Getting To The Source

Upper Qu'Appelle River and Wascana Creek Watersheds Source Water Protection Plan

March 2008

Saskatchewan
Watershed
Authority

Upper Qu'Appelle River and
Wascana Creek Watersheds Advisory Committees

Developed by the:

Lanigan/Manitou Watershed Advisory Committee

Last Mountain Lake Watershed Advisory Committee

Qu'Appelle River Watershed Advisory Committee

Wascana Creek Watershed Advisory Committee

Upper Qu'Appelle River and Wascana Creek Technical Committee

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Table of Contents

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- Agriculture and Agri-Food Canada – Prairie Farm Rehabilitation Administration
- Ducks Unlimited Canada
- Fisheries and Oceans Canada
- National Research Council Canada – Centre for Sustainable Infrastructure Research
- Saskatchewan Ministry of Agriculture
- Saskatchewan Ministry of Environment
- Saskatchewan Ministry of Municipal Affairs
- Regina Qu'Appelle Health Region
- Saskatchewan Watershed Authority
- Saskatoon Regional Health Authority

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Foreword

This document outlines the plan to help guide future source water management and protection of the Upper Qu'Appelle River and Wascana Creek watersheds. It is designed to be led and coordinated independent of municipal, provincial or federal governments, although delivery will rely heavily on government agencies, ministries and departments to address specific elements of the plan.

The Upper Qu'Appelle River watershed and subsequently, the Wascana Creek watershed, were chosen by the Saskatchewan Watershed Authority as priority areas for watershed and aquifer planning. The areas were chosen mainly because of their many residents and subsequent impact on these watersheds, and the broad support and diversity of stakeholders for community-based watershed and aquifer planning. Stakeholders in these watersheds who stand to benefit from sound water management and source water protection include residents, producers, land managers, as well as all those involved in industry, conservation, health and natural resource management.

Four Watershed Advisory Committees have been involved in the planning process: Lanigan/Manitou, Last Mountain Lake, Qu'Appelle River and Wascana Creek.

The Committees' members' collective experiences and additional scientific information were incorporated into discussions on many aspects of watershed management and protection. Discussions ranged from aquifer protection to lake and river water management information-posting, to governance and legislative requirements. Interests and issues brought forth by stakeholders' representatives form the basis for source water protection in these watersheds. The recommendations and actions in this document are based on the premise that implementation would result in actions most beneficial to residents of the watersheds.

Executive Summary

Despite Saskatchewan having some of the best and most abundant supplies of water in the world, or perhaps because of this fact, there is a growing interest in sound water management–and source water protection–at the community watershed level.

Over three years ago, Saskatchewan Watershed Authority planners approached community stakeholders in the Upper Qu'Appelle River and subsequently, in the Wascana Creek watersheds, inviting these stakeholders to participate in watershed and aquifer planning as Watershed Advisory Committee members. This document is the culmination of those planning efforts, efforts involving rural and urban municipal representatives as well as those from nature-based conservation groups, agricultural agencies and industry. These representatives have shared table-space and meeting rooms, tour buses and project site workshops, and have discussed the challenges, options and opportunities around source water protection in their watersheds.

The recommendations and actions contained in this Source Water Protection Plan, known as the Plan, have been proposed, discussed, prioritized, revamped and reconsidered, then accepted by the members of the Watershed Advisory Committees and reviewed by experts from the Technical Committee. Watershed residents were consulted about the Plan through "open house" venues in several areas of these watersheds. The comments and suggestions received from residents were then provided to the Watershed Advisory Committees for final consideration in the Plan.

Watershed and aquifer planning in the Upper Qu'Appelle River and Wascana Creek watersheds is not a panacea for these areas. Instead, community-based planning may be viewed as a viable and creative component of sustainable watershed management. The recommendations and actions contained therein focus on protecting source waters from degradation in quality or reduction in quantity. Although only priority items are contained in this Plan, the Committees' members view the Plan as a "living" document. They understand some of the recommendations or actions contained in this Plan may be adapted or evolve to address the changing needs and priorities of the communities it represents.

The heart of this document is the core of actions and recommendations developed by community people within these two watersheds. Eighty-two initiatives are contained within ten broad categories. The categories are: Aquifer and Ground Water Management, Communication and Information, Economics, Governance, Legislation and Policy, One-Stop Services, Research, Water Conveyance, Water Management and Water Quality. The recommendations and actions identified by the Committees' members as "Key Priority" items include the development of a broad-scope communication strategy to enhance residents' knowledge of watershed protection and to establish a central repository of watershed information and governance. There is also a need to develop a comprehensive watershed environmental health report and to encourage aquifer and ground water protection. Also identified is the need to strengthen zoning bylaws and for governments and stakeholders to support the delivery of the Plan in its entirety.

It is clear residents' awareness of source water protection and sound watershed management has been broadened through these planning initiatives. Residents from Humboldt to Sedley, from Tugaske to Tyvan, have considered the value of water quality protection and conservation, and stand poised for delivery and implementation. The Watershed Advisory Committees involved in these planning efforts take pride and ownership of its contents and are committed to guide and help facilitate implementation. They are actualizing their theme of "Getting to the Source", first steps in sound watershed management.

Framework

The design and model of watershed and aquifer planning in Saskatchewan was developed shortly after the Saskatchewan Watershed Authority was formed in October 2002. It is believed that the management and protection of Saskatchewan's water resources is best served when stakeholders collaborate through frank rapport and mutual respect, then commit to actions that support a common goal. The goal of planning in these watersheds is to protect the quality and quantity of source waters.

Initial planning efforts focused on areas within the Upper Qu'Appelle River watershed only, but during preliminary discussions with the Watershed Advisory Committees, it was determined the Wascana Creek watershed should become involved in similar activities. It was also determined that one plan would result from all planning efforts in these areas.

Watershed and aquifer planning in these watersheds has taken approximately three years. Geographic and considerable travel distances precluded regular common gatherings of interested stakeholders, thus four areas were identified and simultaneous planning efforts began in each area. Later in the process many of these community stakeholders met for the first time, and then devised ways to work together to develop a unified plan that represented both watersheds: the Upper Qu'Appelle River and the Wascana Creek.

Because of the broad base of interests expressed by members of the Watershed Advisory Committees, the parameters of source water protection were extended to include many direct and indirect aspects of water management for sustainable water quality and abundance. In tandem with this theme, there is need to bolster cooperation and collaboratively share the governance and vision when managing our water-related resources.

Products of this Source Water Protection Plan include:

- an explanation of the circumstances relating to each recommendation or action, and an indication of its respective urgency and need to implement;
- statements describing what is needed, either as recommendations or actions, most of which apply to both watersheds;
- a categorization of recommendations and actions developed and subsequently validated by the four Watershed Advisory Committees and reviewed by the Technical Committee;
- an identified lead agency or organization for each recommendation or action with expectations that the identified entity will consider ways and means of accomplishing at least part of the said recommendation or action; and
- preliminary plans for coordinating implementation of the recommendations and actions with initial focus on the Key Priority items; and a summary table of all recommendations and actions contained in this document and their related aspects of implementation.

Methodology

Planning in the Upper Qu'Appelle River watershed began early in 2004 with the formation of three Watershed Advisory Committees: the Lanigan/Manitou, the Last Mountain Lake and the Qu'Appelle River. A provincial watershed and aquifer planning model had recently been designed and two planning staff of the Saskatchewan Watershed Authority were assigned to the watershed.

Stakeholder organizations, directly or indirectly involved or influential in water use or re-use, were invited to participate through their representation as Watershed Advisory Committee members. Considerable efforts were expended to encourage participation from First Nations, rural and urban municipalities, cities, towns, villages and resort villages, agricultural and environmental interest groups, and academic institutions. Initial meetings were held to explain the value and urgency of watershed and aquifer planning, and to initiate the Saskatchewan Watershed Authority community-based planning model. The Saskatchewan Watershed Authority mandate and the role of it's planners in the planning process were also discussed.

Many Watershed Advisory Committee members participated as volunteers, receiving little or no direct remuneration for their planning efforts. Early in the planning process, members of the three Committees also determined the Wascana Creek watershed residents should become involved in watershed and aquifer planning and join these planning efforts. Early in 2005 the Wascana Creek Watershed Advisory Committee was formed and began community-based watershed and aquifer planning in the area.

In tandem with the formation of the Watershed Advisory Committees, Technical Committee agency representatives specializing in natural resource management began working with the Committees. Technical Committee representatives spanned federal and provincial governments, academic, research and non-government organizations. They provided expertise on surface and ground water management, water quality monitoring, agricultural and environmental programming and practice, urban storm water research, and climate change.

Updates, tours and pilot project information helped the Watershed Advisory Committees' members more fully understand their watersheds. Additional tours helped the Committees' members better understand the dynamics of watershed and aquifer management. As issues arose, Technical Committee members were called on to provide technical expertise and/or program support.

Planning activities involved open and frank discussions about existing and new water-related issues. These issues ranged from erosion control to sharing water management communication needs … to water conservation and the effects of climate change. The Committees' members generally focused on local and regional water-related issues and considered how source waters entering their areas could be better conserved and protected. Discussions on these interests or issues began at Watershed Advisory Committee meetings as members became familiar with each other; at subsequent Committee meetings their discussions centred on prioritizing their respective objectives and developing recommendations.

Watershed information was shared among participants in many ways. Background information on the watersheds' physical and ecological characteristics, its macro- and micro-economics, water resources, and current management considerations was provided

for participants. Guest presentations on specific topics of interest were commonplace at Committee meetings, mostly during the initial two years of planning. Tours of the watersheds enabled scientific and visual learning as well as the sharing of circumstances and experiences across these areas. Newsletters for residents featured the progress in activities related to the Committees' planning efforts and highlighted key priority actions and recommendations.

Abandoned water well decommissioning workshops were held in various areas of the watersheds, raising awareness about the need for aquifer and ground water protection. Opportunities through the Agri-Environmental Group Plan, a component of the federal government's *Agricultural Policy Framework and Growing Forward*, were explored and promoted within the Committees. The Committees' members welcomed the Technical Committee's clarity and science to better define the many complex issues around sustainable water management. Overall, considerable information was gathered and shared during regular monthly Committee meetings in each of the four areas.

It is also noted Wascana Creek Watershed Advisory Committee members identified several additional interests and issues that, because of lower priority ranking, were not incorporated directly into the Upper Qu'Appelle River and Wascana Creek Watersheds Source Water Protection Plan. These interests and issues exemplify the breadth and depth of the Committee's discussions relating to watershed and aquifer planning, and although not pursued as part of the current objectives and recommendations, have been recorded and are being held for future reference. Also recognized are access of information limitations in *The Privacy Act* relating to aquifer and ground water management information.

Considerable time, efforts and dedication by Watershed Advisory Committees' members have helped to formulate the recommendations and actions contained therein. More recently, the four Committees participated in joint meetings that involved their Technical Committee members and resulted in the validation of a Source Water Protection Plan for these watersheds.

Not all members were able to attend all planning meetings despite efforts to secure comprehensive, broad-scope representation. Agencies and additional First Nations will be invited to participate with implementation of the Plan. More information about implementation of the Upper Qu'Appelle River and Wascana Creek Watersheds Source Water Protection Plan follows the Objectives and Recommendations section of this document.

Objectives and Recommendations

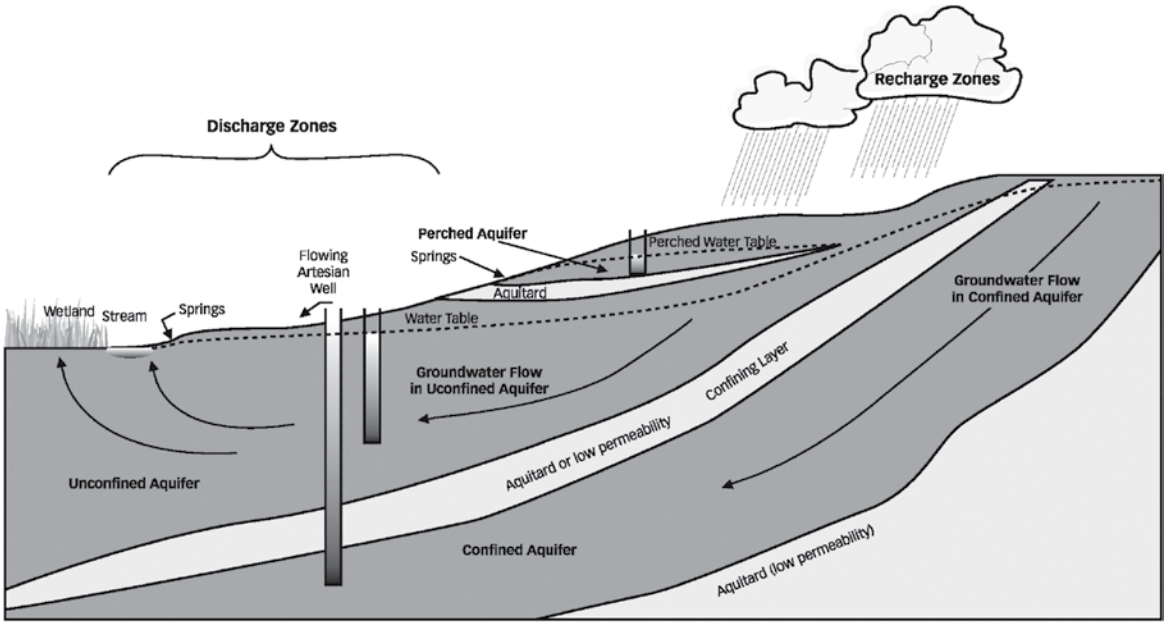
1.1 Aquifer and Ground Water Management–Key Priority

In the initial stages, watershed and aquifer planning in the Upper Qu'Appelle River and Wascana Creek watersheds focused on surface water. During the Watershed Advisory Committee meetings, the participants indicated concerns about ground water.

Ground water is the primary source of drinking water for the majority of communities and rural residents within the watersheds. Most of the residents in the Lanigan/Manitou planning area rely on ground water for their potable water supply. In addition, approximately 45 per cent of Saskatchewan's population and 62 per cent of Saskatchewan communities rely on ground water as their primary water source. Source water protection of both the quality and quantity of ground water is extremely important.

Measuring ground water quality and quantity is generally a difficult task. Data indicating the amount of available ground water in the Upper Qu'Appelle River and Wascana Creek watersheds, with the exception of the aquifers around the City of Regina, is limited. Ground water can be contaminated from numerous activities or sources, including gravel extraction, septic systems, and agriculture practices, but generally the deeper the ground water source is located, the less potential there is for the water quality to be impacted by surface activities.

The dependency on ground water by communities and concerns about contamination sparked much discussion in the planning process. The Committees requested better information about the ground water and aquifers with the objective of source water protection. A recommendation was made for ground water protection plans within the geographic areas of the Upper Qu'Appelle River and Wascana Creek watersheds. To reach the greater public, the Committees requested that basic information about hydrology and Saskatchewan aquifers be made available on a website.



Aquifers and Aquitards Courtesy of The Idaho Museum of Natural History

Abandoned water wells can be a conduit for the contamination of aquifers and ground water. Several well decommissioning field days were held in the planning areas. The Committees recommended that decommissioning of abandoned wells should become a regular program of the provincial government. In addition, funding should be provided to assist landowners with the costs for decommissioning these wells.

Objectives:

- Identify sensitive aquifers in the Upper Qu'Appelle River and Wascana Creek watersheds and increase public awareness about the needs and methods of protecting aquifers and recharge areas.
- Provide all users (municipalities, industry and individuals) with guidelines and regulations for water well placement taking into account factors as such slope, soil permeability, setback distance, and land uses including livestock feedlots, hog barns, sewage lagoons, septic field and residential acreages.

Well decommissioning near Leroy, Saskatchewan.
Photo credit: Saskatchewan Watershed Authority

- Understand the capability and capacity of the aquifers within the boundaries of the Upper Qu'Appelle River and Wascana Creek watersheds as these features relate to water consumption and overuse.
- Implement a pathway identification and record system for abandoned wells.

Each Recommendation and Action in this Plan contains the lead agency in bold, and associated agencies or ministries identified for delivery. This list is not inclusive.

RECOMMENDATION AND KEY PRIORITY ACTION 1

Aquifer and Ground Water Well Database: That the aquifer and ground water database of operational and abandoned wells and the observation well network for Saskatchewan continue to be developed, improved, updated and maintained for aquifer and ground water protection.

Responsibility	Priority	Completion Date
Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Saskatchewan Ministry of Health and Regional Health Authorites Agriculture and Agri-Food Canada - PFRA Watershed implementation agency	High	April 2010

RECOMMENDATION AND KEY PRIORITY ACTION 2

Aquifer and Ground Water Protection: That a ground water management plan for the Upper Qu'Appelle and Wascana Creek watersheds be developed and implemented to protect aquifers and ground water (e.g., Wascana Creek Condie aquifer, Hatfield aquifer, and the Lanigan/Manitou area such as the Town of Nokomis). The plan shall include aquifer sensitivity mapping programs and public information about the needs and methods of protecting aquifers, ground water and recharge areas with respect to water quality and quantity. The ground water management plan shall also include recommended land use techniques, recommended zoning bylaws, and the interrelationships among aquifers, ground water, recharge areas, catchment basins and surface waters.

Responsibility	Priority	Completion Date
Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Saskatchewan Ministry of Health and Regional Health Authorities Watershed implementation agency	High	April 2012

RECOMMENDATION AND KEY PRIORITY ACTION 3

Aquifers "101", Hydrology "101" and Water Well Management: That documents be prepared, published for public use and placed on the appropriate provincial website with:

- information on existing aquifers and ground water and how they interact based on aquifer and ground water studies requested in the Source Water Protection Plan;
- basic principles and theory of hydrology; and
- a comprehensive information package regarding well placement, monitoring, maintenance and decommissioning.

Responsibility	Priority	Completion Date
Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Agriculture and Agri-Food Canada - PFRA Environment Canada Saskatchewan Research Council	Medium	Ongoing

RECOMMENDATION AND KEY PRIORITY ACTION 4

Mandatory High-Risk Aquifer/Ground Water Protection: That, based on results of the studies to identify high-risk aquifers and ground water, a well decommissioning program be developed to ensure decommissioning of abandoned water wells occurs and other protection measures are implemented.

Responsibility	Priority	Completion Date
Saskatchewan Watershed Authority Agriculture and Agri-Food Canada - PFRA Saskatchewan Research Council	High	Ongoing

RECOMMENDATION AND KEY PRIORITY ACTION 5

Fund Well Decommissioning: That a program be developed to encourage and financially support a well decommissioning program for abandoned water wells. The program would increase financial program support, reduce costs and simplify the abandoned well decommissioning process.

Responsibility	Priority	Completion Date
Saskatchewan Watershed Authority Watershed implementation agency Agriculture and Agri-Food Canada - PFRA Saskatchewan Ministry of Agriculture Saskatchewan Ministry of Environment	High	2008

1.2 Communications and Information

People often take good quality, abundant water for granted. They do not always understand how their actions can alter water quality and quantity, or how stewardship and improved land-use practices can be implemented to maintain and improve water. Changing behaviour is fundamental to promoting environmental sustainability, as the cumulative impact of individual and group actions far outweighs what can be accomplished through the broad regulatory management of agencies such as the Saskatchewan Watershed Authority.

The Watershed Advisory Committees brought forward several objectives on communications and information. A key priority was the development of a communications strategy with extensive information on source water protection and management.

The Committees have also requested a comprehensive report on watershed health for the Upper Qu'Appelle River and Wascana Creek watersheds. This information would be more detailed than the current State of the Watershed Report prepared by the Saskatchewan Watershed Authority.

Technology in water treatment changes rapidly to meet water quality standards. The Committees recommended that current technologies be promoted within the watersheds' communities. Recommendations were also put forth on the need for the federal and provincial governments to publicize the Agri-Environmental Group Plans to local residents.

Watershed and aquifer planning was a significant step in informing local stakeholders about the allocation and management of water resources. The Committees recommended that this dialogue should be continued with the watershed's communities and advisory groups.

Objectives:

- Enhance public awareness of managing aquatic and terrestrial habitat for economic, social and environmental values. Enhance public awareness of sound ecosystem management and the value of maintaining natural areas to build support for watershed and aquifer planning and management.
- Inform users about the impact of urban and industrial development on water infiltration and runoff.
- Upper Qu'Appelle River and Wascana Creek Technical Committee to provide techniques to encourage environmentally-friendly shoreline/riparian development and reclamation.
- Make information on quality and sustainability of ground waters and aquifers more accessible to the public. Clarify the relationship between aquifers and ground water.
- Increase public understanding of the impacts of water quantity during flood events on marshes, recreation and irrigation areas from agricultural drainage and flood control measures.
- Increase public understanding of Wascana Creek. Information is necessary on how the creek functions, its use as a conveyance/storage system and the limits of its capacity.
- Provide information on the impacts of chlorinated waters on soils (ground water) and levels of chlorine in treated waste water.

RECOMMENDATION AND KEY PRIORITY ACTION 6

Communication Strategy Developed/Implemented: That the provincial government lead in the development and implementation of a communication strategy. The communication strategy to include:

- stakeholders' opportunities to participate in watershed and aquifer planning and implementation;
- impacts of climate change on/by people and ecosystems (e.g., effects of water/energy conservation programs and agricultural beneficial management practices);
- drainage and flood control;
- impacts of urban and industrial development on water infiltration and runoff (e.g., paving parking lots);
- use of salts in water softeners (e.g., potassium chloride vs. sodium chloride, also as beneficial management practices);
- impact of chlorine in water and soils;
- the difference between chlorine and chloride;
- ecosystem management and a broader understanding of what an ecosystem is and the value of natural areas;
- agricultural developments including drainage, intensive livestock operations, irrigation and beneficial management practices;
- programs that impact the watershed;
- waste water effluent management;
- aquifer and ground water management and source water protection;
- a water flow and release hotline;

- State of the Fisheries Report;
- an information package for the various components of Wascana Creek.

The communications strategy would work toward enhancing the public's awareness about protecting and maintaining aquatic and terrestrial habitat for sustainable economics and a sustainable environment.

The communications strategy would ensure that watershed residents near water bodies be informed about environmentally-friendly shoreline/riparian development and reclamation (e.g., providing them with *On the Living Edge* handbooks and information from websites).

The communication strategy would, after consultation with stakeholders, inform the public about the complexities of drainage and flood control relating to aquatic ecosystems, recreation and irrigation areas in the watersheds (e.g., Wascana Creek and Lanigan/Manitou areas).

Irrigation users may be a specific audience targeted in the communication strategy. The strategy should be designed with consultation from all stakeholders. Environmental venues to be used to provide information could include: Wings Over Wascana Festival, Chaplin Shorebird Festival, provincial parks and Prairie Conservation Action Plan initiatives. Water management plans, policies and decision rationale should be communicated regularly and in a timely fashion to water users through venues such as newsletters, a website, and a seven-day a week telephone number.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Last Mountain Lake Stewardship Group Watershed implementation agency	Key	June 2008

Objectives:

- Determine what, if any, impact current waste water management has on surface and ground water, and determine what impact water control infrastructure has on water quality.
- Determine if current waste water management is in line with the Canada-wide strategy of the Canadian Council of Ministers of the Environment.
- Establish a comprehensive repository of information including wells, abandoned wells, irrigation, water courses and intensive livestock operations.
- Acquire information on the impact of chemicals and manure in agricultural runoff upon surface and ground water (e.g., nitrogen, pesticides, herbicides and fertilizers).
- Ensure watershed managers and watershed users are informed and understand the interrelationships between and among aquifers, recharge areas and surface waters. Planning decisions must be based on good information.
- Acquire current maps and databases to determine location of riparian areas and small wetlands in order to facilitate further understanding and overall management toward ecological health of the area. This information will establish a reference point for

benchmarking, baseline management and planning. In addition, ensure that data sets are readily accessible to watershed organizations.

- Determine and communicate causes of changing water quality and lake health within the entire Upper Qu'Appelle River and Wascana Creek watersheds.
- Determine if the current increase in waterfowl and wildlife populations is having an impact on water quality. Acquire more information on the impact of wildlife and waterfowl feces on water quality.
- Acquire information on current research findings regarding potash mine tailings and brine ponds as they relate to ground water quality. Information is needed on future water use from Saskatchewan Ministry of Environment, Saskatchewan Energy and Resources and the potash industry.

RECOMMENDATION AND KEY PRIORITY ACTION 7

Watershed Environmental Health Report of the Upper Qu'Appelle River and Wascana Creek Watersheds: That a comprehensive, detailed report on watershed environmental health be prepared every three years with annual updates by sub-watershed. The first comprehensive report including baseline data and interpretation specific to these watersheds shall be produced by 2009. This report is required for publics' understanding and to guide public policy.

The framework of the report will:

- review watershed environmental health history;
- identify current practices, current watershed environmental health as well as current and potential stressors;
- identify data gaps and research to be conducted to eliminate data gaps to determine inter-relationships between and among aquifers, ground water, recharge areas and surface waters;
- assess risk for stressors;
- rate effects of stressors and potential stressors on water quality;
- indicate new/amended policies and regulations;
- identify mitigation measures and assessment of their effectiveness and practicality; and
- include recommendations for future actions.

The report to include but not be limited to:

- existing water allocation;
- study of aquifers and ground water with high sensitivity;
- identify hazards and assess risks to aquifers and ground water;
- base information on ground water quantity and quality;
- effects of urban and rural practices on surface and ground water quality and quantity;
- monitoring of urban storm waters;
- algae blooms and production of toxin;
- status of fisheries;
- impact of nutrients, e.g., manufactured fertilizer, manure and sewage effluent;
- impact of synthetic chemicals, e.g., chlorinated water, oil, pesticides, herbicides, personal care products, cleaning substances and pharmaceuticals;

- impact of salts and alkalinity, e.g., potash mine tailings and brine, water softener and road salt;
- land-use practices including development that benefits or compromises water quality from source to supply;
- cottage developments adjacent to water bodies including the Qu'Appelle River, Buffalo Pound Lake and Last Mountain Lake;
- industrial activity and gas caverns, other mining and manufacturing containment ponds;
- all agricultural impacts including intensive livestock operations, high density agriculture versus traditional or extensive agriculture, containment near fuel/chemical tanks, manure handling/disposal, disposal of dead animals and livestock access to waterways;
- water infrastructure and current waste water treatment that includes sewage management;
- potential stressors from wildlife, e.g., feces, urine, and carcasses;
- riparian buffers along watercourses;
- impact of soil erosion;
- storm water runoff quantity and quality from cities, towns and roads
- assess if current treatment systems are in line with the Canada-wide strategy of the Canadian Council of Ministers of the Environment, specifically ammonia and phosphorus reduction;
- effects of extreme weather, e.g., drought, flooding and torrential rainfall.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Saskatchewan Ministry of Health and Regional Health Authorities Watershed implementation agency	Key	April 2009

Objective:

- Provide Watershed Advisory Committees with information about alternate water supplies and watering systems for water users.

RECOMMENDATION AND ACTION 8

Monitor Progress of Agri-Environmental Group Plan Efforts: That progress of the Agri-Environmental Group Plan's dissemination of information and programs on alternate water supplies and watering systems for water users be regularly monitored by the Watershed Advisory Committees or watershed implementation agency.

Responsibility	Priority	Time Frame
Watershed implementation agency	High	Annually beginning in April 2008

RECOMMENDATION AND ACTION 9

Treatment Technologies in Communities/Municipalities: That awareness of new and current technologies/options for drinking water and effluent treatment be promoted within small communities and municipalities.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Environment Saskatchewan Ministry of Municipal Affairs Saskatchewan Ministry of Health	Medium	Annually beginning in April 2008

Objective:

- Understand policies, regulations and processes surrounding water allocation, e.g., licensing and management, nationally, inter-provincially, and provincially.

RECOMMENDATION AND ACTION 10

Apprise on Water Allocation Policy, Regulations and Process: That the Watershed Advisory Committees and their successors continue to be apprised of policy, regulations and process surrounding ground and surface water allocation (including national, inter-provincial, and provincial) e.g., Qu'Appelle River.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority	High	October 2010

1.3 Economics

Economic factors have a significant role in source water protection. A common topic in the Watershed Advisory Committees' meetings was that a healthy economy was integral to implementation of the Source Water Protection Plan. Several recommendations stress the need to balance a sustainable environment with a sustainable economy.

Early in the watershed and aquifer planning process, participants identified the need for water conservation in terms of reducing both water and energy use. Presentations regarding the Saskatchewan Water Conservation Plan were provided to the Watershed Advisory Committees.

Another factor in discussions around water conservation were the initial studies for the *Qu'Appelle River Conveyance Improvement Project* from Lake Diefenbaker to Buffalo Pound Lake. Committees' members stressed that effective water management and conservation would impact the design for this proposal.

Provincial and federal government support for communities for water infrastructure and testing was encouraged by the Committees' members. More stringent environmental regulations may result in municipalities dedicating greater funds to drinking water and sewage treatment thus the requirement for ongoing financial support.

Related to this topic was the recommendation for full cost recovery including life cycle costs for utilities. The Committees' members indicated that the provincial government and communities should account for all costs for water conveyance and infrastructure. All levels of government, along with stakeholders, were requested to contribute to the cost of incorporating fish passage into dams, road crossings and other water works.

The Watershed Advisory Committees stated that the federal and provincial governments should continue to fund stewardship actions that contribute to source water protection.

Objectives:

- Ensure government policy reflects a balance between sustainable economic development and sound environmental management.
- Ensure environmental regulations are complimentary to sustainable agriculture.

RECOMMENDATION AND ACTION 11

Balance Economics with Enviroment: That the provincial government address sustainable economic development without sacrificing sound environmental management, and consult with stakeholders, and consider environmental impacts when developing legislation, regulations and policy, e.g., Saskatchewan Green Strategy. Furthermore, environmental and agricultural recommendations should be in harmony to ensure sustainable agriculture and environment.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Environment **Saskatchewan Ministry of Agriculture** Saskatchewan Ministry of Energy and Resources Saskatchewan Ministry of Municipal Affairs	High	April 2009 and ongoing

Objective:

- Manage energy and water use wisely.

RECOMMENDATION AND ACTION 12

Water/Energy Conservation: That water reuse, recycling, and water and energy conservation programs be publicly encouraged, and that building codes and permits on developments or renovations address water conservation techniques and devices, e.g., low-flush toilets.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority National Research Council Canada - Centre for Sustainable Infrastructure Research Communities of Tomorrow Saskatchewan Ministry of Environment Saskatchewan Ministry of Energy and Resources Municipal governments	High	October 2008 and ongoing

Objectives:

- Ensure communities enact provincial standards of sewage management and water supply protection, and have access to government funding.
- Ensure appropriate, adequate long-term funding for water quality testing and monitoring.

RECOMMENDATION AND ACTION 13

Funding for Municipal Sewage Management: That municipal governments be provided with some negotiated level of funding to ensure changing government standards for sewage management and water supply can be met.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Municipal Affairs Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Saskatchewan Ministry of Health and Regional Health Authorities Infrastructure Canada Environment Canada	High	April 2008 and ongoing

Objective:

- Water is valuable and fairness is needed in the allocation of costs for infrastructure. Ensure the life-cycle costs for management of water utilities are affordable for communities.

RECOMMENDATION AND ACTION 14

Cost Recover for Water Infrastructure: That municipal water and waste water works be operated as utilities to ensure full-cost recovery billing for water that includes life-cycle costs of:

- construction;
- operation;
- replacement;
- watershed and aquifer/ground water protection.

These efforts may be introduced in stages.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Municipal Affairs Saskatchewan Watershed Authority Infrastructure Canada SaskWater Municipal governments	High	April 2008 and ongoing

Objective:

- Future dams, road crossings and other water works that provide fish habitat should be altered to accommodate fish passage.

RECOMMENDATION AND ACTION 15

Fish Passage Through Works: That additional expense for design, installation or alteration of dams, road crossings, and other water works required to accommodate fish passage be solved through consultation and cost-sharing among municipal, provincial and federal governments, and other stakeholders.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Municipal Affairs Fisheries and Oceans Canada Saskatchewan Ministry of Environment Saskatchewan Wildlife Federation Municipal governments	Medium	Process developed by October 2008

RECOMMENDATION AND ACTION 16

Economic Support: That the provincial and federal governments support specific conservation and stewardship actions taken by an individual or a group that are commonly recognized to protect source waters and benefit society.

Responsibility	Priority	Time Frame
Environment Canada Agriculture and Agri-Food Canada - PFRA Fisheries and Oceans Canada Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Saskatchewan Ministry of Agriculture	High	April 2008 and ongoing

Objective:

- Achieve sound environmental farm planning that is funded equitably by society.

RECOMMENDATION AND ACTION 17

Agricultural Plan Framework: That provincial financial support be secured and federal financial support increased for the delivery of Agri-Environmental Group Plans under the *Agricultural Policy Framework and Growing Forward*.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Agriculture Agriculture and Agri-Food Canada - PFRA	High	October 2008

Objective:

- Society should benefit economically and educationally from the use of natural areas within the Upper Qu'Appelle River and Wascana Creek watersheds.

RECOMMENDATION AND ACTION 18

Ecotourism Development: That potential ecotourism and educational opportunities be considered/developed in key areas of the Upper Qu'Appelle River and Wascana Creek watersheds, e.g., Wascana Lake area, Manitou Lake, Craik Sustainable Living Project and others.

Responsibility	Priority	Time Frame
Saskatchewan Nature and Ecotourism Association Saskatchewan Ministry of Energy and Resources Municipal governments	Medium	October 2008 and ongoing

1.4 Governance

The general direction of source water protection is towards local watershed management. The watershed and aquifer planning process provides an opportunity for the development of watershed-focused and more effectively engaged stakeholders. Non-government agencies and other interest groups are critical for decision-making and implementation of the Source Water Protection Plan. At the same time, Saskatchewan's watershed and aquifer planning philosophy does not imply a reduced role for government or a substitute for regulation or monitoring. The agencies involved in the Technical Committee are expected to assist in this implementation through programming or funding.

In the Upper Qu'Appelle River and Wascana Creek watersheds planning process, governance was a prime topic of discussions during the sessions. Participants stressed the importance of

building alliances among governments, conservation organizations, municipalities, industry and agriculture for successful adoption of the Plan.

In their recommendations, the Watershed Advisory Committees stated each planning area (Lanigan/Manitou, Last Mountain Lake, Qu'Appelle River and Wascana Creek) would continue to have an ongoing presence during development and implementation of the Upper Qu'Appelle River and Wascana Creek Watersheds Source Water Protection Plan. The Committees endorsed the model of equal representation and fairness among stakeholders.

Consultation among federal and provincial agencies was considered to be a priority, particularly in the joint jurisdictional area of fisheries resources. The Committees recommended that the watershed implementation agency provide advice to municipalities and individuals in regard to environmental regulations with the provision that both levels of government provide adequate funding for this role.

Objectives:

- Ensure that the public have a mechanism for involvement in the protection of their local watersheds.
- Ensure that the implementation of the Source Water Protection Plan is carried through with the Committees as an advisory to the Saskatchewan Watershed Authority.

RECOMMENDATION AND ACTION 19

Upper Qu'Appelle River/Wascana Creek Watersheds Advisory Committees' Presence: That Lanigan/Manitou, Last Mountain Lake, Wascana Creek and the Qu'Appelle River Watershed Advisory Committees have an ongoing presence and independence in the Upper Qu'Appelle River and Wascana Creek watersheds.

Responsibility	Priority	Time Frame
Watershed implementation agency	High	Immediate and ongoing

RECOMMENDATION AND ACTION 20

Watershed Advisory Committees' Independence From Government: That the provincial government maintain Watershed Advisory Committees representing local watersheds as part of the watershed implementation agency.

Responsibility	Priority	Time Frame
Watershed implementation agency	Low	October 2007 and ongoing

RECOMMENDATION AND ACTION 21

Local Implementation of the Source Water Protection Plan: That the provincial government develop a strategy to ensure local implementation of the Upper Qu'Appelle River and Wascana Creek Watersheds Source Water Protection Plan and provide technical, financial and moral support.

Responsibility	Priority	Time Frame
Watershed implementation agency	High	October 2007 and ongoing

Objective:

- Include all sectors in future evaluation and implementation of the Upper Qu'Appelle River and Wascana Creek Watersheds Source Water Protection Plan. A sense of fairness to all sectors must prevail in developing and implementing the Plan.

RECOMMENDATION AND ACTION 22

Communication and Participation: That the Source Water Protection Plan be communicated to residents and participation solicited so that all stakeholders in the watershed have an opportunity to participate as equals during Source Water Protection Plan governance.

Responsibility	Priority	Time Frame
Watershed implementation agency	High	April 2008

Objective:

- Be transparent and co-operative, and co-ordinate a common understanding of watershed-related issues among residents and secure the quality, quantity and sustainability of our water resources.

RECOMMENDATION AND ACTION 23

Involvement in Local and Regional Water Issues: That the watershed implementation agency for the Upper Qu'Appelle River and Wascana Creek watersheds be involved in relevant local and regional water-related issues. The goal is to enhance meaningful public consultation and engagement for watersheds' residents.

Responsibility	Priority	Time Frame
Watershed implementation agency	High	Immediate and ongoing

Objective:

- Encourage improved interaction among federal, provincial and municipal governments regarding fish habitat (e.g., culvert replacement and other activities).

RECOMMENDATION AND ACTION 24

Funding of Watershed Co-ordinator/Liaison: That funding be secured through federal and provincial governments for someone dedicated to the watersheds to facilitate the bureaucratic process, such as permitting and regulations, which individuals, landowners and municipal governments face for projects near and in water.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Municipal Affairs Saskatchewan Association of Rural Municipalities Saskatchewan Urban Municipalities Association Saskatchewan Watershed Authority Fisheries and Oceans Canada Agriculture and Agri-Food Canada - PFRA Saskatchewan Ministry of Environment	Medium	April 2009

Objective:

- Ongoing information is required on the water conveyance in the Upper Qu'Appelle River channel to ensure protection from erosion, mitigation and water quality sustainability.

RECOMMENDATION AND ACTION 25

Input in Conveyance Decision-Making: Qu'Appelle River Watershed - That the watershed implementation agency, as a stakeholder, be formally represented and have input into decision-making regarding all phases of the *Qu'Appelle River Conveyance Improvement Project*, which may involve continuation of the Watershed Advisory Committee beyond completion of the Source Water Protection Plan.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Watershed implementation agency	High	April 2008

Objective:

- Strengthen the relationship among stakeholders in watershed and aquifer planning, specifically Conservation Area Associations and Watershed Associations.

RECOMMENDATION AND ACTION 26

Co-operation: That local Conservation Area Associations and Watershed Associations work together on issues of mutual current and potential concern relating to surface and ground water stewardship.

Responsibility	Priority	Time Frame
Watershed implementation agency Conservation Area Associations Watershed Associations	Medium	April 2010

1.5 Legislation and Policy

The initial steps of the watershed and aquifer planning process included the provision of information to the Watershed Advisory Committees about the regulatory and programming role of the federal and provincial government on water quality and management. Technical Committee members or staff from Environment Canada, Fisheries and Oceans Canada, Saskatchewan Ministry of Environment, Saskatchewan Ministry of Agriculture and the Saskatchewan Watershed Authority provided presentations on their respective role in the world of water.

From the presentations, discussion focused upon both the overlaps and gaps in legislation on the topic of source water protection. A key priority identified by the Committees is for the provincial government to assist municipal governments by developing zoning templates which promote source water protection. The emphasis is continued with recommendations for legislation for the protection of ground water and aquifers. The topic of storm water was discussed extensively and the recommendation reflects the need for more substantive legislation in this area.

The licensing of intensive livestock operations was reviewed in the watershed and aquifer planning process. The Committees recommended that the responsibility for regulation of intensive livestock operations should be reviewed by the provincial government with the possibility of administration by an agency other than the Saskatchewan Ministry of Agriculture.

Objective:

- Municipal governments will require technical and financial assistance if the municipalities have to develop and enforce appropriate zoning bylaws that incorporate watershed and aquifer planning, management and source water protection.

RECOMMENDATION AND KEY PRIORITY ACTION 27

Zoning Bylaws: That the provincial government promote an understanding of the value and challenges and enforcement of development plans and zoning bylaws, and communicate to local administrators, council members and developers. The provincial government should develop an official community plan and zoning bylaw templates that include:

- surface and ground water protection;
- slope stability;
- effluent discharges;
- building codes;
- septic and sewage pump-outs;

- water collection and drainage;
- solid waste disposal;
- site drainage;
- septic fields;
- set-back distances from shorelines based on local geography, soil types and topography;
- harmonization with adjacent municipalities' bylaws;
- local council and administration accountability;
- enforceability;
- development officer;
- bylaw enforcement officer;
- municipal basic planning statement (or development plan);
- landscaping and service installations;
- country residential developments.

These templates shall be developed by the provincial government in consultation with Saskatchewan Association of Rural Municipalities (SARM), Saskatchewan Urban Municipalities Association (SUMA) and Provincial Association of Resort Communities (PARCS). The templates will include timely technical and financial assistance from the federal and provincial governments. Municipalities should incorporate these templates and enforce or conform to new or revised regulations through a planning statement and zoning bylaws.

It is anticipated municipal representatives will have an opportunity to work with SUMA and SARM planners to develop harmonized bylaws among municipalities relating to flood plain development. Urban and rural municipal governments need to develop the bylaws, educate and inform the public, and then enforce zoning bylaws that incorporate:

- watershed planning;
- stewardship;
- watershed management;
- source water protection.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Municipal Affairs Municipal governments National Research Council Canada - Centre for Sustainable Infrastructure Research Saskatchewan Ministry of Environment Saskatchewan Watershed Authority Saskatchewan Ministry of Health and Regional Health Authorities	Key	April 2010

RECOMMENDATION AND ACTION 28

Aquifer Protection: That provincial regulations for the protection of quality and quantity of aquifers, ground water and recharge areas be developed.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Saskatchewan Ministry of Health and Regional Health Authorities Saskatchewan Ministry of Agriculture Saskatchewan Ministry of Municipal Affairs	Medium	April 2013

RECOMMENDATION AND ACTION 29

Aquifer Protection in *The Planning and Development Act*: That aquifer and ground water protection be incorporated into all relevant provincial legislation including *The Planning and Development Act*. A review to incorporate relevant legislation should occur every five years.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Municipal Affairs Saskatchewan Ministry of Health and Regional Health Authorities Saskatchewan Ministry of Environment Municipal governments	Medium	April 2013 and ongoing

Objective:

- Re-examine what is currently perceived as an inadequate monitoring and evaluation process for existing feedlots, hog barns and slaughter plants.

RECOMMENDATION AND ACTION 30

Re-examine Evaluation/Monitoring of Feedlots, Hog Barns, Slaughter Plants: That the provincial government re-examine the current evaluation and monitoring process for existing feedlots, hog barns and slaughter plants, as currently administered by the Saskatchewan Ministry of Agriculture, for possible administration by a different regulatory agency or new review body.

Responsibility	Priority	Time Frame
Independent Review Board Saskatchewan Ministry of Environment Saskatchewan Ministry of Agriculture Saskatchewan Ministry of Health and Regional Health Authorities	Medium	April 2009

Objective:

- Set storm water quality regulations and legislation in consultation with municipalities and stakeholders. Develop water quality guidelines and regulations for urban runoff.

RECOMMENDATION AND ACTION 31

Stormwater Legislation and Urban Runoff Guidelines: That the provincial government, in consultation with municipalities and stakeholders, develop storm water quality and quantity legislation/regulations/guidelines for urban runoff, ensuring implementation to achieve compliance is manageable, affordable, enforceable, and environmentally-acceptable. The guidelines shall include monitoring and analysis to identify and manage contaminants.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Environment Saskatchewan Ministry of Municipal Affairs Municipal governments Watershed implementation agency Saskatchewan Watershed Authority National Research Council Canada - Centre for Sustainable Infrastructure Research Environment Canada	High	April 2013

Objective:

- Ensure compliance with the federal *Fisheries Act* is manageable, affordable and environmentally-acceptable.

RECOMMENDATION AND ACTION 32

Review of the Federal *Fisheries Act*: That Fisheries and Oceans Canada review the federal *Fisheries Act* with the intent of conducting an update of the Act and its Regulations. The review should cover regulatory issues that involve discharges to sanitary sewers, clarifying deleterious substances (including ammonia), source control, accountability, seasonal weather and climate issues, roads, bridges and culverts. A principle of the review is to ensure compliance is manageable, affordable and environmentally-acceptable.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Environment Fisheries and Oceans Canada Environment Canada Stakeholders	High	Ongoing

RECOMMENDATION AND ACTION 33

Guidelines for Agricultural, Industrial and Highway Runoff: That water quality guidelines and regulations for agricultural, industrial and highway runoff, e.g., salt, be developed and implemented, ensuring implementation to achieve compliance is manageable, affordable, enforceable and environmentally-acceptable.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Environment Canadian Council of Ministers of the Environment Saskatchewan Ministry of Agriculture Saskatchewan Ministry of Energy and Resources Saskatchewan Ministry of Highways and Infrastructure Watershed implementation agency	Medium	April 2013

RECOMMENDATION AND ACTION 34

Watershed Health Report: That a "Watershed Health of the Upper Qu'Appelle River and Wascana Creek Watersheds" report become a legislative requirement of the provincial government.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Agriculture and Agri-Food Canada - PFRA Saskatchewan Ministry of Environment Saskatchewan Ministry of Agriculture Saskatchewan Ministry of Health and Regional Health Authorities Saskatchewan Ministry of Energy and Resources Partners FOR the Saskatchewan River Basin Saskatchewan Soil Conservation Association Prairie Conservation Action Plan Ducks Unlimited Canada	High	April 2010

RECOMMENDATION AND ACTION 35

Health Regulations: That the provincial government of Saskatchewan revisit requirements toward safe and responsible standards, applicable to the diversity of Saskatchewan's topography (particularly slopes), for septic fields, leaching pits and sewage pump-outs with proximity to a water body or high water table, e.g., set-back distances from water must incorporate topography.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Health and Regional Health Authorities Saskatchewan Ministry of Environment Health Canada Saskatchewan Ministry of Municipal Affairs Fisheries and Oceans Canada	Medium	April 2010

Objectives:

- Develop a comprehensive water management policy for the Upper Qu'Appelle River and Wascana Creek watersheds.
- Develop a comprehensive and consistent provincial drainage policy, with consideration to ecological and hydrological impacts of drainage.

RECOMMENDATION AND ACTION 36

Provincial Flood and Drainage Policies: That flood, wetlands and drainage policies and associated regulations be developed and implemented with consideration to regional circumstances and ecological and hydrological impacts.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Watershed implementation agency Saskatchewan Ministry of Agriculture Saskatchewan Ministry of Environment Agriculture and Agri-Food Canada - PFRA	High	April 2010

Objective:

- Strengthen flood control regulations as necessary.

RECOMMENDATION AND ACTION 37

Provincial Flood and Drought Strategy: That the provincial flood and drought strategy be reviewed and updated to mitigate the effects of floods and drought. The strategy should address the effects of climate change.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Agriculture Agriculture and Agri-Food Canada - PFRA Environment Canada Climate Change Saskatchewan	High	April 2009

Objective:

- Manage development within and adjacent to flood plains to ensure a sustainable watershed environment.

RECOMMENDATION AND ACTION 38

Develop/Implement Flood Plain Regulation: That consistent flood plain guidelines and regulations be adopted in municipal planning statements and zoning bylaws, if not currently enacted, and enforced to restrict development on or adjacent to all flood plains.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Municipal Affairs Municipal governments Environment Canada Agriculture and Agri-Food Canada - PFRA	High	April 2009

Objective:

- Promote conservation and restoration of wildlife habitat throughout the watersheds.

RECOMMENDATION AND ACTION 39

Natural Capital: That federal and provincial governments and conservation agencies continue to develop the concept of "natural capital" to recognize value and protect our natural capital through public information before implementation of broad-scale economic instruments.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Environment Ducks Unlimited Canada Nature Conservancy of Canada Saskatchewan Ministry of Finance Fisheries and Oceans Canada Saskatchewan Wildlife Federation Environment Canada Agriculture and Agri-Food Canada - PFRA Saskatchewan Watershed Authority Saskatchewan Ministry of Agriculture	High	April 2009

Objective:

- Provide optimal water quality for recreation and ecotourism.

Recreation on Last Mountain Lake
Photo credit: Sharon Rodenbush

RECOMMENDATION AND ACTION 40

Protect, Conserve and Restore Wetlands: That policy and legislation be developed to encourage the protection, conservation and/or restoration of wetlands and ecosystems, bearing in mind sustainable agriculture must also be maintained.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Ducks Unlimited Canada Watershed implementation agency	High	April 2009

1.6 One-Stop Services

In Saskatchewan, several agencies are responsible for legislation and programming around water. During the watershed and aquifer planning meetings, the Watershed Advisory Committees' members indicated some concern about the different jurisdictions on water, fisheries, habitat and land-use. Specific responsibilities of each agency were difficult for the participants to understand, thus communities and the public may face the same or even greater difficulties. The recommendations advocate better communication of the role of federal and provincial governments along with the implementation of a "one-stop" organization as a point of contact for water issues.

Objective:

- Inventory, simplify and update the Watershed Advisory Committees' and the public's understanding of federal and provincial statutes, regulations and programs that influence watershed management in Saskatchewan. This process will identify inconsistencies, increase regulatory compliance and promote program participation.

RECOMMENDATION AND KEY PRIORITY ACTION 41

One Water Contact Agency: That regulatory processes be streamlined by establishing and implementing one contact agency for all aspects of water. The provincial government shall co-ordinate the one-window, issue-based administration for clarity and expediency among jurisdictions for water-related issues such as source water protection, source water protection planning, research, monitoring and regulation for water quality, supply, allocation and conservation, fish and wildlife habitat, and water management. Furthermore, a one-window

enforcement approach involving agreement between provincial and federal agencies shall be developed and implemented. That policies and legislation relating to source water protection, habitat and water management be aligned. In the interim, that a comprehensive list of agencies and lead responsibilities, e.g., issuing of permits and project approvals, for water in Saskatchewan be developed, kept current, and be easily accessible to Saskatchewan residents on the Saskatchewan Watershed Authority website. This shall include an inventory of present regulations and address inconsistencies.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Saskatchewan Ministry of Agriculture Saskatchewan Ministry of Health and Regional Health Authorities Fisheries and Oceans Canada Environment Canada Saskatchewan Ministry of Municipal Affairs	Key	April 2009 and ongoing

Objectives:

- Inform and educate Watershed Advisory Committees about programs that provide potential funding opportunities and linkages to technical or financial support, including programs that address specific concerns of the Committees.
- Promote the shared needs of agricultural and wildlife, to conserve and maintain habitat as well as to sustain the economy.

RECOMMENDATION AND KEY PRIORITY ACTION 42

One-Stop Information Centre: That a "one-stop" information centre be established and funded as a resource to provide information and promote:

- source water protection;
- aquifer and ground water protection and abandoned well decommissioning;
- emergency flood management and mitigation of flood potential;
- fish and wildlife habitat protection/conservation;
- agricultural and wildlife needs;
- economic sustainability;
- agricultural beneficial management practices.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Saskatchewan Ministry of Agriculture Fisheries and Oceans Canada Environment Canada	Key	April 2009 and ongoing

1.7 Research

During the watershed and aquifer planning process, information was provided to the Watershed Advisory Committees through Technical Committee presentations and the Background Report. Members of the Committees identified gaps in the availability of information on which to base sound watershed management decisions.

The key priority is to develop a baseline of information about the watersheds and aquifers. This knowledge is to be made available in a format easily accessible to stakeholders and the public.

Presentations were made on water quality, including a rating of the Water Quality Index by Saskatchewan Watershed Authority's Monitoring and Assessment staff. This presentation indicated Pasqua Lake has serious ecological problems. In addition, the Committees' members were made aware of the Pasqua Lake research completed by Dr. Peter Leavitt of the University of Regina. The Committees identified the need for study and cooperation among researchers and the provincial government about Pasqua Lake.

Learning to identify aquatic invertibrates in the field.

More specific studies were recommended regarding the impact of salts on surface waters. Urban use of water softeners and possible leaching from irrigation were discussed. The impacts of pharmaceuticals in waste water systems was also discussed.

Many experts indicate that the water quality of a lake is often reflected in the health and diversity of its fish population. The Committees requested more comprehensive and current studies about the fishery in major lakes in the watersheds such as Last Mountain Lake and Buffalo Pound Lake.

Little Manitou Lake is situated in the north area of the Upper Qu'Appelle River watershed. Lying within a former glacial spillway and fed by underground springs, the lake has mineral salt (sodium, magnesium and potassium) concentrations of 180,000 milligrams per litre. This high salinity gives it a specific gravity of 1.06, making the water exceedingly buoyant. The high salinity has also created a unique ecosystem with a commercial brine shrimp fishery. Local concerns about the influx of surface fresh water and recreational development resulted in a recommendation for a major study of the Little Manitou Lake area.

Eyebrow Lake is located between Lake Diefenbaker and Buffalo Pound Lake on the Upper Qu'Appelle River. This shallow lake has a Ducks Unlimited Canada project with a water control structure on the eastern end. Concerns about water quality prompted a recommendation for study of this lake.

Objective:

- To understand the effects that various sources of potential pollutants may have on water quality including: cities, industrial sources, wildlife, agriculture, recreation, cottages,

wetlands, suspended solids including silt, natural pollutants, e.g., alkali; then promote the public's understanding of these potential pollutants and a balanced, fair perspective of how these potential pollutants should be handled.

RECOMMENDATION AND KEY PRIORITY ACTION 43

Repository of Watershed Information: That a comprehensive repository of information relevant to economic and natural system sustainability that includes shallow aquifers and ground water, water control structures, existing and abandoned wells, irrigation systems, water courses (streams, rivers, lakes), and drainage works be established, updated and maintained. This information shall be publicly available in readily-accessible formats such as mapping and in a Geographical Information System (GIS). The following steps should be taken:

- That the most recent, comprehensive set of natural physical watershed attributes, e.g., types of soils, upland characteristics and roads, be amalgamated and converted into usable form.
- That data sets and mapping of riparian, upland and wetland areas in the watershed be acquired and interpreted.
- That potential sources, pathways and receptors, e.g., intensive livestock operations and agriculture, across the watershed be identified by the provincial government to establish risk management priorities. Examine what happens to water quality and quantity from upstream to downstream locations and why.
- That federal, provincial and municipal agencies, landowners and other stakeholders have access to maps and data for watershed planning, implementation and monitoring.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Saskatchewan Ministry of Agriculture Environment Canada Watershed implementation agency	Key	April 2010

Objectives:

- Use lakes in the watersheds, such as Pasqua, as research areas to analyze and determine causes of problems with water quality and health. The Watershed Advisory Committees will seek assistance from other agencies for assessment, planning and research.
- Protect the Qu'Appelle lakes from increased algae blooms.

RECOMMENDATION AND ACTION 44

Pasqua Lake Research: That a comprehensive program of research for Pasqua Lake and other lakes in the Qu'Appelle lakes chain be developed and implemented. The provincial government shall co-ordinate interested parties, e.g., academics, conservationists, non-government organizations, research agencies and governments at all levels, to develop and implement a comprehensive program of research for Pasqua Lake.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority **Saskatchewan Ministry of Environment** University of Regina and other researchers City of Regina City of Moose Jaw Municipal governments Saskatchewan Research Council First Nations National Research Council Canada - Centre for Sustainable Infrastructure Research Agriculture and Agri-Food Canada - PFRA Environment Canada	High	April 2013

Objective:

- Acquire more information regarding the effects and impacts on dugouts and water courses from spreading salt on highways and use in urban areas.

RECOMMENDATION AND ACTION 45

Ecosystem Impact From Salt: That the effects of salt on water quality and impact on ecosystems be clarified with reference to the use of salt from highways, softeners, irrigation water and salts from source waters. Furthermore, monitoring and research should be ongoing and alternate uses to salt should be considered and promoted for water softening and highway management.

Responsibility	Priority	Time Frame
National Research Council Canada - Centre for Sustainable Infrastructure Research Saskatchewan Ministry of Highways and Infrastructure Saskatchewan Ministry of Environment City of Regina	Medium	April 2011

RECOMMENDATION AND ACTION 46

Incentives for Research of Safe Use/Re-Use of Water: That research incentives be provided for the safe use/re-use of water for domestic, industrial and agricultural purposes. These techniques should be publicized and advocated with the Upper Qu'Appelle River and Wascana Creek watersheds.

Responsibility	Priority	Time Frame
National Research Council Canada - Centre for Sustainable Infrastructure Research Watershed implementation agency Communities of Tomorrow Saskatchewan Ministry of Agriculture Agriculture and Agri-Food Canada - PFRA	Medium	April 2010

Objective:

- Undertake a comparison of quality of fish from Upper Qu'Appelle River and Wascana Creek watershed lakes versus fish quality on other Saskatchewan lakes for:
  - mercury levels;
  - large predator fish versus other fish in the food chain;
  - tourists' perceptions of water quality on Saskatchewan lakes;
  - areas designated as floodplains in the Qu'Appelle River system;
  - restrictions in place to restrict development on the floodplain.

RECOMMENDATION AND ACTION 47

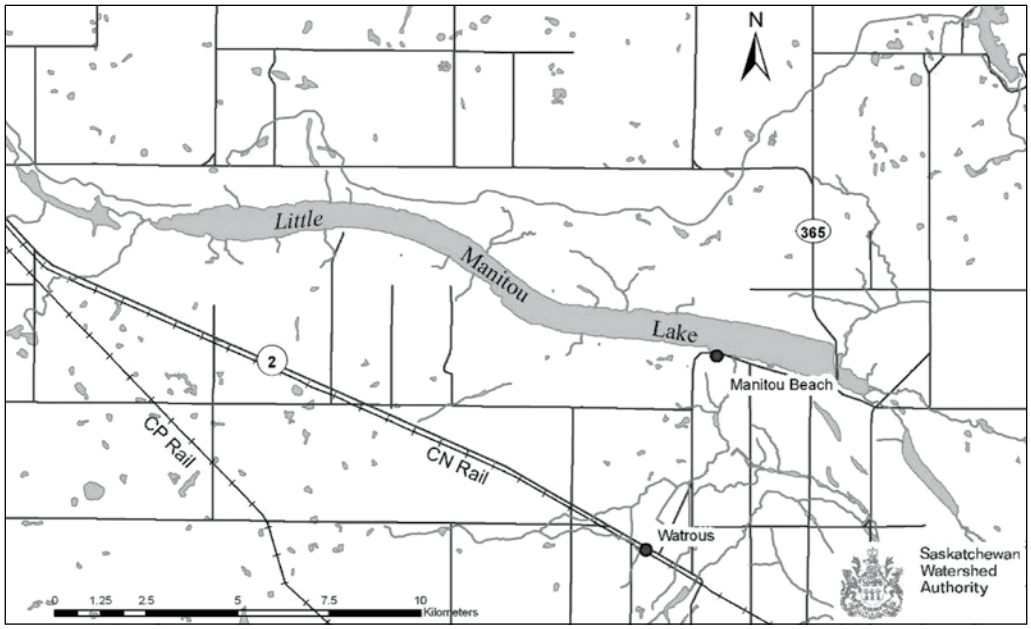
State of the Fisheries Research: That specific information (e.g., health/fish quality, populations, angling user-days and species diversity) relating to fishery monitoring and research for Last Mountain Lake, Buffalo Pound Lake and other watershed lakes be provided, analyzed, and used for watershed planning and decision-making.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Environment Fisheries and Oceans Canada Saskatchewan Wildlife Federation	High	April 2009

RECOMMENDATION AND ACTION 48

Little Manitou Lake Study: That federal and provincial governments, in conjunction with local residents, study the Little Manitou Lake ecosystem and develop lake management plans to protect the unique natural values of this ecosystem.

Responsibility	Priority	Time Frame
Watershed Implementation Agency Saskatchewan Ministry of Environment Saskatchewan Watershed Authority National Hydrological Research Institute Local stakeholders	High	April 2011

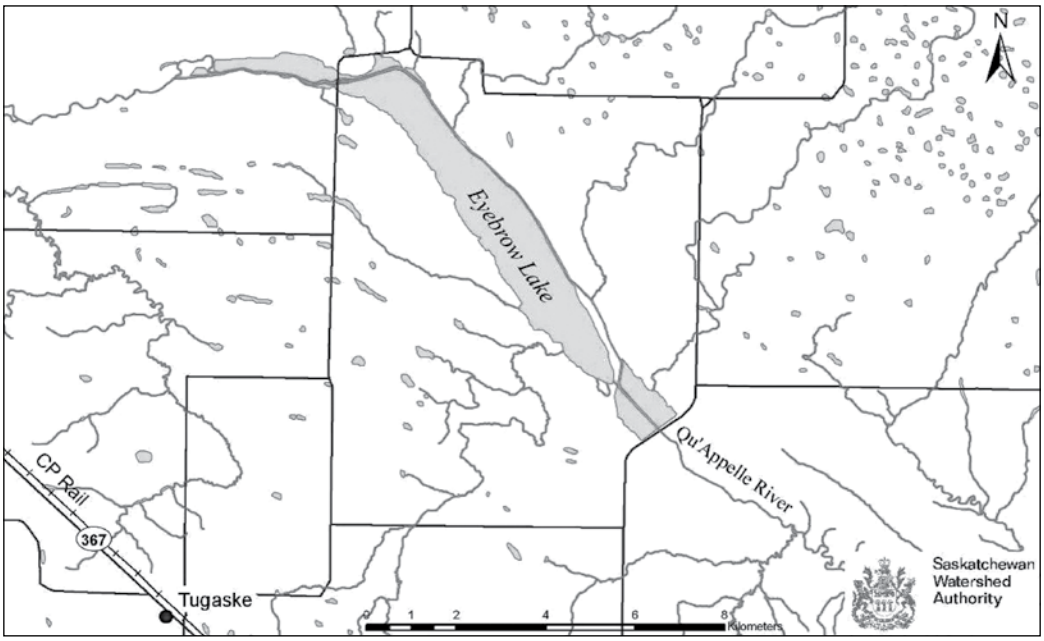


Little Manitou Lake

RECOMMENDATION AND ACTION 49

Eyebrow Lake/Ducks Unlimited Canada Water Quality Investigation: That the provincial government conduct an investigation and publicize a report from this investigation regarding the quality of water discharged from Eyebrow Lake.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Ducks Unlimited Canada	High	October 2008



Eyebrow Lake

Objective:

- Protect Wascana Creek downstream of Regina from the adverse impacts of irrigation from the Creek and Wascana Lake.

RECOMMENDATION AND ACTION 50

Effects of Irrigation–Wascana Creek: That research be conducted to determine the effects of irrigation from Wascana Lake and Wascana Creek on downstream areas in the watershed.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority National Research Council Canada - Centre for Sustainable Infrastructure Research Wascana Centre Authority City of Regina	Medium	April 2011

1.8 Water Conveyance

Under natural conditions, the upper reach of the Qu'Appelle River was an intermittent channel, with highly variable flows. The Upper Qu'Appelle Conveyance (UQC) Project was developed in the 1960s as a means for providing a reliable source of water to the Qu'Appelle River system. The project lies along a 97-kilometre reach of the Upper Qu'Appelle River between the Qu'Appelle River Dam on Lake Diefenbaker and Buffalo Pound Lake. Approximately 25 per cent of the population of Saskatchewan relies on the UQC Project for their water supply.

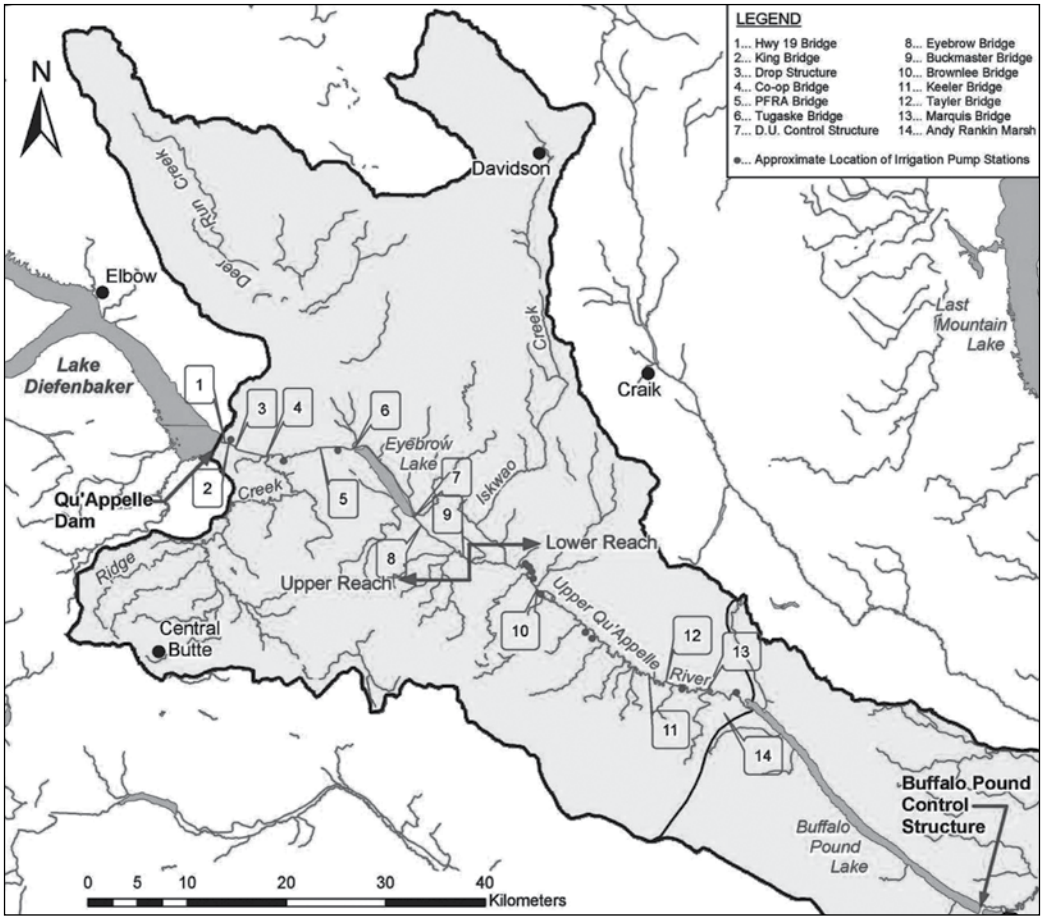
Releases from Lake Diefenbaker have altered the natural intermittent flow regime of the channel. Erosion, sedimentation and growth of aquatic weeds in some areas of the channel have reduced its conveyance capacity, more prominently from spring to late summer. The reduced conveyance capacity has lead to potential water shortages for downstream users, occasional over-bank flooding, and some adverse impacts on the water quality of Buffalo Pound Lake.

Restoration and improvements to the conveyance capacity are necessary if current and future water supply shortages for downstream users are to be avoided. These changes are also needed to support new water based economic development in the region and to maintain or enhance the ecological health of the river system.

The Saskatchewan Watershed Authority has been considering the restoration and improvements to the channel conveyance capacity, through the *Qu'Appelle River Conveyance Improvement Project*. Currently, environmental, engineering and social studies of the project are underway. Some pilot projects that enable the testing of various techniques to reduce erosion and sedimentation have been conducted.

The *Qu'Appelle River Conveyance Improvement Project* was discussed extensively in the watershed and aquifer planning process, particularly in the Qu'Appelle River planning area. Concerns were raised about water quality, channel erosion and overall water supply in the Qu'Appelle River system.

The principle recommendation is that the study and engineering work take hydrological, engineering and environmental factors into consideration. Local stakeholders and residents have indicated they want to be kept informed and involved in making decisions about conveyance improvement. The Committees' members recommend consistent and sustainable funding so that the channel and constructed areas will not be allowed to deteriorate in the future. A recommendation was made for compensation and/or mitigation for landowners along the Qu'Appelle River from Lake Diefenbaker to Buffalo Pound Lake for erosion problems and loss of land.



Upper Qu'Appelle River Conveyance Project drainage basin
Courtesy of Saskatchewan Watershed Authority

Objectives:

- Determine the current and future demands on the Qu'Appelle River, then determine the best options for increased conveyance.
- Provide water management that is equitable and environmentally-balanced, recognizing the following in the Qu'Appelle River system:
  - timing of water flows relative to reducing concentration of pollutants;
  - year-round water flows with no abrupt or extreme water level changes;
  - capabilities of infrastructure along the river.

- Plan any conveyance project with minimal environmental and ecological impacts, including instream flow requirements to support aquatic life and balance the needs of commercial, industrial and agricultural operations.
- Mitigate sedimentation, erosion and deposition along the Upper Qu'Appelle River caused by changes in channel capacity.
- Identify the potential impact of water quality and aquatic habitat in Last Mountain Lake and north from increased flows through the *Qu'Appelle River Conveyance Improvement Project*.

RECOMMENDATION AND KEY PRIORITY ACTION 51

Water Conveyance Management: That water management be jointly planned with local Watershed Advisory Committees, local, provincial and federal governments. The water conveyance plan shall be environmentally-sound and economically-balanced, recognizing:

- timing of water flows;
- effluent and other inflows into system;
- tributary in-flows;
- extreme water level changes;
- natural water level changes;
- flooding, climate change and drought (extremes);
- sedimentation, erosion and deposition;
- year-round water flows;
- capacity and capability of conveyance system;
- potential of the system for increased conveyance;
- monitoring and reporting;
- development (municipal zoning, building on flood plain and other);
- irrigation and water consumption;
- fish habitat and instream flow requirements;
- impact on fish habitat of increased water flows from Lake Diefenbaker to Buffalo Pound Lake through the proposed changes of the *Qu'Appelle River Conveyance Improvement Project*;
- ecological impacts and benefits, and inherent value to the ecosystem, e.g., natural capital;
- capacity of infrastructures (bridges and other) along the Upper Qu'Appelle River;
- maintenance of conveyance channel and infrastructures, e.g., bridges, dams and waterways;
- water allocation, into and out of the system; and
- compensation plan.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Municipal governments Watershed implementation agency	Key	April 2009 and ongoing

RECOMMENDATION AND ACTION 52

Assess Current/Future Conveyance Demand: That current and future conveyance demands be assessed through a broad-scope environmental, social and economic assessment, and completed prior to any increased water conveyance.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority	Medium	April 2009

RECOMMENDATION AND ACTION 53

Current and Future Water Demand, Qu'Appelle River: That the best options for increased conveyance of water to maintain water quality and aquatic habitat, in addition to the *Qu'Appelle River Conveyance Improvement Project* be determined.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Local stakeholders	High	April 2011

RECOMMENDATION AND ACTION 54

Adequate Water Conveyance: That a strategic plan and specific actions be developed to ensure adequate water supplies from the Qu'Appelle River are maintained, e.g., ethanol plant development and inter-provincial needs.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Local stakeholders	High	April 2011 and ongoing

Objective:

- Determine the best options for the maintenance required for conveyance.

RECOMMENDATION AND ACTION 55

Plans and Funding For Conveyance Maintenance: That plans and adequate financial support be allotted for ongoing maintenance of the Upper Qu'Appelle River Conveyance Improvement Project for the increased conveyance of water.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority	High	April 2009 and ongoing

Objective:

- Erosion due to the conveyance projects along the Qu'Appelle River system shall require mitigation with landowners. Mitigation options should include technical assistance, erosion control mechanisms, stewardship programs and/or financial compensation.

RECOMMENDATION AND ACTION 56

Compensation For Qu'Appelle River Shore Erosion: Qu'Appelle River Watershed - That a plan be developed and funding coordinated for mitigation with property owners/stakeholders affected by erosion and flooding along, but not limited to, the Qu'Appelle River man-made system.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority	High	Ongoing

1.9 Water Management

The Upper Qu'Appelle River and Wascana Creek watersheds are extremely complex. Many interrelated factors influence the water supply, the water quality and the extent and duration of flooding episodes.

One of the major challenges in managing the system is to accommodate the multitude of interests. At the turn of the century, operation of the Qu'Appelle River system only concerned navigation and agricultural uses. Later, recreation and wildlife considerations became important. Today, management of the system must take into account these interests as well as water quality, fisheries, municipal and industrial water use along the Qu'Appelle River, and the volume of water which passes into Manitoba.

Downstream effects must also be considered in making control structure operation decisions. In many cases, operations which would benefit a local area could harm downstream users in the watershed.

Buffalo Pound Control Structure
Photo credit: Saskatchewan Watershed Authority

The Wascana Creek watershed represents only one half of one per cent of Saskatchewan's land area but contains over 20 per cent of the province's population. In the last one hundred years, the growth of the City of Regina has had a huge demographic impact on the watershed. The upper portion of the watershed is relatively flat with former lake-bottom clay soils, and is farmed to the edge of the creek in most areas. The

impact of drainage from one of this province's first Conservation Area Authorities (Wascana C.A.A. No. 2) and the province's second largest city, have influenced flows both in peaks and in duration, including an annual increase in constant flows from Regina's effluent discharge. The changes in runoff characteristics have also included water quality and sedimentation impacts over the years.

Improved farming practices, urban storm sewer buffers and improved treatment facilities have had positive impacts on the watershed. It is important to note that some of the major users within the watershed are looking forward to improved mitigation.

Due to the topography and soils found in the watersheds, flooding is an ongoing concern for residents. The participants have recommended actions that would mitigate the effect of floods. Infrastructure such as bridges and culverts would be inventoried and constructed to withstand estimated flood frequencies.

During the watershed and aquifer planning process, the Saskatchewan Watershed Authority initiated a provincial review of the drainage and wetland policies with various stakeholders. The Committees recommended that specific management plans be developed for drainage works and water control structures in the watersheds. A balance between economic and environmental sustainability in the operation of drainage works was requested. To address some of these issues, the Committees' members called for water retention areas, both natural and artificial, along smaller streams.

Climate change from the effects of greenhouse gases was discussed extensively in the watershed planning process with presentations provided by Prairie Adaptation Research Centre and the Saskatchewan Ministry of Environment. The Committees' recommended that climate change impacts must be taken into consideration along with source water protection.

Current information indicates that the supply of water from prairie streams is strongly affected by climate and varies from year to year. Longer and hotter summers will increase evaporation and reduce water levels in lakes and rivers. As a result, demands on ground water could increase, making it even more important for Saskatchewan residents to use water resources wisely. Extreme events, such as severe thunderstorms, tornadoes, hailstorms, and heat waves, may become more common on the prairies due to climate change. Warmer winters may mean more intense winter storms, and increase the likelihood of rain. In the summer, flooding may increase due to heavier rainfalls.

In the watershed-specific recommendations, a study was requested on the hydraulics of the Wascana Creek system. In addition, a management plan for the Albert Street control structure on Wascana Lake was requested.

The Committees' members requested that the Lanigan Creek-Dellwood Brook Watershed Association become more broadly-based to include all stakeholders in the watersheds. In the Last Mountain Lake planning area, a study was requested on the dam on Lanigan Creek within the Last Mountain Lake National Wildlife Area. A study has also been requested to measure water flowing into Last Mountain Lake.

Objectives:

- Ensure water managers are aware and responsible for the primary, secondary and tertiary effects of their water management.
- Develop a regional watershed strategy for drought including aspects of storage.

RECOMMENDATION AND ACTION 57

Collaboration Among Water Managers: That water managers collaborate with water users, e.g., commercial, industrial and agricultural, in water management decisions and disclose, mitigate and/or compensate for the primary, secondary and tertiary impacts of decisions on the watershed.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Watershed implementation agency	High	April 2011 and ongoing

Objective:

- Urban and rural water management in the Upper Qu'Appelle River and Wascana Creek watersheds must consider economic impacts related to flooding.
- Develop an action plan to mitigate the extreme flood potential and consider proactive options such as the protection of infrastructure.

RECOMMENDATION AND ACTION 58

Action Plan to Mitigate Flood Potential: That an action plan to mitigate extreme flood potential and consider proactive options to protect infrastructure be developed.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Municipal Affairs Municipal governments	Medium	April 2010

RECOMMENDATION AND ACTION 59

Emergency Flood Responses: That the responses to flooding emergencies take priority among regulatory agencies.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Corrections, Public Safety and Policing	Medium	Ongoing

RECOMMENDATION AND ACTION 60

Inventory Structures at Risk of Flood: That structures at risk (culverts, bridges, roads, highways and other) for flood destruction on various flood-frequencies, (e.g., 1:25 or 1:200 year), be inventoried, and that cost-effective, flood-resistant structures be built in strategic areas.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Saskatchewan Ministry of Highways and Infrastructure Municipal governments	Medium	Immediate and ongoing; depends on size of structures

Objectives:

- Ensure safety and functionality as well as economic and environmental sustainability of all water control structures.
- Understand, as well as we can, the climate change factors affecting the future of the watersheds.

RECOMMENDATION AND ACTION 61

Climate Change: That all levels of government, stakeholders and other publics consider climate change an integral part of source water protection decisions. Use the latest research on factors affecting the future of the watershed from the Prairie Adaptation Research Centre, National Hydrology Research Institute, Saskatchewan Research Council and other research institutes.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Environment Canada National Research Council Canada - Centre for Sustainable Infrastructure Research Prairie Adaptation Research Centre National Hydrology Research Institute Saskatchewan Research Council	High	Ongoing

Objectives:

- Manage water quality impacts and downstream erosion associated with all drainage works and water control structures within the watersheds.
- Minimize negative impacts and optimize positive impacts from approved drainage works on local economic operations and infrastructure in the Upper Qu'Appelle River and Wascana Creek watersheds.

RECOMMENDATION AND ACTION 62

Drainage Works/Control Structure Plans: That specific management plans for approved drainage works and water control structures in the watershed be developed, implemented and evaluated regularly. That the provincial government develop a strategy to address unauthorized drainage and water control structures.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Watershed Associations Conservation Area Associations	High	April 2011

RECOMMENDATION AND ACTION 63

Drainage Works: That all approved existing drainage works are operated and maintained with respect to economic and environmental sustainability.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Conservation Area Associations Watershed Associations	Medium	April 2010 and ongoing

RECOMMENDATION AND ACTION 64

Surface Water Retention: That the development of surface water retention areas in natural or existing sites along smaller water courses be considered for ground water replenishment and wildlife habitat. Local watershed development must include adequate funding from provincial and federal governments.

Responsibility	Priority	Time Frame
Watershed implementation agency Conservation Area Associations Watershed Associations	Medium	April 2011 and ongoing

Objectives:

- Inform the public and encourage the adoption of water conservation by industry, commerce, agriculture, municipal and domestic sectors because water is a valuable natural resource.
- Encourage water conservation practices that also reduce the volume of waste water.

RECOMMENDATION AND ACTION 65

Implement Water Conservation Strategy: That the Saskatchewan Watershed Authority promotes water conservation and encourage public adoption of water conservation practices. The Authority will promptly implement the *Saskatchewan Water Conservation Plan* including new financial incentives.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority	Medium	Ongoing

Objectives:

- Strengthen the relationship among stakeholders in watershed planning, specifically Conservation Area Authorities and Watershed Associations.
- Mitigate the impacts of elevated flows in Wascana Creek while ensuring agricultural producers have adequate drainage.

RECOMMENDATION AND ACTION 66

Develop a Plan to Mitigate Drainage–Wascana Creek: Wascana Creek Watershed - That the hydraulics of the Wascana Creek system be evaluated and a plan devised to mitigate those impacts and maintain adequate drainage.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Wascana Creek Conservation Area Association	Medium	April 2010

Objective:

- Minimize flooding and downstream erosion associated with the Albert Street structure.

RECOMMENDATION AND ACTION 67

Albert Street Management Plan–Wascana Creek: Wascana Creek Watershed - That an environmental management plan for the Albert Street structure within the City of Regina be created which includes issues of downstream erosion, upstream drainage, flood prevention and maintenance of water levels for habitat preservation. Stakeholders to be consulted include the City of Regina, Wascana Centre Authority, Wascana Conservation Area Association and others with a direct interest. This management plan shall be implemented and evaluated regularly.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority City of Regina Wascana Centre Authority Wascana Conservation Area Association Local stakeholders	High	April 2009

Albert Street Bridge, Wascana Creek
Photo credit: Saskatchewan Watershed Authority

RECOMMENDATION AND ACTION 68

Local Management: That the existing watershed association be expanded and sufficiently funded to include all Lanigan Creek and Manitou Lake stakeholders, e.g., Friends of Little Manitou Lake, with managerial responsibility for controlled dams and waterways and source water protection in the area. Benchmarks for adequate control of infrastructures be developed to ensure dams and waterways are adequately maintained.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Local stakeholders Conservation Area Associations Watershed Associations Watershed implementation agency	High	April 2009 and ongoing

Objective:

- Acquire relevant information regarding benefits and drawbacks of removing the main dam on Lanigan Creek within the Last Mountain Lake National Wildlife Area. Sources of such information include Ducks Unlimited Canada, Fisheries and Oceans Canada and Saskatchewan Ministry of Highways and Infrastructure.

RECOMMENDATION AND ACTION 69

Fish Ladder on Ducks Unlimited Canada Dam: Lanigan/Manitou Watershed - That the current study of fish passage on Lanigan Creek near the main water control structure within the Last Mountain Lake National Wildlife Area be completed. If recommended, fish passage shall be constructed to retain and use water in the control structure.

Responsibility	Priority	Time Frame
Environment Canada - Canadian Wildlife Service Ducks Unlimited Canada Saskatchewan Wildlife Federation Saskatchewan Ministry of Environment Fisheries and Oceans Canada	High	April 2009

RECOMMENDATION AND ACTION 70

Monitoring Water Flow, Last Mountain Lake: That monitoring of water flowing into the north end of Last Mountain Lake be increased (enhanced) to enable comparisons of volume and quality for long-term management.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority	Medium	April 2009 to address funding issue and ongoing

RECOMMENDATION AND ACTION 71

Maintenance and Management Plans for Waterways: That sustainable operations and maintenance plans, including monitoring, reporting and adapting, be established through the following:

- beneficial management practices;
- inventory of current status;
- set standards for safety, functionality, economic and environmental performance (quantity and quality);
- accountability;
- action plan to mitigate extreme flood potential and protect infrastructure;
- local plan implementation for dams and waterways;
- jointly planned with local Watershed Advisory Committees, and provincial and federal government;
- financial planning;
- storm water management planning;
- adequate control, measured against established standards;
- meaningful electronic real-time monitoring of infrastructure for end users and water managers to ensure dams and waterways are maintained.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority	Medium	April 2009

1.10 Water Quality

The key recommendation for water quality emphasizes the need for support from the provincial government of Saskatchewan and local groups for implementation of this source water protection plan. Furthermore, the Watershed Advisory Committees' members identified the need for technical and financial assistance by the agencies within the Technical Committee to achieve this end.

The first step to establishing quality water requires information on the ecological integrity of the Upper Qu'Appelle River and Wascana Creek watersheds. This data would form the basis for an ecological management plan for the two watersheds.

Water quality sampling at Last Mountain Lake
Photo credit: Saskatchewan Watershed Authority

General information was provided to the Committees on the licensing of waste water systems and the possible impacts of waste water systems on the watersheds. The Committees' recommend a holistic approach in evaluating the impact of the waste water treatments, including sewage lagoons, on surface waters. Given the inter-relationship between surface waters, recharge areas, aquifers and ground water, Beneficial Management Practices should be developed, prioritized and applied to sustain water quality and to protect source waters.

Water quality monitoring at the municipal level is integral to the multi-barrier approach of source water protection. Adequate funding by all levels of government was recommended by the Committees. Another recommendation urged continuation of the *Rural Water Quality Advisory Program* for rural residents by the Saskatchewan Watershed Authority.

The numerous abandoned landfills in the watersheds have been identified as a threat, particularly to ground water resources. Similarly, contaminated sites in the watershed also pose a threat to local aquifers. Recommendations were made that the provincial government establish trust funds to deal with both landfills and contaminated sites.

Objectives:

- Propose a Source Water Protection Plan that addresses specific, select issues in all areas of the watershed. The Plan shall balance the needs of urban and rural communities, the agricultural sector, industry and the environment.
- Ensure the governance process includes meaningful public consultation.
- Ensure a Source Water Protection Plan that reflects historical development of the watershed and acknowledges continued development.

RECOMMENDATION AND KEY PRIORITY ACTION 72

Need to Develop and Implement Source Water Protection Plans: That the provincial government employ the various Watershed Advisory Committees' recommendations and actions for development and implementation in the Upper Qu'Appelle River and Wascana Creek Source Water Protection Plan.

Responsibility	Priority	Time Frame
Watershed implementation Agency Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Saskatchewan Ministry of Health and Regional Health Authorities Saskatchewan Ministry of Agriculture Saskatchewan Ministry of Municipal Affairs Stewardship groups	Key	June 2008

Objectives:

- Enhance the public's understanding and clarify the responsibility and cost for properly disposing of landfill material and decommissioning existing landfills/dumpsites.
- Ensure that solid waste is managed in such a way that aquifers and surface water quality are not impacted.

RECOMMENDATION AND ACTION 73

Support For Source Water Protection Plan Delivery: That the provincial government, in conjunction with federal and local governments, non-government organizations and/or industry, support the delivery of approved Source Water Protection Plans through adequate technical and financial assistance.

Financial support should be provided for various programs to encourage land-use practices that conserve natural features of wetlands, riparian areas and uplands. The programs should be environmentally- and economically-sustainable and be offered to watershed residents, industry, agriculture, municipal, and provincial governments. Buffer zones and riparian areas (between the water's edge and development) should be conserved and/or restored.

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority Fisheries and Oceans Canada Environment Canada Agriculture and Agri-Food Canada - PFRA Saskatchewan Ministry of Environment Saskatchewan Ministry of Agriculture Saskatchewan Ministry of Municipal Affairs Ducks Unlimited Canada Municipal governments	High	Ongoing

Objective:

- Maintain habitat, healthy ecosystems and water quality to ensure ecological diversity and environmental integrity.

RECOMMENDATION AND ACTION 74

Ecological Assessment of Wascana Creek and Upper Qu'Appelle River Watersheds:
That tools be developed to regularly assess the status and ecological integrity of the Upper Qu'Appelle River and Wascana Creek watersheds.

Responsibility	Priority	Time Frame
Watershed implementation agency National Research Council Canada - Centre for Sustainable Infrastructure Research Saskatchewan Research Council Environment Canada University of Regina Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Saskatchewan Ministry of Agriculture Fisheries and Oceans Canada	Medium	April 2013

RECOMMENDATION AND ACTION 75

Ecological Management Plan for Wascana Creek and Upper Qu'Appelle River Watersheds:
That an ecological management plan be developed, implemented and regularly monitored by the watershed implementation agency.

Responsibility	Priority	Time Frame
Watershed implementation agency	High	April 2010

Objectives:

- Assess the impact of all waste water treatment systems (including single and multiple users) to help resolve concerns about contamination to surface and ground water.
- Manage water quality impacts and downstream erosion associated with all waste water treatment facilities in the watershed.

City of Regina Waste Water Treatment Plant
Photo credit: City of Regina

RECOMMENDATION AND ACTION 76

Waste Water Treatment: That the provincial government assess the impact of all waste water treatment systems, including single and multiple users, to help resolve concerns about environmental impacts and impact on drinking water sources, both surface and ground water. The provincial government will inform lagoon operators (urban and rural municipalities) of the legal responsibilities and cumulative environmental impacts of lagoon operations, seepage and discharges on water quality.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Health and Regional Health Authorities **Saskatchewan Ministry of Environment** Saskatchewan Watershed Authority	Medium	April 2013

RECOMMENDATION AND ACTION 77

Waste Water Treatment: Management plans for waste water treatment facilities in the watersheds be developed, implemented and evaluated regularly. The management plans should adhere to beneficial management practices including monitoring of sewage lagoons and downstream impacts.

Responsibility	Priority	Completion date
Saskatchewan Ministry of Environment Urban municipal governments	Medium	April 2011

Objectives:

- Determine cumulative adverse effects of status quo cottage development and management specifically relating to shoreline development, drinking water quality, sewage treatment and effluent disposal. In addition, ensure recreational development along shorelines minimizes harm to fish habitat and biodiversity.
- Mitigate the degradation of streams, lakes and rivers as well as reduce erosion.
- Encourage environmentally and economically sustainable land use practices that conserve natural features or wetlands including guidelines for recreational development. The Technical Committee will assist and advise on enforceable standards of practice for development of valley walls, shoreline banks, riparian hillsides and recreational sites.
- Increase awareness and adoption of Beneficial Management Practices (BMP) by watershed residents. Determine the science that directly links Beneficial Management Practices to sound water quality. If the science provides this link, adopt Ducks Unlimited Canada's and/or the *Canada-Saskatchewan Farm Stewardship Program*'s and/or other Beneficial Management Practices that include the conservation and voluntary restoration of natural landscape features (wetlands, riparian areas and uplands) and devise ways to implement them.

RECOMMENDATION AND ACTION 78

Beneficial Management Practices: That Beneficial Management Practices be developed, evaluated, prioritized and applied in the watershed, based on an understanding of the inter-relationships between and among aquifers and ground water, recharge area and surface waters to sustain water quality, and to protect source waters. These topics should include, but not be limited to, point, e.g., sewage/manure lagoons, and non-point, e.g., field runoff, sources such as:

- salt for water softeners (potassium chloride vs. sodium chloride);
- intensive livestock operations;
- livestock operations less than 300 animal units;
- grain farming;
- urban development;
- recreational developments such as cottage subdivisions;
- landfills;
- industry, mining and quarrying;
- chemical storage and dumpsite areas;
- sewage lagoon sites.

Beneficial Management Practices should be developed and promoted for construction on and management of valley walls, riparian hillsides, shoreline banks and recreational sites. Efforts will mitigate degradation of stream banks and reduce erosion leading to less siltation in waterways. The objective will be to encourage and promote restoration, maintenance and establishment of riparian buffers along all waterways.

Failure to apply Beneficial Management Practices may lead to the creation or strengthening of government regulations and enforcement for both point and non-point sources. Beneficial Management Practices will be applied in the absence of formal regulation. Funding and/or incentive considerations will be addressed.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Municipal Affairs Watershed implementation agency Fisheries and Oceans Canada Saskatchewan Ministry of Agriculture Agriculture and Agri-Food Canada - PFRA Saskatchewan Ministry of Energy and Resources Saskatchewan Watershed Authority Saskatchewan Ministry of Environment Saskatchewan Ministry of Health and Regional Health Authorities	High	April 2009 and ongoing

Objective:

- Identify ramifications to private rural residents and municipal governments of the increased cost of water quality testing by the Saskatchewan Disease Control Laboratory.

RECOMMENDATION AND ACTION 79

Funding For Water Monitoring: That adequate funding be provided for monitoring programs for municipal potable water and waste water. Funding shall be provided for additional surface water and stormwater monitoring programs.

Responsibility	Priority	Time Frame
Saskatchewan Ministry of Municipal Affairs Saskatchewan Ministry of Environment Saskatchewan Ministry of Health and Regional Health Authorities Municipal governments Saskatchewan Watershed Authority	High	Ongoing

RECOMMENDATION AND ACTION 80

Continue Water Testing Program: That support for an annual water testing subsidy program be continued through mechanisms such as the *Rural Water Quality Advisory Program.*

Responsibility	Priority	Time Frame
Saskatchewan Watershed Authority	Medium	Ongoing

RECOMMENDATION AND ACTION 81

Landfill Decommisioning: That closure and decommissioning of existing landfills/dumpsites receive provincial government support or support through establishment of a trust fund which may involve federal and provincial funds. This process would include:

- an inventory of abandoned landfills and dumpsites;
- an assessment of each site including effects on surface waters, aquifers and ground water; and
- prioritizing the highest risk sites to apply remediation/mitigation measures.

Responsibility	Priority	Completion date
Saskatchewan Ministry of Environment Saskatchewan Ministry of Municipal Affairs	Medium	April 2013

RECOMMENDATION AND ACTION 82

Contaminated Sites: That closure and decommissioning of potentially contaminated sites receive provincial government support or support through establishment of a trust fund which may involve federal and provincial funds. This process would include:

- an inventory of potentially contaminated sites;
- an assessment of each site including effects on surface waters and aquifers;
- identification and tracking of site polluters;
- prioritize highest risk sites;
- apply remediation and mitigation measures.

That a trust fund be developed to financially deal with "orphan" contaminated areas such as abandoned industrial sites, asphalt or fertilizer sites and underground fuel tank sites.

Responsibility	Priority	Completion date
Saskatchewan Ministry of Environment	Medium	April 2013

Implementation

Preliminary efforts have recently begun to pave the way from planning to implementation, and to develop a framework to deliver on the recommendations and actions of this Plan. In October 2007, a committee of up to four members from each of the Watershed Advisory Committees was struck to begin developing the structure and presence, and to facilitate delivery of the Plan. This committee, known as the Upper Qu'Appelle River and Wascana Creek Steering Committee, initially met in November and will continue to meet regularly until a structure for delivery is in place. Four members from this Committee, one from each of the Watershed Advisory Committees, were also selected to form an executive committee whose primary task is to orchestrate the Steering Committee's decisions. This effort involves the formation of sub-committees charged with structuring governance and developing bylaws for a new entity, identifying communications needs and facilitating First Nations involvement. Steering Committee efforts also focus on funding options and fiscal management.

The Saskatchewan Watershed Authority believes successful source water protection planning occurs through community-based leadership, guidance and local delivery. The Upper Qu'Appelle River and Wascana Creek watersheds are no exception. As well as commending Watershed Advisory Committees members in these watersheds for the development of the Plan, the Saskatchewan Watershed Authority is providing financial and technical support for its delivery after the Plan is finalized. Details, including specific contributions from the Saskatchewan Watershed Authority, will be determined through a system that factors in aspects such as geographic size and population numbers, conditions and risk assessments of source waters, the communities' commitment and overall, partnership development. Technical assistance, including staff to assist with the transition from planning to implementation, is also being provided to those involved in instituting delivery of the Plan. This support will be provided to help build the capacity to lead and facilitate the infrastructure and implementation of the Plan over its first three years of delivery.

To achieve finalization of the Plan, "open house" public consultation events were being held in January, enabling all watersheds' residents to discuss and comment on the Plan. In February, Watershed Advisory Committees' members met to further consider the publics' comments, and by consensus, finalized the Plan. This finalized Plan was then published and will be presented to the Minister Responsible for the Saskatchewan Watershed Authority, accompanied by a request for initial funding for implementation.

At-A-Glance

Upper Qu'Appelle River and Wascana Creek Watersheds Source Water Protection Plan

RECOMMENDATION/ACTION	Lead**	PRIORITY*	TIMELINE*	COMPLETE
AQUIFER AND GROUND WATER MANAGEMENT–KEY				
1. Aquifer and Ground Water Well Database	SWA	High	2 years	2010
2. Aquifer and Ground Water Protection	SWA	High	4 years	2012
3. Aquifers "101", Hydrology "101" and Water Well Management	SWA	Medium	3 years+	Ongoing
4. Mandatory High-risk Aquifer/Ground Water Protection	SWA	High	Ongoing	Ongoing
5. Fund Well Decommissioning	SWA	High	6 months	2008
COMMUNICATIONS AND INFORMATION				
6. Communication Strategy Developed/Implemented	SWA	Key	Immediate	2008
7. Watershed Environmental Health Report	SWA	Key	1 year	2009
8. Monitor Progress of Agri-Environmental Group Plan Efforts	wia	High	Annually	2008+
9. Treatment Technologies in Communities/Municipalities	SME	Medium	Annually	2008+
10. Apprise on Water Allocation Policy, Regulations and Process	SWA	High	6 months	2010
ECONOMICS				
11. Balance Economics with Environment	SME/ SMA	High	1 year; ongoing	2009+
12. Water/Energy Conservation	SWA	High	6 months; ongoing	2008+
13. Funding for Municipal Sewage Management	SMMA	High	Immediate; ongoing	2008+
14. Cost-recovery for Water Infrastructure	SMMA	High	Immediate; ongoing	2008+
15. Fish Passage Through Works	SMMA	Medium	Immediate	2008
16. Economic Support	n/i	High	Immediate; ongoing	2008+
17. Agricultural Plan Framework	SMA	High	Immediate	2008
18. Ecotourism Development	SNEA	Medium	Immediate	2008
GOVERNANCE				
19. Upper Qu'Appelle/Wascana Creek WACs' Presence	wia	High	Immediate; ongoing	Ongoing
20. Watershed Advisory Committees' Independence from Government	wia	Low	Ongoing	Oct 2007-
21. Local Implementation of Source Water Protection Plan	wia	High	6 months; ongoing	Oct 2007-
22. Communication and Participation	wia	High	Immediate	2008
23. Involvement in Local and Regional Water Issues	wia	High	Immediate	2008+
24. Funding of Watershed Co-ordinator/Liaison	SMMA	Medium	1 year	2009
25. Input in Conveyance Decision-making (Qu'Appelle River only)	SWA	High	Immediate	2008
26. Co-operation	wia	Medium	Within 2 years	2010
LEGISLATION AND POLICY				
27. Zoning Bylaws	SMMA	Key	2 years	2010
28. Aquifer Protection	SWA	Medium	5 years	2013
29. Aquifer Protection in *The Planning and Development Act*	SWA	Medium	5 years; ongoing	2013+
30. Re-examine Evaluation/Monitoring of Feedlots, Hog Barns, Slaughter Plants	irb	Medium	1 year	2009

31. Stormwater Legislation and Urban Runoff Guidelines	SME	High	5 years	2013
32. Review of the federal *Fisheries Act*	SME	High	Ongoing	2008+
33. Guidelines for Agricultural, Industrial and Highway Runoff	SME	Medium	5 years	2013
34. Watershed Health Report	SWA	High	2 years	2010
35. Health Regulations	SMH	Medium	2 years	2010
36. Provincial Flood and Drainage Policies	SWA	High	2 years	2010
37. Provincial Flood and Drought Strategy	SWA	High	1 year	2009
38. Develop/Implement Flood Plain Regulation	SWA	High	1 year	2009
39. Natural Capital	SME	High	1 year; ongoing	2009
40. Protect, Conserve and Restore Wetlands	SWA	High	1 year	2009
ONE-STOP SERVICES				
41. One Water Contact Agency	SWA	**Key**	1 year; ongoing	2009+
42. One-Stop Information Centre	SWA	**Key**	1 year; ongoing	2009+
RESEARCH				
43. Repository of Watershed Information	SWA	**Key**	2 years	2010
44. Pasqua Lake Research	SME/SWA	High	1 year	2013
45. Ecosystem Impact from Salt	NRCC-CSIR	Medium	3 years	2011
46. Incentives for Research of Safe Use/Re-use of Water	NRCC-CSIR	Medium	3 years	2010
47. State of the Fisheries Research	SME	High	2 years	2009
48. Little Manitou Lake Study	wia	High	Immediate; ongoing	2011
49. Eyebrow Lake/Ducks Unlimited Canada Water Quality Investigation	SWA	High	Immediate; ongoing	2008
50. Effects of Irrigation-Wascana Creek	SWA	Medium	3 years	2011
WATER CONVEYANCES				
51. Water Conveyance Management	SWA	**Key**	1 year; ongoing	2009+
52. Assess Current/Future Conveyance Demand	SWA	Medium	1 year	2009
53. Current and Future Water Demand, Qu'Appelle River	SWA	High	3 years	2011
54. Adequate Water Conveyance	SWA	High	3 years; ongoing	2011+
55. Plans and Funding for Conveyance Maintenance	SWA	High	1 year; ongoing	2009+
56. Compensation for Qu'Appelle River Shore Erosion	SWA	High	Ongoing	2009+
WATER MANAGEMENT				
57. Collaboration Among Water Managers	SWA	High	3 years; ongoing	2011+
58. Action Plan to Mitigate Flood Potential	SWA	Medium	2 years	2010
59. Emergency Flood Responses	SWA	Medium	Ongoing	2009+
60. Inventory Structures at Risk of Flood	wia	Medium	Immediate, ongoing	2009+
61. Climate Change	SWA	High	Ongoing	2009+
62. Drainage Works/Control Structure Plans	SWA	High	3 years	2011
63. Drainage Works	SWA	Medium	2 years; ongoing	2010+
64. Surface Water Retention	wia	Medium	3 years; ongoing	2011+
65. Implement Water Conservation Strategy	SWA	Medium	Ongoing	2009+
66. Develop Plan to Mitigate Drainage-Wascana Creek (WC only)	SWA	Medium	1 year; ongoing	2010
67. Albert Street Management Plan-Wascana Creek (WC only)	SWA	High	2 years	2009
68. Local Management	SWA	High	1 year; ongoing	2009+

69. Fish Passage on Ducks Unlimited Canada Dam	EC-CWS	High	12 months	2009
70. Monitoring Water Flow, Last Mountain Lake	SWA	Medium	1 year; ongoing	2009+
71. Maintenance and Management Plans for Waterways	SWA	Medium	1 year	2009
WATER QUALITY				
72. Need to Develop and Implement Source Watershed Protection Plans	wia	**Key**	3 months	2008
73. Support for Source Water Protection Plan Delivery	SWA	High	Immediate, ongoing	2008+
74. Ecological Assessment of Wascana Creek and Upper Qu'Appelle River Watersheds	wia	Medium	5 years	2013
75. Ecological Management Plan for Wascana Creek and Upper Qu'Appelle River Watersheds	wia	High	2 years	2010
76. Waste Water Treatment	SMH/RHA/SME	Medium	5 years	2013
77. Waste Water Treatment Systems	SME	Medium	3 years	2011
78. Beneficial Management Practices	SMMA	High	1 year, ongoing	2009+
79. Funding for Water Monitoring	SMMA	High	Ongoing	2009+
80. Continue Water Testing Program	SWA	Medium	Ongoing	2008+
81. Landfill Decommissioning	SME	Medium	5 years	2013
82. Contaminated Sites	SME	Medium	5 years	2013

**Acronyms are defined on following page.*

***Definitions provided on following page.*

Acronyms:

CWS	– Canadian Wildlife Service
EC	– Environment Canada
SMMR	– Saskatchewan Ministry of Municipal Affairs
NRCC-CSIR	– National Research Council Canada – Centre for Sustainable Infrastructure Research
RHA	– Regional Health Authority(ies)
SMA	– Saskatchewan Ministry of Agriculture
SME	– Saskatchewan Ministry of Environment
SMH	– Saskatchewan Ministry of Health
SNEA	– Saskatchewan Nature and Ecotourism Association
SWA	– Saskatchewan Watershed Authority
wia	– watershed implementation agency now known as WUQWATR (Wascana Upper Qu'Appelle Watersheds Association Taking Responsibility, Inc.)
irb	– independent review board
n/i	– not indicated

Definitions:

Lead:

The organization, governments' department/ministry, Crown corporation, or association identified to lead delivery.

Priority:

Key	– must be addressed immediately after Plan is formalized
High	– prompt action required
Medium	– address following completion of Key and High priority items
Low	– address as time and resources permit

Glossary

Abandoned well - a well that is no longer being used or maintained for future use is considered abandoned. Abandoned wells pose a serious threat to the preservation of ground water quality and are a serious safety hazard for children and animals.

Aboriginal peoples – as identified in s. 35, *Constitution Act*, 1983, includes the Indian, Inuit and Métis peoples of Canada

Advisory committee – a diverse group of people from a community who dedicate their efforts to completion of a source water watershed plan. The committee's function is to discuss and facilitate consensus-based decision-making among stakeholders that will help resolve issues of source water protection and sound watershed management.

Allocation – the amount of water assigned for use, out of the total amount that is available for use in a particular watershed or aquifer

Animal unit – one mature cow of approximately 1000 pounds and a calf up to weaning, usually six months of age, or equivalent

Aquatic – consisting of, relating to or being in water; living or growing in, on or near water

Aquifer – an underground layer of porous rock, sand or other material that allows movement of water between layers of non-porous rock or clay. The formation is usually restricted to water bearing structures capable of yielding water in sufficient quantity to constitute a usable supply.

Aquifer recharge – the process of adding water to an aquifer through the ground, occurring during rainfall, melting snow and with water from streams, rivers, wetlands and lakes

Beneficial Management Practices (BMP) – practices generally accepted for some aspect of natural resource management such as water conservation, drainage management or erosion control and typically incorporating conservation criteria

Biodiversity (biological diversity) – the many and varied species of life forms on earth, including plants, animals, micro-organisms, the genes they possess and their habitats

Catchment basin - an area in which all of the underground and/or surface water runs down to the lowest point following the natural slope and collects to form a river, a lake or ground water

Channelization – the straightening or dredging of a stream to make it straighter, deeper or shorter

Climate – meteorological elements (e.g., precipitation, temperature, radiation, wind, cloudiness) that characterize the average and extreme conditions of the atmosphere over long periods of time at a location or region of the earth's surface

Climate change – an alteration in measured meteorological conditions that significantly differs from previous conditions and is seen to endure, bringing about corresponding changes in ecosystems and socio-economic activities

Conservation – the preservation and renewal, when possible, of human and natural resources; the use, protection and improvement of natural resources according to principles that ensure their highest economic and social benefits

Conservation easement – a voluntary legal agreement between a property owner and a government or qualified conservation agency. These agreements are tailored to each individual landowner and conserve the property's natural values and features by restricting the type and amount of development that can occur on the owner's property.

Cubic decametre (dam^3) – a volume unit of measure of 1,000 cubic metres or 10 metres by 10 metres by 10 metres, commonly used for water

CWQI – Canadian Water Quality Index, a tool to provide consistent procedures for Canadian jurisdictions to report water quality information to both management and the public

Development – building, engineering, mining or other operations that alter or intensify the use of a resource

Deleterious substance – any substance that is deleterious to fish, fish habitat, or to the use by humans of fish that frequent that water. See the *Fisheries Act* for further details.

DFO – Fisheries and Oceans Canada, with regulatory jurisdiction of all provincial waters that affect fish habitat management

Discharge – the flow of surface water in a stream or ditch or the flow of ground water from a spring or flowing artesian well; the rate of flow

Diversion – the removal of water from any waterbody, watercourse or aquifer (either for use or storage), including the removal of water for drainage purposes. Construction of any works required for the diversion of water need approval pursuant to Section 50 of *The Saskatchewan Watershed Authority Act*. The total diversion is equal to the allocation plus any losses from evaporation or seepage.

Diversity – the measure of the number of species and their relative abundance

Domestic – use for residential purposes, including household use, personal hygiene, drinking, washing clothes and dishes, flushing toilets, watering of domestic animals and outside use such as swimming pools, car washing and lawn, garden, trees and shrub maintenance

Drainage – movement of water off land, either naturally or manmade

Drought – generally in reference to periods of less than average or normal precipitation over a set time, sufficiently prolonged to cause serious hydrological imbalance that result in biological or economic losses

DUC – Ducks Unlimited Canada, a non-profit corporation that conserves, restores and manages wetlands and associated habitat for North American waterfowl. These habitats also benefit other wildlife and people.

Ecological – pertains to the relationship between living organisms and their environments

Ecological diversity – the variety of biological communities or ecosystems, including various organisms and their differing, critical environments, in a given area

Economic development – the process of using and converting resources into wealth, jobs and an enhanced quality of life

Ecosystem – a dynamic complex of organisms (biota) including humans, and their physical environment, that interacts as a functional unit in nature

Ecotourism – travel to relatively undisturbed natural areas to study, admire and enjoy the scenery and its wild plants and animals, and the cultural aspects of the area. A tool for community use, that when used appropriately may help sustain a healthy environment.

Effluent – the treated waste water discharged into the environment

Facultative – bacteria that can live in a range of external conditions, including both aerobic and anaerobic conditions

First Nation – an Indian band or an Indian community functioning as a band but not having official band status, not including Inuit or Métis peoples

Ground water – water beneath the surface of the earth in the pores and fractures of sand, gravel and rock formations

Habitat – natural surroundings or native environment where a plant or animal grows and lives

Hectare – an area of land equivalent to 2.471 acres, considered an area slightly less than three Canadian football fields

Herbicide – substance used to kill unwanted plants that compete with a crop for sunlight, nutrients and water

Holistic – relating to or concerned with the whole or complete system rather than an analysis of dissected parts for treatment, e.g., holistic ecology

Hydro – from the Greek hydor, meaning "water"

Hydrology – the science of the waters of the earth, their occurrences, circulation and distribution on or below the earth's surface

Hydrometric – pertaining to the measurement of hydrological parameters

Hydrometric station - a location where systematic records of stage (water level) or stage and discharge (flow) are obtained

Infrastructure – basic facilities, services and installations needed for a community or society to function, such as transportation, communication, health, power, water and waste water treatment systems

Intensive Livestock Operation (ILO) – production facilities such as feedlots and buildings where many animals are raised in a confined space that does not have naturally-growing vegetation and where waste accumulates if not removed (as defined by *The Agricultural Operations Act* in Saskatchewan)

Land cover – predominant vegetation on the surface of a parcel of land

Land use – present use of a given area of land

Leachate – solution formed when water percolates through a permeable medium. Sometimes leachates are toxic or carry bacteria when derived from solid waste.

Mitigation – reduction or elimination of negative impacts from a specific activity

Multi-barrier approach – the consideration of all threats to water quality and the application of techniques or mechanisms to eliminate or minimize their impacts. Threats may involve seasonal droughts or floods, activities of agriculture, industry or recreation, or treatment plants and distribution system breakdowns.

Non-point source pollution – single or multiple contaminants of unknown origin that enter waterways, degrading water quality

Partnership – co-operative, collaborative alliance between/among stakeholders in a non-legal arrangement used to improve and build relationships and achieve common goals

Pesticide – chemical agents such as herbicides, insecticides, fungicides, nematocides and rodenticides used to control specific organisms or kill unwanted pests

Permeability – the ability of a material to allow the passage of a liquid, such as water through rocks. Permeable materials, such as gravel and sand, allow water to move quickly through them, whereas impermeable material, such as clay, does not allow water to flow freely.

Point source contamination – a static and easily identifiable source of air, soil or water pollution

Policy – a course or principle of action adopted or proposed

Pollution – alternation of the character or quality of the environment that renders it unfit or less suited for use. Water pollution alters the physical, chemical or biological properties through introduction of substance(s) that adversely affect beneficial uses for water

Recharge – replenishment of the ground water by the addition of water

Restoration – the act of restoring something to a satisfactory state

Riparian – an area of land adjacent to or connected with a stream, river, lake or wetland that contains vegetation that is distinctly different from vegetation of adjacent upland areas

Riparian areas – the zone of vegetation alongside waterways and other surface water. Lush and diverse vegetation is the best sign of healthy, well-managed riparian areas and is critical to filtering and slowing runoff

River basin - an area that contributes to form a watershed

Rural municipality - a defined territory incorporated under *The Municipalities Act*. A rural municipality is created by a ministerial order that describes the municipal boundaries and divisions therein. A rural municipality is governed by an elected council that can hire staff to manage daily administration and maintain municipal services (e.g., roads, utilities, recreation facilities).

SARM – Saskatchewan Association of Rural Municipalities, an independent association that represents rural municipal government in Saskatchewan

Sewage – the waste and waste water from residential or commercial establishments that are normally discharged into sewers

Sewage lagoon – a shallow pond where sunlight, bacterial action and oxygen work to purify waste water; also used for storage of waste water

Shoreland – Crown land that lies inland and within 30 metres of a bank or high water mark and between the boundaries of a surveyed subdivision and highwater mark of a water body

Source waters – untreated water from streams, rivers, lakes or underground aquifers used to supply private wells and public drinking water

Source water protection – the prevention of pollution and the sound management of factors and activities that (may) threaten water quality and quantity of lakes, reservoirs, rivers, streams and ground water

Stakeholder – individual or group with direct or indirect interest in issues or situations, usually involved in understanding and helping resolve or improve their situations

Stewardship – judicious care and responsibility by individuals or institutions for reducing their impacts on the natural environment

Sustainability – the ability of an ecosystem to maintain ecological processes and functions, biological diversity and productivity over time

Sustainable – the ability to manage and sustain a resource over time or the capability of being continued with minimal long-term effect on the environment

SUMA – Saskatchewan Urban Municipalities Association, working to improve urban life for Saskatchewan people

SWF – Saskatchewan Wildlife Federation, a non-profit, non-government charitable organization comprising more than 25,000 Saskatchewan sportsmen and conservationists

SWQI – Saskatchewan Water Quality Index

Tailings – waste material resulting from the washing, concentration or treatment of ground ore

Water quality – the chemical, physical and biological characteristics of water with respect to its suitability for a specific use

Watershed – an elevated boundary contained by its drainage divide and subject to surface and subsurface drainage under gravity to the ocean or interior lakes

Watershed health – the desired maintenance over time of biological diversity, biotic integrity and ecological processes of a watershed

Watershed and aquifer management – a process, within the geographic confines of a watershed or aquifer, that facilitates planning, directing, monitoring and evaluating activities to ensure sustainable, reliable, safe and clean water supplies

Watershed and aquifer planning – a process, within the geographic confines of a watershed or aquifer and with the participation of stakeholders, to develop plans to manage and protect water resources

Watershed protection - the treatment of watershed lands to control soil, water and wind erosion and ensure sound management and protection of source waters

Water quality – the chemical, physical and biological characteristics of water with respect to its suitability for a specific use

Waterworks – a single unit such as a pumping station, part of the water system of reservoirs, tanks, buildings, pumps and pipes, that supplies water to a city, town or municipality

Wetland – an area of low-lying land covered by water often enough to support aquatic plants and wildlife for part of the life cycle. The wetland area includes the wet basin and adjacent upland.

Appendices

Watershed Advisory Committees

Lanigan/Manitou Watershed Advisory Committee

Willard Beeler	Town of Nokomis
Rob Bennett	Manitou Environmental Group
Jordon Bergermann	R.M. of Humboldt #370
Don Bowman	Lanigan Creek Dellwood Brook Conservation Area Association #5 R.M. of Usborne #310
Rob Bubnick	Potash Corporation of Saskatchewan Inc. - Lanigan Division
Garth Burns	R.M. of Prairie Rose #309
Tim Davies	Resort Village of Manitou Beach
Dwayne Djkowich	Saskatoon Health Region
Leland Greenfield	Town of Nokomis
Curtis Greve	Town of Lanigan
Rod Halyk	City of Humboldt
Teresa Hards	Village of Simpson
Joseph Hinz (deceased)	R.M. of Wolverine #340 Burr Conservation Area Association
Jerry McGrath	R.M. of LeRoy #339
Calvin Michel	R.M. of Leroy #339 Lanigan Creek Dellwood Brook Conservation Area Association #5
Ernie Oblander	R.M. of Mount Hope #279
Paul Paquet	Resident of Meacham area
Todd Schuler	Humboldt Lake Resort
Jerry Sopatyk	Liaison, Lanigan/Manitou Environmental Farm Plan
Dion Tarasoff	Town of Watrous
Don Teneycke	R.M. of Morris #312
George Widdifield	Termuende Research Farm – Prairie Agricultural Machinery Institute

Last Mountain Lake Watershed Advisory Committee

Malcolm Campbell	Last Mountain Lake Fishermen's Co-op R.M. of Last Mountain Valley #250
Peter Counios	Town of Regina Beach
Doris A. Florness	Village of Aylesbury
Tony Gillich	Town of Strasbourg
Kerry Hecker	Last Mountain Lake National Wildlife Area
Sam Holinaty	South Shore Wildlife Federation
Jim Kautz	Arlington Beach
Lois Kavanagh	Village of Buena Vista
Cam Mackay (alternate)	Village of Buena Vista
Al McKenzie	Village of Buena Vista
Geoff Merifield	Resort Village of Kannata Valley
Brian Millar	Town of Craik
Brian Miller	City of Regina
Todd Richter	Resort Village of Grandview Beach Last Mountain Lake Stewardship Group
Dennis Scheer	R.M. of Longlaketon #219
Delbert Schmidt	R.M. of Longlaketon #219
David Silversides	Saskatchewan Ministry of Environment
Hilton Spencer	R.M. of Craik #222
Nelson Swanston	R.M. of McKillop #220
Shaun Thomson	R.M. of Wreford #280
Gilbert Wagner	Qu'Appelle River Conservation Area Association
Dennis Wesaquate	Piapot First Nation
Murray Wild	East Shore Wildlife Federation
Ray Wild	Saskatchewan Wildlife Federation
Lorne Willner	R.M. of Arm River #252
Michael Zaleschuk	Town of Regina Beach

Qu'Appelle River Watershed Advisory Committee

Sandra Bathgate	Town of Central Butte
Ron Bessey	Village of Bladworth
Ben Boots	Buffalo Pound Water Treatment Plant
Jim Brandt	Mosaic Potash Belle Plaine
Gord Brown	Resort Village of South Lake
Orval Brownlee	R.M. of Moose Jaw #161
Dave Bueckert	R.M. of Huron # 223 Town of Tugaske
Wayne Cozart	R.M. of Eyebrow #193
Darryl Crabbe	Saskatchewan Wildlife Federation
Jim Cross	Town of Davidson
O'Dell Dodd	Moose Jaw Wildlife Federation
Chad Drake	R.M. of Huron #223
Ed Geall	R.M. of Sherwood #159
Bob Gray	Brownlee North Water Users
Barry Gunther	Resort Village of Sun Valley
Claudette Halladay	R.M. of Marquis #191
Craig Hellings	Resident of Buffalo Pound Lake area
Jim Hipkin	R.M. of Lumsden #189
Thomas A. Lezetc	Resort Village of South Lake
Kim McCallum	Village of Brownlee
Don McDonald	R.M. of Dufferin #190
Roy Morrison	R.M. of Pense #160
Vern Noble	Resort Village of North Grove
David Paul	R.M. of Dufferin #190
Terry Rollie	Resort Village of South Lake
Jack Smith	R.M. of Craik #222
Lori Splett	City of Regina
Jim Supynuk	Resort Village of North Grove
John Watkins	Brownlee Water Irrigators
Blaine White	R.M. of Huron #223 Village of Tugaske

Wascana Creek Watershed Advisory Committee

Rick Ackerman	Town of Pilot Butte
Howard Arndt	Saskatchewan Ministry of Government Services
Robert J. Baker	Village of Sedley
Alex Banga	R.M. of Lajord #128
Fred Clipsham	City of Regina Saskatchewan Urban Municipalities Association member
Avens Dawson	University of Regina
Jim Elliott	Nature Regina
Ed Geall	R.M. of Sherwood #159
Maurice Giroux	Save-A-Goose Wildlife Federation
Peter Hagar	City of Regina
Rod Heise	R.M. of Lajord #128 Wascana Conservation and Development Area Authority #2
Joseph Hnatiuk	Saskatchewan Nature and Ecotourism Association
S.P. (Van) Isman	Wascana Centre Authority
Scott Langen	Saskatchewan Science Centre
Dennis W. Lawson	Nature Saskatchewan
George R. Leier	R.M. of Francis #127
Doug McBain	Town of White City
Dena McMartin	Faculty of Engineering, University of Regina
Gary Nieminen	City of Regina
Lori Parks	Ministry of Government Services
Jacques Poissant	Wascana Conservation and Development Area Authority #2
Doug Schaeffer	Save-A-Goose Wildlife Federation
David Sloan	Wascana Conservation and Development Area Authority #2
Darlene Woloshyn	Town of White City
Ed Zsombor	Town of Pilot Butte

Upper Qu'Appelle and Wascana Creek Technical Committee

Mohanath Acharya	Saskatchewan Watershed Authority
Twyla Armstrong	Agriculture and Agri-Food Canada–PFRA
Joel Brimacome	Agriculture and Agri-Food Canada–PFRA
Doug Brook	Ducks Unlimited Canada
Tim Cheesman (interim)	Saskatchewan Ministry of Municipal Affairs
Karen Cossitt	National Research Council Canada– Centre for Sustainable Infrastructure Research
John-Mark Davies	Saskatchewan Watershed Authority
Dwayne Djkowich	Saskatoon Regional Health Authority
Darryl Dormuth	National Research Council Canada– Centre for Sustainable Infrastructure Research
Kimberlea Driedger	Saskatchewan Watershed Authority
Len Erickson	Saskatchewan Ministry of Agriculture
Martin Grajczyk	Saskatchewan Watershed Authority
John Grigg	Saskatchewan Watershed Authority
Rod Halyk	Lanigan/Manitou Watershed Advisory Committee
Tom Harrison	Saskatchewan Watershed Authority
Kerry Hecker	Last Mountain Lake Watershed Advisory Committee
Craig Hellings	Qu'Appelle River Watershed Advisory Committee
Ross Herrington	Environment Canada
Joseph Hnatiuk	Wascana Creek Watershed Advisory Committee
Bruce Howard	Fisheries and Oceans Canada
Ron Kerr	Saskatchewan Ministry of Municipal Affairs
George Koutsoulis	Regina Qu'Appelle Health Region
Len Kowalko	Saskatchewan Ministry of Municipal Affairs
Ralph Leibel (interim)	Saskatchewan Ministry of Municipal Affairs
John Linsley	Saskatchewan Ministry of Agriculture
Michael McCann	Regina Qu'Appelle Health Region
Maureen McKegney-Clay (interim)	Agriculture and Agri-Food Canada–PFRA
Don Newcombe	Saskatchewan Watershed Authority
Bob Parker (interim)	Saskatchewan Watershed Authority

Upper Qu'Appelle and Wascana Creek Technical Committee *(continued)*

Ian Pickering	Agriculture and Agri-Food Canada–PFRA
Sharon Rodenbush	Saskatchewan Watershed Authority
Nolan Shaheen	Saskatchewan Watershed Authority
Dwayne Siba	Saskatchewan Watershed Authority
David Sloan	Wascana Creek Watershed Advisory Committee
Jerry Sopatyk	Lanigan/Manitou Watershed Advisory Committee
Kendra Svingen	National Research Council Canada– Centre for Sustainable Infrastructure Research
Robin Tod	Saskatchewan Watershed Authority
Rob Walcer	Saskatchewan Watershed Authority
Akira Watanabe	Saskatchewan Watershed Authority
Richard Zitta	Saskatchewan Ministry of Environment