



Saskatchewan  
Watershed  
Authority

March 2012

# Carrot River Watershed Source Water Protection Plan







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## Message from the President, Saskatchewan Watershed Authority

The Saskatchewan Watershed Authority is committed to watershed planning as an effective means to address risks to the province's water supply, safety and ecosystems.

I would like to congratulate the Watershed Authority staff, as well as the watershed advisory committees, technical advisory committee and board of the Carrot River Valley Watershed Association for developing the Carrot River Watershed - Source Water Protection Plan. This Plan, which represents considerable effort over the past three years, identifies priorities for tackling many of the challenging issues facing your watershed.

Thank you as well to the dozens of volunteers who contributed hundreds of hours to the development of this Plan, for your work to date and for your ongoing efforts in watershed management as you move on to the implementation of the Plan.

Water is essential for the health of our population, economy and ecosystems. As such, it is imperative and gratifying to realize a shared commitment by government, our communities and citizens toward ensuring a safe and sustainable water supply for the people of Saskatchewan.

**Wayne Dybvig**, President  
Saskatchewan Watershed Authority



## Message from the Carrot River Valley Watershed Association

The mission of the Carrot River Valley Watershed Association is to protect and improve water quantity and the health of our watershed, through collaborative planning and facilitating partnerships. The Association is also dedicated to preserving the beauty, diversity, and integrity of the watershed by raising awareness and understanding of watershed issues and promoting sustainable environmental, economic and cultural activities.

On behalf of the members of the Carrot River Watershed advisory committees, we are pleased to provide the Source Water Protection Plan for Carrot River Watershed. This document is the result of a planning process that began in December 2008 and incorporated over three years of involvement with local volunteers. The Plan contains a series of objectives, recommendations and key actions, created to protect both surface and ground water supplies and address infrastructure issues. Key actions were designed to provide a clear direction of what needs to be done, and by whom. The result of these actions will meet the challenges of today and tomorrow, helping to ensure clean water supplies for the future.

We wish to thank the members of the technical committee, who greatly assisted the watershed advisory committees throughout the development of the Source Water Protection Plan.

The Plan was completed under the leadership of the Saskatchewan Watershed Authority, through consultation with local watershed advisory committees. The Committees' broad membership included representatives from urban and Rural Municipalities, industry, conservation organizations, Agri-Environmental Group Plan (AEGP) committee, and First Nations.

Many have joined our positive approach to incorporating best management practices in both the urban and rural landscapes of our communities in the Carrot River Watershed. Our Association imagines the positive future we all wish to see: healthy families, parks and open spaces with abundant wildlife, clean drinking water, and good jobs. As we work towards these goals, we believe it is important to reassess both our environmental management systems and the value systems that underlie them.

Through actions aimed at educating the public about environmental and watershed health issues, stewardship initiatives on private lands and enhancement work that will improve the water quality of creeks and streams, you can be part of the watershed's future. Landowners are encouraged to maintain, enhance and protect existing natural features and consider the ecological health of natural systems in their land use activities.

I deeply appreciate the efforts that have gone into completion of the Carrot River Source Water Protection Plan. I look forward to implementation of the plan with the support of local communities and residents.

**Garfield Hnatiuk**, Chairperson  
Carrot River Valley Watershed Association





# 1. Executive Summary

The Province of Saskatchewan needs to ensure that it has an adequate supply of high quality water for the future. Under the Long-Term Safe Drinking Water Strategy, source water protection planning began in 2003 for at-risk watersheds in the populated areas of the province.

In the fall of 2008, Watershed Authority planners approached stakeholders in the Carrot River Watershed to participate in source water protection planning. Watershed advisory committees, which were assembled from volunteers, began planning meetings in December 2008. A technical committee was established with advisors from the Watershed Authority and partner agencies including Saskatchewan Ministry of Environment, Saskatchewan Ministry of Agriculture and Ducks Unlimited Canada.

The Carrot River Watershed is a relatively large geographic area. As such, watershed advisory committee members were divided into three "sub-watershed" advisory committees for planning purposes: Carrot River East, Carrot River West and Lenore Lake.

Watershed advisory committee members discussed the challenges and opportunities surrounding source water protection for the watershed. The goal of the process was to develop planning objectives, recommendations and key actions as the foundation of a source water protection plan. The Carrot River Watershed Source Water Protection Plan (Plan) is the product of subsequent planning efforts which involved representatives of rural and urban municipalities, First Nations, conservation groups and local Conservation and Development Area Authorities.

The Plan's objectives, recommendations and key actions have been developed by the members of the watershed advisory committees in collaboration with the technical committee. This content has been reviewed by subject experts from the technical committee. The watershed advisory committees have identified high, medium and low priority items to assist in the implementation of the plan.

Watershed residents were consulted through a series of open houses. Their comments were provided to the watershed advisory committees for consideration. Comments were also received from the provincial and federal government agencies, as well as stewardship organizations, which made up the technical committee and will support implementation of the Plan. These comments were reviewed through a joint meeting of the technical committee and watershed advisory committees.

The core of the Plan is its objectives, recommendations and key actions. These are grouped into eight categories: Groundwater and Aquifer Protection, Communications and Education, Research, Water Conservation, Water and Watershed Management, Watershed Infrastructure and Engineering, Watershed Stewardship and Watershed Stressors.

The Carrot River Valley Watershed Association has been established to lead implementation of the Plan. This non-profit group includes representatives of the local governments and organizations that made up the watershed advisory committees. The Carrot River Valley Watershed Association will work with the partner agencies and local stakeholders for implementation of the Source Water Protection Plan.

## 2. Introduction

Water is a fundamental component of any sustainable community. Safe drinking water, support for agriculture and industry, habitat, hydropower generation and recreation are ensured by managing and protecting this vital resource. This is a major contribution to ensuring a safe and prosperous Saskatchewan.

The protection of water quality is a critical aspect of water management. The quality of water can be influenced by a number of natural and human factors. Natural factors include climate and topography. Human factors include agricultural runoff and wastewater discharges (CCME 2004, 64). These and many other potential sources of contamination underscore the need to properly manage and protect Saskatchewan's water resources.

The 2001 *Cryptosporidium parvum* outbreak in North Battleford, Saskatchewan is an example that illustrates the need for water management and protection. Between March and April 2001, an estimated 5,800 to 7,100 people became ill after *Cryptosporidium parvum* entered the city's water treatment plant (Laing 2002, 4). In response to this event the Government of Saskatchewan ordered the Commission of Inquiry into the safety of the public drinking water in North Battleford (Laing 2002). Commissioner Justice Robert Laing recommended 28 actions to improve the safety of the province's drinking water. The *Long-Term Safe Drinking Water Strategy* (Strategy) was developed in response to the needs identified by the North Battleford Water Inquiry (Saskatchewan 2002).

The Strategy is a comprehensive action plan designed to address the risks that affect drinking water. It establishes a vision for "a sustainable, reliable, safe and clean supply of drinking water that is valued by the citizens of Saskatchewan" (Saskatchewan 2002). In order to achieve this vision, the Strategy employs the multi-barrier approach, which is widely accepted as the most effective method to protect drinking water (Saskatchewan 2002, 5). The Canadian Council of Ministers of the Environment (CCME) defines the multi-barrier approach as "an integrated system that prevents or reduces the contamination of drinking water, from source to tap, in order to reduce risks to public health" (CCME 2002, 4). This approach establishes barriers along the water supply route to prevent or reduce potential contaminants from reaching the end user.

The three barriers identified in the Strategy are:

- source protection;
- water treatment and operation; and
- water monitoring and testing.

Although the multi-barrier approach is a comprehensive method to ensure safe drinking water, the CCME stresses the fact that "individually, the barriers may be inadequate in removing or preventing contamination of drinking water" (CCME 2002, 5). Greater assurance of safe drinking water only occurs when all barriers are used together.

As the first step in the multi-barrier approach, source water protection is an essential component of any strategy to minimize contamination risks in a drinking water system (CCME 2002, 9). The Strategy identifies the following as the essential components of a source water protection plan (Saskatchewan 2002, 3):

- an inventory and characterization of the water source;
- an up-to-date inventory of all sources of pollution affecting the water source;
- the type of pollutants being discharged into each watershed must be quantified; and
- goals and strategies for protecting, monitoring and evaluating each watershed must be developed.





The goals and strategies, which form the basis of source water protection, must consider both short and long-term actions to control non-point<sup>1</sup> and point<sup>2</sup> sources of pollution over time. The Strategy also establishes source water protection goals and objectives for the Province of Saskatchewan. The goal is “to protect source waters now and into future” (Saskatchewan 2002, 2). The objectives are to ensure “risks to source water quality are known” and “watersheds are protected, natural purification and protection processes are maximized and potential for contamination is minimized” (Saskatchewan 2002, 2).

As a key action established in the Strategy, in 2002 the provincial government created the Watershed Authority to manage and protect water quantity and source water quality in Saskatchewan. In order to meet its mandate, the Watershed Authority released *Protecting our Water: a Watershed and Aquifer Planning Model for Saskatchewan* (Model) to the public in 2003. This document provided the Watershed Authority with the framework to establish watershed and aquifer plans in the province.

Watershed and aquifer planning is an essential part of implementing the source water protection goals and objectives set out in the Strategy. In addition to delivering source water protection in the strict sense, the Model is designed to address related concerns about water management, the quality and quantity of the water resources, demand for water, flooding and drought, climate change, the protection of riparian<sup>3</sup> and wetland areas, and maintaining biodiversity.

Watershed planning is a collaborative effort among government, non-government agencies and local stakeholders. The planning process identifies and explores threats to source water quantity and quality while providing a forum for stakeholders to participate in developing a strategy that contributes to sound water management.

The management and protection of the water resources for the benefit of Saskatchewan residents is best served when stakeholders collaborate frankly and with mutual respect, then commit to actions that support common goals. Involving local stakeholders in plan development ensures that vital local knowledge is incorporated. This involvement establishes local support and ownership of the plan.

The watershed planning process also relies on the expertise of natural resource managers from various government and non-government agencies. These experts assemble information in order to target areas of concern, inform discussion among partner agencies and stakeholder representatives, and present options to address issues.

Regardless of the scope, the Model is designed to achieve consensus, collaboration and stakeholder involvement throughout the process. With a focus on protecting the quantity and quality of water supplies, the planning process is designed to identify threats and initiate opportunities to address them.

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1 Non-point source pollution - Non-point source pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. Non-point source pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters and groundwaters (U.S. Environmental Protection Agency 2011).

2 Point source pollution - Pollution discharged through a pipe or some other discrete source from municipal water treatment plants, factories, confined animal feedlots, or combined sewers (United States Geological Survey 2011).

3 Riparian area - An area of land directly influenced by water. An ecosystem that is transitional between land and water ecosystems. Riparian areas usually have visible vegetative or physical characteristics reflecting the influence of water. River sides, lake borders, and marshes are typical riparian areas (www.biology-online.org 2005).

## The Carrot River Watershed

The Carrot River Watershed, located in both Saskatchewan and Manitoba, covers an area of approximately 17,500 square kilometres (See Figure 1). Nearly 15,750 square kilometres of the watershed are situated in Saskatchewan. The scope of this Plan is limited to the portion of the Watershed located in the Province of Saskatchewan.

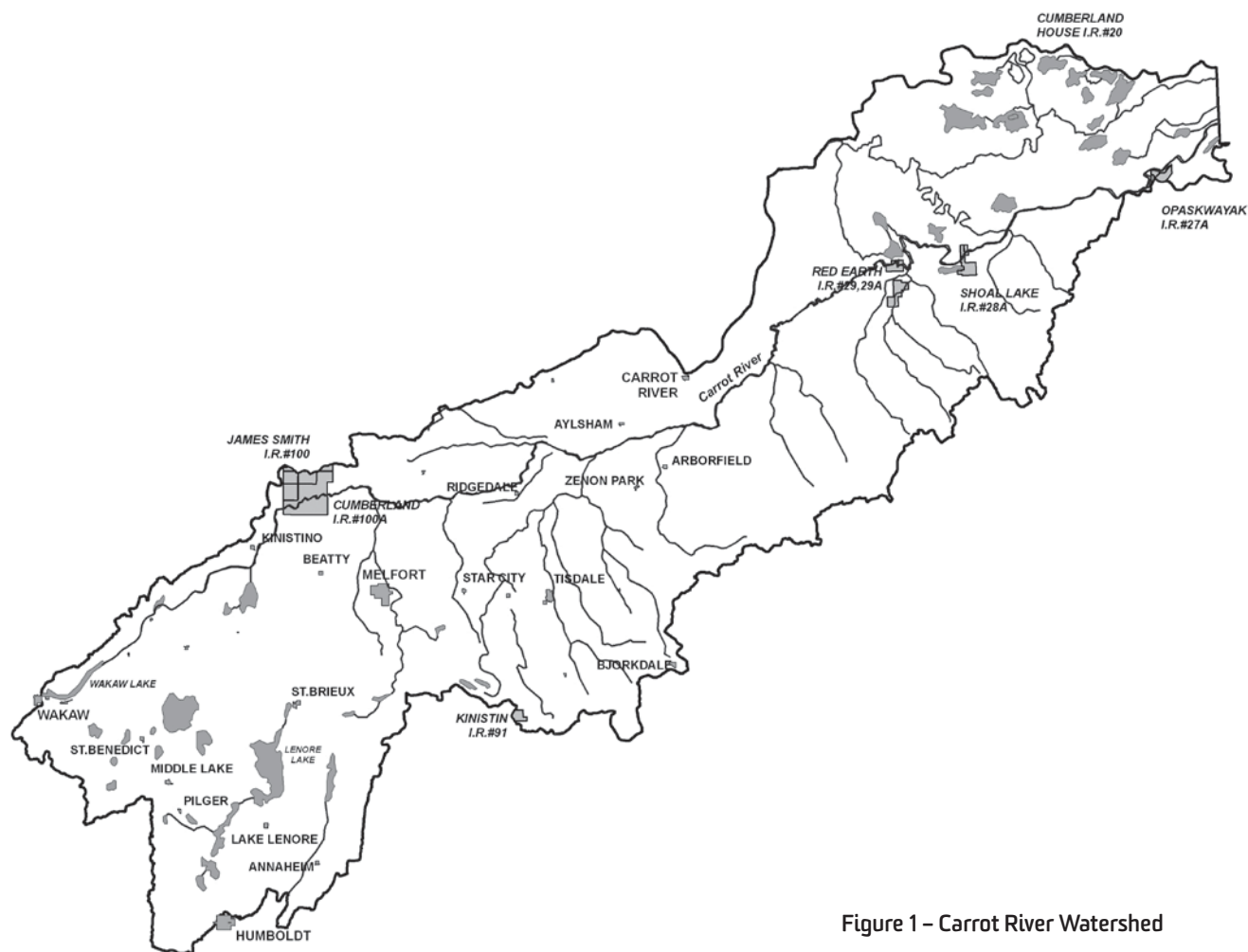


Figure 1 – Carrot River Watershed



Waldsea Lake flooding from July 2010 tour with speaker Murray Suchan, Saskatchewan Watershed Authority

The Carrot River is the dominant watercourse in this watershed. The river's headwaters originate in the Cudworth and Tiger Hills Plains near the Town of Wakaw. The outlet of Wakaw Lake marks the start of the Carrot River. From there, the river flows northeast through the Melfort and Red Earth Plains until it empties into the Saskatchewan River west of The Pas, Manitoba. The river's total length is approximately 300 kilometres. The Carrot River parallels the course of the South Saskatchewan and Saskatchewan Rivers. The distance between these rivers never exceeds 50 kilometres, while the width of the Carrot River Watershed never exceeds 80 kilometres (SaskWater 1994, 3). The Pasquia Hills form the southeastern border of the watershed and contribute a substantial amount of water to the Carrot River.



St. Brieux Regional Park.  
Credit: St. Brieux Realty

Tributaries that flow northward towards the Carrot River include Coldwell Creek, McCloy Creek, Dead River, Goosehunting Creek, Melfort Creek, Sweetwater Creek, Leather River, Presbyterian River, Doghide River, Crooked River, Burntout Brook, Jordan River, Papikwan River, Cracking River, Man River and Rice River. Tributaries north of the Carrot River include Sandhill Creek, Little Bridge Creek, and Emmons Creek.

The Lenore Lake internal drainage basin is within the Carrot River Watershed. The Lenore Lake Basin is characterized by moderately rolling to hilly terrain. The unique topography of the basin has developed several saline water bodies such as the Lenore, Basin, Houghton, Middle, Deadmoose, Waldsea and Ranch lakes. Both Waldsea and Basin are

terminal lakes, with Waldsea receiving water from Deadmoose while Basin receives water from Middle Lake during wet periods. All the lakes within the basin are saline with the exception of St. Brieux and Burton lakes.

The watershed climate is classified as dry sub-humid and is characterized by cool summers, cold winters, and moderate precipitation (SaskWater 1994, 3). Consistent with the Prairie climate, the amount of precipitation varies widely from year to year. The area's average annual precipitation ranges from approximately 400 millimetres in the west to nearly 500 millimetres in the east (SaskWater 1994, 3).

The Carrot River Watershed includes the City of Melfort, seven towns, 11 villages, 21 Rural Municipalities and six First Nation Reserves. The total population of the watershed is estimated at 25,500 (Statistics Canada n.d.). Approximately 13,500 inhabitants are classified as rural residents, while roughly 12,000 residents live in the watershed's urban centres. The majority of the population is concentrated in the south central portions of the watershed.

The State of the Watershed Report is used to provide an overall indication of the health of a specific watershed in Saskatchewan. The reporting process is based on a Stress-Condition-Response model, which uses indicator-based assessments to rate watershed health, environmental stressors, and management responses. This Model explicitly recognizes relationships between the health of the watershed (condition), human impacts on the ecosystem (stressors) and the associated management activities (responses) that have been adopted to mitigate stresses and improve the health of the watershed.

The Carrot River Watershed, as determined by the 2010 State of the Watershed, is classified as "Stressed." This means that while the functions and services it provides have not declined or deteriorated, the watershed has lost its resistance to change. As shown in Table 1, four of six conditions are rated as stressed. These include surface and ground water quality, riparian areas and rangeland health.

**Table 1 – Carrot River Watershed State of the Watershed Report Card for Condition Indicators**

Condition	Status
Surface Water Quality	Stressed
Groundwater Quality	Stressed
Aquatic Benthic Macroinvertebrate	Healthy
Riparian Areas	Stressed
Rangeland Health	Stressed
Environmental Acidification	Healthy
Health Grade	Stressed





Each of the watershed advisory committees developed a terms of reference during the initial meetings. These included information to address the rules of committee operation and the consensus-based decision-making process.

The Carrot River Watershed is a relatively large geographic area. To ensure reasonable travel times for the watershed advisory committee volunteer members, the watershed was divided into three “sub-watershed” planning areas: Carrot River East, Carrot River West and Lenore Lake (see Figure 2).

The technical committee included representatives from agencies with expertise in natural resources management. Various divisions of the Watershed Authority provided staff, including surface and ground water specialists. External agencies included:

- Agriculture and Agri-Food Canada  
Agri-Environment Services Branch;
- Ducks Unlimited Canada;
- Fisheries and Oceans Canada;
- Provincial Council of Agriculture  
Development and Diversification  
Boards for Saskatchewan;
- Saskatchewan Ministry of Agriculture;
- Saskatchewan Ministry of Environment;
- Saskatchewan Ministry of  
Municipal Affairs; and
- Weyerhaeuser Canada Ltd.



Carrot River East Watershed Advisory Committee Meeting. Left to Right: Gary Jones, Lynne Roszell, Alvin Alyea, John Daisley, Brian Campbell and Wilfred Trites

The role of the technical committee was to support the watershed advisory committees by providing expert knowledge, relevant research and responses to specific information requests from the committee.

The planning team consisted of staff from Watershed Planning and Lands Management Branch. Key responsibilities of the planning team included establishing and managing the watershed advisory and technical committees, compiling background information, managing the public consultation process and developing the plan. The team guided participants in round table discussions to determine issues and set priorities. Group validation of and commitment to sound watershed management was encouraged. Each watershed advisory committee selected a chairperson as the main point of contact between the committee and the planning team.

In September 2008, the planning process began with a series of open houses. Potential watershed advisory committee members were invited to attend an open house, learn about watershed planning and discuss their interests and issues. A media release was also issued at this time to inform the public about the planning process.



## Discussion of Interests and Issues

The next phase of the planning process began in December 2008 with the definition of interests and issues. Various interests and issues were discussed by the watershed advisory committees. Presentations by technical agency representatives served to guide the discussions, with relevant interests and issues discussed at the conclusion of each presentation.

All three watershed advisory committees received the following presentations:

- Agri-Environmental Group Plans;
- Aquatic Ecosystem Health of Carrot River;
- Carrot River Watershed Groundwater Overview;
- Hydrology of the Carrot River Basin;
- In-stream Flow Needs;
- Organization and Operation of the Assiniboine Watershed Stewards Association;
- Overview of Drainage Legislation and Policy;
- Protection of Drinking Water and Management of Wastewater;
- Riparian Area Characteristics and Benefits;
- Role and Responsibilities of Fisheries and Oceans Canada;
- Role of Regional Operations in Carrot River Watershed;
- State of the Watershed Report for Carrot River;
- Watershed Protection during Forest Operations; and
- Wetland Retention and Water Quality.

Once all presentations were completed, each of the three watershed advisory committees drafted an interests and issues list. After review by the watershed advisory committees, the identified interests and issues were provided to technical committee members. In September 2010, the final interests and issues list was completed.

Technical committee members then worked with the planning team to prepare a background report. Relevant data was included to assist stakeholders in understanding the watershed and support decision-making. Information included population and demographic details, economic activities and land use, climate, physical and topographic characteristics including soils, surface and ground water availability, water allocations, trends in water use and wastewater disposal and treatment. The background report also focused on the ecology of the watershed, with an emphasis on ecological diversity, indicators of riparian health and ecologically sensitive areas. Following review at a technical committee meeting, the background data was distributed to watershed advisory committee members.

Touring the watershed and discussing the situation on site provided additional information and a different perspective. Two watershed tours, which were open to all watershed advisory committee and technical committee members, were held in July 2010. Attendees travelled to significant facilities, such as water and wastewater treatment systems, viewed demonstrations of beneficial agricultural management practices and visited sites with specific water management issues like flooding and erosion.

Other techniques were adopted to inform watershed residents about the process. Information about Carrot River Watershed planning, including meeting notes and presentations, was made available online. A Carrot River Watershed newsletter was sent to all watershed residents during the finalization of the interests and issues phase. This newsletter identified the importance of watershed planning, discussed the planning approach, highlighted the significant interests and issues in the watershed and invited public comment.



## Drafting of the Plan

A final list of interests and issues was prepared in September 2010. As each sub-watershed advisory committee brought forward approximately 20 separate interests and issues, the planning team recognized that the committees would not be able to complete the entire process in a reasonable length of time. In June 2011, each committee prioritized its ten most important issues to be included in the Plan.

Technical committee members developed information in their areas of expertise, with the assistance of the planning team. The planning team used this technical information to create planning worksheets for each issue. The worksheets were then used by the watershed advisory committees to establish objectives, recommendations, key actions, potential partner agencies and timelines that addressed the issues.

The draft worksheets were reviewed by the technical committee, which provided feedback and comment. In December 2011, a joint meeting of the watershed advisory and technical committees was held to review the comments and revise the objectives, recommendations, key actions, responsible agencies and timelines for the draft Plan. The objectives, recommendations and key actions were then prioritized as low, medium or high. This marked the completion of the draft source water protection plan.

## Implementation Agency Development

To reduce the potential lag time between the end of the planning process and the beginning of Plan implementation, the first steps toward implementation were taken before the planning process ended. Preparation of the draft plan and the initial stages of implementation occurred concurrently.

In July 2011, approximately six months before the draft plan was completed, a steering committee was established to direct the formation of a non-profit stewardship group to implement the plan. The steering committee, which was composed of two to three committee members from each watershed advisory committee, met regularly for six months to direct the incorporation process, develop by-laws and establish the membership requirements of the stewardship group.

The steering committee incorporated the stewardship group as the Carrot River Valley Watershed Association Inc. The Association then entered into a contribution agreement with the Authority to provide core funding. The Association then advertised for an Executive Director to supervise implementation of the plan.

The next step in the process was the election of a permanent Board of Directors for the Carrot River Valley Watershed Association.

## Review of the Plan

Once the draft Plan was completed, it was then taken to the public for comment through a series of open houses in watershed communities. During January 2012, seven open houses were held in five locations. Public comments were recorded and provided to the watershed stewardship group for consideration.

The draft source water protection plan was also distributed to the agencies involved with the technical committee for review and comment. Other agencies, which were identified as potential partners to assist with plan implementation, were also asked to provide comments.

A joint meeting of the watershed advisory and technical committees was held in February 2012 to review all comments and determine the final objectives, recommendations, key actions, partner agencies and timelines.

## 4. Mission Statement, Goal and Principles

During the initial watershed advisory committee meetings in 2009, the planning team worked with the watershed advisory committees to develop the following mission statement, goal and principles for the planning process.

### Mission Statement

The watershed advisory committees and technical committee will work co-operatively to provide accurate information, describe issues of concern, protect source waters and recommend solutions for implementation of the Source Water Protection Plan.

### Goal

The watershed advisory committees will participate in the development and recommend implementation of a Source Water Protection Plan that will provide for watershed protection and help sustain water quality and quantity in an integrated and environmentally sound manner.

### Principles for Watershed Planning

The watershed advisory committees will develop a Source Water Protection Plan that will:

- Promote the needs and wishes of the people and communities within the watershed planning area, and in general, the people of Saskatchewan, on watershed protection issues.
- Incorporate integrated resource management by linking water quality and quantity and the management of other resources, recognizing hydrological, ecological, social and institutional systems.
- Promote water conservation and the protection of water quality by recognizing the value and limits of water resources and acknowledging both consumptive and non-consumptive values.
- Resolve water management issues through the Adaptive Resource Management model, monitoring and consultation.
- Seek beneficial management practices and stewardship actions that will improve source water.
- Ensure accountability through open communication, education and public access to information.
- Respect the rights of First Nations and Métis communities, municipalities, interest groups and the public.
- Consider the values and interests of First Nations and Métis communities, municipalities and other participants when making management recommendations.
- Recognize the authority and responsibilities of the irrigation districts, watershed associations, conservation area associations, municipalities, non-government organizations, provincial government ministries, provincial Crown corporations, federal government departments and First Nations and Métis that are involved with the planning process.
- Recognize and be consistent with current legislation and policies, and recommend changes where appropriate.
- Be flexible and adapt to new circumstances and information.
- Be subject to review and consideration by the non-government organizations, irrigation districts, watershed associations, conservation area associations, municipalities, provincial government ministries, provincial Crown corporations, federal government departments and First Nations and Métis that have been identified as responsible for aspects of plan implementation, on a regular basis.





## 5. Planning Objectives, Recommendations and Key Actions

Within the planning process, water management interests and issues such as drainage concerns typically dominate the initial committee discussions. The quality and quantity of the water resources in contrast to the demands that are placed on the resource, flooding and drought, climate change and the protection of riparian areas are issues that regularly come to the fore. Validating and prioritizing these issues are important outcomes of this step in the process (Watershed Authority 2003).

### Objectives

Planning objectives were developed after discussion and prioritization of the issues in the watershed. Objectives can range from activities to provide watershed residents with an improved understanding of the quality and quantity of the water resources and related ecological components to an assessment of a specific issue that is of particular interest or concern to stakeholders. Taking steps to improve water supply and source water quality are the type of specific objectives which could be pursued in a watershed or aquifer plan.

The assembly and analysis of information to address planning objectives is typically undertaken by the technical committee. The type of information gathered and degree of analysis conducted depends on the issues. In many cases, the analysis involves evaluating a range of options to address the planning objective. The analysis provides the basis for activities to address watershed issues and concerns. For example, an objective of addressing threats to groundwater can result in identifying best management practices to deal with those risks.

### Recommendations and Key Actions

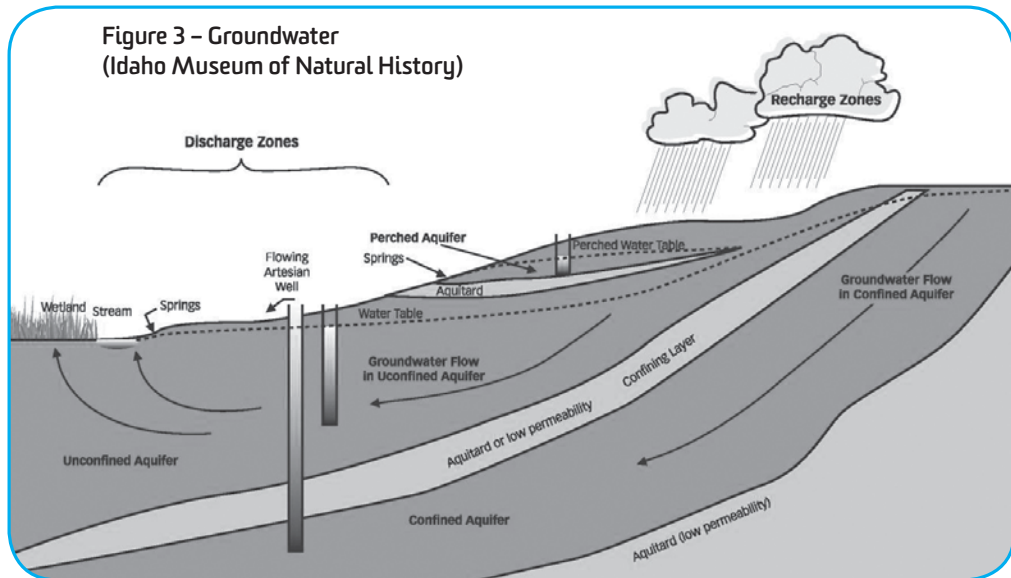
The concluding section of the Source Water Protection Plan summarizes the outcomes of the committee discussions and technical analysis. Responses to the planning objectives are usually presented through a series of recommendations, along with a general discussion of the perspectives of watershed residents. Because actions to implement the recommendations are critical to the acceptance and ultimate success of the plan, a clear indication of what needs to be undertaken, and by whom, is needed.

## 5.1 Groundwater and Aquifer Protection

The discussions of the watershed advisory committees during the process identified aquifer and groundwater protection as significant issues. This section provides a basic background about aquifer and groundwater protection along with the objective, recommendations and key actions to address these issues.

### Groundwater

Groundwater is an important part of the earth's water cycle. Water continuously circulates between land, air and ocean in the form of rain, snow, water vapour, surface water and groundwater (See Figure 3). Groundwater starts off as surface water or precipitation and enters the ground through areas generally referred to as recharge areas (Mauce 2008).



### Aquifers

Aquifers are rock or soil that is completely saturated with water (Mauce 2008). Aquifers are formations from which water can be removed economically. Although water moves through an aquifer, it is not an underground river. Typically, aquifers are made up of sediments with relatively large and connected pore spaces that permit water movement. Aquifers are most commonly composed of sands and gravels, but in some areas may be formed by cracked or fractured coal or shale.

### Groundwater Quality in Saskatchewan

Groundwater is an important source of domestic and drinking water in rural Saskatchewan. Groundwater supplies in Saskatchewan are highly mineralized, and can include sulphate, sodium, chloride, calcium, magnesium, bicarbonate and carbonate.

The quantity of dissolved minerals and the type of ions dissolved in the water are primarily dependent on the type of rock and soil that the water comes into contact with as it infiltrates the soil (Mauce 2008). Groundwater quality in Saskatchewan is quite variable but, in general, deep aquifers tend to have higher total dissolved solid levels than shallow aquifers. Shallow aquifers are more susceptible to contamination from local land use activities, and can be vulnerable to nitrate and microbial contamination.



Abandoned Water Well Decommission Workshop  
October 2010, Yellow Creek



Unfortunately, most groundwater supplies in Saskatchewan do not meet Canadian Drinking Water Quality Guidelines (Mauce 2008). Most commonly, they exceed guidelines for aesthetic parameters, such as total dissolved solids, hardness, and levels of iron and manganese. The frequency in which the water from domestic wells exceeds health-related parameters, such as bacteria, nitrate, arsenic, selenium and uranium, is of greater concern. Some studies have shown that up to 99% of domestic wells sampled exceeded a health or aesthetic parameter, and 35% or more exceeded one or more health parameters. Despite the relatively poor quality of groundwater, the water can be treated to meet a satisfactory quality level in most cases. This makes it very important for well owners to test their water supplies regularly, identify any quality issues and either take appropriate treatment actions to make the water safe for its intended use or locate an alternate water source.

Several communities in the Carrot River Watershed, including the towns of Carrot River and Tisdale, rely on groundwater for their drinking water. In the rural areas, many residents also use groundwater to supply their household and agricultural needs. The watershed advisory committees identified concerns about possible threats to groundwater from surface contamination and developed the following objectives, recommendations and key actions.

## Planning Objective

Promote measures for groundwater protection in the Carrot River Watershed.

## Recommendations

- Increase awareness and education surrounding abandoned water well decommissioning in partnership with the Carrot River Watershed Agri-Environmental Group Plan.
- Deliver abandoned water well decommissioning and well head protection programs, working with rural and urban municipalities, First Nations and other partners.

### KEY ACTIONS

1. Deliver abandoned water well decommissioning workshops in the watershed area.
2. Work with the Carrot River Watershed Agri-Environmental Group to assist farmers in applying for cost-shared funding to decommission abandoned water wells through the Canada-Saskatchewan Farm Stewardship Program.
3. Seek funding to decommission all abandoned water wells and to protect active water wells for communities and for residents who are not eligible for the Canada-Saskatchewan Farm Stewardship Program.
4. Identify abandoned water wells to decommission in areas that rely on groundwater as the primary or secondary water source and communicate this information to the Watershed Authority.
5. Record and track the number and location of decommissioned water wells within the watershed. When applicable, utilize the Authority's groundwater database to provide decommissioned water well locations to the Authority.

Lead Responsibility	Time Frame	Priority
Partners		
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association (co-lead)</b></li><li>• <b>Carrot River Watershed Agri-Environmental Group Plan (co-lead)</b></li><li>• Saskatchewan Watershed Authority</li><li>• Saskatchewan Ministry of Environment</li></ul>	2012 and ongoing	High

## 5.2 Communications and Education

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 improve their water. Encouraging the public to change behaviours and promoting environmental sustainability are important steps in source water protection.

The watershed advisory committees brought forward several objectives on communications and education. A key priority was the development of a communications strategy where success could be measured and monitored. One of the communication objectives was to promote water quality testing for both water wells and dugouts. As noted in the preceding section (Aquifer and Groundwater Protection), a majority of wells in Saskatchewan exceed one or more health or aesthetic standards.

During advisory committee discussions, concern was raised about the process and costs of meeting fish habitat protection requirements for construction and replacement of infrastructure such as culverts. An objective was established to improve communications between Fisheries and Oceans Canada, the Saskatchewan Ministry of Environment, municipalities and local residents.

### Planning Objective

Develop a communications strategy, which will serve to establish, and then track agency profile, key watershed issues, and programming success.

### Recommendation

Develop a communications strategy with measureable success as a priority. Focus the strategy on the planning objectives, recommendations and key actions in the Source Water Protection Plan.

#### KEY ACTIONS

6. Develop a communications strategy for the Carrot River Valley Watershed Association within the first year of operation, and ensure the following principles are incorporated:
  - objectives;
  - messaging;
  - audiences;
  - tools and activities;
  - resources and timescales; and
  - metrics for evaluation and revision.
7. Implement the communications strategy during the first year of operation and monitor for three years.
8. Use appropriate metrics such as surveys, media coverage, volunteer hours and in-kind support to gauge effectiveness, programming successes, and agency profile within the watershed.
9. Revise the strategy after the third year of implementation to ensure it remains effective and relevant.
10. Communicate the planning objectives, recommendations and key actions of the Carrot River Watershed Source Water Protection Plan through the communications strategy.

Lead Responsibility Partners	Time Frame	Priority
• Carrot River Valley Watershed Association	2012 and ongoing	High



## Planning Objective

Promote water quality testing for water supplies including active water wells and dugouts in the Carrot River Watershed to protect human health, livestock, and aquifers.

## Recommendation

Seek partnerships with agencies such as the Watershed Authority and the Saskatchewan Ministry of Environment to encourage water quality testing for water supplies including water wells and dugouts in the Carrot River Watershed.

### KEY ACTIONS

11. Promote water quality testing for active water wells and dugouts by developing newsletter articles and including links to educational materials on the Saskatchewan Ministry of Environment and Watershed Authority websites.
12. Indicate Association support for the Rural Water Quality Advisory program administered by the Watershed Authority.

Lead Responsibility	Time Frame	Priority
Partners		
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Carrot River Watershed Agri-Environmental Group Plan</li><li>• Saskatchewan Watershed Authority</li><li>• Saskatchewan Ministry of Environment</li></ul>	2012 and ongoing	High

## Planning Objective

Improve communication about the protection of fish habitat and shoreline alteration legislation among Fisheries and Oceans Canada, the Saskatchewan Ministry of Environment, local municipalities and watershed residents.

## Recommendations

- Provide information to local municipalities and watershed residents on the policies, legislation and standards of Fisheries and Oceans Canada and the Saskatchewan Ministry of Environment relating to fish habitat and shoreline alteration.
- Provide information to local communities on obtaining environmental approvals and licences from regulatory agencies.

### KEY ACTIONS

13. Encourage Fisheries and Oceans Canada and the Saskatchewan Ministry of Environment to provide information on their policies, legislation and standards through public education programs and workshops with local municipalities.
14. Assist Fisheries and Oceans Canada and the Saskatchewan Ministry of Environment to inform local municipalities and watershed residents about requirements for protection of fish habitat.
15. Work with Fisheries and Oceans Canada to deliver seminars and disseminate information on Fisheries and Oceans Canada's operational statements, policy and legislation to local municipalities and Conservation and development area authorities.
16. Act as a local municipality resource and liaison for inquiries regarding approvals and licences from Fisheries and Oceans Canada, Environment Canada, Saskatchewan Ministry of Environment, and the Watershed Authority.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Fisheries and Oceans Canada</li><li>• Environment Canada</li><li>• Saskatchewan Ministry of Environment</li><li>• Saskatchewan Watershed Authority</li><li>• Provincial Association of Recreational Communities of Saskatchewan</li><li>• Rural and urban municipalities</li><li>• Conservation and development area authorities</li></ul>	Ongoing	Medium



## 5.3 Research

The success of a source water protection plan is often related to the baseline information that is accessible on the particular watershed. The watershed advisory committees in the Carrot River planning process found that specific information about the watershed was not always available. Committee members identified concerns about possible increases in flows in the tributaries of the Carrot River originating in the Pasquia Hills. Research to determine the possible causes of these flows and the downstream effects of flooding, stream bank erosion and turbidity in these streams was suggested.

Local municipalities have encountered challenges with fish habitat protection requirements under provincial and federal legislation. One issue is the cost for determining if a particular stream or river contains fish and aquatic species which, in turn, influences decisions related to fish habitat protection. Working together with Fisheries and Oceans Canada, the committees recommended that a fish habitat inventory be developed for the waterways in the Carrot River Watershed.

The Town of Arborfield uses Burntout Brook as their water supply. As a pilot project for water quality monitoring in the watershed, a study was recommended for this Carrot River tributary. In addition, a recommendation was brought forward to assist the Wakaw Lake Stewardship Group in their Lakeshore Management Study by providing aquatic health and water quality information. Wakaw Lake lies on the extreme western end of the watershed and is subject to intense recreational development.



Aerial view of Wakaw Lake  
*Credit: Town of Wakaw*



Burntout Brook in Pasquia Hills  
*Credit: Weyerhaeuser Canada Ltd.*

## Planning Objectives

- Determine, through scientific research, the volume and contributing factors affecting the peak flows on the tributaries of the Carrot River originating in the Pasquia Hills.
- Obtain advice on measures to mitigate flooding and erosion.

## Recommendation

Continue to work with partners to develop a hydrological study on peak flows for the tributaries of the Carrot River originating in the Pasquia Hills. The study will include recommendations to mitigate flooding and erosion.

## KEY ACTIONS

17. Work with Watershed Authority, research institutions, and other partners to develop a study that will determine the volume and contributing factors affecting the peak flows in the tributaries of the Carrot River originating in the Pasquia Hills.
18. Educate watershed advisory committee members and watershed residents about forest harvesting and forestry research that has been completed within the woodland areas of the Pasquia Hills.
19. Ensure this study includes a review of past research and recommendations for measures to deal with flooding and erosion.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Saskatchewan Watershed Authority</li><li>• Saskatchewan Ministry of Environment</li></ul>	Initiate in 2012 and complete by 2015	Medium

## Planning Objectives

- Initiate a fish and fish habitat assessment in the Carrot River Watershed. The assessment will improve the capacity of local, provincial and federal authorities to make decisions about the presence or absence of fish and fish habitat.
- Identify priorities to maintain and improve fish passage and connectivity as part of the assessment.

## Recommendation

Partner with Fisheries and Oceans Canada, the Fish and Wildlife Branch of Saskatchewan Ministry of Environment and the Saskatchewan Wildlife Federation to conduct a fish and fish habitat assessment in the Carrot River Watershed.

## KEY ACTIONS

20. Work with the identified agencies to complete the fish and fish habitat study design, discuss considerations for perspective and interpretation of results, and confirm resources and equipment required for execution of the study.
21. Complete a desktop study of the existing watershed data using existing research completed in the Lenore Lake sub-watershed.
22. Develop and submit funding proposals based on the assessment design in order to access required resources for field work and ground truthing.<sup>4</sup>
23. Execute the fish and fish habitat assessment in the Carrot River Watershed. Coordinate the interpretation of results with identified agencies to ensure findings are put in the proper context.
24. Distribute appropriate mapping and a summary document to local municipalities to guide their decision making within the watershed.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Fisheries and Oceans Canada</li><li>• Saskatchewan Ministry of Environment, Fish and Wildlife Branch</li><li>• Saskatchewan Wildlife Federation</li><li>• Local wildlife federations</li></ul>	Project to be initiated by 2012 and completed by 2020	Low

<sup>4</sup> Ground truth - in the earth sciences, the facts that are confirmed in an actual field check is done at a location, specifically the determination of facts by examining the ground for patterns revealed by remote sensing or aerial photography (Dictionary.com 2012).





## Planning Objective

Develop a study monitoring the quality of raw water for communities using surface water in the watershed.

## Recommendation

Seek partnerships to develop a water quality baseline study using Burntout Brook as a case study.

### KEY ACTION

25. Develop a five-year baseline water quality study using Burntout Brook to represent the watershed. The study will include monitoring, analysis and interpretation of results.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Saskatchewan Ministry of Environment</li><li>• Saskatchewan Watershed Authority</li><li>• Town of Arborfield</li></ul>	Initiate in 2012 and complete by 2017	High

## Planning Objective

Develop a more comprehensive understanding of ecosystem health and water quality on the headwaters of the Carrot River Watershed by supporting the initiatives of the Wakaw Lake Stewardship Group.

## Recommendation

Support the Wakaw Lake Stewardship Group in obtaining federal, provincial and municipal government funding and technical assistance for the Wakaw Lake Lakeshore Management Study.

### KEY ACTION

26. Support the Wakaw Lake Stewardship Group in their pursuit of funding and technical support under the Lakeshore Management Study for the water quality and aquatic health reports.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Saskatchewan Watershed Authority</li><li>• Saskatchewan Ministry of Environment</li><li>• Fisheries and Oceans Canada</li><li>• Wakaw Lake Stewardship Group</li><li>• University of Regina<ul style="list-style-type: none"><li>◦ Department of Biology</li><li>◦ Faculty of Engineering and Applied Science</li></ul></li></ul>	Initiate in 2012 and complete by 2017	Medium

## 5.4 Water Conservation

With thousands of lakes, Saskatchewan appears to have infinite water resources to sustain our lives and livelihoods, while offering plentiful recreation, commercial and industrial opportunities. While water is a renewable resource, climatic variability and poor management can affect availability (Watershed Authority 2009).

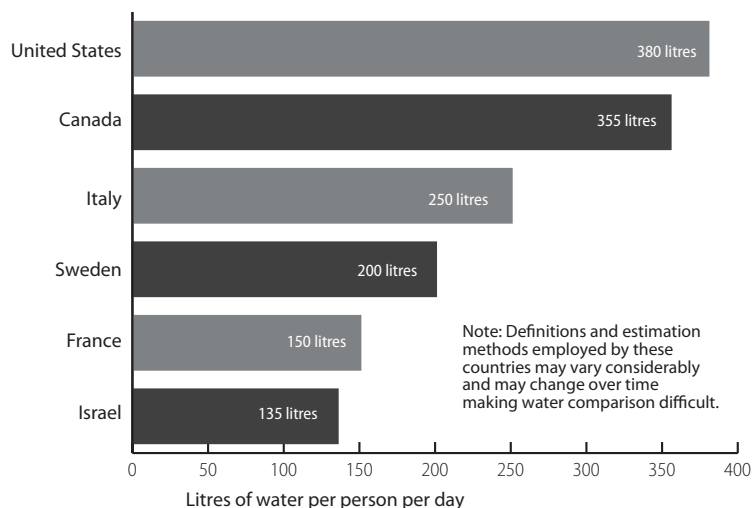
At 355 litres per capita per day, Canada is the second highest user of water among developed nations (Environment Canada n.d.) (See Figure 4). Average European water use is estimated at 200 litres per capita per day, while water use in developing nations is estimated at only 20 litres per capita per day (Valley 2006).

Not only are Canadians among the world's highest consumers of water (See Figure 5); the price we pay for water is one of the lowest. These two factors tell us that we undervalue one of our most essential resources.

Information collected during the committee meetings indicated that several communities in the watershed, as well as many rural residents, relied on the SaskWater regional supply systems with pipelines from the Saskatchewan River. These communities are assessed the direct costs for treatment and distribution of potable water. Water conservation would have an equally direct benefit by reducing expenses for community water utilities and building resiliency to hydro-climatic risk.

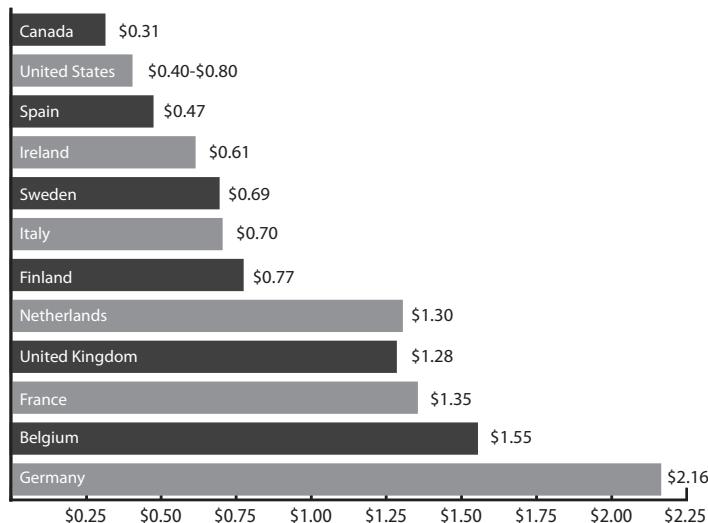
The watershed advisory committees recommended that local municipalities adopt best water conservation management practices. The Carrot River Valley Watershed Association will take the lead in educating watershed residents on the benefits of water conservation. An additional recommendation was brought forward that cautioned against implementation of low-flush toilets in some communities due to problems with wastewater infrastructure.

**Average Daily Domestic Water Use**  
(per capita)



**Figure 4 – Average Daily Domestic Water Use**  
(Environment Canada n.d.)

**Typical Municipal Water Prices in Canada and Other Countries**  
(per cubic metre)



**Figure 5 – Typical Municipal Water Prices in Canada and Other Countries**  
(Environment Canada n.d.)



## Planning Objective

Reduce water consumption in the Carrot River Watershed by 3% per year by 2017. (Local water consumption is based on the ten-year average litres/per capita/per day (LCD) from the Watershed Authority's June 2010 Saskatchewan Community Water Use Records.)

## Recommendation

Promote and implement water conservation best management practices and educate the public, industry and municipalities on the socio-economic and environmental benefits of water conservation.

### KEY ACTIONS

27. Encourage provincial and federal governments to provide ongoing financial support to communities with populations under 10,000 for continued upgrades to water and sewer infrastructure.
28. Develop a water conservation awareness strategy to engage watershed residents, especially youth.
29. Distribute a water conservation fact sheet.
30. Ask provincial and municipal governments to provide financial incentives to promote the use of water conservation technologies.
31. Encourage the use of water meters, as well as the application of user pay systems, for water delivery and wastewater infrastructure within the watershed.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Saskatchewan Watershed Authority</li><li>• Rural and urban municipalities</li><li>• Saskatchewan Ministry of Environment</li><li>• Saskatchewan Ministry of Municipal Affairs</li><li>• Saskatoon and Kelsey Trail Regional Health Authorities</li><li>• Environment Canada</li><li>• Infrastructure Canada</li></ul>	2017	Medium

## Planning Objective

Review the regulation and promotion of low-flush toilets in each community in the watershed. (Some communities have experienced problems with wastewater infrastructure; specifically older clay pipe wastewater systems.)

## Recommendation

Communities in the watershed should determine whether low-flush toilets are appropriate for their wastewater system and develop guidelines that would either restrict or promote these toilets.

### KEY ACTION

32. Distribute a letter to communities within the Carrot River Watershed identifying concerns about low-flush toilets and the potential impact on certain wastewater systems. Advise individual communities to develop guidelines that would either promote or restrict the installation of low-flush toilets.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Saskatchewan Watershed Authority</li><li>• Rural and urban municipalities</li></ul>	2012	Medium



## 5.5 Water and Watershed Management

The Carrot River is a significant feature of east central Saskatchewan, flowing northeast from populated agricultural lands to the forests and wetlands in the eastern portion of the watershed. The headwaters are Wakaw Lake on the western extreme of the watershed with a number of tributaries contributing as the waterway flows to the Manitoba border and the confluence with Saskatchewan River.

The Lenore Lake Basin is a closed basin. Although this basin does not contribute water to the Carrot River, it is part of the Carrot River Watershed.

Beginning in 2005, five years of above normal precipitation caused water levels in the Lenore Lake Basin to rise close to or even exceed historical peaks. The only natural means of removing water from closed basins is evaporation. The water level at any point reflects the balance over time between inflows into the lakes and outflows, which are consistent due to evaporation. It will take many years where evaporation exceeds precipitation for water levels to return to historical levels.

During the Lenore Lake watershed advisory committee meetings, local concerns were expressed that any outflow from Deadmoose and Houghton lakes into Lenore Lake will harm the Lenore Lake fishery. This issue, along with concerns about agricultural drainage and flooding around several lakes in the basin, were raised at the committee meetings. Due to an ongoing court case regarding the closure of culverts between Houghton Lake and Lenore Lake, Watershed Authority legal counsel advised that only limited discussion regarding flooding and water management issues could occur.

Flooding is an ongoing concern in the watershed, particularly downstream where the Carrot River spreads to form a delta. In 2005 and again in 2011, the Red Earth Cree Nation experienced significant flooding. The Plan recommends that a stronger relationship be developed between governments to provide long term solutions to this situation. In the past and as recently as 2011, there have been studies and considerable work done to address some of the issues. The past studies should be reviewed and their recommendations reassessed, as these may contain enough information to provide the required solutions.

The committees also recommended that common principles for source water protection be developed. These principles could be incorporated into municipal plans and zoning.



High water levels on Carrot River at Turnberry monitoring station, summer 2010  
Credit: Environment Canada

## Planning Objective

Develop a stronger relationship between the Carrot River Valley Watershed Association, Red Earth Cree Nation, Aboriginal Affairs and Northern Development Canada and Watershed Authority to investigate flood protection measures.

## Recommendation

Enhance partnerships among Red Earth Cree Nation, Aboriginal Affairs and Northern Development Canada and the Watershed Authority to address ongoing flooding problems.

### KEY ACTION

33. Work with the Red Earth Cree Nation, Aboriginal Affairs and Northern Development Canada and the Watershed Authority to investigate long-term solutions to the ongoing flood risk on the First Nation's lands.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Saskatchewan Watershed Authority</li><li>• Rural and urban municipalities</li><li>• Red Earth Cree Nation</li><li>• Aboriginal Affairs and Northern Development Canada</li><li>• Saskatchewan Watershed Authority</li></ul>	2012 and ongoing	High

## Planning Objective

Encourage municipalities in the watershed to develop official community plans and a zoning bylaw to promote source water protection.

## Recommendation

Encourage urban municipalities and adjacent rural municipalities to develop a common zoning bylaw for source water protection.

### KEY ACTION

34. Develop and promote common principles to protect source waters within the Carrot River Watershed. These principles can be used by rural and urban municipalities in the development of official community plans and zoning bylaws.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Saskatchewan Ministry of Municipal Affairs</li><li>• Rural and urban municipalities</li><li>• Saskatchewan Ministry of Environment</li><li>• Fisheries and Oceans Canada</li><li>• Saskatchewan Watershed Authority</li></ul>	2013 and ongoing	Medium

## 5.6 Watershed Infrastructure and Engineering

As previously noted, nearly half of the residents of the Carrot River Watershed live in rural areas and small hamlets outside of the major centres. The majority of the rural residents are located in the settled areas of the watershed which are found in the western portion of the basin. Agricultural settlement has resulted in a network of roads, with bridges and culverts required for waterway crossings.

In the Carrot River Watershed area, there are 19 active Conservation and development area authorities. These authorities administer a total of 850 kilometres of ditches and have taxation assessments on some 462,500 hectares of land inside their administrative boundaries. Conservation and development area authorities are responsible for extensive drainage conveyances, bridges and culverts.

Due to concerns about maintenance and replacement of water infrastructure, the Plan encourages provincial and federal governments to provide funding which is targeted to communities of fewer than 10,000 people.

Several specific infrastructure concerns were raised during the watershed planning process. The Town of Arborfield has an extensive berm which protects the community from the floods of the Burntout Brook. The plan recommends that the berm be improved to meet engineering standards and the licensing requirements of the Authority. Another specific project was the Smoky Burn low-level crossing on the Carrot River, which needs rehabilitation and improved fish passage capacity.

### Planning Objective

Mitigate flood risk to the Town of Arborfield and obtain licensing and operating approvals from Watershed Authority by ensuring all dikes and conveyance works meet engineering and safe building evaluation standards by 2016.

### Recommendation

Work in partnership with local representatives from the Town of Arborfield, the Arborfield Conservation and Development Area Authority, Rural Municipality of Arborfield No. 456, and the Watershed Authority to:

- investigate costs and requirements to obtain Watershed Authority approval;
- meet engineering and safe building elevation standards; and
- prioritize high risk structures.



Town of Arborfield flooding September 12, 2005



## KEY ACTIONS

35. Prepare a joint funding proposal with the Town of Arborfield to access financial support for projects to meet Watershed Authority's approval requirements, engineering requirements, and safe building elevation standards.
36. Increase capacity of the culvert on the Burntout Brook north of the Highway #23 bridge (SW3-48-12-W2) on the north-south grid road.

Lead Responsibility	Time Frame	Priority
Partners		
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association (co-lead)</b></li><li>• <b>Town of Arborfield (co-lead)</b></li><li>• Rural Municipality of Arborfield No. 456</li><li>• Arborfield Conservation and Development Area Authority</li><li>• Saskatchewan Watershed Authority</li></ul>	Initiate in 2012, complete by 2016	High

## Planning Objective

Seek partnerships, in-kind expertise and funding support to restore stream banks significantly affected by erosion.

## Recommendation

Develop a protocol for reporting, documenting and prioritizing areas affected by stream bank erosion. Employ this site prioritization protocol to guide the implementation of erosion control projects at three of the sites considered most at risk by 2017.

## KEY ACTIONS

37. In partnership with local rural and urban municipalities, prepare funding proposals for engineered erosion control projects to reduce stream bank erosion on the Carrot River at the Pasquia Regional Park and other identified high risk sites.
38. Work with watershed residents to implement the stream bank erosion protocol.
39. Work with watershed residents and the Carrot River Watershed Agri-Environmental Group Plan to promote riparian area buffers to prevent future erosion.

Lead Responsibility	Time Frame	Priority
Partners		
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Carrot River Agri-Environmental Group Plan</li><li>• Rural Municipality of Arborfield No. 456</li><li>• Rural Municipality of Moose Range No. 486</li><li>• Town of Carrot River</li><li>• Town of Arborfield</li><li>• Village of Aylsham</li><li>• Village of Zenon Park</li><li>• Saskatchewan Watershed Authority</li></ul>	Initiate in 2012, complete by 2017	Low





## Planning Objective

Coordinate the rehabilitation and improvement of the fish passage of the Smoky Burn low-level crossing on the Carrot River (NW28-32-1-W2).

## Recommendation

Seek possible funding from provincial and federal governments to rehabilitate the Smoky Burn low-level crossing.

### KEY ACTION

40. Work with the Rural Municipality of Moose Range No. 486, Fisheries and Oceans Canada and the Watershed Authority to rehabilitate and improve the fish passage of the Smoky Burn low-level crossing.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• Carrot River Valley Watershed Association</li><li>• Rural Municipality of Moose Range No. 486</li><li>• Saskatchewan Watershed Authority</li><li>• Fisheries and Oceans Canada</li><li>• Edgewood Forest Products Inc. (Carrot River)</li><li>• Saskatchewan Ministry of Environment Fish and Wildlife Development Fund</li><li>• Saskatchewan Wildlife Federation</li></ul>	Initiate in 2012, complete by 2017	Low

## Planning Objective

Raise awareness of the need for sustainable financing of municipal water and wastewater treatment infrastructure to ensure continued high quality potable water for watershed residents.

## Recommendation

Encourage federal and provincial governments to provide continued funding for municipal infrastructure.

### KEY ACTION

41. Work with local municipalities and other watershed agencies to influence the Canadian and Saskatchewan governments to provide long-term funding programs accessible to communities under 10,000 population.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• Carrot River Valley Watershed Association</li><li>• Saskatchewan Association of Watersheds</li><li>• Rural and urban municipalities</li><li>• Saskatchewan Association of Rural Municipalities</li><li>• Saskatchewan Urban Municipalities Association</li></ul>	2012 and ongoing	Low

## 5.7 Watershed Stewardship



Papikwan River crossing in Pasquia Hills  
*Credit: Weyerhaeuser Canada Ltd.*

The objectives of watershed stewardship are to raise awareness of water-related issues and to undertake local activities to protect and enhance the watershed's rivers, lakes and streams. The Carrot River Valley Watershed Association will work with local groups to provide information and promote best management practices for landowners, leading to improvements in water quality, fish habitat, riparian zones and wetlands in the watershed area.

During the watershed planning process, a need was identified for better environmental stewardship programs for the watershed's agricultural producers. The Saskatchewan Ministry of Agriculture and Agri-Food Canada's Growing Forward program for the development of an agri-environmental group plan. The result was the Carrot River Watershed Agri-Environmental Group Plan, which

was established in April 2010 with the support of the Provincial Council of Agricultural Development and Diversification Boards for Saskatchewan Inc. A beneficial management practices technician was hired to assist local producers to move forward with environmental farm plans that include a focus on habitat and water protection.

The Plan recommends a closer relationship between the Carrot River Valley Watershed Association and the Carrot River Watershed Agri-Environmental Group Plan. One option for collaboration is addressing the problem of noxious weeds and invasive plants. Another project is the completion of riparian health assessments for waterways in the area.

One issue was connected to both land stewardship and infrastructure. The plan urges that local producers be discouraged from farming into the drainage conveyance rights-of-way. Producers also need to be aware of the restrictions for spraying with pesticides along the same rights-of-way.

The committees identified stewardship of the local ecosystems as an important aspect of watershed management. Recommendations were made for enhanced education of all-terrain vehicle users about protection of the environment, particularly in forest areas.

Increasing beaver populations in some areas resulted to a recommendation for better coordination of beaver control among municipalities.



## Planning Objective

Support the Carrot River Watershed Agri-Environmental Group Plan and beneficial agricultural management practices.

## Recommendation

Support the integration of the Carrot River Watershed Agri-Environmental Group Plan and the Carrot River Valley Watershed Association.

### KEY ACTIONS

42. Meet with the Carrot River Watershed Agri-Environmental Group Plan Board to discuss agency integration.
43. Encourage provincial and federal governments to continue their support of the Canada-Saskatchewan Farm Stewardship Program by writing to Agriculture and Agri-Food Canada – Agri-Environmental Services Branch, the Saskatchewan Ministry of Agriculture and other partners.
44. Support the use of the beneficial management practices available through the Carrot River Watershed Agri-Environmental Group Plan.

Lead Responsibility	Time Frame	Priority
Partners		
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Carrot River Watershed Agri-Environmental Group Plan</li><li>• Provincial Council of Agriculture Development and Diversification Boards for Saskatchewan Inc.</li></ul>	2012 and ongoing	Low

## Planning Objective

Develop education, monitoring and control measures to reduce invasive plants, including prohibited, noxious and nuisance weeds within the Carrot River Watershed to reduce the threats to biodiversity and the health of riparian areas.

## Recommendation

Use current procedures and approaches to address invasive plants and prohibited, noxious and nuisance weeds.

### KEY ACTIONS

45. Develop an integrated weed management plan for the Carrot River Watershed in consultation with the Saskatchewan Ministry of Agriculture and local municipalities.
46. Increase awareness and understanding of invasive plants and prohibited, noxious and nuisance weeds as potential threats to the watershed.
47. Develop a program to assess and monitor problems; use results to guide control measures.
48. Promote the adoption of weed control programs by watershed municipalities, including establishing weed inspectors and forming cooperative weed management boards.
49. Develop and share extension materials on weed control and *The Weed Control Act*.
50. Organize invasive plant and prohibited, noxious and nuisance weed field days.
51. Promote the beneficial management practices for integrated pest management available through the Carrot River Watershed Agri-Environmental Group Plan.

Lead Responsibility	Time Frame	Priority
Partners		
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Carrot River Watershed Agri-Environmental Group Plan</li><li>• Saskatchewan Ministry of Agriculture</li><li>• Provincial Council of Agriculture Development and Diversification Boards for Saskatchewan Inc.</li></ul>	2012 and ongoing	Low

## Planning Objective

Minimize environmental damage from all-terrain vehicles (ATVs) by enhancing awareness of the impacts of ATV use among ATV users and the general public.

## Recommendation

Seek local partners and investigate opportunities to coordinate awareness efforts through the implementation of the Saskatchewan Ministry of Environment's Pasquia/Porcupine Integrated Forest Land Use Plan.



## KEY ACTIONS

52. Educate and communicate with ATV users by:
- developing articles on the environmental impacts of improper ATV use; incorporate in newsletters and other forms of media;
  - educating ATV users about their impacts on riparian areas and wetlands;
  - educating organizers of ATV rallies about practices with minimal impacts on the local environment;
  - distributing existing trail maps to promote trail use; and
  - including environmental responsibility and awareness in ATV training for 12- to 15-year-old users.
53. Investigate the possibility of licensing ATV vehicles on Crown lands and the provincial forest with the Saskatchewan Ministry of Environment and Saskatchewan Government Insurance (SGI).
54. Work with trail clubs and recreational users to identify and rehabilitate sites within the watershed that have been impacted by ATV use.

Lead Responsibility	Time Frame	Priority
Partners		
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Saskatchewan Government Insurance (SGI)</li><li>• Saskatchewan Ministry of Environment</li><li>• Saskatchewan Snowmobile Association</li><li>• Saskatchewan All Terrain Vehicle Association</li><li>• Saskatchewan Outfitters Association</li><li>• Recreational off-roading groups</li></ul>	Ongoing	Medium

## Planning Objective

Encourage all urban municipalities, rural municipalities and First Nations in the Carrot River Watershed to develop beaver management programs. Encourage the provincial government to offer incentives for beaver management.

## Recommendation

Work with local governments to develop a uniform strategy to manage beaver populations within the watershed.

### KEY ACTION

55. Encourage the provincial government to offer financial incentives that support beaver management programs.

Lead Responsibility	Time Frame	Priority
Partners		
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Saskatchewan Ministry of Environment</li><li>• Saskatchewan Conservation and Development Association</li><li>• First Nations</li><li>• Rural and urban municipalities</li><li>• Saskatchewan Association of Watersheds</li></ul>	Initiate in 2012, complete by 2016	Low

## Planning Objective

Promote education of agricultural producers about the conservation benefits of protecting wetlands, riparian areas and surface waters.

## Recommendation

Support the Carrot River Watershed Agri-Environmental Group Plan and producers in implementing the beneficial management practices available through the Canada-Saskatchewan Farm Stewardship Program.

### KEY ACTIONS

56. Partner with the Carrot River Watershed Agri-Environmental Group Plan to hold up to four field days or workshops per year to promote beneficial management practices.
57. Partner with the Carrot River Watershed Agri-Environmental Group Plan to develop newsletters and publications that promote the economic and environmental benefits of livestock management, including off-site watering and rotational grazing systems.
58. Support the Carrot River Watershed Agri-Environmental Group Plan in developing producer contacts through referrals and workshops.

Lead Responsibility	Time Frame	Priority
Partners		
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Carrot River Watershed Agri-Environmental Group Plan</li><li>• Agriculture and Agri-Food Canada Agri-Environmental Services Branch</li><li>• Saskatchewan Watershed Authority</li><li>• Saskatchewan Ministry of Agriculture.</li></ul>	2012 and ongoing	Medium



## Planning Objectives

- Ensure awareness of and compliance with legislation and regulations regarding application of pesticides near water bodies.
- Provide education about conveyance channel right-of-ways and their purpose.
- Prevent damage and disturbance to the buffer area of conveyance channel right-of-ways.

## Recommendation

Promote awareness of all regulations and special permits required by producers, employees and custom operators who farm adjacent to or have the potential to impact conservation and development area authority structures or watercourses.

### KEY ACTIONS

59. Develop partnerships with agencies that deliver educational materials to producers and landowners.
60. Convey information about regulations and permit requirements through media such as radio, newspapers, magazines, newsletters and workshops, using articles and interviews from the Watershed Authority, the Saskatchewan Conservation and Development Association, the Saskatchewan Ministry of Environment and the Saskatchewan Ministry of Agriculture.
61. Develop a factsheet showing beneficial management practices for farming near conservation and development area authority structures and riparian areas.

Lead Responsibility	Time Frame	Priority
Partners		
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Carrot River Watershed Agri-Environmental Group Plan</li><li>• Conservation and development area authorities</li><li>• Saskatchewan Conservation and Development Association</li><li>• Pesticide Management Regulatory Agency (Health Canada)</li><li>• Saskatchewan Watershed Authority</li><li>• Saskatchewan Ministry of Environment</li><li>• Saskatchewan Ministry of Agriculture</li></ul>	2012 and ongoing	Medium



## Planning Objective

Improve the health of the riparian areas in the Carrot River Watershed.

## Recommendations

- Conduct riparian health assessments for waterways in the Carrot River Watershed.
- Identify areas that are classified as unhealthy as targets for improvement and restoration.
- Provide education to the public, producers and stakeholders about the importance of healthy riparian areas.
- Initiate contact with federal and provincial agencies; look for options to fund ecological goods and services through an annual payment to agricultural producers.

### KEY ACTIONS

62. Solicit partners to develop a study of riparian health in the Carrot River Watershed.
63. Partner with the Carrot River Watershed Agri-Environmental Group Plan to develop a communication and education strategy targeted to producers, the public and stakeholders, which focuses on the importance of healthy riparian areas.
64. Promote the agricultural beneficial management practices available through the Carrot River Watershed Agri-Environmental Group Plan as a way to protect and improve riparian areas.
65. Partner with other watershed groups, the Saskatchewan Association of Watersheds and other organizations to obtain funding for ecological goods and services. Consult with other interested agencies such as Agriculture and Agri-Food Canada Agri-Environmental Services Branch, the Saskatchewan Ministry of Agriculture and the Saskatchewan Ministry of Environment on the promotion of ecological goods and services.

Lead Responsibility	Time Frame	Priority
Partners		
<ul style="list-style-type: none"><li>• <b>Carrot River Valley Watershed Association</b></li><li>• Carrot River Watershed Agri-Environmental Group Plan</li><li>• Agriculture and Agri-Food Canada Agri-Environmental Services Branch</li><li>• Saskatchewan Association of Watersheds</li><li>• Saskatchewan Watershed Authority</li><li>• Saskatchewan Ministry of Agriculture</li><li>• Saskatchewan Ministry of Environment</li></ul>	2012 and ongoing	Medium





## 5.8 Watershed Stressors

As noted previously, the watershed advisory committees were informed about the State of the Watershed Report as a reference for the health of the watershed. This report uses the Stress-Condition-Response model in its evaluation.

To assess the potential stress of human activities on watersheds in Saskatchewan, 22 stressor indicators were developed. These indicators were designed to focus on five issues associated with human activities: water use, human population, agricultural influences, industrial influences, and natural resource extraction.

Several of the stressors identified in the State of the Watershed Report deal with nutrient management, including manure production by livestock. The Carrot River Valley Watershed Association will work with the Carrot River Agri-Environmental Group Plan to promote beneficial management practices for improved nutrient management.

Another stressor for watersheds is the density of landfills. The Plan recommends that agricultural plastics be diverted from landfills and that demolition materials are disposed of in a safe manner. The Carrot River Valley Watershed Association will work with other stewardship organizations to promote recycling oil, oil containers and filters.

Municipal wastewater effluent discharges were also identified as a stress factor. The Plan supports better wastewater treatment options by supporting the “Canada Wide Strategy for the Management of Municipal Wastewater Effluent” (CCME 2009). One notable area of concern is the level of chemicals left behind by personal care products such as pharmaceuticals and deodorants. The plan recommends that these products be studied by provincial and federal government, leading to standards for acceptable levels of these chemicals.

### Planning Objective

Promote nutrient management education, beneficial management practices and alternative methods of nutrient management for agricultural producers.

### Recommendation

Support the Carrot River Watershed Agri-Environmental Group Plan and producers in implementing beneficial management practice demonstration projects and pilot research projects that focus on improved nutrient management.

#### KEY ACTIONS

66. Implement improved nutrient management agricultural demonstration projects to reduce impacts on surface and ground water.
67. Coordinate the development of communications material by the Carrot River Valley Watershed Association and the Carrot River Watershed Agri-Environmental Group Plan to promote the economic and environmental benefits of improved nutrient management and extensive winter field grazing.
68. Investigate research partnerships to explore alternative methods of dealing with nutrients from agriculture production in the Carrot River Watershed.
69. Collect and provide information to watershed residents about studies on best practices for nutrient management in Saskatchewan and Western Canada.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"> <li>• Carrot River Valley Watershed Association</li> <li>• Carrot River Watershed Agri-Environmental Group Plan</li> <li>• Saskatchewan Ministry of Agriculture</li> <li>• Saskatchewan Forage Council</li> <li>• Consultants such as the Prairie Agricultural Machinery Institute</li> </ul>	Ongoing	High

## Planning Objective

Encourage protection of groundwater and improved management of current landfills by:

- diverting agricultural plastics (specifically grain bags) from landfills into recycling programs;
- promoting the safe disposal of non-recyclable items;
- communicating options for disposal of oil, oil filter and oil containers through the Saskatchewan Resource Recovery Corporation;
- promoting safe disposal of construction wastes such as concrete; and
- promoting proper disposal of unused agricultural pesticides and household hazardous waste.

## Recommendation

Work with partners to promote diversion of agricultural plastics from landfills, safe disposal of construction and demolition waste, recycling of oil, oil filters and oil containers, unused agricultural pesticides and household hazardous waste.

### KEY ACTIONS

70. Develop and promote recycling days in the Carrot River Watershed for the collection and recycling of grain bags.
71. Investigate an option for on-farm grain bag pick-up. The collection should be guided by the Provincial Council of Agriculture Development and Diversification Boards for Saskatchewan Inc. pilot project recommendations.
72. Work with Saskatchewan Resource Recovery Corporation to educate watershed residents about recycling of oil, oil filters and oil containers and recycling locations.
73. Promote education of municipal councils and watershed residents on safe and proper disposal of construction and demolition waste.
74. Promote education about the proper disposal of unused agricultural pesticides and household hazardous waste.
75. Promote a regional model for recycling of materials in those areas of the watershed not currently covered by a regional program.

Lead Responsibility	Time Frame	Priority
Partners		
<ul style="list-style-type: none"> <li>• <b>Carrot River Valley Watershed Association</b></li> <li>• Saskatchewan Association of Watersheds</li> <li>• Saskatchewan Ministry of Environment</li> <li>• Regional Authority of Carlton Trail</li> <li>• Provincial Council of Agriculture Development and Diversification Boards for Saskatchewan Inc.</li> <li>• Carrot River Watershed Agri-Environmental Group Plan</li> <li>• Saskatchewan Association for Resource Recovery Corporation</li> <li>• Saskatchewan Waste Reduction Council</li> <li>• Rural and urban municipalities</li> </ul>	2012 and ongoing	Medium



## Planning Objective

Support the “Canada-wide Strategy for the Management of Municipal Wastewater Effluent” (CCME 2009) and encourage watershed communities to comply with the proposed standards.

## Recommendation

Assist the Saskatchewan Ministry of Environment in informing watershed communities about the “Canada-wide Strategy for the Management of Municipal Wastewater Effluent”.

### KEY ACTIONS

76. Promote wastewater treatment infrastructure that will meet the standards required under the “Canada-wide Strategy for the Management of Municipal Wastewater Effluent.”
77. Use workshops and field days to raise community awareness of the current technologies and options for wastewater treatment.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• Carrot River Valley Watershed Association</li><li>• Saskatchewan Ministry of Environment</li><li>• Western Canada Water and Wastewater Association</li></ul>	2012 and ongoing	Low

## Planning Objective

Support funding of continued research on the presence of chemicals from pharmaceutical and personal care products in surface water; determine if these chemicals are detrimental to the ecosystem and human health. Pharmaceuticals such as hormones within treated effluent are a potential threat to humans and ecosystem health.

## Recommendation

Encourage Environment Canada and the Saskatchewan Ministry of Environment to promote and fund research on the impact of pharmaceuticals and personal care products on ecosystem and human health. If determined to be a threat, encourage Environment Canada and the Saskatchewan Ministry of Environment to develop standards for acceptable levels and require wastewater treatment.

### KEY ACTIONS

78. With the assistance of the Saskatchewan Association of Watersheds, inform Environment Canada and the Saskatchewan Ministry of Environment, of the Carrot River Valley Watershed Association’s concerns about the impact of pharmaceutical and personal care products, stressing support for continued research.
79. Provide information to watershed residents and communities about the issues surrounding pharmaceutical and personal care products. This information should include material about proper disposal of these products.

Lead Responsibility Partners	Time Frame	Priority
<ul style="list-style-type: none"><li>• Carrot River Valley Watershed Association</li><li>• Saskatchewan Association of Watersheds</li><li>• Environment Canada</li><li>• Saskatchewan Ministry of Environment</li></ul>	Ongoing	Low

# 5.9 Plan Implementation Strategy

A critical step in any planning process is implementation of the plan. Without the successful execution of the key actions, a plan is no more than a list of good intentions.

Local direction, with the ongoing support of partner agencies, is vital to successful implementation. This approach promotes a strong sense of purpose with a cooperative drive to meet the Plan’s goals and objectives. The Carrot River Valley Watershed Association will fill this role as implementation agency for the Source Water Protection Plan.

## Planning Objective

Create a watershed agency composed of representatives of municipalities, First Nations, Metis governance, conservation organizations and interested individuals to implement the key actions contained in the plan.

## Recommendation

The Carrot River Watershed steering committee, with representatives from the watershed advisory committees, will establish a watershed agency with an elected board.

### KEY ACTIONS

- 80. The Carrot River Watershed steering committee will organize and incorporate a watershed agency for implementation of the watershed protection plan.
- 81. The Carrot River Valley Watershed Association will establish a board with representation from the First Nations, Metis governance, municipalities, conservation organizations and interested individuals within the watershed.

Lead Responsibility	Time Frame
Partners	
<ul style="list-style-type: none"><li>• Carrot River Watershed steering committee</li><li>• Carrot River Valley Watershed Association</li><li>• Saskatchewan Watershed Authority</li></ul>	2012



## Planning Objective

Explore and secure funding sources for the implementation of the Carrot River Watershed Source Water Protection Plan.

## Recommendation

Pursue federal, provincial and municipal financial support to ensure the continued sustainability of the Carrot River Valley Watershed Association and implementation of the Carrot River Watershed Source Water Protection Plan.

### KEY ACTION

82. Solicit funding at the federal, provincial and municipal level for the implementation of the Carrot River Watershed Source Water Protection Plan.

Lead Responsibility Partners	Time Frame
<ul style="list-style-type: none"><li>• Carrot River Valley Watershed Association</li><li>• Saskatchewan Watershed Authority</li></ul>	2012 and ongoing

## Planning Objective

Ensure local decision-making is based on the best available scientific data, interpretation and expert advice.

## Recommendation

Continue to engage the technical committee to provide advice and guidance in the implementation of the Carrot River Watershed Source Water Protection Plan.

### KEY ACTION

83. The Carrot River Valley Watershed Association will meet annually with the Carrot River Watershed technical committee.

Lead Responsibility Partners	Time Frame
<ul style="list-style-type: none"><li>• Carrot River Valley Watershed Association</li><li>• Saskatchewan Watershed Authority</li></ul>	2012 and ongoing



## 6. Conclusion

The source water protection planning process has engaged local communities and stakeholders to develop a series of objectives, recommendations, and key actions that will improve water quality and water management in the Carrot River Watershed. Through a collaborative and consensus-based process that relied on the expertise of the agencies that made up the technical committee, local priorities have been identified and solutions offered.

Implementation is the next step in the process. With the continued involvement of local residents and ongoing support from the technical committee agencies, implementation will translate the Plan into actions that will have lasting positive effects on the watershed area. As the implementation process follows the adaptive resource management approach, future opportunities may make it appropriate to periodically review, update or revise the planning objectives, recommendations and key actions.



Carrot River at Pasquia Regional Park





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