West Souris River

Integrated Watershed Management Plan

EXECUTIVE SUMMARY

The West Souris River integrated watershed management plan was developed in partnership with the West Souris River Conservation District, the Province of Manitoba and an engaged group of community stakeholders. The planning process extended over four years and was completed in 2012. The plan outlines goals and guidelines for municipalities, watershed residents, soil and water organizations, and other stakeholders to work towards conserving or restoring land, water, and protecting drinking water sources within the study area.

This ten-year plan will act as a roadmap for anyone who wants to see this area support a healthy community in the future. The plan outlines many challenges for stakeholders to overcome in four key categories:

1
WATER SUPPLY

2
WATER QUALITY

3
NATURAL AREAS AND AQUATIC ECOSYSTEMS

4
WATER MANAGEMENT

This plan will help to ensure that conservation funds are directed to areas where they will provide the most benefit for the long term health of the watershed. Governments, stakeholders and residents each have a role to play in ensuring this plan is successfully implemented. By developing new partnerships and integrating our resources we can look forward to measurable improvements in our area over the next ten years.

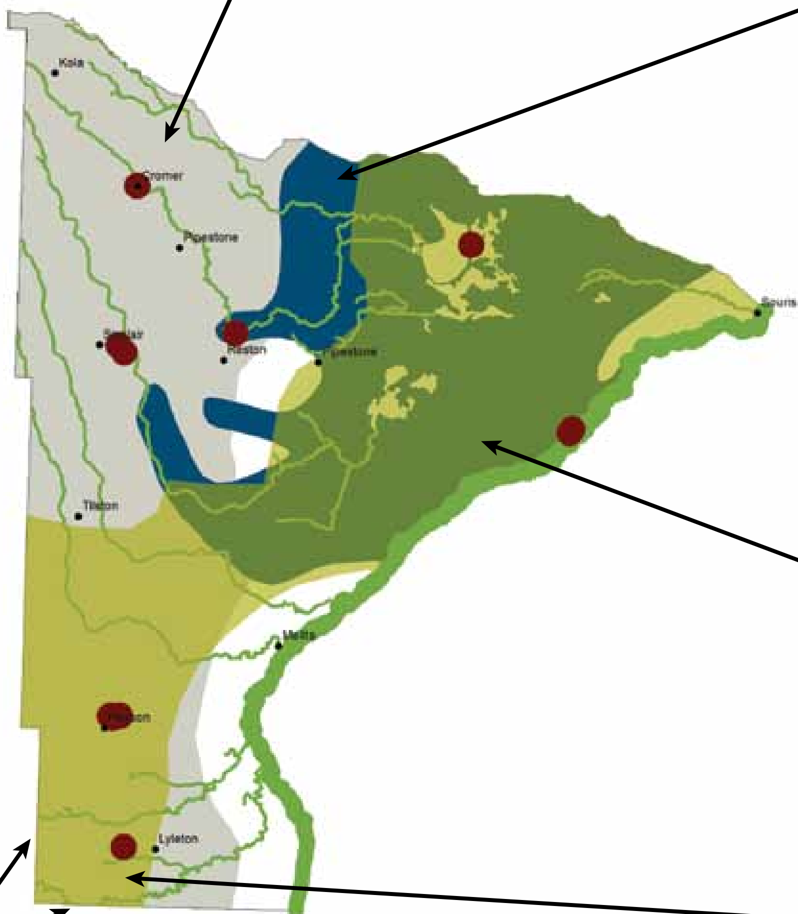
WATER SUPPLY

CHALLENGES

- Groundwater in usable quantities is not available in all areas. Potable aquifers may not be present on the west and south sides of the watershed.
- Large amounts of freshwater are being used to develop oil wells in a drought prone region.

KEY ACTIONS

- Minimize depletion of potable water sources by petroleum development through encouraging municipalities to develop non-potable water sources (like the Buried Valley Aquifer) for petroleum development.
- Construct water storage projects.



WATER MANAGEMENT

CHALLENGES

- There are limitations in terms of managing water on a watershed basis with Provincial and Federal jurisdictional boundaries.
- The drainage area which passes through the West Souris River watershed boundaries is three times larger than the West Souris River watershed area itself.

KEY ACTIONS

- Increase communications between the Souris River Basin Commission and municipalities within the Souris River Basin.
- Encourage Saskatchewan counterparts to review their drainage licensing and permitting system. Greater standards are needed to protect downstream impacts, explore implementing a system similar to the Province of Manitoba.

WATER QUALITY

CHALLENGES

- Implementation of the OLA plan has been taking place since 2000. In order to protect this valuable resource, the OLA plan implementation should be supported.

KEY ACTIONS

- Provide incentives to manage and control grazing to limit nutrient leeching into the soil.
- Conduct source water assessments (wellhead surveys, inventories) and action plans for private wells and sandpoints. Provide incentives to implement assessment recommendations.

NATURAL AREAS

CHALLENGES

- Mixed grass prairies are considered the most converted, least protected habitat on earth, and are habitat for a number of threatened or endangered species in the watershed.
- Introduced invasive species are having significant and increasing impacts on Manitoba's ecosystems, economy, and native species.

KEY ACTIONS

- Work with local landowners and municipalities to develop conservation easement terms that are more acceptable to the local stakeholders.
- Work with partnering agencies to develop invasive species management plans on natural areas.

SOURCE WATER

CHALLENGES

- A variety of recommendations need to be implemented to preserve or enhance public drinking water sources.

KEY ACTIONS

- Implement the Source Water Protection Plan.

Project Management Team

Chairman Manson Moir	Former councillor from the Rural Municipality of Albert
Lloyd Atchison	Chair of the West Souris River Conservation District
Karen Jones	Rural Municipality of Albert Councillor
Michelle McMechan	Producer from the Rural Municipality of Edward
Darrel Elliot	Producer from the Rural Municipality of Wallace
Linda Harmon	Teacher from the Melita School
Rick Plaisier	Reeve of the Rural Municipality of Sifton
Roland Perreault	Member of the Oak Lake Aquifer Round Table
David Houston	Development Officer from Dennis County Planning District
Dean Brooker	Manager of the West Souris River Conservation District
Glen Campbell	Former Manager, West Souris River Conservation District
Cole Turner	Former Manager, West Souris River Conservation District
Jason Senyk	Former Watershed Planner, Manitoba Conservation and Water Stewardship
Sarah Coughlin	Former Senior Watershed Planner, Manitoba Conservation and Water Stewardship
Andrea McLean	Watershed Planner from Manitoba Conservation and Water Stewardship

Prepared and published by

West Souris River Watershed Planning Authority

In Partnership with

WEST SOURIS RIVER
CONSERVATION DISTRICT

Manitoba

INTRODUCTION

What is an Integrated Watershed Management Plan?

An Integrated Watershed Management Plan (IWMP) is a plan prepared by the community that describes the actions needed over time to achieve a sustainable, healthy watershed. The plan can be thought of as a roadmap for the community that outlines watershed priorities and presents strategies to address these priorities. The plan answers important questions like:

> How to achieve shared goals for the watershed?
>
> Who will be doing the work?
>
> ...and the most asked question,
>
> Who will be paying for this work?

Through collaborative community planning exercises a vision of success, recommendations and measurements of progress are presented in this document.

Why Watershed Planning?

Watershed planning uses watersheds as the boundary for planning. A watershed can be defined topographically as an area of land in which all water drains to a common point. Using the watershed as the unit, planning provides opportunities to address water quality and quantity issues in both the upstream and downstream portion of a watershed. Watershed planning simplifies and harmonizes decision making across the contributing land area of a waterway, preventing redundant or conflicting action plans that can result from using administrative boundaries. Although this plan is focused on the portion of the Souris River Basin within Manitoba and west of the Souris River, we have taken steps to ensure complementary planning activities outside of this area have been reviewed.

Why Integrated Planning?

An integrated watershed management plan is an inclusive planning process, used to establish watershed issues and share knowledge. It is presented as a plan of action that combines the needs of people and diverse industries, while being supportive of ecosystems within the watershed. An integrated plan considers the integration of land activities that impact water quality and quantity. Information and recommendations in the plan can also be used by local municipalities and planning districts in developing responsible and sustainable development plans.

How was this plan developed?

In 2007, the West Souris River Conservation District (WSRCD) was designated the water planning authority by the Province of Manitoba under the authority of *The Water Protection Act*. The Board of this District selected a representative team of people to lead plan development, including representatives from the conservation and planning districts, the Province of Manitoba, the Oak Lake Aquifer Board, Oak Lake Cottage Owners Association and watershed residents representing different resources in the watershed.

This project management team (PMT) met regularly to make key decisions during plan development. This plan took three years to develop from the first public consultation to final Ministerial approval. Implementation of this plan is anticipated to take decades, with a full review in 10 years.

The WSRCD will continue to act as plan leaders with annual updates on progress and programming closely tied to plan implementation.

Issues and Concerns in the West Souris River Watershed

This plan is unique and based largely on the issues and concerns of the West Souris River watershed community. To understand local concerns, three methods of consultation were hosted by the PMT.

1. Public consultation events were held in Cromer, Pipestone and Pierson on March 24th, 25th, and 26th, 2009, respectively. These events were well advertised throughout the district through radio and newspaper advertisements, bulletin board signage and in a brochure delivered to each home in the watershed.

2. Kitchen table meetings were held at seven homes throughout the district. Members of the Project Management Team interviewed families in their home (at 'kitchen tables') to get a more detailed understanding of issues specific to regions within the watershed.

3. Consultations were held with local, provincial and federal government officials and stakeholder group representatives through a watershed team meeting. Representatives were invited to provide information about issues of concern and to suggest practical solutions.

In all, 207 comment forms were collected through the public consultation events. Through these forms and the hundreds of discussions that took place at watershed team and project management meetings, a vision for the future of the watershed was created.

To achieve this vision takes time and a commitment by many organizations and all levels of government. This collective effort guided our approach to presenting the goals and objectives of this plan.

Our Approach to Presenting Our Plan Actions

Our goal is to ensure that the actions and policies contained within this plan are implemented. The plan has been written with the group responsible for carrying out the actions in mind. Supplementary communication has been developed to highlight actions pertaining to the West Souris River Conservation District, local municipal councils, and watershed residents. These documents are available on the West Souris River Conservation District website www.wsrcd.com.

THE PLAN

This document provides a brief description of the watershed and illustrates landscape information to set the stage for recommendations for actions and policies. Recommended actions have been laid out in the plan for all stakeholders within the study area. Summary tables indicate details necessary for stakeholder organizations to apply actions within their mandate, such as timeline, target area and a measure of success for each action.

WEST SOURIS RIVER CONSERVATION DISTRICT STRATEGIC PLAN (WWW.WSRCD.COM)

Recommendations for incentive-based programming for organizations like conservation districts have been outlined in action tables. These tables help to allocate programming to provide measurable improvements to the watershed, and indicate details necessary for the West Souris River Conservation District to budget for and apply actions within their mandate.

MUNICIPAL COUNCIL MAPS (WWW.WSRCD.COM)

Recommendations and policies intended for municipalities have been summarized in maps. Actions are condensed for use in council meetings with suggestions on how to easily apply this plan during regular council meetings.

WATERSHED RESIDENT BROCHURE (WWW.WSRCD.COM)

Recommendations for watershed residents have been included in a brochure, easily mailed to every homeowner in the watershed. Key information about the watershed is provided, as well as applications to programs available through soil and water organizations to encourage action.

PLANNING DISTRICT MAPS (WWW.WSRCD.COM)

The *Water Protection Act* and *Planning Act* require watershed planning authorities and planning districts to adopt plans that have regard for the policies contained in the plans of each other. Recommendations and policies intended for planning district consideration have been summarized in maps.

Our vision is to ensure water and the ecosystems it supports remain available and in good quality for future generations.

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THE PLAN

THE SOURIS RIVER BASIN | The Bigger Picture

The study area for this plan is part of the much larger Souris River Basin, which drains 61,000 square kilometers (23,550 square miles) of land to the Souris River. The Souris River Basin spans two Canadian provinces and two American states (Figure 1).

Starting in southeast Saskatchewan, the headwaters of the Souris River flow in a southeasterly direction into and across northern North Dakota. From North Dakota, the river crosses the international border again into southwest Manitoba flowing northeast and eventually spilling into the Assiniboine River near Treesbank, approximately 40km (25 mi) southeast of Brandon.

The Souris River Basin valley is a relatively flat, semi-arid prairie that is extensively cultivated. Major tributaries of the Souris River include the Antler, Deep and Des Lacs Rivers, as well as Bank, Gainsborough, Graham, Jackson, Long, Moose Mountain, Stoney, Pipestone, Plum and Willow Creeks. Considerable reservoirs have been constructed in both the American and Canadian portions of the basin, including; Boundary, Rafferty and Alameda Reservoirs in Saskatchewan, Lake Darling in North Dakota, and Oak Lake in Manitoba (Figure 2).

CHALLENGE
The study area is just a small part of a basin that spans two countries, two Canadian provinces and two American states, making real changes in water management a challenge.

Figure 1: The Souris River Basin

WATER MANAGEMENT IN THE SOURIS RIVER BASIN

Several binational organizations have been established over the years to address Souris River transboundary water issues. These include the International Joint Commission (IJC), International Souris River Board of Control (ISRB), the International Souris-Red Rivers Engineering Board, and the American and Canadian governments' Souris River Bilateral Water Quality Monitoring Group.

INTERNATIONAL JOINT COMMISSION (IJC)

Due to cross boundary water supply and flood control issues, in January 1940, the American and Canadian governments requested the IJC to investigate and report on regulation, use and flow of the Souris River and its tributaries, and the apportionment of water between the two countries. In 1958, the IJC recommended changes to allow Saskatchewan and North Dakota rights to divert, store and use waters originating in their respective portions of the basin subject to Saskatchewan not diminishing flows across the boundary by more than 50% of the natural flow. It also required North Dakota to deliver, as far as practicable, 20 cfs (0.57 m3/s) to Manitoba from June to October annually. The IJC established the ISRB to monitor compliance.

The ISR Board oversees monitoring of reservoir elevation as well as the flows and levels of the river and tributaries associated with them. If water level or flow data obtained from monitoring exceeds or falls below values set within the Boundary Waters Treaty, the ISRB advises the operators to make adjustments.

"It is further agreed that the waters herein defined as boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other".

– Boundary Waters Treaty, Article IV

FACT

The Rafferty-Alameda Project was developed between 1988-95 to provide water for the area including the Shand power station near Estevan, and as flood protection for residents downstream in Saskatchewan and North Dakota.

WATER CONTROL SYSTEMS

Residents of the Souris River Basin have experienced extreme variation in seasonal water flows. Such cycles of drought and floods severely affected water users and limited future development in the area. As a result, a number of structures have been built over the years to help mitigate the annual and seasonal variation in water supply. The main basin structures include: Moosomin Reservoir, the Boundary, Rafferty, and Alameda Dams in Saskatchewan; and Lake Darling, Upper and Middle Des Lacs Lakes, and a wildlife refuge in North Dakota. Although these structures are outside the IWMP area, they regulated flows coming into the West Souris River watershed across the Saskatchewan and North Dakota borders and can significantly affect drought and flood events and the general hydrological regime. (Figure 2).

CHALLENGE
The Souris River Basin has extreme variation in annual flows. The Basin is highly regulated by structures to help minimize impacts of this variation. The regulation of these structures outside the study area influences the water management within the study area.

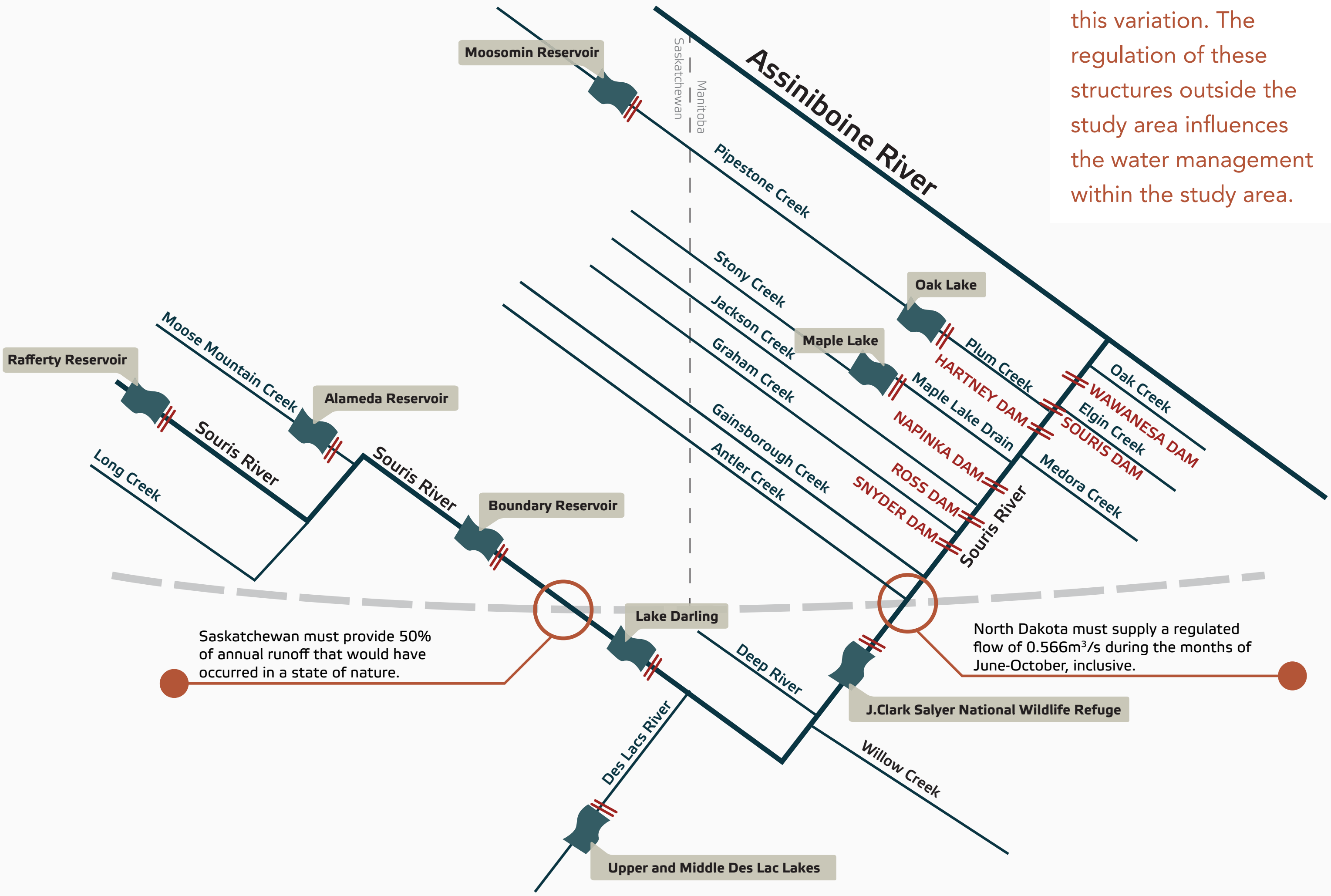


Figure 2: Souris River Basin series of water control structures operated in Saskatchewan, North Dakota, and Manitoba.

There are currently 11 water control structures under Manitoba provincial jurisdiction within the area. From 1930 to 1941, severe drought conditions prompted Prairie Farm Rehabilitation Administration to construct four stock watering dams including: the Snyder and Ross Dams near Melita, the Napinka Dam, and the Hartney Dam. All were stop log dams with a total capacity of 3,000,000 m^3 (2,400 acre feet). These stock watering dams are no longer operated. The Souris Dam was built for flood control, water supply, and flow regulation. In 1964, a two dam system was also constructed on the Oak and Plum Lakes to regulate lake levels for recreation purposes.

FACT
Streamflows in the basin are highly variable and unpredictable, the highest annual flow on record for the Souris River being about 1100 times greater than the smallest one. (EIA 1991, WSC 05NG021).

Other Water Management Plans

In the Souris River Basin, there have been a number of water-related planning initiatives completed or are in development (Figure 3), including this plan as well as:

- Upper Souris River Watershed – Source Water Protection Plan (2010)
- East Souris River IWMP (2006),
- Lower Souris River Watershed – Source Water Protection Plan (2006),
- Oak Lake Aquifer Management Plan (2005), and
- Souris River Basin Study Report (1978)

CHALLENGE
There needs to be a coordinated effort to implement a variety of planning initiatives which have taken place over time, at different spatial scales and by different organizations.

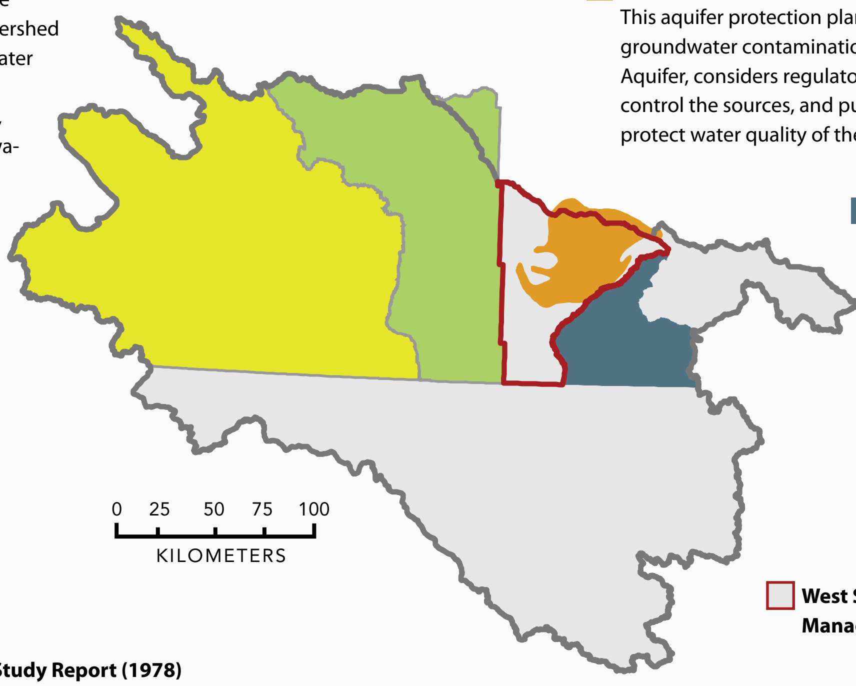


Figure 3: Water related planning initiatives completed or in development in the Souris River Basin.

THE WEST SOURIS RIVER CONSERVATION DISTRICT

The West Souris River IWMP study area encompasses most of the West Souris River Conservation District (Figure 4). The WSRCD is governed by a seven member board and funded through a municipal-provincial partnership. Formed in 1995, the District has a mandate to address watershed issues. The Board follows a guiding statement that "envisions a landscape where the land, water and related natural resources exist in a healthy sustainable state and are capable of supporting a healthy and economically viable watershed over the long term." The WSRCD offers incentive-based programming aimed at improving soils and landscape health, water and aquatic ecosystem health, and provides educational programs to schools and watershed residents. The primary mandate of the WSRCD will be to carry out and coordinate the implementation of the actions within this plan.

STUDY AREA | THE WEST SOURIS RIVER WATERSHED

This plan is focused in the southwest portion of Manitoba with a study area of 4,320 km^2 (1,668mi^2). Although not a true-watershed, it includes the area of the Souris River Basin which falls within Manitoba provincial borders that are west of the Souris River (Figure 4). The main industries within the watershed are agriculture and oil

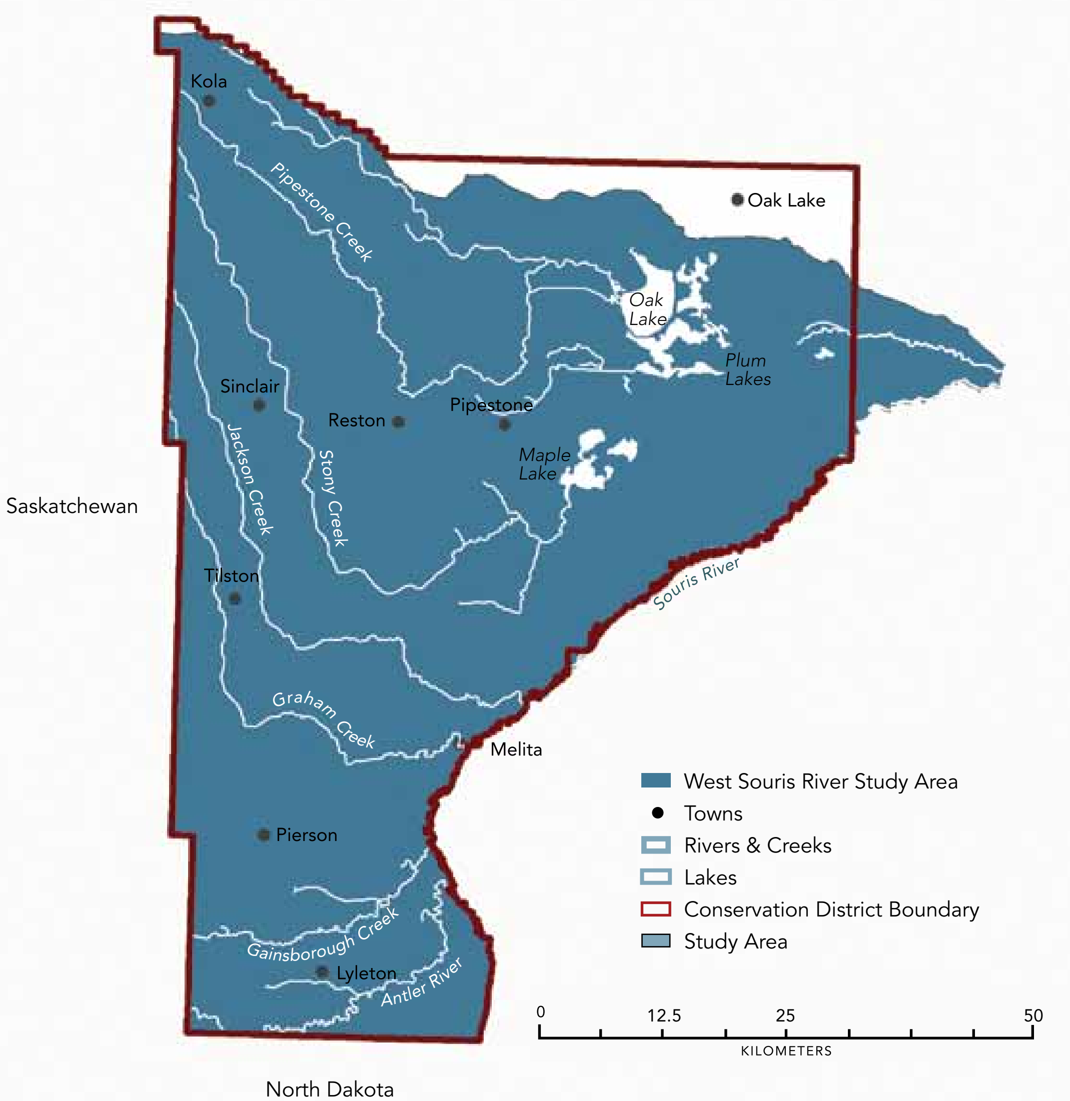


Figure 4: Location of the West Souris River Conservation District in relation to the Study Area.

Geology and Topography

The West Souris River watershed moves from flat to gentle rolling plains with an elevation change of only 410 feet (125 m). There are two physiographic regions within the watershed; the Oxbow Till Plain (northwest) and the Souris Plain (south and east). Bedrock consists of Riding Mountain Formation shale and has a glacial deposition ranging from more than 196 feet (60 m) in the area west of the Souris River, and up to 350 feet (107 m) in the vicinity of Oak Lake and north. Glacial till deposits are found mainly in the northwest portion of the watershed and along the provincial boundary to the west. Lake deposits are dominant in the northeast and form extensive aquifers including the Oak Lake Aquifer (OLA).

CHALLENGE
Groundwater in usable quantities is not available in all areas. Potable aquifers may not be present on the west and south sides of the watershed.

Groundwater

The Oak Lake Aquifer is a significant sand and gravel aquifer in the watershed that acts as the primary source of drinking water for residents and livestock and supports industries like oil and gas. The Oak Lake Aquifer provides high yields of good quality water. Other aquifers consisting of small lenses of sand and gravel are found scattered around the Tilston to Cormer area. These aquifers generally provide low yields of poorer quality water that is often too saline for human consumption.

CHALLENGE
Groundwater from shallow unconfined aquifers, like the OLA, are at greater risk to contamination from surface activities.

Oak Lake Aquifer

The Oak Lake Aquifer is located between the Assiniboine and Souris Rivers in the northeast region of the watershed (Figure 5). This aquifer underlies 3 million acres (1.2 million ha) of land. Although water quantity varies from year to year, the OLA can store approximately 37,005 dam^3 (3 million acre feet) of water of water, with an annual sustainable yield conservatively estimated at 18,500 dam^3 (15,000 acre feet). The OLA is the source for two public drinking water systems including Hartney and Melita, as well as many wells for private domestic consumption, livestock watering and irrigation uses. The sand and gravel thickness is up to 20m (66ft) (Render, 1987) but averages considerably less than that and can be quite thin in areas. Most of the aquifer recharge occurs within the West Souris River watershed and groundwater from shallow unconfined aquifers, like the OLA, is at greater risk to contamination from surface activities.

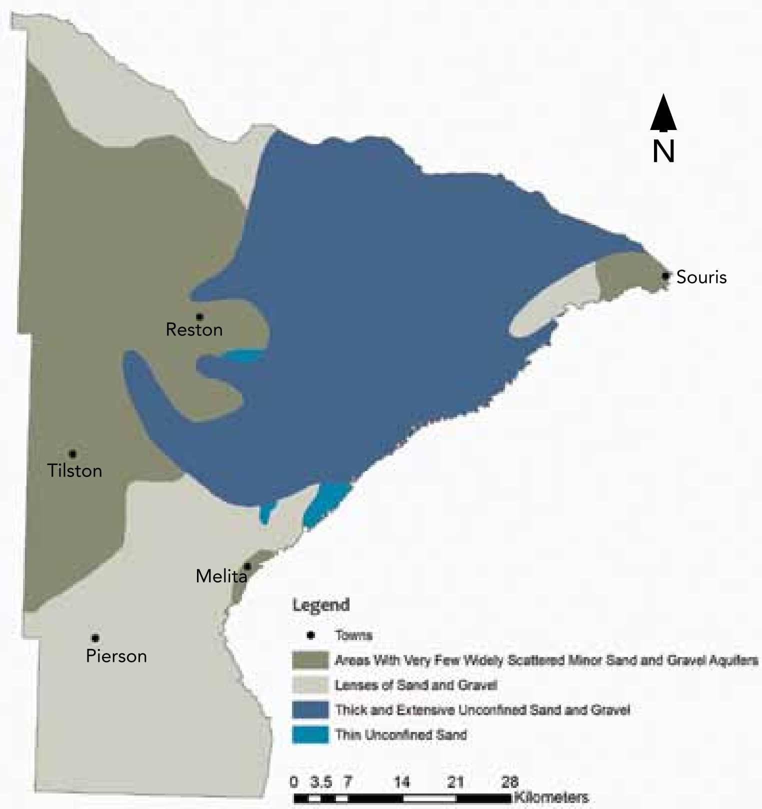


Figure 5: The Oak Lake Aquifer is a thick and extensive unconfined sand and gravel aquifer which dominates the northeast portion of the watershed.

Oak Lake Aquifer Plan

In 1997, the Government of Manitoba initiated a process to develop a management plan for the Oak Lake Aquifer. The purpose was to protect and preserve the aquifer water resources. The plan was finalized in 2000 using a consensus process with all major stakeholder groups with an interest in the management of the aquifer. The plan included the following guiding principles;

CHALLENGE
Implementation of OLA plan recommendations has been taking place since 2000 and needs to be continued.

- **Water Quantity Protection Plan**
  - o Water use must be less than or equal to recharge rates.
  - o Detain runoff to accelerate recharge.

- **Water Quality Protection Plan**
  - o Land use activities should minimize cultivation and the addition of agricultural wastes and chemicals.

- **Education Plan**
  - o The aquifer is more likely to be valued and protected if everyone understands how it works.

- **Monitoring Plan**
  - o Must be extensive enough to allow estimation of recharge and withdrawal.
  - o Must be sensitive enough to warn of local water quality deterioration prior to prolonged, extensive or irreversible damage.

PLAN UPDATE

Since 2000, many actions have been taken towards the recommendations of the OLA plan. In 2009, the WSRCD in partnership with Conservation and Water Stewardship's Groundwater Management Section, sampled private wells within the conservation district boundaries. A total of 104 samples were collected, a quarter of which were completed into the OLA. The samples were tested for a wide variety of major nutrients and trace elements. Results were sent to the cooperating well owners and the CD organized three water quality workshops to discuss results.

CHALLENGE
A 2008 survey indicated that one in every four wells in the watershed failed to meet drinking water guidelines due to presence of bacteria or high levels of nitrates and nitrites.

ACCESSING GROUNDWATER IN THE AREA

There are many ways to access groundwater. The method applied is often determined by the material below, depth which it can be accessed and the type of aquifer. The amount of water which can be obtained from a well depends on the permeability of the materials, the thickness of the saturated materials and on well construction.

CHALLENGE
Shallow wells are more prone to contamination from the ground surface.

There are two main types of wells used in the watershed to access water, sandpoint (driven) wells and drilled wells. Sandpoint wells are created by driving a pointed screened pipe into the ground until groundwater is encountered. A sandpoint well is no more than 10 meters (30 feet) below the ground in areas with sandy soils and a high water table. Sandpoints are generally shallow and as a result are more prone to contamination originating at or near the ground surface. In the watershed approximately 50% of the wells are completed into the OLA, the majority of which are sandpoint wells.

Drilled wells are mainly found in the area outside of the Oak Lake Aquifer. Drilled wells are constructed to much greater depths than sandpoint wells, up to several hundred feet sometimes. The producing aquifer is generally less susceptible to pollution from surface sources and water supplies tend to be more reliable since it is less affected by seasonal weather patterns. These water sources however, typically contain more minerals in solution and may require treatment to be potable.

SOURCE WATER PROTECTION PLAN

A drinking water protection committee conducted a preliminary assessment on the 11 water sources that supply public water systems in the West Souris River watershed (Figure 6). The protocol and procedures used in this assessment were derived from a report entitled "Manitoba Source Water Assessment Recommended Method for Public Water Systems". It is important to note that the assessment process is qualitative and is a part of multi-barrier approach to assessing threats to public drinking water. A summary of this non-technical process is described below.

Each water source supplying a public water system was mapped and a buffer was applied around the withdrawal point. Buffers are important management tools, because areas closer to a withdrawal point are more likely to impact water quality than an area that is further away. For groundwater systems, a 1.5 km buffer was used. A site visit was conducted by provincial and municipal representatives and a a public works officer familiar with the treatment system to look at land activities within these buffer areas. An informal list of potential pollutant sources or risks was created. For each public water system the top few threats identified by this team are presented in the Summary Actions portion of this plan, as well as a list of recommended actions to reduce risk and protect the source of drinking water for the thousands of residents.

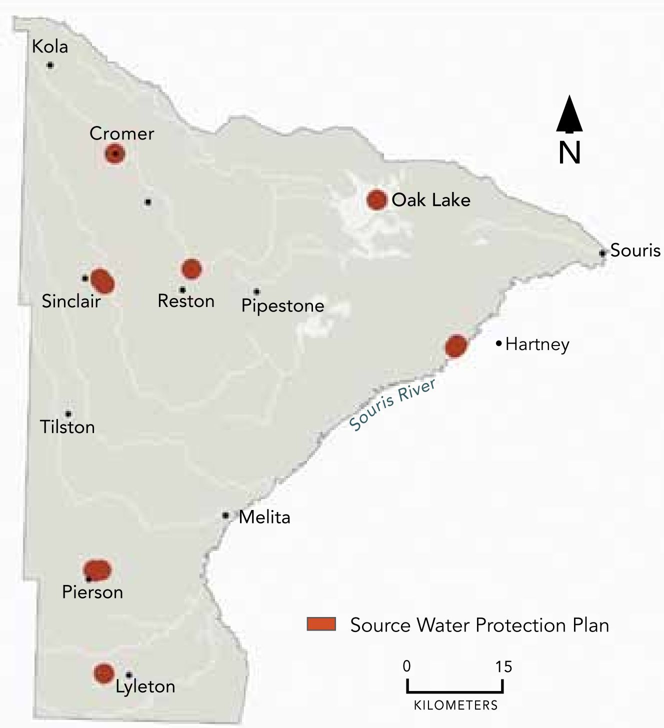


Figure 6: Public drinking water sites in the West Souris River watershed.

CHALLENGE
A variety of recommendations need to be implemented to preserve or enhance public drinking water sources.

LAND COVER

Agriculture is the primary land use in the watershed representing approximately 52% (or 224,257 ha) of land area in 2006 (Figure 7). Grassland/pasture areas cover 30% (or 128,841 ha) and forage land usually consisting of alfalfa stands cover another five per cent of the watershed. Both pasture and forage lands are located throughout the area, but are more prevalent in the north eastern part of the watershed. Treed areas are found mainly in the northeastern part of the watershed occupying just over five per cent of the watershed. Additionally, in the Lyleton area, there is an extensive system of field shelterbelts which were planted in the 1930s. Wetlands occupy just three percent of the watershed, with the majority found in the north. Approximately two per cent of the watershed can be classified as water, consisting mainly of the Oak and Plum Lakes.

Change in land use can influence flooding, water supply, and water quality. In the watershed, there was an overall increase of 900 ha (2,225 acres) of wetlands between 1993 and 2006. Changes are likely a result of increased flows in upstream portions of the watershed, precipitation and conversion of grasslands to wetlands, rather than wetland restoration.

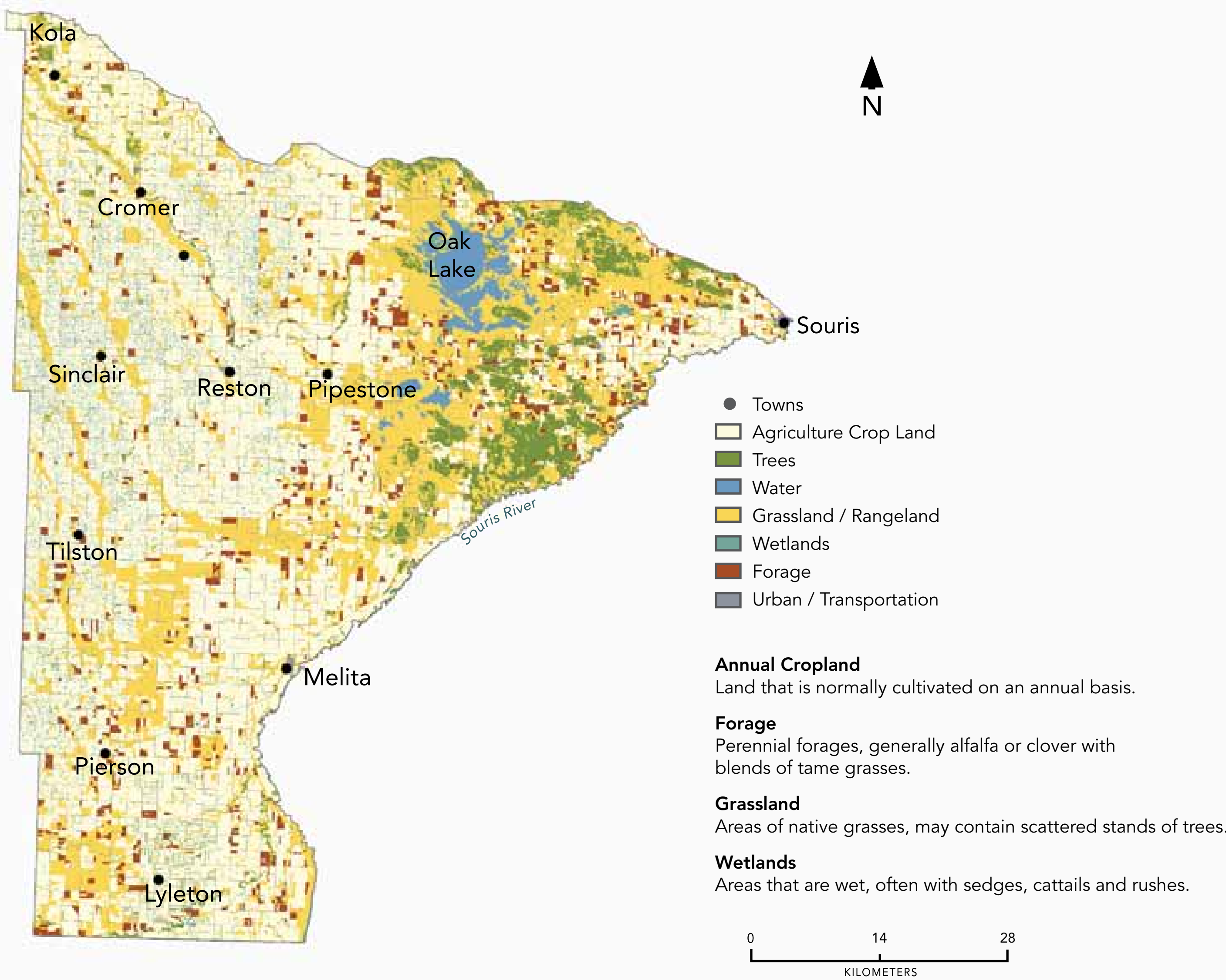


Figure 7: Land cover classes in the West Souris River integrated watershed management planning area.

BIODIVERSITY

Effective watershed management is dependent on maintaining a balance between anthropogenic activities and the natural environment. One of the main ecosystems dominant in the south-west portion of the province is the Mixed Grass Prairie. Manitoba's Mixed Grass Prairie is composed of shorter species of grass which thrive in more arid conditions, and tall grass species which are more dominant to the east. These temperate grassland communities occur on well-drained, sandy or gravelly soils. The Mixed Grass Prairies support increasingly threatened species designated under *Manitoba's Endangered Species Act (ESA)* and the federal Species at Risk Act (SARA). Over 60% of the endangered species in Manitoba are found in this watershed. Therefore, this is one of the most important watersheds in Manitoba for the conservation of Manitoba's endangered species.

CHALLENGE
Mixed grass prairies are considered the most converted, least protected habitat on earth, and are significantly affected by invasive species encroachment, and agricultural and petroleum development. They are also habitat for a number of threatened or endangered species in the watershed.

Notable species at risk:

ANIMALS:
Baird's Sparrow (ESA)
Burrowing Owl (SARA, ESA)
Ferruginous Hawk (SARA, ESA)
Loggerhead Shrike (SARA, ESA)
Piping Plover (SARA, ESA)
Sprague's Pipit (SARA, ESA)
Yellow Rail (SARA)
Dakota Skipper (SARA, ESA)
Great Plains Toad (SARA, ESA)
Leopard Frog (SARA)

PLANTS:
Hackberry (ESA)
Hairy Prairie Clover (SARA, ESA)
Smooth Goosefoot (SARA)
Small White Lady's-slipper (SARA, ESA)
Western Spiderwort (SARA, ESA)

Threats

Agriculture
The mixed grass prairies are considered to be the most converted, least protected habitat on earth with less than 2% effectively conserved worldwide. In Canada, more than 70% of mixed grass prairie has been converted to annual or forage crop, or human infrastructure. In the watershed, there was an overall decrease in grasslands from 1993 to 2006. Agricultural and petroleum development pressures can be attributed to much of the fragmentation of the natural areas within the watershed.

Petroleum
Oil development pressures threaten the biological communities within the watershed. Pipeline development has significant impact on the health of the habitat if developed within these ecosystems. There are ways to minimize these impacts primarily through site selection (avoiding natural areas) and the use of directional boring.

CHALLENGE
Pipeline development has significant impact on ecosystem health if developed within these ecosystems.

Invasive Species
Invasive species are plants, animals or other organisms that are growing outside their original region. Over the last decade, there has been a growing awareness that introduced invasive species are having significant and increasing impacts on Manitoba's economy, ecosystems, native species and human health. Invasive species impacting agricultural production or encroaching on native species habitat include: leafy spurge in upland areas and purple loosestrife in wetland areas.

Oak Lake

Both the Oak and Plum lakes are designated as an Important Bird Area and have Candidate Heritage Marsh Status. The largest waterbody in the watershed is Oak Lake. It is and will continue to be an extremely popular and important sport fishery and recreational area within south western Manitoba. The province of Manitoba annually stocks Oak Lake in the spring with approximately 800,000 walleye fry, depending on availability from the hatchery. There is believed to be little or no natural reproduction occurring in Oak Lake or its tributary. On the other hand, northern pike, yellow perch and white suckers, all reproduce naturally.

CHALLENGE
Oak Lake and its tributaries are important bird and fish habitat as well as important recreational areas. This resource should be maintained and protected.

Aeration
Oak Lake is a 2,830 ha (7,000 acre) shallow waterbody. The largest waterbody that has been successfully aerated to date is Rossman Lake and it is only 215 ha (530 acres). The major issue related in maintaining this type of aeration system at Oak Lake would be the high annual operating costs and liability associated with multiple open water areas during the winter. Presently, there is no known technology that could cost effectively aerate a waterbody of Oak Lake's size. Ideas of partial or limited aeration systems have been attempted but unfortunately they do not guarantee against winter

fish kill.

SOILS

Soil drainage reflects the amount of excess water in the soil. Approximately 40% (173,230 ha) of the watershed can be considered poor to imperfectly drained, with 30% of annual cropland impacted by this condition. Most of the imperfectly drained soils are associated with the eastern portion of the watershed around the Oak, Plum, and Maple Lake. In areas with porous underlying soils, such as the Oak Lake Aquifer, rapid infiltration can pose risks to leeching of nutrients and contaminants into the groundwater. Well drained soils similar to the soils located in the western side of the watershed, combined with water deficiencies can result in soils being vulnerable to wind and water erosion.

Erosion Risk

Approximately 46% of the watershed, primarily in the eastern portion, is considered to have a moderate to severe wind erosion risk. Based on the 2006 land cover data, approximately 33% of the annual cropland was located on soils with a high to severe risk for wind erosion. In 2006, according to Census data, 70 to 85% of seeded fields were prepared using minimum or zero tillage, a management tool intended to decrease wind erosion.

Agricultural Capability

Agricultural capability is the ability of the land to support agricultural land use activities. Lands progressively move from Class 1 which have no limitations to support agricultural activities, to Class 7 which have severe limitations. In the watershed, approximately 70% of the area was classified as Class 1, 2, and 3. Twenty-eight per cent of the watershed was considered Class 4 to 7. Just over 15% of marginal lands rated Class 4 or poorer are being annually cropped. These soils have significant limitations for crop production and are often better suited to other land uses.

CHALLENGE
40% of the watershed soils are considered poor to imperfectly drained. The majority of these soils are under annual cropland around the lakes, an area designated by the public as flooding issue area.

CHALLENGE
33% of the annual cropland, mainly in the eastern portion of the study area, has moderate to severe wind erosion risk.

CHALLENGE
15% of annual croplands were found on lands rated more suitable for other agricultural uses.

Photo Credit: Christian Artuso

INDUSTRY

PETROLEUM DEVELOPMENT

Oil development in the West Souris River watershed has fluctuated over the past 60 years; however, the recent boom which started in 2008 is the largest ever experienced. A record 14.8 million barrels of oil were produced in 2011, an increase of over 3 million barrels from 2010. As of December 2010, approximately 2,970 wells were producing oil in Manitoba, many of which are located within the West Souris River watershed.

Expansion of the oil industry in the watershed can be attributed to higher oil prices and technological advances enabling oil companies to extract more oil from the ground. Recent technologies include horizontal drilling and hydraulic fracking technology, a combination of which enable easier access to oil reserviors. Horizontal drilling enables access to multiple underground reservoirs of oil rather than the vertical drilling process which is limited to single reservoir access. Using horizontal drilling technology allows drilling companies to drill fewer wells, but each well requires a larger bore. Hydraulic fracturing, or 'fracking', uses water mixed with sand and chemicals under high pressure to create fractures in a rock layer. The goal of fracking is to create a network of interconnected fractures that will serve as pore spaces for the movement of oil to the well bore. Hydraulic fracturing combined with horizontal drilling has turned previously unproductive organic-rich shales into productive oil fields.

Oil development in the watershed has benefited community residents and municipalities economically. With increased employment, royalties, taxes and payments to landowners to access land, local residents and municipalities typically welcome increased development in this portion of Manitoba that has traditionally experienced rural depopulation and economic hardships. Approximately 80% of the oil and gas rights are owned by companies or private individuals, with the remaining 20% owned by the Crown. Royalties paid to private oil and gas rights owners in Manitoba were estimated at $93 million in 2010. The boom in recent years has not lead to drastic increases in the resident populations. Transient populations have increased, boosting local economies temporarily. Local businesses are thriving, hotels and motels are continually booked, housing is in short supply, and small towns are struggling to keep up with demands on infrastructure.

Although oil development is adding to the local and provincial economy, development and production activities have had impacts to infrastructure and the environment. Heavy equipment damages roads and waterway crossing infrastructure. The environmental impacts of oil development in the West Souris watershed are unknown at this time, but local residents indicated during public consultations that those impacts include habitat loss or degradation through the clearing of vegetation and the drainage of wetlands, increased water consumption, increases in traffic and noise, increased risk of spills and contamination of groundwater. It is anticipated that most environmental impacts occur during construction of oil-development related infrastructure (drill pads, access roads, pump stations or pipelines), rather than during ongoing operations. Typically the disturbed area of each well head is approximately 20,000 m^2 (4 acres), as well as the area disturbed during construction of access roads. Pipeline construction occurs within the right-of-way (ranging from a 15 to 45 metres wide) and can extend for hundreds of kilometres. Both pipeline construction and well pad site preparations can have significant impacts on local habitat and natural areas including wetlands, woodlands, and more specifically the already threatened mixed grass prairie ecosystems.

CHALLENGE

Both pipeline construction and well pad site preparations can have significant impacts on local habitat and natural areas including wetlands, woodlands, and more specifically the already threatened Mixed Grass Prairie ecosystem.

WATER USE FOR PETROLEUM DEVELOPMENT

Water use is an essential component of oil development during both the drilling and hydraulic fracturing processes. A typical vertical well uses a mixture of clay and water to carry rock cuttings to the surface, as well as to cool and lubricate the drill bit. Vertical oil wells require an average of 50 cubic metres (0.04 acre-feet) of water during construction. A higher volume of water is used in the hydraulic fracturing process. A mixture of water, sand and chemicals that include recognized carcinogens and hazardous materials (such as hydrochloric acid and ethylene glycol) is injected into oil formations at high pressures, using an average of approximately 600 cubic metres (0.5 acre-feet) per well. Although the volume of water used during the fracking process is significantly larger than that used during construction of a typical vertical well, this volume is still well below the amount of water applied by an irrigation centre pivot on a quarter section of land in western Manitoba during a dry summer (as much as 166,000 cubic metres).

CHALLENGE
Large amounts of freshwater are being used to develop oil wells in a drought prone region.

Several sources of water for oil exploration and development are used such as surface waterways, lakes, wetlands, and groundwater. There are three main ways an oil company obtains water for the purposes of creating a new oil well including: purchasing access to surface or groundwater sources near the proposed well site through negotiations with surface rights landowners, purchasing water from a water outfitter, or drilling a water well from a deep saline aquifer. The first two options tend to be the easiest and most inexpensive.

To obtain water, oil companies will either purchase water from a water supplier, discussed below, or negotiate a fee with landowners to gain the right access their private land, which includes the right to access available water on their land. Freshwater can be taken from either a groundwater or surface water source in close proximity to the desired location of the oil well. In Manitoba, water withdrawals of less than 25 m^3 (0.02 acre-feet) a day do not require a water rights license under *The Water Rights Act*. Because of this daily threshold, most water used to develop and operate wells within Manitoba are not licensed. There are concerns that this unlicensed use has contributed to local adverse well interference and even draw downs to the Oak Lake Aquifer. Provincial groundwater records indicate that water levels in monitoring wells in the region have generally increased over the last 15 years and local, smaller aquifers are more susceptible to natural fluctuations in precipitation and drought, than to oil development impacts. Even in situations where domestic water wells are located in close proximity to the industrial water supply wells, there was a negligible or minimal impact on water levels within the domestic wells.

There are currently two active industrial water use licenses within the West Souris River watershed for supplying the oil industry, and one Groundwater Exploration Permit due to expire. Water withdrawals at both licensed sites combined have a total of 4.8 dam^3 per year allocated under the license. Outfits that supply water for industrial use are assigned an allocation and are charged an industrial usage fee annually by the by the Province. These outfits are required to keep accurate measurement of water usage through water flow meters. If withdrawals reach above 200 dam^3 per year, the licensee will be required to complete an Environment Act License, to ensure the volumetric withdrawals will not have a negative impact on local environment.

AGRICULTURE

The watershed has a diverse agricultural landscape. Slight variations in soil type, land use, crop production and livestock practices are evident throughout the watershed. Though both crop and livestock production are important, crop production tends to dominate in the west and south, while beef production is more dominant in the northeast due to soil limitations for annual crops.

CHALLENGE
The general trend is that agricultural operations are moving towards larger scale operations.

Agricultural land use is dynamic with many factors influencing changes over time including economic drivers like commodity prices, land values, input costs and government programs with social influences such as demographic changes and increased environmental awareness. These pressures have led to a reduction in the number of farms within the watershed. Many farmyards have been abandoned, and with new more efficient and expensive technologies, smaller farming operations or non-profitable operations have been consolidated in larger more economical operations. According to the analysis of the Census of Agriculture from 2001 to 2006, there was a general reduction in the number of farms reporting. Subsequently, a corresponding increase in average farm size occurred with the greatest increase in total farm land reported in the Jackson and Graham Creek areas.

"Agriculture is turning into a business rather than the way of life it used to be. Our sons didn't want to take the farm over; it was a lifestyle choice for them. Lots of the local farms are being purchased by the bigger farms. Those bigger farms need to have good business sense, as well as an increased investment. If you don't take over a farm from a parent, the investment will be huge."

Manson Moir – Chairperson West Souris River PMT.

POPULATION TRENDS

The population of the West Souris River watershed has been on a steady decline since 1956 caused by rural depopulation (Figure 9). Rural depopulation (or rural flight) is used to describe the exodus of people from rural areas into urban areas. In modern times, it often occurs in a region following the industrialization of agriculture when fewer people are needed to bring the same amount of agricultural output to the market and related agricultural services and industries are consolidated. For various reasons, rural residents have left in favour of urban settings.

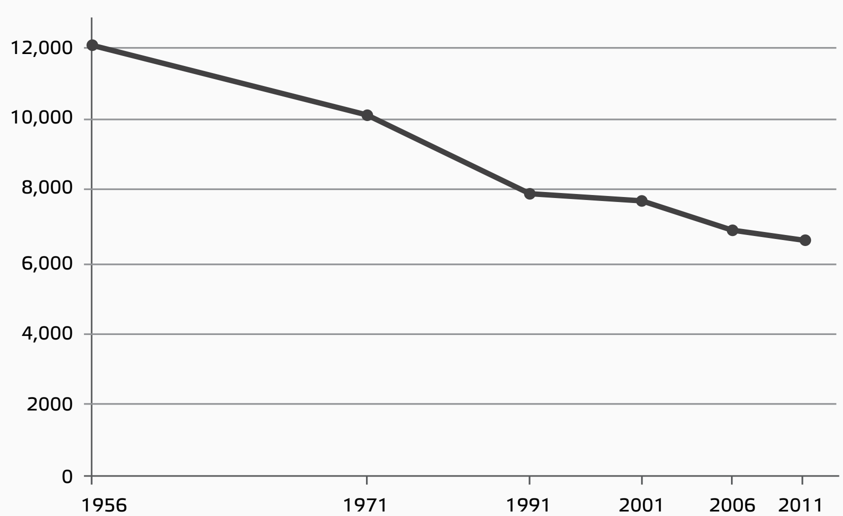


Figure 8: Population values of the West Souris River Watershed from 1956 to 2011.

HYDROLOGY

Water levels on Oak Lake from 1954 to 2011 were highest in April 1976 (430.76 m.a.s.l.) and lowest in February 1990 (427.84 m.a.s.l.). Lake levels fluctuate throughout the year, with increases during spring melt and decreases from outflows to Plum Creek as well as evaporation and infiltration. Longer trends in lake levels are correlated to periods of wet or dry years.

The Oak and Plum Lakes are important for recreational activities like boating, fishing, and hunting. Water levels have been maintained on these lakes to support recreational activities through the operation of the Oak Lake Dam. Water flows over the Oak Lake Dam into the Plum Creek and Plum Lakes. Plum Creek typically overtops its banks causing significant flooding of adjacent haylands. This was a major concern for watershed residents during public consultations.

CHALLENGE
The Plum Creek typically overtops its banks causing significant flooding of haylands downstream of Oak Lake dam.

The Souris River typically has continuous flow throughout the year, with peak flows occurring in April and May. Many of the creeks contributing to the Souris River in the watershed are characterized by similar flows which are typically limited to spring snow-melt events and larger precipitation events in the spring and summer. Often all tributaries are dry by fall.

CHALLENGE
The drainage area for the watershed is three times the watershed itself.

Creeks in the watershed flow in a general southeast direction, originating in Saskatchewan and ultimately discharging to various points along the Souris River. As a result, a significant portion of the flow in creeks like Gainsborough, Pipestone, Antler, Jackson and Stoney Creeks originate from lands on the Saskatchewan side of the watershed.

2011 Flood

The spring and summer of 2011 brought extensive flooding to southwest Manitoba. The Souris River experienced record high water flows which surpassed the previous record flood of 1882. Extensive flooding damage was sustained to roads, bridges, culverts, highways, buildings, residences, and other important infrastructure. Most agricultural producers in this watershed experienced delayed seeding or no seeding at all. Hundreds of heavy equipment operators and thousands of volunteers were called upon to help raise dikes around the communities of Melita and Souris, among many others. Thousands of people were mandatorily evacuated from residences within the flood zones. South-western Manitoba rivers crested more than once during the 2011 flood season due to heavy spring run-off and subsequent heavy spring rainfall events in eastern Saskatchewan and western Manitoba. For the Souris River this meant three peaks, April 23rd at 414.49 metres asl (1359.86 feet asl), June 15th at 414.87 metres asl (1361.13 feet asl), and one on July 5th at 415.95 metres asl (1364.68 feet asl), the highest in recorded history. The highest in recorded history. Despite the dire circumstances, governments and residents of the watershed worked together to ensure that no lives were lost and property damage was kept to a minimum. In the direct aftermath of the unprecedented flooding, politicians, policy makers, and planners reaffirmed the importance of prudent land use planning, investment in flood proofing initiatives, careful water management, and thorough emergency preparedness.

CLIMATE

The watershed is typically moisture-deficient with a mean annual precipitation accumulation of 467mm. (Figure 9). Towns within or close to the watershed, like Pierson and Carlyle, have a much lower amount of rainfall than other watersheds within Manitoba. Most of the water from spring and summer rainfall events infiltrates into the ground, with approximately 75% of the annual precipitation falling as spring and summer rainfall. As a result, most producers in the area rely on spring runoffs to replenish their water supplies.

CHALLENGE
The watershed is moisture deficient and there is a huge dependence on spring and early summer runoff for different supplies of water.

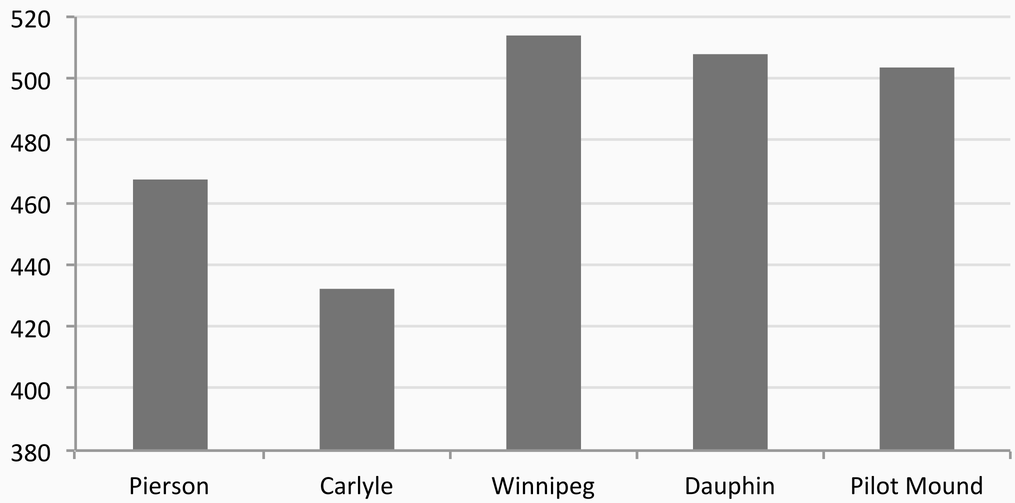


Figure 9: Mean annual precipitation of Pierson, Carlyle, Dauphin, Pilot Mound and Winnipeg Environment Canada Climate Stations (Environment Canada, 2009).

CLIMATE CHANGE

Over the last twenty years, global climate change has become a significant matter of concern. Recently a report called ***From Impacts to Adaptation: Canada in a Changing Climate*** was published by the International Institute for Sustainable Development. The report illustrates through, climatic modeling, recent trends, and future predictions, the following impacts of climate change on water resources in the Prairies:

CHALLENGE
Climate change predictions describe an increase in the severities of drought events in watersheds already scarce with water.

- Reduced snow accumulations;
- Decline in annual streamflows;
- Shift in timing of streamflows to earlier in the year, meaning lower late season water supplies;
- Falling lake levels;
- Increasing soil moisture and surface water deficits; and
- Greater frequency of dry years, but also increased precipitation in the form of rain and higher probability of severe flooding.

ADAPTABILITY – "Adaptation to changes in the hydrology of the Prairies will be challenging, especially where current water supplies are almost fully allocated…Increases in water scarcity represent the most serious climate risk" – from Impacts to Adaptation: Canada in a Changing Climate

SURFACE WATER QUALITY

The Water Quality Index (WQI) is used for reporting technical information in a consistent, easy to understand manner. The index ranges from 0 to 100 and summarizes data into simple categories like excellent, good, fair, marginal and poor. Sufficient data is not available to calculate the WQI for the Souris River within the study area. The WQI for the Pipestone Creek at the diversion sampling site is presented (Figure 10). Consistently high total phosphorous throughout the testing period (1995-2006) is likely the cause of of the fair to marginal WQI rating. Between 1996 and 2004, total phosphorous exceeded the guidelines 100% of the time by a significant amount.

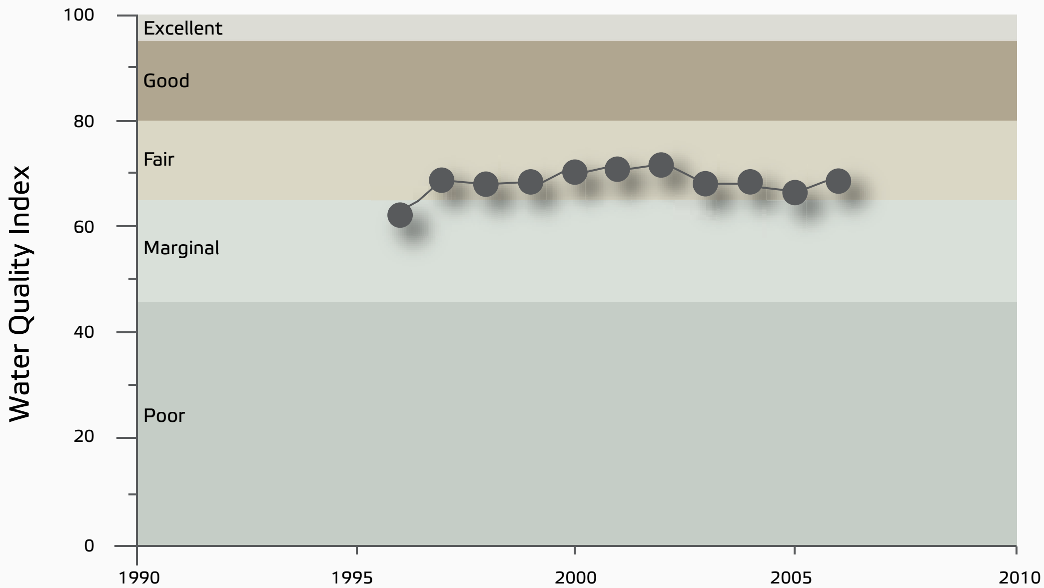


Figure 10: Water Quality Index (WQI) for the long-term water quality station located at the Pipestone Creek at the diversion.

Between 2000 and 2009, the Antler River, Gainsborough, Graham, Jackson, Pipestone, Plum and Stony Creeks were monitored for water quality. Most variables measured were below the provincial guidelines with some exceptions;

- Total phosphorous consistently exceeded the Province-wide narrative guidelines in all seven water bodies. This is common for prairie streams. High levels of nutrients like phosphorous may result in algal blooms.
- Concentrations of dissolved oxygen (DO) periodically declined below 5mg/L at all sites. Some aquatic life in these sites may be adapted to low DO concentrations, however concentrations lower than 1.0 mg/L can result in fish kills and foul smelling water. Poor riparian protection practices, nutrient runoff from livestock areas and cropping practices are contributing factors to these low dissolved oxygen levels. Low concentrations of dissolved oxygen have significant impacts on fish populations.
- Total suspended solids and conductivity commonly exceeded the water quality objective in the Pipestone Creek.
- Trace elements were also measured. Total iron and manganese concentrations regularly exceeded the drinking water and aquatic life guidelines in Pipestone Creek.

CHALLENGE
All creeks in the watershed exceeded provincial guidelines for total phosphorous and had concentrations of dissolved oxygen lower than 5mg/L.

"Poor riparian protection practices, nutrient runoff from livestock areas and cropping practices can be contributing factors to low dissolved oxygen."

Water Use

Water Licensing and Allocation

Water licenses are provided under The *Water Rights Act* in Manitoba with the intention of protecting the interests of the licensees, domestic users, the general public, and the environment. In this watershed, irrigators are the highest water users from a volumetric perspective. A total of 2,347 acre-feet (2,894.9 dam^3) of water is licensed to irrigators each year (Table 1). Irrigators withdraw from both surface (49%) and groundwater (51%) sources. Most surface water sourced irrigators are withdrawing from the Souris River. Agricultural withdrawals from surface sources, primarily for livestock production, are common on the Pipestone and Stoney creeks.

Most licensed withdrawals in the watershed are from groundwater sources (63%). All municipal and industrial (non-agriculture) water users withdraw from groundwater sources.

TABLE 1: Water use license summary for surface and ground water sources within the WSR watershed.

	Allocated Under License (acre-feet)		Total Allocation
Purpose	Groundwater	Surface Water	(acre-feet)
Agricultural	119.0	105.9	224.9
Industrial	3.9	0.0	3.9
Irrigation	1319.0	1027.9	2346.9
Municipal	349.7	0.0	349.7
Other	16.2	0.0	16.2
TOTAL	**1807.8**	**1133.8**	**2941.6**

Oak Lake Aquifer Water Budget

Provincial water budget models are developed by Conservation and Water Stewardship to set allocation limits for major streams and aquifers. The OLA contains 3,000,000 acre-feet of fresh water. Its average annual recharge is conservatively estimated to be 15,000 acre-feet. This is the quantity of water that the aquifer can discharge each year and continue to maintain the current water level regime. Common practice is to require that one half of this discharge be reserved to maintain surface environment as stream flows, lake and wetland water levels, water supply for vegetation that can access the water table, and for domestic use. The balance of this discharge, 7,500 acre-feet per year, is the allocation limit available for licensing. All licensed water use within the OLA area has consistently remained well below the 7,500 acre-feet water budget.

CHALLENGE
With greater water pressures predicted in the future, licensing should remain within water allocation budgets.



SURFACE WATER MANAGEMENT PLAN

In Manitoba, a surface water management plan typically refers to the management of water to prevent or reduce flood damage on agricultural or residential land. Although flood protection is important, surface water management can also serve to enhance the function of aquatic ecosystems, offer recreational opportunities, improve water quality, and increase water supply.

Currently the tools to manage surface waters for flood protection are low-level dams, the channelization of streams and the construction of drains to remove water off the land as quickly as possible. As characterized by one resident

> **"[we are] unable to retain and control spring runoff of the creeks ... too often the spring surplus becomes a shortage of pond water in the summer."**

In fact, since the early part of the last century, 50% to 70% of the nation's original wetlands have been drained, dredged, filled, leveled, and/or flooded (Dahl and Johnson, 1991). A more holistic approach to surface water management is needed in this watershed to include a broader range of watershed values such as aquatic ecosystem health, water quality, climate change resilience, and water supply.

To achieve a better balance, the watershed team has 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 may work to the detriment of other watershed priorities. 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 for flood protection.

To determine "where it matters most", the project management team utilized information gathered from local landowners, municipalities, local experts, and government planners and scientists. The PMT used this information to create three surface water areas, each with a unique statement of intent for how to direct land management activities and landscape characteristics.

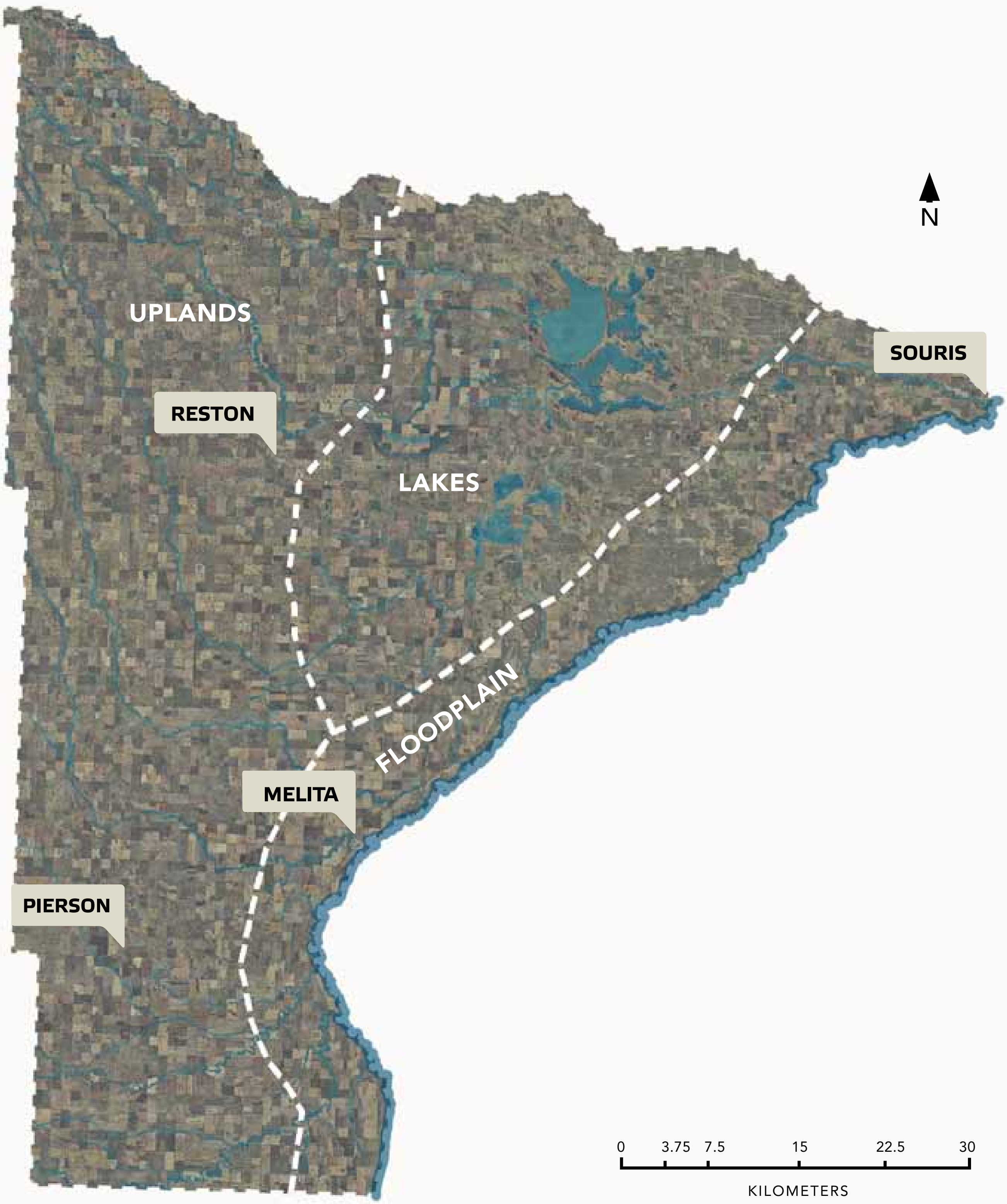
Watershed Areas

1. **UPLANDS**
   This area should maintain natural water hold back areas and is suitable to construct infrastructure to slow water flows and reduce downstream flooding, while providing valuable water supplies to cattle producers. Comprised of mostly Class 2 soils, land use in this area is a mixture of cropland and pasture.

2. **LAKES**
   This area is characterized by relatively poorly drained soils, natural wetlands, and poorly defined creek beds. It contains valuable wildlife habitat with important recreational value around Oak Lake. The primary land use in this area is hay and pasture land.

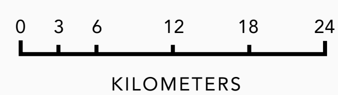
3. **FLOODPLAIN**
   This zone is a natural floodplain. Souris River water levels and incoming flows from upstream can significantly impact the severity, timing and length of flooding in this area. The primary land use in this area should be for maintaining natural water fluctuations.

Watershed Areas



UPLANDS AREA

Surface water issues specific to this area were collected during public and municipal consultations.



INTENT

Land within this area should be managed with the goal of increasing water retention during spring runoff to reduce downstream flooding impacts and provide a supply when dryer conditions are present.

ISSUES SPECIFIC TO THIS AREA

- Timing of release of agricultural drainage causes downstream flooding.
- Uncontrolled drainage on the Saskatchewan side of border causes increased flows and downstream flooding on the Manitoba side of the border.
- There are numerous livestock operations on streams within this area that adversely affect affect riparian areas and water quality.
- Stream bank erosion on creeks causes slumping.

Tools to get there…

1. Land protection programs (i.e. conservation agreements, taxation easements, ecological goods and services payments, land purchases).
2. Beneficial management practices aimed at protecting and enhancing natural cover, riparian areas, and wetlands.
3. Incentive programs to store or slow water volumes and the rate at which water leaves this area (i.e. backfloods, small dams, control gates on existing/new culverts).
4. Downstream friendly drain management practices to retain water flows until peak waters have receded in the Lakes area.
5. Drain licensing should consider cumulative downstream impacts to ALL infrastructure within this area downstream from license applications.
6. Drain management should include consideration and mitigation measures for flooding concerns in all other areas.
7. Partnerships with Saskatchewan and North Dakota that work toward slowing or retaining cross border waters.
8. Educate landowners on drainage licensing procedure and water retention options and benefits.
9. Conduct a water storage option plan.
10. Clean out tree deadfall in creek bed.

In the following section, the above tools need to be employed to solve these issues.

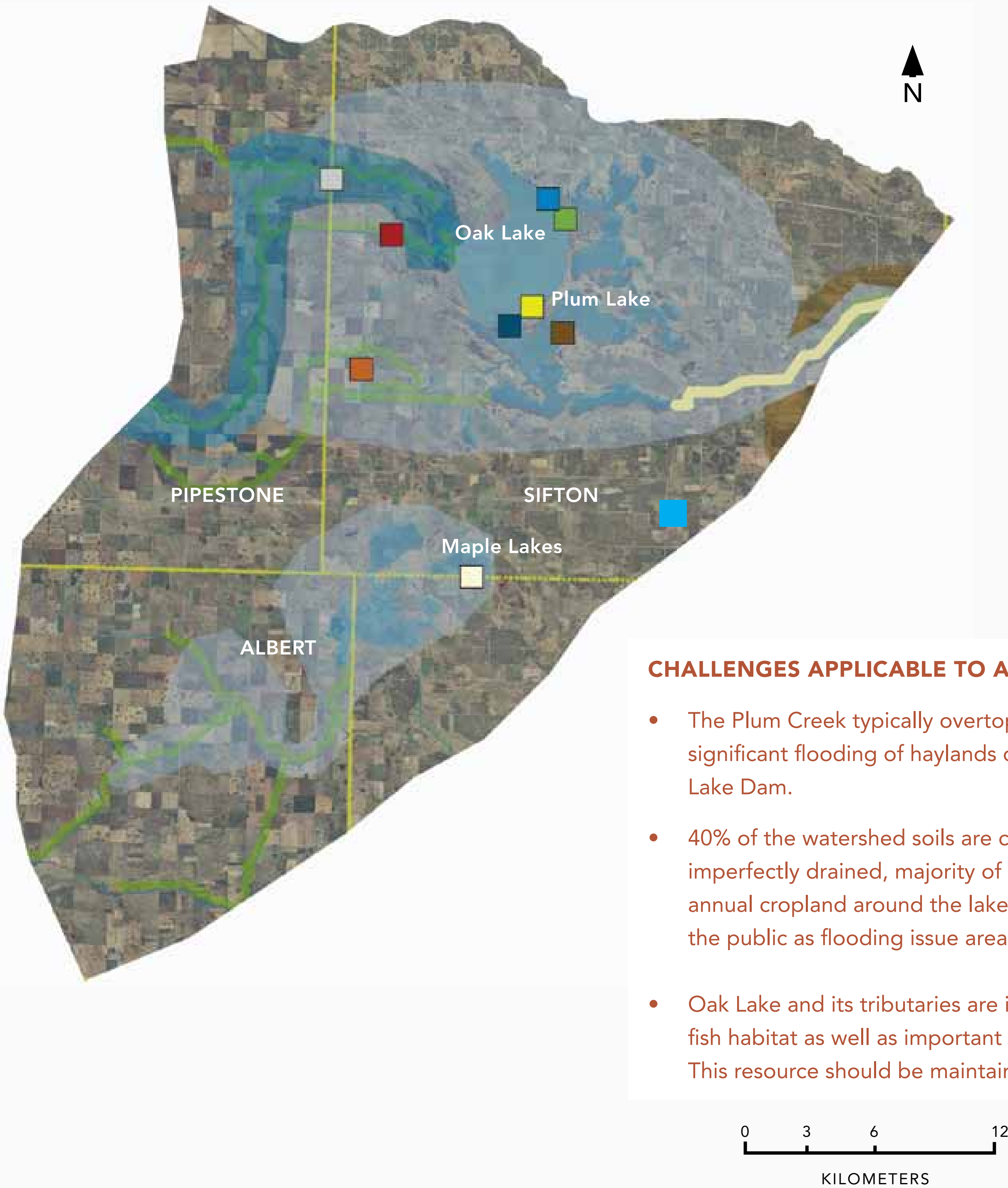
Linking to Development Planning

- Changes to the natural drainage should be avoided.
- Development should be located outside wetlands. The limits of the wetland should be determined by the implementing authority, in consultation with Manitoba Conservation and Water Stewardship. Development adjacent to wetlands may be permitted only if it is demonstrated not to result in any of the following:
    - Loss of wetland functions;
    - Subsequent demand for future development which will negatively affect existing wetlands functions; and
    - Loss of contiguous wetlands area.
- Planning districts are strongly encouraged to incorporate Provincial Planning Regulations 5.1.3 under the Water Policy. "To ensure the protection, retention and, where required, rehabilitation of riparian areas, the following setbacks should be applied in respect to development: a) a minimum setback of 15 m upslope from the normal high water mark of: i) first and second order drains, and ii) artificially created retention ponds; b)a minimum setback of 30 m upslope from the normal high water mark for all natural water bodies and waterways, including ephemeral streams; c) a minimum setback greater than 30 m upslope from water bodies and waterways that i) are designated under enactment, ii) are socially, historically or culturally important, or iii) contain unique aquatic assemblages and species."

UPLANDS AREA :: SPECIFIC ISSUES

- Reston's sewage lagoon is limited in capacity for the number of residents it needs to support.
- Beavers build dams which cause flooding of some agricultural lands.
- During spring melt and heavy rainstorms, culverts occasionally wash out.
- A dam on Pipestone Creek at Cromer is needed to regulate water flows and provide a water source for agriculture. If constructed, this dam should have stipulations outlining no recreational use or cottage development.
- The Ridell drain was constructed in 1906. The maintenance and upkeep of this drain is no longer cost effective.
- A small dam needs repair.
- Riparian Area target for related riparian area policies.
- Public identified area where dead trees slow water movement causing flooding.
- Public identified area of excess drainage.

LAKES AREA



CHALLENGES APPLICABLE TO AREA

- The Plum Creek typically overtops its banks causing significant flooding of haylands downstream of Oak Lake Dam.
- 40% of the watershed soils are considered poor to imperfectly drained, majority of which are under annual cropland around the lakes, designated by the public as flooding issue area.
- Oak Lake and its tributaries are important bird and fish habitat as well as important recreational areas. This resource should be maintained and protected.

INTENT

Land within the lakes area should be managed to protect and preserve the ecological and recreational quality of the lakes and surrounding habitat.

ISSUES SPECIFIC TO LAKES AREA

- Lack of coordination of upstream drainage to downstream flows causes bottleneck in Plum Creek

Tools to get there...

1. Land protection programs on low lying flood prone areas (i.e. conservation agreements, taxation easements, ecological goods and services payments, land purchases).
2. Beneficial management practices aimed at protecting and enhancing natural cover, and wetlands.
3. Limit future development downstream of the Oak Lake Dam through land protection programs.
4. When available, drain management and licensing should include consideration and mitigation for timed releases after peak flows have receded.
5. Maintain creek bed free from debris to minimize flooding of private properties and buildings (i.e. mowing, willow cutting etc...).

Linking to Development Planning

- Limit future development downstream of Oak Lake Dam.
- All development around Oak Lake should be required to have an engineer-approved storm water management and grading plans.
- All new construction development along lakes should be built above the 2011 flood of record elevation (1412.27 feet ASL) or any subsequent flood of record plus two feet of freeboard.
- Changes to the natural drainage should be avoided.
- Development should be located outside wetlands. The limits of the wetland can be determined by the watershed planning authority, in consultation with Manitoba Conservation and Water Stewardship. Development adjacent to wetlands may be permitted only if it is demonstrated not to result in any of the following:
  - Loss of wetland functions;
  - Subsequent demand for future development which will negatively affect existing wetlands functions; and
  - Loss of contiguous wetlands area.
- Planning districts are strongly encouraged to incorporate Provincial Planning Regulations 5.1.3 under the Water Policy. "To ensure the protection, retention and, where required, rehabilitation of riparian areas, the following setbacks should be applied in respect to development: a) a minimum setback of 15 m upslope from the normal high water mark of: i) first and second order drains, and ii) artificially created retention ponds; b)a minimum setback of 30 m upslope from the normal high water mark for all natural water bodies and waterways, including ephemeral streams; c) a minimum setback greater than 30 m upslope from water bodies and waterways that i) are designated under enactment, ii) are socially, historically or culturally important, or iii) contain unique aquatic assemblages and species."
- Restrict the removal of >25% of natural vegetation within 50m of riparian areas for all new recreational developments surrounding Oak Lake.

LAKES AREA :: SPECIFIC ISSUES

During spring runoff, the Oak Lake Resort regularly floods due to drainage issues, there is also significant bank erosion along Cherry Point development

During high water years, the road floods.

In some winters, Oak Lake has dissolved oxygen dropping below threshold levels for fish survival.

During spring melt and heavy rainstorms, water backfloods onto private property and does not drain back.

Cattle have unlimited access to Pipestone Creek

- CD will work with landowners and provide incentives to install off-site watering systems and riparian fencing.

During Spring melt, water backs up and floods along Old Pipestone Creek.

During the summer, water levels on the Plum Lake Marsh are too high, inhibiting hay production.

Plum Creek has a poorly defined creek bed where water frequently overtops its banks.

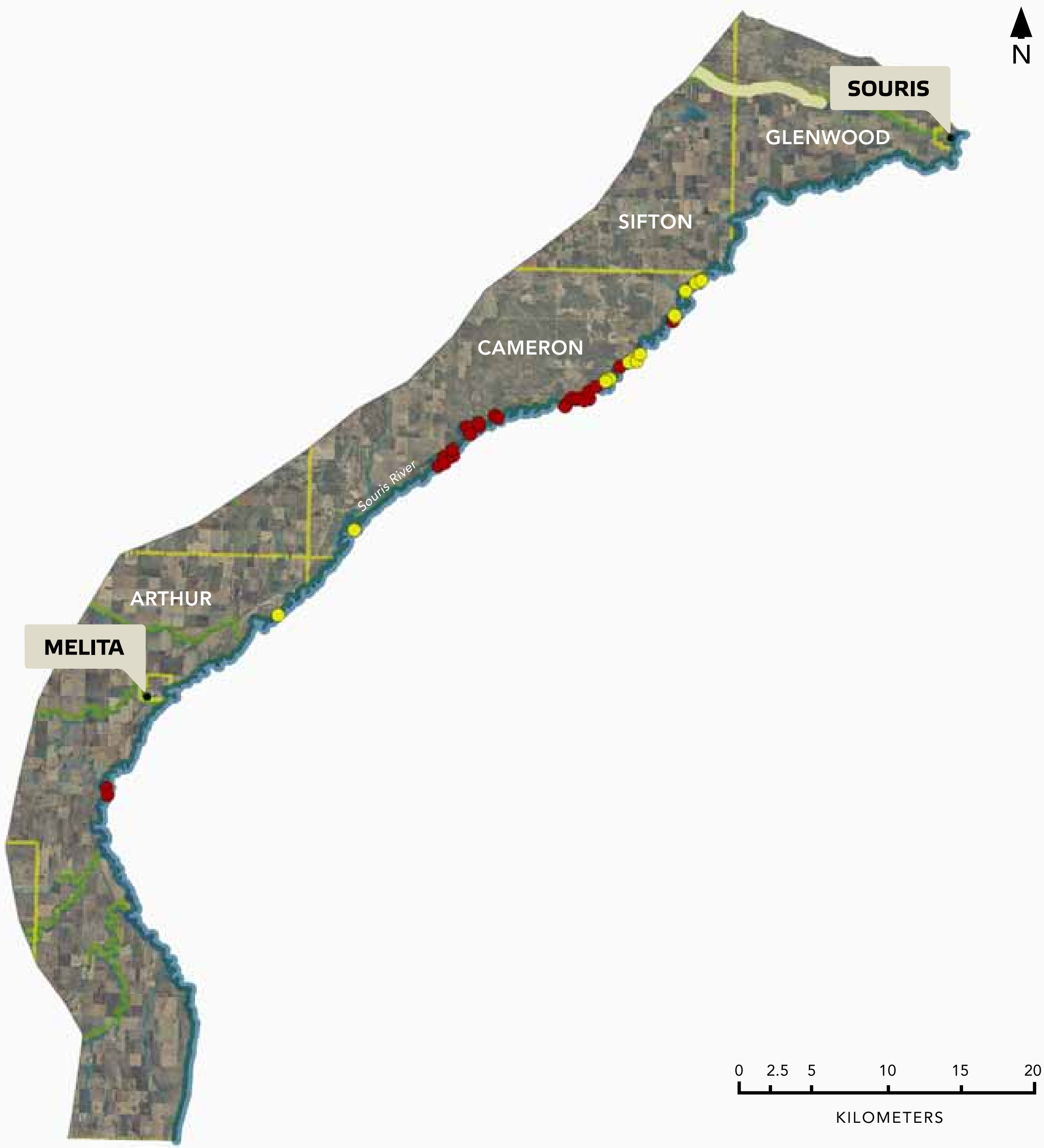
Erosion on the Provincial Dyke

Oak Lake Dam has deteriorated over the last 10 years.

- Fix and maintain the Oak Lake dam including appropriate fish passage structure and study to determine effects of raising the lake six inches.

Outlined riparian area for related riparian area policies.

FLOODPLAIN AREA



INTENT

Land within this area should be recognized as an area that floods. Land use practices within the floodplain zone should be able to withstand periodic flooding impacts and residents should understand limitations to development.

ISSUES SPECIFIC TO FLOODPLAIN AREA

- Prolonged water fluctuations affect primary land use,
- International agreement: timing of release of flows cause extended flooding in the Manitoba portion of the Souris River.
- Livestock and crop production operations on the Souris River impact water quality.

Tools to get there...

1. Land protection programs (i.e. conservation agreements, taxation easements, ecological goods and services payments, land purchases).

2. Implementation of beneficial management practices aimed at reducing nutrient loading and enhancing riparian areas.

3. Complete Souris River Riparian Enhancement Program projects where recommended.

4. When available, adopt environmentally friendly drain management practices for land-locked flood prone areas.

5. Manitoba government should revisit the established guidelines with the North Dakota government. Timed release of water from retention structures in the States should be limited to flows within the capacity of the Souris River and natural flooding seasons.

6. Prevent added drainage of water into the Souris River from Whitewater Lake. Additional water from neighbouring areas will add stress to riparian areas during times of flood. Poor quality water from neighbouring areas may also lower water quality in the Souris River.

Linking to Development Planning

- Planning districts are strongly encouraged to incorporate Provincial Planning Regulations 5.1.3 under the Water Policy. "To ensure the protection, retention and, where required, rehabilitation of riparian areas, the following setbacks should be applied in respect to development: a) a minimum setback of 15 m upslope from the normal high water mark of: i) first and second order drains, and ii) artificially created retention ponds; b)a minimum setback of 30 m upslope from the normal high water mark for all natural water bodies and waterways, including ephemeral streams; c) a minimum setback greater than 30 m upslope from water bodies and waterways that i) are designated under enactment, ii) are socially, historically or culturally important, or iii) contain unique aquatic assemblages and species."
- The development of permanent structures upon lands adjacent to the Souris River should be confined to lands which are in excess of the corresponding 100 year flood level or the corresponding flood of record level. Lands subject to flooding, erosion, or bank instability should be left in its natural state or only developed for low intensity uses such as open space recreation, grazing, cropping, forestry and wildlife habitat. Permanent structures which are proposed for construction upon flood prone lands must be constructed upon building sites raised with clean, impervious fill to an elevation above the 100 year flood elevation or the flood of records elevation, whichever is greater, plus two feet of free board..
- Changes to the natural drainage should be avoided.
- Development should be located outside of designated flood prone areas. The limits of the designated flood prone areas should be determined by the implementing authority, in consultation with Manitoba Conservation and Water Stewardship. Development within these areas should take appropriate measures to reduce the impact of flooding.

FLOODPLAIN AREA :: SPECIFIC ISSUES

Plum Creek has a poorly defined creek bed where water frequently overtops its banks.

Outlined riparian area for related riparian area policies.

Riparian health is impaired at indicated locations within this zone. The range of impairments include cropping to the river's edge, unlimited cattle access to the river, and bank erosion.

- High Priority
- Moderate Priority

IMPLEMENTATION OF AN INTEGRATED WATERSHED MANAGEMENT PLAN

The most important aspect of any integrated watershed management plan is implementation. Without it, the plan is no more than a list of good intentions. In the case of the West Souris River Integrated Watershed Management Plan, a concerted effort from watershed residents, stakeholder organizations, and all levels of government is necessary to ensure the recommendations outlined in the plan are implemented successfully.

The challenges outlined in the previous section helped the Watershed Team to formulate goal statements and actions to specifically address local watershed concerns. The following sections are broken down into four different watershed priorities including: water supply, water quality, natural areas, and water management. Challenges and recommended actions have been laid out for each priority. Summary tables indicate details necessary for stakeholder organizations to apply actions within their mandate.

Progress and success of the plan's implementation will be assessed on an anuual basis. Watershed report cards will be distributed to watershed 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 ten years.

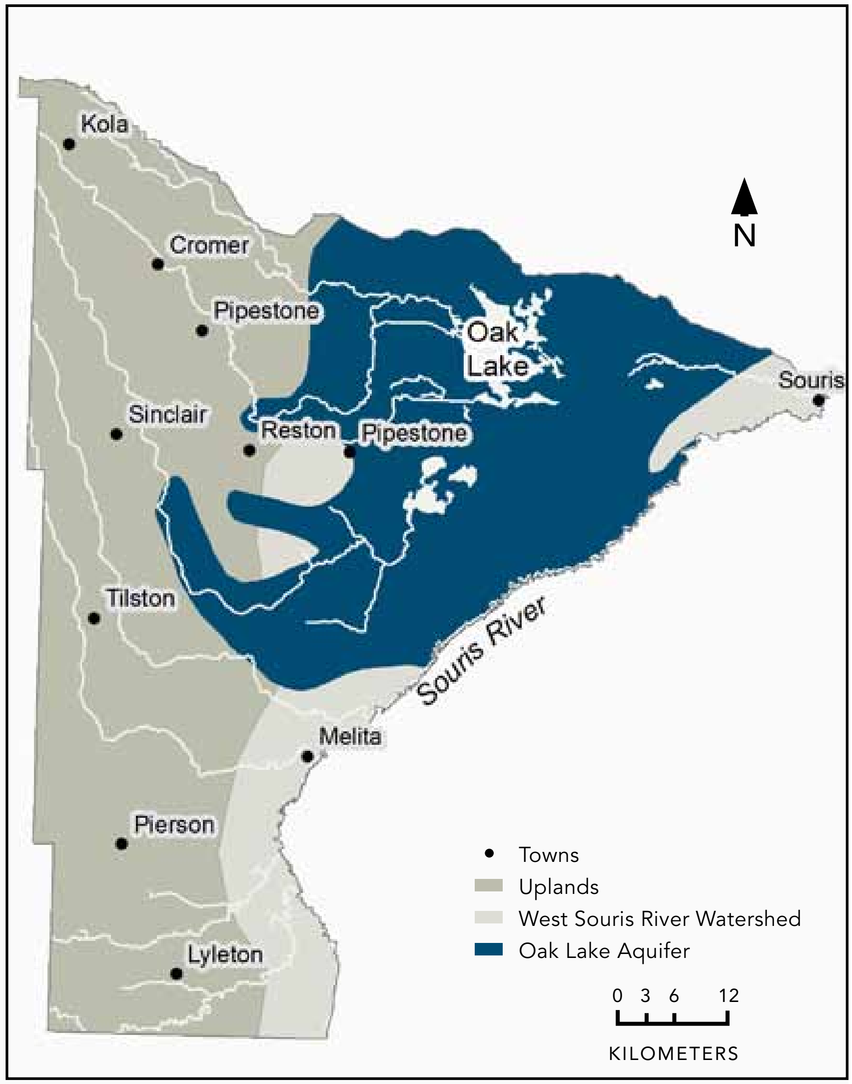
SUMMARY OF ACTIONS

Water Supply

VISION: In 25 years our grandchildren will have an ample supply of good quality water to sustain and enhance the population and biodiversity of the area.

CHALLENGES:

- Groundwater in usable quantities is not available in all areas. Potable aquifers may not be present on the west and south sides of the watershed.
- The watershed is moisture deficient and there is a huge dependence on spring and early summer runoff for different supplies of water.
- Climate change predictions describe an increase in severities of drought events in watershed already scarce with water.
- With greater pressures predicted in the future, water allocation licensing needs to remain within the OLA budget.
- Large amounts of freshwater are being used to develop oil wells in a drought prone region.



OBJECTIVE 1: Increase surface water storage capacity (acre-feet) for supply and groundwater recharge.

Recommended Action	Measure of Success	Responsibility	Timeline	Target Area
Complete an assessment of surface water managment options with focus on increasing water supply sources for agriculture and industrial use and adaptation to climate change.	Completed study.	CD, RMs	1-2 years	Watershed wide
Restore and protect wetlands.	2% increase in surface area of wetlands from 2009.	Federal, Provincial Govts, CD, Conservation Agencies	odd years	Outside OLA, Uplands
Complete water storage projects.	2% increase in acre-feet storage from 2009; 2% reduction in annual mean flow volumes.	CD, Provincial Gov't, Federal Gov't	1-3 years	Uplands

OBJECTIVE 2: Reduce water usage

Recommended Action	Measure of Success	Responsibility	Timeline	Target Area
Build climate change resilience.	Adaptation to new weather extremes.	CD,PRACC, RMs, Provincial Govt, Local Schools	Ongoing	Watershed wide
Educate and promote water soft path planning.	30% reduction in volume based on data per number of devices after installation.	MWSB, RMs, Landowners, Federal Govt	Ongoing	Outside OLA
Municipal participation in water soft planning course.	# in attendance/course.	CD, RM	Even years	Outside OLA
Minimize oil development foot prints through employing BMPs that work towards minimizing the need or use of potable or freshwater for oil well development.	Reduced water withdrawals from potable sources in the study area Responsibility: MB Petroleum Branch.	MB Petroleum Branch, Petroleum Companies	Ongoing	Watershed wide
Monitor the Oak Lake Aquifer more frequently and examine the impacts of oil development on water table levels.	Determination of current usage and water loss through oil development in the watershed.	MB Petroleum Branch and MB Groundwater Section	2014	Oak Lake Aquifer
Minimize risk of depletion of potable water sources by petroleum development through encouraging municipalities to develop non-potable water sources (like the Buried Valley Aquifer) for petroleum development.	Increased revenues for municipalities. No increase in industrial water use licenses for petroleum development.	Municipalities, MB Conservation and Water Stewardship, Petroleum Companies.	1-10 year	Watershed wide

OBJECTIVE 3: Increase the knowledge of locations of groundwater sources within water short regions.

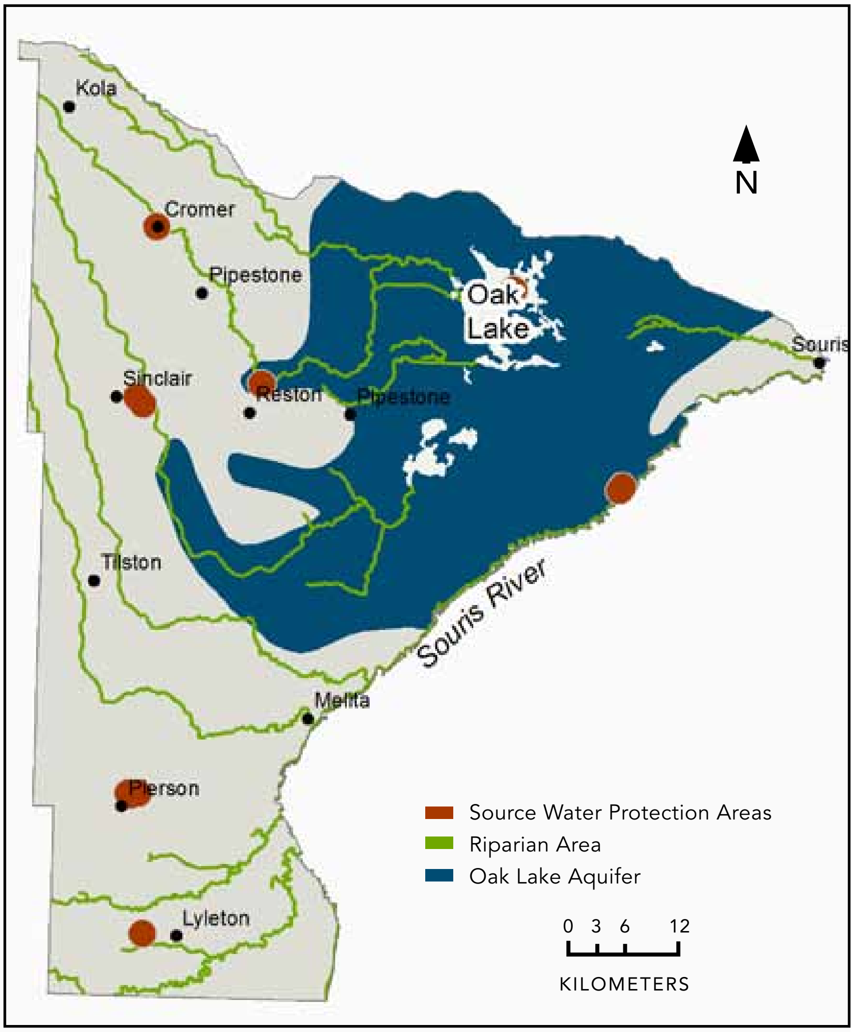
Recommended Action	Measure of Success	Responsibility	Timeline	Target Area
Update groundwater resource maps by including local and technical input.	Map of available and potential groundwater sources.	MB Conservation and Water Stewardship	1-10 years	Outside OLA area

Water Quality & Aquatic Ecosystem Health

VISION: Clean, safe water that sustains a healthy community and natural ecosystems

CHALLENGES:

- Groundwater from shallow aquifers, like the OLA are at greater risk to contamination from surface activities.
- Implemenation of the OLA plan has been taking place since 2000. In order to protect this valuable resource, the OLA plan implementation should be supported.
- A 2008 survey indicated that one in every four wells in the watershed failed to meet drinking water guidelines due to presence of bacteria or high levels of nitrates and nitrites.
- Shallow wells are more prone to contamination from the ground surface.
- A variety of recommendations need to be implemented to preserve or enhance public drinking water sources.
- The water quality index in most streams is marginal.
- Oak Lake and its tributaries are important bird and fish habitat as well as important recreational areas. This resource should be maintained and protected.



OBJECTIVE 4: Protect and prevent contaimination of drinking water sources.

Recommended Action	Measure of Success	Responsibility	Timeline	Target Area
Provide incentives to manage & control grazing to limit nutrient leeching into soil.	3km of fencing/year.	CD, MAFRI	Ongoing	OLA
Relocate feedlot sites from sensitive areas which may pose a risk.	1 biannually.	CD, MAFRI	Ongoing	OLA
Assist with annual water tests for private and semi-private water sources.	All semi-private wells and 25% of known private wells.	CD, MWS to help fund bacteria testing	Annually	Watershed wide
Seal unused wells.	15 wells annually.	CD	Annually	Watershed wide
Conduct source water assessments (wellhead survey and inventory) and action plans for private wells and sandpoints.	Completed assessments and inventory.	CD, RMs	Years 3, 6, and 9	Watershed wide
Provide incentives to implement well assessment recommendations.	20% of assessment wells upgraded annually.	CD	Year 5	Watershed wide

Source Water Protection Plan Recommendations

- Seal unused and poorly constructed wells located within a source water protection zone.
- Provide incentives to upgrade existing private wells and improve wellhead protection (caps, grass seed, replace pits, re-contouring the slope).
- Distribute publications that educate landowners and industry on:
  - Drinking water sources;
  - Water conservation measures;
  - Groundwater protection;
  - Impacts of land use activities;
  - How to perform well assessments;
  - Proper well maintenance;
  - Wellhead protection measures; and
  - Proper septic system maintenance.
- Provide information on well location and source protection zone to all local emergency measures organizations and fire departments.
- Promote communication and coordination with local water operators.

Location	Recommendation
Cromer	The well casing should have a cover or steel wool placed over top of it to keep small rodents and foreign material out of the casing.
Four Seasons Island Resort	Add new cover or extend existing well casing. Repair damage to the well cribbing. Install a barrier to keep people, animals, and vehicles away from the wellhead. Seed grass in the area immediately around the wellhead.
Lyleton	Seed grass the area immediately around the well. Fence off the area around the wellhead. Build a well house or protective box around the well being used.
Melita	Stop the practice of pumping water from temporary wells to recharge the two production wells. Seed grass the area immediately around the well. North & south wells should have protective bollards. Supplemental and new wells should have building or protective cover placed over top to secure the well. South supplemental well and new north well should have the well casing extended. The water utility should assess their production wells and properly seal any wells not used for production.
Pierson	The land in the vicinity of the well should be re-contoured to prevent surface water from ponding at or near the wellhead. Seed grass the area immediately around well #4. Well #1 should be sealed and an alternative site should be chosen. If used as pasture, fence the immediate wellhead area off from livestock (25m). Seal well #8. Ensure that the water line that extends SE is physically disconnected from the public water system.
Sinclair	Add new cover or extend existing casing. The unused well inside of the pumphouse next to the Isaac well should be properly sealed to ensure that it does not act as a conduit to the aquifer for any contaminants. Isaac well needs bollards and the area should be mowed to increase visibility. Water utility to stop using Isaac Well. Rodent proof the well house around Track well.
Tilston	The private well pit presents a threat to the public drinking water system – once the residence is vacated or sold the well pit should be sealed. The existing back-up well should be disconnected from the public system, consider installing a new back-up well for Tilston's water supply. The well casing should have a vented sanitary seal placed over top and new cover or extended casing should be installed.
Hartney	Seed grass the area immediately around the well.
Reston	Both wells should have bollards installed to protect the well.
Kola	See Arrow Oak Source Water Protection Plan.
Souris	See Central Assiniboine Source Water Protection Plan.

Linking to Development Planning

- 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 sewage treatment facilities) should be restricted in source water protection areas for all public drinking water sources. Where restriction is not possible, development must be limited and may be subject to:
  - Demonstration by the proponent that no significant negative effect on water is likely to occur;
  - The implementation of mitigation measures and alternative approaches that protect, improve or restore these areas; and
  - The preparation of a strategy for mitigation in the event that negative impacts do occur.
- Ensure an emergency response plan is developed for each public drinking water system to address spills, accidents, and other emergencies that may affect public drinking water sources.
- All new development should be required to seal all known abandoned wells in public water system source water protection areas.

OBJECTIVE 5: Improved surface water quality index of all creeks.

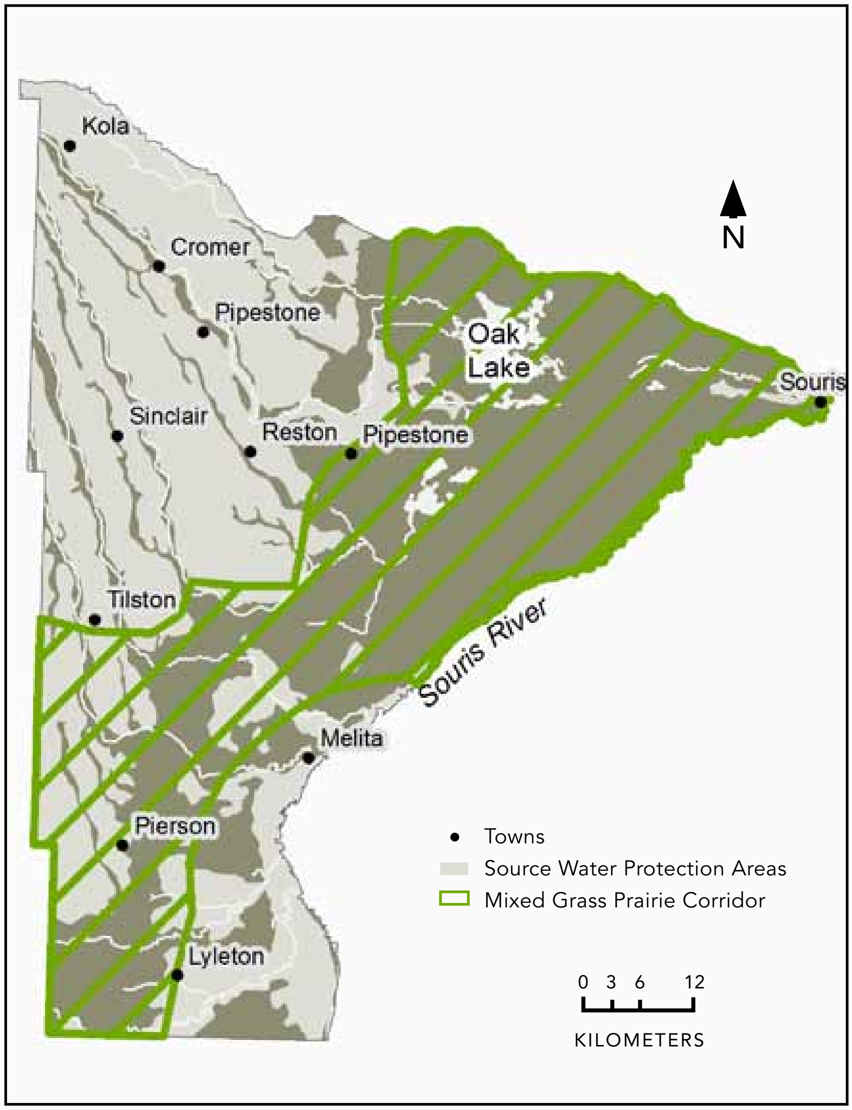
Recommended Action	Measure of Success	Responsibility	Timeline	Target Area
Offer technicial advice on how to manage land within riparian areas to minimize impact to riparian areas while maintaining economic importance of the area.	Areas have been identified which indicate where technical assistance is needed.	CD, MAFRI, Federal Gov't	1-5 years	Riparian Areas
Restore impaired riparian areas.	In five years more than 30% of impaired riparian areas have been restored.	CD, MAFRI, Federal Gov't	1-5 years	Riparian Areas (Souris River given priority)
Cleanup deadfall around streams at a minimal level to achieve a balance between the necessity for aquatic habitat and the nuisance to human activities.	10km annually.	CD	1-2 years	Antler River

Natural Areas

VISION: Maintain and increase natural areas.

CHALLENGES:

- Mixed grass prairies are habitat for a number of threatened or endangered species in the watershed.
- Mixed grass prairies are considered the most converted, least protected habitat on earth.
- Introduced invasive species are having significant and increasing impacts on Manitoba's ecosystems, economy, and native species.
- Larger sized agricultural operations are an increasing trend which puts tremendous pressure on natural areas.
- 33% of the annual cropland, mainly in the eastern portion of the watershed, has moderate to severe erosion risk.
- 16% of annual croplands were found on lands rated Class 4 or lower.
- Pipeline development has significant impact on ecosystem health if developed within the mixed grass prairie ecosystem.



OBJECTIVE 6: Decreased fragmentation of the mixed grass prairie ecosystem.

Recommended Action	Measure of Success	Responsibility	Timeline	Target Area
Develop management practices which provide connective corridors for wildlife within the mixed grass prairie habitat.	Management plans implemented.	Conservation Agencies, MB Conservation and Water Stewardship, CD	Ongoing	Mixed grass prairie corridor
Off set the costs of maintaining mixed grass prairie habitat.	Producers are provided payments to keep mixed grass prairie habitat intack.	Provincial Gov't, Federal Gov't, Conservation Agencies	1-5 years	Mixed grass prairie corridor
Work with local landowners and RMs to develop conservation easement terms that are more acceptable to the local stakeholders.	Overall increase in protected natural areas.	RMs, Conservation Agencies	1-2 years	Mixed grass prairie corridor
Oil development should minimize habitat impacts by avoiding natural areas.	Current mixed grass prairie ecosystem acres are maintained.	MB Conservation and Water Stewardship, Petroleum Branch	Ongoing	Mixed grass prairie corridor
Promote protection of riparian areas and undeveloped rights-of-way to provide connectivity and travel corridors for wildlife.	10% of natural areas restored or protected.	CD, MB Conservation and Water Stewardship, Conservation Agencies, RM	Ongoing	Mixed grass prairie corridor
Create a formal plan for removal of abandoned pipelines to satisfy all stakeholders in the watershed.	Sign off from all stakeholders in the watershed once plan is developed.	MB Petroleum Branch and oil companies	2014-15	Watershed wide
Encourage oil companies to set aside funding for reclamation for abandoned pipelines to restore the area to conditions previous to pipeline installation.	Established fund.	MB Petroleum Branch	2016	Watershed wide
Restrict the sale of crown lands when the agricultural capability of the land is compromised due to lack of fertility or environmental conditions such as flooding or susceptible erodible soils. Restrict the sale of lands with high recreational value, that are of particular importance to species within Manitoba's Endangered Species Act or the federal Species at Risk Act or that provide a potential natural cooridor between Mixed Grass Prairie habitats.	No decrease in the number of acres designated as Crown Lands from 2011-2021.	Manitoba Conservation and Water Stewardship Block Planning Committees 2 and 3	Ongoing	Mixed Grass Prairie Corridor

OBJECTIVE 7: Maintain the current number of acres of wetland habitat in the watershed.

Recommended Action	Measure of Success	Responsibility	Timeline	Target Area
Restore drained wetlands.	2% increase in acre-feet storage from 2009.	Conservation Agencies, Provincial Gov't, CD	Ongoing	Watershed
Work with local landowners and RMs to develop conservation easements on wetlands to discourage future loss that are more acceptable to local stakeholders.	5 CA signed.	Conservation Agencies	Odd years	Wetlands
Offset the cost of maintaining wetland habitat in its current state.	10% reduction in the number of applications for licenses to drain.	Conservation and Water Stewardhip, Conservation Agencies, CD, MAFRI	1-5 years	Wetlands

OBJECTIVE 8: Increase local awareness of the importance of natural areas to the health of the watershed.

Continue South-West Manitoba Water Festival.	Attendence of 100 students from area annually.	CD	Annually	Local Schools
Hold educational producer workshops illustrating the benfits to taking marginal land out of production and restoring its natural function.	Average of 10 producers in attendance.	CD, Conservation Agencies, Federal Gov't	Biannually	Class 4 or poorer soils.
Work with partnering agencies to develop invasive species management plans on natural areas.	Reduction or management of spread of invasive species.	Invasive Species Council, Conservation Agencies, CD, Weed District	Ongoing	Invasive species 'hot spots'
Continued education & information to prevent spread/ introduction of invasive species.	Limited introduction or dispersal of invasive species from 2010 data.	Invasive species council	Ongoing	Watershed

OBJECTIVE 9: Increase soil wind erosion risk management practices on annual cropland.

Offer technicial advice on how to manage land with sensitive soils.	5 workshops.	CD, Federal Gov't, MAFRI	Ongoing	Moderate to severe designated wind soil erosion risk areas.
Promote zero tillage.	5% increase in the use of zero till.	CD, MAFRI	Ongoing	
Provide incentives to promote perrennial cover.	80 acres/year.	CD, MAFRI	1-5 years	
Promote the use of shelterbelts and natural wind fences to reduce soil erosion risk where zero tillage cannot be applied.	2km/year.	CD, Federal Gov't, MAFRI	Ongoing	

Water Management

VISION: To manage water to minimize negative impacts related to flooding and drought within the study area on a watershed basis.

CHALLENGE:

- The study area is just a small part of a basin that spans two countries, two Canadian provinces and two American states.
- Surface waters are managed through international boards, changes to which are beyond the scope of this planning initiative.
- The Souris River Basin has extreme variation in flow. The Basin is highly regulated by structures to help minimize the impacts of this variation. The regulation of these structures outside the watershed influences the water management within the watershed.
- A variety of planning initiatives have taken place over time, at different spatial scales and by different organizations.
- There are limitations in terms of managing water on a watershed basis with Provincial and Federal jurisdictional boundaries.
- The drainage area which the watershed drains, is three times the watershed area itself.

OBJECTIVE 10: Increased cross jurisdictional communications.

Recommended Action	Measure of Success	Responsibility	Timeline	Target Area
Use commonalities between plans as basis for initiating cross boundary communications and developing relationships.	Better communications between cross border organizations.	All stakeholders in Basin	Ongoing	Souris River Basin
All new watershed planning activities should consult or reference previous watershed planning activities in other jurisdictions within the Souris River Basin.	Plans are corrdinated to address issues on a basin scale.	All stakeholders in Basin	Ongoing	Souris River Basin
A member of the WSR PMT should participate in the Souris River Basin annual meetings to increase communications and relay basin information back to the PMT.	Increase in communications to the PMT on ISR Board activities.	PMT, ISR Board	Annually	Souris River Basin
Distribute the West Souris River IWMP to all water management boards within the Souris River Basin.	All agencies received copies of the plan.	CD	Prior to finalization of plan	Souris River Basin

OBJECTIVE 11: Decreased economic impacts related to flooding and drought events within the study area.

Implement the reccommendations of the Surface Water Management Plan on pages 28 to 35.	Recommendations are implemented.	All stakeholders	Ongoing	Watershed
Encourage Saskatchewan to review their current drainage licensing and permitting system to reduce downstream impacts in Manitoba.	Decreased drainage impacts on Manitobans.	Saskatchewan Gov't Manitoba Gov't.	2018	Souris River Basin (Saskatchewan portion).

GLOSSARY

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 Practices (BMP)
A practical solution used to deal with soil and water conservation concerns, including techniques to manage agricultural and urban runoff and modify agricultural waste management.

Conservation Easement
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.

Conservation Agencies
An organization who's mandate is to preserve, restore or enhance native habitats.

Development
The construction of a building on, over or under land; a change in the use or intensity of use of a building or land; the removal of soil or vegetation from land; the deposit or stockpiling of soil or material on land and the excation of land.

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
The 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 that provides ecological goods and services, including wildlife habitat.

Riparian Area
The transition zone which acts as the interface between the upland ecosystem and water courses.

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

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

Water Quality Index (WQI)
A means of summarizing large amounts of data into simple terms for reporting to management and the public in a consistent manner. It is calculated using twenty-five water quality variables and combines the scope, frequency and amplitude that variables exceed the water quality objectives and guidelines. The Water Quality Index ranges from 0-100 and is used to rank water quality into categories ranging from poor to excellent. Similar to the UV index or an air quality index, it can tell us whether the overall quality of water bodies poses a potential threat to various uses of water, such as habitat for aquatic life, irrigation for agriculture and livestock, recreation and aesthetics, and drinking water supplies.

Water Soft Planning
Long-term, comprehensive water management approaches that will ensure adequate quantities of water for the future. Work is largely focused on ways that communities can effectively implement tailored strategies to seasonably manage their water resources.

Waterway
A landscape feature (natural or artificial) that continuously or intermittently transports water on the earth's surface, including headwater, rivers, creeks, channels, streams, and drains.

ACRONYMS

AESB – Agri-Environmental Services Branch

CD – Conservation District

DO – Dissolved Oxygen

EIA – Environmental Impact Assessment

ESA – Endangered Species Act

IJC – International Joint Commission

ISRB – International Souris River Board

IWMP – Integrated Watershed Management Plan

MAFRI – Manitoba Agriculture Food and Rural Initiatives

MWSB – Manitoba Water Services Board

OLA – Oak Lake Aquifer

PMT – Project Management Team

PRAC – Prairie Regional Adaptation Council

RM – Rural Municipality

SARA – Species at Risk Act

WQI – Water Quality Index

WSRCD – West Souris River Conservation District


West Souris River
CONSERVATION DISTRICT
Water Stewardship

West Souris River
Integrated Watershed Management Plan