



NETLEY-GRASSMERE

INTEGRATED WATERSHED MANAGEMENT PLAN

EXECUTIVE SUMMARY

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

The planning process extended over three years and was completed in 2011. The plan focuses on addressing the priority land and water issues identified by watershed residents through four public meetings in June 2008: pollution of surface water, flooding of agricultural land, contamination of drinking water and degradation of natural areas.

FOUR GOALS WERE DEVELOPED TO ADDRESS THESE CONCERNS.

- 1. IMPROVE SURFACE WATER QUALITY IN WATERWAYS WITHIN THE NETLEY-GRASSMERE WATERSHED**
- 2. ADOPT A WATERSHED-BASED APPROACH TO SURFACE WATER MANAGEMENT**
- 3. PROTECT AND IMPROVE THE QUALITY OF DRINKING WATER**
- 4. PROTECT AND RESTORE THE QUALITY AND INTEGRITY OF NATURAL AREAS TO MAINTAIN A HEALTHY WATERSHED**

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

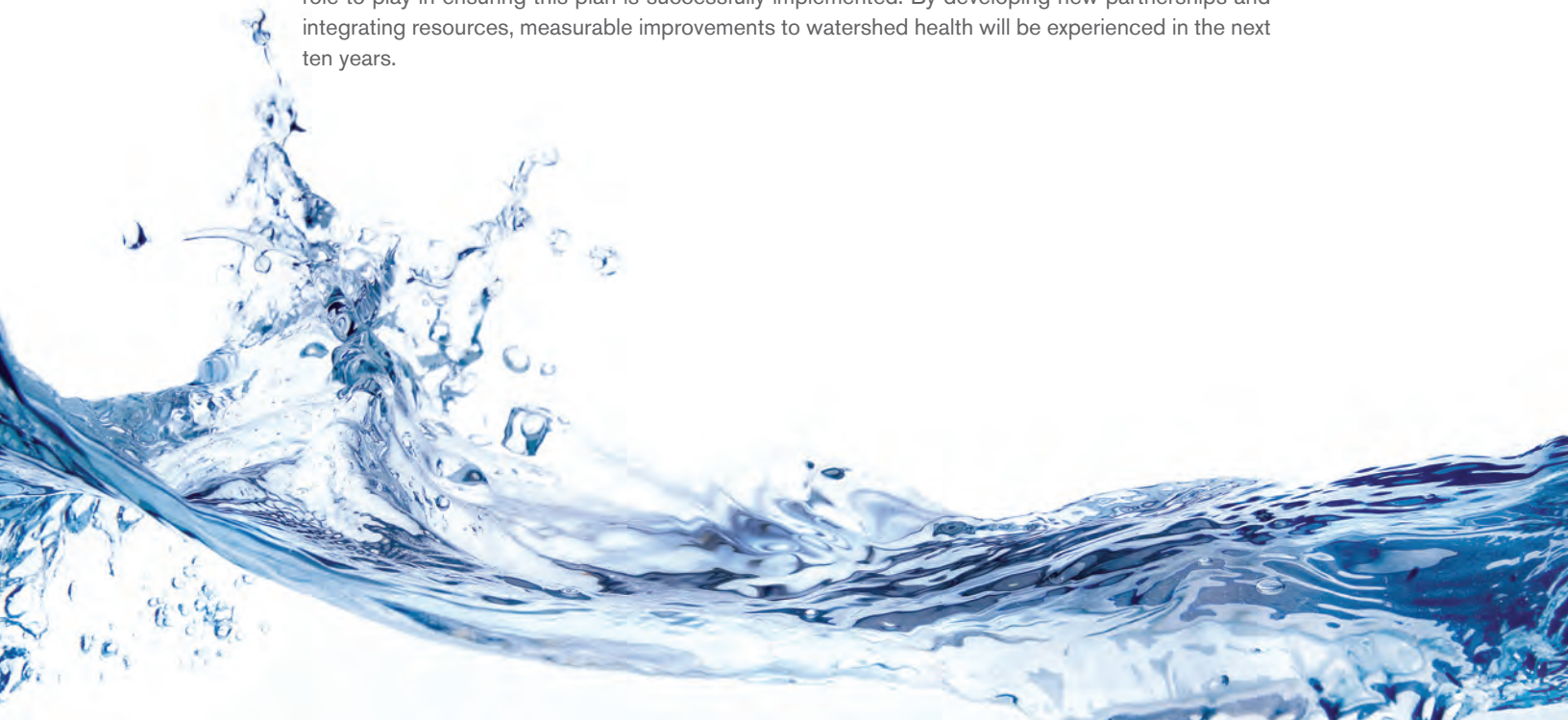


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INTRODUCTION

The Netley-Grassmere watershed is arguably one of the most diverse watersheds in Manitoba. This 2,300 square kilometre parcel of land includes one of Canada's largest freshwater wetlands, a North American birding hot spot and is underlain by the expansive and productive Carbonate aquifer. This watershed is also one of Manitoba's most altered watersheds, where what used to be the St. Andrews bog stretching north from the City of Winnipeg to Teulon, is now high quality farmland surrounded by quickly encroaching and expanding urban communities. These unique and important landscape features have shaped the issues faced by residents living in this watershed and the management recommendations proposed in this plan.

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

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

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

KEY PLAYERS

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

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

The **Project Management Team (PMT)** for the Netley-Grassmere watershed was formed in the spring of 2008. The role of the PMT is to act as the key decision-makers during the development of the plan. As such, the Netley-Grassmere PMT met regularly and was responsible for designing communication materials, hosting open houses to engage the public; combining local and technical information to generate the goals, objectives, and actions for the watershed; and finalizing the content of the watershed plan.

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

NETLEY-GRASSMERE **WATERSHED**

The Netley-Grassmere watershed is located north of the City of Winnipeg, along the western bank of the Red River, stretching northward to the south-western shore of Lake Winnipeg's south basin. It contains wholly or part of the Rural Municipalities of Armstrong, Rockwood, Rosser, St. Andrews, West St. Paul, and Woodlands, the City of Selkirk, the Towns of Stonewall, Teulon, and Winnipeg Beach and the Village of Dunnottar. The watershed also contains lands within the Peguis First Nation, located along the southern edge of the Netley Marsh and north of the City of Selkirk.

1,583 km of ordered drains in the watershed, of which only a fraction are natural water courses. The Netley-Grassmere watershed is located adjacent to Lake Winnipeg, the 10th largest body of freshwater in the world, and is part of the second largest watershed system in Canada, the Lake Winnipeg watershed.

The Netley-Grassmere watershed is home to approximately 40,000 people and includes the Netley and Oak Hammock marshes, expanding suburban communities located north of the City of Winnipeg, cottage communities along the shores of Lake Winnipeg and Netley Marsh, as well as, prime and marginal agricultural lands. The southern portion of the watershed is located adjacent to the Red River where a large portion of the population resides in the urbanized corridor between Selkirk and Winnipeg. Despite this rapid development, agriculture remains an important industry in this watershed.

During the summer months, the population in this watershed swells as cottagers from Winnipeg and surrounding areas arrive to enjoy the beaches and recreational activities along Lake Winnipeg and the nearby creeks and marshland. Tourism is an important industry in this watershed as the white sandy beaches found along the shore of Lake Winnipeg draw thousands of visitors annually. Lake Winnipeg also supports a large commercial fishery, while sport fishing remains popular with both residents and visitors.

For more information on the land and water resources of the Netley Grassmere watershed, please refer to the Watershed Characterization Report which is available from the East Interlake Conservation District office or online at www.eicd.ca.



The Netley-Grassmere watershed has a drainage area of approximately 2,362 km² and contains four sub-watersheds: the Netley Creek sub-watershed (977 km²), the Wavey Creek sub-watershed (662 km²), the Grassmere Creek sub-watershed (479 km²), and the Parks Creek sub-watershed (244 km²). The watershed was once largely covered by an extensive marsh, the St. Andrews bog, but since has been widely drained to support agriculture and land development. There are presently

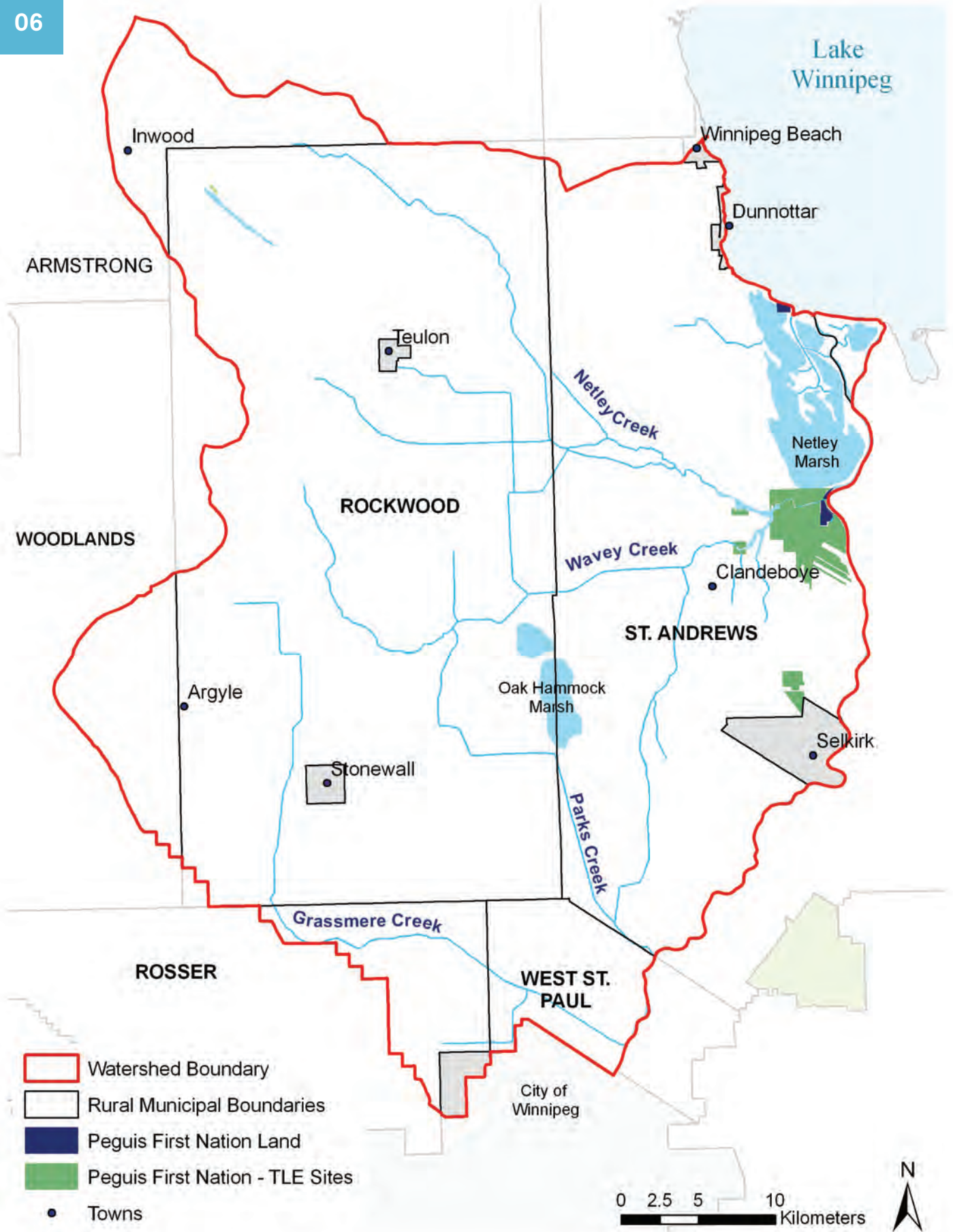


Figure 1: Overview of the Netley-Grassmere watershed

WATERSHED ISSUES

To identify local land and water issues and concerns, watershed residents and stakeholders were asked to provide input at one of six meetings held throughout the Netley-Grassmere watershed. Issue statements were collected from two groups of watershed stakeholders:

- 1) watershed residents at public meetings held in Selkirk, Dunnottar, Stonewall, and Teulon and;
- 2) the watershed team – a group of technical experts and community stakeholders at two meetings held during plan development.



The project management team considered both the issues raised by watershed residents and any concerns identified in technical submissions provided by the watershed team. Most of the issues raised could be categorized

into four areas of concern: pollution of surface water, flooding of agricultural land, contamination of drinking water sources, and degradation of natural areas. Four goals were developed to address these concerns.

WATERSHED GOALS:

1. IMPROVE SURFACE WATER QUALITY IN WATERWAYS WITHIN THE NETLEY-GRASSMERE WATERSHED
2. ADOPT A WATERSHED-BASED APPROACH TO SURFACE WATER MANAGEMENT
3. PROTECT AND IMPROVE THE QUALITY OF DRINKING WATER
4. PROTECT AND RESTORE THE QUALITY AND INTEGRITY OF NATURAL AREAS TO MAINTAIN A HEALTHY WATERSHED

Improve Surface Water Quality in Waterways

WITHIN THE NETLEY-GRASSMERE WATERSHED

REASON FOR GOAL

Residents are concerned about the degradation of water quality in many waterways within the Netley-Grassmere watershed. Every year extensive algal blooms emerge on Lake Winnipeg as a result of excess nutrients entering waterways from a variety of sources, both natural and human produced. Rapid development in recent years is escalating this concern as public wastewater treatment facilities are aging or operating at or beyond their capacity.

UNDERSTANDING THE ISSUES

There is little long-term water quality information available for waterways within the Netley-Grassmere watershed. One site located on the Red River at Selkirk has been routinely monitored since 1967. This station showed statistically significant increases in both total phosphorus (TP) and total nitrogen (TN) from 1978 to 2001 of 28.8 % and 57.8 %, respectively. The Netley-Grassmere watershed constitutes 6% of the area and 2% of the flow to the Red River basin. Due to the size of the Red River and its contributing basin, it is recognized that the information from this station better represents the water quality conditions in the upstream portion of the Red River basin and may not fairly represent the water quality conditions in the Netley-Grassmere watershed.

In 2007, an additional four water quality monitoring stations were established along the Netley Creek, Wavey Creek, Grassmere Drain and Parks Creek. Water quality analysis for most of these sites has indicated elevated concentrations of nutrients are present. High levels of TP were present in Wavey Creek, Netley Creek and especially in Grassmere Drain. In general, water quality tends to decrease as you move southward through the watershed, however data is only available from 2007 at these sites. There is a need to continue to monitor water quality on a long-term basis within the Netley-Grassmere watershed.



ACTIONS

To achieve this goal, a list of recommendations is provided below. For more details on the implementation of these actions, *please see pages 41 - 49.*

- Continue long-term water quality monitoring programs

DID YOU KNOW?

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

In the Netley-Grassmere watershed, activities, developments and land uses that pose a high risk of contributing excess nutrients to waterways include the improper or over application of fertilizer or manure to crops or lawns, discharge from wastewater lagoons and sewage treatment plants, failing septic systems, runoff from farming operations or urban developments and the loss of vegetation in riparian areas. The implementation of beneficial management practices that reduce nutrient loading, along with awareness and incentive programs, are important to achieving the goal of improving water quality in waterways within the Netley-Grassmere watershed.

Creating, protecting and improving riparian areas is important to the health of the watershed as they act as natural filters of both surface water and groundwater, provide wildlife habitat and protect stream banks and shoreline from flooding and erosion.

Awareness of what an individual can do to reduce their nutrient loading, from both urban and rural sources, is important to achieving this goal. Environmental education programs, like the Environmental Farm Plan Program, are encouraged as they provide producers with the opportunity to assess environmental risks associated with their farming operation, identify beneficial management practices to reduce those risks and improve their farm production efficiencies. Projects that demonstrate the benefit of on-farm beneficial management practices will promote producer uptake and provide awareness on proper implementation and maintenance techniques.¹

- Implement beneficial management practices (BMPs) that reduce or eliminate excess nutrients from entering waterways, including exclusion fencing, off-site watering systems, vegetated riparian buffers, wintering site management, improved manure management, relocation of livestock facilities and improved fertilizer application practices
- Encourage the adoption of nutrient management planning (including manure and soil testing) aimed at matching application rates with crop nutrient requirements
- Establish and maintain permanent vegetative cover in riparian areas to minimize soil loss and erosion and filter runoff
- Develop a watershed public education program to promote what individuals can do to reduce their nutrient loading
- Provide environmental education programs to help producers assess the environmental risk of their operations, like the Environment Farm Plan Program
- Support education opportunities that demonstrate the benefits of implementing beneficial management practices

DID YOU KNOW?

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

¹*Agriculture and Agri-Food Canada – Agri-Environment Services Branch and Manitoba Agriculture, Food and Rural Initiatives, 2009. An Analysis of the Agricultural Change in the Netley-Grassmere Study Area Using Land Cover, Soils and Ag-Profiling.*

Acknowledging producers and traditional land users as the stewards of the land is important in maintaining a healthy watershed. Producers are major landowners in this watershed and many are managing their land in a responsible manner for the benefit of future generations. It is important to acknowledge this as it demonstrates good management practices to other residents in the watershed.

Elevated levels of bacteria, namely *Escherichia coli* (*E. coli*) and total coliform, are also a concern for watershed residents who use creeks, bogs, and lakes as a drinking water source for livestock or for recreation. Potential sources of bacteria are effluent discharge from wastewater lagoons and sewage treatment plants, failing septic systems and surface water runoff from farming operations and urban developments. It is important to note that there are also many natural sources of bacteria such as animal waste and decomposition. Water quality tests indicate that bacteria concentration has been above guideline levels in the Grassmere Drain and Parks Creek. Beaches along Lake Winnipeg are also monitored for densities of *E. coli* as part of Manitoba Water Stewardship's Clean Beaches Program. Generally, recreational water quality is excellent at most beaches. On occasion, densities of *E. coli* exceed recreational guidelines but return to acceptable levels within 24 hours. It is important to identify and map potential sources of bacterial contamination and to develop strategies for mitigation such as reducing over-grazing in riparian areas, enhancing wastewater management and improving management and application of manure. The Province of Manitoba, under the *Environmental Act*, has prohibited the winter spreading of manure for operations with more than 300 animal units. The winter spreading of manure will be prohibited on operations with less than 300 animal units after November 10, 2013.²

Given the extent of urban development in this watershed, wastewater management has become a point of concern for residents. Municipal wastewater effluent typically contains human and other organic waste, nutrients, pathogens, microorganisms, suspended solids and household and industrial chemicals that may pose risks to human health and the environment. To prevent or minimize these risks, management of effluent quality, proper levels of treatment, monitoring before discharge and reporting are important.

Many communities have expanded beyond the capacity of their existing wastewater facility, while other communities are still operating using private on-site wastewater management systems such as septic fields, tanks or ejectors. Expansion of municipal wastewater treatment facilities into sprawling communities located in the urban corridor between Winnipeg and Selkirk and in other growing rural and cottage communities, such as the towns of Stonewall and Winnipeg Beach, is needed. It was also identified that some wastewater treatment plants may be operating without a license in this watershed. The Province of Manitoba is taking the necessary steps to ensure compliance with provincial legislation.

- Acknowledge agricultural producers and traditional land users as the stewards of the land, including publications highlighting the implementation of beneficial management practices (BMPs)
- Identify and map potential sources of pollution and develop mitigation strategies
- Reduce grazing in riparian areas along the Grassmere Creek and Parks Creek
- Encourage the incorporation or injection of manure into soil during application
- Discourage the winter application of manure
- Ensure emergency discharge plans are in place for all wastewater lagoons and treatment plants. Plans are to outline procedures to notify the public and should include mitigation measures for negative affects on water quality



- Expand wastewater treatment within the urban corridor and major urban centres
- Ensure all wastewater treatment facilities are licensed

² *Manitoba Conservation - The Environment Act: Livestock Manure and Mortalities Regulation.*
<http://web2.gov.mb.ca/laws/regs/pdf/e125-042.98.pdf>

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

Close to 40% of watershed residents, over 15,000 people, live within 8 kilometres of the Red River, Netley Marsh or Lake Winnipeg. Degradation of water quality from urban sources of nutrients, bacteria and other contaminants is a concern. This includes storm water runoff, fertilizer and pesticide application, failing septic systems and landfills. Programs that reduce urban sources of nutrients and other contaminants are encouraged.

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

A Red River Corridor Designated Area was established under the Onsite Wastewater Management Systems Regulations section of *Manitoba's Environment Act*. These regulations require landowners to submit a proposal to the Director of Manitoba Conservation for any proposed activity related to the construction, installation, location, replacement and modification of a disposal field within the corridor. The regulations also indicate that disposal fields can only receive wastewater from a secondary treatment system. The Director of Manitoba Conservation will only approve proposed activities that will not adversely affect environmental quality.³

Public understanding and education is an essential component in improving water quality. Education programs designed at raising awareness of school-aged children will encourage individuals to alter their everyday behavior to prevent degradation of water quality. These children will grow up and teach future generations about good management practices.

- Operators of wastewater lagoons should investigate possible treatment improvements, outline strategies for improved record keeping, identify options for nutrient abatement, include a map of the service area and address access issues
- Conduct environment risk assessments for all wastewater treatment lagoons and sewage treatment plants and establish site-specific effluent discharge objectives
- Reduce urban sources of nutrients and other contaminants through the promotion of grey water recycling, reduced use of fertilizers, storm water management and retention
- Implement better management practices for landfill runoff capture, monitoring and treatment
- Educate watershed residents on how to properly maintain and inspect septic fields and tanks
- Enhance the inspection program for on-site wastewater management systems on residential properties in sensitive areas along the Red River corridor and near Lake Winnipeg and in source water protection zones, with the goal of mandatory inspections every 8 years being implemented by 2018
- Spatially track the installation of new septic systems installations using a geodatabase
- Provide septic system retrofit incentives or subsidies
- Incorporate surface water quality education into schools or subsidies

³ *Manitoba Conservation - The Environment Act: Onsite Wastewater Management Systems Regulations*. <http://web2.gov.mb.ca/laws/regsl/pdf/e125-083.03.pdf>

Adopt a Watershed-based Approach

TO SURFACE WATER MANAGEMENT ACTIONS

REASON FOR GOAL

Landowners are frustrated with the repeated flooding of residential and agricultural lands. The frequency and extent of flooding has increased in recent years due to a combination of wetland loss, drainage issues, waterlogged soils and more extreme precipitation events.

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

UNDERSTANDING THE ISSUES

Effective surface water management is a priority for residents of the Netley-Grassmere watershed. The term “surface water management” encompasses a wide variety of activities including flood protection, drainage, water control, permanent water retention, temporary water hold-back, erosion control, and shoreline or stream bank protection.

Flooding in the Netley-Grassmere watershed typically occurs as a result of spring snow melt runoff, which can be aggravated in some locations by ice jams and coincident heavy rain storms. As recent as April/May 2011, May/June 2010 and March/April 2009, the watershed experienced serious flooding as a result of various factors including a large snow pack, saturated soils, spring and summer rainstorms, high river flows, major ice jams and ice-blocked drainage systems. In addition to spring flooding, more localized flooding can occur in summer months due to heavy summer rainstorms. Some low lying areas also experience frequent flooding including areas near the communities of Balmoral, Dunnottar, Petersfield, Teulon and Winnipeg Beach and, to a lesser degree, around Stonewall and Argyle.

Flooding can also occur along the shores of Lake Winnipeg when strong northerly winds result in significant wave action along the south-western shoreline. Many landowners have implemented flood protection measures along the shoreline to protect against flooding and erosion. Flood protection dikes located in Petersfield protect the community from high water levels along the Netley Creek, which is often a result of high water levels in the Netley Marsh and Lake Winnipeg.



ACTIONS

To achieve this goal, a list of recommendations is provided below. For more details on the implementation of these actions, *please see pages 41 - 49.*

- Establish development restrictions in flood prone areas to above the 1997 high water levels and the 2009 ice jam water levels

The agriculture drainage network is designed to remove excess runoff from cropland during the growing season to improve the productive capability of the soil. If excess runoff sits on the soil for too long, crops will be deprived of oxygen and damaged or destroyed. There are very few places in this watershed where natural soil conditions provide sufficient drainage to support annual crop production. To enable crop production, many artificial drains have been constructed to remove excess water off lands. Many of the larger drains were constructed in the early 1960s, and over the years, many smaller drains were added resulting in increased volumes of water flow through the drainage network. Due to a lack of regular maintenance and higher than normal amounts of precipitation, many of the drains are insufficient in removing runoff from cropland during the growing season.

Drains in Manitoba are classified from 1st to 7th order, with 1st order being the smallest and 7th order being the largest. Municipalities, towns and villages typically maintain all 1st, 2nd, and some 3rd order drains, whereas the Province of Manitoba typically manages and maintains most of the 3rd order and higher drains. There are approximately 276 kilometres of Provincial waterways and 1,307 kilometres of municipal drains in the Netley-Grassmere watershed. Information on drainage licensing procedures and policies is available from Manitoba Water Stewardship.

- Ensure that the standard of drainage provided is compatible with current and future land uses
- Implement and encourage low impact, environmentally friendly drainage design practices

- Distribute information on drainage licensing procedures and policies, including instructions on how to apply for a license and what types of works requires a license



Maintenance of existing drainage infrastructure is a priority and is essential in protecting agriculture cropland and developments from flooding. With limited resources, it is important for water managers to prioritize surface water management projects to determine where the most benefits are experienced. The East Interlake Conservation District is working to complete surface water assessments in the Netley-Grassmere watershed, however, only the Grassmere sub-watershed has been completed to date. These studies include an assessment of culvert and drain condition and outline potential locations for water retention projects. This work will continue in the Netley, Wavey and Parks sub-watersheds and the information collected will be shared with member municipalities, the Province of Manitoba and the public.

The coordination of surface water management will be improved through the establishment of a surface water management committee. The committee will contain a representative from all rural municipalities, the East Interlake Conservation District manager, the regional drainage officer, an engineer and watershed planner from Manitoba Water Stewardship and a regional representative from Manitoba Infrastructure and Transportation. The committee will improve communication among stakeholders who are responsible for water management through regular meetings. The committee will also coordinate the implementation of actions identified in the Surface Water Management Plan found on pages 15 - 27.

Rapid development in the watershed, including many new rural sub-divisions, has exacerbated the risk associated with flooding. Many homes and businesses are being built in areas that are prone to flooding, resulting in an increase of impervious surfaces and runoff, which contributes to the possibility of flooding of land in the downstream portions of the watershed. Many residents expressed the need to incorporate runoff retention into new sub-division developments to ensure the increased volume of runoff can be retained until downstream portions of the waterway can accommodate the flows. Retention volume can be determined by the increased runoff volumes created as a result of an increase in the amount of impervious surfaces from the development.

The Project Management Team recognizes that flooding is a major concern for residents, however protecting the watershed from climate change induced drought conditions must be considered. The actions outlined in the following surface water management plan strive for a balance of maintaining wetlands, especially in upstream areas, while strategically improving drainage.

- Develop and update a geodatabase of the drainage system, including an assessment of drain and culvert condition
 - Replace severely damaged culverts
 - Identify culverts with markers
 - Distribute existing surface water management assessment information
-
- Establish a Surface Water Management committee to update surface water management policies, coordinate the implementation of the surface water management plan, assess the current state of the drainage system, identify and map flood prone areas, review annual maintenance schedules and work plans on a watershed basis and coordinate equipment needs
 - Incorporate runoff retention into new subdivisions



SURFACE WATER **MANAGEMENT PLAN**

In Manitoba, “surface water management” typically refers to the management of water to prevent or reduce flooding of agricultural, industrial and residential land. Although flood protection is important, surface water management can also serve to enhance the function of aquatic ecosystems, offer recreational opportunities and improve water quality.

Currently, the tools used 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. A more holistic approach to surface water management is to manage water for a broader range of watershed values, such as aquatic ecosystem health, water quality, climate change resilience and recreational enjoyment, as well as flood protection. This approach is supported by watershed residents as shown during public consultations, where nearly 80%, expressed their support in prioritizing water quality, ensuring the preservation of natural areas or protecting groundwater from pollution.

When surface water is managed for flood protection, the landscape is often changed dramatically to influence the timing and volume of flows. The result is the loss of natural meanders in a stream, the removal of riparian vegetation and an increase in water run-off rates. Subsequently, water quality is quickly reduced, aquatic ecosystems are degraded and the health of natural areas gradually declines. The results of this water management approach work to the detriment of other watershed values, such as protecting aquatic ecosystems and preserving natural areas.

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 surface water for flood protection.

To determine ‘*where it matters most*’ to protect for flooding, the preservation of natural areas, drinking water, or recreational areas, a team of watershed stakeholders, municipal representatives and government planners and scientists met to discuss the Netley-Grassmere watershed and its diversity of landscape conditions. The watershed team used this diversity to create five zones, each with a unique surface water management goal. These zones were created by characterizing the watershed into areas with similar landscape characteristics, such as topography, soil capability and land cover.

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

WATERSHED ZONES

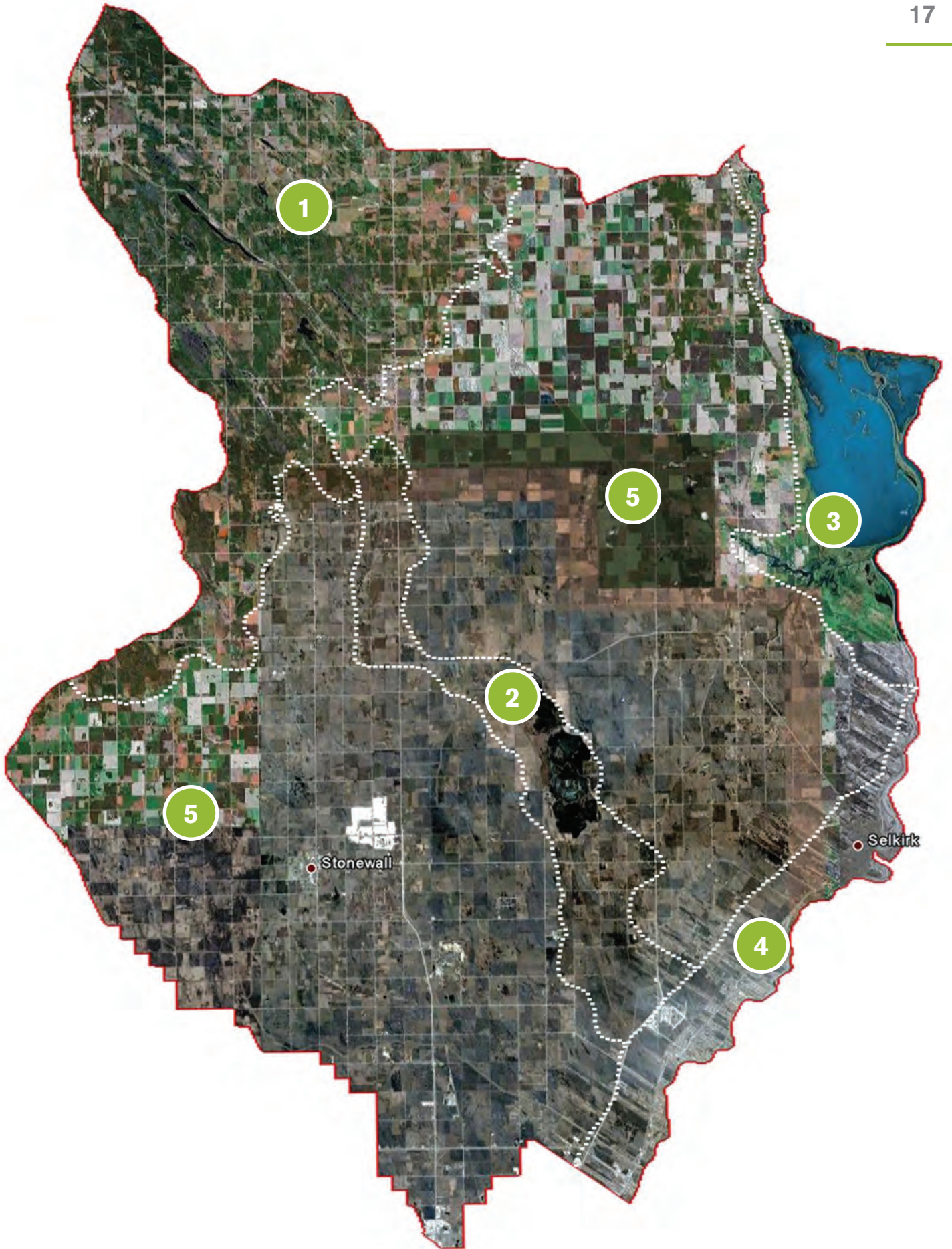
MANAGING SURFACE WATER TO SUIT THE LANDSCAPE

- 1 This zone is characterized by poor drainage and natural water retention areas such as wetlands and the intermittent streams. This zone contains valuable wildlife habitat, recreational areas like Norris Lake and the upper reaches of Netley Creek.
- 2 This zone was drawn around a corridor of land which is characterized by the marshlands (including Oak Hammock Marsh), and greater forestry and riparian areas than zones directly north and south. This area was historically known as the St. Andrews Bog and is now heavily regulated by control structures.
- 3 This zone contains waterfront communities and Netley Marsh. This zone consists of many small communities of permanent and seasonal homes, such as Winnipeg Beach, Dunnottar and Peterfield.
- 4 This zone is characterized by a highly urbanized corridor located between the cities of Selkirk and Winnipeg. There is significant impervious cover in this area due to the high density of roads and buildings. This zone also contains the towns of Argyles, Balmoral, Gunton, Inwood, Stonewall, Stony Mountain, and Teulon.
- 5 This zone contains higher classed agricultural lands. This area is characterized by the soils suitable for annual and specialty crop production. The area is relatively flat, with water flowing in a southeasterly direction.

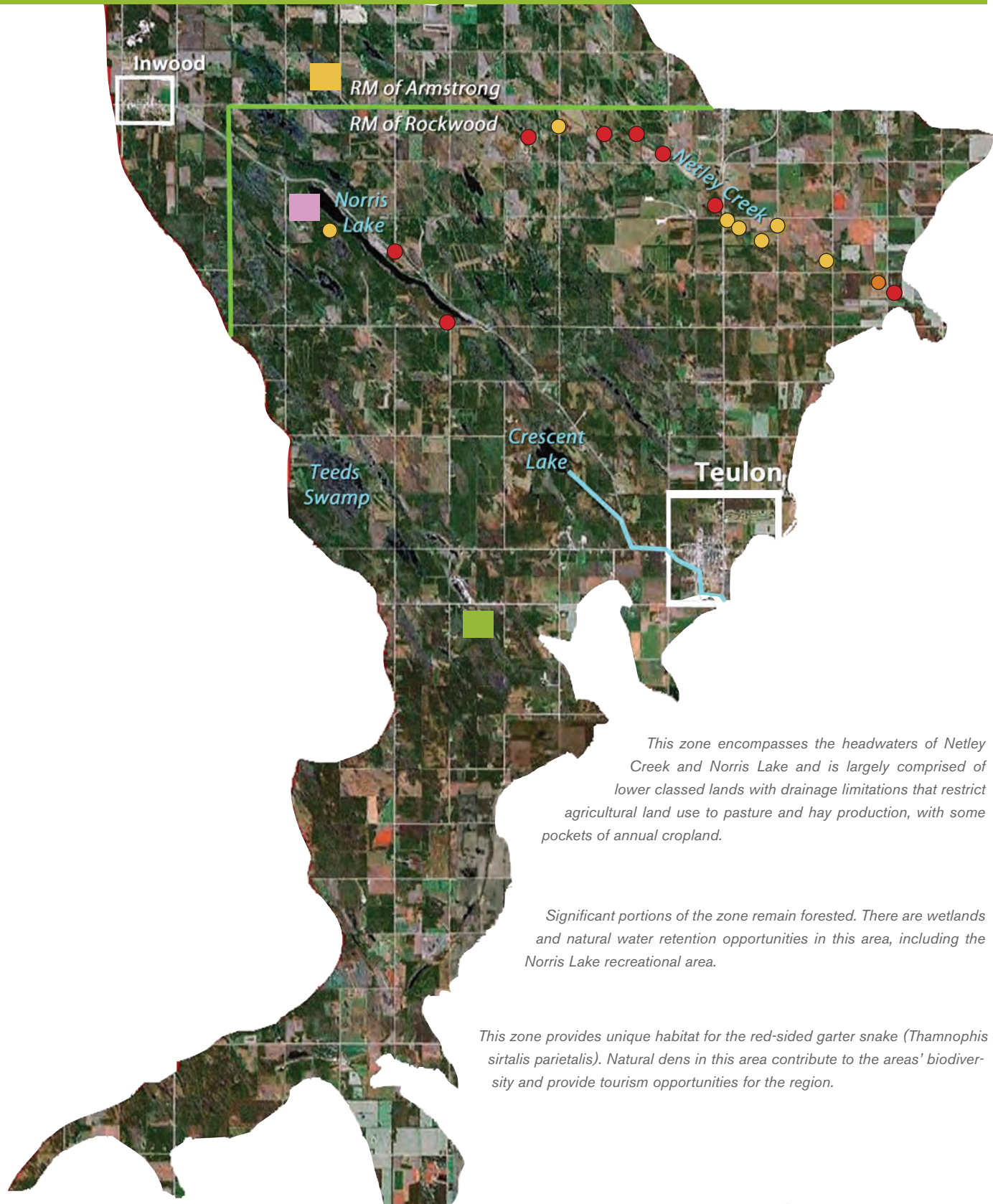
PRIORITIZING SURFACE WATER MANAGEMENT PROJECTS

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

1.	Does the project meet the “goal” statement for the watershed zone in which it’s located?	The project should be consistent with the intent of the goal statement.
2.	Position within the watershed	Drain improvement projects should receive priority in downstream portions of the watershed, while water retention projects should receive priority in upstream portions of the watershed. Drainage projects should be prioritized downstream first, moving upstream. Drainage projects should not occur upstream until downstream drainage improvements are completed.
3.	Cost-benefit ratio	Projects with a higher cost-benefit ratio should receive priority. Projects with a low cost-benefit ratio should not proceed.
4.	Ability to complete the project	Projects with funding available should be given priority.
5.	Ecological impact	Projects that negatively impact water quality, wetlands and aquatic or terrestrial habitat should not proceed, unless mitigation or compensation measures are incorporated into the project design.
6.	Partnerships	Partnership projects should be given priority.
7.	Length of time	Projects that address a long standing issue should be given priority.



ZONE 1 - NATURAL RETENTION



This zone encompasses the headwaters of Netley Creek and Norris Lake and is largely comprised of lower classed lands with drainage limitations that restrict agricultural land use to pasture and hay production, with some pockets of annual cropland.

Significant portions of the zone remain forested. There are wetlands and natural water retention opportunities in this area, including the Norris Lake recreational area.

*This zone provides unique habitat for the red-sided garter snake (*Thamnophis sirtalis parietalis*). Natural dens in this area contribute to the areas' biodiversity and provide tourism opportunities for the region.*

TOOLS TO PROMOTE AND ENHANCE WATER RETENTION

In this zone, our goal is to protect and enhance wetlands, wood lots and riparian areas. All surface water management decisions should work towards achieving this goal. Additionally, because this zone is in the upstream portion of the watershed, water should be managed to alleviate downstream flooding.

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

- Land protection programs (i.e., conservation and/or taxation easements, payments for ecological goods and services and land purchases)
- Implement beneficial management practices aimed at protecting and enhancing wildlife habitat, riparian areas and wetlands (including incentive programming)
- Complete the aquatic habitat rehabilitation projects where recommended
- Do not channelize naturally meandering watercourses (like Crescent Creek) and prohibit the construction of new drains where downstream landowners or the environment will experience negative impacts
- Limit the maintenance of existing drains to their original drain standard and restrict drain maintenance on crown lands
- Continue to restrict the sale of crown lands that contain permanent or semipermanent wetlands or lands that are prone to flooding
- Continue to understand the best place to locate new controlled water retention projects, or enhance existing ones, and then build them
- Compensate landowners to retain water on their property, either permanently or temporarily during spring melt and after heavy summer rainfall events. Control structures could be used to reduce water levels when downstream conditions are suitable
- When available, adopt environmentally friendly drain management practices and conduct erosion control projects where necessary
- Limit future development on flood prone lands through land protection programs or through the adoption of development plan policies

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

ZONE 1 - PLAN IN ACTION



The RM of Rockwood maintains a control structure on Norris Lake. Fluctuating lake levels frustrate landowners throughout the watershed.

- The RM of Rockwood is to conduct a study and public consultations to address high water levels in Norris Lake.



During spring melt and heavy summer rainstorms, the upper reaches of Ross Creek commonly floods adjacent agricultural land.

- Province of Manitoba is to address flooding along Ross Creek. A hydraulic study is necessary.



For years the RMs of Rockwood and Armstrong have struggled with water crossing municipal boundaries. Concerns include complaints about too much water entering the Chic Canal.

- Province of Manitoba is to maintain ditch along PR 229. Investigate appropriate maintenance options and prioritize retention projects.
- Province of Manitoba and the Rural Municipalities of Armstrong and Rockwood are to complete a partnership project to alleviate flooding concerns along the Chic Canal.



Crescent Lake, a small lake located just northwest of Teulon floods local landowners and town property.

- RM of Rockwood is to conduct a study and public consultations to address high water levels in Crescent Lake. Crescent Lake is a Class III wetland and natural retention area. Proposed solutions should not impact the integrity of the wetland or create negative downstream impacts.



Aquatic ecosystem habitat is impaired at 18 locations within this zone. The range of impairment ranges from: minor problems like sloughing stream banks to major fish passage barriers.

- East Interlake Conservation District is to lead or facilitate the completion of the 18 projects in the order recommended in the habitat assessment.

ZONE 1 - There is no formal mechanism for preserving or incenting local landowners to maintain existing forested and wetland areas in this zone. This part of the watershed contains unprotected areas of vegetation that provide biodiversity, climate change resilience and upland water storage possibilities. The current land taxation structure works to encourage the conversion of forested land into cropland, regardless of soil quality and the resulting infrastructure requirements to sustain crop production.

- Promote the value of wetlands, landscape diversity, riparian areas and important habitat such as the garter snake dens in the zone through education programs.
- Offer targeted incentive based programming that protects or enhances natural areas.
- Acknowledge agricultural producers as the stewards of the land, including publications highlighting the implementation of beneficial management practices.

ZONE 1 - Existing drains in the zone are poorly maintained and result in upstream flooding.

- Municipalities and Province of Manitoba are to maintain existing drains to their original design standard. Province of Manitoba is to restrict the sale of crown lands that are flood-prone or contain wetlands, as well as, restrict drain maintenance on crown lands.

ZONE 2 - BENEFICIAL MANAGEMENT PRACTICES CORRIDOR

The zone is located in the central region of the Netley-Grassmere watershed and connects the urbanized region in the southeastern portion of the watershed to the natural areas found in the north-western region.

This area was historically known as the "St Andrews Bog", a wetland that covered approximately 47,000 hectares. This bog was drained to 60 hectares to support limited crop production in the early 1900s with the construction of ditches that were dug by hand at first and later by steam and gas-powered dredges.

Now this zone encompasses Oak Hammock Marsh, a restored prairie marsh located in a 3600 hectare Wildlife Management Area that features aspen-oak bluff, waterfowl lure crops, artesian springs and some of Manitoba's last remaining patches of tall-grass prairie. The marsh is home to 25 species of mammals, 300 species of birds, numerous amphibians, reptiles, and fish, and countless invertebrates.



TOOLS TO PROTECT NATURAL AREAS


In this zone, our goal is to protect and enhance natural areas including wetlands, woodlots and riparian areas. As such, the preservation and enhancement of Oak Hammock Marsh is important in this zone. All surface water management decisions should work towards achieving this goal.

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


- Land protection programs (i.e., conservation and/or taxation easements, payments for ecological goods and services and land purchases)
- Implement beneficial management practices aimed at protecting and enhancing natural areas, such as wildlife habitat rehabilitation, riparian area management and wetland restoration (including incentive programming)
- Limit the maintenance of existing drains to their original drain standard
- Upgrade water control infrastructure to facilitate the healthy function of Oak Hammock Marsh
- Understand the best place to locate new water retention projects, or enhance existing ones, then build them
- Compensate landowners to retain water on their property, either permanently or temporarily during spring melt and after heavy summer rainfall events
- When available, adopt environmentally friendly drain management practices and conduct erosion control projects where necessary
- Limit future development on flood prone lands through land protection programs or through the adoption of development plan policies

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


ZONE 2 - PLAN IN ACTION

 During spring melt and heavy summer rainstorms, Wavy Creek commonly floods adjacent agricultural land.

- Province of Manitoba is to reconstruct a portion of Wavy Creek to alleviate flooding concerns. A hydraulic study may be necessary.

 Many residents have expressed concern about flooding near a hutterite colony and chemical plant due to heavy summer rainfall events.

- RM of Rockwood and Province of Manitoba is to investigate flooding concerns located near a hutterite colony and Chemical Plant.

 Downstream landowners of Oak Hammock Marsh are commonly flooded during spring melt and heavy summer rainstorms.

- Ducks Unlimited Canada and Manitoba Conservation are to investigate retention capacity within Oak Hammock Marsh and the potential for upgrading control structures, without harming the natural function of the wetland system.

ZONE 2 - There is no formal mechanism for preserving or incenting local landowners to maintain existing forested areas in this zone. This part of the watershed contains unprotected areas of vegetation that provide biodiversity, climate change resilience and upland water storage possibilities. The current land taxation structure works to encourage the conversion of forested land into cropland, regardless of soil quality and the resulting infrastructure requirements to sustain crop production.

- Promote the value of wetlands, landscape diversity, riparian areas, and woodlots in the zone through education programs.
- Offer targeted incentive based programming that protect and enhance natural areas.
- Acknowledge agricultural producers as the stewards of the land, including publications highlighting the implementation of beneficial management practices.

ZONE 2 - Existing drains in the zone are poorly maintained and result in upstream flooding.

- Municipalities and Province of Manitoba are to maintain existing drains to their original design standard.

ZONE 3 - WATERFRONT COMMUNITIES



This zone encompasses the Netley Marsh, the mouth of the Red River and many small waterfront communities located along the shores of Lake Winnipeg, including Winnipeg Beach, Donnattar and Petersfield. Many of these communities contain permanent homes and seasonal cottages. This zone also includes Peguis First Nation land.

Netley Marsh is located at the southern edge of Lake Winnipeg at the mouth of the Red River. The marsh is part of the Netley-Libau Marsh system, a large freshwater coastal wetland encompassing 25,000 hectares. This marsh system is considered one of the largest freshwater wetlands in North America.

Water levels in Netley Marsh are influenced by the flow of the Red River and the level of Lake Winnipeg. Persistent high water levels, as seen in recent years, do not support the healthy function of the marsh.



TOOLS TO PROTECT NETLEY MARSH AND PREVENT FLOODING

In this zone, our goal is to protect waterfront communities from flooding, preserve undeveloped shoreline along lake Winnipeg and promote the restoration of Netley Marsh. All surface water management decisions should work towards achieving this goal.

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

- Land protection programs (i.e., conservation and/or taxation easements, payments for ecological goods and services and land purchases)
- Limit future development along the shores of Lake Winnipeg through land protection programs or through the adoption of development plan policies
- Implement beneficial management practices aimed at reducing nutrient loading and enhancing riparian areas (including incentive programs)
- Maintain existing drains to minimize flooding of private properties and buildings
- When available, adopt environmentally friendly drain management practices and conduct erosion control projects where necessary
- Consult a geotechnical engineer to determine the best approach for shoreline protection and to develop a design plan
- Complete the aquatic habitat rehabilitation projects where recommended

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

ZONE 3 - PLAN IN ACTION



During spring melt and heavy rainstorms, Kerstead Road Drain commonly floods adjacent land.

- Rural Municipality of St. Andrews is to investigate the possibility of diverting water from Kernstead Road Drain to Thomas Road Drain. Drains may need to be widened and/or extended to Lake Winnipeg.



Siltation and vegetation growth is prohibiting water flow in the ditches along PR 232 and PR 225.

- Rural Municipality of St. Andrews and Province of Manitoba are to investigate the need for drain maintenance along PR 232 and PR 225. Mitigation of negative impacts on water quality and natural areas is recommended.



Winnipeg Beach Provincial Park commonly floods during spring melt and heavy summer rainstorms.

- Province of Manitoba and Town of Winnipeg Beach are to address flooding concerns in Winnipeg Beach Provincial Park.



Aquatic ecosystem habitat is impaired at four locations within this zone. The range of impairment ranges from: minor problems like sloughing stream banks to major fish passage barriers.

- East Interlake Conservation District is to lead or facilitate the completion of the four projects in the order recommended in the habitat assessment.

ZONE 3 - Much of the shoreline along Lake Winnipeg and Netley Marsh has been developed for residential and cottage communities and recreational opportunities. Many of these developments, especially houses and cottages, have been built in close proximity to the waters edge increasing the risk of shoreline erosion.

- Raise awareness of the value of existing intact shoreline vegetation and encourage beneficial management practices to protect or enhance these natural areas.
- Planning districts are to adopt a development plan policy for a mandatory 100 metre riparian area buffer for all future development along the shoreline of Lake Winnipeg and Netley Marsh.
- Consult a geotechnical engineer to determine the best approach for shoreline protection and to develop a design plan.

ZONE 3 - The use of recreational vehicles is affecting the health of natural areas and degrading water quality in Lake Winnipeg, Netley Marsh and associated tributaries.

- Cottage Associations are to provide education about the impact of recreational vehicles such as boats, ATVs, snowmobiles, seadoos, and other watercraft on natural areas and water quality.

ZONE 3 - Existing drains in the zone are poorly maintained and result in upstream flooding.

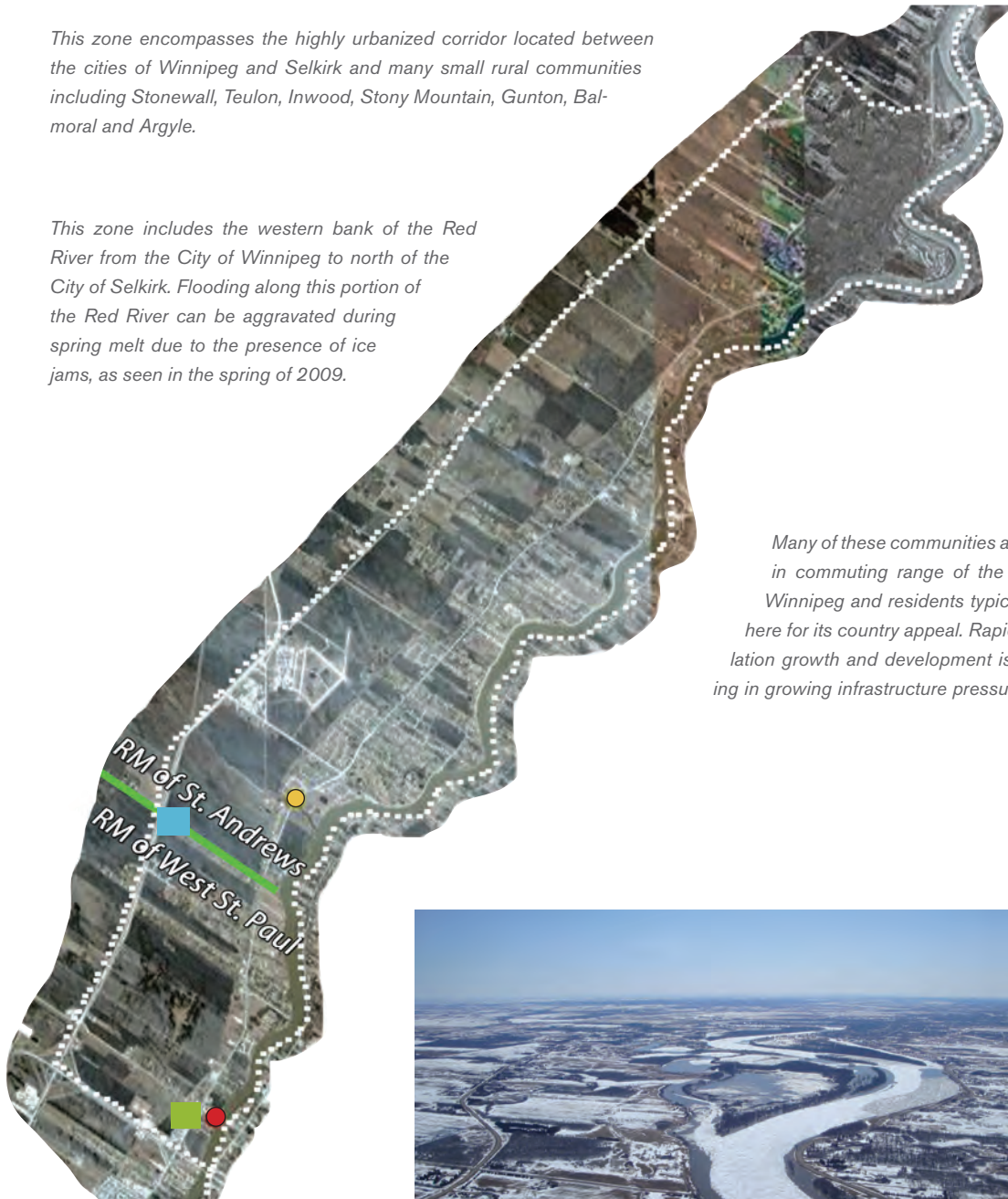
- Municipalities and Province of Manitoba are to maintain existing drains to their original design standard.

ZONE 4 - URBAN COMMUNITIES

This zone encompasses the highly urbanized corridor located between the cities of Winnipeg and Selkirk and many small rural communities including Stonewall, Teulon, Inwood, Stony Mountain, Gunton, Balmoral and Argyle.

This zone includes the western bank of the Red River from the City of Winnipeg to north of the City of Selkirk. Flooding along this portion of the Red River can be aggravated during spring melt due to the presence of ice jams, as seen in the spring of 2009.

Many of these communities are within commuting range of the City of Winnipeg and residents typically live here for its country appeal. Rapid population growth and development is resulting in growing infrastructure pressures.



TOOLS TO PROTECT COMMUNITIES FROM FLOODING


In this zone, our goal is to protect communities from flooding and support sustainable development to minimize impacts on existing natural areas and water quality. All surface water management decisions should work towards achieving this goal.

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


- Limit future development on flood prone lands and along the stream bank of the Red River through land protection programs or through the adoption of development plan policies
- Implement beneficial management practices aimed at reducing nutrient loading and enhancing riparian areas (including incentive programs)
- Complete the aquatic habitat rehabilitation projects where recommended
- Maintain existing drains to minimize flooding of private properties and buildings
- When available, adopt environmentally friendly drain management practices, and conduct erosion control projects where necessary
- Consult a geotechnical engineer to determine the best approach for shoreline protection and to develop a design plan
- Adopt development plan policies for new developments to include extra green space for temporary surface water storage during spring melt and after summer rainstorms due to the increases in impervious surfaces

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




ZONE 4 - PLAN IN ACTION

 The bridge located along the Grassmere Drain at Main Street causes back-flooding of water during spring melt and heavy rainstorms.

- Province of Manitoba is to investigate capacity of the PTH bridge located on the Grassmere Drain at Main Street.

 During spring melt and heavy summer rainstorms, Parks Creek commonly floods adjacent land.

- Province of Manitoba is to investigate the capacity of Parks Creek around Miller Road.

   Aquatic ecosystem habitat is impaired at four locations within this zone. The range of impairment ranges from: minor problems like sloughing stream banks to major fish passage barriers.

- East Interlake Conservation District is to lead or facilitate the completion of the four projects in the order recommended in the habitat assessment.

ZONE 4 - Much of the shoreline along the Red River in this zone has been developed for residential communities and recreational opportunities. Many of these buildings are located in close proximity to the waters edge increasing the risk of stream bank erosion.

- Raise awareness of the value of existing intact stream bank vegetation and encourage beneficial management practices to protect or enhance these natural areas.
- Planning districts are to adopt a development plan policy for a mandatory 100 metre riparian area buffer for all future development along the stream bank of the Red River.
- Consult a geotechnical engineer to determine the best approach for stream bank protection and to develop a design plan.

ZONE 4 - The development of rural and residential sub-divisions has increased the amount of impervious surfaces in this zone which has resulted in an increase in water runoff rates and volumes.

- Planning districts are to adopt policies for new developments to include extra green space for temporary surface water storage during spring melt and after summer rainstorms due to the increases in impervious surfaces.

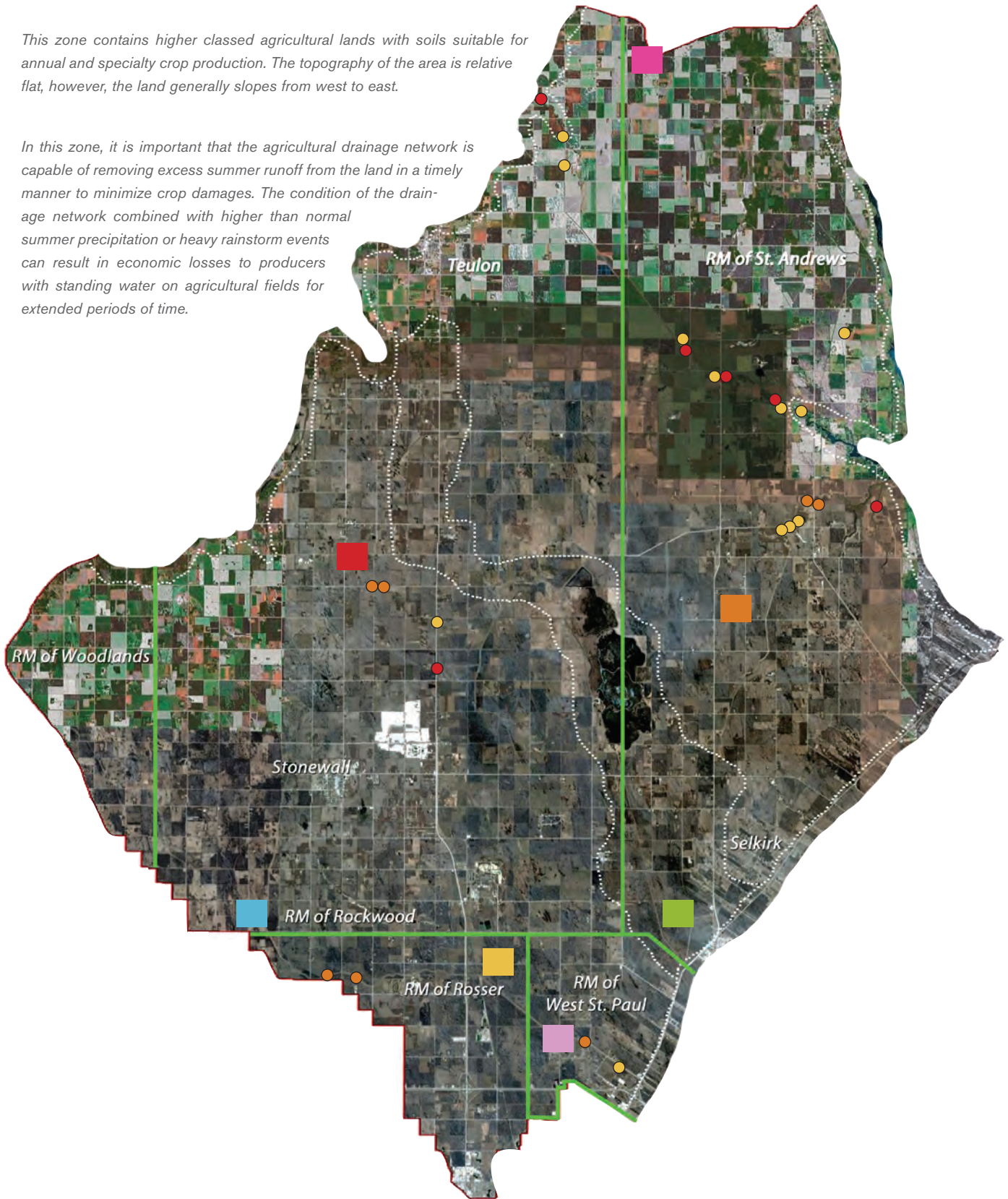
ZONE 4 - Existing drains in the zone are poorly maintained and result in upstream flooding.

- Municipalities and Province of Manitoba are to maintain existing drains to their original design standard.

ZONE 5 - PRODUCTION AGRICULTURE

This zone contains higher classed agricultural lands with soils suitable for annual and specialty crop production. The topography of the area is relative flat, however, the land generally slopes from west to east.

In this zone, it is important that the agricultural drainage network is capable of removing excess summer runoff from the land in a timely manner to minimize crop damages. The condition of the drainage network combined with higher than normal summer precipitation or heavy rainstorm events can result in economic losses to producers with standing water on agricultural fields for extended periods of time.



TOOLS TO PROTECT ANNUAL CROPLAND FROM FLOODING









In this zone, our goal is to protect annual cropland from flooding and to improve water quality by reducing nutrient loading. All surface water management decisions should work towards achieving this goal.

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

- Maintain existing drainage infrastructure to original design standard, reconstruct if necessary
- Limit future development on flood prone lands through land protection programs or development plan policies
- Implement beneficial management practices that protect and enhance existing riparian areas, wetlands and upland habitat (including incentive programs)
- Offer environmental education programs to help producers assess the environmental risk of their farming operations
- Demonstrate the value of implementing beneficial management practices through workshops and tours of demonstration projects
- When available, adopt environmentally friendly drain management practices, and conduct erosion control projects where necessary
- Complete the aquatic habitat rehabilitation projects where recommended

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

ZONE 5 - PLAN IN ACTION

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p> During spring melt and heavy summer rainstorms, the CPR crossing along Jackfish Creek commonly causes back flooding on adjacent agricultural land.</p> | <ul style="list-style-type: none"> • Province of Manitoba is to conduct a hydraulic analysis of Jackfish Creek at the CPR crossing. |
| <p> During spring melt and heavy summer rainstorms, portions of the drainage ditches along PR 321 (near PTH 8) and PR 220 (near PR 321) commonly floods adjacent agricultural land.</p> | <ul style="list-style-type: none"> • Province of Manitoba is to investigate capacity and possible reconstruction of ditches along PR 321 to PTH 8 and PR 220 to PR321. |
| <p> During spring melt and heavy summer rainstorms, the upper reaches of Grassmere Drain commonly floods adjacent agricultural land.</p> | <ul style="list-style-type: none"> • RM of Rockwood is to investigate the need for maintenance along the upper reaches of the Grassmere Drain. A hydraulic analysis is required. |
| <p> During spring melt and heavy summer rainstorms, agricultural land located between the Grassmere Drain and the City Protection Drain commonly floods.</p> | <ul style="list-style-type: none"> • Province of Manitoba to investigate possible reconstruction between the Grassmere Drain and the City Protection Drain. A hydraulic study may be necessary. |
| <p> An abandoned wooden bridge located on the Grassmere Drain causes back-flooding of water during spring melt and heavy rainstorms.</p> | <ul style="list-style-type: none"> • Province of Manitoba is to investigate the possibility of removing an abandoned wooden bridge along the Grassmere Creek that is currently used as the Water Survey of Canada's monitoring station. |
| <p> During spring melt and heavy summer rainstorms, Long Lake Drain commonly floods adjacent agricultural land.</p> | <ul style="list-style-type: none"> • Province of Manitoba is to address flooding along Long Lake Drain. A hydraulic study may be necessary. |
| <p> Siltation and vegetation growth is prohibiting water flow in the municipal portion of the Boundary Drain.</p> | <ul style="list-style-type: none"> • Rural Municipalities of St. Andrews and Rockwood is to investigate flooding concerns along Boundary Drain and develop a maintenance plan. |
| <p> Aquatic ecosystem habitat is impaired at 21 locations within this zone. The range of impairment ranges from: minor problems like sloughing stream banks to major fish passage barriers.</p> | <ul style="list-style-type: none"> • East Interlake Conservation District is to lead or facilitate the completion of the 21 projects in the order recommended in the habitat assessment. |
| <p>ZONE 5 - Runoff from agricultural land is contributing to the nutrient loading into waterways within the Netley-Grassmere watershed and into Lake Winnipeg.</p> | <ul style="list-style-type: none"> • Acknowledge agricultural producers as the stewards of the land, including publications highlighting the implementation of beneficial management practices. • Encourage the adoption of nutrient management planning (including manure and soil testing) aimed at matching application rates with crop nutrient requirements |
| <p>ZONE 5 - Existing drains in the zone are poorly maintained and result in flooding of annual cropland.</p> | <ul style="list-style-type: none"> • Municipalities and Province of Manitoba are to maintain existing drains to their original design standard, reconstruct if necessary. |

Protect and Improve the Quality of Drinking water

REASON FOR GOAL

Clean, potable drinking water is critical for human life and a necessity for prosperous sustainable communities. In the Netley-Grassmere watershed, there are thirteen public drinking water systems and one federal-owned and operated system at the Stony Mountain Penitentiary. Public drinking water systems contain more than 15 service connections. All public systems in this watershed withdraw their water from groundwater aquifers, as do all known semi-public and private water sources. Groundwater is a highly valuable resource which once polluted, exploited or altered may have a negative effect on public health and future development. The protection and improvement of groundwater quality is a priority for residents.

UNDERSTANDING THE ISSUES

In this watershed, drinking water is extracted from a major fresh water aquifer, known as the Carbonate aquifer. The Carbonate aquifer is highly productive and consists of limestone and dolostone inter-layered with several impermeable sections which act as a barrier to water movement. The Carbonate aquifer is underlain by shale and sandstone aquifer known as the Winnipeg Formation. The Winnipeg Formation is a productive aquifer, however, water quality tends to be saline, and thus, the Carbonate aquifer is the main source of drinking water in this watershed.

Bedrock is overlain by a variable thickness of clay and glacial till, commonly referred to as the overburden layer. In the Netley-Grassmere watershed, the overburden layer varies in thickness from zero to approximately 40 metres (131 feet). Groundwater is considered "sensitive" to pollution in areas of less than six metres of overburden as surface waters may infiltrate directly into the aquifer over a short period of time (Figure 3). The potential for aquifer pollution also exists where the overburden is punctured by quarries, gravel pits, and by abandoned, poorly maintained or constructed wells. Improper design, construction or maintenance of domestic waste disposal systems may also contaminate groundwater. More information about the impact of quarry extraction and the interaction between surface water and groundwater, including an examination of recharge processes and rates, groundwater quality in recharge areas and groundwater withdrawal rates is needed.



ACTIONS

To achieve this goal, a list of recommendations is provided below. For more details on the implementation of these actions, *please see pages 41 - 49*.

- Complete a study on the interaction between surface water and groundwater, including an examination of recharge processes and rates, groundwater quality in recharge areas and groundwater withdrawal rates
- Investigate opportunities to complete a study on the impact of quarry extraction on groundwater quality
- Continue to sample private wells for nutrients and bacteria and expand to include the identification of potential sources of contamination

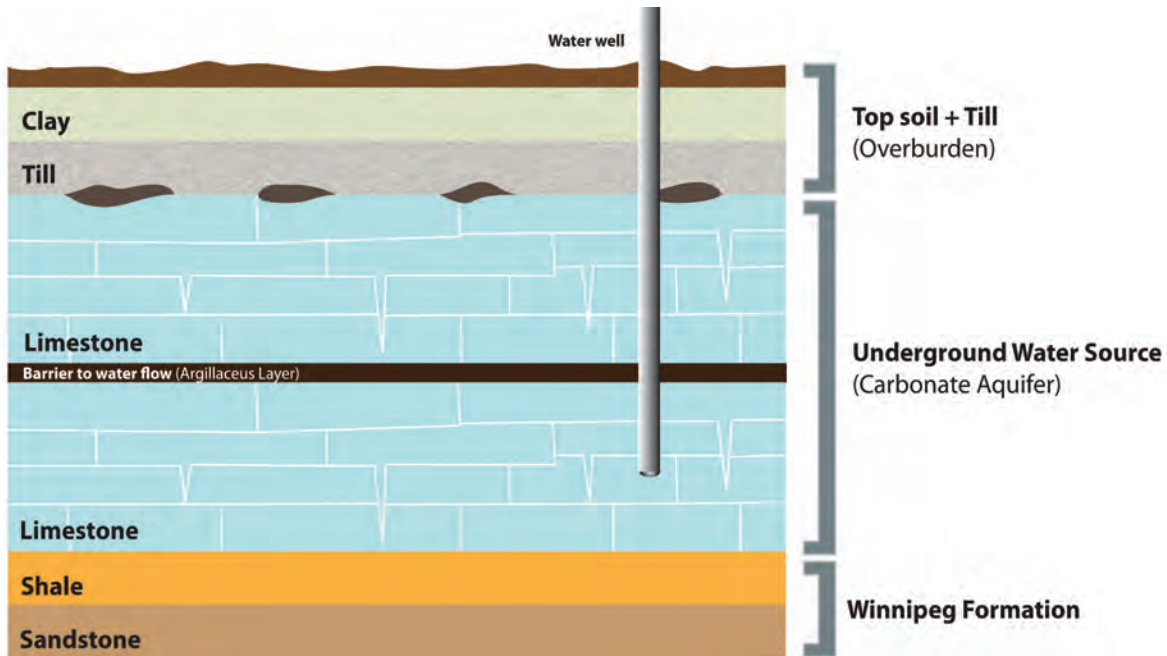


Figure 2: Geology Cross-section

A recent well inventory study conducted by the East Interlake Conservation District, in partnership with Manitoba Water Stewardship, indicated that one in every four wells in the Netley-Grassmere watershed failed to meet drinking water guidelines due to presence of bacteria or high levels of nitrates. Nitrate levels seemed to be particularly high in areas with shallow overburden. Distributing information on how to protect drinking water would benefit many watershed residents. The enhanced communication of the nature and extent of boil water advisories and potential source of contamination would also allow residents to take the necessary precautions to protect their health.

Developments, activities, land uses and structures such as chemical and fertilizer application or storage facilities, septic systems, fuel storage, waste disposal grounds, wastewater lagoons, transportation of dangerous goods and intensive livestock operations may negatively impact groundwater quality by leaching contaminants through the ground into the aquifer. Since the risk of contamination is more severe in areas of less than six metres of overburden and in areas located near public drinking water systems, these developments, activities, land uses and structures should be restricted. Where restriction is not possible, development must be limited and may be subject to:

- demonstration by the proponent that no significant negative affect on water quality is likely to occur;
- the implementation of mitigation measures and alternative approaches that protect, improve or restore these areas;
- the preparation of a strategy for mitigation in the event that negative impacts do occur.

- Distribute educational information on sources of drinking water, the importance of groundwater protection, the impacts of land use activities, how to perform well assessments, wellhead protection measures and proper maintenance procedures for wells and septic systems
- Incorporate groundwater education into schools
- Enhance communication of boil water advisories and potential contamination sources
- Develop policies that restrict development and land use activities that pose a high risk of causing pollution (including chemical/fertilizer storage, septic systems, petroleum tanks, waste disposal grounds, lagoons, intensive farming operations, industrial plants, etc) in source water protection zones and in areas with less than six meters of overburden
- Implement beneficial management practices (BMPs) to reduce or prevent groundwater contamination, including the promotion of pitless well adapters, planting grass around wellheads, regular well inspection and maintenance and improved on-site storage and handling of potential contaminants such as fertilizer, petroleum products, and pesticides
- Coordinate and promote drop off depots for hazardous waste, chemicals or other potential contaminants

Sinkholes and abandoned wells can act as a direct conduit for pollutants to flow into the aquifer. Flooding events may also carry nutrients and other contaminants directly into the aquifer through poorly located or improperly maintained active wells. Other potential sources of contamination include cross connections in drinking water distribution systems, poor conditions around the well head, aging treatment plant infrastructure and vandalism. Flowing wells can also cause problems for watershed residents, especially if the well discharges into a ditch during the winter months and results in ice-clogged drains and culverts.



Rapid urban and cottage development in the watershed has increased the need for new public drinking water systems or the expansion of existing water treatment facilities. Some communities have expanded beyond the capacity of their water treatment plant; therefore, some residents are supplied by public water while others still use private wells. Other communities in the watershed have been affected by poor drinking water quality for many years. It is important for these communities to consider water supply issues and develop options to ensure residents have access to clean drinking water.

- Seal unused, abandoned or problem flowing wells within all source water protection zones and in areas of less than six metres of overburden
- Conduct an annual inspection of the Grassmere Drain for sinkholes before the Town of Stonewall discharges its lagoon
- Seal sinkholes that pose a threat to groundwater quality
- Ensure water treatment plants are locked to provide security against vandalism

- Promote the expansion or upgrading of drinking water treatment in urban and cottage communities that are currently not serviced by a public system
- Implement policies for the mandatory sealing of wells in areas that become serviced by public water systems



SOURCE WATER PROTECTION

Throughout the development of this plan, a preliminary assessment was conducted by a drinking water protection committee for all 13 of the public drinking water in the watershed. The committee was comprised of a drinking water officer, a groundwater specialist and representatives from the Project Management Team. The purpose of the assessment was to collect information about the operation of each public drinking water system and treatment plant, identify potential sources of contamination and develop recommendations to address the activities which pose a high risk of polluting sources of public drinking water.

First, the source water protection committee mapped each public drinking water system and compiled information such as water quality results, well construction, depth of overburden and landscape characteristics. The committee determined that Source Water Protection Zones consisting of a 1.5 kilometre buffer would be applied to all 13 public drinking water systems.

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

Then, the source water protection committee ranked all potential sources of contamination based on their risk of contaminating the aquifer and the vulnerability of the public system to groundwater pollution. Recommendations to address the potential sources that pose a high threat of contamination were developed and included in Table 1 below.

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

TABLE 1: RECOMMENDATIONS FOR PUBLIC DRINKING WATER SYSTEMS

PUBLIC SYSTEM	SITE-SPECIFIC RECOMMENDATIONS
Stony Mountain	Investigate possible cross-connections to the public water distribution system and address if discovered
Town of Stonewall	Relocate the above ground fuel tank located outside of the Parks & Recreation building or install secondary containment
Chesley's Family Resort	Collect additional information on well including the proximity of septic tanks
Community of Rivercrest	Investigate options to upgrade the water treatment plant as infrastructure is old and the system is unable to support all residents
Stonewall Trailer Court	Investigate whether the back-up well meets drinking water standards and seal it if it does not
All other systems	Ensure emergency response plans are in place. Refer to watershed-wide recommendations on pages 41 - 49.

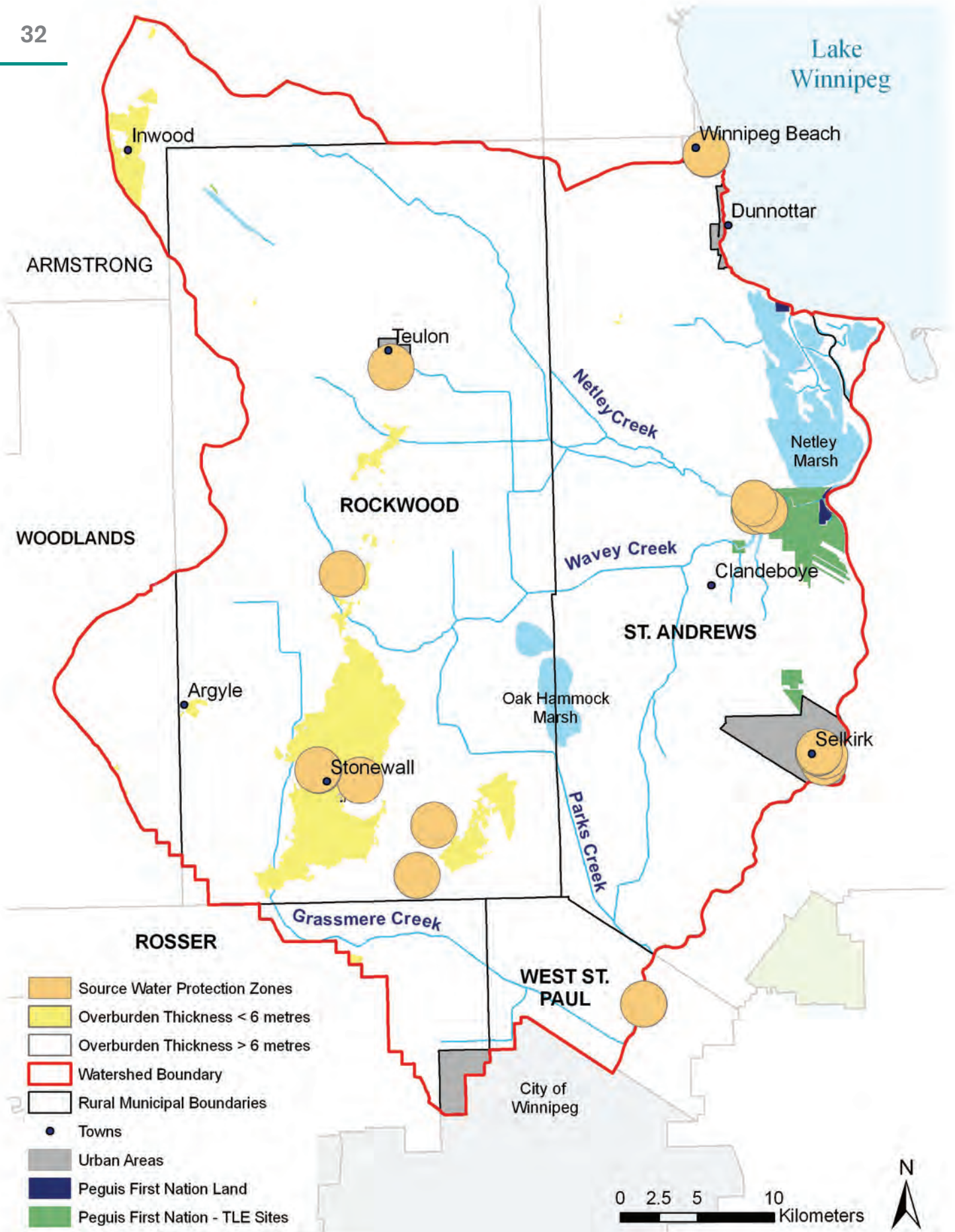


Figure 3: Sensitive Groundwater Areas (areas of less than six metres of overburden and source water protection zones)

In addition to groundwater quality concerns, some watershed residents expressed concern about groundwater supply due to possible future drought conditions, reduced recharge, or overuse of the water supply.

- Develop policies to encourage water conservation and efficiency in new developments, such as the installation of water saving appliances
- Provide rebates or subsidies for improved water conservation, such as low-flow toilets, showerheads, rain barrels and grey water recycling practices
- Educate watershed residents on water conservation practices, such as low-flow water fixtures, water saving appliances and xeriscaping practices

DID YOU KNOW?

In 1991 and 1992, well tests indicated that groundwater was contaminated by trichloroethylene (TCE) and 1,1,1- trichloroethane (TCA) in the area surrounding the Bristol Aerospace Rockwood Propellant Plant. TCE and TCA are solvents that were used since 1963 as degreasers in the production of solid-fuel rocket motors at the plant. Communities affected by this contamination include Stony Mountain and portions of the Rural Municipalities of Rockwood, St. Andrews, Rosser and West St. Paul. The communities are now serviced by a piped public water supply. This contaminated region is now covered by the Rockwood Sensitive Area Regulation, which applies to residential, agricultural, commercial and exploratory wells. As of June 1994, residents located in this sensitive area are required to obtain a permit and follow strict requirements before drilling, modifying or abandoning a well. This protective measure is designed to prevent the spreading of TCE and TCA.⁴

A groundwater remediation facility constructed by Bristol Aerospace at the Rockwood Propellant Plant began operation in October 1994. This facility was designed to contain contamination on the Bristol property by pumping groundwater from three source wells, treating the water and discharging it to the local surface water drainage system. Manitoba Conservation oversees and reviews the groundwater monitoring program delivered by Bristol Aerospace Limited where selected wells are sampled throughout the contaminated and uncontaminated areas to track the containment of the solvents.⁴

⁴ Manitoba Conservation – State of the Environment Report. <http://www.gov.mb.ca/conservation/annual-reports/soe-reports/soe93/water.html>

Protect and Restore the Quality and Integrity of Natural Areas

TO MAINTAIN A HEALTHY WATERSHED

REASON FOR GOAL

Ensuring sufficient habitat in the Netley-Grassmere watershed is critical to supporting healthy aquatic and terrestrial ecosystems. The quality and integrity of water is dependant on complex interrelationships that occur between the natural physical, chemical and biological characteristics of the watershed and the changes that have been made through human activities. Much of the agricultural land in the Netley-Grassmere watershed was once marshland or land that was frequently flooded. The 47,000 hectare St. Andrews bog was drained by natural creeks and streams, but over the years, many of these creeks have been altered for improved drainage through a network of ditches, dikes and diversion channels to create more productive farmland. Significant land development to support cottage and rural sub-division development has also caused habitat loss. The cumulative effects of these human-induced changes have resulted in a loss or degradation of natural areas, especially wetlands, riparian areas, forests, and aquatic habitat.

UNDERSTANDING THE ISSUES

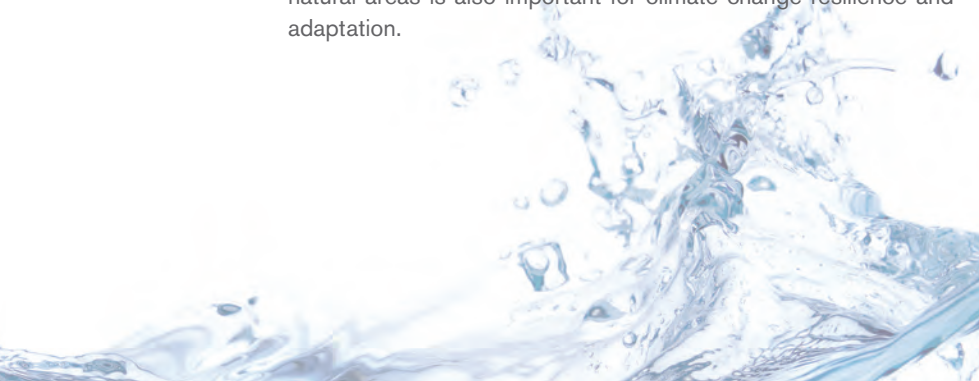
In this plan, the term “natural areas” is used to refer to terrestrial and aquatic habitat, including but not limited to riparian areas, wetlands, forests and aquatic ecosystems. At this time, the extent of these natural areas are unknown in the Netley-Grassmere watershed. Awareness of the value of natural areas is important to their protection, conservation and restoration. Activities that protect, maintain and enhance these areas are essential to achieving this goal, especially programs that provide financial incentives to landowners. Another important tool for protecting natural areas is the restriction of the sale of crown lands. When crown lands are sold, they become private property and the expectations for agriculture productivity may change resulting in a loss of natural areas such as wetlands and woodlots, or an increase in drainage improvements causing negative impacts to downstream residents. In the event that crown lands are sold, instruments like easements or land-use agreements can be utilized to ensure the land is managed in a sustainable manner. Protecting natural areas is also important for climate change resilience and adaptation.



ACTIONS

To achieve this goal, a list of recommendations is provided below. For more details on the implementation of these actions, *please see pages 41 - 49.*

- Map natural areas and identify key areas for rehabilitation
- Continue to identify natural areas for inclusion in the Province's Protected Areas initiative and classify them accordingly in the Province's crown land plans
- Raise awareness of the value of existing intact wetlands, aquatic habitat, and shoreline and riparian management practices
- Preserve natural areas through land protection programs such as conservation or taxation easements, ecological goods and services programs or the purchase of land
- Continue to restrict the sale of crown lands



A study conducted in 2007 - 2008 by the East Interlake Conservation District assessed fish presence and aquatic habitat in 3rd order and higher waterways. The study revealed that 35 species of fish utilize waterways within the watershed and, in general, aquatic habitat is marginal with some exceptions along Netley Creek, Wavey Creek and Norris Lake which are good quality. Potential detriments to aquatic ecosystems include livestock access in riparian areas, removal of riparian vegetation or a lack of buffer zones, urban encroachment and recreational abuse. Some fish passage issues were also identified in this watershed; however, most of the issues related to poor aquatic habitat as a result of poor water quality or degradation of existing aquatic habitat and riparian areas. This study revealed 47 sites for rehabilitation, as seen in maps located on pages 18 – 27.⁵

The shoreline along Lake Winnipeg and Netley Marsh and the stream bank along the Red River are also considered riparian areas; however, much of the natural vegetation has been removed to support waterfront development. Vegetation cover is the primary defense against erosion. Vegetation protects soil from eroding by holding or binding the soil with the root system of plants, by removing water from the soil by uptake and transpiration, by reducing runoff velocity, by reducing frost penetration and by the buttressing or reinforcing action of large tree roots. Structural and non-structural options can be used for shoreline or stream bank protection measures. It is recommended that a property owner retain the services of a qualified geotechnical engineer prior to constructing shoreline protection works to ensure that the design plan is properly engineered. A buffer of 50 metres is recommended along the shoreline of Lake Winnipeg, Netley Marsh and in areas that have significant recreational value. A 30 metre buffer from the high water mark has been established for crown lands.

Significant rural residential subdivision development has also occurred along the Red River, Netley Creek, Wavey Creek and to a lesser degree along Muckles Creek. This development has resulted in significant degradation of riparian areas and loss of wildlife corridors. Riparian habitat has also been lost on the middle and upper reaches of these creeks due to stream channelization to facilitate residential and agricultural development and drainage. Wetlands in the watershed have also been drained to support agriculture.

⁵ Graveline, P.G., 2008. *East Interlake Conservation District: Watershed 05OJ Riparian Assessment Survey – with emphasis on third order drains or higher – 2007 and 2008*

- Restore degraded riparian areas and eliminate barriers to fish passage, including the completion of 47 identified rehabilitation projects

- Create policies to limit future development along the shores of Lake Winnipeg, Netley Marsh and in areas that have significant recreational value, including a 50 metre buffer to minimize impact on natural areas and decrease shoreline erosion.

- Consult a geotechnical engineer to determine if a structural or nonstructural method is the best approach for shoreline protection and to develop a design plan

- Implement beneficial management practices (BMPs) that create or enhance riparian areas and protect against erosion and sedimentation

- Develop a demonstration site to illustrate the benefits of re-meandering waterways

The largest concentration of snakes in the world can be found in the north-western region of the watershed. The Narcisse Wildlife Management Area (WMA), which is located just outside the watershed, protects the winter snake dens. On warm days in early May, the snakes emerge from their dens and begin to mate. Once mating occurs, the females travel up to 20 kilometres to their summer hunting grounds, where they give birth to their live young. Males may remain at the dens for a month or two before they leave to hunt. When the evenings start to cool at the end of August, the snakes migrate back to the dens. As temperatures drop, the snakes move underground, down into the dark caverns carved in the limestone bedrock where they will safely wait out the winter months.⁶ Maintaining the integrity of these major snake denning sites is crucial to sustaining the garter snake populations found in the Interlake region. Development proponents should be prepared to replace over-wintering habitat when their activities significantly impact winter dens. The use of mortality mitigation techniques such as tunnels and drift fencing to protect migration corridors and the distribution of educational information is also important.

- Distribute information on the importance of protecting garter snakes and their dens
- Maintain the integrity of the major denning sites
- Protect snake migration corridors from development through the use of mortality mitigation techniques, such as tunnels and drift fences, in locations where snake migration is concentrated

DID YOU KNOW?



WETLANDS IN THE NETLEY-GRASSMERE WATERSHED

There are many wetlands in the Netley-Grassmere watershed. Wetlands:

- provide and improve upon the fertile soils of the watershed;
- store water, reducing flooding impacts to downstream landowners;
- filter pollutants (wetlands retain nutrients, preventing or reducing eutrophication of downstream waterways);
- provide extensive habitat for wildlife and fish;
- may recharge groundwater;
- provide for excellent hunting, fishing and general recreational use;
- are aesthetically valuable; and
- provide diversity to the landscape.

⁶ Manitoba Conservation: Snakes of Narcisse.

<http://www.gov.mb.ca/conservation/wildlife/spmon/narsnakes/index.html>

DID YOU KNOW?

The Netley Grassmere watershed contains two of Manitoba's most important marshes, Oak Hammock Marsh and Netley Marsh. Oak Hammock Marsh has been protected through the provincial protected areas initiative as a Wildlife Management Area. The Netley Marsh has not received any level of protection at this time. Although each marsh merits a management plan of its own, a short summary of the history and challenges facing both of these marshes follows.

THE NETLEY MARSH

The Netley Marsh is an expansive coastal marsh comprised of upland and wetland habitat. Located at the southern end of Lake Winnipeg, south of the beach ridge and approximately 65 km north of Winnipeg, the marsh is a remnant of glacial Lake Agassiz. Netley Marsh is located adjacent to the Libau Marsh and is sometimes referred to as the Netley-Libau Marsh. At 250 square kilometers, this marsh system is one of North America's largest freshwater wetlands.

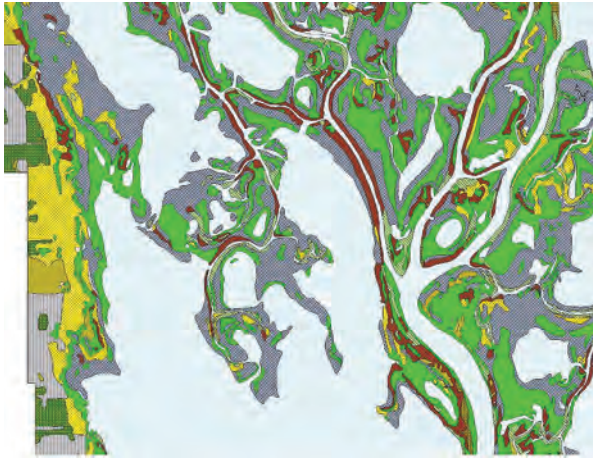
The marsh is comprised of shallow lakes, channels and wetland areas whose water levels are influenced by Lake Winnipeg.⁷ The marsh provides significant spawning, nursery and feeding habitat for fish populations in the Red River and Lake Winnipeg. The marsh has been significantly degraded by drainage, dredging and other water management activities that have substantially altered the natural flow of the Red River through the marsh.

Fluctuating water levels promote growth of a diversified, healthy wetland. Lake Winnipeg levels are stabilized to ensure sufficient and consistent flows for generating stations downstream. With stabilized water levels, the Netley Marsh is slowly dying from high water. Emergent plants (plants that grow above water) are a fundamental element of wetlands and marshes. Under low-water conditions plant communities from drier stages can germinate and survive. Without the extended dry periods, there has been a slow but consistent loss of emergent vegetation in the marsh. Grosshans, Wrubleski and Goldsborough made comparisons between 1979 and 2001 to reveal several significant changes in the Netley-Libau Marsh. Loss of emergent vegetation and the erosion of separating uplands between adjoining water bodies has been extensive, resulting in the expansion of many marsh bays and ponds. Currently, half of the entire marsh is open water, compared to 35% in 1979.⁸

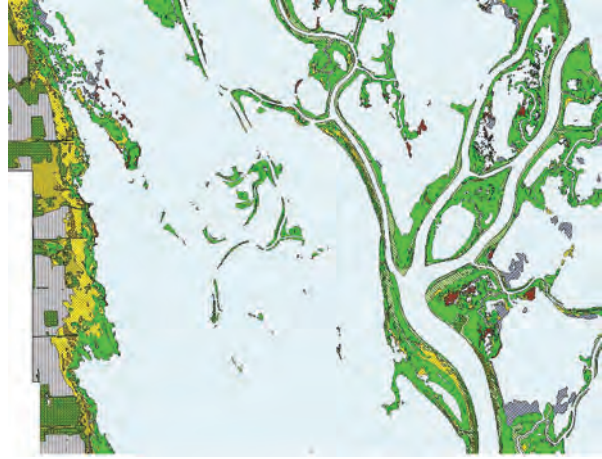
⁷ Janusz, R.A. and J.F. O'Connor, 1985. *The Netley-Libau Marsh fish resource. Manitoba Department of Natural Resources MS Report. No. 85-19*

⁸ Grosshans, R. E., Wrubleski D. A. and Goldsborough L. G., 2004. *Changes in the Emergent Plant Community of Netley-Libau Marsh Between 1979 and 2001. Delta Marsh Field Station (University of Manitoba) Occasional Publication No. 4, Winnipeg, Canada.*

EMERGENT PLANT GROWTH



1979



2001

The Netley–Libau marsh is impacted by other stressors as well. High flow events on the Red River result in the erosion and collapse of weak points in the levees that border the river and other channels. The Netley Cut, which was originally dredged in 1913, has been gradually eroded to a point where it now carries a substantial portion of the Red River flow into Netley Marsh. High nutrient loads in the Red River, along with the arrival of common carp, may also be contributing to enhanced algal growth and loss of vegetation within the marsh.⁹

NETLEY CUT



1923



2003

⁹ International Institute of Sustainable Development, 2010. *The Netley Libau Marsh Research Project (2005-2010): Netley-Libau Marsh – Part of the Solution The Historical Significance and EGS Benefits of Lake Winnipeg's Coastal Wetland.*

OAK HAMMOCK MARSH

Oak Hammock Marsh, a restored prairie marsh, is located in a 36 square kilometer Wildlife Management Area that is comprised of aspen-oak bluff, waterfowl lure crops, artesian springs and patches of tall-grass prairie providing valuable wildlife habitat. Oak Hammock Marsh sustains over 300 species of birds, and during migration season the number of waterfowl using the marsh during migration can exceed 400,000 daily. Oak Hammock Marsh has been recognized as a Ramsar Site – a Wetland of International Significance.¹⁰

Oak Hammock Marsh is managed by Manitoba Conservation. An interpretive centre located within the marsh is a joint project of Ducks Unlimited Canada and the Province of Manitoba. Oak Hammock Marsh faces its own set of challenges and stresses.



Marsh managers strive to balance the needs of surface water levels for marsh health with the need to protect downstream landowners from flooding. Proper and timely water level manipulation within the marsh is required to maintain the integrity of the dike system and

to maintain optimal wetland habitat. Water is often stored within the marsh to help alleviate flooding problems downstream. At some point in the season water needs to be released to ensure water level fluctuations for healthy emergent vegetation populations. This release may negatively effect downstream landowners during wet years, even if it's conducted later in the growing season. Water levels are elevated further as illegal drainage on private and crown land may take place. As more water is drained in upstream portions of the watershed, higher volumes of water move through the marsh system.

Invasive species are another key threat to the Oak Hammock Marsh. All Terrain Vehicles (ATV) spread invasive species like purple loosestrife. Although there has been no purple loosestrife found in the marsh to date, the weed has been found in areas nearby.

ADDRESSING THESE CHALLENGES

It is recognized that many of the challenges facing the Netley and Oak Hammock marshes are beyond the scope of this integrated watershed management plan. The Project Management Team acknowledges the need for a study on Netley-Libau marsh rehabilitation. The Project Management Team supports ongoing efforts of many organizations that are currently managing, studying and/or restoring these marshes.

¹⁰ Oak Hammock Marsh Interpretive Centre: Field Notes. <http://www.oakhammockmarsh.ca/nature/field-notes/pdf/history.pdf>

PLAN LINKAGES

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

There are four Planning Districts within the Netley-Grassmere watershed, of which, all are at various stages of plan development.

- Selkirk and Area Planning District
- Fisher-Armstrong Planning District
- Southern Interlake Planning District
- Eastern Interlake Planning District

Development plans are utilized by municipalities to ensure orderly and organized development of the local land resources. Development plans set

out zoning by-laws and restrictions for residential, commercial, recreation and industrial land uses. The Netley-Grassmere Water Planning Authority recognizes the close linkage between the Netley-Grassmere Integrated Watershed Management Plan and local development plans. By working together, both development planning and watershed planning can promote improvements to watershed health for the benefit of all residents.

The most vital action that was identified in the development of this plan was the need to place adequate restrictions on land use development around public drinking water sources and in sensitive groundwater areas. The protection of undeveloped shoreline along Lake Winnipeg and Netley Marsh was also identified as a priority.

Rural Municipalities and Planning Districts should consider the following recommendations:

1. Develop policies that restrict 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/ fertilizer storage and application, septic systems, petroleum storage, waste disposal grounds, industrial factories and wastewater facilities) in source water protection zones around all public drinking water systems and in areas with less than six meters of overburden;
2. Limit future development along the shores of Lake Winnipeg, Netley Marsh and in areas that have significant recreational value, including a 100 metre buffer to minimize impact on natural areas and decrease shoreline erosion;
3. Continue to restrict the sale of crown lands that contain permanent or semi-permanent wetlands or land that is prone to flooding to minimize the loss of natural areas and the need for drainage improvements and the associated impacts to downstream residents;
4. Establish development restrictions in flood prone areas, especially along the Red River to above the 1997 high water levels and the 2009 ice jam water levels;
5. Include East Interlake Conservation District as a commenting agency for all applications for new or expanding livestock facilities, new residential and subdivision developments and conditional use licenses;
6. Implement policies for the mandatory sealing of wells in areas that become serviced by public water systems;
7. Implement policies for new subdivisions to include extra green space for temporary surface water storage during spring melt and after summer rainstorms due to the increases in impervious surfaces; and
8. Develop policies to encourage water conservation and efficiency, such as the installation of water saving appliances in new homes.

IMPLEMENTATION

The most important aspect of any integrated watershed management plan is its implementation. Without it, the plan is no more than a list of good intentions. In the case of the Netley-Grassmere 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. As such, many organizations have committed to implementing the actions outlined in this plan.

Progress and success of the plan's implementation will be assessed on an annual basis. Watershed report cards will be distributed to water 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.

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



TABLE 2: IMPLEMENTATION PLAN FOR THE NETLEY-GRASSMERE IWMP

GOAL 1: IMPROVE SURFACE WATER QUALITY IN WATERWAYS WITHIN THE NETLEY-GRASSMERE WATERSHED

Objective 1A: Identification and assessment of water quality			
RECOMMENDATIONS	LEAD ORGANIZATION(S) *	TARGET AREA(S) **	EVALUATION OF SUCCESS
Identify and map potential contamination sources and develop mitigation strategies	EICD, MB CON	Watershed	Geodatabase is completed
Continue long-term water quality monitoring programs	MWS, EICD	Red River, Parks Creek, Wavey Creek, Netley Creek, Grassmere Creek	Five long term water quality monitoring stations are maintained
Objective 1B: Reduction of nutrients entering waterways			
RECOMMENDATIONS	LEAD ORGANIZATION(S)	TARGET AREA(S)	EVALUATION OF SUCCESS
Implement beneficial management practices (BMPs) that reduce or eliminate excess nutrients from entering waterways, including exclusion fencing, off-site watering systems, vegetated riparian buffers, wintering site management, improved manure management, relocation of livestock facilities, and improved fertilizer application practices	MAFRI, EICD, AAFC-AESB	Watershed	100 projects are completed
Establish and maintain permanent vegetative cover in riparian areas to minimize soil loss and erosion and filter runoff	MHHC, EICD, Planning Districts, Municipalities, MIT	Watershed	200 acres of riparian area is maintained or created
Reduce urban sources of nutrients and other contaminants through the promotion of grey water recycling, reduced use of fertilizers, stormwater management and retention	Landowners, MWS, Planning Districts, Municipalities	Zone 3, 4	Three activities are completed, such as development plan policies or subsidy programs
Encourage the adoption of nutrient management planning (manure and soil testing) aimed at matching application rates with crop nutrient requirements	MAFRI, AAFC-AESB, EICD	Zone 1, 2, 5	Five educational activities are completed
Encourage the incorporation or injection of manure into soil during application	Landowners, MAFRI	Zone 1, 2, 5	Five educational activities are completed
Discourage the winter application of manure	Landowners, MAFRI	Zone 1, 2, 5	Three educational activities are completed by 2013

Reduce grazing in riparian areas along the Grassmere Creek and Parks Creek	Landowners, MAFRI, EICD, AAFC-AESB, Municipalities	Zone 1, 2	A reduction in grazing
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Objective 1C: Enhancement of sewage and wastewater treatment

RECOMMENDATIONS	LEAD ORGANIZATION(S)	TARGET AREA(S)	EVALUATION OF SUCCESS
Conduct environment risk assessments for all wastewater treatment lagoons and sewage treatment plants and establish site-specific effluent discharge objectives	TBD	Watershed	All wastewater treatment plants and lagoons establish site specific effluent discharge objectives
Operators of wastewater lagoons should investigate possible treatment improvements, outline strategies for improved record keeping, identify options for nutrient abatement, include a map of the service area and address access issues	Municipalities, Stony Mountain Federal Penitentiary	Watershed	All wastewater lagoons have management plans
Expand wastewater treatment within the urban corridor and major urban centres	Municipalities	Zone 3, 4	An increase in the number of communities connected to public wastewater treatment facilities
Ensure emergency discharge plans are in place for all wastewater lagoons and treatment plants. Plans are to outline procedures to notify the public and should include mitigation measures for negative impacts on water quality	Municipalities, Stony Mountain Federal Penitentiary	Watershed	All wastewater lagoons have emergency discharge plans
Enhance the inspection program for on-site wastewater management systems on residential properties in sensitive areas along the Red River corridor and Lake Winnipeg and in source water protection zones, with the goal of mandatory inspections every 8 years being implemented by 2018	Municipalities, MB CON	Watershed	100 inspections per year
Spatially track the installation of new septic systems installations using a geodatabase	MB CON, Municipalities, Septic System Companies	Watershed	Spatial inventory of septic system installation is developed
Provide septic system retrofit incentives or subsidies	EICD	Watershed	10 septic systems upgrade projects are completed
Implement better management practices for landfill runoff capture, monitoring and treatment	Municipalities	Watershed	One project is completed
Ensure all wastewater treatment facilities are licensed	Municipalities, MB CON	Watershed	All wastewater treatment facilities are licensed

Objective 1D: Education on how to improve surface water quality			
RECOMMENDATIONS	LEAD ORGANIZATION(S)	TARGET AREA(S)	EVALUATION OF SUCCESS
Develop a public education program to promote what individuals can do to reduce their nutrient loading	EICD, MWS, LWF, RRBC	Watershed	Five activities or publications that educate residents are completed
Provide environmental education programs to help producers assess the environmental risk of their operations, like the Environment Farm Plan Program	MAFRI, AAFC-AESB	Zones 1, 2, 5	Environmental education programs are offered every year
Support education opportunities that demonstrate the benefits of implementing beneficial management practices	MAFRI, EICD, AAFC-AESB	Zones 1, 2, 5	Five demonstration events are held
Educate watershed residents on how to properly maintain and inspect septic fields and tanks	EICD, MB CON	Watershed	Three activities or publication that educate residents are completed
Acknowledge agricultural producers and traditional land users as the stewards of the land, including publications highlighting the implementation of BMPs	MAFRI, AAFC-AESB, EICD	Zone 1, 2, 5	Five activities are completed
Incorporate surface water quality education into schools	Manitoba Education, Citizenship and Youth, EICD, Project WET, Oak Hammock Marsh, South Basin Reeves and Mayors Committee	Watershed	Three activities that educate youth are completed

GOAL 2: ADOPT A WATERSHED-BASED APPROACH TO SURFACE WATER MANAGEMENT

Objective 2A: Improved coordination of surface water management			
RECOMMENDATIONS	LEAD ORGANIZATION(S) *	TARGET AREA(S) **	EVALUATION OF SUCCESS
Establish development restrictions in flood prone areas, especially along the Red River to above the 1997 high water levels and the 2009 ice jam water levels	Municipalities, Planning Districts	Watershed	A development policy is adopted
Establish a Surface Water Management committee to update surface water management policies, coordinate the implementation of the surface water management plan, assess the current state of the drainage system including capacity and condition, identify and map flood prone areas, review annual maintenance schedules and work plans on a watershed basis and coordinate equipment needs	EICD, Municipalities, MIT, MWS	Watershed	A Surface Water Management Committee is established and projects identified in the plan are implemented

Develop and update a geodatabase of the drainage system, including an assessment of drain and culvert condition	EICD, Municipalities, MIT	Watershed	A geodatabase is maintained
Implement and encourage low-impact, environmentally friendly drainage design practices	Municipalities, MIT	Watershed	A manual is made available
Ensure that the standard of drainage provided is compatible with current and future land uses	Municipalities, MIT	Watershed	The surface water management plan is utilized to make decisions
Replace severely damaged culverts	Municipalities, MIT	Watershed	All severely damaged culverts are replaced

Objective 2B: Promotion of temporary hold back and permanent retention of water

RECOMMENDATIONS	LEAD ORGANIZATION(S)	TARGET AREA(S)	EVALUATION OF SUCCESS
Incorporate runoff retention into new subdivisions	Planning Districts, Municipalities	Zone 3, 4	A by-law or development plan policy is adopted

Objective 2C: Education about surface water management

RECOMMENDATIONS	LEAD ORGANIZATION(S)	TARGET AREA(S)	EVALUATION OF SUCCESS
Distribute information on drainage licensing procedures and policies, including instructions on how to apply for a license and what types of works require a license	MWS	Watershed	Three educational activities are completed
Distribute existing surface water management assessment information	Municipalities, MIT, EICD	Watershed	Information is more readily available
Identify culverts with markers	Municipalities, MIT	Zone 1, 2, 5	50% of culverts are marked

GOAL 3: PROTECT AND IMPROVE THE QUALITY OF DRINKING WATER

Objective 3A: Source water protection for public drinking water sources

RECOMMENDATIONS	LEAD ORGANIZATION(S) *	TARGET AREA(S) **	EVALUATION OF SUCCESS
Develop policies that restrict development and land use activities that pose a high risk of causing pollution (including chemical/fertilizer storage, septic systems, petroleum tanks, waste disposal grounds, lagoons, intensive farming operations, industrial plants, etc) in source water protection zones and in areas with less than six metres of overburden	Planning Districts, Municipalities	Source Water Protection Zones and areas with less than six metres of overburden	By-laws and development plan policies are adopted

Expand or upgrade drinking water treatment in urban and cottage communities	Municipalities, Provincial and Federal Government, Manitoba Water Services Board	Zone 3, 4	An increase in the number of communities connected to public drinking water treatment systems
Seal unused, abandoned and problem flowing wells within all source water protection zones and in areas of less than six metres of overburden	EICD, Landowners, Municipalities	Source Water Protection Zones and areas with less than six metres of overburden	40 wells are sealed
Investigate possible cross-connections to the Stony Mountain public water distribution system and address if discovered	Stony Mountain Water Supply Utility, MWS	Stony Mountain Water Supply	An investigation is completed and any cross-contamination issues are addressed
Investigate whether the back-up well for the Stonewall Trailer Court meets drinking water standards and seal if it does not	Stonewall Trailer Court Water Supply Utility, MWS	Stonewall Trailer Court Water Supply	The Stonewall Trailer Court backup well meets the standards or the well is sealed
Ensure water treatment plants are locked to provide security against vandalism	Operators of public drinking water systems	All public drinking water systems	All treatment plants are locked
Relocate an above ground fuel tank located outside of the Town of Stonewall Parks & Recreation building or install secondary containment	Town of Stonewall	Town of Stonewall	The fuel tank is relocated or secondary containment is installed
Collect additional information on well specifications at Chesley's Resort, including the proximity of septic tanks	MWS	Chesley's Resort	All necessary information on the well is collected
Investigate options to upgrade the community of Rivercrest's water treatment plant as infrastructure is old and the system is unable to support all residents	Rural Municipality of West St. Paul	Community of Rivercrest	All necessary information on the well is collected
Ensure emergency response plans are in place	Operators of public drinking water systems	All public drinking water systems	Plans are developed
Objective 3B: Protection of non-public drinking water sources (semi-public and private wells)			
RECOMMENDATIONS	LEAD ORGANIZATION(S)	TARGET AREA(S)	EVALUATION OF SUCCESS
Enhance communication of boil water advisories and potential contamination sources	MWS	Watershed	An increase in communication activities
Complete a study on the interaction between surface water and groundwater, including an examination of recharge processes and rates, groundwater quality in recharge areas, and groundwater withdrawal rates	MWS	Watershed	A study is completed

Investigate opportunities to complete a study on the impact of quarry extraction on groundwater quality	Rockwood Quarry Committee, EICD	Rockwood Quarries	If feasible, a study is completed
Continue to sample private wells for nutrients and bacteria and expand to include the identification of potential sources of contamination	EICD, MWS	Watershed	A well sampling program is offered
Conduct an annual inspection of the Grassmere Drain for sinkholes before the Town of Stonewall discharges its lagoon	MIT	Grassmere Drain	Annual inspections of the Grassmere Drain are completed
Seal sinkholes that pose a threat to groundwater quality	MIT, Municipalities	Areas with less than six metres of overburden	All sinkholes that pose a threat to drinking water are sealed
Coordinate and promote drop off depots for hazardous waste, chemicals or other potential contaminants	Municipalities, MB CON	Watershed	A drop-off depot for contaminants is established
Implement beneficial management practices (BMPs) to reduce or prevent groundwater contamination, including the promotion of pitless well adapters, planting grass around wellheads, regular well inspection and maintenance, and improved on-site storage and handling of potential contaminants such as fertilizer, petroleum products and pesticides	MAFRI, EICD, AAFC-AESB	Watershed	30 projects are completed
Implement policies for the mandatory sealing of wells in areas that become serviced by public water systems	Municipalities, Planning Districts	Watershed	A development plan policy and by-law are adopted

Objective 3C: Promotion of water conservation

RECOMMENDATIONS	LEAD ORGANIZATION(S)	TARGET AREA(S)	EVALUATION OF SUCCESS
Provide rebates or subsidies for improved water conservation, such as low-flow toilets, showerheads, rain barrels and grey water recycling practices	MWS, EICD	Zone 3, 4	A subsidy or rebate program is established
Develop policies to encourage water conservation and efficiency in new developments, such as the installation of water saving appliances	Planning Districts, Municipalities	Watershed	A development plan policy and by-law are adopted
Educate watershed residents on water conservation practices, such as low-flow water fixtures, water saving appliances and xeriscaping	EICD, MWS	Watershed	Two educational activity is completed

Objective 3D: Education about the aquifer and the importance of groundwater protection

RECOMMENDATIONS	LEAD ORGANIZATION(S)	TARGET AREA(S)	EVALUATION OF SUCCESS
Distribute educational publications on sources of drinking water, the importance of groundwater protection, the impacts of land use activities, how to perform well assessments, wellhead protection measures and proper maintenance procedures for wells and septic systems	EICD, MWS	Watershed	Three publications or education activities are completed
Incorporate groundwater education into schools	Manitoba Education, Citizenship and Youth, EICD	Watershed	Three activities that educate youth are completed

GOAL 4: PROTECT AND RESTORE THE QUALITY AND INTEGRITY OF NATURAL AREAS TO MAINTAIN A HEALTHY WATERSHED

Objective 4A: No net loss of natural areas

RECOMMENDATIONS	LEAD ORGANIZATION(S) *	TARGET AREA(S) **	EVALUATION OF SUCCESS
Map natural areas, including wetlands, aquatic habitat, forests and riparian areas, and identify key areas for rehabilitation	EICD, DUC, MHHC	Watershed	An inventory is completed
Continue to identify natural areas for inclusion in the Province's Protected Areas initiative and classify them accordingly in the Province's crown land plans	MB CON	Watershed	Natural areas are identified and classified
Preserve natural areas through the implementation of conservation easements, taxation easements, ecological goods and services programs or the purchase of land	MHHC, EICD, DUC, Municipalities	Watershed – focus on Zone 1 and 2	640 acres of natural areas are preserved or protected
Implement beneficial management practices (BMPs) that create or enhance riparian areas and protect against erosion and sedimentation	MAFRI, EICD, MHHC, AAFCAESB	Zone 1, 2, 3	20 projects are completed
Maintain the integrity of the major snake denning sites	MB CON	Zone 1	Two activities are completed
Protect snake migration corridors from development through the use of mortality mitigation techniques, such as tunnels and drift fences, in locations where snakes migration is concentrated	Municipalities, Planning Districts, MB CON	Zone 1	Two activities are completed

Create a riparian area buffer of 100m for all future development along the shore of Lake Winnipeg and Netley Marsh	Planning Districts, Municipalities	Watershed	A development policy is adopted
Continue to restrict the sale of crownlands that contain permanent or semi-permanent wetlands or lands that are prone to flooding	MAFRI, Municipalities MB CON	Zone 1	A development policy is adopted or a by-law is passed

Objective 4B: Protection and enhancement of aquatic habitat

RECOMMENDATIONS	LEAD ORGANIZATION(S)	TARGET AREA(S)	EVALUATION OF SUCCESS
Restore degraded riparian areas and eliminate barriers to fish passage, including the completion of 47 identified rehabilitation projects	EICD, Municipalities, MIT, DFO	Watershed	47 aquatic rehabilitation projects are completed
Develop a demonstration site to illustrate the benefits of re-meandering waterways	Municipalities, MIT, MWS, DFO	Watershed	A demonstration project is completed
Continue to conduct studies on the management and restoration of Netley Marsh	IISD, Universities, RRBC, MWS	Zone 3	A study is completed
Consult a geotechnical engineer to determine if a structural or non-structural method is the best approach for shoreline protection and to develop a design plan	Landowners	Zone 3	An engineer is hired to provide guidance on erosion control practices

Objective 4C: Education about ecosystems and the importance of protecting natural areas

RECOMMENDATIONS	LEAD ORGANIZATION(S)	TARGET AREA(S)	EVALUATION OF SUCCESS
Raise awareness of the value of existing intact wetlands, aquatic habitat, shoreline and riparian areas	EICD, MHHC	Zone 3	Three publications or activities are completed
Distribute information on the importance of protecting garter snakes and their dens	MB CON	Zone 1	Two publications or activities are completed

- * Lead and support organizations are included. Lead organizations are listed first.
- ** Refer to maps found on pages 17 – 27, 32.



GLOSSARY

AAFC - AESB – Agriculture and Agri-Food Canada - Agri-Environment Services Branch
(formerly Prairie Farm Rehabilitation Administration)
DFO – Department of Fisheries and Oceans
DUC – Ducks Unlimited Canada
EICD – East Interlake Conservation District
IGA – Manitoba Local Government (formerly Manitoba Intergovernmental Affairs)
IWMP – Integrated Watershed Management Plan
LWF – Lake Winnipeg Foundation
LWSB – Lake Winnipeg Stewardship Board
MAFRI – Manitoba Agriculture, Food and Rural Initiatives
MB CON – Manitoba Conservation
MHHC – Manitoba Habitat Heritage Corporation
MWS – Manitoba Water Stewardship
MIT – Manitoba Infrastructure and Transportation
PMT – Project Management Team
RM – Rural Municipality
RRBC – Red River Basin Commission
TBD – To be determined
WPA – Water Planning Authority

DEFINITIONS

ALGAL BLOOM

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

AQUATIC ECOSYSTEM

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

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

BENEFICIAL MANAGEMENT PRACTICE (BMP)

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

CONSERVATION AGREEMENT

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

DEVELOPMENT PLAN

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

DRINKING WATER SOURCE

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

ECOLOGICAL GOODS AND SERVICES

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

NATURAL AREAS

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

NUTRIENT LOADING

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

PLANNING DISTRICT

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

PRIVATE WATER SOURCE

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

PUBLIC WATER SOURCE

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

RIPARIAN AREA

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

RISKY DEVELOPMENT

Developments, activities, land uses and structures that have a high risk of causing pollution and include but are not limited to chemical/fertilizer storage and application, septic fields and tanks, petroleum storage, waste disposal grounds, industrial factories and wastewater facilities.

SEMI-PUBLIC WATER SOURCE

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

SENSITIVE GROUNDWATER AREA

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

SOURCE WATER

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

STAKEHOLDER

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

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