



WILLOW CREEK

INTEGRATED WATERSHED MANAGEMENT PLAN

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EXECUTIVE SUMMARY

The Willow Creek Integrated Watershed Management Plan was developed in partnership with the East Interlake Conservation District, the Province of Manitoba, community stakeholders and a vibrant group of watershed residents. This 10-year plan outlines actions for the protection, conservation and restoration of land, water and aquatic ecosystems in the Willow Creek watershed.

The planning process extended over three years and was completed in 2012. The plan focuses on addressing the five land and water priorities identified by watershed residents in the summer of 2009.

WATERSHED PRIORITIES

1. DRINKING WATER QUALITY
2. SURFACE WATER MANAGEMENT
3. SURFACE WATER QUALITY
4. SOIL AND SHORELINE MANAGEMENT
5. WILDLIFE AND FISH HABITAT

This plan is the third integrated watershed management plan (IWMP) that has been developed by the East Interlake Conservation District; the Icelandic River – Washow Bay Creek IWMP was completed in 2010 and the Netley-Grassmere IWMP was completed in 2011. Residents in the Willow Creek watershed are concerned about similar issues to residents in these adjacent watersheds. Efforts have been made to complement and link actions in this plan to the actions in both of these neighbouring watershed plans for ease of implementation.

Hundreds of thousands of dollars will be directed towards conservation programming in this watershed over the next 10 years. This plan will help ensure that resources will be allocated to areas where it will provide the most benefit. All levels of government, stakeholders and residents each have a role to play in ensuring this plan is successfully implemented. By developing new partnerships and integrating resources, measurable improvements to watershed health will be experienced in the Willow Creek watershed over the next 10 years.



INTRODUCTION

The Willow Creek watershed is a diverse watershed located in Manitoba's Interlake region adjacent to Lake Winnipeg's south basin. This 1,210 square kilometre watershed includes approximately 40 kilometres of Lake Winnipeg shoreline, the world's largest concentration of red-sided garter snakes and is underlain by the expansive and productive Carbonate aquifer. The watershed contains high quality and marginal agricultural land, Camp Morton Provincial Park and many vibrant communities such as Gimli which is known for its strong Icelandic heritage and commercial fishing industry. These unique and important landscape features have shaped the issues faced by residents living in this watershed and the management recommendations proposed in this plan.

In Manitoba, resource managers are moving towards a watershed-based management philosophy. A watershed is a topographically defined area of land where the water within it flows to a common point. Water moves downstream through a watershed and any activity that affects water quality, quantity or rate of flow at one location will affect locations downstream. In other words, what happens upstream affects what happens downstream.

Watersheds are considered the most ecologically and administratively appropriate units for managing water. Working within watersheds gives people the opportunity to address water quality, quantity, community and habitat issues beyond the scope of single jurisdictions like towns or municipalities, as well as, consider cumulative impacts of land use practices.

An Integrated Watershed Management Plan (IWMP) is a document that outlines actions to address priority land and water resource issues on a watershed basis. This plan is a tool to assist residents, stakeholders and all levels of government in making responsible decisions on how to manage water, develop land and allocate financial resources. An effective watershed plan is important for the sustainable development of thriving communities like those in the Willow Creek watershed, as the implementation of its actions not only includes improvements to the environment, but also social and economic benefits.

The Willow Creek IWMP will only succeed if you, and the rest of the watershed community, embrace the plan and become active and involved in its implementation.

KEY PLAYERS

Watershed residents are the single most important group in the creation and implementation of a watershed plan. The Willow Creek IWMP is intended to be a reflection of the collective values of watershed residents in relation to land and water resources. Throughout the development of this plan, watershed residents shared their issues related to land and water and their vision of what the Willow Creek watershed should look like for future generations.

The **Water Planning Authority (WPA)** is the organization designated under The Water Protection Act with the responsibility to develop an integrated watershed management plan. The East Interlake Conservation District was designated as the WPA for the Willow Creek watershed in December 2008.

The **Project Management Team (PMT)** for the Willow Creek watershed was formed in the spring of 2009. The role of the PMT is to act as the key decision-makers during the development of the plan. As such, the Willow Creek PMT met regularly and was responsible for designing communication materials, hosting open houses to engage the public, combining local and technical information to generate the goals, objectives and actions for the watershed and finalizing the content of the integrated watershed management plan.

The **Watershed Team** is a group of community representatives and technical experts from key stakeholder organizations and all levels of government. The role of the Watershed Team is to provide technical information and guidance throughout the development of the plan.

WILLOW CREEK **WATERSHED**

The Willow Creek watershed is located in Manitoba's Interlake region. As shown in Figure 1, it contains all or parts of the Rural Municipalities of Armstrong, Gimli, Rockwood and St. Andrews. The watershed is home to many rural and cottage communities including Gimli, Narcisse, Fraserwood, Meleb, Chatfield, Komarno, Malonton, Sandy Hook and Arnes.



The Willow Creek watershed is located adjacent to Lake Winnipeg, the 10th largest body of freshwater in the world, and is part of the second largest watershed system in Canada, the Lake Winnipeg watershed. The Willow Creek watershed has a drainage area of approximately 1,210 square kilometres and contains approximately 620 kilometres of ordered drains and two large lake complexes, Fish Lake and Dennis Lake. In the western region of the watershed, water generally flows in a south-easterly direction following the ridge and swale topography. A large ridge located just east of the boundary between the Rural Municipalities of Armstrong and Gimli causes the movement of water to slow down. As the water flows over the ridge, the speed of flow increases. This drainage pattern has been altered by the construction

of roads and drains through this ridge causing the water to change direction flowing eastward towards Lake Winnipeg. The elevation of land varies from approximately 280 masl (919 ft) in the western region to 217 masl (712 ft) near the shores of Lake Winnipeg, as shown in Figure 1.

The Willow Creek watershed is home to approximately 7,000 people and includes high quality and marginal agricultural land and an abundance of natural habitat. Although the amount of natural habitat has declined slightly in recent years, nearly 80% of the watershed remains classified as wetlands, trees, pasture and grasslands according to recent land cover data. The majority of the land in this watershed is suitable for livestock and forage production.

Over 25%, or 28,000 hectares (69,190 acres), of land in the watershed is owned by the Crown, most of which is located in the Rural Municipality of Armstrong. Approximately 15,000 hectares (37,066 acres) of these Crown lands are available for agricultural use through the Agricultural Crown Lands Leasing Program. Another 5,242 hectares (12,953 acres) is managed by Agriculture and Agri-Food Canada - Agriculture Environment Services Branch at the Narcisse Community Pasture.¹

During the summer months, the population in this watershed grows as cottagers from Winnipeg and surrounding areas arrive to enjoy the beaches and recreational activities along Lake Winnipeg. The white sandy beaches draw thousands of visitors annually. Lake Winnipeg also supports a productive commercial fishing industry, while sport fishing remains popular with both residents and visitors.

For more information on the land and water resources of the Willow Creek watershed, please refer to the technical reports submitted by members of the Watershed Team on the East Interlake Conservation District website (www.eicd.ca).

¹ Agriculture and Agri-Food Canada – Agri-Environment Services Branch (AESB) and Manitoba Agriculture Food and Rural Initiatives (MAFRI) 2010. *Agricultural Land Use and Management in the Willow Creek Watershed*

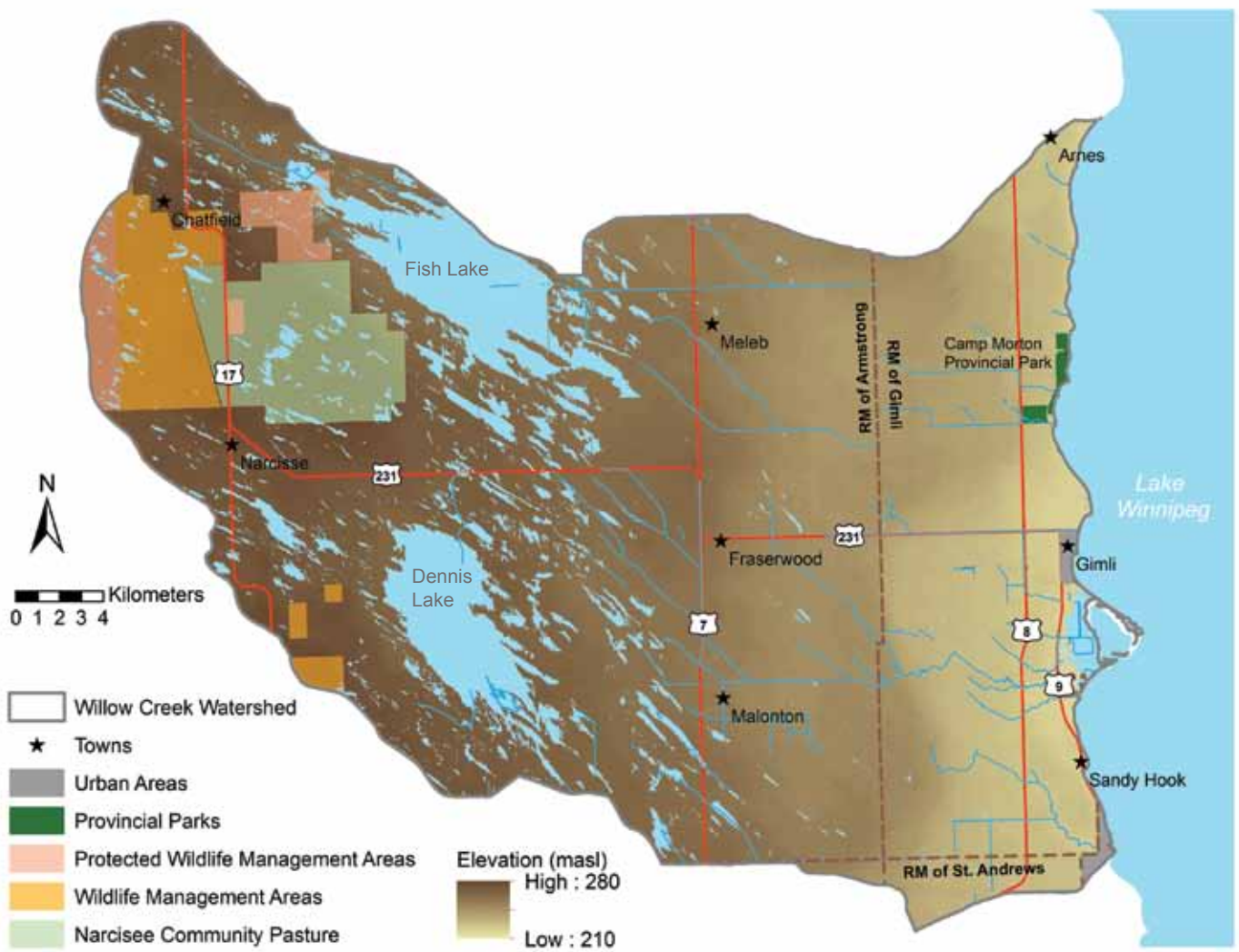


Figure 1: Willow Creek Watershed

WATERSHED PRIORITIES

To identify local land and water concerns, watershed residents and stakeholders were asked to provide input at three consultation events held throughout the Willow Creek watershed in the summer of 2009. Input was gathered from two groups:

- 1) Watershed residents at public consultation events held in Fraserwood and Gimli; and

- 2) The Watershed Team, a group of technical experts and community stakeholders, at a meeting held in Fraserwood.

The project management team considered input from both of these groups in the development of this plan. The plan is organized to address issues within the following five top priorities:

WATERSHED PRIORITIES:

1. DRINKING WATER QUALITY
2. SURFACE WATER MANAGEMENT
3. SURFACE WATER QUALITY
4. SOIL AND SHORELINE MANAGEMENT
5. WILDLIFE AND FISH HABITAT

The plan has been formatted to address issues within these five priorities. The left-hand side of the page outlines the issues, whereas the right-hand side of the page highlights the corresponding actions.



DRINKING WATER QUALITY

Clean, potable drinking water is critical for human life and a necessity for prosperous sustainable communities. Residents prioritized drinking water quality as their top issue of concern for this watershed. Approximately 85% of residents are provided with treated drinking water from a public water system. In Manitoba, the Office of Drinking Water defines a public water system as a potable supply of drinking water with 15 or more connections. The Willow Creek watershed contains 12 public drinking water systems, all of which withdraw their water from a groundwater source. There are also numerous semi-public systems and a large number of private wells.

Recognizing that the actions are more likely to be achieved when there is a clear understanding of success, the Project Management Team developed measures of success for each priority issue within this plan.

Measure of Success	How will this be measured?
The percentage of private wells exceeding human health guidelines for drinking water will be reduced.	East Interlake Conservation District is to complete a well inventory in 2014 and 2019 in the Willow Creek watershed. Results will be compared to the 2009 well water inventory that indicated one in every eight wells (12.5%) failed to meet drinking water guidelines.
More watershed residents will be served by public drinking water systems in areas where population density warrants it.	As of 2010, there were 12 public systems operating in the Willow Creek watershed serving approximately 6,000 people. In 2015 and 2020, Manitoba Conservation and Water Stewardship's Office of Drinking Water will compare the number of systems and the number of people served by a public system to the 2010 data.



UNDERSTANDING THE ISSUES

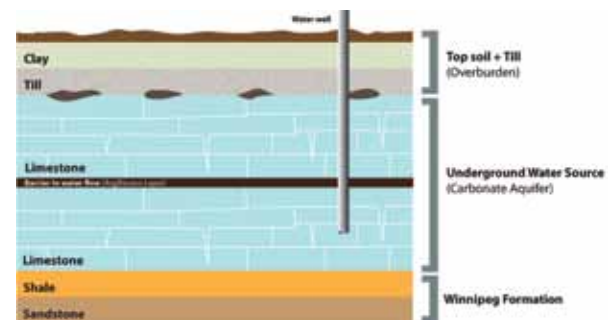
In the Willow Creek watershed, drinking water is withdrawn from a major fresh water aquifer, known as the Carbonate aquifer. The Carbonate aquifer is highly productive and consists of limestone and dolostone inter-layered with several impermeable layers which act as a barrier to water movement. The Carbonate aquifer is underlain by a shale and sandstone aquifer known as the Winnipeg Formation. The Winnipeg Formation is also a productive aquifer; however, water quality tends to be saline.

The Carbonate aquifer is overlain by a layer of materials consisting of clay, silt, sand and gravel, commonly referred to as the overburden layer. The overburden acts as a protective layer by filtering water as it moves from the ground surface through the overburden material into underlying aquifers by reducing or minimizing the downward movement of potential contaminants. A thicker overburden layer provides more protection than a thinner overburden layer. In the Willow Creek watershed, the overburden layer varies in thickness from zero to approximately 54 metres (177 feet). The overburden layer tends to be thicker in the eastern region of the watershed, offering more protection to the aquifer.

Groundwater is considered “sensitive” to land use activities in areas with less than six metres of clay overburden as surface waters may infiltrate directly into the aquifer over a short period of time. The potential for aquifer pollution also exists where the overburden layer is punctured, fractured or where the aquifer is exposed to the surface. Sinkholes, natural fractures, gravel pits, abandoned or poorly maintained active wells can act as a direct conduit for pollutants to flow into the aquifer. Other potential sources of contamination include influences from other wells, poor conditions around the well head, aging infrastructure and vandalism. Flowing wells can also cause problems for watershed residents, especially if the well discharges into a ditch during winter months resulting in ice-clogged drains and culverts. More information on the interaction of surface water and groundwater is needed, particularly to understand which wetlands and streams interconnect directly with groundwater and which are isolated from groundwater. Additional understanding is also needed of recharge processes and rates and how these vary over the landscape, as well as groundwater contamination processes and how these are related to land use practices and aquifer vulnerability.

ACTIONS

For more details on the implementation of these actions, *please see pages 50-57.*



- Seal unused, abandoned, problem flowing and drainage wells
- Seal any sinkholes that pose a threat to groundwater quality
- Adopt policies for the mandatory sealing of wells in areas that become serviced by public water systems
- Complete a study on the interaction of surface water and groundwater and continue to research recharge processes and groundwater contamination processes

A recent well inventory study conducted by the East Interlake Conservation District, in partnership with Manitoba Conservation and Water Stewardship, indicated that on average one in every eight wells failed to meet drinking water guidelines due to presence of bacteria or high levels of nitrates. Since groundwater is the main source of drinking water in the watershed, activities that educate residents on how they can protect groundwater are essential. The East Interlake Conservation District has also been working with landowners to improve their wells or change land use practices to reduce the risk of contamination. Additional information on this well inventory report can be found on the East Interlake Conservation District website (www.eicd.ca).

Developments, activities, land uses and structures such as chemical and fertilizer application or storage facilities, septic systems, fuel storage, waste disposal grounds, wastewater lagoons and livestock operations may negatively impact groundwater quality by leaching contaminants through the ground into the aquifer or by surface water runoff directly into the aquifer through a conduit such as an abandoned or poorly constructed well. Since the risk of contamination is more severe in areas with less than six metres of overburden and near public drinking water systems, local planning districts and municipalities should adopt policies to ensure future developments, activities, land uses and structures are constructed properly and include mitigation measures for any negative impacts on surface and groundwater quality and aquatic ecosystems. Landowners should also complete beneficial management practices (BMPs) to reduce the potential for groundwater contamination.

- Educate residents on how to protect drinking water resources through the distribution of publications on locations of public drinking water systems, the importance of groundwater protection, the impacts of land use activities on groundwater quality, how to perform well assessments, wellhead protection measures and proper maintenance procedures for wells and septic systems
- Complete a well inventory program to sample bacteria and nutrients in private wells
- Provide technical and financial assistance to landowners to improve the construction and maintenance of their wells or change land use practices to reduce the risk of groundwater contamination
- Adopt policies to ensure that future intensive and high risk developments (developments, activities, land uses and structures that have a high risk of causing pollution and include, but are not limited to: chemical and fertilizer storage facilities, septic fields and tanks, fuel tanks, waste disposal grounds and lagoons) in source water protection zones and in areas with less than six meters of overburden are constructed properly and include mitigation measures for any negative impacts to water quality and aquatic ecosystems
- Promote and provide technical and financial assistance to producers for point source BMPs such as improved management of livestock confinement areas and the proper storage of fertilizer, manure, silage, pesticides, petroleum and waste
- Promote and provide technical and financial assistance to producers for non-point source BMPs such as improved nutrient and pesticide management, land conversion to perennial cover and wetland restoration
- Implement BMPs to reduce or prevent groundwater contamination, including the installation of pitless well adapters, planting grass around wellheads, regular well inspection/maintenance and improved on-site storage and handling of potential contaminants such as fertilizer, petroleum products and pesticides



SOURCE WATER PROTECTION

Throughout the development of this plan, a preliminary drinking water assessment was conducted by a drinking water protection committee for all 12 public drinking water systems in the watershed. The committee was comprised of a drinking water officer, a groundwater specialist, Project Management Team members and water treatment plant operators. The purpose of the assessment was to collect information about the operation of each public drinking water system and treatment plant, identify potential sources of contamination and develop recommendations to address the activities which pose a high risk of polluting sources of drinking water.

As part of the assessment process, the source water protection committee first mapped and compiled information such as water quality results, well construction, depth of overburden and landscape characteristics. The committee determined that source water protection zones consisting of a 1.5 kilometre buffer would be applied to all 12 public drinking water systems, as shown on Figure 2.

Next, the source water protection committee conducted site visits of the public drinking water systems. At each site, the committee met with the local water treatment plant operator to assess equipment condition and maintenance, to review plant operation and to identify potential sources of contamination.

For each public system, the source water protection committee ranked all potential sources of contamination based on a qualitative assessment of risk to the aquifer from activities observed during the assessment. Recommendations to address potential sources of contamination were developed and are included in Table 1.

The detailed source water protection assessment can be found on the East Interlake Conservation District website (www.eicd.ca). It is important to note that the assessment process is qualitative and this is an informal approach to assessing threats to public drinking water sources.

TABLE 1: RECOMMENDATIONS FOR PUBLIC DRINKING WATER SYSTEMS

PUBLIC SYSTEM	SITE-SPECIFIC RECOMMENDATIONS
All Systems	<ul style="list-style-type: none"> • Ensure an emergency response plan is in place for all public drinking water systems
Camp Morton	<ul style="list-style-type: none"> • Install vacuum breaker for sewage dump/wash site • Fill in the well pit
Camp Neustadt	<ul style="list-style-type: none"> • Better protect against vandalism of the drinking water system
Shorepoint Village	<ul style="list-style-type: none"> • Move fuel tank or ensure it is inspected often and has secondary containment
Pelican Beach	<ul style="list-style-type: none"> • Extend well casing to at least 16 inches above ground surface for all wells
Sandy Hook RV Resort	<ul style="list-style-type: none"> • Extend well casing to at least 16 inches above ground surface for all wells

There are many semi-public drinking water systems located in the Willow Creek watershed. A semi-public system is a potable supply of water that serves more than a single residence, but less than 15 service connections. It is strongly suspected that there are semi-public drinking water systems, particularly campgrounds and trailer parks, that are serving in excess of 15 connections. Once a system serves more than 15 connections, it becomes a public system which falls under *The Drinking Water Safety Act*. Additional work is necessary to bring these operations into compliance with provincial regulations.

In addition to groundwater quality concerns, some watershed residents expressed concern about groundwater supply due to possible future drought conditions, reduced groundwater recharge or over consumption. A major groundwater user in the watershed is the distillery industry which draws high quality water from the Carbonate aquifer to support its operation. Even though overall water consumption is much less than the available water supply, water conservation practices such as reduced water use for lawn care and the installation of low-flow water fixtures and water saving appliances are important.

- Ensure campgrounds and trailer parks serving in excess of 15 connections are reporting to the Office of Drinking Water as a public system and are operating in compliance with regulatory requirements

- Educate watershed residents on water conservation practices such as the installation of low-flow water fixtures, water saving appliances and xeriscaping



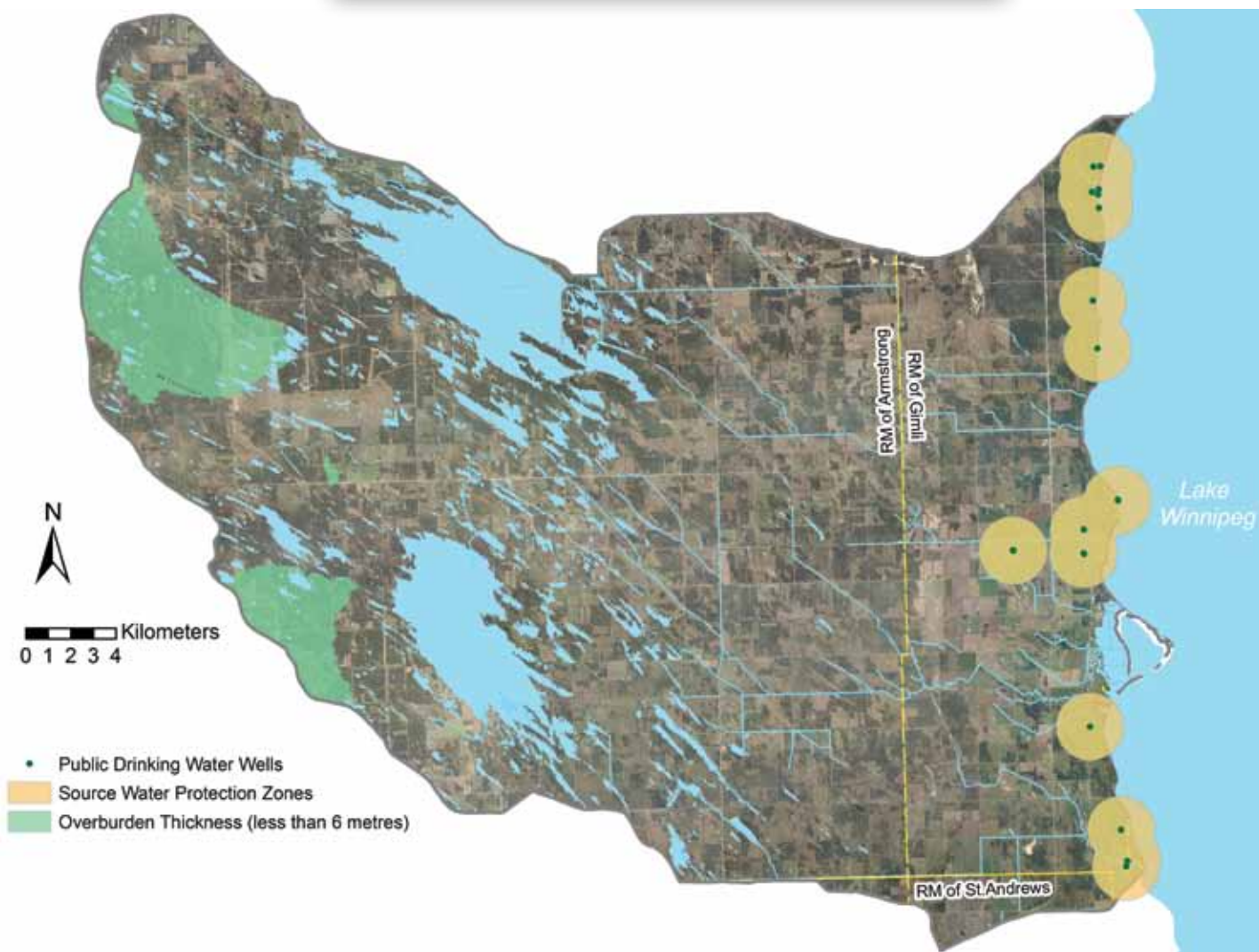


Figure 2: Source Water Protection Zones and areas of less than six metres of overburden

Surface Water Management

Landowners are frustrated with the repeated flooding of residential and agricultural lands. The frequency and extent of flooding has increased in recent years due to a combination of water-logged soils, higher than normal amounts of precipitation and unplanned and inadequately maintained drains.

When people talk about surface water management in Manitoba, emotions run high, and the public response in this watershed was no different. Public feedback was generally divided between those who wanted flood waters off the land as quickly as possible and those that expressed concern with the negative impact caused by drainage activities. Protecting natural water retention areas and creating management policies that respect the natural landscape will help to reduce the impacts of severe flood events and support land use practices that are better suited for the environment.



Townships with a 10-year average of over 500 unseeded acres of annual cropland.

Measure of Success	How will this be measured?
There will be a reduction in the number of townships with a 10-year average of over 500 unseeded acres of annual cropland.	The Manitoba Agricultural Services Corporation (MASC) administers a crop insurance program for excess moisture. The 10-year average of the number of acres claimed per year for excess moisture crop insurance will be compared between 2000 – 2009 and 2010 – 2019.
Surface water management decisions will be made on a watershed basis with consideration of downstream impacts.	Water managers (Manitoba, RMs of Armstrong and Gimli) will meet regularly to discuss surface water management on a watershed basis using the goals outlined in the Surface Watershed Management Plan found on pages 17 – 27.

UNDERSTANDING THE ISSUES

Land in the Willow Creek watershed generally slopes in an easterly direction towards Lake Winnipeg. In the western portion of the watershed, there are numerous low Lake Agassiz beach ridges oriented in a southeasterly direction, with swales located between these ridges, altering the flow of surface water. A large ridge located just east of the boundary between the Rural Municipalities of Armstrong and Gimli near PTH 7 causes rapid surface water flow into downstream regions of the watershed which are relatively flat. Waterways flow in a southeast direction in the upstream portions of the watershed, however, once they reach the vicinity of PTH 7, the flow pattern has been altered by road and drain construction to an easterly direction into Lake Winnipeg.

This ridge and swale topography in the western region of the watershed has created a landscape with numerous natural retention areas including many small lakes and wetlands. The drainage network in the eastern portion of the watershed is much more developed to support annual crop production on higher classed land.

Flooding in the Willow Creek watershed typically occurs as a result of spring snowmelt runoff which can be amplified in some locations by coincident heavy rain storms or water-logged soil. The agriculture drainage network is designed to remove excess runoff from cropland during the growing season to improve the productive capability of the soil. If excess runoff sits on the soil for too long, crops will be deprived of oxygen and damaged or destroyed. There are very few places in this watershed where natural soil conditions provide sufficient drainage to support annual crop production. To enable crop production, many artificial drains have been constructed to remove excess water off the land. Due to a lack of regular maintenance and higher than normal amounts of precipitation in recent years, many of the drains have a reduced capacity for removing runoff from cropland during the growing season.

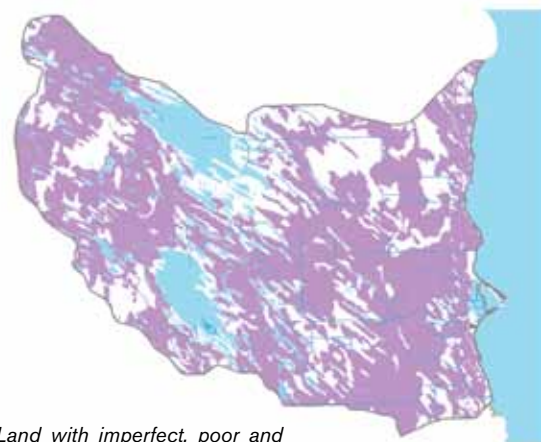
Drains in Manitoba are classified from 1st to 7th order, with 1st order being the smallest and 7th order being the largest. Municipalities, towns and villages typically maintain all 1st, 2nd and some 3rd order drains, whereas the Province of Manitoba typically manages and maintains most 3rd order and higher drains. There are approximately 120 kilometres of provincial waterways and 500 kilometres of municipal drains in the Willow Creek watershed.

Effective surface water management is a priority for residents of the Willow Creek watershed. Surface water management encompasses a wide variety of activities including flood protection, drainage, water control, permanent water retention, temporary water hold-back, erosion control, and shoreline or streambank protection. Maintenance of existing drainage infrastructure is essential in protecting agricultural cropland, development and infrastructure from flooding. With limited resources, it is important for water managers to prioritize surface water management projects where the most benefits would be experienced.

ACTIONS

For more details on the implementation of these actions, *please see pages 50-57.*

- Maintain and manage wetlands and water retention areas to allow for healthy wetland function and enhanced water storage capacity



Land with imperfect, poor and very poor soil drainage (purple).

- Complete a pilot project on environmentally friendly drainage practices such as meandering stream channels, naturalizing drains, two-staged ditches, streambank erosion control techniques, etc.
- Promote and provide technical and financial assistance to landowners for the implementation of BMPs such as riparian area management, riffle structures and controlled upstream water retention

Although it is recognized that drainage in the Willow Creek watershed is necessary to support agricultural production, it is also recognized that drainage works may negatively impact downstream residents, water quality and fish habitat. All future drainage should be constructed in a way that minimizes the loss of nutrients into waterways. Water managers should strive to conduct drain maintenance, construction, and re-construction activities in an environmentally friendly manner.

The East Interlake Conservation District will conduct an assessment of infrastructure in the Willow Creek watershed, which is intended to help water managers make informed watershed-based decisions for managing surface water. This study will include an assessment of culvert and drain condition and will outline potential locations for upstream water retention. This assessment will be shared with member municipalities, the Province of Manitoba and the public. Improved communication among water managers will be achieved through regular meetings. Throughout the development of this IWMP, water managers developed a surface water management plan which contains surface water management goals and a list of prioritized surface water management projects. Please refer to this plan on the following pages 17-27. This plan strives to address numerous surface water management issues including two long-standing flooding issues in the Husavik-west area and along the Willow Creek. Water managers will also meet regularly to discuss surface water management issues on a watershed scale.

Flooding along the shoreline of Lake Winnipeg is a concern for many waterfront residents. The water level of Lake Winnipeg has been high in recent years and is often exacerbated by strong northerly or easterly winds resulting in significant wave action. In 1974, local rural municipalities and the provincial government jointly constructed dikes along the shores of Lake Winnipeg's south basin to protect against flooding and shoreline erosion. Many landowners have also implemented flood protection measures on their property. Subsequent to high lake levels in 2005, local rural municipalities and the provincial government once again initiated a flood protection program. In this program, approximately 49 kilometres of dikes were constructed in 2005 and 2006, along with temporary flood protection measures in some communities.

The Willow Creek watershed has experienced a number of significant weather events in recent years. The dikes proved somewhat effective in wind storms in October/November 2005 and October 2006; however, unseasonably strong wind storms in June/July 2009 and November 2010 combined with sustained higher than normal water levels in spring and summer of 2011 have caused significant damage to many of these dikes. Additional information on shoreline erosion can be found on pages 34-41.

- Conduct drainage works using environment friendly practices
- Complete an assessment of drainage infrastructure, including culvert and drain condition
- Implement priority projects and activities identified in the Surface Water Management Plan
- Complete the necessary work to address the long standing drainage issue in the Husavik-west area
- Investigate options to address flooding concerns along the Willow Creek
- Meet regularly to discuss surface water management issues on a watershed scale (at least twice a year)



DENNIS LAKE AND WILLOW CREEK

During public consultations many people voiced concerns about flooding around Dennis Lake, a land-locked lake located in the Rural Municipality of Armstrong. Dennis Lake is a marsh-lake complex that varies from 20 to 40 square kilometers in size and is located within a closed sub-watershed within the Willow Creek watershed. The lake and surrounding area provide important marsh habitat and staging grounds for waterfowl and furbearing species like muskrats and beavers. Land surrounding the lake provides pasture and haying opportunities to about a dozen landowners and Crown land lessees in the area. Over time, lake levels have fluctuated in 15 to 20 year 'cycles' resulting in periodic flooding of private and Crown lands located around the perimeter of the lake. Records show a period of rapid lake level rise in 1974 followed by a decrease in lake levels in the 1980s and a steady rise through the mid-1990s as shown in Figure 3. Up until the mid-1970s, the level of the lake was generally between 871 – 873 feet. In the last decade, Dennis Lake has been operating at an elevation of approximately 875 to 878 feet. Increases in average lake levels are commonly attributed to the hydrological 'wet cycle' observed over the last decade in central Canada. Surface water inflows are trapped in this closed basin due to the ridge and swale topography of the area and kept at surface due to the poor drainage capacity of the soils. Lake levels have risen as much as 5 feet during this most recent wet cycle.

Once Dennis Lake reaches an elevation of over 876.5 feet, water flows uncontrolled out of the lake causing downstream flooding on Willow Creek and Netley Creek. Water levels on Dennis Lake would need to be controlled so the lake can be used as a water retention area when major rainfall events occur, easing the downstream effects on Willow and Netley Creek.

There have been many attempts to solve this problem over the years. In the early 1980s, a series of studies to examine the proposed regulation of the lake were completed including the Dennis Lake Engineering Study (1981)², the Dennis Lake Regulation Study (1983)³ and the Dennis Lake/Fish Lake Resource Management Study – Final Report (1984)⁴. The 1984 report recommended that the lake be controlled at an elevation of 873/874 feet to allow for fluctuations in water level to support the re-growth of wetland vegetation; however, due to a lack of consensus among government and area residents, the project did not proceed. This report was completed during a dry cycle and it is unclear how applicable the recommendations would be today. The RM of Armstrong completed a subsequent study in 2001 that recommended an operating level of 874 feet. The report also included a recommendation to drain water to the Bass Drain once water levels exceeded 874 feet. The Bass Drain flows into Willow Creek, a creek that regularly floods downstream landowners. To regulate a lake over 2 square kilometers in size, there is a requirement to complete an Environmental Impact Assessment (EIA) as outlined in Manitoba's *The Environment Act*.⁵



Figure 3: Dennis Lake water levels from 1965 - 2009 (Station 05SB801)

² Ngai, C.D., 1981. *Dennis Lake Engineering Study*. Province of Manitoba - Water Investigations Service. March 1981.

³ Water Resources Branch, 1983. *Dennis Lake Regulation Study*. Province of Manitoba – Wildlife Branch. October 1983.

⁴ Dennis Lake/Fish Lake Task Force, 1984. *Dennis Lake/Fish Lake Resource Management Study – Final Report*. December 1984. Province of Manitoba, 1987. *The Environment Act*. C.C.S.M. c. E125. <http://web2.gov.mb.ca/laws/statutes/ccsm/e125e.php>

⁵ Province of Manitoba, 1987. *The Environment Act*. C.C.S.M. c. E125. <http://web2.gov.mb.ca/laws/statutes/ccsm/e125e.php>

This project did not proceed for a variety of reasons, including a lack of funding and no organization to champion the completion of the EIA and a lack of funds to complete the project itself. Additionally, there were ancillary effects that would likely result from the proposed project. Downstream landowners had growing concerns over additional water being routed into the already overtaxed Willow Creek. There is a five kilometre section of annual cropland along the Willow Creek west of PTH 8 that commonly floods during peak runoff periods. This flooding can be attributed to additional upstream drainage, reduced capacity along the Willow Creek due to natural siltation processes and above normal precipitation combined with heavy summer storm events.

In response to the public's concern, the Project Management Team coordinated a series of meetings with the Province, RMs of Armstrong and Gimli, and Department of Fisheries and Oceans Canada (DFO) to resume discussions about this ongoing issue. The group discussed projects recommended in earlier reports, including the regulation of Dennis Lake using a controlled outlet through the Bass Drain into Willow Creek combined with increasing capacity of Willow Creek west of PTH 8. The lack of information on the impacts of these proposed projects on downstream flooding, water quality and fish habitat made it difficult for the group to move forward or commit to these projects.

Over half of the length of Willow Creek, or nearly 10 kilometres, is classified as Class A and B fish habitat according to a Riparian and Aquatic Habitat Assessment completed by the East Interlake Conservation District in 2007.⁶ Increasing the capacity along the Willow Creek would likely cause harmful alteration, disruption or destruction (HADD) of fish habitat. In such instances, DFO must conduct an assessment under the Canadian Environmental Assessment Act (CEAA) prior to issuing an authorization under the Fisheries Act.⁷ To determine the impacts on fish habitat, DFO recommends that a study be undertaken to investigate the effects of any proposed projects on flooding, erosion, fish passage and the effects to fish and fish habitat such as fish stranding and changes to spawning potential.

At this time, no party has stepped forward to complete an environmental assessment to understand the impacts of regulating the level of Dennis Lake. Today, the high level of Dennis Lake remains an issue for producers who own or lease land around Dennis Lake. The RMs of Armstrong and Gimli along with the Province of Manitoba will continue to investigate options to address flooding concerns along the Willow Creek. Once downstream flooding issues are addressed, these three parties will work together to manage the storage and flow of surface water in the upstream portion of the watershed. Currently, the East Interlake Conservation District is investigating opportunities to protect or purchase commonly flooded land surrounding the lake.

FISH LAKE

Fish Lake experiences similar issues as Dennis Lake; however, Fish Lake has defined outlets. The Fish Lake Detention Basin was constructed in 1960s to reduce spring flooding to the east of the basin by storing water during the spring runoff period. To manage the flow of water, two controlled outlets, one uncontrolled outlet and dikes located on the north and south side of the lake were constructed. To increase storage capacity for spring runoff, the level of the lake is usually lowered during dry periods in the summer and fall. Over the years, there has been an ongoing disagreement on the desired operating level of Fish Lake. The Province of Manitoba, along with the RMs of Armstrong, Bifrost and Gimli, will determine an appropriate operating level for Fish Lake with input from the public.

⁶ Graveline, P.G., 2008. *East Interlake Conservation District: Watershed 05SB Riparian Assessment Survey – with emphasis on third order drains or higher – 2007 and 2008*

⁷ Department of Fisheries and Oceans Canada, 1985. *Fisheries Act, R.S.C., 1985, c. F-14*

SURFACE WATER MANAGEMENT PLAN

In Manitoba, “surface water management” typically refers to the management of water to prevent or reduce flooding of agricultural, industrial and residential land. Surface water management can also serve to enhance the function of aquatic ecosystems, offer recreational opportunities and improve water quality. Currently, surface water is managed largely for flood protection using tools such as low-level dams, channelization of streams, and the construction or maintenance of drains to remove water off the land as quickly as possible.

A more holistic approach to surface water management is to manage water for a broader range of watershed values such as aquatic ecosystem health, water quality, climate change resilience and recreational enjoyment, as well as flood protection. It is evident that many watershed residents value agricultural production and, through public consultations, have expressed the need to improve drainage to support the livelihood of this industry. Many watershed residents also expressed concern about the loss of wetlands, degrading water quality and the loss of natural habitat in this watershed. This surface water management plan strives to balance the needs of all watershed residents.

Utilizing a watershed-based approach to managing surface water is necessary as there is connectivity between upstream and downstream portions of the watershed. Any activity that affects water quality, quantity or flow rate in one part of the watershed affects many locations downstream. Understanding this connectivity is helpful when planning and making decisions about surface water management.

Throughout the development of this plan, the Project Management Team hosted a series of meetings with representatives from the Province and the RMs of Armstrong and Gimli to discuss surface water management on a watershed basis. The group developed recommendations and policies that are intended to benefit a broader range of watershed values and are sensitive to the application of surface water management tools that balance the needs of watershed residents. This is achieved by suggesting changes to current surface water management tools, applying new tools, understanding ‘where it matters most’ to protect watershed resources and by agreeing on areas of the watershed where it makes sense to manage surface water for flood protection.

To determine ‘where it matters most’ to protect for flooding and preserve shoreline and natural areas, a team of watershed stakeholders, municipal representatives, government planners and technical experts met to discuss the Willow Creek watershed and its diversity of landscape conditions. Four zones, each with a unique surface water management goal, were developed. These zones were created by characterizing the watershed into areas with similar landscape characteristics, such as topography, soil capability and land cover.

In the following pages, the watershed team has outlined recommendations for each watershed zone that work towards achieving the surface water management goal created to be respective of landscape conditions.

WATER STORAGE

The ridge and swale topography in the upstream portion of the watershed, combined with the poor drainage capacity of the soil, has formed a landscape with many small wetlands and natural retention areas. Over the years, some of this land has been drained to support agricultural production, mainly forage crops with some small pockets of annual cropland. As a result of higher than normal spring melt and summer precipitation in recent years, the RM of Armstrong is currently storing high volumes of water in these natural retention areas.

Many of these retention areas are full, lack well defined outlets, and are overflowing onto adjacent farmland. Drawing down the volume of water stored in these natural retention areas during dry periods would increase the capacity to store water during wet periods. Storing water in these retention areas during wet periods would be a useful tool in alleviating flooding in downstream portions of the watershed. Managing these retention areas for future flood protection requires the construction of control structures as mechanism to draw down water volumes in dry periods. The RMs of Armstrong and Gimli, along with the Province, should continue discussions on utilizing these retention areas for flood protection, including compensation for water storage. Accurate elevation data, such as LIDAR surveys, would assist in the planning and management of water. The RMs of Gimli and Armstrong should work with other levels of government to acquire LIDAR data for this watershed.

WATERSHED ZONES

MANAGING SURFACE WATER TO SUIT THE LANDSCAPE

1 Natural Upland Habitat and Rangeland

This zone is located in the upstream portion of the Willow Creek watershed. It includes agricultural land that supports cattle production, forage crops, pasture land and an abundance of natural areas including forests, wetlands and the renowned snake dens. This zone also includes the Narcisse Community Pasture, some small pockets of annual cropland and two important lake complexes—Dennis Lake and Fish Lake.

2 Agricultural Production

This zone contains agricultural land that supports cattle production, including forage crops, pasture land and some small pockets of annual cropland.

3 Annual Cropland

This zone contains agricultural land which primarily supports annual crop production.

4 Urban and Rural Communities

This zone is located in the eastern portion of the watershed along the shore-line of Lake Winnipeg. It includes Camp Morton Provincial Park, the Gimli Industrial Park and many waterfront communities such as Gimli, Arnes, Siglavak, Sandy Hook, Winnipeg Beach and many more.

PRIORITIZING SURFACE WATER MANAGEMENT PROJECTS IN ALL FOUR ZONES

WATER MANAGERS SHOULD CONSIDER THE FOLLOWING FACTORS WHEN PRIORITIZING SURFACE WATER MANAGEMENT PROJECTS:

FACTOR	GUIDELINE
1. Does the project meet the “goal” statement for the watershed zone in which it’s located?	The project should be consistent with the intent of the goal statement.
2. Position within the watershed	Drainage projects should receive priority in downstream portions of the watershed (Zone 3 and 4), while water retention projects should receive priority in upstream portions of the watershed (Zone 1 and 2). These retention areas can be drawn down when downstream conditions are suitable. Water managers must consider downstream impacts of drainage projects.
3. Cost-benefit ratio	Projects with a higher cost-benefit ratio should receive priority.
4. Ecological impact	Projects that significantly impact water quality, wetlands and aquatic or terrestrial habitat should not proceed, unless mitigation or compensation measures are incorporated into the project design.
5. Partnerships	Partnership projects should be given priority.
6. Length of time	Projects that address a long standing issue should be given priority.



ZONE GOALS:

- 1) Maintain a balance between agricultural production and natural areas such as wetlands, forests and fish habitat.
- 2) Improve the management of surface water to maximize economic benefit of cattle and forage crop production while minimizing negative impacts downstream and to the environment.
- 3) Improve the management of surface water to maximize economic benefit of crop production while minimizing negative impacts downstream and to the environment.
- 4) Maintain or restore shoreline health and improve waterways to accommodate inflows from upstream.

ACTIONS TO BALANCE AGRICULTURAL PRODUCTION AND NATURAL AREAS

In this zone, **our goal is to maintain a balance between agricultural production and natural areas such as wetlands, forests and fish habitat.** All surface water management decisions should work towards achieving this goal.

Examples of the types of surface water management tools appropriate to apply in this zone include:

- Land protection programs (conservation and/or taxation easements, payments for ecological goods and services and land purchases)
- Compensate landowners to retain water on their property, either permanently or temporarily during spring melt and after heavy summer rainfall events
- Understand the best place to locate new controlled water retention projects, or enhance existing ones, and then build them. Control structures could be utilized to lower water levels when downstream conditions are suitable
- Implement beneficial management practices aimed at protecting or enhancing wildlife habitat, riparian areas and wetlands
- Preserve the existing coding of agricultural Crown lands

- Continue to use a long-term integrated approach to managing land and water resources to allow for flexibility between wet and dry cycles
- Promote and provide technical and financial assistance for the implementation of BMPs that preserve or enhance wildlife habitat, including riparian areas and wetlands
- Promote and provide technical and financial assistance for the implementation of beneficial management practices aimed at improving livestock and manure management such as improved manure land application, farmyard runoff control, relocation of livestock facilities and improved manure storage and handling
- Continue to restrict the sale of Crown lands that contain permanent or semi-permanent wetlands or lands that are prone to flooding. If Crown lands are sold, the purchaser should be made aware that there is no guarantee that drainage improvements will be approved or that access will be provided

Surface water issues specific to this zone were identified during public and municipal consultations. In the following section, the above tools are employed to solve these priorities.

ZONE 1 - PLAN IN ACTION



The boundaries of Dennis Lake have expanded in recent years, flooding adjacent hay and pasture land and sometimes overflowing watershed boundaries causing downstream flooding along the Bass Drain and Netley Creek. For a more detailed explanation of these complex issues, please refer to pages 15 - 16.



The Provincial portion of Fish Lake drain floods frequently.



The installation of a large culvert at PR 231 is causing downstream flooding along the Bass drain.

- The RMs of Armstrong and Gimli along with the Province of Manitoba will continue to investigate options to address flooding concerns along the Willow Creek. Once downstream flooding issues are addressed, these three parties will work together to manage the storage and flow of surface water in the upstream portion of the watershed.
- The East Interlake Conservation District will explore opportunities to protect or purchase land surrounding Dennis Lake.
- The Province is to complete upgrades along the Provincial portion of Fish Lake drain.
- The Province of Manitoba, along with the RMs of Armstrong, Bifrost and Gimli, will determine an appropriate operating level for Fish Lake with input from the public.
- The Province and RM of Armstrong are to investigate a potential water retention project to temporarily hold-back water during peak flows.
- RMs of Armstrong and Gimli are to acquire legal access or ownership of these drains, then conduct the necessary maintenance work.

There are a number of drains on private land that were constructed by municipalities; however, the municipalities do not have legal access to complete maintenance work.



ACTIONS TO IMPROVE SURFACE WATER MANAGEMENT TO SUPPORT CATTLE PRODUCTION

In this zone, **our goal is to improve the management of surface water to maximize economic benefit of cattle and forage crop production while minimizing negative impacts downstream and to the environment.**

All surface water management decisions should work towards achieving this goal.

Examples of the types of surface water management tools appropriate to apply in this zone include:









- Land protection programs (conservation and/or taxation easements, payments for ecological goods and services and land purchases)
- Compensate landowners to retain water on their property, either permanently or temporarily during spring melt and after heavy summer rainfall events
- Understand the best place to locate new controlled water retention projects, or enhance existing ones, and then build them. Control structures could be utilized to reduce water levels when downstream conditions are suitable
- Promote and provide technical and financial assistance for the implementation of beneficial management practices that preserve wildlife habitat and improve water quality such as riparian area management, improved nutrient

management and wetland preservation

- Promote and provide technical and financial assistance for the implementation of BMP's aimed at improved storage, handling and field-application of manure, farmyard runoff control, and relocation of livestock facilities
- Complete the aquatic habitat rehabilitation projects where recommended
- Adopt environmentally friendly drain management practices and conduct erosion control projects where necessary
- Limit future development on flood prone lands through land protection programs or through the adoption of development plan policies
- Continue to restrict the sale of Crown lands that contain permanent or semi-permanent wetlands or lands that are prone to flooding. If Crown lands are sold, the purchaser should be made aware that there is no guarantees that drainage improvements will be approved or that access will be provided

Surface water issues specific to this zone were identified during public and municipal consultations. In the following section, the above tools are employed to solve these issues.

ZONE 2 - PLAN IN ACTION

	Land surrounding the South Malaton Drain experiences periodic flooding.	• The Province is to investigate possible upgrades along a 4 mile section of the South Malaton Drain to ensure it meets the design standard.
	Land surrounding Bass Drain commonly floods.	• The Province and RM of Armstrong are to work together to complete upgrades along Bass Drain to accommodate design standard flows.
	Flooding is common along the ditch on Boundary Road north of PR 229.	• RM of Armstrong is to conduct maintenance work on the ditch along Boundary Road north of PR 229.
	Meleb Drain commonly experiences flooding.	• The Province is to design and complete the reconstruction of Meleb drain.
	Flooding is common along PR 231 between Road 13 and Road 15.	• The Province and the RMs of Armstrong and Gimli are to investigate options to address this issue.
  	Aquatic ecosystem habitat is impaired at 7 locations within this zone. The range of impairment ranges from: minor problems like sloughing stream banks to major fish passage barriers.	• East Interlake Conservation District is to lead or facilitate the completion of these 7 projects in the order recommended in the habitat assessment.
	There are a number of drains on private land that were constructed by municipalities; however, the municipalities do not have legal access to complete maintenance work.	• RMs of Armstrong and Gimli are to acquire legal access or ownership of these drains, then conduct the necessary maintenance work.



ACTIONS TO IMPROVE SURFACE WATER MANAGEMENT TO SUPPORT ANNUAL CROP PRODUCTION

In this zone, **our goal is to maintain or restore shoreline health and improve waterways to accommodate inflows from upstream.** All surface water management decisions should work towards achieving this goal.






Examples of the types of surface water management tools appropriate to apply in this zone include:

- Maintain and improve drainage infrastructure
- Promote and provide technical and financial assistance for the implementation of BMPs aimed at protecting and improving water quality such as riparian area management, on-farm water management, improved fertilizer and pesticide application, cover crops, shelterbelts, nutrient management planning and improved cropping systems

- Land protection programs (conservation and/or taxation easements, payments for ecological goods and services and land purchases)
- Adopt environmentally friendly drain management practices and conduct erosion control projects where necessary
- Limit future development on flood prone lands through land protection programs or through the adoption of development plan policies
- Complete the aquatic habitat rehabilitation projects where recommended

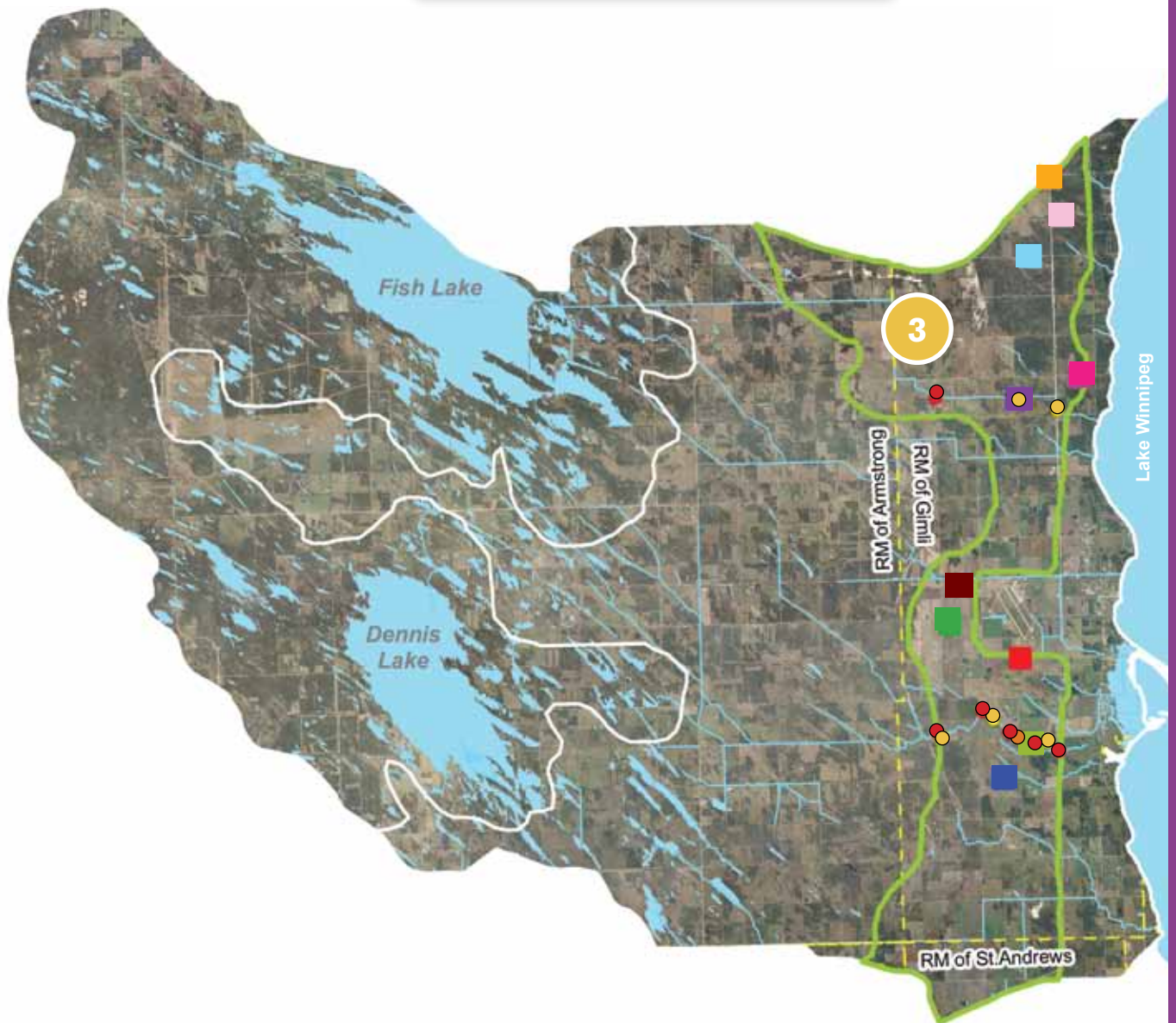
Surface water issues specific to this zone were identified during public and municipal consultations. In the following section, the above tools are employed to solve these issues.

ZONE 3 - PLAN IN ACTION

	High quality annual cropland is commonly flooded along Willow Creek.	• The RMs of Armstrong and Gimli along with the Province of Manitoba will continue to investigate options to address flooding concerns along Willow Creek.
	Excess water ponds at the intersection of Road 18E and Road 121. Occasionally, water has crossed roads making them impassable.	• RM of Gimli is to investigate if drain improvements are required.
	Land along the drain on Camp Morton Road (Road 116) west of PTH 8 commonly floods.	• The Province is to investigate if drain improvements are required.
	Husavik Drain has deteriorated significantly over the years.	• RM of Gimli to clean out the drain along Husavik Road. Manitoba to re-grade the ditch along the west side of PTH 8.
	Approximately 3.5 miles of the ditch along Minerva Road has not been cleaned since it was built.	• RM of Gimli to clean out approximately 3.5 miles of ditch along Minerva Road.
	Overgrown trees and vegetation in the ditch along Glen Bay Road, west of PTH 8, is causing flooding to the adjacent land.	• RM of Gimli is to clean out the ditch along Glen Bay Road west of PTH 8.
	Flooding along Spruce Bay Road is common due to a restrictive culvert that is located downstream.	• RM of Gimli to upgrade the ditch along Spruce Bay Road. Upgrades to the culvert may be necessary.
	Land adjacent to the drain on the north side of Gimli Park Road (Road 110) commonly floods.	• RM of Gimli to clean approximately 2.5 kilometres of the drain along Gimli Park Road (Road 110).
	Flooding is common along the ditch on PR 116, west of PR 222.	• RM of Gimli and the Province are to clean 0.5 miles of the south side of the ditch along Road 116 and upgrade 1 mile of the west side of the ditch along PR 222.
	Flooding is common along PR 231 between Church Road and Lilac Road.	• The Province is to clean ditches along PR 231 between Church Road and Lilac Road.
  	Aquatic ecosystem habitat is impaired at 13 locations within this zone. The range of impairment ranges from: minor problems like sloughing stream banks to major fish passage barriers.	• East Interlake Conservation District is to lead or facilitate the completion of these 13 projects in the order recommended in the habitat assessment.

There are a number of drains on private land that were constructed by municipalities; however, the municipalities do not have legal access to complete maintenance work.

- RMs of Armstrong and Gimli are to acquire legal access or ownership of these drains, then conduct the necessary maintenance work.



ACTIONS TO IMPROVE SHORELINE CONDITION AND UPGRADE MAJOR OUTLETS

In this zone, **our goal is to maintain or restore shoreline health and improve waterways to accommodate inflows from upstream.** All surface water management decisions should work towards achieving this goal.

Examples of the types of surface water management tools appropriate to apply in this zone include:

- Improved management of storm water runoff
- Maintain and improve drainage infrastructure
- Protect shoreline from erosion using site specific recommendations from a qualified geotechnical engineer
- Limit future development along the shoreline of Lake Winnipeg through the adoption of development plan policies







- Promote and provide technical and financial assistance for the implementation of BMPs aimed at protecting and improving water quality such as improved application of fertilizer to crops and lawns, better pet waste management, enhanced riparian area management, inspection and proper management of on-site septic systems, detention basins, rain gardens and enhanced stormwater control and treatment.

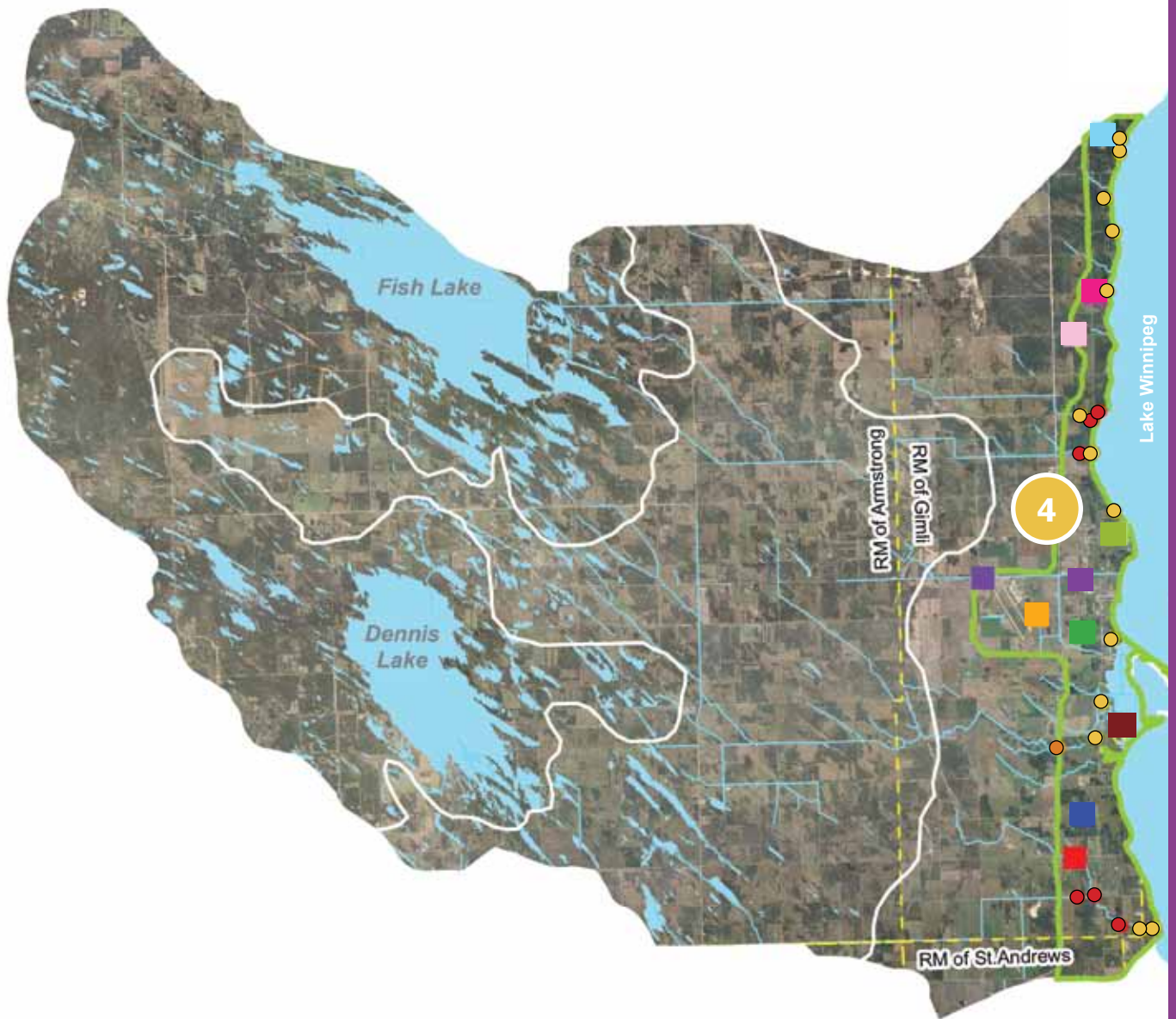
- Adopt environmentally friendly drain management practices and conduct erosion control projects where necessary

- Complete the aquatic habitat rehabilitation projects where recommended

Surface water issues specific to this zone were identified during public and municipal consultations. In the following section, the above tools are employed to solve these issues.

ZONE 4 - PLAN IN ACTION

	The Pelican Beach sub-division has increased the need for drainage improvements along Segrams Road from PTH 8 to the lake.	• RM of Gimli and the Province of Manitoba are to investigate options to improve drainage near the Pelican Beach sub-division.
	The development of a sub-division near the airfield has resulted in an increased need for improved drainage in the area.	• RM of Gimli is to construct a new ditch near the sub-division to carry water to a major drain.
	A large elevation drop near the Lake Forest sub-division has resulted in erosion of the drain.	• RM of Gimli is to investigate if improvements are necessary along the ditch near the Lake Forest sub-division including the installation of a drop structure.
	Water flow along Sandy Hook Drain is significantly decreased due to undersized culverts.	• The Province is to work with the RM of Gimli to investigate if culvert and drain improvements are necessary along the Sandy Hook Drain.
	Culverts along Boundary Creek are holding back water.	• RM of Gimli is to investigate if upgrades are needed to the culverts along Boundary Creek.
	Overgrown trees and vegetation in the ditches along Road 123 and Arnes Road continue to restrict water flow despite cleaning efforts.	• RM of Gimli is to continue to clean out the 4 to 5 miles of ditch along Road 123, west of PTH 8.
	Land adjacent to the drain on the north side of Gimli Park Road (Road 110) east of PTH 8 commonly floods.	• RM of Gimli to re-grade approximately 0.5 kilometres of the drain along the north side of Gimli Park Road (Road 110).
	Due to upstream drainage work, the volume of flows in the drain along Ukrainian Park Road between PTH 8 and PR 222 has increased.	• RM of Gimli is to re-grade the drain along Ukrainian Park Road between PTH 8 and PR 222. Increasing the size of culverts may be necessary.
	Flooding along PR 231 is common.	• The Province is to clean the ditches along PR 231 between PTH 8 and PTH 9.
	Flooding of residential and agricultural land in the community of Husavik is common.	• RM of Gimli and the Province of Manitoba are to investigate options to address this issue.
  	Aquatic ecosystem habitat is impaired at 24 locations within this zone. The range of impairment ranges from: minor problems like sloughing stream banks to major fish passage barriers.	• East Interlake Conservation District is to lead or facilitate the completion of these 24 projects in the order recommended in the habitat assessment.
	There are a number of drains on private land that were constructed by municipalities; however, the municipalities do not have legal access to complete maintenance work.	• RMs of Armstrong and Gimli are to acquire legal access or ownership of these drains, then conduct the necessary maintenance work.



Surface Water Quality

Every year extensive algal blooms emerge on Lake Winnipeg as a result of excess nutrients entering waterways from a variety of sources, both natural and human produced. Residents are concerned about excess nutrients entering waterways within the Willow Creek watershed contributing to this problem. Residents are also concerned about high bacteria levels on Lake Winnipeg beaches.

Measure of Success	How will this be measured?
There will be a 10% reduction in nitrogen and phosphorus concentrations and/or loading in the Willow Creek and Fish Lake Drain.	Manitoba Conservation and Water Stewardship, in partnership with the East Interlake Conservation District, have been sampling nutrient concentrations in the Willow Creek and Fish Lake Drain since 2005. The 5-year average concentrations and/or loading of nitrogen and phosphorous will be compared between 2005 – 2010, 2010 – 2015 and 2015 - 2020.
There will be a reduction in the number of bacteria exceedences above the recreational water quality guidelines in the Willow Creek and Fish Lake Drain.	Manitoba Conservation and Water Stewardship, in partnership with the East Interlake Conservation District, have been sampling bacteria in the Willow Creek and Fish Lake Drain since 2005. The number of exceedences above the recreational guideline for total coliform and <i>E. Coli</i> will be compared between 2005 - 2010, 2010 - 2015 and 2015 - 2020.
There will be a reduction in the number of bacteria exceedences above the recreational water quality guidelines in the Gimli stormwater drains.	Manitoba Conservation and Water Stewardship, in partnership with the East Interlake Conservation District, sampled bacteria the Gimli stormwater drains for two years in 2008 and 2009. The number of exceedences above the recreational guideline for total coliform and <i>E. Coli</i> will be compared between 2008 - 2009, 2013 - 2014 and 2018 - 2019.

DID YOU KNOW?

Excessive levels of phosphorus and nitrogen fuel the production of algae and aquatic plants. Extensive algal blooms can cause changes to aquatic life habitat, reduce essential levels of oxygen, clog commercial fishing nets, interfere with drinking water treatment facilities, cause taste and odour problems and affect recreational activities. In addition, some forms of blue-green algae can produce highly potent toxins.

UNDERSTANDING THE ISSUES

There is one long-term water quality monitoring station within the Willow Creek watershed located on Willow Creek at PTH 8. This site has been monitored quarterly since 2005 by the East Interlake Conservation District and was added to the provincial long-term water quality network in 2010. The East Interlake Conservation District also monitors water along the Fish Lake Drain. Relative to other streams in the East Interlake Conservation District, Willow Creek water is generally of better quality; however, both Total Kjeldahl Nitrogen (TKN) and total phosphorus levels were relatively high during this five-year sampling period. In terms of total phosphorus levels, all samples collected to date have shown levels at or exceeding the Tier III Manitoba Water Quality Guideline⁸ of 0.05 mg/L. TKN levels were all above 1.0 mg/L. Ammonia, a form of nitrogen which can be toxic in its unionized form, was found to be in low concentrations within the Willow Creek.

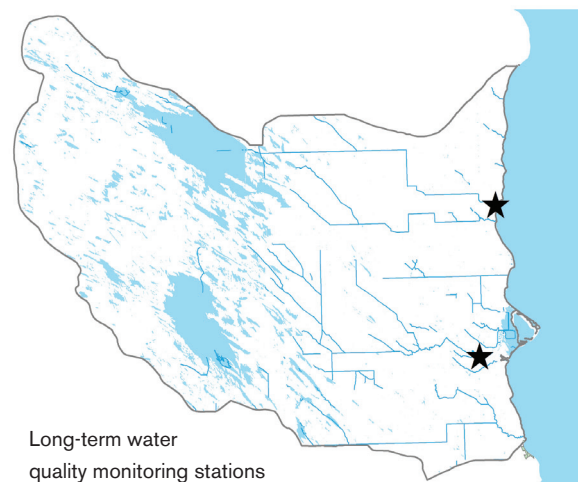
The East Interlake Conservation District, in partnership with the Lake Winnipeg Foundation, has also been monitoring macro-invertebrates at three sites along the Willow Creek since 2005. Macro-invertebrates are good indicators of stream health because they are easy to sample and highly susceptible to chemical and physical changes in their environment. Typically, it is the density, abundance and diversity of the macro-invertebrate community which are used to evaluate water quality. According to Hilsonhoff's Family Biotic Index, two of three monitoring sites were classified as having fair water quality, while the macro-invertebrate community of the third site yielded a poor water quality ranking.



ACTIONS

For more details on the implementation of these actions, please see pages 50-57.

- Continue to monitor water quality along the Willow Creek and Fish Lake Drain on a long-term basis



Long-term water quality monitoring stations

⁸ Williamson, D.A., 2002. *Manitoba Water Quality Standards, Objective, and Guidelines*. Manitoba Conservation. Report 2002-11 http://www.gov.mb.ca/waterstewardship/water_quality/quality/mwqsog_2002.pdf

Activities, developments and land uses that pose a high risk of contributing excess nutrients to waterways include the application of fertilizer or manure to agricultural or urban land, discharge from wastewater lagoons and sewage treatment plants, failing septic systems and runoff from farming operations and urban developments. Implementing beneficial management practices that reduce nutrient loading, in combination with offering awareness and incentive programs, is an important tool to improve water quality in the Willow Creek watershed.

Creating, protecting and improving riparian areas is important to the health of the watershed. Riparian areas act as natural filters of both ground and surface water, provide wildlife habitat and protect streambanks and shoreline from flooding and erosion. Similar to riparian areas along waterways, wetlands filter runoff and slow erosion which helps to reduce nutrient loading. Wetlands also help to manage flood waters by storing excess water and releasing it slowly.

Reducing nutrient loading in the Willow Creek watershed is a challenge that will require the participation and co-operation of all levels of government, stakeholders and watershed residents. Awareness of what an individual can do to reduce their nutrient loading, from both urban and rural sources, is important. Environmental education programs, like the Environmental Farm Plan Program, are encouraged as they provide producers with the opportunity to assess environmental risks associated with their farming operation, identify beneficial management practices to reduce those risks and improve their farm production efficiencies. Projects that demonstrate the benefit of on-farm beneficial management practices will promote producer uptake and provide awareness on proper implementation and maintenance techniques.¹

- Promote and provide technical and financial assistance to producers to implement BMPs that reduce nutrient loading such as nutrient management planning, soil testing, manure testing, improved fertilizer/manure application, and riparian area management
- Promote and provide technical and financial assistance to producers for grazing management and agro-forestry BMPs such as perennial forage establishment, sustainable woodlot management and sustainable rotational grazing
- Establish and maintain wetlands and permanent vegetative cover in riparian areas to minimize soil loss and filter runoff
- Educate residents on activities that reduce nutrient loading from urban sources such as environment-friendly lawn care (fertilizer application, lawn clippings)
- Incorporate education on water into local schools
- Explore options to use Narcisse Community Pasture for demonstration projects or extension activities for BMP implementation

DID YOU KNOW?

Riparian areas are the transitional zones found along waterways, streambanks, lake shores and wetlands. Healthy riparian areas may have any combination of trees, shrubs and grasses depending on local conditions. Riparian areas are highly valuable ecosystems because they connect aquatic ecosystems to terrestrial ecosystems.

¹ Agriculture and Agri-Food Canada – Agri-Environment Services Branch and Manitoba Agriculture, Food and Rural Initiatives, 2009.

Elevated levels of bacteria, namely *Escherichia coli* (*E. coli*) and total coliform, are also a concern for watershed residents who use creeks, bogs and lakes as a drinking water source for livestock or for recreational purposes. Potential sources of bacteria include effluent discharge from wastewater lagoons and sewage treatment plants, failing septic systems and runoff from farming operations and urban developments. It is also important to note that there are many natural sources of bacteria such as animal waste and decomposition. Manitoba Conservation and Water Stewardship undertakes an extensive beach monitoring program along the shores of Lake Winnipeg. *E. coli* samples are collected from four locations adjacent to the Willow Creek watershed since 2003, including Spruce Sands Beach, Gimli Beach, Sandy Hook Beach and Winnipeg Beach. When blooms are present, samples are also collected for algal cell density and algal toxin analysis. Lake Winnipeg beaches are periodically posted with “Algal Advisory” signs when guidelines for cell counts or toxin concentrations are exceeded.

Manitoba Conservation and Water Stewardship has also been collecting water quality samples from Willow Creek at PTH 9 as part of the clean beaches program. Bacteria levels at this site are usually below the irrigation objective of 1000 *E. coli* per 100 mL and most often below the body contact recreation objective of 200 *E. coli* per 100 mL. Extensive studies were undertaken by Manitoba Conservation and Water Stewardship in 2003 to determine the source of occasionally high *E. coli* counts and the mechanism of transfer to Lake Winnipeg beaches. Studies have shown that large numbers of *E. coli* are present in the wet sand of Lake Winnipeg beaches. During periods of high winds, when water levels are rising in the south basin, these bacteria can be washed out of the sand and into the swimming area of the lake. Research has shown that less than 10% of the *E. coli* at Lake Winnipeg beaches is from human sources, whereas over 70% is from animal sources such as birds and livestock.⁹



⁹ Williamson, D.A., W.E. Ralley, A. Bourne, N. Armstrong, R. Fortin, and C.E. Hughes. 2004. Principal factors affecting *Escherichia coli* densities at Lake Winnipeg beaches. Water Quality Management Section. Manitoba Water Stewardship. Manitoba Water Stewardship Report No. 2004-01. 18pp. http://www.gov.mb.ca/waterstewardship/water_quality/lkwpg_beach_report_interim-040129.pdf



Many watershed residents live in close proximity to Lake Winnipeg in shorefront communities such as Gimli, Husavik, Siglavik, Sandy Hook, Pelican Beach, Winnipeg Beach and many more. Degradation of water quality from urban sources of nutrients, bacteria and other contaminants is a concern for these residents. Sources of contamination include stormwater runoff, fertilizer and pesticide application, failing septic systems and landfills. Programs that reduce urban sources of nutrients and other contaminants are encouraged. Future development should be conducted using strategies that protect water quality and aquatic habitat such as the mandatory installation of water-saving fixtures and appliances in new homes, stormwater retention ponds in new developments and greywater recycling. Also, future developments that dramatically alter shorelines should not be approved.

Failing septic systems pose a high risk of contaminating both surface and groundwater resources. Septic systems may be failing if they were installed improperly, not well maintained, equipment fails or if the infrastructure is aging and needs replacement. In most cases, landowners are unaware that their septic system is failing as inspections are uncommon. Education on how to inspect and properly maintain septic systems is important in improving surface water quality.

In 2008-2009, the East Interlake Conservation District, in partnership with the Rural Municipality of Gimli, monitored water quality in stormwater drains in the Gimli urban centre and surrounding area. When examining each storm drain on an individual basis, it was found that the storm drain system exiting at the Viking statue failed the highest number of tests; followed by the drains exiting at the Gimli Library, the concession stand and Loni Beach respectively. The two storm drains that have their outflow on the public beach are of highest concern in terms of human health as they showed bacteria levels well above recommended guidelines for recreational water use. The October sampling of the storm drain in Loni Beach indicated *E. coli* concentrations 70 times greater than what a municipal wastewater treatment system can legally release to surface waters. Direct contact with these outflows could result in serious illness. The main route of exposure to these pathogens is through ingestion of contaminated water while swimming. Of the different illnesses that may be contracted, gastrointestinal illness occurs most frequently. However, gastrointestinal illness is rarely life-threatening and symptoms include mild fever, stomach ache, nausea, vomiting, and diarrhea. Other illnesses and conditions affecting the eye, ear, skin, and upper respiratory tract can be contracted as well. Based on these findings, the East Interlake Conservation District has made a number of recommendations to improve water quality such as installing pet waste disposal bags in public places, creating a map of the stormwater system, survey the urban centre to identify potential pollution sources and educating residents. Many of these recommendations are included in this plan. A copy of this report can be found on the East Interlake Conservation District website (www.eicd.ca).

- Adopt policies for future development projects to incorporate low-impact, environmentally friendly concepts into their design to minimize pollution loads and improve water-use to minimize pollution loads and improve water-use efficiency such as stormwater retention, environmentally friendly drainage construction and maintenance, greywater recycling, low-flow water fixtures and water-saving appliances
- Educate residents on activities that reduce bacteria sources such as septic system maintenance and pet waste management
- Ensure private sewage disposal systems are checked on a regular basis to ensure they are not leaking or showing signs of saturation
- Promote the enhancement of private waste management systems such as septic tanks, fields and ejectors including an increase in inspections
- Create a map of the Gimli urban centre storm drain system and delineate catchment areas
- Survey the Gimli urban centre stormwater drain system to identify sources of bacteria and non-storm related flows
- Educate residents on the location of stormwater drains using signage or by painting fish along the drainage system
- Educate landowners on the proper disposal of pet waste in parks and public spaces





Wastewater management has become a point of concern for residents, especially in urban communities located in the eastern region of the watershed. Municipal wastewater effluent typically contains human and other organic waste, nutrients, pathogens, microorganisms, suspended solids and household and industrial chemicals that may pose risks to human health and the environment. To prevent or minimize these risks, management of effluent quality, proper levels of treatment, monitoring before discharge and reporting are important. Many residents are required to use private on-site wastewater management systems such as septic fields, holding tanks or ejectors. In 2009, the Rural Municipality of Gimli began operating a new wastewater treatment plant. There may be opportunities to expand the service area of this plant to neighbouring communities that still use private on-site wastewater systems. This would decrease the risk to human health and the environment as the level of treatment is higher. The Rural Municipality of Gimli will also benefit by investigating options to rehabilitate the old Gimli sewage lagoons and reduce infiltration into the new treatment plant.

In general, municipalities that operate wastewater facilities are required to test for and meet the recreational guidelines for bacteria, *E. coli* and total coliform, before the effluent is discharged. Residents expressed the need to test effluent discharge for additional parameters such as nutrients before it is released into waterways. It was also identified that many municipal lagoons do not have management plans that investigate possible treatment improvements, outline strategies for improved record keeping, identify options for nutrient abatement, include a map of the service area, address access issues and outline emergency discharge procedures.

- Evaluate options for potential reduction of nutrients from municipal and private wastewater treatment systems using techniques such as effluent irrigation, trickle discharge, constructed wetland treatment, or chemical treatment
- Expand existing wastewater treatment plant to include all homes in the Gimli urban centre and to surrounding communities from Arnes to Dunnottar
- Investigate options for the rehabilitation of the Rural Municipality of Gimli sewage lagoons and ways to reduce infiltration into the new treatment plant
- Educate landowners about the impacts of infiltration into the wastewater system
- Conduct environment risk assessments for all wastewater lagoons or sewage treatment plants and establish site-specific effluent discharge objectives
- Investigate possible treatment improvements, outline strategies for improved record keeping, identify options for nutrient abatement, include a map of the service area, address access issues and outline emergency discharge procedures

Soil and Shoreline Management

There is approximately 40 kilometres of Lake Winnipeg shoreline in the Willow Creek watershed. In recent years, high lake levels combined with major wind and rain storm events have caused significant erosion along portions of the lake. In response to this flooding and increased shoreline erosion, many property owners have constructed their own shoreline protection works to varying degrees of success. Landowners in this watershed also experience erosion of annual cropland as a result of wind and water action. This soil loss contributes excess nutrients to waterways flowing into Lake Winnipeg.

Measure of Success	How will this be measured?
There will be a reduction in total suspended solids in the Willow Creek and Fish Lake Drain.	Manitoba Conservation and Water Stewardship, in partnership with the East Interlake Conservation District, has been sampling total suspended solids in the Willow Creek and Fish Lake Drain since 2005. The 5-year average concentration of total suspended solids will be compared between 2005 – 2010, 2010 – 2015 and 2015 – 2020.
There will be an increase in residue management practices used in the watershed such as cover crops, no-till or minimum-till practices.	Data available from the Agricultural Census between 1993 and 2006 will be compared to new data collected between 2011 and 2021.
There will be a decrease in the amount of shoreline with a “high” risk of erosion.	The East Interlake Conservation District conducted a shoreline assessment in 2011. This assessment indicated that 11 kilometers of shoreline have a “high” risk of erosion. The East Interlake Conservation District will complete a similar assessment by 2021 and compare the results with the 2011 data.

DID YOU KNOW?

The shoreline along Lake Winnipeg is considered a riparian area; however, much of the natural vegetation has been removed to support waterfront development. Vegetation cover is the primary defense against erosion and is important to long-term erosion protection. Vegetation protects against erosion by holding or binding the soil with the root system of plants, by removing water from the soil by uptake and transpiration, by reducing runoff velocity, by reducing frost penetration and by the buttressing or reinforcing action of large tree roots.

UNDERSTANDING THE ISSUES

Within the Willow Creek watershed, approximately 10% of the watershed is considered to have a risk to wind erosion, whereas 4% is considered to have a risk of water erosion. Cropping and residue management practices can significantly reduce erosion risk depending on crop rotation, soil type and landscape features. Shelterbelts, cover crops and riparian buffer strips are examples of good beneficial management practices that reduce the risk by protecting against soil erosion.¹ Effective management of surface water will also reduce the risk of soil erosion. Please refer to the Surface Water Management Plan on pages 17 - 27.

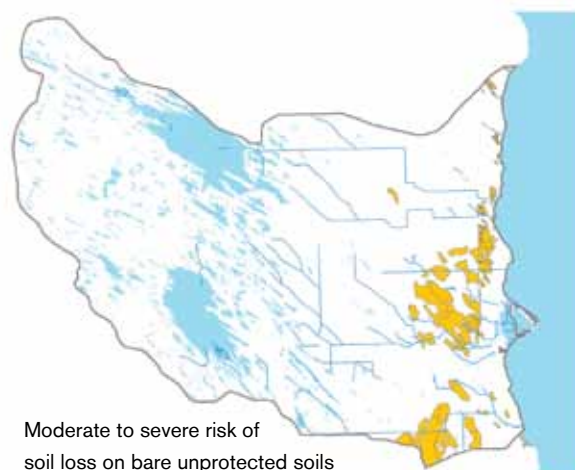


Lake Winnipeg has a history of shoreline erosion problems. Property owners and municipalities have tried various approaches to protect shorelines from erosion over the years. The majority of shoreline on the west side of Lake Winnipeg is composed of glaciolacustrine clay overlying clay or till material. Erosion of fine grained material such as clay and silt can easily occur when exposed to water. The amount of erosion is largely dependent on water depth; however, other factors such as bank height, bank slope, geology, groundwater, surface water and vegetation also affect erosion rates.

ACTIONS

For more details on the implementation of these actions, please see pages 50-57.

- Promote and provide technical and financial assistance to landowners for the implementation of BMPs such as cover crops, residue management techniques and shelterbelt establishment where wind erosion is an issue
- Promote and provide technical and financial assistance to landowners for the implementation of BMPs prioritized for water erosion risk areas such as riparian buffer, and perennial cover establishment for the lower class of lands in severe or highly erosive areas



¹ Agriculture and Agri-Food Canada – Agri-Environment Services Branch (AESB) and Manitoba Agriculture Food and Rural Initiatives (MAFRI) 2010. *Agricultural Land Use and Management in the Willow Creek Watershed*

The water level of Lake Winnipeg fluctuates from season to season, year to year, and is generally affected by inflow to the lake, precipitation amounts, evaporation and outflow of the lake. Several rivers flow into Lake Winnipeg including the Red, Winnipeg and Saskatchewan Rivers, however, there are also many small tributaries and drains flowing into Lake Winnipeg including many in the Willow Creek watershed. The outflow of Lake Winnipeg is regulated by Manitoba Hydro.

Wind set-up also contributes to fluctuations of water levels of Lake Winnipeg. Lake Winnipeg is particular prone to wind set-up and set-down events due to its large surface area and relatively shallow depth. Wind set-up is caused by strong winds blowing in one direction over the lake for many hours. Strong winds for a long duration results in increased water levels in the downwind direction and decreased water levels in the upwind direction. The decreased water levels are called wind set-down. In recent years, wind set-up and set-down have resulted in significant differences in water levels by up to two metres between the north and south basin. In this watershed, wind set-up can be nearly 5 feet under sustained periods of high winds.

Waves generated by wind on Lake Winnipeg have the potential to cause severe shoreline erosion. The height of a wave is a function of wind speed, wind direction, wind duration and fetch. Wave uprush is a significant concern when large wind events occur for a long duration on Lake Winnipeg. The magnitude of wave uprush is a function of wave height and bank slope. Therefore, a shallower bank slope will experience less wave run-up than a steep bank slope. Wave overtopping occurs when the height of the land is less than the height of the waves. Wave overtopping can result in backshore flooding and may affect the integrity of shoreline and associated erosion protection works.



DID YOU KNOW?

Differential isostatic rebound is also contributing to higher water levels in the south basin. Isostatic rebound is the slow rise of land that has occurred since the weight of the ice sheet was removed after the last glacial period. The northern outlet of Lake Winnipeg is rising in elevation at a faster rate than the southern inlet resulting in the water level in the south basin to rise approximately 20 cm per century over the last three hundred years.



LAKE WINNIPEG REGULATION

Manitoba Hydro regulates Lake Winnipeg outflow at their Jenpeg Generating Station for power production purposes when the wind-eliminated water level is between 711 and 715 feet. When the level of the lake rises above 715 feet, Manitoba Hydro is required to operate at maximum discharge. During periods when the level falls below 711 feet, control of Lake Winnipeg outflow is under the direction of the Province of Manitoba.¹⁰ Some residents are concerned that the gates at the generating station are not opened quickly enough following periods of high precipitation which leads to higher lake levels and shoreline erosion issues. There is also a common misconception about Manitoba Hydro's regulation of Lake Winnipeg; that lake levels are kept consistently high for power production.

Water level records for Lake Winnipeg have been monitored by the Government of Canada since 1913 as illustrated in Figure 4. Prior to 1976, when Manitoba Hydro began regulating outflows from the lake, the average level was 713.4 feet. Since regulation, the average lake level is not significantly different at 713.5 feet. Average levels on any given day post-regulation are essentially unchanged from pre-regulation levels. Regulation of the lake has decreased the frequency of extreme high and low lake levels as illustrated below.¹⁰

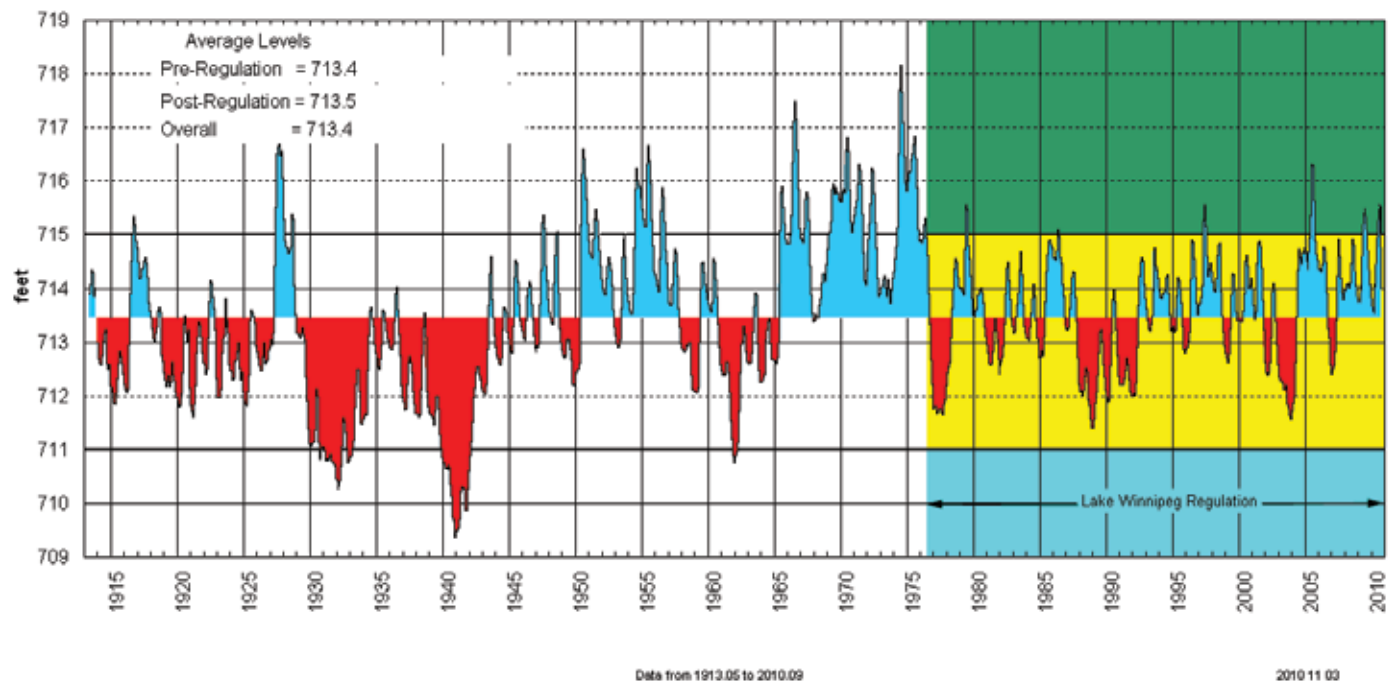


Figure 4: Lake Winnipeg water levels¹⁰

¹⁰Manitoba Hydro, 2011. *Energy Matters: Lake Winnipeg Water Levels*. January 2011, Volume 11, Number 01

Groundwater may also affect erosion rates. Groundwater is typically able to flow vertically through sand but is not able to flow as quickly through clay. Groundwater flow that is impeded by clay will cause increased erosion on a bank face. Erosion of a bank face will eventually result in the recession of the shoreline as the undercut portions of the bank are transported into the lake by wave action. Therefore, bank movement or bank collapse is more likely to occur when a bank is saturated.

The stability of the shoreline is influenced by lot drainage. If lot drainage directs water towards a steep slope, back erosion is more likely. Eavestroughs should be directed away from the shoreline to reduce the risk of bank erosion and instability. Septic fields and perforated septic tanks can cause water and waste to drain into the lake, potentially contributing to bank erosion and degrading water quality. Redirecting surface water away from the top of the bank or providing an erosion resistant drainage channel which transports the water down the bank face in a controlled environment, such as interceptor and tile drains, will help minimize surface erosion.

Natural trees, shrubs, willows and grasses with deep roots provide a stabilizing influence and protection from surface erosion. Vegetation has the ability to reinforce the soil with a root system, remove water from the soil through evapotranspiration, reduce runoff velocity, reduce frost penetration and provide a buttress for large tree roots. Planting native vegetation with deep root systems, especially at the top of the bank, will help protect against surface erosion and provide a stabilizing influence.

- Direct water from eavestroughs away from Lake Winnipeg to reduce the risk of shoreline erosion
- Redirect surface water away from the top of the slope or provide an erosion resistant drainage channel which transports the water down the bank face in a controlled manner
- Plant natural vegetation along the shoreline to stabilize the bank



Heavy structures located near the bank of a waterbody can contribute to bank instability. Banks with homes or cottages located directly overtop are more likely to fail, increasing the possibility of further shoreline recession. A minimum set-back distance of 100 metres is recommended unless otherwise specified by a qualified geotechnical engineer.

It should be recognized that individual assessments are required when structural options are being considered for shoreline protection. Understanding what influences shoreline processes is very technical, and neighbouring properties may benefit from adopting a coordinated approach and hiring a qualified engineer to help coordinate erosion control. The Lake Winnipeg Shoreline Management Handbook is an excellent resource for private landowners who reside along the shores of Lake Winnipeg. The handbook provides a brief synopsis on the basic shoreline erosion processes, information on selecting a shoreline management approach and an overview of various shoreline protection measures.¹¹

- Adopt policies for a minimum set-back distance of 100 metres for new development or buildings along the shoreline of Lake Winnipeg, as well as policies to protect natural vegetation along shorelines
- Coordinate with neighbouring properties to determine an appropriate shoreline protection approach



DID YOU KNOW?

Two levels of shoreline protection are typically utilized: heavy protection and light protection. Examples of heavy protection include boulder revetments and seawalls. Examples of light protection include light revetments, bulkheads and timber cribs. Heavy protection is designed to protect the shoreline from erosion during large storm events while light protection provides less resistance to erosion. Light protection is less expensive and may leave more of the beach for enjoyment, but in general the design life is shorter and maintenance is required more often. However, it is important to note that regardless of the type of shoreline protection constructed, maintenance work will be required. Structural protection works that attempt to replicate the natural processes or work with the natural processes such as beach nourishment, lakebed armouring, groyne, artificial headlands and detached breakwaters require a study and would typically be applied on a much larger scale than one individual landowner.

¹¹ Province of Manitoba, 2001. Lake Winnipeg Shoreline Management Handbook.

Prior to constructing shoreline protection works, it is encouraged that a property owner retain the services of a qualified geotechnical engineer to ensure that the final design plan is properly engineered. Property owners must determine ownership of the land on which the structure will be built. If the structure is being built on public land, such as a beach reserve, then the property owner must obtain approval from the appropriate authorities. This includes contacting their local planning district to determine if a building permit is required. The Province of Manitoba does not have the legislated authority to issue permits for shoreline protection works. Unlike other municipalities located along Lake Winnipeg, the Eastern Interlake Planning District currently does not issue permits for shoreline protection works.

The Shoreline Erosion Technical Committee (SETC) is a multi-disciplinary Committee composed of representatives from local, provincial and federal governments that provide technical advice on shoreline erosion issues. The SETC provides suggestions towards the design and construction of shoreline protection works on Lake Winnipeg and elsewhere around the province. Applications can be submitted to the SETC through your local planning district or local development permitting authority.

The Department of Fisheries and Oceans (DFO) Canada partners with the SETC during the site specific review of proposed shoreline protection works. Under *The Fisheries Act*, no one may carry out work that will cause harmful alteration, disruption or destruction (HADD) of fish habitat unless it is authorized by DFO. This coordinated application process eliminates the need for an individual to submit a separate application to DFO for the authorization to conduct shoreline protection works.

- Encourage landowners to retain the services of a qualified geotechnical engineer prior to construction shoreline protection works
- Ensure shoreline protection works receive all necessary approvals and permits from local municipalities, planning district and the Department of Fisheries and Oceans Canada
- Forward all landowner applications for shoreline protection works to the SETC for a joint review with DFO



DID YOU KNOW?

Groynes are commonly used to stabilize shorelines, however; many groynes constructed on Lake Winnipeg are ineffective because they are too short to protect the shoreline. Also, groynes may negatively impact adjacent properties by trapping material and reducing the sediment supply or by deflecting nearshore material into deeper offshore water.

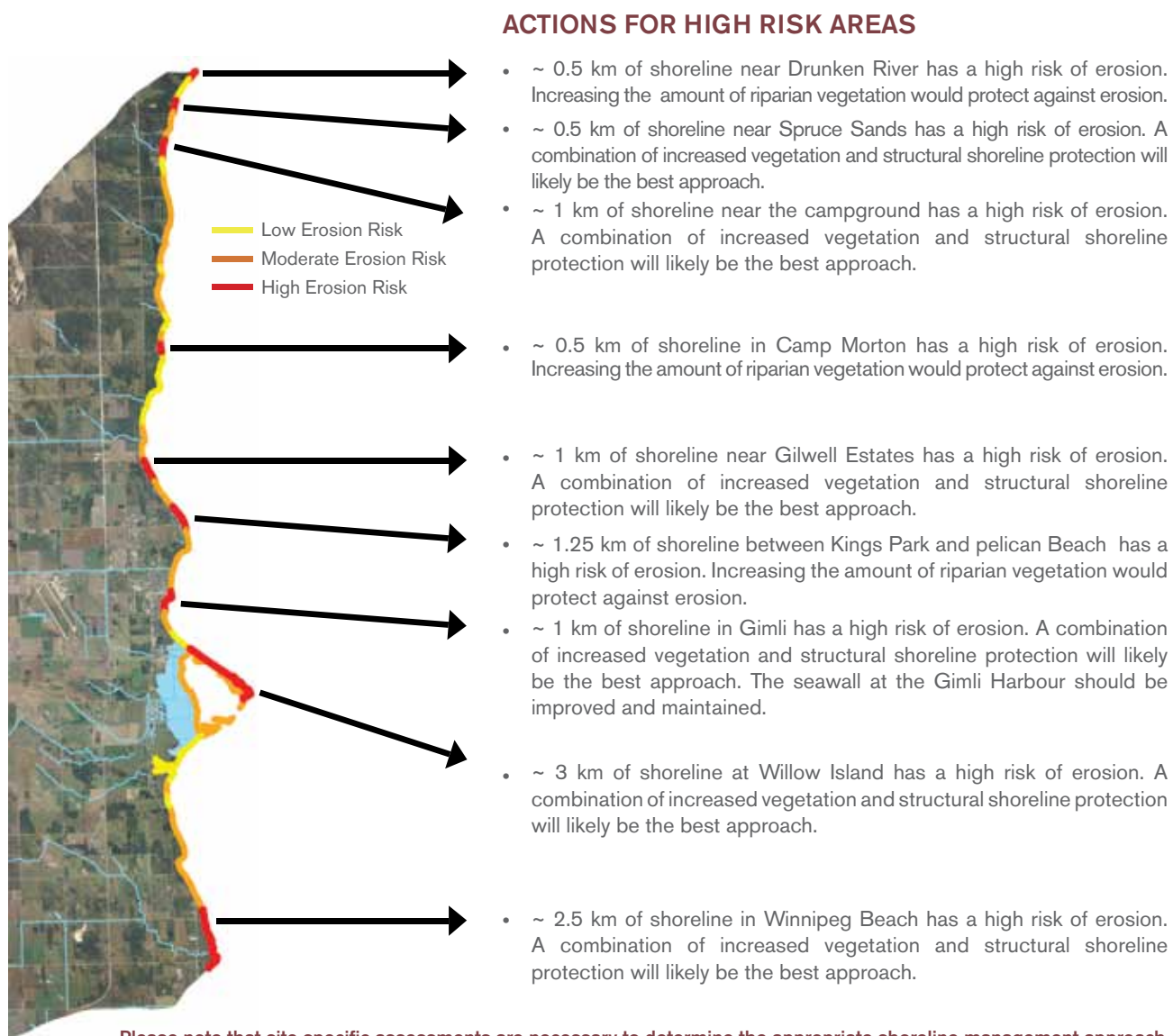
SHORELINE MANAGEMENT PLAN

FOUR THINGS TO CONSIDER WHEN PLANNING TO PROTECT OR ENHANCE SHORELINES

- 1) Let nature do the work. Natural vegetation, such as trees and willows, provide bank stabilization using their root structures;
- 2) Contact a geotechnical engineer to develop a site-specific approach for shoreline protection;
- 3) Ensure all appropriate approvals are in place before any works are initiated; and
- 4) Work with your neighbours for a coordinated approach to protecting shorelines.

PRELIMINARY ASSESSMENT OF SHORELINE HEALTH

In 2011, the East Interlake Conservation District conducted an assessment of the risk of shoreline erosion along approximately 40 kilometers of shoreline in the Willow Creek watershed. The study assessed landuse, beach width, existing shoreline protection, vegetative cover and distance of nearest development. The study did not consider slope, elevation or soil type. Below are the results of this preliminary assessment.



Wildlife and Fish Habitat

Protecting natural habitat in the Willow Creek watershed is critical to supporting healthy aquatic and terrestrial ecosystems. The preservation of existing wildlife and fish habitat is a priority for watershed residents.

Measure of Success	How will this be measured?
Maintain existing natural areas including forests, riparian areas and wetlands.	According to 2006 land cover data, 40% of the watershed was classified as trees while 8% was classified as wetlands. New land cover data collected between 2011 and 2021 will be compared to the 2006 data.
Degraded aquatic habitat will be restored.	The East Interlake Conservation District completed an aquatic and riparian habitat assessment in 2007-2008. Forty-four priority projects were identified in this study. By 2020, 20 priority projects identified in the study will be completed.



UNDERSTANDING THE ISSUES

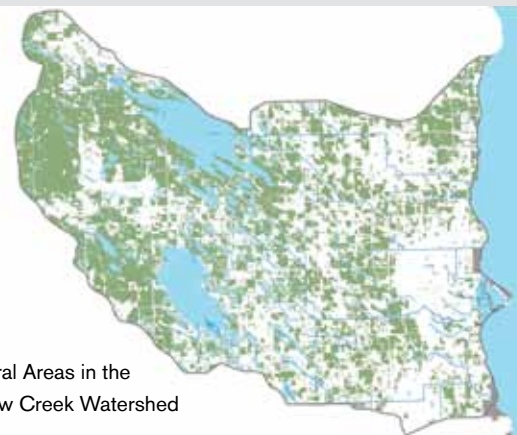
In this plan, the term “natural areas” is used to refer to terrestrial and aquatic habitat including riparian areas, wetlands, forests, grasslands and aquatic ecosystems. In 2006, 40% of the watershed was classified as trees while 8% was classified as wetlands. Awareness of the value of existing natural areas is important to their protection. Activities that protect, maintain and enhance these areas are vital to the overall health of the watershed.¹

The Willow Creek watershed contains two large lakes – Fish Lake and Dennis Lake. The Fish Lake complex is utilized as a water retention area and includes a variety of habitats including wetlands, bogs and oak-aspen forest. This wetland habitat supports waterfowl, waterbirds and furbearing animals. The bog area is a unique habitat that supports a variety of unusual and rare plant species, such as orchids, pitcher plants and sundews. In addition, the bog's extensive system of artesian springs is known to over-winter northern leopard frogs. Snowmobile and all terrain vehicle (ATV) traffic should be confined to designated trails. New trails should not be developed in this sensitive bog area. The oak-aspen forest habitat supports white-tailed deer, moose, elk, black bear, wolves and coyotes, as well as many species of birds such as ruffed grouse, sharp-tailed grouse and songbirds.

Dennis Lake is a wetland complex that supports significant staging waterfowl and waterbirds during the spring and fall migration periods. The surrounding upland forests support white-tailed deer, elk, black bears, coyotes and a wide variety of birds.

ACTIONS

For more details on the implementation of these actions, *please see pages 50-57.*



Natural Areas in the
Willow Creek Watershed

- Protect existing natural areas, especially wetlands, through conservation easements, Ecological Goods & Services (EG&S) programs or the purchase of land
- Ensure snowmobile and ATV traffic is confined to designated trails

¹ Agriculture and Agri-Food Canada – Agri-Environment Services Branch (AESB) and Manitoba Agriculture Food and Rural Initiatives (MAFRI) 2010. *Agricultural Land Use and Management in the Willow Creek Watershed*

The largest concentration of snakes in the world can be found in the south-western region of the watershed. The Narcisse Snake Dens, located in the Narcisse Wildlife Management Area (WMA) and near the Narcisse Community Pasture, protects nine red-sided garter snake dens (hibernacula). These dens are found in natural limestone sinkholes that provide critical over-wintering habitat for the survival of Narcisse red-sided garter snakes. The dens within the WMA are protected from all forms of commercial development; however, the dens located outside this area may not have the same level of protection.¹²

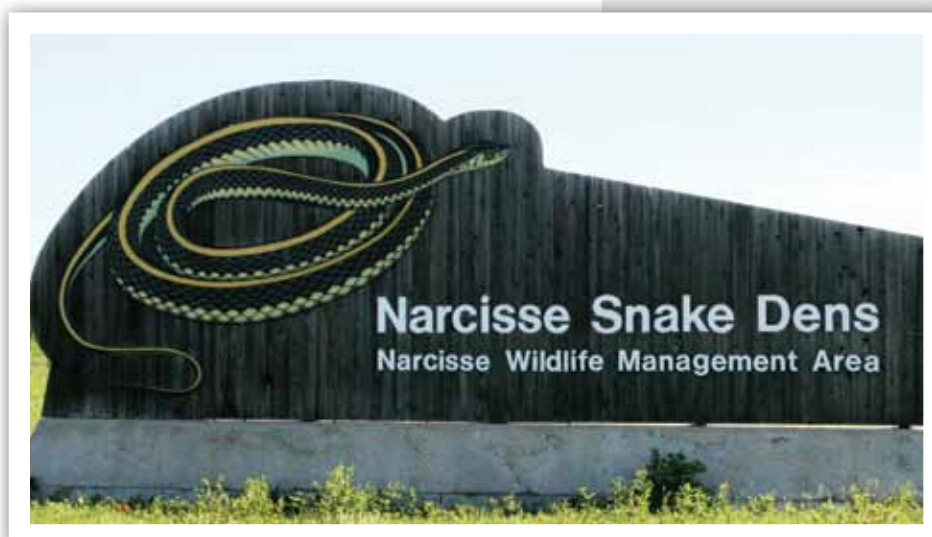
Maintaining the integrity of these major snake denning sites is crucial to sustaining the garter snake populations found in this region. Development in the area surrounding the Narcisse Snake Dens should be restricted or include mitigation measures to protect these important snake denning sites. Agriculture and Agri-Food Canada - Agri-Environment Services Branch have taken steps to protect red-sided garter snake habitat within their Community Pasture including their fencing plans and grazing practices. Fisher River – Armstrong Planning District should consider developing policies that restrict development activities that have negative impacts on snake denning sites.

Garter snakes move within the Willow Creek watershed as they migrate between summer hunting grounds and winter dens. The use of roadway tunnels and drift fencing to protect migration corridors will reduce garter snake mortality. The distribution of educational material is also important to prevent unnecessary mortalities.



Red-sided garter snake - B.L. Joynt

- Maintain and protect the integrity of snake dens
- Protect snake migration corridors from development through the use of mortality mitigation techniques, such as roadway tunnels and drift fences, in locations where snake migration is concentrated
- Educate residents on the importance of protecting snake dens and migration corridors



¹² Manitoba Conservation: Snakes of Narcisse <http://www.gov.mb.ca/conservation/wildlife/viewing/narcisse.html>

An area encompassing the eastern portion of the Narcisse Wildlife Management Area, the north end of the Narcisse Community Pasture and adjacent private lands constitutes critical wintering habitat for white-tailed deer. This area includes the Chatfield Deer Wintering Area which consists of mixed deciduous-conifer forest that provides critical wintering habitat for a population of 1000 to 2000 white-tailed deer. While some clearing for agricultural purposes has occurred, the majority of this wintering area is secure as it is partially located within the Narcisse Wildlife Management Area.

The Willow Creek watershed also contains the Clematis - Sandridge Deer Wintering Area. This aspen forest-grassland area provides critical wintering habitat for 300 to 500 white-tailed deer and 25 to 50 elk. White-tailed deer migrate to these areas from as far away as fifty kilometers. Loss of this critical habitat to agricultural development would diminish the value of this area as a wintering site for white-tailed deer.

The Least Bittern, a small wading bird that is designated as threatened by the Federal Species at Risk Act, inhabits parts of the watershed near Fish Lake. Least bitterns are attracted to areas of dense cattail and bulrush adjacent to water deep enough to support fish, which is its primary prey. The most significant threat to this species is the dramatic lowering of water levels in wetlands, especially during nesting periods in June. Water management on Fish Lake and Dennis Lake should ensure that water levels are sufficiently high enough to maintain the habitat preferred by Least Bitterns.

- Protect important deer and elk wintering habitat by preserving forested areas using development policies or protection programs such as conservation easements or EG&S payments



- Ensure that Least Bittern habitat is considered when establishing water levels for Fish Lake



Female Least Bittern
Benoit Jobin, Canadian Wildlife
Service

Willow Island Marsh is a wetland-lake complex that supports nesting and migrating waterfowl and shorebirds. It also provides important roosting habitat for waterbirds such as American white pelicans, cormorants, gulls and terns. The beach ridge on the eastern periphery of the lagoon is used extensively by migrating songbirds. In the recent past, the endangered Piping Plover has attempted to nest on a wide exposed sand beach on the beach ridge. Human disturbance and roosting by gulls and terns has likely caused the abandonment of nesting attempts by this important shorebird. Since the endangered Piping Plover has used this area for nesting, it has been designated as critical habitat under the Federal Species at Risk Act. While this critical habitat is not under immediate threat from development, the land is privately owned and there is no guarantee that changes in its present undisturbed state will not occur in the future. Future use of this nesting site by Piping Plovers must be secured through limitations on the level of development on the beach ridge and restrictions on ATV use in the area. Residential development on private lands within the marsh complex threatens the diversity of habitats and wildlife in this area.

East of PTH 7, significant agricultural and rural residential development has resulted in habitat fragmentation through the removal of forests and riparian areas along Lake Winnipeg, Willow Creek and Boundary Creek. Healthy riparian areas provide excellent habitat for white-tailed deer, furbearing animals and a wide variety of songbirds. Potential threats to riparian habitat include pressure to improve drainage, erosion and increasingly intensive agricultural development including degradation caused by cattle access to creeks and cropping near waterways. Permanent cover re-establishment in locations of severe riparian degradation, like those along Willow Creek and Boundary Creek, should be promoted and supported through education and incentive programs. These activities will not only improve wildlife habitat, but they will also have positive affects on water quality and aquatic ecosystems.

Another important tool for protecting natural areas is restricting the sale of Crown lands. When Crown lands are sold, they become private property and the expectations for agriculture productivity may change, resulting in a loss of natural areas such as woodlots and wetlands through clearing bush or drainage improvements. These activities can result in a loss of important wildlife habitat, degradation of water quality, reduced groundwater recharge and flooding of downstream land. Manitoba Conservation and Water Stewardship should continue to restrict the sale of Crown lands that contain permanent or semi-permanent wetlands or that are prone to flooding as it is a useful tool to protecting overall watershed health. In the event that Crown lands are sold, instruments like conservation easements or land-use agreements can be utilized to ensure the land is managed in a sustainable manner. Purchasers should also be made aware that there is no guarantees that drainage improvements will be approved or that access will be provided.

- Adopt policies to limit development on Willow Island and surrounding wetlands
- Install barriers and signs to restrict snowmobile and ATV traffic in areas with Piping Plover nests



Piping Plovers
Skip Shand

- Adopt policies to restrict the removal of riparian habitat within 30 metres of a natural waterways for all new developments
- Promote and provide technical and financial assistance to producers for BMPs that protect and enhance riparian areas through BMPs such as exclusion fencing, off-site watering systems and planting of vegetated buffer strips
- Restrict the sale of Crown lands that contain permanent and semi-permanent wetlands or that are prone to flooding. If Crown lands are sold, the purchaser should be made aware that there are no guarantees that drainage improvements will be approved or that access will be provided

A study conducted in 2007 - 2008 by the East Interlake Conservation District assessed fish presence and aquatic habitat in 3rd order and higher waterways.¹³ The study revealed that 24 species of fish utilize waterways within the Willow Creek watershed and that aquatic habitat has been highly to severely impacted by human activity. Channelization of waterways and the loss of riparian areas are major factors in the degradation of aquatic ecosystems. The majority of land use in the areas surrounding waterways was determined to be agricultural land, pasture and hayland.

Potential detriments to aquatic habitat include livestock access in riparian areas, removal of riparian vegetation or a lack of buffer zones, urban encroachment, recreational abuse and improperly designed stream passage. Forty-four potential rehabilitation sites were identified and prioritized on a scale from 1 to 3, mostly related to poor aquatic habitat as a result of poor water quality or degradation of existing riparian and fish habitat. A number of potential barriers to fish migration were also identified. These barriers varied in size, severity of blockage and location in the watershed. The study suggested that priority should be given to the fish passage issues on Fish Lake Drain, Meleb Drain, Boundary Creek and to a lesser extent on the Drunken River. In terms of improving fish habitat, priority should be given to the natural meandering sections of Willow Creek and Fish Lake Drain; however, it is also important to maintain and improve water quality throughout the entire watershed as it is vital to the health of aquatic ecosystems and the function of aquatic organisms.¹³

Aquatic invasive species such as rainbow smelt, zebra mussels, rusty crayfish and curly leafed pondweed are a concern as they may invade creeks and wetlands resulting in damage to natural habitats and a decline in biodiversity. Purple loosestrife has not yet established in any significant degree in this watershed because of continued eradication efforts; however, the existence of this invasive species in residential gardens remains a concern. The widespread existence of red bartsia has become a significant problem because of its ability to out compete native vegetation. Continued expansion of red bartsia throughout the watershed will diminish the quality of native cover, reduce wildlife habitat and impact livestock production. Landowners along with local government should take action to eradicate invasive species where feasible and using environmentally sensitive techniques.



- Conserve, enhance and rehabilitate fish and wildlife habitat by completing 15 of the 44 priority projects identified in the Aquatic and Riparian Habitat Rehabilitation Study
- Prevent the introduction and spread of invasive species in an environmentally sensitive way

DID YOU KNOW?

Manitoba's commercial fishery is an important industry and a major provider of employment in the Interlake region, including the Willow Creek watershed. Lake Winnipeg is the largest commercial fishery in Manitoba, contributing 47% of the province's total commercial production and 67% of the landed value of the harvest. Walleye is the predominant species of fish harvested in Lake Winnipeg's south basin, locally known as pickerel. The resource is managed through the use of quotas, restrictions on the mesh size of gill nets, seasons and regulating the number of fishers licensed. These management tools allow fish populations and the industry to remain viable.¹⁴

¹³ Graveline, P.G., 2008. East Interlake Conservation District: Watershed 05SB Riparian Assessment Survey – with emphasis on third order drains or higher – 2007 and 2008

¹⁴ Manitoba Fisheries website, 2010 <http://www.gov.mb.ca/waterstewardship/fisheries/commercial/commercial.html>

PLAN LINKAGES

In addition to the Willow Creek watershed, the East Interlake Conservation District is currently in the process of developing and implementing integrated watershed management plans for three other watersheds in the district: Icelandic-Washow Bay, Netley-Grassmere and Fisher River watersheds.

There are two planning districts within the Willow Creek watershed: the Fisher-Armstrong Planning District and the Eastern Interlake Planning District. Development plans are utilized by municipalities

to ensure orderly and organized development of the local land resources. Development plans set out zoning by-laws and restrictions for residential, commercial, recreation, agricultural and industrial land uses. The Project Management Team recognizes the close linkage between the Willow Creek Integrated Watershed Management Plan and local development plans. By working together, both plans can promote improvements to watershed health for the benefit of all residents.

Rural Municipalities and Planning Districts should consider the following recommendations:

1. Adopt policies for the mandatory sealing of wells in areas that become serviced by public water systems;
2. Adopt policies that restrict future intensive and high-pollution risk developments (developments, activities, land uses and structures that have a high risk of causing pollution and include, but are not limited to chemical and fertilizer storage facilities, septic fields and tanks, fuel tanks, waste disposal grounds and lagoons) in source water protection zones for all public drinking water sources and in areas with less than six meters of overburden. Where restriction is not possible, development should be limited and may be subject to:
 - demonstration by the proponent that no significant negative effect on water quality is likely to occur;
 - the implementation of mitigation measures and alternative approaches that protect, improve or restore these areas;
 - the preparation of a strategy for mitigation in the event that negative impacts do occur;
3. Adopt policies for future development projects to incorporate low-impact, environmentally conscientious concepts into their design to minimize pollution loads and improve water-use efficiency such as stormwater retention, environmentally friendly drainage construction, greywater recycling, low-flow water fixtures and water-saving appliances;
4. Adopt policies for a minimum set-back distance of 100 metres for new development or buildings along the shoreline of Lake Winnipeg, as well as policies to protect natural vegetation along shorelines;
5. Ensure shoreline protection works receive all necessary approvals and permits;
6. Forward all landowner applications for shoreline protection works to the SETC for a joint review with DFO;
7. Maintain and protect the integrity of snake hibernacula; and
8. Protect snake migration corridors from development through the use of mortality mitigation techniques, such as roadway tunnels and drift fences, in locations where snake migration is concentrated;
9. Protect important deer and elk wintering habitat by preserving forested areas using development policies or protection programs such as conservation easements or EG&S payments;
10. Adopt policies to limit development on Willow Island and surrounding wetlands;
11. Install barriers and signs to restrict snowmobile and ATV traffic in areas with Piping Plover nests;
12. Adopt policies to restrict the removal of riparian habitat within 30 metres of a natural waterway for all new developments; and
13. Restrict the sale of Crown lands that contain permanent and semi-permanent wetlands or that are prone to flooding. If Crown lands are sold, the purchaser should be made aware that there is no guarantees that drainage improvements will be approved or that access will be provided.

IMPLEMENTATION

The most important aspect of any integrated watershed management plan is its implementation. Without it, the plan is no more than a list of good intentions. In the case of the Willow Creek Integrated Watershed Management Plan, a concerted effort from residents, stakeholder organizations, and all levels of government is necessary to ensure the recommendations outlined in plan are implemented successfully. As such, many organizations have committed to implementing the actions outlined in this plan.

Progress and success of the plan's implementation will be assessed on an annual basis. Watershed report cards will be distributed to residents every three to five years. After five years of implementation, the plan may be revised if watershed issues or priorities have changed or if new actions are required. A new plan will be developed in 10 years.

A summary of all watershed recommendations is provided on the following pages.



TABLE 2: IMPLEMENTATION PLAN FOR THE WILLOW CREEK IWMP

PRIORITY 1: DRINKING WATER QUALITY

RECOMMENDATIONS	LEAD & SUPPORT ORGANIZATION(S)*	TARGET AREA(S)**	EVALUATION OF SUCCESS	MORE INFO
Seal unused, abandoned, problem flowing and drainage wells	EICD, landowners	Source Water Protection Zones and areas with less than six metres of overburden	50 wells are sealed	Page 07
Seal any sinkholes that pose a threat to groundwater quality	EICD, MIT, MCWS	Watershed	Problem sinkholes are sealed	Page 07
Adopt policies for the mandatory sealing of wells in areas that become serviced by public water systems	Planning Districts, Municipalities	Watershed	Development plan policies and/or by-laws are adopted	Page 07
Complete a study on the interaction of surface water and groundwater and continue to research recharge processes and groundwater contamination processes	MCWS	Watershed	A study is completed	Page 07
Educate residents on how to protect drinking water resources through the distribution of publications on locations of public drinking water systems, the importance of groundwater protection, the impacts of land use activities on groundwater quality, how to perform well assessments, wellhead protection measures and proper maintenance procedures for wells and septic systems	EICD, MCWS	Watershed	Five educational activities are completed	Page 08
Complete a well inventory program to sample bacteria and nutrients in private wells	EICD	Watershed	Wells are re-sampled in 2014 and 2019	Page 08
Provide technical and financial assistance to landowners to improve the construction and maintenance of their wells or change land use practices to reduce the risk of groundwater contamination	EICD	Watershed	10 projects are completed	Page 08
Adopt policies to ensure that future intensive and high risk developments in source water protection zones for all public drinking water sources and in areas with less than six meters of overburden are constructed properly and include mitigation measures for any negative impacts to water quality and aquatic ecosystems	Planning Districts, Municipalities	Source Water Protection Zones and areas with less than six metres of overburden	Development plan policies and/or by-laws are adopted	Page 08

Promote and provide technical and financial assistance to producers for point source BMPs such as improved management of livestock confinement areas and the proper storage of fertilizer, manure, silage, pesticides, petroleum and waste	MAFRI, AAFC-AESB, EICD	Watershed	50 projects are completed	Page 08
Promote and provide technical and financial assistance to producers for non-point source BMPs such as improved nutrient and pesticide management, land conversion to perennial cover and wetland restoration	MAFRI, AAFC-AESB, EICD, MHHC, MCWS	Watershed	15 projects are completed	Page 08
Implement BMPs to reduce or prevent groundwater contamination including the installation of pitless well adapters, planting grass around wellheads, regular well inspection/maintenance and improved on-site storage and handling of potential contaminants such as fertilizer, petroleum products and pesticides	EICD, landowners	Watershed	20 projects are completed	Page 08
Ensure an emergency response plan is in place for all public drinking water systems	Owners of Public Drinking Water Systems	All public drinking water systems	All emergency response plans are in place	Page 09
Install vacuum breaker for sewage dump/wash site	MCWS	Camp Morton	Vacuum breaker is installed	Page 09
Fill in the well pit	MCWS	Camp Morton	Well pit is filled properly	Page 09
Better protect against vandalism of the drinking water system	German Society	Camp Neustadt	Protection against vandalism is increased	Page 09
Move fuel tank or ensure it is inspected often and has secondary containment at Shorepoint Village	Shorepoint Village	Shorepoint Village	Fuel tank is relocated or increase inspections	Page 09
Extend well casing to at least 16 inches above ground surface for all wells	Rural Municipality of Gimli	Pelican Beach	Casing is extended to at least 16 inches	Page 09
Extend well casing to at least 16 inches above ground surface for all wells	Sandy Hook RV Resort	Sandy Hook RV Resort	Casing is extended to at least 16 inches	Page 09
Ensure campgrounds and trailer parks serving in excess of 15 connections are reporting to the Office of Drinking Water as a public system and are operating in compliance with regulatory requirements	Owners of Campgrounds and Trailer Parks, MCWS	Watershed	All drinking water systems are operating in compliance with regulatory requirements	Page 10
Educate watershed residents on water conservation practices such as the installation of low-flow water fixtures, water saving appliances and xeriscaping	EICD, MCWS	Watershed	Two educational activities are completed	Page 10

PRIORITY 2: SURFACE WATER MANAGEMENT

RECOMMENDATIONS	LEAD & SUPPORT ORGANIZATION(S)*	TARGET AREA(S)**	EVALUATION OF SUCCESS	MORE INFO
Maintain and manage wetlands and water retention areas to allow for healthy wetland function and enhanced water storage capacity	Rural Municipalities, MIT, EICD	Watershed, with focus on Zones 1 and 2	Wetlands and water retention areas are managed properly	Page 13
Complete a pilot project on environmentally friendly drainage practices such as meandering stream channels, naturalizing drains, two-staged ditches, streambank erosion control techniques, etc.	Rural Municipalities, MIT, EICD	Watershed	One pilot project is completed	Page 13
Promote and provide technical and financial assistance to landowners for the implementation of BMPs such as riparian area management, riffle structures and controlled upstream water retention	EICD, MAFRI, AAFC-AESB	Watershed	20 projects are completed	Page 13
Conduct drainage works using environment friendly practices	Rural Municipalities, MIT	Watershed	10 environmental friendly drainage projects are completed	Page 14
Complete an assessment of drainage infrastructure, including culvert and drain condition	EICD, Rural Municipalities, MIT	Watershed	An assessment is completed	Page 14
Implement priority projects and activities identified in the Surface Water Management Plan	Rural Municipalities, MIT	Watershed	28 projects are completed	Page 14
Complete the necessary work to address the long standing drainage issue in the Husavik-west area	Rural Municipalities, MIT	Zones 3 and 4	Project is completed	Page 14
Investigate options to address flooding concerns along the Willow Creek	MIT, Rural Municipalities	Zone 3	Issue is addressed	Page 14
Meet regularly to discuss surface water management issues on a watershed scale (at least twice a year)	EICD, Rural Municipalities, MIT, MCWS	Watershed	20 meetings are held	Page 14

PRIORITY 3: SURFACE WATER QUALITY

RECOMMENDATIONS	LEAD & SUPPORT ORGANIZATION(S)*	TARGET AREA(S)**	EVALUATION OF SUCCESS	MORE INFO
Continue to monitor water quality along the Willow Creek and Fish Lake Drain on a long-term basis	MCWS, EICD	Willow Creek	Monitoring continues to occur on a quarterly basis	Page 29
Promote and provide technical and financial assistance to producers to implement BMPs that reduce nutrient loading such as nutrient management planning, soil testing, manure testing, improved fertilizer/manure application, and riparian area management	MAFRI, AAFC-AESB, EICD	Watershed, with focus on annually cropped lands located near waterways	50 projects are completed	Page 30

Promote and provide technical and financial assistance to producers for grazing management and agro-forestry BMPs such as perennial forage establishment, sustainable woodlot management and sustainable rotational grazing	MAFRI, AAFC-AESB, EICD	Watershed, with focus on annually cropped lands of Class 4 or lower and coarse textured soils	10 projects are completed	Page 30
Establish and maintain wetlands and permanent vegetative cover in riparian areas to minimize soil loss and filter runoff	Rural Municipalities, MIT, EICD, landowners	Watershed	Wetlands and riparian areas are maintained and five new ones are established	Page 30
Educate residents on activities that reduce nutrient loading from urban sources such as environment-friendly lawn care (fertilizer application, lawn clippings)	Lake Friendly Campaign, EICD, MCWS, SBMRC	Watershed	Five educational activities are completed	Page 30
Incorporate education on water into local schools	Lake Friendly Campaign, EICD, local schools	Watershed	Five educational activities are completed in schools	Page 30
Explore options to use Narcisse Community Pasture for demonstration projects or extension activities for BMP implementation	AAFC-AESB, EICD, MAFRI	Watershed	Two demonstration projects or tours are completed	Page 30
Adopt policies for future development projects to incorporate low-impact, environmentally friendly concepts into their design to minimize pollution loads and improve water-use efficiency, such as stormwater retention ponds, greywater recycling, low-flow water fixtures and water-saving appliances	Rural Municipalities, Planning Districts	Watershed	Development plan policies and/or by-laws are adopted	Page 32
Educate residents on activities that reduce bacteria sources such as septic system maintenance and pet waste management	EICD	Watershed	Five educational activities are completed in schools	Page 32
Ensure private sewage disposal systems are checked on a regular basis to ensure they are not leaking or showing signs of saturation.	Landowners	Watershed	Proper inspections of septic systems are completed	Page 32
Promote the enhancement of private waste management systems such as septic tanks, fields and ejectors including an increase in inspections	MCWS, Rural Municipalities	Watershed	50 inspections are completed	Page 32
Create a map of the Gimli urban centre storm drain system and delineate catchment areas	Rural Municipality of Gimli	Gimli urban centre	A map is created	Page 32
Survey the Gimli urban centre stormwater drain system to identify sources of bacteria and non-storm related flows	Rural Municipality of Gimli	Gimli urban centre	All potential sources of bacteria are identified	Page 32

Educate residents on the location of stormwater drains using signage or by painting fish along the drainage system	Rural Municipality of Gimli, EICD	Gimli urban centre	Stormwater drains are identified using signage	Page 32
Educate landowners on the proper disposal of pet waste in parks and public spaces	EICD, Rural Municipality of Gimli	Gimli urban centre	Two educational activities are completed	Page 32
Evaluate options for potential reduction of nutrients from municipal and private wastewater treatment systems using techniques such as effluent irrigation, trickle discharge, constructed wetland treatment, or chemical treatment	Rural Municipalities	Watershed	An assessment is completed for each municipal wastewater system	Page 33
Expand existing wastewater treatment plant to include all homes in the Gimli urban centre and to surrounding communities from Arnes to Dunnottar	Rural Municipality of Gimli	Zone 4	Plant includes the entire Gimli urban centre and neighbouring communities	Page 33
Investigate options for the rehabilitation of the old Rural Municipality of Gimli sewage lagoons and ways to reduce infiltration into the new treatment plant	Rural Municipality of Gimli	Gimli urban centre	An assessment of options is completed	Page 33
Educate landowners about the impacts of infiltration into the wastewater system	Rural Municipality of Gimli	Gimli urban centre	Two educational activities are completed	Page 33
Conduct environment risk assessments for all wastewater lagoons or sewage treatment plants and establish site-specific effluent discharge objectives	MCWS	Watershed	An assessment is completed for each wastewater lagoon or plant	Page 33
Investigate possible treatment improvements, outline strategies for improved record keeping, identify options for nutrient abatement, include a map of the service area, address access issues and outline emergency discharge procedures for all municipal waste water treatment facilities	Rural Municipalities	Watershed	Improvements are completed at each wastewater lagoon or plant	Page 33



PRIORITY 4: SOIL AND SHORELINE MANAGEMENT

RECOMMENDATIONS	LEAD & SUPPORT ORGANIZATION(S)*	TARGET AREA(S)**	EVALUATION OF SUCCESS	MORE INFO
Promote and provide technical and financial assistance to landowners for the implementation of BMPs such cover crops, residue management techniques and shelterbelt establishment where wind erosion is an issue	MAFRI, AAFC-AESB, EICD	Annual cropped lands of class 4 or lower or coarse textured soils	10 projects are completed	Page 35
Promote and provide technical and financial assistance to landowners for the implementation of BMPs prioritized for water erosion risk areas such as riparian buffer, and perennial cover establishment for the lower class of lands in severe or highly erosive areas	MAFRI, AAFC-AESB, EICD	Annual cropland in close proximity to waterways with a high risk of erosion	10 projects are completed	Page 35
Direct water from eaves troughs away from Lake Winnipeg to reduce the risk of shoreline erosion	Landowners, Rural Municipality of Gimli	Zone 4	5 projects are completed	Page 38
Redirect surface water away from the top of the slope or provide an erosion resistant drainage channel which transports the water down the bank face in a controlled manner	Landowners, Rural Municipality of Gimli	Zone 4	5 projects are completed	Page 38
Plant natural vegetation along the shoreline to stabilize the bank	Landowners, Rural Municipality of Gimli	Zone 4	5 projects are completed	Page 38
Adopt policies for a minimum set-back distance of 100 metres for new development or buildings along the shoreline of Lake Winnipeg, as well as policies to protect natural vegetation along shorelines	Planning Districts, Rural Municipalities	Zone 4	Development plan policies and/or by-laws are adopted	Page 39
Coordinate with neighbouring properties to determine an appropriate shoreline protection approach	Landowners, Rural Municipality of Gimli	Zone 4	A coordinated approach is used	Page 39
Encourage landowners to retain the services of a qualified geotechnical engineer prior to construction shoreline protection works	Rural Municipalities, Planning Districts	Zone 4	A qualified geotechnical engineer is consulted	Page 40
Ensure shoreline protection works receive all necessary approvals and permits from local municipalities, planning district and the Department of Fisheries and Oceans	Rural Municipalities, Planning Districts, SETC, DFO	Zone 4	Applications for shoreline protection works receive all necessary approvals	Page 40
Forward all landowner applications for shoreline protection works to the SETC for a joint review with DFO	Rural Municipalities, Planning Districts, SETC, DFO	Zone 4	Applications for shoreline protection works are forwarded to the SETC	Page 40

PRIORITY 5: WILDLIFE AND FISH HABITAT

RECOMMENDATIONS	LEAD & SUPPORT ORGANIZATION(S)*	TARGET AREA(S)**	EVALUATION OF SUCCESS	MORE INFO
Protect existing natural areas, especially wetlands, through conservation easements, Ecological Goods & Services (EG&S) programs or the purchase of land	MHHC, EICD, MCWS, MAFRI, AAFC-AESB	Watershed, with focus on Zones 1 and 2	500 acres of natural areas is protected	Page 43
Ensure snowmobile and ATV traffic is confined to designed trails	Rural Municipalities	Area surrounding Fish Lake bog	Two educational activities are completed	Page 43
Maintain and protect the integrity of snake dens	Fisher-Armstrong Planning District, MCWS, AAFC-AESB, landowners	Zone 1 - Narcisse Snake Dens and surrounding area including routes to summer foraging areas	Development plan policies and/or by-laws are adopted	Page 44
Protect snake migration corridors from development through the use of mortality mitigation techniques, such as roadway tunnels and drift fences, in locations where snake migration is concentrated	MCWS, MIT, Rural Municipalities, landowners	Zone 1 - Narcisse Snake Dens and surrounding area	Two projects are completed	Page 45
Educate residents on the importance of protecting snake dens and migration corridors	MCWS	Zone 1 - Narcisse Snake Dens	Two education activities are completed	Page 45
Protect important deer and elk wintering habitat by preserving forested areas using development policies or protection programs such as conservation easements or EG&S payments	EICD, Rural Municipalities, Planning Districts, MHHC	Zone 1 and 2	Development plan policies and/or by-laws are adopted	Page 45
Ensure that Least Bittern habitat is considered when establishing water levels for Fish Lake	Rural Municipalities, MIT, MCWS	Zone 2 and 3	Habitat needs are considered	Page 45
Adopt policies to limit development on Willow Island and surrounding wetlands	Rural Municipalities, Planning Districts	Zone 4	Development plan policies and/or by-laws are adopted	Page 46
Install barriers and signs to restrict snowmobile and ATV traffic in areas with Piper Plover nests	Rural Municipalities, Planning Districts	Zone 4	A policy or by-law is adopted	Page 46
Adopt policies to restrict the removal of riparian habitat within 30 metres of a natural waterways for all new developments	Rural Municipalities, Planning Districts	Zone 4	Development plan policies and/or by-laws are adopted	Page 46

Promote and provide technical and financial assistance to producers for BMPs that protect and enhance riparian areas through BMPs such as exclusion fencing, off-site watering systems and planting of vegetated buffer strips	EICD, MAFRI, AAFC-AESB	Watershed	25 projects are completed	Page 46
Restrict the sale of Crown lands that contain permanent and semi-permanent wetlands or that are prone to flooding. If Crown lands are sold, the purchaser should be made aware that there are no guarantees that drainage improvements will be approved or that access will be provided	Rural Municipalities, Planning Districts	Zone 1 and 2	The sale of flood-prone Crown lands are restricted	Page 46
Conserve, enhance and rehabilitate fish and wildlife habitat by completing 15 of the 44 priority projects identified in the Aquatic and Riparian Habitat Rehabilitation Study	EICD, Rural Municipalities, MIT	Zone 2, 3 and 4 as prioritized in the study	15 projects are completed	Page 47
Prevent the introduction and spread of invasive species in an environmentally friendly way	Rural Municipalities, MIT	Watershed	Invasive species are managed	Page 47

- * Lead and support organizations are included. Lead organizations are listed first.
- ** Refer to maps found on pages 9, 17-27, 41.



GLOSSARY

AAFC - AESB – Agriculture and Agri-Food Canada - Agri-Environment Services Branch
(formerly Prairie Farm Rehabilitation Administration)

DFO – Department of Fisheries and Oceans

DUC – Ducks Unlimited Canada

EICD – East Interlake Conservation District

HADD - Harmful, Alteration, Disruption or Destruction

IWMP – Integrated Watershed Management Plan

LWF – Lake Winnipeg Foundation

LWSB – Lake Winnipeg Stewardship Board

MAFRI – Manitoba Agriculture, Food and Rural Initiatives

MASC – Manitoba Agricultural Services Corporation

MCWS – Manitoba Conservation and Water Stewardship

MHHC – Manitoba Habitat Heritage Corporation

MIT – Manitoba Infrastructure and Transportation

PMT – Project Management Team

RM – Rural Municipality

SBMRC – South Basin Mayors and Reeves Committee

SETC – Shoreline Erosion Technical Committee

WPA – Water Planning Authority

DEFINITIONS

ALGAL BLOOM

A heavy growth of algae in a body of water, often a result of high nutrient concentrations and warm weather conditions.

AQUATIC ECOSYSTEM

The components of the earth related to, living in or located in or on water or the beds or shores of a water body, including but not limited to:

- a) all organic and inorganic matter, and
- b) all living organisms and their habitat, and their interacting natural systems.

BENEFICIAL MANAGEMENT PRACTICE (BMP)

a proven, practical and affordable approach to conserving soil, water and other natural resources

CONSERVATION AGREEMENT

A legal agreement between a landowner and a conservation organization that ensures the protection of the property's conservation values by limiting future use or development.

DEVELOPMENT PLAN

A document that outlines the general objectives and policies that will guide the overall use, planning and development of land in a planning district or individual municipality.

DRINKING WATER SOURCE

Raw, untreated water in the environment that is used to supply a drinking water system as defined in *The Drinking Water Safety Act*.

ECOLOGICAL GOODS AND SERVICES

Natural services that healthy ecosystems provide to society such as the purification of air and water, water supply, raw materials (timber), recreation, habitat, scenery, waste treatment, climate stabilization, erosion control and sediment retention, regeneration of soil fertility, soil formation, carbon storage, biological control and pollination, to name a few.

NATURAL AREAS

Land which remains undeveloped and supports a healthy ecosystem and provides ecological goods and services. Examples include forests, wetlands, aquatic habitat and riparian areas.

NUTRIENT LOADING

Discharging of nutrients from the watershed into a receiving water body (lake, river, wetland); expressed usually as mass per unit area per unit time.

PLANNING DISTRICT

A group of two or more partnering municipalities that share similar geography and land use. A Planning District works to ensure the prudent development and use of the districts resources for agricultural, commercial, industrial, residential, social and environmental needs. Planning Districts utilize development plans and zoning by-laws to help shape the future of their region.

PRIVATE WATER SOURCE

A surface or groundwater source that provides water to a single connection, usually a home or farm.

PUBLIC WATER SOURCE

A surface or groundwater source that provides water to a system with 15 or more service connections.

RIPARIAN AREA

The land adjacent to a stream, river, lake or wetland. It contains vegetation that, due to the presence of water, is distinctly different from the vegetation of adjacent upland areas.

SEMI-PUBLIC WATER SOURCE

A surface or groundwater source that is not public or private, consists of more than one but less than 15 service connections, or a single connection that supplies a public facility such as a school or hospital.

SENSITIVE GROUNDWATER AREA

Regions that are vulnerable to groundwater contamination such as areas with less than six metres of overburden above the aquifer and the Rockwood Sensitive Area.

SOURCE WATER

The raw, untreated water that is used to supply a public or semi-public water source. Source waters may be from groundwater sources such as an aquifer or surface water sources such as a lake, reservoir or river.

STAKEHOLDER

A person (or group) who has an interest in and is affected by the outcome of a process.

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Supporting technical information can be found on the
East Interlake Conservation District website: www.eicd.ca