of the resources provided in all case study watersheds shows a strong emphasis on the importance of federal financial resources. These financial resources range from paying for BMP adoption and maintenance (the environmental farm plans), to supporting appropriate organizational capacity to assist producers in agri-environmental management and other necessary capacities (such as the *clubs-conseils* in Quebec).

Only a few federal resources (e.g., Greencover Canada Technical Assistance Component assistance in Saskatchewan and the WEBs project, which specifically focused on watersheds) were/are devoted directly to supporting agricultural management *specifically within or connected to* an integrated water resources management process. Greencover Canada TAC assistance was a very substantial factor in the development of Saskatchewan's Agri-Environmental Group Farm Planning process, which today has increasingly focused programming at the watershed level, in partnership with local watershed organizations supported by the Saskatchewan Watershed Authority. This is a model worth considering for national application.

While watershed planning and agri-environmental management receive federal, provincial and regional support independently, there is little support or requirement for linking them explicitly or for incenting any collaborative management between the watershed groups and the agri-environmental planners. On the watershed management side, there is an emphasis on watershed-based approaches for building community support for achieving multiple environmental management objectives. In watersheds with a significant agricultural component, this entails significant agri-environmental management. Yet this connection is tenuous in most of our case studies. Support for agri-environmental management comes mostly in the form of incentives to adopt established BMPs that weakly link to the watershed priorities or planning processes. This, in turn, means that many of the significant co-benefits of watershed-based management of agri-environmental issues, including the possibility of watershed-based monitoring of results, are overlooked. This influences the effectiveness of the integrated approach, and can impede the optimization of program design and targeting. Programs such as the watershed evaluation of beneficial management practices (WEBs) and pilot ACAAF EGS pilot initiatives (such as those reported in the Quebec, PEI and Saskatchewan cases) demonstrate the potential for delivering agri-environmental programming on a watershed basis. An important approach towards strengthening this synergy is to increase awareness of the broad personal, community-level and societal impacts of agri-environmental management within a watershed.

Context-specific needs: Our case studies reveal that IWRM initiatives may develop in a number of ways, including being initiated by: 1) a small, concerned group of committed individuals (e.g., agricultural producers or watershed stewards); 2) local governments; 3) a range of community leaders at the watershed or basin scale (British Columbia); 4) in response to clear provincial policy direction (Saskatchewan); or 5) in response to significant federal, provincial or other funding support. There is no proven formula for the most effective approach; several methods appear to work. Keeping in mind differences in IWRM motivation and the nature of participation, support systems for enhancing agricultural sector participation can be developed to adapt to regional peculiarities and needs. These varying realities and origins of IWRM programming must be recognized, with additional support provided in response to watershed-based needs and priorities at the local and regional levels.

The four case studies conducted in four diverse regions of the country revealed a range of drivers and barriers to agricultural sector participation in existing IWRM activities. A main finding was that programming and program response is specific to the context and issues, as well as the cultural and environmental climate, and that programming needs to be locally responsive in order to be effective. This is clarified in the P.E.I. case study, where financial and technical resources play some role in motivating farmer participation in the watershed, but a large part of the motivation comes from a

local sense of place, and an expressed need for a healthy community, environment and agricultural sector. In contrast to this, while B.C. and Quebec producers feel a strong sense of commitment to their local communities, they have indicated that financial incentives are crucial to strong uptake of watershed programming actions and agri-environmental management.

Financial incentives are seen as a positive driver for farmers to adopt BMPs. In Quebec, the Lisière Vert project saw about 90 per cent participation based on significant, cost-shared financial incentives. In the Saskatchewan and B.C. cases, and based on producer interview responses, it is estimated that financial assistance is the key driver for BMP adoption for about 50 per cent of producers.

Another important driver, in addition to the sometimes absent financial incentives, is a broader recognition of community and environmental sustainability. This driver is being especially articulated in the P.E.I., B.C. and Saskatchewan case studies. Some producers will adopt programs without being compensated for the EGS benefits from the implementation. However, compensation for lost time, income, and so forth, is seen as a definite incentive. In most cases, farmers believe that they are not receiving compensation that equates to the value of the benefits that they are providing through agri-environmental management and that they often not being compensated for the entire loss in income that they incur in adopting BMPs. In the Lower Souris in Saskatchewan, the EGS project showed that the cost of altering land-use practices for environmental benefits is $39–$70 per acre. Farmers in the region do not receive a similar level of compensation to provide these. In a related finding, a number of case studies revealed that federal and provincial funding for agri-environmental management has been significantly reduced in the last few years (an exception to this might be Quebec, where a strong federal-provincial program exists). This is reflected not only in the magnitude of incentive payments, but also in declining levels of extension support available and the level of overall local and context-specific monitoring data.

Technical resources vary widely in their availability and use. For example, technical support was not emphasized as a key driver of agricultural participation in the Souris watershed in P.E.I. On the other hand, on being further questioned, they claimed that there just wasn't adequate and locally relevant data available for their purposes. Local data was not adequately updated, and many were depending on non-local data for their management decisions and implementation. This was seen as somewhat of a barrier to decision-making. Continued declines in federal and provincial on-farm extension support were noted as a major concern in Saskatchewan's Lower Souris watershed, while emerging provincial and private-based extension services are not viewed as effective or appropriate. Meanwhile, agricultural producers in the Okanagan Basin appear to be well served with technical and scientific support via the Summerland Research Station. However, a growing need is emerging in terms of "systems-level research," which AAFC may be able to fill. Other areas, however,

reported that there is a decline in the quantity and quality of locally relevant data and information. Technical information in the form of GIS and LIDAR data were identified as important in Quebec. The users of these data were generally more locally based (e.g., *clubs-conseils*) and not provincial or federal.

Extension services were identified as key drivers for producer participation in locally driven IWRM processes, particularly in the Saskatchewan case study. It seems that the prior regional history of this watershed, with the high level of on-farm technical and agrology extension support through the former PFRA and provincial staff, has increased their appreciation for this sort of hands-on support. Recognition and appetite for this sort of technical support is growing and anticipated to increase with the increasing numbers of young farmers in the region. While AAFC's role was clearly acknowledged, there is recognition that local organizations such as the LSRWC, who provide support on programs such as the Agri-Environment Group Plan and even help producer with paperwork related to programs that they don't deliver, are becoming more and more relevant as the "go-to" places locally. Increasing the capacity of these institutions for producer extension support might be appropriate in this new emphasis on watershed-based programming.

Information resources are available at fairly diverse levels in the different watersheds. Most watershed groups admitted to accessing federal sources of maps and information but there was no consistent messaging around what was deemed as a key information resource. Some cited local farm cooperatives and magazines as being the right level of relevant information. For example, a local watershed bulletin in the Ruisseau des Aulnages Watershed (funded by MAPAQ and the Federation de l'UPA de Saint-Hyacinthe) provides information describing IWRM, information on funding opportunities and articles on IWRM activities in the area, and was cited as a useful resource. The PCAB in Saskatchewan plays a similar role, in some sense, providing hands-on workshops to inform producers about agricultural programming and benefits, and offer institutional support to develop environmental farm plans. The Okanagan Basin Water Board has spent considerable effort in communicating the results of its research-based initiatives, including the application of a web-based "Okanagan Basin Viewer," which seeks to make water supply and demand modelling research relevant for any basin stakeholder. There are different levels of information resources that are deemed important and useful by stakeholders and they include promotional, high-level informational, as well as technical, resources.

Scale: Our case studies ranged from the very small, local sub-watershed (Souris in P.E.I.) to larger, more complex watersheds, such as the 8,000 square km Okanagan River Basin. It did come through somewhat consistently that a localized approach to agri-environmental management in close connection with IWRM goals and processes is likely achieved best at a sub-watershed level. In the Quebec case, while the selected Yamaska watershed was the scale of the IWRM initiative, the agri-

environmental management is largely facilitated by the seven locally focused *clubs-conseils*. The Lower Souris River Watershed Committee in Saskatchewan is also comprised of representatives from three active local sub-watershed organizations.

The need for increased local participation and decision-making ability, as well as locally defined programs, is seen as appropriate and optimum. An Okanagan basin contact highlighted regulations that are being decided in Ottawa as "not representative of the local needs and ecosystem properties," and a Lower Souris River Watershed contact questioned the utility of a single, nation-wide approach, suggesting that "what works on P.E.I. may well not be the answer on Vancouver Island."

Monitoring impacts to facilitate adaptive management of IWRM programming, measuring the impact of the programs, and providing information that can target the most critical areas for management interventions are also important for program success. Significant monitoring resources are missing in all watersheds, although some IWRM processes have articulated this as a future step.

Watershed-based EGS programming, including financial incentives for prioritized BMPs, can be one way to reorganize traditional BMP-based funding to strongly link local watershed objectives and agri-environmental management. Reports on EGS pilots are mixed in our case study research. Most saw EGS pilots as being a step closer to realizing the broader benefits from agri-environmental management. Our research comprised two case studies with ACAAF EGS pilots (Saskatchewan and P.E.I) and one adjoining an ACAAF EGS pilot (Quebec). All three acknowledge the benefits of EGS programming for producers, although respondents revealed a sense of uncertainty around the future of such initiatives. In Saskatchewan, for example, there was some uncertainty regarding the utility of the research, as its policy impacts are not yet apparent.

8.1 Identified Needs for Improving Agricultural Participation in IWRM

8.1.1 Strengthen Integration between IWRM and Agri-Environmental Management

These four detailed case studies have demonstrated that there is considerable need to strengthen the linkages between IWRM planning and agri-environmental management implementation processes in the various regions of Canada. While there are linkages between the two areas of programming, and, in some cases, the two complement each other to some extent, these connections are not explicitly articulated through common or complementary goals, processes and monitoring.

Stronger linkages between IWRM goals and more locally relevant BMPs developed with inputs from local watershed management authorities would help provide a good basis for prioritized actions in the analyzed watersheds. For example, in the Saskatchewan case study, the watershed organization is

quite involved in agri-environmental programming and, in many instances, provides the expertise and implementation support needed for effective program delivery. This sort of programming and institutional alignment is important for improving program uptake and efficiency. Greater federal attention to this local program delivery model is warranted.

Important federally-funded research has occurred through programs such as the ACAAF pilot EGS program and research projects and extension support from past years. The WEBs project also helps highlight the measurable benefits of watershed delivery of agri-environmental programming, even though this is not the explicit motivation for WEBs. From a program delivery perspective, this would be an important step for policy designers. Improving the integration between IWRM and agri-environmental programming with supportive research will improve our understanding of overall impacts, reduce redundancies and improve the realization of co-benefits. One potential integration method could be to direct agricultural funds and programming at existing IWRM initiatives with specific goals to improve agricultural representation on the boards of watershed organizations, and improve watershed-based monitoring of agri-environmental programming. Another side of this would be to extend agri-environmental funding to watershed-based prioritization and monitoring, ensuring the relevant provincial agencies make the relevant linkages at the provincial bureaucracy level, as well as ensuring that ground-level implementation sees higher degrees of integration.

8.1.2 Identify and Support the Appropriate Scale of Watershed-Based Programming

Identifying an appropriate scale for strengthening the linkages between IWRM and agricultural processes in a region is important. For example, in our Quebec case study, although the official IWRM process is at a watershed level (approximately 4,800 square km), the most relevant scale of agricultural support was through the seven *club-conseils* at the sub-watershed level. One 30 square km watershed had achieved high BMP implementation through local cooperation and support. This level of area support was also found to be very effective in P.E.I. The Souris watershed case study in P.E.I. was approximately 50 square km. A smaller scale lends itself to easier outcome monitoring for programs; however, a nested approach is needed to ensure that the smaller initiatives are having the required cumulative impact on the larger landscape and watershed levels. A key factor in determining the most appropriate scale to support watershed-based programming is community interest. A watershed must be viewed as both meaningful and manageable by its residents if they are to initiate significant efforts aimed at improving its health and function. The Lower Souris and Okanagan Basin cases highlight that this is possible at a larger scale.

A lesson in finding the appropriate level of support is to allow for some of these initiatives to emerge at the most appropriate scale to the local culture and context, and support a variety of scales of IWRM initiatives. While more local sub-watersheds may be more appropriate for incenting local

participation, larger watersheds can be selected for setting up monitoring stations to measure the cumulative impacts of groups of such sub-watersheds. IWRM processes would then have to take into account a variety of scales of processes that fit within one another, essentially forming the basis of a nested watershed approach to regional land and water management.

Organizations like the Lower Souris River Watershed Committee have been successful due to their ability to build local interest and support for a common vision—a vision that recognizes the economic realities of agricultural producers. As one of many watershed organizations emerging in Canada, it seems there could be exciting opportunities for AAFC to dramatically enhance the effectiveness of these organizations. This may mean that the notion of one single nationally relevant framework is outdated and perhaps a new framework involves federal leadership targets and strong vision with appropriate tools and support for watershed-based organizations to find their own means of fulfilling the overall goals and expectations. Beyond the current province-level agreement structure, this suggests that more federal/provincial flexibility may be warranted, toward the application of an even more focused approach that uses watershed-based boundaries to target regional programming within provinces or even across provincial boundaries.

8.1.3 Strengthen Watershed-Based Monitoring Systems

A strengthened focus on monitoring is potentially an area for federal and provincial support moving forward. This need for monitoring agri-environmental programming impact is closely aligned with the need in IWRM processes to measure and provide feedback to clearly articulated goals. The application of an adaptive management cycle inherent in IWRM processes will likely be beneficial for agri-environmental programs. The need for better systems for monitoring the impacts of agri-environmental programming has been highlighted in the *2008 December Report of the Commissioner of the Environment and Sustainable Development* (Office of the Auditor General of Canada, 2008) asking for more measurement of environmental change resulting from AAFC's programs. A closer alignment of agricultural programs with watershed goals and targets is needed, as this will address the need for closer alignment with regional priorities, as well as allow for watershed-based monitoring of impacts such as stream flows, flood impacts and water quality.

The need for better monitoring systems has a potential impact on producer involvement in IWRM processes. One driver for producer participation that was reinforced in our research was the need for knowledge of impacts of producer actions. This knowledge does help in improving participation in agri-environmental programs. Higher levels of monitoring and results that are made available to producers will likely incent producers to make the necessary changes to improve their impacts on their local drains and streams. The federal government has played a key monitoring role in the past. It could and should play an enhanced role in the future of watershed monitoring, particularly as it relates to measuring the impact of agri-environmental programming.

8.1.4 Provide Fair and Long-Term Financial Incentives and Organizational Support

The magnitude and duration of financial support received consistent attention in our interview responses. There was some criticism from interviewees who stated that producers are disappointed with the increasing levels of complexity and decreasing levels of financial assistance available for BMP implementation support. A general lack of direct federal participation in supporting the core operation of local watershed organizations was also noted in most cases. A consistent message that came through in the research was a perception that available financial resources are either decreasing over the years or being spread thinner (resulting effectively in less financial support for individual watersheds and producers).

While some producer representatives admit that they are not driven by incentive payments, many interviewees commented that programs should cover at least the costs of implementation. Others made the case for payments for lost revenue, and there was a high level of interest in financial incentives that align more closely to the public benefits acquired from these actions. In addition, the time frames associated with financial support are often short and inflexible in terms of staging projects (to make their implementation easier for smaller producers). This was seen as a deterrent to maintaining the level and consistency of support necessary to build producer participation. Economic value was a key driver for motivating the participation of agricultural producers in both IWRM and BMP planning. For producers farming within a watershed, proposed solutions to issues must be economically feasible and practical.

8.1.5 Help Build a "Sense of Place" and Support Local Organizations

There is a significant need for more core operational support in many areas, except British Columbia's Okanagan Basin (where the Okanagan Basin Water Board is sustained by its member local governments). In some cases (e.g., Saskatchewan), significant core funding support is provided from the local and provincial level, but provincial amounts have been declining. Federal support was a key factor in establishing local watershed capacity, and this represents an important future consideration for renewed federal involvement in the future. Local organizations would like to see more federal participation in terms of program staffing and office support, with contribution agreements including predictable payment schedules. With the waning role of extension support from organizations such as the former PFRA and the province, such capacity needs to be developed and supported in locally relevant organizations such as the LSRWC, which provides broad-based support for program delivery.

While financial payments are seen as being a strong driver for BMP adoption, there was a significant case made for the role of the producers' own sense of responsibility and need for healthy and sustainable agricultural and environmental systems. This strong driver of agri-environmental

management can likely be enhanced through programs that strengthen a sense of place and commitment to sign up for voluntary agri-environmental payments. Place-based information and knowledge of the impacts of their actions will potentially build on this sense of responsibility. Communication in the Quebec sub-watershed of ruissueau des Aulnages, in the form of annual bulletins, signage, community meetings and door-to-door discussions helped encourage producer participation. Another example is the Watershed Awareness Initiative in Saskatchewan that aims not only to create an awareness of the relevance and need for watershed based action in producers, but also builds leadership for environmental group planning for achieving watershed goals. A sense of community and place will also increase community buy-in by creating a culture of responsibility. It seems that, although financial incentives will definitely improve producer uptake of agri-environmental programming, it is their voluntary nature that makes them popular. Building this "sense of place" may also help overcome the expressed deterrent of distrust towards government programming. Relating to this, imposition of regulatory requirements on producers met with consistent resistance in all of our case studies.

A strong message from the interviews was the need to support local-level implementation of agri-environmental management for IWRM. In all cases, it seemed like the primary financial resources were federal, oversight was a combination of federal and provincial, and implementation was local. Organizations such as the *club-conseils* at the sub-watershed level in Quebec, the LSRWC in at the watershed level in Saskatchewan and the SRWMC at the watershed level in P.E.I. are the appropriate scale for agri-environmental implementation that aligns with watershed processes. Many respondents identified that the most useful role of the federal government is to provide targeted financial and technical resources to such organizations. This role is important particularly given the declining role of the federal and provincial governments in providing direct on-farm technical and extension support, which was viewed as very valuable to agricultural producers.

8.1.6 Make Resources Accessible and Provide Appropriate Extension Support

Ease of access to resources is a significant driver for agricultural participation in IWRM processes and for increasing BMP adoption rates. Complex paperwork, complicated bureaucratic processes, an inability to understand application requirements and get clear feedback, and multiple applications for similar programs were all quoted as strong deterrents. All case studies made a case for simplified processes with some expert capacity requirements to help with funding applications and processes associated with agri-environmental applications and implementation. While this does not seem to be a potential area for direct federal level involvement, making resources available for this role might be prudent. Further, the logic of coordinating BMP program delivery through a watershed/community-level organization should be explored. The federal transfer of agriculture program funding to the provinces—and in at least the case of Saskatchewan, the establishment of a third party BMP delivery

agency—is not perceived as having simplified program delivery for either local organizations or agricultural producers. A specific recommendation from the P.E.I. case study was to consider a single application for multiple programs with only short appendices or attachments relevant to the specific aspects. Others emphasized the importance of one-on-one support in filling out forms to help increase participation.

8.1.7 Support Locally Relevant Research

The critical need for watershed-based scientific research cannot be underestimated. The case of the Okanagan Basin Water Board (OBWB) appears to be fairly unique in that the vast majority of its efforts have been focused on a series of partnership-based research initiatives—all designed to collect the best possible level of data to model actual water supply and demand across the basin. Based on this research, the OBWB is conducting an extensive stakeholder communication effort. At this point, the OBWB does not have a direct program delivery role focused on agricultural producers. In the future, it may become apparent that strong research and communication functions represent the best initial approach for IWRM initiatives, as these offer the opportunity to: a) clarify the issues based on science and b) build broad community support for whatever initiatives are developed to address these issues. This may ultimately be the most effective approach in determining, targeting, and delivering the most appropriate agricultural BMPs for measurable results at the watershed level.

In both the Okanagan and Lower Souris River case studies, the need for more "systems" research was identified, and it was noted that AAFC could play a pivotal role in this regard by conducting holistic research over time, at a level beyond what most university researchers can do or are interested in doing. However, the perceived trend is that AAFC is significantly reducing its capacity to provide the type of long-term, comprehensive research that is required to support watershed sustainability within agricultural landscapes. The WEBs project is viewed as hopeful evidence that this trend could be reversed in the future.

8.1.8 Provide Technical Support for Local and Consistent High-Resolution Data

In terms of technical support, there is a shortage of locally relevant and updated data for farm and watershed decision-making. This was expressed as a potential role for federal government support. Specific suggestions about the need for technical support included higher resolution LIDAR data (popular in the Quebec watershed), reliable and updated soil nitrate data (relevant in the P.E.I. case study), water-use data (demonstrated by the popularity of the B.C Water Demand Model and its Okanagan Basin Viewer) and relevant mapping and GIS capacity (shown to be relevant in the Saskatchewan case study). References to local crop data, research on alternative crops and more updated data was made several times as a potential area for federal or provincial financial support.

While varying levels of agricultural sector participation in IWRM were evident in our four case studies, an overall lack of integration was apparent in all four. Our conclusions in this section have provided a variety of ways to address this disconnect. We continue to believe that watershed-based land and water management with a high level of sectoral and stakeholder integration can help provide the cost efficiency and environmental effectiveness that is increasingly needed from these programs. In addition, such an integrated approach will optimize co-benefits and potentially create the basis for a new and effective ecosystem approach to land and water management that overcomes traditional sector-based approaches.

9.0 Recommendation for Improving Agricultural Sector Participation in Canadian IWRM

Our case study observations and the federal Growing Forward Agricultural Policy Framework (GF) ground our key recommendations to AAFC-AESB. Growing Forward envisions a Canadian agricultural sector that "contributes to the priorities of increasingly health-conscious and environmentally-aware Canadians" (AAFC, 2011) and Canadian consistently rate water issues—quality and quantity—as their most important environmental issue.

A report by the Commissioner of the Environment and Sustainable Development (Office of the Auditor General of Canada, 2008) identified an important accountability gap with respect to the environmental impact of federal GF programs. AAFC support to watershed-based IWRM processes would address this accountability gap as watersheds provide the most practical management unit for measuring environmental impact. The social aspects of IWRM—community health and economic well-being—can also be analyzed and monitored on a watershed basis.

Our case studies illustrate important regional differences; however, they also highlight significant financial, technical and institutional deficiencies for integrated watershed planning and processes within Canada's agricultural landmass.

The **Okanagan Basin** case in British Columbia demonstrates the value of collaborative and focused research to support watershed initiatives. The Water Supply and Demand Project particularly exemplifies the value of applied and practical research of great importance to the agricultural sector.

The **Lower Souris Watershed** in Saskatchewan reveals the priority accorded to locally relevant extension knowledge and support, particularly due to the capacity gap left by PFRA's departure. The case study provides justification for renewed forms of localized technical support from federal and provincial sources. If emerging IWRM initiatives are going to be effective in engaging agricultural producers, an effective presence is required—in the field—to improve watershed management with tangible forms of producer extension support. This support could occur through the establishment of new federal or provincial staff, or through the provision of core funding for local watershed organizations.

The **Yamaska Watershed** in Quebec highlights the viability and benefit of a nested watershed approach and reinforces the effectiveness of financial incentives—through the Prime-Vert and EGS programming—to engage producers and operationalize IWRM.

The **Souris River Watershed** in P.E.I. demonstrates the pivotal role of social capital in smaller communities, and illustrates how technical and financial assistance can reinforce a community-based commitment, reward volunteer-based efforts and improve a sense of responsibility for watershed stewardship.

A commitment from AAFC-AESB to support IWRM at a fundamental operational level is justified, logical and compelling, and provides the agency with a clear mission consistent with societal priorities and the need for place-based management. Professionalizing IWRM capacity across Canada is a key priority identified through our case studies. IISD therefore makes the following recommendations:

- Based on the joint federal/provincial constitutional responsibility for agriculture in Canada, AAFC should provide 50/50 provincially cost-shared support to core operations of watershed management organizations operating in all agricultural regions of the country. This would dramatically enhance IWRM program delivery capacity by providing direct support that is highly valued by producers.
- Core support should include 50/50 salary support for IWRM professional capacity, specifically including professionals such as a hydrologist, a field agrologist, a range ecologist, an extension specialist, a water science monitoring technician, a geo-spatial analyst and an administrator. These positions should be remunerated at a salary scale commensurate with the civil service to attract highly qualified personnel willing to become contributing members of the communities they serve. IWRM staff should possess qualifications that enable them to interact with the research community and farmers, the long-term value of which is clearly demonstrated by the Okanagan case study.
- The number and spatial scale of the watershed management agencies supported will be determined by the level and priority of matching provincial resources. A recommended limit in the spatial range of support that each individual can effectively service would be in the range of 5000-10,000 square km. Matching provincial funds would ensure shared responsibility, regional flexibility in fulfilling local staffing needs and some prioritization at the provincial level, and a unified federal/provincial commitment to support integrated land and water management.
- A co-requisite to core salary support for IWRM agencies will be an investment in adequate water quality and quantity monitoring in supported watershed. This is fundamental to IWRM principles as well as to program accountability and will strengthen program delivery and evaluation.

Developing appropriate capacity at the watershed level will help overcome a number of barriers to agricultural sector involvement in IWRM initiatives. Strong professional capacity at the watershed

level with a range of urgently required expertise, including agrologists and hydrologists, will address a majority of gaps identified in our case studies (e.g., local research, capacity, data needs, core funding, etc.) as well as ensure closer linkages between watershed and farm processes.

Rather than invest in ad-hoc BMP and EGS programming without linking them to place-based targets and outcomes, AAFC and the Canadian public will be much better served by setting targets and watershed-based environmental outcomes and investing in institutional and professional capacity. The institutional investments recommended in this report will facilitate the systematic, responsible, and efficient deployment of agri-environmental program resources in Canada.

"Give a man a fish; you have fed him for today. Teach a man to fish; and you have fed him for a lifetime" *Author unknown.*

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Appendix A: Template for Interview Questionnaire

For Ag Canada Representative

- What resources do you provide to watershed groups?
    - Technical resources?
    - Funding resources?
    - Other?
    - How well-utilized do you feel these resources are by watershed groups?
- We are researching producer participation in IWRM activities. From your perspective:
    - What do you think might be the motivations for producers to participate?
    - What might be the deterrents/barriers?
    - Do you have any insights on how:
        - A) watershed group participation could be increased?
        - B) producer participation could be increased?

For Watershed Organization

- What Agriculture and Agri-Food Canada (AAFC) resources does your group use?
    - Technical resources?
    - Funding resources?
    - Other?
    - Based on answers from the regional Ag Canada representative, ask probing questions about specific programs.
        - E.g., Are you aware of XYZ funding program?
- What provincial resources does your group use?
    - Technical resources?
    - Funding resources?
    - Other?
    - If you found some particularly relevant provincial resources in your web research, ask probing questions.
        - E.g., Are you aware of XYZ funding program?
- What other resources do you access?
- How complimentary/congruent do you think federal and provincial programs are?
    - Do they duplicate each other?
    - Are there synergies? (explain any synergies)
    - Do they still leave gaps that should be filled? (if so, talk about the gaps)

- What appears to motivate producer participation in programs? (e.g., livelihood benefits, preference to avoid regulations, other economic/social motivations)
    - Do benefits to livelihoods appear to be a motivation?
    - Does fear of regulation appear to be a motivation?
- What might be deterrents to participation?
- Would you be able to recommend and put me in touch with at least one producer to whom I can speak on this topic? (e.g., a keen participant or avid opponent to the programs)
- In what ways might the following ideas be helpful:
    - Establishing a federal interdepartmental IWRM team to coordinate federal participation in local or regional watershed initiatives?
    - Assurance of longer-term support (staffing, technical, financial)?
    - More reliable watershed science data (either gathered by the federal government, or funded by them)?
    - Perhaps some other ideas can be tested from the 2009 report, as well?
- What else would help you with IWRM planning and producer engagement?
- What further roles could AAFC play that could enhance agricultural participation?
- Do you have any other recommendations? If so, please describe.
- What is the size of the watershed?
- Number of farms? (as well as number of farms participating in the relevant IWRM programs)
- Characterization of farms? (pork, poultry, grain, dairy etc.)
- Do you have any other relevant farm statistics?

For Producers

- How are you involved with [insert name of watershed organization]?
- Are you participating in any AAFC programs? (You might already know this from the watershed manager)
- What is your opinion of the IWRM approach? (may have to define IWRM for them[10])
- What motivates you to participate/not participate?
- Can you identify any deterrents or barriers to participation? (either that you perceive or that you know other producers perceive)

[10] Integrated Water Resources Management, or IWRM, can be defined as a beneficial process that promotes the co-ordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. (from AAFC website)

- What would you change about the program(s) and how they are run from the producer's perspective? (i.e., recommendations)
- What might encourage farmers who are not currently participating to join the program?

Appendix B: Current Agri-environmental and IWRM-related Initiatives in BC

Source of Support	Activity/Objective	Type/Level of Support
Federal/Provincial: BC Agricultural Research and Dev. Corp. (ARDCorp). Website: www.ardcorp.ca	EFP development support	Technical: ongoing
Federal/Provincial: ARDCorp: Growing Forward	BMP planning for nutrient mgmt., integrated pasture mgmt., grazing mgmt., irrigation mgmt., water mgmt., and riparian health	Technical: ongoing
Federal/Provincial: ARDCorp: Growing Forward	BMP:NMP 2401 – improving soil/manure nutrient mgmt.	Financial: $70,000 maximum payment per farm over program life; maximum of two BMPs per farm per year
Federal/Provincial: ARDCorp: Growing Forward	BMP:IPMP 2501 – improving integrated pest mgmt.	Financial: $70,000 maximum payment per farm over program life; maximum of two BMPs per farm per year
Federal/Provincial: ARDCorp: Growing Forward	BMP:GMP 2601 – improving grazing mgmt.	Financial: $70,000 maximum payment per farm over program life; maximum of two BMPs per farm per year
Federal/Provincial: ARDCorp: Growing Forward	BMP:IMP 2901 – improving irrigation mgmt.	Financial: $70,000 maximum payment per farm over program life; maximum of two BMPs per farm per year
Federal/Provincial: ARDCorp: Growing Forward	BMP:WMP 2902 – improving water mgmt.	Financial: $70,000 maximum payment per farm over program life; maximum of two BMPs per farm per year
Federal/Provincial: ARDCorp: Growing Forward	BMP:RHA 3001 – improving riparian health/erosion control	Financial: $70,000 maximum payment per farm over program life; maximum of two BMPs per farm per year
Federal/Provincial: ARDCorp: Growing Forward	Agriculture Environment and Wildlife Fund – reduce/mitigate agr. impacts on env. values through: 1) demonstration and adoption of stewardship practices; 2) collaborative area planning; 3) research/education	Financial: Applications from farm organizations and ag-related groups have been funded from $5,000–$50,000

Provincial: BC Agriculture and Lands, Res. Mgmt. Branch. Website: www.agf.gov.bc.ca	Watershed Stewardship: A Guide for Agriculture	Institutional: Basic guide for producers and agricultural organizations
Federal/Prov/Univ/NGO: Wetland Stewardship Partnership. www.bcwetlands.ca	Local government-focused tools and resources including: green bylaws toolkit, interim planning guidelines, and primers on grasslands and wetlands	Institutional: Prescriptive guides for local government
Various NGOs: South Okanagan-Similkameen Conservation Program www.soscp.org	Provision of sustainable agriculture information with respect to biodiversity	Institutional: Basis guides for producers and residents
Federal/Prov/Local/NGO: Cariboo Cattlemen's Watershed Stewardship Council	Organization of demonstration tours, workshops and field days for reducing the impacts of ranching on water quality	Institutional and technical
NGO: Fraser Basin Council: Integrated Planning Processes	Coordination of processes in the Shuswap, Chilako, Nechako watersheds/regions	Institutional: Integrated planning support
Provincial: BC Water Plan. www.livingwatersmart.ca	Contains a strong focus on Water for Agriculture	Institutional: Includes commitments to work with the irrigated ag. sector

Appendix C: Prime-Vert Initiatives that Contribute to IWRM in Quebec

Action name *** = initiative with federal funding**	**Objective**	**Financial support available** (for duration of program, unless otherwise noted)
5.1 Construction of manure storage facilities	Support agricultural operations in resolving point source pollution-related problems through adequate manure management and storage.	Up to 90% of expenses for one manure storage facility or more for first 800 m^3, and up to 50% for volumes exceeding 800 m^3 (funding decreased to 50% as of April 1, 2011, for any volume); not to exceed $125,000 per agricultural operation.
5.3 Dairy effluent management	Enable agricultural operations to manage their dairy effluent.	Up to 70% of expenses for labour and professional services up to a maximum of $20,000
5.4 Alternative facilities for manure management	Help agricultural operations resolve point source pollution problems through adequate manure management.	For installation of new facilities: up to 90% for the first 90 animal units, and 50% for additional animal units; not to exceed $125,000 per agricultural operation For upgrading alternative facilities: up to 70% for labour and professional services, up to a maximum of $20,000 per livestock production site
5.5.1 Management of produce wash and fertilizer solutions; and 5.5.2 Management of post-harvest produce residues	Help agricultural operations resolve point source pollution problems through adequate management of produce wash water and fertilizer solutions/through adequate management of post-harvest produce residues.	Up to 70% for professional services and infrastructure work and the purchase and installation of equipment to better manage produce wash water and greenhouse fertilizer solutions, up to a maximum of $50,000 per agricultural operation
5.6 Aeration of irrigation ponds (to help improve water quality used for crop irrigation)	Help agricultural operations improve the quality of the water used for crop irrigation.	Up to 70% of eligible expenses for professional services and infrastructure work and the purchase and installation of equipment to establish a system to aerate an irrigation pond, up to a maximum of $10,000 per agricultural operation

6.1 Technology for surplus nutrient management	Find a solution for an already-existing problem with manure nutrient surplus management.	Up to 70% for establishing a partial or complete treatment system or an alternative accepted by MAPAQ; or Up to 70% for additional investments for retrofitting a livestock building's liquid manure management system to accommodate a solid-liquid manure or solid manure management system, up to a maximum of $300,000 per agricultural operation
7.0 Manure spreading equipment*	Improve manure spreading management, reduce odours from liquid manure, and reduce greenhouse gas emissions by using low-boom spreaders and equipment for simultaneous incorporation.	Between 50% and 70% for the cost of acquiring a low-boom spreader, depending on model, to a maximum of between $7,000 and $10,000, depending on model.
8.1 Agri-environment support plan (referred to as PAA)*	Support agricultural operations in improving their farming practices by the development of an agri-environmental support plan.	Up to $2,200 per agricultural operation
8.2 Agri-environmental advisory clubs*	Foster the maintenance and development of agri-environmental support club expertise to enable agricultural operations to: • obtain specialized services to support them as part of a structured agri-environmental process that includes production of an agri-environmental support plan; • develop a global vision for their operation in keeping with the imperatives of sustainable agriculture; • speed up the adoption of environment-friendly practices; • promote exchange and transfer of knowledge; • produce or update a phosphorus report, where applicable.	Base: up to equivalent of membership fees Up to $4,000 for group services and agri-environmental research Up to $15,000 for administrative support Up to $30,000 for engineering services Up to $30,000 for geomatics services
8.3 Coordination of agri-environmental advisory clubs*	Support agri-environmental club advisers in their work with members of agricultural operations by encouraging the development of training activities and by devising ways of promoting the exchange of knowledge, information and tools.	Up to $500,000/year

9.1 Group agri-environmental advisory services: Information and awareness	Provide free information about the technological and economic aspects of on-farm manure treatment to agricultural operations and stakeholders.	Up to $80,000 per group
9.2 Group agri-environmental advisory services: Group-oriented activities	Offer advisory services concerning manure nutrient surplus management and treatment to agricultural operations with a phosphorus production surplus. These services, offered to groups or individuals, must enable them to meet the requirements of the *Agricultural Operations Regulation*.	Up to $100,000 per group; up to 50% of the real cost of professional services billed to an agricultural operation by a group, not to exceed $1,500 per year per agricultural operation.
10.1 Measures for reducing nonpoint source pollution*	Reduce the impact of agriculture as a nonpoint source of pollution, and improve water and air quality, and foster the conservation of biodiversity.	Up to 90% for initiatives to reduce nonpoint source pollution, for a maximum of $50,000 per agricultural operation
10.2 Water quality monitoring	Evaluate the impact on water quality of measures to reduce nonpoint source pollution.	Up to 100% for operations required for monitoring water quality in watersheds, notably, gauging, maintenance, laboratory analysis, sample-taking, and water level measurement, for a maximum of $25,000 a year per group.
10.3 Coordination of water management by watershed group*	Ensure coordination of agricultural watershed activities in order to promote reduction of nonpoint source pollution and contribute to improving water quality in farming communities through successful collaboration.	Cost for hiring a project coordinator, for a maximum of $50,000 per year.
10.4 Provincial coordination of watershed projects	Support the implementation and monitoring of watershed group projects for water management carried out under the action plan to combat blue-green algae.	Up to $200,000 per year (including the administrative management of calls for tender, training of project coordinators, and coordination of plan implementation)
10.5 Information and awareness in matters of optimal agricultural practices for improving water quality	Develop and disseminate information in order to promote agricultural adoption by producers of farm technology and practices aimed at improving water quality through information and awareness activities.	Up to 100% for a maximum of $5,000 per project.
11.1 Reduced use of pesticides and risk reduction: Support for Quebec's *Stratégie phytosanitaire*	Step up adoption of integrated pest management in order to rationalize, reduce and replace pesticide use and to protect human and environmental health.	Up to 70% for group-oriented projects, for a maximum of $30,000 for one-year technology transfer projects and one-year development projects, and of $60,000 for two-year development projects.

11.1 Reduced use of pesticides and risk reduction: Pesticide application equipment	Reduce pesticide drift and promote safer and more effective pesticide use in order to lessen the risk to human health and the environment.	Up to 50% for retooling spraying equipment to a maximum of $800 for limiting drift; Up to 70% for purchase of new equipment, for a maximum of $15,000 per sprayer; Up to 50% of the purchase cost of parts that make pesticide use safer (rinsing tank, mixing and loading facilities, pre-mixer), for a maximum of $1,200 per sprayer.

Appendix D: List of Resources for Agri-Environmental Programming in P.E.I.

Federal Assistance			
Branch/Section	**Initiative**	**Type**	**Year**
AAFC (Agriculture and Agri-Food Canada)	Prince Edward Island Ecological Goods and Services Pilot Project	Funding $354,000 Technical (in-kind)	2007–2008, 2008–2009
AAFC	Canada-P.E.I. Agriculture Stewardship Program	Financial	2006
AAFC	Canada-Prince Edward Island National Water Program (Core funding for WGs) – National Water Supply Expansion Program (NSWEP)	Funding, Technical	2006–2011
DFO (Partner: SRWMC)	Community Aquatic Monitoring Program (CAMP) (Water sampling and monitoring)	Funding, Technical	2008–2010
DFO (Partner P.E.I. Department of Fisheries, Aquaculture and Rural Development (DFARD))	Oceans Day	Technical	2010
AAFC (P.E.I. Department of Agriculture, P.E.I. DEEF)	Project WEBS (Watershed Evaluation of Beneficial Management Practises – Spring Ploughing vs. Fall Ploughing effects on nitrate leaching)	Financial, Technical	2010–2011
DFO	Water Quality Testing (water temperatures, dissolved oxygen, salinity, conductivity)	Technical (in-kind)	2010
Provincial Assistance			
Branch/Section	**Initiative**	**Type**	**Year(s)**
P.E.I. Federation of Agriculture (P.E.I. FOA)	Prince Edward Island Ecological Goods and Services Pilot Project	Technical (in-kind)	2007–2008, 2008–2009
P.E.I. DEEF	Prince Edward Island Ecological Goods and Services Pilot Project	Technical (in-kind)	2007–2008, 2008v2009
P.E.I. DEEF	P.E.I. Watershed Management Fund (provides part time Watershed Coordinator)	Financial, Technical (in-kind), Equipment (in-kind)	2006–2011
P.E.I. DEEF	P.E.I. Wildlife Conservation Fund	Financial, Technical (in-kind)	2006–2011
P.E.I. DEEF	P.E.I. Green Spaces Program (Free trees—Souris plants in mainly riparian areas)	Financial, Technical (in-kind)	2006–2011

P.E.I. Department of Transportation and Public Works (P.E.I. DTPW)	Summer Employees (stream bank enhancement, beaver removal, tree planting)	Financial, Technical (in-kind)	2006, 2007
P.E.I. DEEF	Prince Edward Island Ecological Goods and Services Pilot Project/ Green Cover Program	Financial	2007–2008, 2008–2009
P.E.I. DEEF	Environmental Futures (provide summer students)	Financial	2007
P.E.I. DEEF	Family Fishing Day	Financial	2006–2010
P.E.I. DEEF, SAB	Nitrate Testing Clinic (Testing for residents water samples)	Financial, Technical	2008–2009
P.E.I. Department of Innovation and Advanced Learning	Skills P.E.I. (Provides employees)	Financial	2009–2010
P.E.I. Employment Development Agency (P.E.I. EDA)	Jobs for Youth Program (Provides employees)	Financial	2010
P.E.I. DFARD (Partner: DFO)	Oceans Day	Technical	2010
P.E.I. DEEF	Variety of studies in Souris Watershed: Electroshock Fish Stock Counting Program (2007, 2008) Invertebrate Study (2010, 2011)	Technical	2007–2010
Other Assistance			
Group	**Initiative**	**Type**	**Year(s)**
Trout River Environmental Committee	Prince Edward Island Ecological Goods and Services Pilot Project	Technical (in-kind)	2007–2008, 2008–2009
University of New Brunswick	Prince Edward Island Ecological Goods and Services Pilot Project	Technical (in-kind)	2007–2008, 2008–2009
Ducks Unlimited	Prince Edward Island Ecological Goods and Services Pilot Project (2007–2008, 2008–2009), Wildlife Photo Contest (2007, 2008, 2009)	Technical (in-kind)	2007–2008, 2008–2009
Shell Environment Fund	Brook Trout Nursery (2006), Tree Swallow Nest Box Project (2007) Perches and Cover Project (2008, 2009)	Funding (2008: $4,700)	2006, 2007, 2008, 2009
Syngenta	Prince Edward Island Ecological Goods and Services Pilot Project	Financial Technical (in-kind)	2007–2008, 2008–2009
Cavendish	Prince Edward Island Ecological Goods and Services Pilot Project	Technical (in-kind)	2007–2008, 2008–2009
Local Grocers, Shops (Co-op foodstores, IGA)	Variety of projects.	Financial, Technical (in-kind)	2006–2011
P.E.I. FOA, Environmental Farm Plan Section	Farm Day Tour (showcased several BMP and EG&S projects)	Financial, Technical (in-kind)	2007
P.E.I. Union of Public Sector Employees (UPSE)	Family Fishing Day (2007)	Financial	2007

SAB	Breeding Stock Program for Ring Necked Pheasants, Wildlife Photo Contest, Family Fishing Day (2006, 2007, 2008)	Financial, Technical	2006–2011
Main Street Home Hardware Building Centre, SAB	Wildlife Photo Contest, Photo Clinic (2010)	Financial, Technical	2007–2011
Souris Harbour Authority Incorporated, SAB	Harmful Alteration, Disruption or Destruction (HADD Program – Breakwater Repairs)	Technical	2008, 2009
Atlantic Salmon Federation			2010
The Atlantic Salmon Conservation Fund	Atlantic Salmon Project (reintroduced over 5,000 Atlantic Salmon into Souris River)	Financial	2009, 2010
Eastern Kings Community Council	Stream Enhancement for approximately 11 river systems.	Financial, Technical	2009
Southern Gulf Coalition, SAB	Coastal Erosion Monitoring Project	Financial, Technical	2009, 2010