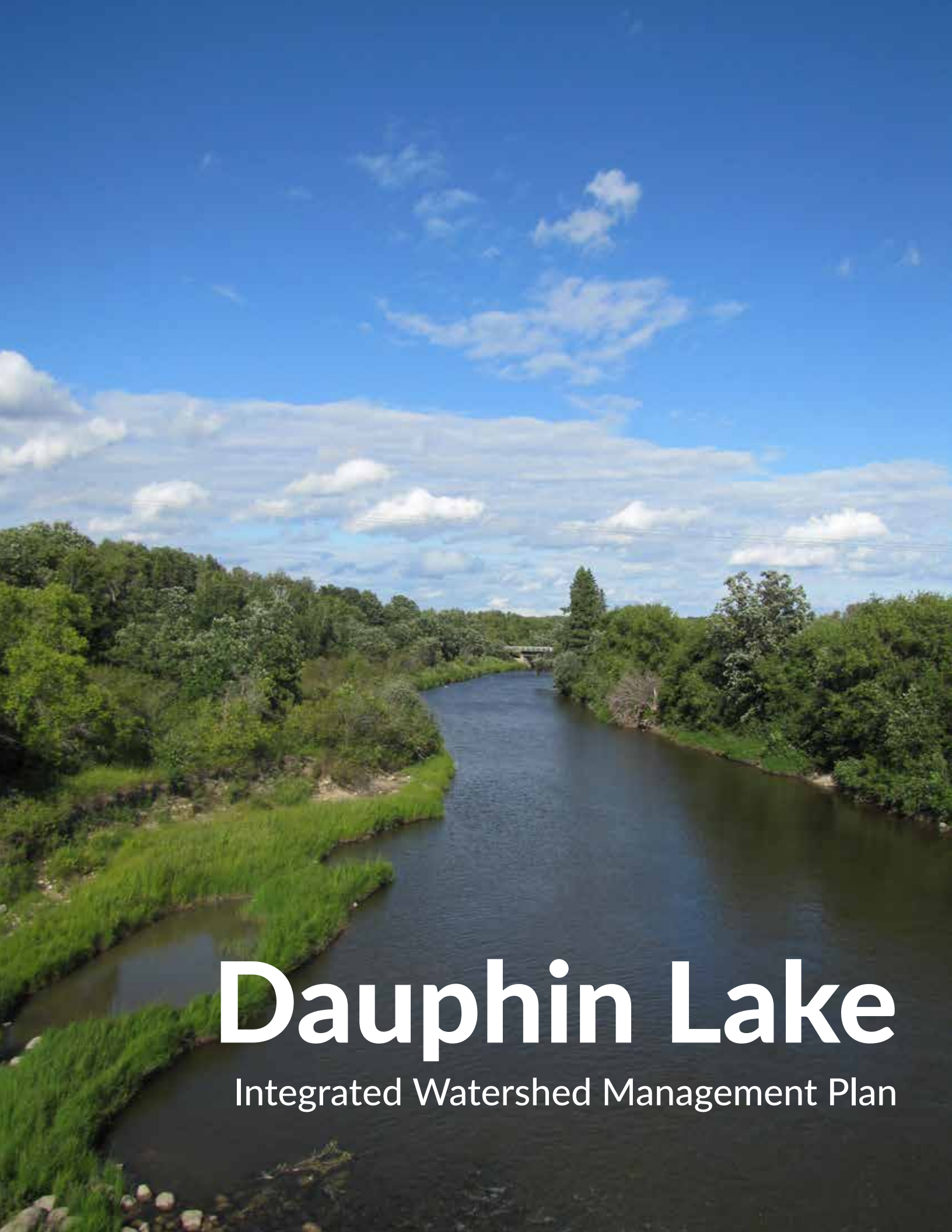


Dauphin Lake

Integrated Watershed Management Plan

Executive Summary

Watersheds are considered the most ecologically and administratively appropriate units for managing water. Working within watersheds facilitates cooperation, allowing people and governments to address surface water management, water quality, drinking water, fisheries and wildlife habitat, and community challenges beyond the scope of single jurisdictions. The size and diversity of the Dauphin Lake Watershed highlight the need for cooperation – at 3,250 sq. mi. (8,414 km^2) it is one of the largest watersheds in southern Manitoba. The Dauphin Lake Watershed is characterized by a wide range of landscapes (from the forested slopes of the Manitoba Escarpment to the lowland plains surrounding Dauphin Lake), seven major tributary streams, seven rural municipalities, and two conservation districts.

This integrated watershed management plan 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 resources within the watershed. Each stakeholder in the watershed has a role in ensuring that this watershed plan is successfully adopted and implemented.

Many actions have been identified within this watershed plan to help us reach our goals related to three priorities: **Drinking Water** **Surface Water Management** **Healthy Fisheries and Wildlife Habitat**

Some of the key outcomes that will result from the targeted implementation of this plan include:

- **An emergency spillway for Dauphin Lake** – the Mossy River Dam on the outlet of Dauphin Lake protects lake levels during periods of drought but there is no protection to minimize flood damages around the Lake during extreme wet periods, resulting in the need to construct an emergency spillway;
- **Rehabilitated streams, alluvial fans and other natural areas** - to minimize erosion and siltation, thereby improving infiltration, water quality, fish spawning habitat, and surface water management;
- **Temporary and permanent water retention** – water retention in upstream areas will help reduce peak flows and subsequent water-based erosion and flood damages in downstream areas; and,
- **Enhanced protection and public awareness** – of drinking water sources, wildlife habitat, and at-risk landscape features throughout the watershed.

Acknowledgements

The Intermountain Conservation District and Turtle River Watershed Conservation District, as the joint Water Planning Authority for the Dauphin Lake Watershed, would like to thank our watershed residents and partners for their support, input and participation in the development of the Dauphin Lake Integrated Watershed Management Plan.

Special acknowledgement is owed to the members of the Project Management Team – Ernie Bayduza, Wes Bernat, Paul Brunel, Myles Haverluck, Jim Kaleta, Boris Michaleski, Rodger Sheldon, John Towle, Bobby Bennett, Jeff Thiele, Jody Tucker, Suzanne Chiupka, and April Kiers North. Thank you to our funding partners – The Province of Manitoba, City of Dauphin, and the Municipalities of Dauphin, Ethelbert, Gilbert Plains, Grandview, Lakeshore, McCreary, and Ste. Rose.

Thank you to the members of the Watershed Team which included representatives from Agriculture and Agri-Food Canada, Ducks Unlimited Canada, Manitoba Habitat Heritage Corporation, Louisiana Pacific, Manitoba Conservation and Water Stewardship, Manitoba Infrastructure and Transportation, Manitoba Agriculture, Food and Rural Development, Manitoba Municipal Government, Nature Conservancy Canada, Riding Mountain National Park, and local municipalities and residents of the watershed.

Table of Contents

Acronyms and Definitions

acre-ft	1 acre-foot is equivalent to the volume of water that would cover one acre to a depth of one foot
ASL	Above Sea Level
CD	Conservation District
dam^3	cubic decametres (1 dam^3 = 0.811 acre-foot)
DUC	Ducks Unlimited Canada
ft	feet
ha	hectares (1 ha = 2.471 acres)
IWMP	Integrated Watershed Management Plan
MAFRD	Manitoba Agriculture, Food and Rural Development
MCWS	Manitoba Conservation and Water Stewardship
MHHC	Manitoba Habitat Heritage Corporation
MIT	Manitoba Infrastructure and Transportation
MMG	Manitoba Municipal Government
NCC	Nature Conservancy Canada
PMT	Project Management Team
RM	Rural Municipalities
RMNP	Riding Mountain National Park
WTP	Water Treatment Plant

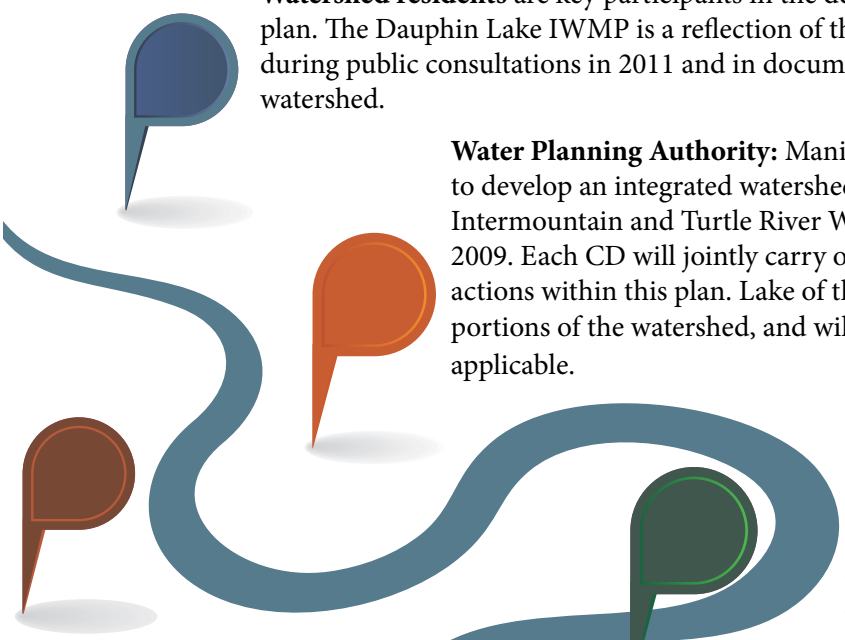
Introduction

The Dauphin Lake Watershed is home to approximately 17,000 people who live, work and play in this diverse and beautiful region. The people who populate this watershed value its natural resources, the rural lifestyle it affords them and the natural beauty of its lakes, rivers, streams, mountain parks and forests. These people helped to shape this integrated watershed management plan (IWMP) for the Dauphin Lake Watershed.

Integrated Watershed Management Planning

Watersheds are considered the most ecologically and administratively appropriate unit for managing water. A watershed is defined as an area of land in which all water drains to a common point, in this case Dauphin Lake. Water flows downstream through a watershed and any activity that happens upstream affects people and places downstream. Planning based on watersheds provides an opportunity to address the cumulative impacts of land and water management practices beyond the scope of single jurisdictions.

In 2010, the Intermountain and Turtle River Watershed Conservation Districts (CDs) were granted authority under the *Water Protection Act* to develop this locally-led IWMP. This ten year plan will be a tool used by residents, governments and other stakeholders to responsibly manage land and water resources and allocate conservation dollars within the watershed. Limited funding for implementation is available, primarily through annual conservation district budgets. In order to maximize implementation of this IWMP, additional funding will be sought from as many sources as possible, including provincial and federal governments, industry, and non-government organizations.



Watershed residents are key participants in the development and implementation of any watershed plan. The Dauphin Lake IWMP is a reflection of their collective values and priorities, as noted during public consultations in 2011 and in documents produced by previous planning efforts in the watershed.

Water Planning Authority: Manitoba's *Water Protection Act* bestows the authority to develop an integrated watershed management plan to local conservation districts. Intermountain and Turtle River Watershed CDs were granted this authority in 2009. Each CD will jointly carry out and coordinate the implementation of the actions within this plan. Lake of the Prairies CD and Alonsa CD also occupy small portions of the watershed, and will be engaged as partners in implementation where applicable.

The Project Management Team (PMT) is comprised of local representatives of the Intermountain and Turtle River Watershed CDs. They met regularly, hosted public consultations, toured the watershed, and finalized content of this watershed plan.

The Watershed Team is a group of experts ranging from local community organizations to technical staff from provincial and federal governments. They provided expertise and technical knowledge during plan development review.

Previous Plans in the Dauphin Lake Watershed

The Dauphin Lake Basin Advisory Board (DLBAB) was established in 1990 with the intent to "set in motion initiatives designed to stop the deterioration of Dauphin Lake." Representatives from 59 agencies, interest groups and local governments participated in the development of the terms of reference and election of an Executive. Although now defunct, the DLBAB paved the way for this integrated watershed management plan. Many of the initiatives outlined in the Basin Management Plan are still relevant today, and have been incorporated into the implementation section of this document.

1989: Dauphin Lake Opportunities for Restoration
A summary of more than thirty years of studies related to Dauphin Lake issues, this report was produced by Water Resources Branch (Manitoba Natural Resources) for the Dauphin Lake Basin Advisory Board (DLBAB). Their objective was to halt deterioration of Dauphin Lake by dealing with key issues throughout the basin, such as erosion, siltation and nutrient loading.

1992: Basin Management Plan
Produced by DLBAB, the management plan identified a large number of potential initiatives in five categories: Education, Flood Control and Lake Level Regulation, Recreation and Tourism, Sediment and Nutrient Load Reductions, and Habitat Development. The implementation of this IWMP builds on the initiatives that were identified in the Basin Management Plan.

1983: Summary Report of the Wilson Creek Experimental Watershed Study
The Wilson Creek Watershed was intensively studied for runoff and erosion control on streams that rise on the steep Manitoba Escarpment between 1957 and 1982. Weather and hydrological data were gathered to determine runoff characteristics; in addition, two headwater reservoirs and numerous channel protection works were constructed and monitored throughout the duration of the study.

1994: Stream Rehabilitation Project in the Dauphin Lake Basin
Projects supported by the DLBAB included rotational grazing, offsite watering, fenced riparian areas, rock riffle stream stabilization, and riparian vegetation re-establishment. Projects were completed along the Turtle, Ochre, Wilson and Vermilion Rivers.

2003: Valley River Watershed Study
The study highlighted riparian areas along the Valley River and its tributaries (Drifting River, Pleasant Valley Creek, Sulphurspring Creek) that have been highly impacted by land uses, channelization and erosion. Aerial surveys and ground truthing were used to determine areas of impact. Potential project areas were identified to reduce cattle impact, reduce erosion, and reduce sediment loading.

2006: Vermilion River Watershed Study
Intermountain CD contracted North/South Consultants Inc. to analyze land use and land cover in riparian areas along the Vermilion River, Edwards Creek, Salt Creek, and Jackfish Creek. Recommendations to enhance riparian conditions included projects to restrict cattle access and reduce flow velocities.

2010: Wilson River Watershed Study
Intermountain CD contracted North/South Consultants Inc., to analyze land use, land cover and degree of impact to riparian areas along the Wilson River and its tributaries. Recommended sites for rehabilitation were recommended for the Dingwall, Harper, Ranch Creek and Renicker Creeks and the Wilson River.

Watershed Overview

The Dauphin Lake Watershed is located in south-central Manitoba, within the larger Lake Winnipegosis/ Lake Manitoba drainage basin. It encompasses 817,700 ha (8,414 km^2 or 3,250 sq.mi.), a vast area of land with diverse topography. The watershed ranges from the forested upland plateaus and slopes of the Riding and Duck Mountains along the Manitoba Escarpment, to the lowland lake plains with a mixture of agriculture, forests and wetlands surrounding Dauphin Lake. The highest point in the province, Mount Baldy (elevation of 832 m (2,730 ft)), is located along the northwestern border of the watershed in the Duck Mountains.

The watershed is comprised of seven sub-watersheds, the headwaters of which originate in the Manitoba Escarpment. These seven sub-watersheds account for 80% of the total drainage area in the watershed, and include the Turtle, Ochre, Vermilion, Wilson, and Valley Rivers; and Edwards and Mink Creeks (Table 1). The remaining 20% of the watershed area is characterized by small creeks and streams that flow directly into Dauphin Lake. The Valley River and Mink Creek originate in the Duck Mountains to the west; the other five tributaries arise from the Riding Mountains to the south. Approximately 23% of the total drainage area is concentrated in the Duck and Riding Mountains. The steep slopes and extreme surface water runoff that characterize these areas contribute to erosion, siltation, and downstream impacts to water quality, aquatic habitat, and water management.

Table 1. Subwatersheds of the Dauphin Lake Watershed (Manitoba Water Commission, 1984)

Subwatershed	Drainage Area (km^2)	Drainage Area (sq.mi.)	Contributing Streams	Stream Gradient
Valley River	2,870	1,108	Drifting River; Pleasant Valley, Silver and Sulphur Spring Creeks	0.4%
	Notes: Low sediment-transport capacity relative to other tributaries.			
Turtle River	2,064	797	Hansen, Henderson, McKinnon, Scott and Wilson Creeks	0.8% (ranges from 7% on the escarpment to 0.1% near Dauphin Lake)
Wilson River	925	357	Brown, Renicker, Ranch and Mineral Creeks	0.06%
	Notes: Rapid runoff with heavy silt load due to extremely steep northern slope of the Riding Mountain.			
Vermilion River	743	287	Salt, Maple, Spruce, Teepee and Edward Creeks	1.0%
	Notes: Rapid runoff with heavy silt load due to extremely steep northern slope of the Riding Mountain.			
Ochre River	344	133	Crooked and Crawford Creeks	2.0%
	Notes: Extremely prone to flooding and erosion, especially immediately below the escarpment.			
Edwards Creek	311	120	45% of drainage area within RMNP and its northern boundary. Includes Jackfish Creek.	1.9%
	Notes: Extensively modified. Straightened portions considerably increased flow velocities and sediment load.			
Mink Creek	274	106		0.57%
	Notes: At 274 km^2 the Mink Creek is the smallest of the major tributaries flowing into Dauphin Lake.			

Dauphin Lake is on the receiving end of its seven major tributaries, acting as the collection basin for runoff from 817,700 ha of land. Dauphin Lake is 49,728 ha in size (192 sq.mi.), with a maximum width of 19.3 km (12 miles) and a maximum length of 41.8 km (26 miles). Its average and maximum depths are 2.35 m (7.7 ft) and 3.66 m (12 ft) respectively. Dauphin Lake's single outlet is through the Mossy River, which flows 35 km (22 miles) from Mossy River Dam to Lake Winnipegosis with an elevation drop of 8.2 m (27 ft).

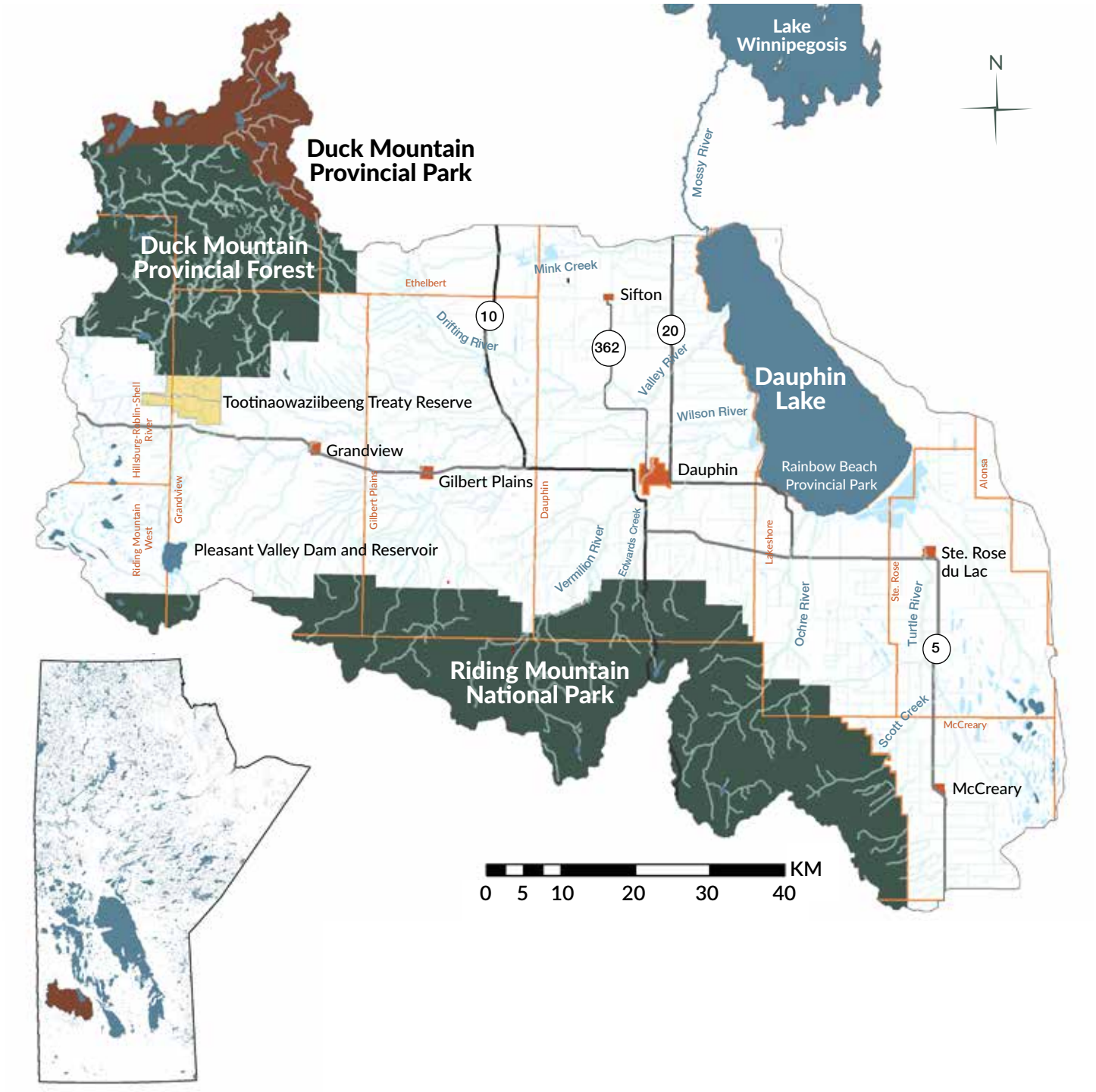


Figure 1. Overview of the Dauphin Lake Watershed

Climate and Topography

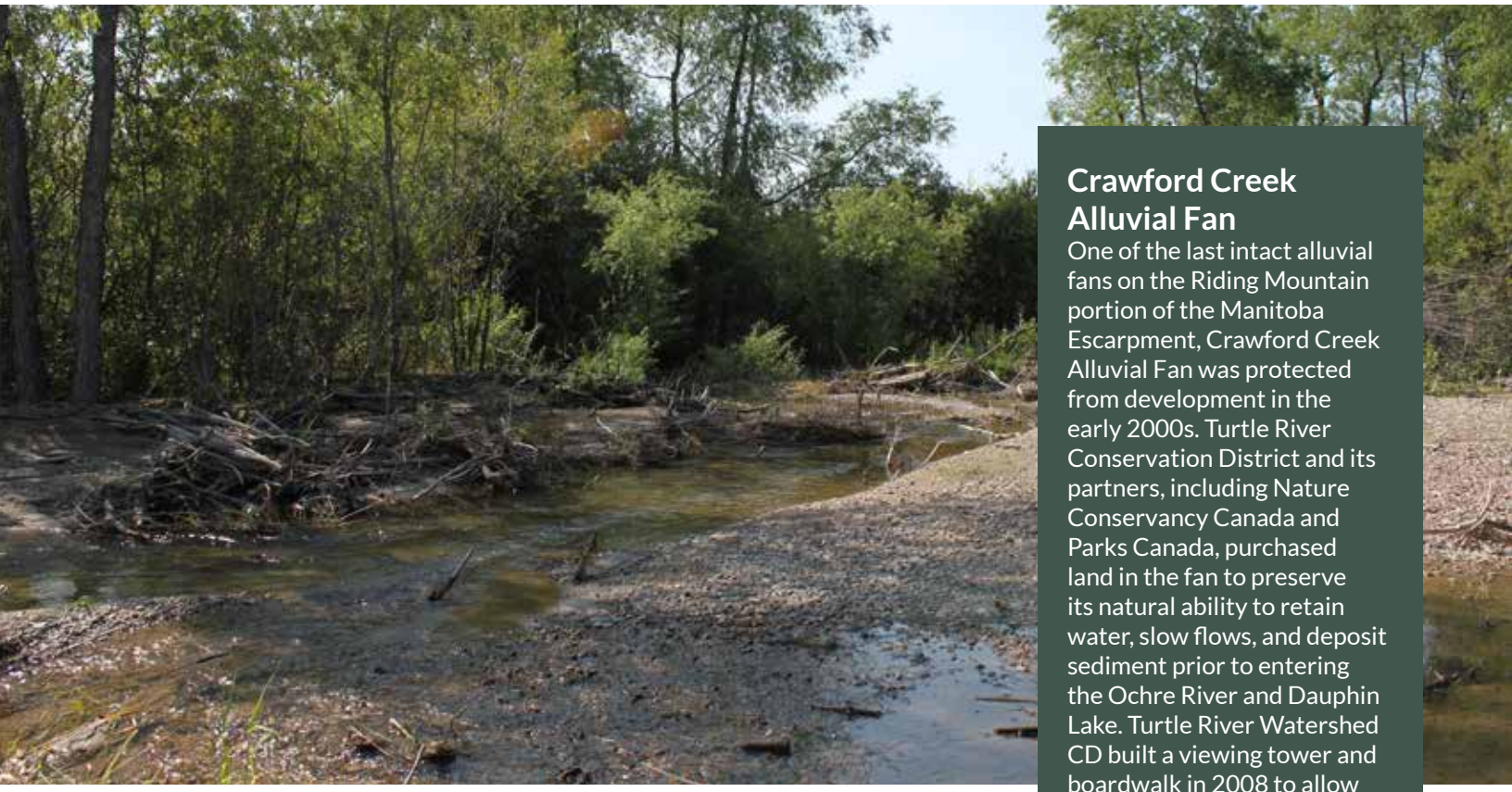
Average monthly precipitation ranges from 0.7 mm in February to 82.0 mm in June. Mean annual precipitation ranges from 480 – 520 mm; approximately one-quarter of total precipitation is due to snowfall. Mean annual temperature ranges from -0.3 – 2.3 ºC. There are 171-179 growing days on average, and the average number of growing degree-days is 1,400 to 1,610 (Environment Canada, 2015).

Localized temperature and precipitation vary with topography. Annual precipitation is generally about 50 mm greater on the eastern slopes of the Duck and Riding Mountains than throughout the rest of the watershed.

Topography describes the surface of the landscape, defines the borders of the watershed, and ultimately influences water movement throughout the landscape. The headwaters of each of the seven major tributaries in the Dauphin Lake Watershed originate between 832 m (2,730 ft) in the Duck Mountains and 670 m (2,440 ft) above sea level (ASL) in the Riding Mountains; and fall to elevation 261 m (855 ft) ASL at Dauphin Lake. Total vertical relief is 571 m (1,875 ft), of which 274 m (900 ft) is concentrated in the steep slopes of the Manitoba Escarpment (Figure 2).

Growing degree-days is a term that indicates the total heat available for plants in the growing season. The calculation is based on mean daily temperatures greater than 5ºC. Growing degree-day totals are used to compare the progress of a growing season to the long-term average, and are useful for estimating crop development and maturity dates.

Alluvial fans at the base of the escarpment act as "catch basins" for the extreme surface water flows that run off the steep slopes of the Riding Mountains. As topography flattens out in these areas, the water slows dramatically and drops its sediment load. All of these areas, with the exception of the Crawford Creek Alluvial Fan, have been drained and modified for human land uses.



Crawford Creek Alluvial Fan

One of the last intact alluvial fans on the Riding Mountain portion of the Manitoba Escarpment, Crawford Creek Alluvial Fan was protected from development in the early 2000s. Turtle River Conservation District and its partners, including Nature Conservancy Canada and Parks Canada, purchased land in the fan to preserve its natural ability to retain water, slow flows, and deposit sediment prior to entering the Ochre River and Dauphin Lake. Turtle River Watershed CD built a viewing tower and boardwalk in 2008 to allow for public access.

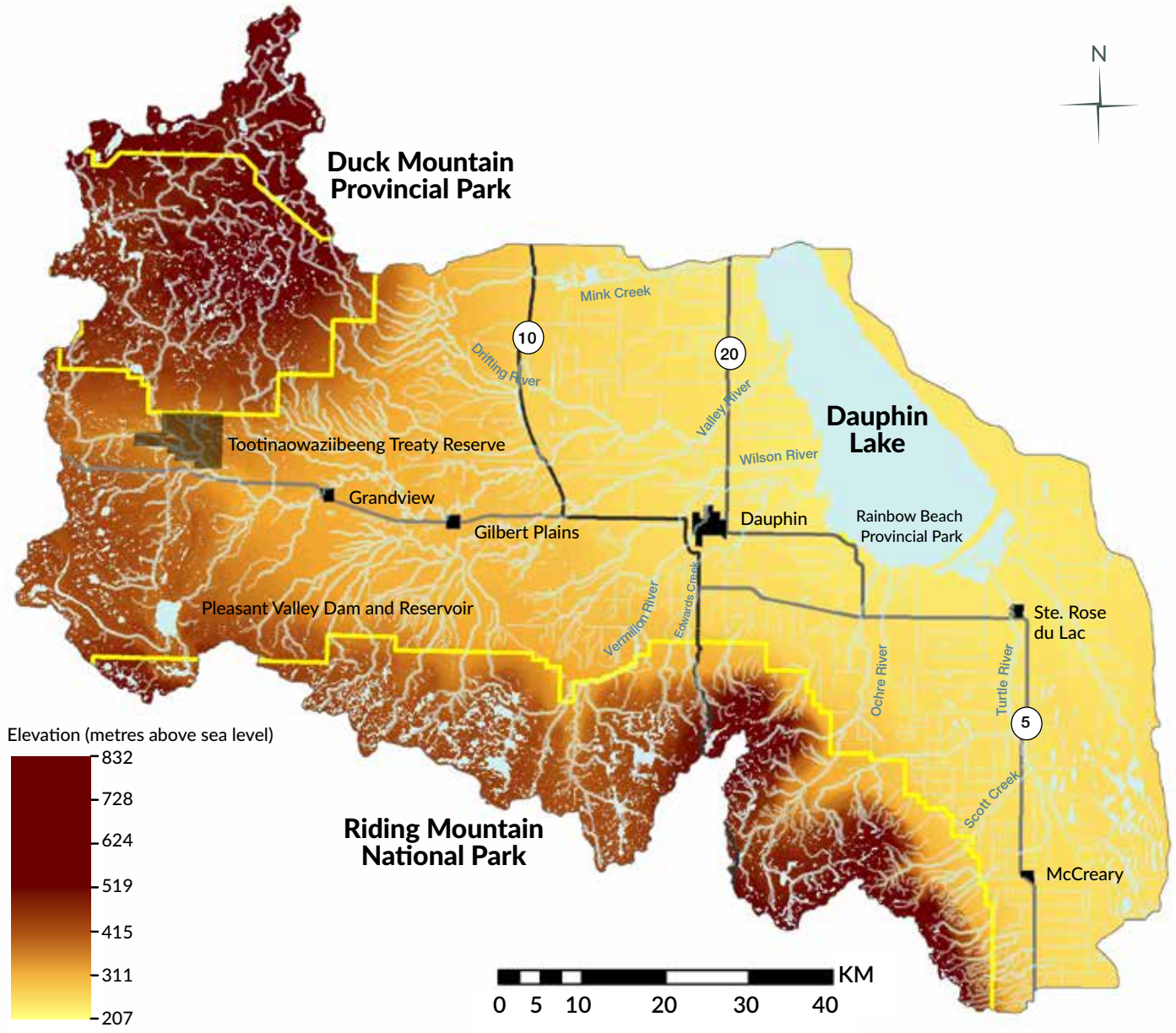


Figure 2. Topography of the Dauphin Lake Watershed

KEY ISSUE: Diverse topography interacts with snow melt and rainfall, contributing to surface water management challenges and water-based erosion downstream. The steep slopes of the Duck and Riding Mountains and extreme surface water runoff that characterize these areas contribute to erosion, siltation, and downstream impacts to water quality, aquatic habitat, and water management.

Geology

Watershed features such as topography and soils are a direct result of the geological history of the Canadian Prairies. In particular, glacial Lake Agassiz, a large body of glacial meltwater that accumulated in the flat basin of the Manitoba Lowlands ten to fifteen thousand years ago, influenced surficial (upper) geology throughout much of southern Manitoba. The Manitoba Escarpment (see sidebar) formed the western shoreline of glacial Lake Agassiz. Geological features that characterize the Dauphin Lake Watershed developed as a result of glaciation and include:

- beach ridge deposits of sand and gravel oriented in a north west direction (parallel to the escarpment) which formed as a result of wave action in glacial Lake Agassiz;
- stony glacial till deposits at the base of the escarpment and at higher elevations;
- occasional peat-containing contours between beach ridges;
- alluvial fans at the base of the escarpment, deposited as fast-flowing glacial streams transported eroded material down the escarpment;
- clay and ground moraine deposits, a mixture of sand, silt and clay, in the lowlands between the escarpment and Dauphin Lake.

Riding Mountain is composed of soft Millwood Shale beds overlain by hard Odanah Shale, much of which was worn away by glacial action. Millwood beds range from 5 – 21 m of soft greenish-gray shale which readily breaks down into clay. Millwood Shale is easily eroded by streams and is a major contributor of fine sediments in Dauphin Lake's tributaries.

Manitoba Escarpment

The Manitoba Escarpment defines much of southwestern Manitoba, extending about 500 km from the Canada - U.S. border near Morden northwesterly to the Manitoba – Saskatchewan border between Swan River and The Pas. The Escarpment is a series of low hills separated by broad river valleys which was formed millions of years ago when present day central Canada was overlain by a series of semi-tropical oceans. Each of these oceans deposited sediments that eventually became compacted and formed vast, thick sheets of shale and limestone - now Manitoba's underlying bedrock formations. The last of these oceans drained away 70 million years ago via a great river which flowed across present-day Manitoba. This great river eroded away the shale and formed an immense valley, the western edge of which still exists today as the Manitoba Escarpment.

Vermilion River

Soils and Agriculture

The Dauphin Lake Watershed is characterized by a range of soils that support a strong and diverse agricultural economy. Approximately 50% of the land in the watershed is owned and managed by farm operations which produce annual crops and beef cattle. Timber harvesting also contributes to farm income in some areas of the watershed. Land cover types in the watershed are primarily forest (38%) and annual cropland (31%). Forage land, indicative of alfalfa or alfalfa-grass stands, covers 6% of the watershed, although pasture and forage together make up 20% of the watershed (AAFC and MAFRI, 2012).

Soil formation is influenced by many factors including climate, vegetation, topography and drainage. These factors also influence soil management on-farm. Agricultural soils of the watershed are highly productive, having developed on Black and Dark Grey Chernozemic parent material of lacustrine and glacial origin (i.e., glacial Lake Agassiz). Fine and coarse loams with well - to imperfectly - drained soil structure support over 186,000 ha (76%) of annual cropland (AAFC and MAFRI, 2012).

Reconnaissance-level soils information (1:125,000) provides an adequate overview of soil distribution at the watershed scale. Highly productive soils for agriculture are distributed throughout the intermediate elevations of the Dauphin Lake Watershed. Approximately 46% (1495 sq.mi.) of watershed soils are classified as Classes 1, 2 and 3 under the Canada Land Inventory System. The majority of annual cropland is on Classes 1 - 3 soils (837 sq.mi.). Class 4 - 6 soils make up 21% (682 sq. mi.) of the watershed (Figure 3).

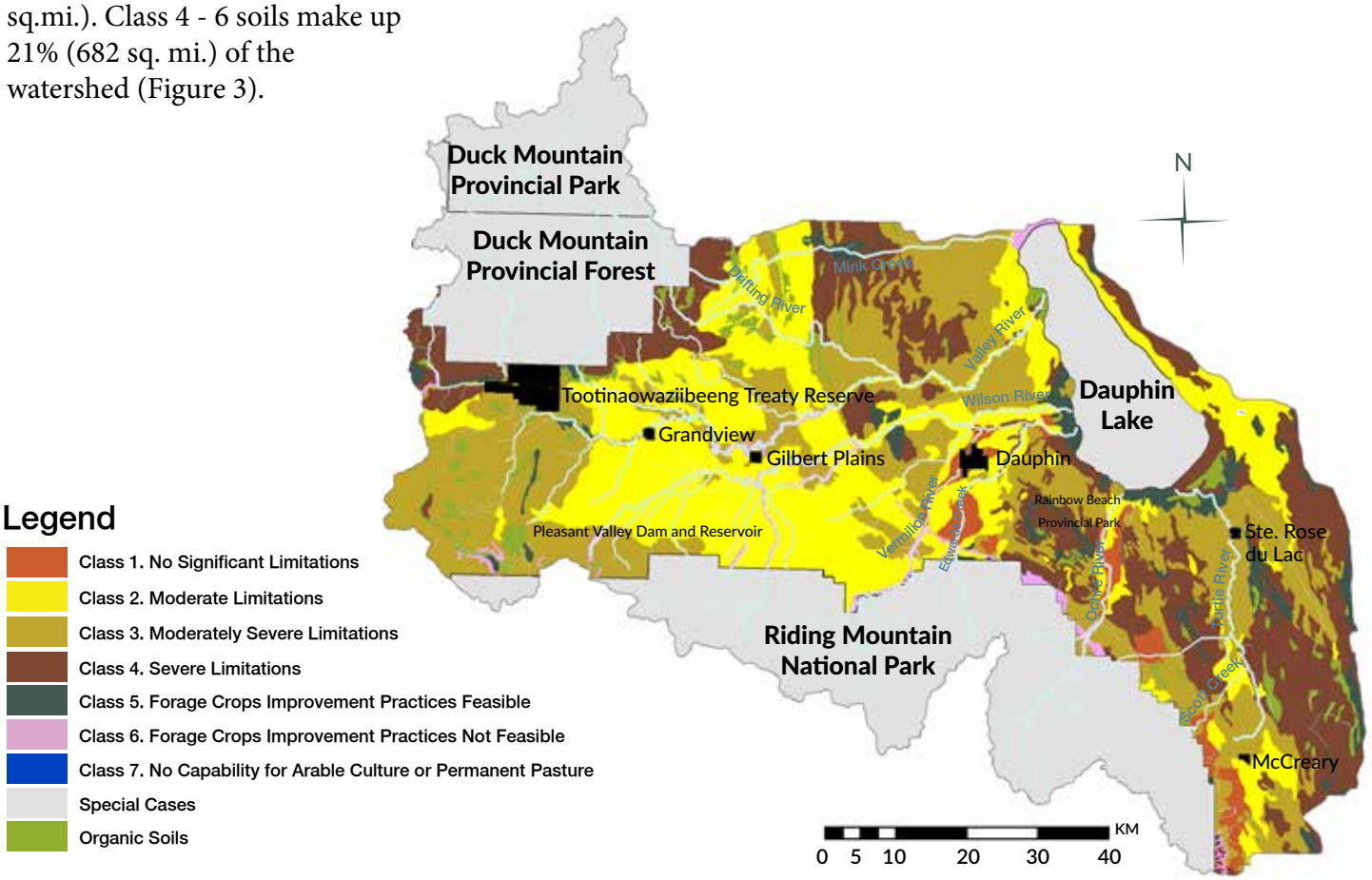


Figure 3. Agricultural capability of soils in the Dauphin Lake Watershed

The Canada Land Inventory System (CLI) is a comprehensive multi-disciplinary land inventory that identifies land capability for agriculture, forestry, wildlife and recreation. The land capability for dry land agriculture is based on evaluation of both external and internal soil characteristics that influence soil suitability and limitations for agricultural use. Class 1 lands have the highest, and Class 7 lands have the lowest capability to support agricultural land use activities. Land use decisions should be based on ground truthing of the data reported within the reconnaissance-level Canada Land Inventory.

Soils immediately adjacent to the shores of Dauphin Lake are carbonated, saline, and classified as poor or imperfectly drained. These conditions support native vegetation such as sedges, reeds, willows, and meadow grasses in the lower elevations surrounding the lake (i.e., below 875 ft (266.7 m) ASL).

KEY ISSUE: Native hay crops have been harvested from this area in the past; however, the recent period of high water levels has resulted in extensive cattail cover. Native hay production has been severely impacted, causing economic losses to livestock producers in recent years.

Risk of soil erosion by wind and water is calculated based on slope length, slope gradient, and soil type on unprotected soils. Both wind and water erode topsoil under exposed conditions, a serious concern for agricultural producers growing annual crops.

Approximately 35% of annual cropland in the Dauphin Lake Watershed is located on soils with moderate, high, or severe risk for wind erosion. However, conservation tillage has become widespread in the last 20 years, reducing the risk of wind erosion. Between 1991 and 2006, there was an increase in adoption of conservation tillage practices and a corresponding decline in conventional tillage (AAFC and MAFRI, 2012).

Water erosion risk is based on the Universal Soil Loss Equation (USLE), which provides an estimate of the amount of soil that is displaced due to soil, climatic, landscape and management factors. Approximately 34% of the watershed (267,000 ha) is characterized by soils that are considered to have a moderate to severe risk of water erosion. Compounding the risk of water erosion, over 61% of annual cropland (600 sq. mi.) is located on these soils categorized by moderate to severe risk of water-based erosion. Not surprisingly, most of these risk areas are located in the western part of the watershed, concentrated in the higher elevations running off of the escarpment (AAFC and MAFRI, 2012).

KEY ISSUE: Diverse topography, snow melt and rainfall contribute to surface water management challenges such as overland flooding, channel and bank erosion, and culvert, road and bridge washouts.

An extensive agricultural drainage system was implemented decades ago to support agricultural productivity. Although these drains effectively move water off fields and help manage excess moisture conditions in soils, there are unintended, adverse effects on water movement, soil erosion and aquatic ecosystem health.

Satellite imagery is classified into seven primary land cover classes in the data presented in the map and below: trees, annual crops, grasslands, wetlands, forage, water, and urban. The Dauphin Lake Watershed consists primarily of forested (38%) and annual crop (31%) cover classes. Other land cover classes are present in varying degrees, as follows:

- Grasslands and rangelands (pasture) are the third most predominant land cover type, making up 14% of the watershed – in particular, in the lowlands along the western shore of Dauphin Lake, and in the Mink Creek subwatershed. Tame forage land covers approximately 6% of the watershed.
- Wetlands make up approximately 7% of the watershed, and are concentrated in Riding Mountain National Park and Duck Mountain Provincial Park, and their adjacent forested areas.
- Approximately 2% of the watershed is classified as water (excluding Dauphin Lake), and 2% is urban.

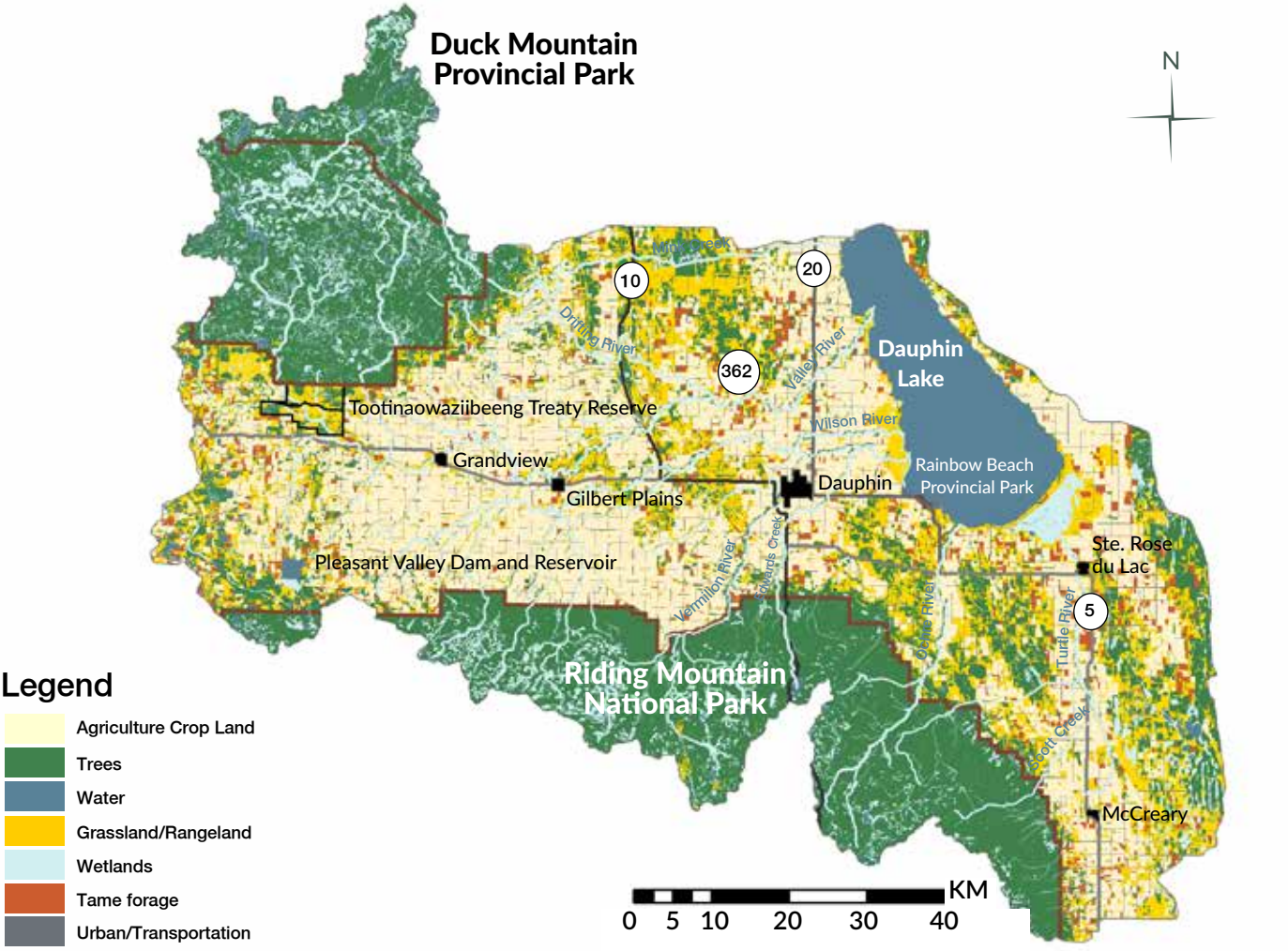


Figure 4. Land cover in the Dauphin Lake Watershed

Land cover data used in this analysis was derived from 30 m resolution LANDSAT Thematic Mapper satellite imagery taken on September 20, 2005 and August 22, 2006.

Forestry

Forest area is the largest single land cover type in the watershed, accounting for 38% of total land cover. The Dauphin Lake Watershed lies in the transition between the prairies and the boreal plains, and includes the Mid-Boreal Uplands, Aspen Parkland and Lake Manitoba Plain ecoregions. The Duck and Riding Mountains are within the Mid-Boreal Uplands ecoregion, characterized by medium to tall closed stands of trembling aspen and balsam poplar with white and black spruce. Balsam fir occurs in late successional stages. Louisiana Pacific Canada Ltd. holds a Forest Management License for the Duck Mountain Provincial Forest and a larger area that includes the entire Dauphin Lake Watershed (Forest Management Units 10, 11 and 13). In addition to LP Canada's logging operations, there are a number of smaller quota holders that harvest and supply LP's Oriented Strand Board plant in Minitonas, Spruce Products Ltd.'s lumber mill in Swan River and other small mills in the area.

Harvesting Practices in Manitoba

Forest harvesting activities are regulated by a series of provincial acts, regulations and guidelines, as well as industry-directed forest management plans, policies, procedures and standard operating guidelines. Forestry companies develop and implement sustainable long-term Forest Management Plans, as outlined in the *Forest Act* (2011). These plans are developed with First Nation, Aboriginal, Métis, public and government input, and are generally approved with conditions established by Manitoba Conservation and Water Stewardship.

Within the framework of a long-term Forest Management Plan a Forest Management Licensee must also prepare Operating Plans. Operating Plans describe in detail the timber harvesting, access development, and forest renewal activities proposed for the licensee and Quota Holders. Provincial water resources, fisheries, parks, forestry and wildlife staff review and improve Operating Plans before they are finalized. Operating Plans clearly identify where forest management activities will take place and how they will be carried out.

Operating Permits and Work Permits are also required to authorize timber harvest on Crown lands. Work permits are issued by regional or district Manitoba Conservation and Water Stewardship offices and may contain site-specific operating conditions in addition to those that may have been identified in *Environment Act* Licences, provincial guidelines, Operating Permits or Operating Plan comments.

The provincial guidebook, *Manitoba Conservation Forest Practices Guidebook: Forest Management Guidelines for Riparian Management Areas* (MCWS, 2008), sets standards for sustainable forest management practices adjacent to riparian and aquatic systems. Harvesting practices may be permitted, restricted or prohibited in different zones, depending on site conditions and distance to riparian areas. Social and traditional values, water quality, fish habitat, soils, wildlife, and forest health are taken into consideration when defining zone widths and prescribing allowable practices for each zone. These prescriptions are reflected in and enforceable by Work Permits.

Crown Lands

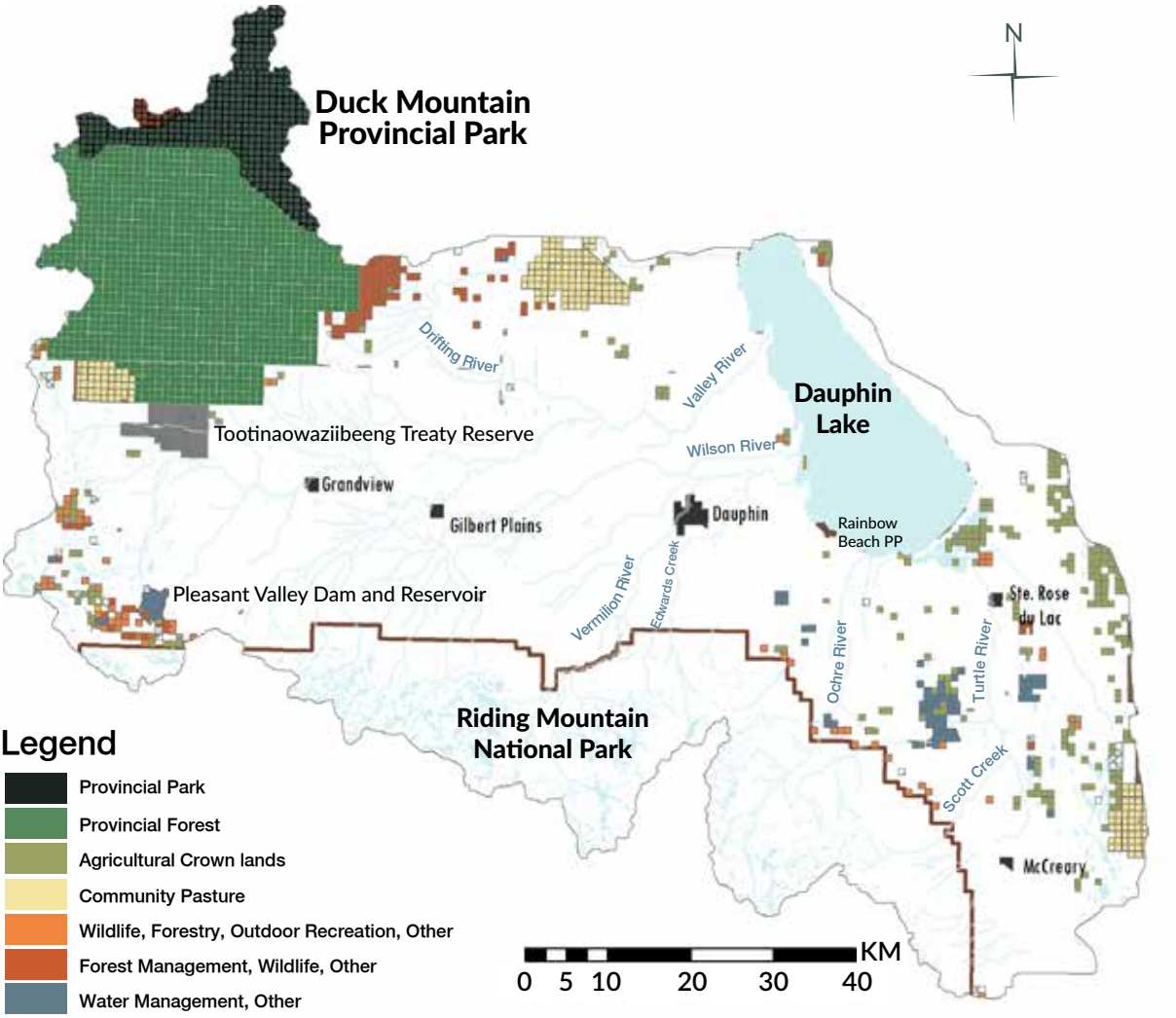


Figure 5. Summarized provincial Crown land coding for the Dauphin Lake Watershed

The *Crown Lands Act* allows the provincial government to designate Crown lands for specific purposes. Crown lands are coded to prescribe limits to land use, permit development, identify length of commitments and outline required permissions. Multi-disciplinary committees guide planning, management and administration of Crown lands, which are coded and categorized by their primary uses (agricultural production, forestry, etc).

Provincial Crown lands in the Dauphin Lake Watershed make up approximately 17% (600 sq.mi.) of the land base. The majority of these lands (82%) are located in Duck Mountain Provincial Forest. Ten per cent (58 sq.mi.) of Crown lands are available for agricultural use through the Agricultural Crown Land Leasing and Permitting Program. Community pastures occupy approximately 50 sq.mi. of the watershed.

KEY ISSUE: Wooded species such as poplars and willows naturally encroach on grasslands during ecological succession, especially in the absence of disturbances such as fire or grazing. Encroachment onto Crown lands that are classified for agricultural use or community pastures disrupts leaseholders and other users of these lands. Between 1994 and 2006, over 17 sq.mi. of agricultural Crown lands were encroached upon by trees. This trend continues to be observed on the landscape.

Surface Water Flows

Hydrology

Dauphin Lake's tributaries originate in the south and west - the Turtle, Ochre, Vermilion, and Wilson Rivers originate in the Riding Mountains; the Valley River and Mink Creek originate in the Duck Mountains. Water flows out of Dauphin Lake through a single outlet - the Mossy River, which flows a distance of 35 km to Lake Winnipegosis. The majority of annual flow - approximately 60% - occurs during the spring snow melt in the months of April and May (Figure 6). Average monthly flow declines throughout the remainder of the ice-free season.

Average annual flows range from approximately 7,000 acre-ft for the Mink Creek to 101,900 acre-ft on the Valley River (Table 2). Average annual flows on the Mossy River are approximately 270,400 acre-ft. Annual flows for the Turtle, Vermilion, Mossy and Valley Rivers have varied considerably over the period of record (Figures 7 and 8). For example, on the Turtle River, annual flows have ranged from 8,700 dam^3 (10,730 ac-ft) in 1961 to 208,000 dam^3 (256,560 ac-ft) in 2011 (Figure 7).

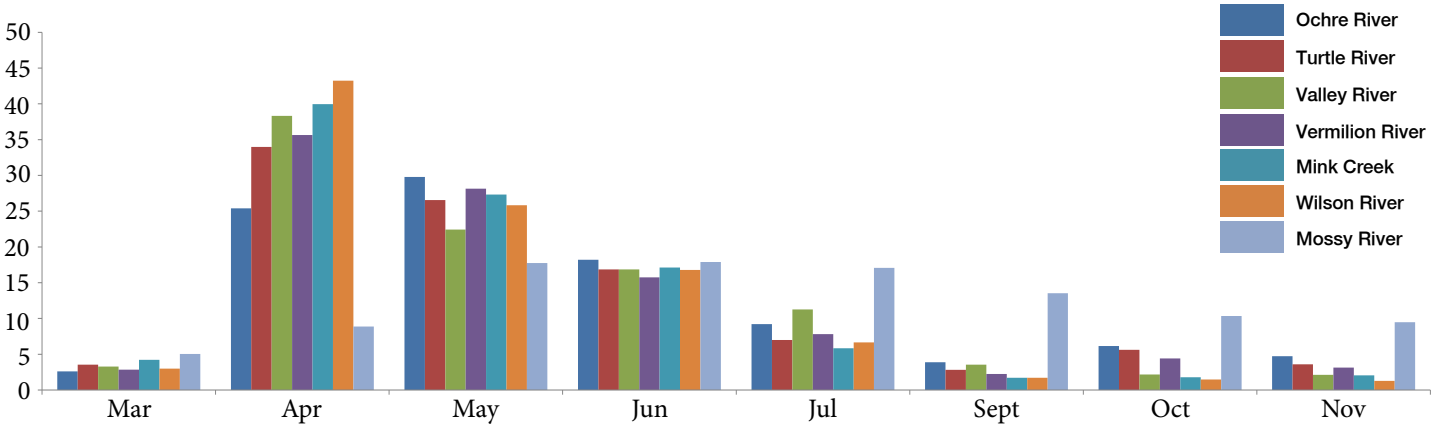


Figure 6. Annual Flow Percentages

Table 2. Average annual flows for select stream gauges in the Dauphin Lake Watershed

Gauge Number	Gauge Name	Period of Record	Average annual flow (dam^3)	Average annual flow (acre-ft)
05LJ005	Ochre River (at Ochre River)	1956-2014	47,000	38,100
05LJ007	Turtle River (near Laurier)	1956-2014	70,400	57,000
05LJ010	Valley River (near Dauphin)	1957-2014	125,700	101,900
05LJ012	Vermilion River (near Dauphin)	1956-2014	57,700	46,800
05LJ019	Mink Creek (near Ethelbert)	1956-1993 2010-2014	8,600	7,000
05LJ045	Wilson River (near Ashville)	1979-2004 2006-2014	52,200	42,300
05LJ025	Mossy River	1957-2014	333,500	270,400

Water level and stream flow data, collected under the Canada – Manitoba Hydrometric Agreement, were provided by Manitoba Conservation and Water Stewardship for these stations in the Dauphin Lake Watershed. Volume is reported as dam^3 (1 dam^3 = 1000 m^3) or acre-feet (1 acre-ft = the volume of water that covers one acre to a depth of one foot).

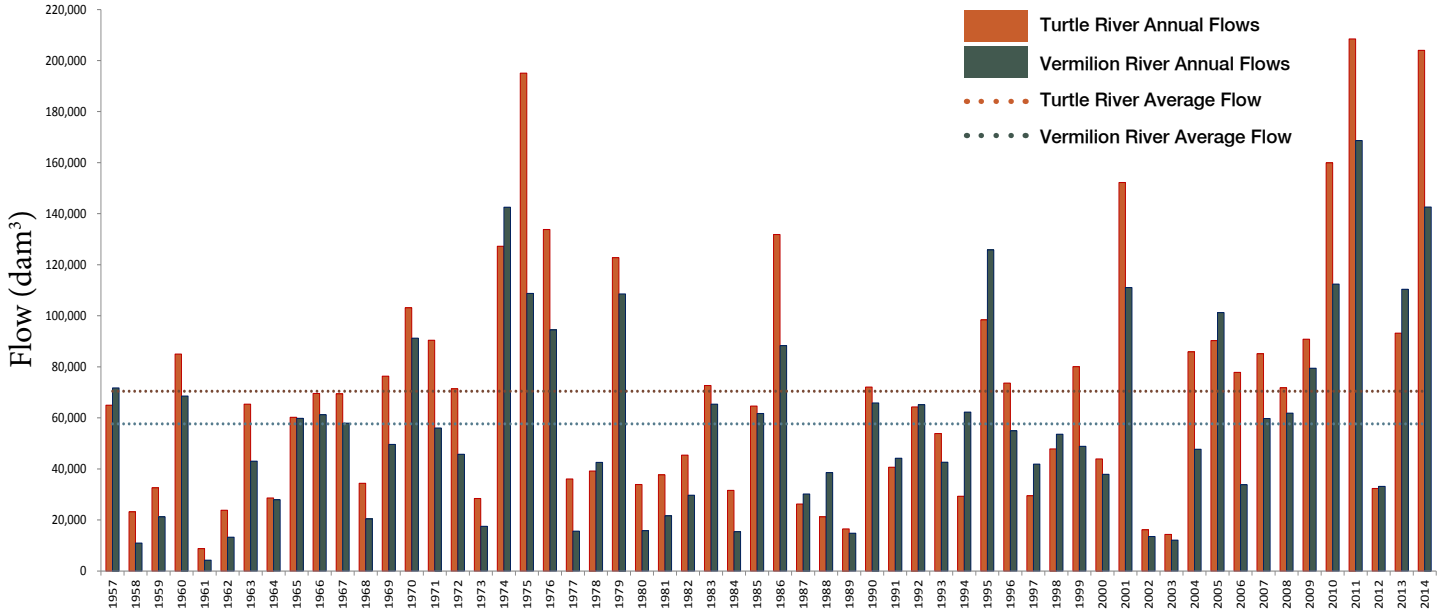


Figure 7. Turtle and Vermilion Rivers Annual Average Flows 1957-2014

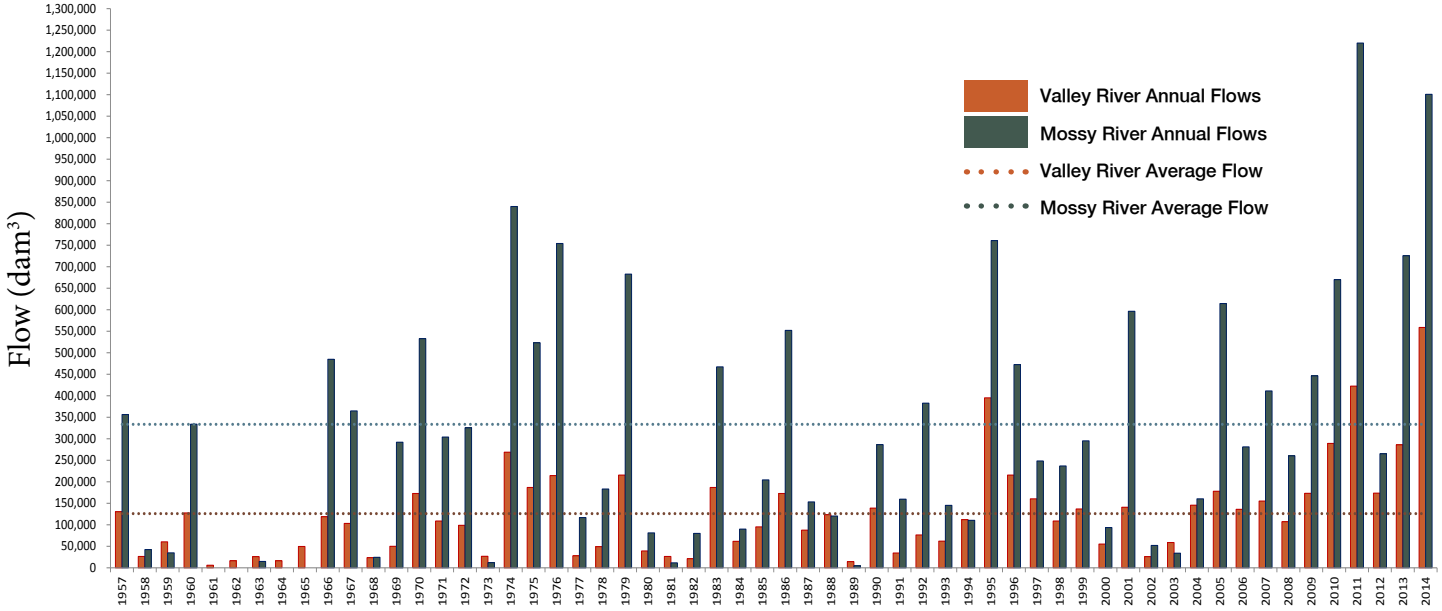


Figure 8. Mossy and Valley Rivers Annual Average Flows 1957-2014

KEY ISSUE: Dauphin Lake water levels are impacted by inflows, outflows and summer evaporation. Because of the large volume of water flowing into Dauphin Lake through its seven major tributaries, especially during extreme events such as 2010, 2011, 2013 and 2014, outflow through the Mossy River and summer evaporation is insufficient to keep lake levels within the range preferred by lake users and residents. Coupled with the extreme wet period that has characterized most of agricultural Manitoba in the last decade, this has resulted in high water volumes in the tributaries and record high water levels on Dauphin Lake.

Changing Land Use Practices

Land clearing and changing land use practices throughout the watershed have rendered soils more susceptible to erosion by both wind and water. These practices have boosted runoff, causing greater runoff peak flows and channel erosion (Manitoba Natural Resources, 1989). Some of these land use practices include:

- Channel straightening: Since 1948, approximately 66 km (41 mi), or 18%, of channel length has been removed from streams in the basin due to straightened flow paths (MNR, 1989). Whether done in an effort to alleviate flooding or to facilitate drainage of agricultural lands, the result has been increased channel gradients, stream flow velocity, energy and turbulence which contribute to increased erosion problems.
- Land clearing: Woodlands decreased from 37% to 21% of total land area in the Valley River subwatershed between 1949 and 1980 (MNR, 1989). This trend was observed throughout the other subwatersheds as well.
- Alluvial fan modification: Historically, alluvial fans at the base of the escarpment provided water storage capability and acted as silt traps. Drainage and other stream modifications have increased runoff through these fans. The silt that formerly settled in these fans is now carried further downstream and much of it settles in Dauphin Lake.

Eosion and siltation are a prime concern for a number of reasons. Erosion of soils and stream banks results in reduced water clarity and impaired water quality. Accumulation of sediment along stream beds and on the lake bottom covers suitable fish spawning substrates, smothering fish eggs and resulting in reduced fish population recruitment. Siltation also degrades lake quality for recreation and tourism opportunities.

KEY ISSUE: Land use practices will continue to change over time. Mitigating the impacts of past and future land clearing and drainage will be accomplished not only by engineered water retention, but also by maintaining and protecting existing natural areas that help to capture, retain and slow down water on the landscape. Forested areas, meadows, pastures, grasslands, wetland, ponds, alluvial fans and naturally meandering streams all help to mitigate downstream impacts of changing land uses.

Drain maintenance in the Turtle River Watershed CD

Surface Water Quality

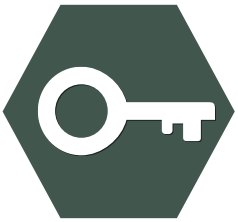
Water is our most essential resource, yet it is continually undervalued and treated as though it is never-ending in both supply and quality. Water quality continues to decline across North America and globally; in particular, Manitoba's water quality concerns are evident in the deterioration of Lake Winnipeg. The Lake Winnipeg Basin is vast, reaching west across the prairies to the Rocky Mountains, south to the United States, and east to Northern Ontario. Water quality in Lake Winnipeg and our local lakes and rivers is impacted by many activities throughout this extensive drainage basin. Because the Dauphin Lake Watershed is part of this vast continental basin, our actions will not only provide local benefits, but will also benefit our Manitoba great lakes: Lake Manitoba, Lake Winnipegosis, and Lake Winnipeg.

Provincial Water Quality Monitoring

Manitoba Conservation and Water Stewardship (MCWS) maintains five long-term water quality monitoring stations in the watershed, with records going back to 1974. Samples are retrieved quarterly from five tributaries: the Edwards Creek, and the Ochre, Turtle, Valley and Vermilion Rivers, and are analyzed for a routine suite of parameters, including general chemistry, nutrients, metals, pesticides and bacteria. The Mossy River is also monitored quarterly, although the station is located well downstream of Dauphin Lake, near Lake Winnipegosis.

MCWS, Water Quality Management Section (2011) provided a summary of data collected throughout the watershed.

- The Water Quality Index (calculated using 25 variables, and used to summarize large amounts of water quality data into simple terms for consistent reporting) was typically "fair" to "good" for the five long-term stations in the watershed. Only two points fell into the "marginal" or "poor" categories during the period of record (1992 to present).
- Total Phosphorus (TP) concentrations at each of the five long-term stations as well as additional historic monitoring locations typically exceeded Manitoba's narrative phosphorus guideline for rivers (0.05 mg/L). It is generally recognized that this guideline doesn't apply to rich prairie soils characteristic of the watershed, and throughout agro-Manitoba. However, in the absence of site-specific water quality guidelines for nutrients, 0.05 mg/L is used as a reference point by MCWS (2011a).
- Total Nitrogen (TN) concentrations at each of the five long-term stations tended to increase during the study period (1974 – present); the majority of values ranged from 0.4 to 2.0 mg/L. There is no provincial guideline for TN; however, the narrative objective states that "nitrogen should be limited to the extent necessary to prevent nuisance growth and reproduction of aquatic rooted, attached and floating plants, fungi, or bacteria."
- Dissolved Oxygen (DO) concentrations were consistently greater than the 5.0 mg/L Manitoba objective during long-term and historic monitoring. Maintaining adequate DO is essential to the health of aquatic life inhabiting rivers and streams. Low levels of DO can occur under winter ice conditions and during summer algal blooms and often result in localized fish kills.



KEY ISSUE: Water quality in the tributary streams and in Dauphin Lake is a key issue for watershed residents. Water quality is impacted by the issues caused by channelization and erosion, including increased turbidity (cloudiness) of receiving waters and nutrient loading. Land use throughout the watershed impacts water quality - some agricultural, industrial and residential practices are known to impair water quality. The reliance of communities on lagoons, which discharge their nutrient loads to surface water bodies each fall, is a concern for all receiving water bodies, including Dauphin Lake and further downstream to Lakes Winnipegosis, Manitoba and Winnipeg.

Water Resources

Water Rights Licenses

Water licenses are provided under the *Water Rights Act* in Manitoba with the intention of protecting the interests of licensees, domestic users, the general public and the environment. Provincial allocation limits are developed by Manitoba Conservation and Water Stewardship to set allocation limits for major streams and aquifers. Common practice is to calculate and conservatively estimate annual recharge rates. This is the quantity of water that the aquifer can discharge each year while maintaining the current water level regime. One half of this discharge is reserved to maintain the surface environment as stream flows, lake and wetland water levels, water supply for vegetation that can access the water table and for domestic use. The balance of the discharge is the allocation limit available for licensing.

There are presently 28 licensed water rights projects within the watershed: 20 groundwater projects and 8 surface water projects (Table 3). A total of 7,571 dam^3 has been allocated, and 90% (6,799 dam^3) of this total is allocated to municipal users.

Table 3. Water allocations under *Water Rights Act* Licenses, Dauphin Lake Watershed

Purpose	Ground Water (dam^3)	Surface Water (dam^3)	Total Allocation (dam^3)
Agricultural	273	0	273
Industrial	0	0	0
Irrigation	0	485	485
Municipal	829	5970	6799
Other	14	0	14
Total	**1116**	**6455**	**7571**

KEY ISSUE: Maintaining good quality ground and surface water is a high priority for watershed residents, not only for human consumption, but also for cattle producers, anglers, cottagers, wildlife and aquatic ecosystems.

Groundwater

Rural and town residents in the Dauphin Lake Watershed depend on groundwater for their domestic supplies, with the exception of the City of Dauphin which sources its water from the Vermilion River Reservoir. Most groundwater is sourced from shallow aquifers located in sands and gravels deposited by glaciers (known as glacial drift deposits). Deeper bedrock aquifers are also available, particularly in the northeastern part of the watershed in sandstone and carbonate bedrock formations.

Groundwater quality varies considerably depending on the nature and permeability of the aquifer, geology, age of the water and groundwater flow systems. Within the Dauphin Lake Watershed, groundwater quality varies depending on location and whether a well is located in glacial drift or bedrock. Water quality is generally better in drift aquifers than in bedrock in this region. Because of its typically higher mineralization and salinity, water from bedrock aquifers is better suited for livestock watering and farm or industrial operations rather than as a drinking water supply.

MCWS Groundwater Management Section (2011) provided an overview of groundwater quality in the Dauphin Lake Watershed.

- Hardness in groundwater wells in this watershed is considered "hard" (100 – 200 mg/L) to "very hard" (up to 500 mg/L).
- Recommended total dissolved solids (TDS) limits for human consumption range from 500 mg/L ("good") to 1,500 mg/L ("poor"); 3,000 mg/L for cattle; 6500 mg/L for horses; and 10,000 mg/L for industrial use. In drift aquifers in this region, TDS ranges from about 500 to 2,000 mg/L. TDS concentrations range from 1,500 to 4,000 mg/L or higher in bedrock aquifers.
- Nitrates are generally within the range specified for Canadian Drinking Water Standards; i.e., less than 10 mg/L. Nitrate concentrations in most wells in the Dauphin Lake Watershed are generally less than 1 mg/L; however, nitrate concentrations greater than 10 mg/L have been detected in some shallower wells completed in glacial drift formations, found primarily north of Highway 5 west of Dauphin Lake, and along the Turtle River and Highway 5 south of Dauphin Lake.
- There are over 3,300 wells listed in Manitoba Conservation and Water Stewardship's database. The majority of these wells (56%) are in glacial drift deposits. A small percentage of wells (less than 10%) are located in each of the bedrock formations (Carbonate, Shale or Sandstone).
- Wells completed in sand and gravel drift deposits are found throughout the watershed. These have been a traditional source of water due to shallower depths and low total dissolved solids. Risk of contamination for these shallower groundwater sources is somewhat greater in areas where potential contamination sources exist, such as larger livestock operations, lagoons, septic systems, and chemical storage.

Source Water Assessment & Protection

Protecting water at its source, before it arrives at our treatment facilities, is a preventative approach to drinking water management. The approach to source water protection varies widely across Canada. Manitoba has adopted a grassroots approach, in which a source water assessment is conducted by a team of local technical and nontechnical representatives. This locally-led approach to protecting drinking water sources is in line with the shared governance model adopted for soil and water management across municipal Manitoba through the Conservation Districts Program. The process is quick, easy to follow and relies primarily on the common sense of the members of the team.

Source water assessments in the Dauphin Lake Watershed were completed for public drinking water systems, defined by the *Drinking Water Safety Act* as those systems serving 15 or more connections. A team including a regional drinking water officer, conservation district representatives and a watershed planner visited each of eight public water systems in October 2013. The team observed treatment facilities and distribution systems, reviewed land uses and potential pollutant sources within a defined buffer zone (1.5 km surrounding groundwater wells, and 400 m surrounding surface water intakes), and recommended actions to minimize threats to public drinking water sources (Table 4; Table 13).

Table 4. Public Water Systems visited by the Source Water Assessment Team in the Dauphin Lake Watershed

Name of Public Water System (PWS)	Municipality Served	Population Served	Owner of System	Source
Sugarloaf PWS	Grandview	365	Grandview Municipality	Groundwater
G-3 PWS	Grandview and Gilbert Plains	2,500	G-3 Water Cooperative	Groundwater
City of Dauphin PWS	City of Dauphin, RM of Dauphin	8,250	City of Dauphin	Surface water
Rainbow Beach PWS	Rainbow Beach Provincial Park	400	Parks Branch	Groundwater
Ste. Rose du Lac PWS	Ste. Rose du Lac (urban)	995	Municipality of Ste. Rose	Groundwater
Ste. Rose South PWS	Ste. Rose (rural)	200	Ste. Rose South Water Cooperative	Groundwater
Laurier PWS	Laurier (urban)	165	Municipality of Ste. Rose	Groundwater
McCreary PWS	McCreary	500	Municipality of McCreary	Groundwater

The Vermilion River Reservoir

The Vermilion River Reservoir is the source of raw water for the City of Dauphin public water system, which supplies 8,250 residents of the City of Dauphin and several water cooperatives in the RM of Dauphin with treated drinking water. Water is piped 6.5 km from the Vermilion River Reservoir, south of Dauphin, to the Water Treatment Plant where it is treated with a variety of processes. From there, it is distributed by pipe to residential and commercial consumers. Edwards Creek is a secondary or back-up source of raw water when required.

The contributing area to the Vermilion River upstream of the reservoir is located entirely within Riding Mountain National Park, and includes Buck, West Scott, Kinnis, Stony and Robinson Creeks. These largely unmodified natural landscapes protected by RMNP have helped to maintain consistent water quality in the reservoir. The dam was built in 1979 by the Prairie Farm Rehabilitation Administration, and is now owned, maintained and operated by Manitoba Infrastructure and Transportation.

Biodiversity and Protected Areas

The Dauphin Lake Watershed is blessed with abundant natural areas that support biodiversity, economic opportunities and outdoor recreation. Diverse plant and animal communities flourish in aquatic and terrestrial habitats throughout the watershed, including forests, lakes, wetlands, riparian areas, grasslands, and other unique features such as alluvial fans, pothole lakes and black spruce bogs. Many of these habitats have been protected by Duck Mountain Provincial Park and Riding Mountain National Park, and by the Parkland Habitat Project - an interagency initiative that has identified conservation corridors between the Duck and Riding Mountains. Some of the issues of concern identified during public meetings and events in the watershed include limiting the spread of bovine tuberculosis from wild elk and deer to domestic cattle, moose migration and population health, and maintaining healthy populations of animals and medicinal plants for traditional Métis and First Nations harvesters.

Duck Mountain Provincial Park

Duck Mountain Provincial Park contains the headwaters of several watersheds in the region, including the Dauphin Lake (Mink Creek and Valley River), Shell River, Swan Lake and East Duck Mountain – Sagemace Bay Watersheds. The park's varying altitudes and soil support three distinct plant communities: boreal forests, deciduous forests and upland meadows. Each of these plant communities provides diverse habitats for large and small mammals, fish, insects and birds. Elk, moose, white-tailed deer, black bear, fox, lynx, coyote and timber wolves can be found in forests and meadows. Raptors, waterfowl and songbirds nest in the marshes and forests, and a wide variety of native and stocked fish species characterize the lakes and streams of the park.

The Duck Mountain Provincial Park Management Plan was completed in 2007. The plan establishes long term direction for the park, while addressing issues specific to resource protection, land use and development. The plan is used in conjunction with park regulations, provincial policy and legislation to guide the work of Manitoba Conservation and Water Stewardship for the next 10 to 15 years. The treaty and Aboriginal rights of Indigenous peoples to pursue traditional uses and activities within Duck Mountain Provincial Park are acknowledged and respected in the park (MCWS, 2007).

Land Use Categories (LUC) established within the park include backcountry, recreational development, and resource management. Backcountry areas in the park (46,836 ha) are protected from commercial activities to preserve their natural, undeveloped characteristics. There are 8,750 ha of recreational development LUC lands that provide a range of camping, day use, hiking, cottaging and fishing uses. Over 86,700 ha of resource management LUC lands provide recreation trails, forest harvest activities and canoe routes. Duck Mountain Provincial Park is surrounded by Duck Mountain Provincial Forest, and although commercial logging occurs to a large extent in the Provincial Forest, less than one percent of the resource management LUC within the park is harvested in a typical year (MCWS, 2007).

Some of the Rare, Threatened and Endangered Species that can be found in the Dauphin Lake Watershed: Northern Leopard Frog
Plains Spadefoot Toad
Tiger Salamander
Red-sided Garter Snake
Songbirds (Baird's Sparrow, Canada Warbler, Golden-winged Warbler, Loggerhead Shrike, Olive-sided Flycatcher)
Great Blue Heron
Trumpeter Swan
Short-eared Owl
Great Gray Owl
Barred Owl
Long-tailed Weasel
Bobcat

Riding Mountain National Park

First designated as forest reserve in 1895, Riding Mountain National Park officially opened on July 26, 1933, protecting an area representative of Canada's southern boreal plains and plateaux natural region. Encompassing approximately 300,000 ha (1,158 sq.mi.), Riding Mountain National Park's rolling hills and valleys, forests and meadows, and lakes, streams and wetlands are home to hundreds of bird species, insects, fish, small and large mammals. White-tailed deer, moose, elk, wolves, lynx, black bears and a captive bison herd are some of the large mammals that are recognizable by the over 250,000 visitors annually (Parks Canada, 2007).

Riding Mountain National Park (RMNP) includes portions of six watersheds: Dauphin Lake, Whitemud River, Little Saskatchewan River, Arrow-Oak River, Assiniboine Birdtail, and Shell River. Within the Dauphin Lake Watershed, headwaters of the Turtle, Ochre, Wilson and Vermilion Rivers are located within the park. Because of its upstream position within the Dauphin Lake Watershed, RMNP's management plan has identified the importance of working with conservation districts and regional partners to mitigate erosion and protect aquatic ecosystems downstream of the park (Parks Canada, 2007).

The park is also included in the UNESCO-designated Riding Mountain Biosphere Reserve (RMBR), an area of cooperation including the municipalities adjacent to the park. Biosphere Reserves are intended as special areas where people demonstrate better approaches to conservation and sustainable resource use (RMBR, 2012).

Other Areas of Interest

In addition to Duck Mountain Provincial and Riding Mountain National Parks, other areas of interest include Rainbow Beach Provincial Park (south shore of Dauphin Lake), Selo Ukraina (south of Dauphin), Cross of Freedom (Trembowla), Fort Dauphin Museum (Dauphin), Negrych Pioneer Homestead National Historic Site (Gilbert Plains) and the replica of the grotto at Lourdes, France (Ste. Rose du Lac). Stoney Point Beach, Dauphin Beach, and Ochre Beach along the southwestern shoreline of Dauphin Lake were once vibrant recreational areas, but repeated flood damages have limited their use in recent years.

Focus on: Dauphin Lake

Dauphin Lake has been the focus of much attention during the last thirty-plus years. A productive commercial walleye fishery, extensive wet meadows that previously supported pasturing cattle and hay production, and recreational values are all well-known features of Dauphin Lake, and its prominent position in Manitoba's Parkland and great beauty have made it a central feature in many Manitobans' lives.

"We would drop whatever we were doing every Sunday evening to meet here and play baseball; this was a very popular recreational area in the 1980s. Now, there is nothing."
- Ernie Bayduza

Stoney Point Beach

Unfortunately, Dauphin Lake has been in decline for decades - its fishery and recreational potential decimated. In response to this decline, the Dauphin Lake Basin Advisory Board (DLBAB) was established in 1990 with representatives from each municipality and community in the watershed and over 30 community organizations representing agricultural, cottager, commercial fishery, and wildlife interests.

Technical advisors to Dauphin Lake Basin Advisory Board (DLBAB) identified several key issues related to the health of Dauphin Lake: fluctuating lake levels, increasing siltation, threats to water quality and declining fish populations (MNR, 1989). As a result, the DLBAB published a Basin Management Plan (DLBAB, 1992) outlining a number of initiatives that were viewed as critical to restoring Dauphin Lake and its tributaries. This integrated watershed management plan acknowledges the progress made in the intervening decades, and the gaps that still need to be addressed.


"We used to fish here all the time – in fact, I remember catching my first fish here as a kid." – Jeff Thiele

Stoney Point Beach

Excerpt from *Dauphin Lake: Opportunities for Restoration* (MNR, 1989):

The health of the Dauphin Lake Basin is in jeopardy. The process of deterioration began accelerating in the 1950s and 60s. Unchecked runoff has decreased the economic and environmental health of the land and streams.

Siltation of Dauphin Lake and its spawning streams threaten an important fishery. Tourism, fisheries, wildlife and other economic opportunities have suffered declines in the wake of basin deterioration.

In 30 years, evidence of restoration efforts will include:

- *Tree-lined streams running clean and clear*
- *Attractive recreational areas that draw visitors from near and far*
- *A reliable walleye fishery in Dauphin Lake*
- *Abundant wildlife*
- *A healthy local economy/tourism industry*

Ice jam damage, 2013

Lake Levels

Lake levels fluctuate with environmental conditions including inflows, outflows and summer evaporation. Inflows from seven major tributary rivers, outflow through the Mossy River, major precipitation events, and summer evaporative losses ranging from 15 to 20 inches are all factors that impact lake levels. The issue of Dauphin Lake water levels has been at the forefront of local concerns for almost a century. Beginning in the dry 1930s, concerns about low lake levels prompted the construction of the Mossy River Dam to ensure minimum elevations were maintained during periods of very low runoff. However, the Mossy River Dam cannot prevent high lake levels because of limited channel capacity of the Mossy River, the only outlet from the lake.

Mean monthly lake levels have fluctuated between 851.5 and 860 ft ASL since routine monitoring began in 1933 (MNR, 1989). In recent decades, water levels have remained at the upper end of the range (855 – 860 ft ASL), and major floods have been recorded in 2014, 2013, 2011, 2010, 1995 and 1974 (Figure 9). Manitoba Infrastructure and Transportation operates the Mossy River Dam to achieve the summer target level of 854.8 ft ASL by June 1st each year, maintaining this level until September 1st if possible. Winter drawdown can be as low as 853.0 ft ASL in order to store spring runoff and attain the summer target level by June 1st. Timing and level of winter drawdown is dependent upon the forecast spring inflow into Dauphin Lake.

Record high water levels were observed on June 18, 2011, reaching 860.7 ft ASL and resulting in devastating impacts to Ochre Beach, its cottage developments and other shoreline areas. The floods in 2013 and 2014 were similarly destructive, water levels reaching 858.0 and 859.8 ft ASL respectively. Not only have cottages been damaged or condemned due to floodwaters, but beach erosion has been prolific, shoreline trees have been decimated, and lakeshore marshes are no longer functioning as waterfowl habitat or sources of wet meadow grasses for hay production. Since 2011, a number of buildings around the lake have been protected through the provincial individual flood protection program; however, this is only part of the approach to minimizing flood damages.

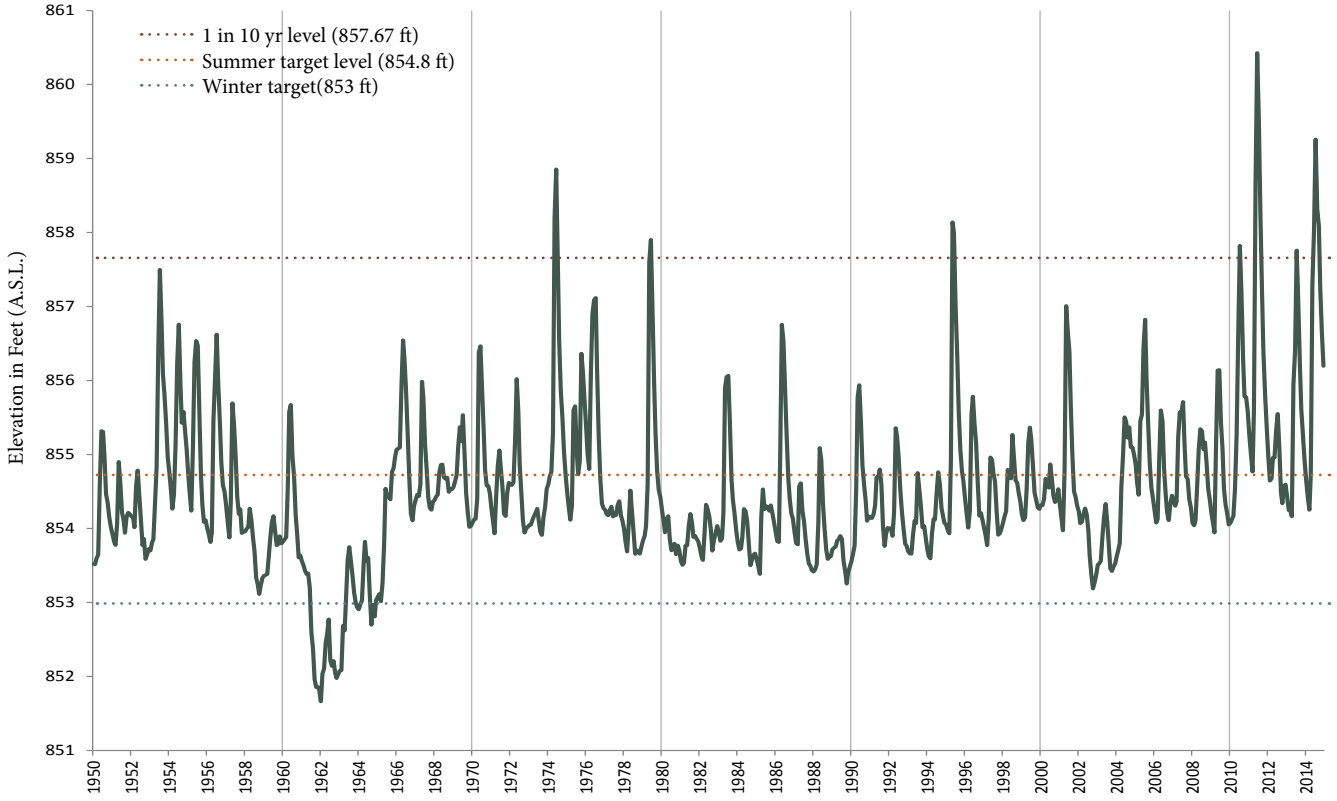


Figure 9. Dauphin Lake mean monthly levels provided by MCWS (Surface Water Management Section), 2015

An Emergency Spillway is Needed

As mentioned previously, channelization of tributary streams, limited outflow from the Mossy River, and changing weather patterns that have resulted in changing summer evaporation and extreme rainfall have modified the hydrologic regime of Dauphin Lake. Desirable water level management on Dauphin Lake has therefore become more difficult. If recent climate change observations and predictions become the new normal, then action needs to be taken to reduce future losses for all stakeholders. Construction of an **emergency spillway** to enhance outflow from Dauphin Lake during high flow (flood) years is required to support economic development for cottage development, recreation and the agricultural economy in addition to providing benefits to the fishery through effective lake level management. In addition to the suite of mitigation measures currently in place (upstream water retention, flood-proofing of vulnerable lands and properties adjacent to the lake, and others as described in the Implementation Plan), the PMT recognizes that an **emergency spillway** near the north end of the lake is required for the following reasons:

- A dam without an emergency spillway is not good planning. An emergency spillway will allow for reliable management under both flood and drought conditions.
- Spending public money on an emergency spillway would be a fraction of the cost of the damages and losses to personal property, agricultural lands, agricultural production, lake shore lands (beaches, treed areas, etc.), municipal infrastructure (roads, bridges, culverts, etc.), business income, flood fighting costs, insurance claims, emotional stress, and the many other associated hidden costs of flooding and continued high water levels.
- A complete benefit-cost analysis (BCA) should be undertaken, which would identify both positive and negative impacts of an uncontrolled rock-filled spillway. Some of these impacts include reduction of damages listed above, the cost of mitigating downstream environmental impacts, and positive impacts to the commercial and recreational fishery. Although the recent Assiniboine River/Lake Manitoba Basins Flood Mitigation Study looked at several options for reducing lake levels, the PMT believes that additional options should be considered with local stakeholders providing input to the BCA (see Objective 11c, page 50).


Mossy River Dam


Mossy River


Ochre Beach

Why are We Concerned?

Throughout southern Manitoba, agricultural and other land use practises have evolved over time. As land use practises change, seemingly for the advancement of livelihoods and communities, changes to land, water, organisms and ecosystems naturally follow. Although it could be argued that the implementation of the agricultural drainage network in the 1940s and even as early as the 1900s created the most drastic changes in the watershed, recent agricultural advancements have the potential to cause even wider cumulative effects. Farms are larger, resulting in larger equipment and more sophisticated drainage techniques. If we reflect on our past to gain a glimpse into our future, it is obvious that continued land clearing, modification of natural flow regimes through tile drainage and other methods and external pressures such as global agricultural markets will result in continued impacts to Dauphin Lake and its watershed.

Climate Change

Most climate change projections for this region indicate a longer growing period but also much drier summers and more extreme weather events. Studies by the Prairie Adaptation Research Collaborative (2008) predict increased frequency of severe rainfall events accompanied by a greater likelihood of large scale droughts. These factors would alter the timing of stream flows, water table levels, water storage availability, and other water regime characteristics. Other localized climatic variations such as less predictable summer temperatures seem to be occurring as a result of changing patterns in the North Atlantic Jet Stream. Local technical experts have observed that evaporative losses from Dauphin Lake have been reduced due to fewer hot dry summer days, exacerbating extreme lake levels.

Aquatic Invasive Species (AIS)

Invasive species are animals, plants, parasites or other organisms not native to a region that when introduced, out-compete native species for available resources and can have negative economic, social, environmental and human health implications. Manitoba currently has 15 aquatic invasive species, all of which are freshwater species - including zebra mussels, spiny waterflea, rusty crayfish, black algae, and European common reed.

Zebra mussels have been identified in Lake Winnipeg, the Red River and in Cedar Lake (west of Grand Rapids). Zebra mussels are small clam-like animals that are a significant environmental and economic concern to Manitoba. They have caused millions of dollars in damages to Ontario's Great Lakes, colonizing on almost any hard surface, including watercraft and water-intake pipes. In Manitoba, zebra mussels are listed as a Prohibited Species under both the *Fisheries Act* and the *Water Protection Act*. The province continues to try to prevent the introduction and spread of AIS in the province though strong education and outreach in addition to the Watercraft Inspection program. It is a collaborate effort whereby raising awareness will be critical to ensuring zebra mussels and other AIS are not imported to the lakes and rivers of the Dauphin Lake Watershed by watercraft.

Dauphin Lake Fisheries

Dauphin Lake once supported a thriving commercial and sport fishery, and was considered one of the most productive fisheries in Manitoba. However, walleye stocks in the lake collapsed in the 1960s, and sport fish such as pike and tulibee declined in the 1970s. The collapse in these fish populations was attributed to habitat degradation in the lake and spawning areas, and commercial over-harvesting (specific to walleye). Walleye stocks were somewhat rehabilitated during the 1980s and early 1990s by a combination of reduced commercial allocation and improvements to spawning habitat. However, efforts are still underway to ensure that walleye stocks are sustainable over the long term. Manitoba Conservation and Water Stewardship is committed to working with local harvesters to protect and conserve walleye stocks for the benefit of future generations (MCWS Fisheries, 2010).

Current Trends - Walleye

Local anglers began to observe a change in walleye populations in the tributaries around 1995. Although monitoring indicated that walleye populations in the lake were relatively stable during the late 1990s and early 2000s, stock assessments conducted by MCWS began to show evidence of weak recruitment (i.e., survival of young fish) into the fishery around 2005. Indicators including age structure, mean age, catch per unit effort (CPUE), and harvest estimates all suggested that walleye recruitment opportunities continued to be limited. As a result, MCWS began establishing conservation and communication measures including:

- Reduction of angler limits and "no harvest" slot sizes (i.e., prohibiting the harvest of fish between 45 and 70 cm in length) for recreational anglers (1999),
- Reduction of commercial fishers' individual quotas (2003),
- Conservation closures on the Turtle and Valley Rivers (2009) and other tributaries; and
- Communication and co-management initiatives with First Nations and Métis peoples.

Continued monitoring has indicated that walleye stocks began recovering in 2012 and 2013 (MCWS Fisheries, 2015).


the Dauphin Herald

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Reduced limits may ensure lake's future

Local walleye limits may change

nglers protest limit changes

Time to save Lake Dauphin

Clarification

Why have fish stocks been impacted in Dauphin Lake?

Overfishing, degraded spawning areas, and more extreme flows in the tributaries have all contributed to impacts to fish populations. Land use changes throughout the watershed, including land clearing and channelization of streams was widespread in the 1940s, 50s and 60s, and continues today.

These practises result in more variable stream discharges, changing the timing and duration of spring runoff events in the tributaries. Highly variable stream discharge in the spring negatively impacts spawning success, as spawning walleye require medium to high flows in the tributaries for a sufficient period of time in order to maximize recruitment. Erosion of stream channels and stream banks result in sediment transport and deposition downstream, which not only suffocates incubating fish eggs, but also destroys entire spawning areas by silting in the spaces that fish typically deposit eggs.

Looking Forward:

Action Plan for a Healthy Dauphin Lake Watershed

What We Value

This plan is largely based on the values specific to Dauphin Lake Watershed residents, including a sustainable rural lifestyle, a healthy Dauphin Lake, and abundant natural areas for wildlife and protection of ecosystem services. The specific values and priorities identified by the public during four public meetings held in 2011 are not very different from those identified by the Dauphin Lake Basin Advisory Board in the early 1990s. Our hope is to work toward achievable actions that will make tangible improvements to the watershed as a whole, as identified by the Dauphin Lake Basin Advisory Board and today's stakeholders.

Words in the cloud (above) represent issues mentioned during public consultation events in 2011. Larger words in the word cloud were mentioned more often by the public.

Our Priorities

Public priorities were weighted and ranked along with the input of local, provincial and federal experts and stakeholders in order to develop priorities and goals for the Dauphin Lake Watershed. Three priorities emerged:

PRIORITY: Surface Water Management

GOAL

Adopt a watershed-based approach to surface water management that is respectful of landscape conditions and current land use.

GOAL

Implement water management that supports productive agriculture and thriving lakeshore communities.

GOAL

Improve and protect surface water quality throughout the watershed.

PRIORITY: Healthy Fisheries and Wildlife Habitat

GOAL

Protect and restore the integrity of natural and riparian areas to maintain healthy wildlife and fisheries habitat in the Dauphin Lake Watershed.

PRIORITY: Drinking Water Quality and Quantity

GOAL

Protect groundwater quantity and quality in the Dauphin Lake Watershed.

Priorities and goals identified in this watershed plan can only be reached if specific, achievable actions are implemented by each of the watershed's partners, including the Intermountain and Turtle River Watershed Conservation Districts, provincial, federal and local governments, landowners and other stakeholder organizations. Each of the CDs will lead the implementation of this plan by: nurturing existing and developing new partnerships, aligning their programming with the priorities and actions identified in the following pages, and seeking out new and innovative sources of technical expertise and funding.

The objectives and actions identified on the following pages are accompanied by potential partnering organizations and measures of success. Progress toward implementation of these actions will be monitored by the Intermountain and Turtle River Watershed Conservation Districts and the PMT on a yearly basis.

Implementation

PRIORITY: Surface Water Management

In Manitoba, surface water management typically refers to the management of water to reduce or prevent repetitive flooding of agricultural, industrial and residential land. Although surface water is managed to protect infrastructure from overland flooding and to remove excess moisture from agricultural lands as quickly as possible, these benefits may be outweighed by unforeseen and unintended consequences on downstream people, property, and aquatic ecosystems. A more holistic approach to surface water management considers multiple benefits, aquatic ecosystem health, water quality, climate change resilience, and downstream impacts to infrastructure and property.

This surface water management plan was developed by the project management team in an effort to bring a holistic and watershed-based approach to surface water management in the Dauphin Lake Watershed. Our goals for surface water management in the Dauphin Lake Watershed are three-fold:

GOAL

Adopt a watershed-based approach to surface water management that is respectful of landscape conditions and current land use.

GOAL

Implement water management that supports productive agriculture and thriving lakeshore communities.

GOAL

Improve and protect surface water quality throughout the watershed.

Objectives, tools, suggested partners and measures of success are identified in the tables that follow. Because surface water quality is so closely linked with surface water movement, we have chosen to include objectives for surface water quality in the surface water management plan. The surface water management plan has been approached as follows:

1. Wide-angle approach: Objectives and actions that should be undertaken throughout the entire watershed in order to help us reach our goals (see Actions 1 – 7 in the table below); and,
2. Macro approach: The watershed was broken into four surface water management zones, each with their own unique challenges and solutions. These include the Mountain and Escarpment Zone, the Mid-Elevation Agricultural Zone, the Lowland Agricultural Zone, and the Lake and Marsh Zone (see Actions 8 – 11 in the tables below).

WATERSHED-WIDE ACTIONS

Objectives and actions are targeted throughout the watershed in support of our goals for surface water management (Table 5). Objective 1, improving watershed awareness, is paramount to achieving the goals and objectives of this watershed plan.

Objectives 2 and 3 address key issues related to erosion and siltation. Protecting and rehabilitating streams and riparian areas through the tools listed below will have many benefits, including improved riparian zone conditions, improved water quality and fish spawning habitat due to reduced silt load, stabilized streambanks, reduced stream channelization, and restoration of natural vegetation or permanent cover in former alluvial fans.

Objectives 4 and 5 improve access to beneficial management practices (BMPs) that retain nutrients and sediments on-farm and programs that aim to reduce the rate of conversion of sensitive lands to annual cropping, residential or industrial uses. Targeting sensitive agricultural soils, shelterbelts, woodlands, wetlands and riparian areas will protect landscape features most at-risk of conversion.

Objectives 6 and 7 enhance awareness of the number and condition of lagoons and other wastewater treatment facilities throughout the watershed, with the intent of reducing nutrient loading from municipal and on-site wastewater systems to waterways throughout the watershed.

Table 5. Watershed-wide objectives and implementation plan (lead partner appears in **bold**)

	Objective	How? Or- Tools to achieve our objective	Who?	Measure of Success?
1	Improve watershed awareness; cultivate a watershed ethic in all target groups (students, general public, municipal governments, private landowners)	Implement demonstration projects; develop new communication initiatives using social media; offer existing and develop new environmental education opportunities such as the Intermountain Water Festival, developing curriculum materials related to watersheds for appropriate grades and community college students; offer subdistrict tours and other educational events for municipal members	**CDs**, municipal governments, provincial departments, environmental NGOs, schools and community colleges throughout the watershed	5 demonstration projects are highlighted each year in each CD using a combination of social media, subdistrict tours, and attendance at industry- or government-sponsored education events; grade four students in each school in the watershed have the opportunity to attend water festivals or are provided with other environmental education opportunities

	Objective	How? Or- Tools to achieve our objective	Who?	Measure of Success?
2	Protect and manage riparian areas in order to reduce streambank erosion and siltation	Implement shoreline stabilization projects including re-establishment of healthy riparian vegetation; maintain shale traps; provide incentives to re-establish and protect riparian and upland buffers	**CDs**, RMs, Landowners, First Nations, provincial & federal departments (RMNP)	1-3 riparian area projects are completed in each zone each year
3	Rehabilitate streams and alluvial fans to reduce stream gradients and improve infiltration, in order to minimize stream bed and bank erosion	Provide incentives to establish permanent cover; install gradient control structures to dissipate hydraulic energy in straightened reaches; re-establish channel meanders	**CDs**, **RMs**, Landowners, First Nations, provincial & federal departments (RMNP)	1-2 projects are implemented in each zone each year
4	Implement BMPs that reduce excess sediments and nutrients entering waterways throughout the watershed, including improved manure management and location of livestock confinement areas, off-stream watering, exclusion fencing, vegetated riparian buffers, grassed waterways etc.	Provide technical assistance and financial support to agricultural producers to implement BMPs	**CDs**, Landowners, First Nations, RMs, **provincial** (**MAFRD**) & federal departments (RMNP), Research Institutions	2-4 projects are implemented in each zone each year
5a	Provide access to land protection programs that maintain natural or permanent cover. Focus on at-risk areas characterized by sensitive soils, shelterbelts, woodlands, wetlands, and riparian areas	Work with conservation agencies to develop conservation agreements; provide incentives to landowners to seed perennial forages; work with RMs to implement taxation easements (e.g., RM of Dufferin wetland tax credit); and develop other programs that maintain ecological goods and services (e.g., Pembina Valley Conservation District's Sustainable Slopes initiative)	**NCC**, **MHHC** **CDs**, RMs	Conservation agreements are signed in each zone each year; innovative programs are offered in each CD by 2018

	Objective	How? Or- Tools to achieve our objective	Who?	Measure of Success?
5b	Provide access to land protection programs that maintain hydrological connectivity between watershed features such as shelterbelts, woodlands, wetlands, and riparian areas	Work with conservation agencies to develop conservation agreements; work with RMs to implement taxation easements (e.g., RM of Dufferin wetland tax credit); and develop other programs that maintain ecological goods and services	**NCC**, **MHHC CDs**, RMs	Conservation agreements are signed in each zone each year; innovative programs are offered in each CD by 2018
6	Ensure wastewater treatment facilities meet or exceed effluent discharge standards; Ensure on-site wastewater systems (i.e., septic fields or tanks) are in proper working order. Target Areas: flooded areas zones adjacent to Dauphin Lake, areas adjacent to waterways throughout the watershed, source water protection zones	Provide information to local elected officials and citizens on proper maintenance procedures and provincial regulations that govern use of on-site systems; Provide incentives to upgrade systems in high-risk areas	**MCWS – Environment**, CDs	All system owners in target areas are contacted and provided with information by 2020
7	Investigate options for potential reduction of nutrients from municipal and private wastewater treatment systems (e.g., constructed wetlands, trickle discharge, effluent irrigation)	Develop demonstration projects (e.g., town of Roblin effluent irrigation, constructed wetlands); educate local elected officials and residents	**CDs, RMs,** MCWS - enviroment	One demonstration project implemented in each CD by 2020

Watershed Zones

The Dauphin Lake Watershed is characterized by a number of features that pose distinct challenges to surface water management. In order to focus our actions during the implementation of this watershed plan, the watershed was broken into four zones, each with its own surface water management challenges, objectives, and recommended actions.

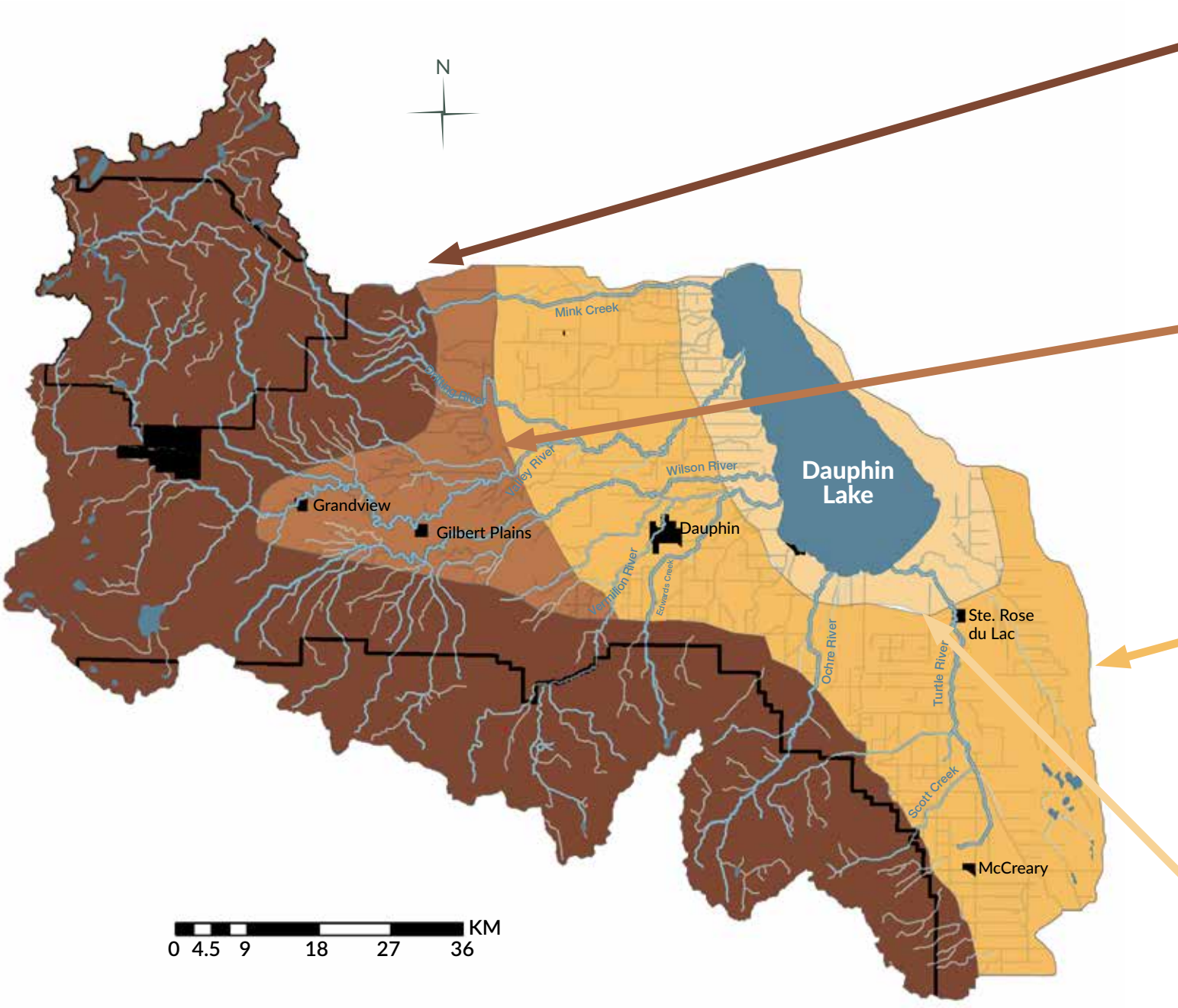


Figure 10. Watershed Management Zones in the Dauphin Lake Watershed

Mountain and Escarpment Zone:

This zone includes the Duck and Riding Mountains, and is characterized by forested land cover, steep slopes, deeply incised river channels, and former alluvial fans at the base of the Escarpment. Riding Mountain National Park, Duck Mountain Provincial Park, and Duck Mountain Provincial Forest all fall within this zone. Higher elevations are characterized by intact mid-boreal forest, as well as a number of lakes and wetlands. Forested areas and wetlands predominate within federal and provincial parks, whereas privately-owned land is characterized by mixed-agricultural usage.

Mid-Elevation Agricultural Zone:

This zone is comprised of moderate elevations and rolling topography. It includes the towns of Grandview and Gilbert Plains. Annual crops are grown throughout the zone, with some pasture and forage lands.

Lowland Agricultural Zone:

This zone is comprised of low, flat lands, with a predominance of pasture, forages and forested areas in northern areas, and annual cropping in the south. The City of Dauphin, and the towns of Ste. Rose du Lac and McCreary fall within this zone.

Lake and Marsh Zone:

This zone includes a band of low-lying lands around Dauphin Lake, including the Wilson River, Turtle River and Valley River Marshes. Cottage developments, residential properties, and agricultural lands are found within this zone. Recent wet years have resulted in marginal agricultural production for local producers, and have inflicted structural damage to developments along the southern shoreline of Dauphin Lake.

Mountain and Escarpment Zone

Our intent is to slow the rate at which water leaves this zone, through the maintenance of natural water holding capacity (permanent natural cover) and improved water retention capability wherever feasible.

Challenges of this Zone:

- Steep Slopes: steep slopes contribute to water volumes moving quickly from the Duck and Riding Mountains, contributing to erosion in this zone and downstream.
- Easily-eroded shale in this zone is transported downstream, reducing carrying capacity of streams and causing overland flooding.
- Natural water retention occurs within RMNP through the protection of wetlands, ponds, lakes and naturally meandering streams. Integrating this natural approach with engineered water retention on private land is challenging, but critical to integrated watershed management.

Enhancing water retention capability in this zone mitigates the effects of flooding within this zone and downstream. Erosion control measures reduce down-cutting of surface drains and reduce transport of eroded materials downstream. Rehabilitating streams, alluvial fans and riparian areas throughout this zone would reduce erosion and siltation in this zone and downstream. Actions to address these challenges are highlighted in Table 6.

Table 6. Mountain and Escarpment Zone objectives and implementation plan (lead partner appears in **bold**)

	Objective	How? Or- Tools to achieve our objective	Who?	Measure of Success?
8a	Develop new and improve existing water retention in headwater areas of each sub-watershed in order to reduce flow volumes downstream	Off-channel storage, headwater retention, alluvial fan restoration	**CDs**, **RMs**, MIT, RM Liaison Committee, federal departments	Increased storage in each subwatershed as outlined in Table 7
8b	Implement erosion control measures appropriate for steep slopes in this area	Installation of erosion control structures, shale removal and drain maintenance - See Actions 2 & 3 (page 33)	**CDs**, **RMs**, MIT, federal departments	1-2 projects are implemented in this zone each year
8c	Protect and manage riparian areas in order to reduce stream bank erosion and siltation	Implement shoreline stabilization projects (including re-establishment of healthy riparian vegetation); See Action 2 (page 33)	**CDs**, RMs, Landowners, First Nations, LP Canada Ltd., provincial & federal departments (RMNP)	1-2 projects are implemented in this zone each year
8d	Rehabilitate streams and alluvial fans to reduce stream gradients and improve infiltration, in order to alleviate stream bed and bank erosion	Provide incentives to establish permanent cover; install gradient control structures to dissipate hydraulic energy in straightened reaches; re-establish channel meanders; develop a program to purchase land and provide financial incentives to landowners for restoration and maintenance of key alluvial fan and shale trap areas	**CDs**, RMs, Landowners, First Nations, provincial (MAFRD) & federal departments (RMNP)	2-4 projects are implemented in this zone each year
8e	Provide access to land protection programs that maintain natural or permanent cover, focusing on the erodible slopes of this zone	Work with conservation agencies to develop conservation agreements; provide incentives to landowners to seed perennial forages; work with RMs to implement taxation easements (e.g., RM of Dufferin wetland tax credit); and develop other programs that maintain ecological goods and services (e.g., Pembina Valley Conservation District's Sustainable Slopes initiative)	**CDs**, NCC, MHHC RMs	Conservation agreements are signed in this zone each year; innovative programs are offered in each CD by 2018

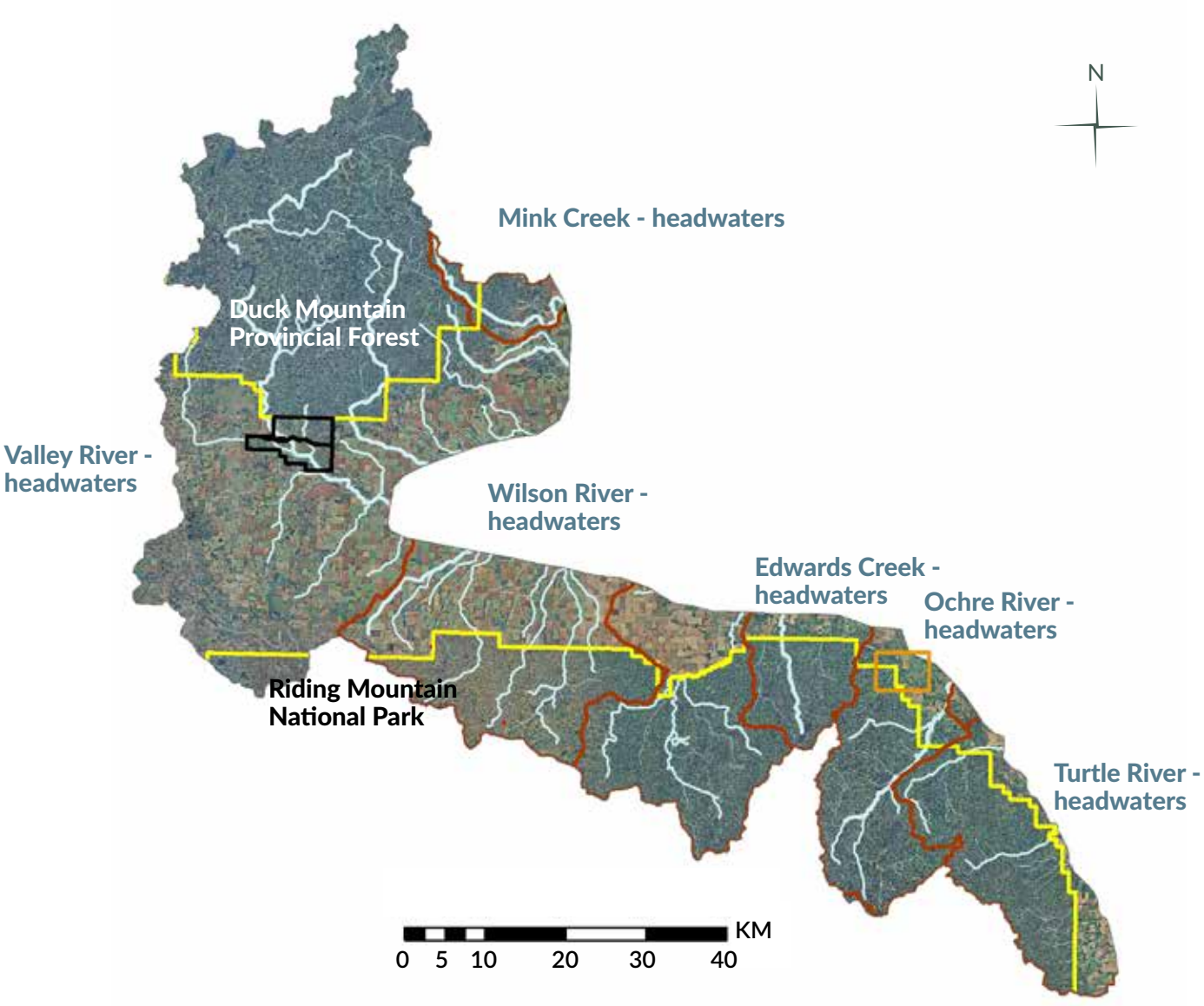


Figure 11. Surface water management features of the Mountain and Escarpment Zone

Legend	Issue	Recommendations
	Investigate headwater retention areas	• Conservation Districts and other stakeholders should investigate possible retention areas on Crown lands, within provincial and federal parks, and on private lands
	Crawford Creek Alluvial Fan	• Encourage water retention and restoration of former alluvial fans using the Crawford Creek site as a demonstration project

PEAK FLOW REDUCTION

Lowering peak flows and distributing flows over a longer period of time reduces the impact of flooding on culverts, roads, bridges, low-level crossings, and private property. The amount of upstream storage needed to reduce peak flows by 5, 10 and 15% has been calculated for each of the subwatersheds within the Dauphin Lake Watershed, for varying flow scenarios (expert analysis was provided to each Conservation District by Manitoba Conservation and Water Stewardship in 2014). These values will assist Intermountain and Turtle River Watershed Conservation Districts to set their water retention planning targets, as described in Objective 8a.

For example, to achieve a 10% reduction in peak flows for the Mink Creek for events with a return period of 10 years, 920 acre-ft of storage would be required throughout the Mink Creek subwatershed (Table 6). To achieve a similar reduction for the Valley River, 3,910 acre-ft of storage would be required. Ultimately, achieving water storage targets is dependent on the interest of private and Crown land managers, the cost of infrastructure, and the unique topography of each subwatershed.

Table 7. Peak flow analysis results for the subwatersheds in the Dauphin Lake Watershed

Station Name	Drainage Area	1:10 Year Flow		10% Reductions of Peak Discharge	Associated Storage Need
	(km^2)	Annual Peak Discharge (cfs)	Hydrograph Volume (ac-ft)	(cfs)	(ac-ft)
Turtle River	1,768	3,900	48,770	3,510	4,450
Ochre River	472	2,120	21,530	1,910	1,840
Vermilion River	758	2,470	20,750	2,220	1,650
Wilson River	997	4,980	61,570	4,480	5,370
Valley River	2,942	4,690	46,440	4,220	3,910
Mink Creek	263	720	9,810	650	920

Mid-Elevation Agriculture Zone

Our intent is to slow the rate at which water travels through this zone, and to reduce overland flooding and erosion in this zone and downstream.

Challenges of this Zone:

- The loss of the alluvial fans at the base of the Escarpment has drastically sped up water movement from the mountains, resulting in down-cutting of many waterways in this zone. This has also resulted in channel and bank erosion problems along the length of many of the tributary rivers from this zone downstream to Dauphin Lake.
- Overland flooding and damages to municipal infrastructure are chronic problems due to rapid water movement and reduced natural infiltration capacity.

Adopting downstream-friendly surface water management practices such as dry dams, control gates on culverts and other methods to retain water during peak runoff periods has a positive impact within this zone and downstream. Outcomes include reduced peak flows within tributary streams; reduced magnitude of overland flooding that occurs as a result of peak flows; and fewer impacts to infrastructure and private property as a result of flooding (i.e., fewer culvert, road and bridge washouts; excess moisture damage to crops is minimized, etc.). Maintaining natural and permanent cover improves natural water infiltration capacity, reduces risk of water- and wind-based erosion, and protects habitat. Actions to address these challenges are highlighted in Table 8.

Vermilion River bank erosion

Table 8. Mid-Elevation Agriculture Zone objectives and implementation plan (lead partner appears in **bold**)

	Objective	How? Or- Tools to achieve our objective	Who?	Measure of Success?
9a	Adopt downstream-friendly surface water management practices to retain water flows during spring and summer runoff, until peak waters have receded downstream	Dry dams; water retention projects utilizing natural ridges or municipal road allowances (similar to South Tobacco Creek); offer control gates for culverts to landowners and municipalities in target areas upstream of chronic problem areas	**CDs**, **RMs**, MCWS, MIT Landowners	1-2 water retention projects are constructed each year; control gate rebates are offered by each CD
9b	Adopt a watershed-based approach to drainage infrastructure maintenance, replacement and upgrades	All stakeholders participate in the implementation of this surface water management plan and local project planning committees	**CDs**, RMs, MCWS, MIT Landowners	CDs lead the establishment of local project planning committees, meeting twice yearly
9c	Protect and manage riparian areas in order to reduce streambank erosion and siltation	Implement shoreline stabilization projects including re-establishment of healthy riparian vegetation	**CDs**, RMs, Landowners, First Nations, provincial & federal departments	1-3 riparian area projects are completed in this zone each year
9d	Rehabilitate streams and alluvial fans to reduce stream gradients and improve infiltration, in order to alleviate stream bed and bank erosion	Provide incentives to establish permanent cover; install gradient control structures to dissipate hydraulic energy in straightened reaches; re-establish channel meanders	**CDs**, RMs, Landowners, First Nations, provincial & federal departments	1-2 projects are implemented in this zone each year
9e	Provide access to land protection programs that maintain natural or permanent cover, focusing on high-risk soils, wetlands, and riparian areas in this zone	Work with conservation agencies to develop conservation agreements; provide incentives to landowners to seed perennial forages; work with RMs to implement taxation easements (e.g., RM of Dufferin wetland tax credit); and develop other programs that maintain ecological goods and services (e.g., Pembina Valley Conservation District's Sustainable Slopes initiative)	**CDs**, **NCC**, **MHHC** RMs	Conservation agreements are signed in this zone each year; innovative programs are offered in each CD by 2018

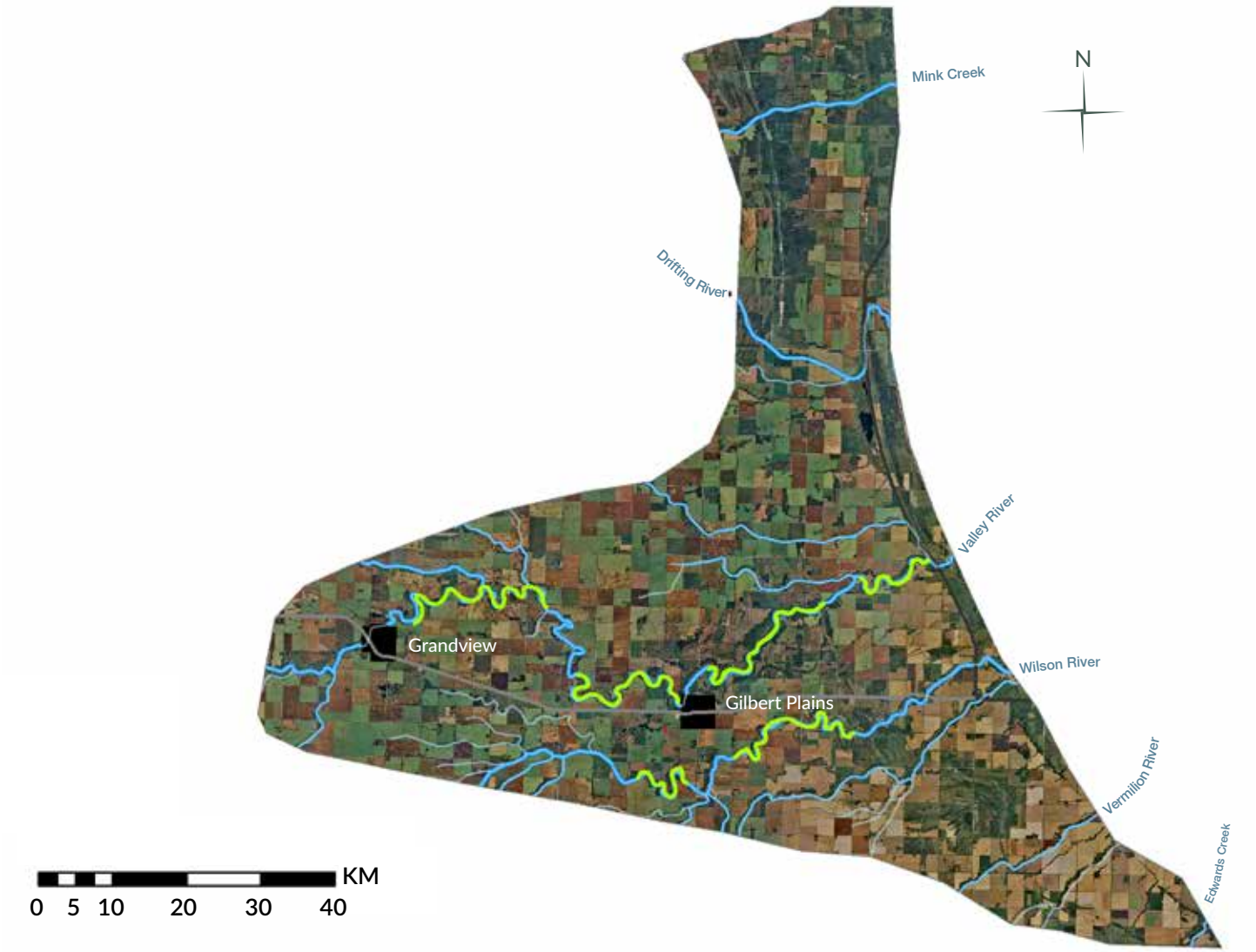


Figure 12. Surface water management features of the Mid-Elevation Agriculture Zone

Legend	Issue	Recommendations
	Streambank erosion – the Wilson, Valley and Vermilion Rivers are characterized by eroded streambanks, due to both natural hydrological processes and upstream modifications	• Landowners should be encouraged to re-vegetate riparian areas • Conservation districts should promote the use of riparian bufferstrips along first, second and third order streams • Conservation districts should work with partners to prioritize streambank restorations • Conservation districts should be actively working in upstream areas and zones
	Upstream water retention potential should be investigated throughout headwater areas in this zone	• Intermountain Conservation District should work with landowners to encourage the adoption of check dams and small dams to slow water flowing into first, second and third order streams


INTERMOUNTAIN
CONSERVATION DISTRICT
Streambank Stabilization
In Partnership With: Gilbert Plains Country Club Inc.
Department of Water Stewardship
Municipalities and Communities of the IMCD


ROAD
CLOSED

Lowland Agriculture Zone

Our intent is to reduce overland flooding and erosion in this zone and downstream. Appropriate land uses such as pasture and hay land on erodible lands, Class 4, 5 or 6 soils, or low-lying, flood-prone areas will allow for periodic flooding impacts while minimizing economic losses.

Challenges of this Zone:

- Low slopes and natural depressions retain water, resulting in excess moisture issues on agricultural land.
- Channelization of streams has increased the speed at which water moves into this zone and has also caused erosion and siltation within this zone and downstream.
- Livestock operations located in close proximity to waterways adversely affect riparian areas and water quality.

Adopting downstream-friendly surface water management practices such as dry dams, control gates on culverts and other methods to retain water during peak runoff periods has a positive impact within this zone and downstream. Outcomes include reduced magnitude of overland flooding that occurs as a result of peak flows and fewer impacts to infrastructure and private property as a result of flooding (i.e., fewer culvert, road and bridge washouts; excess moisture damage to crops is minimized, etc.). Maintaining natural and permanent cover improves natural water infiltration capacity, reduces risk of water- and wind-based erosion, and protects habitat. Actions to address these challenges are highlighted in Table 9.

Table 9. Lowland Agriculture Zone objectives and implementation plan (lead partner appears in **bold**)

	Objective	How? Or- Tools to achieve our objective	Who?	Measure of Success?
10a	Adopt downstream-friendly surface water management practices to retain water flows during spring and summer runoff, until peak waters have receded downstream	Dry dams or other water retention projects utilizing natural ridges or municipal road allowances (similar to South Tobacco Creek); offer control gates for culverts to landowners and municipalities in target areas upstream of chronic problem areas	**CDs** **RMs** MCWS, MIT Landowners	1-2 water retention projects are constructed each year; control gate rebates are offered by each CD
10b	Adopt a watershed-based approach to drainage infrastructure maintenance, replacement and upgrades	All stakeholders participate in the implementation of this surface water management plan and local project planning committees; develop a program to purchase land in low-lying, flood-prone areas as well as areas conducive for back flooding and water retention	**CDs** **RMs** MCWS, MIT Landowners	CDs lead the establishment of local project planning committees, meeting twice yearly
10c	Protect and manage riparian areas in order to reduce streambank erosion and siltation	Implement shoreline stabilization projects including re-establishment of healthy riparian vegetation	**CDs**, RMs, Landowners, First Nations, provincial & federal departments	1-3 riparian area projects are completed in this zone each year
10d	Rehabilitate streams to reduce stream gradients and improve infiltration, in order to alleviate stream bed and bank erosion	Provide incentives to establish permanent cover; install gradient control structures to dissipate hydraulic energy in straightened reaches; re-establish channel meanders	**CDs**, RMs, Landowners, First Nations, provincial & federal departments	1-2 projects are implemented in this zone each year
10e	Provide access to land protection programs that maintain natural or permanent cover, focusing on high-risk soils, wetlands, and riparian areas in this zone	Work with conservation agencies to develop conservation agreements; provide incentives to landowners to seed perennial forages; work with RMs to implement taxation easements (e.g., RM of Dufferin wetland tax credit); and develop other programs that maintain ecological goods and services (e.g., Pembina Valley Conservation District's Sustainable Slopes initiative)	**CDs** **NCC**, **MHHC** RMs	Conservation agreements are signed in this zone each year; innovative programs are offered in each CD by 2018

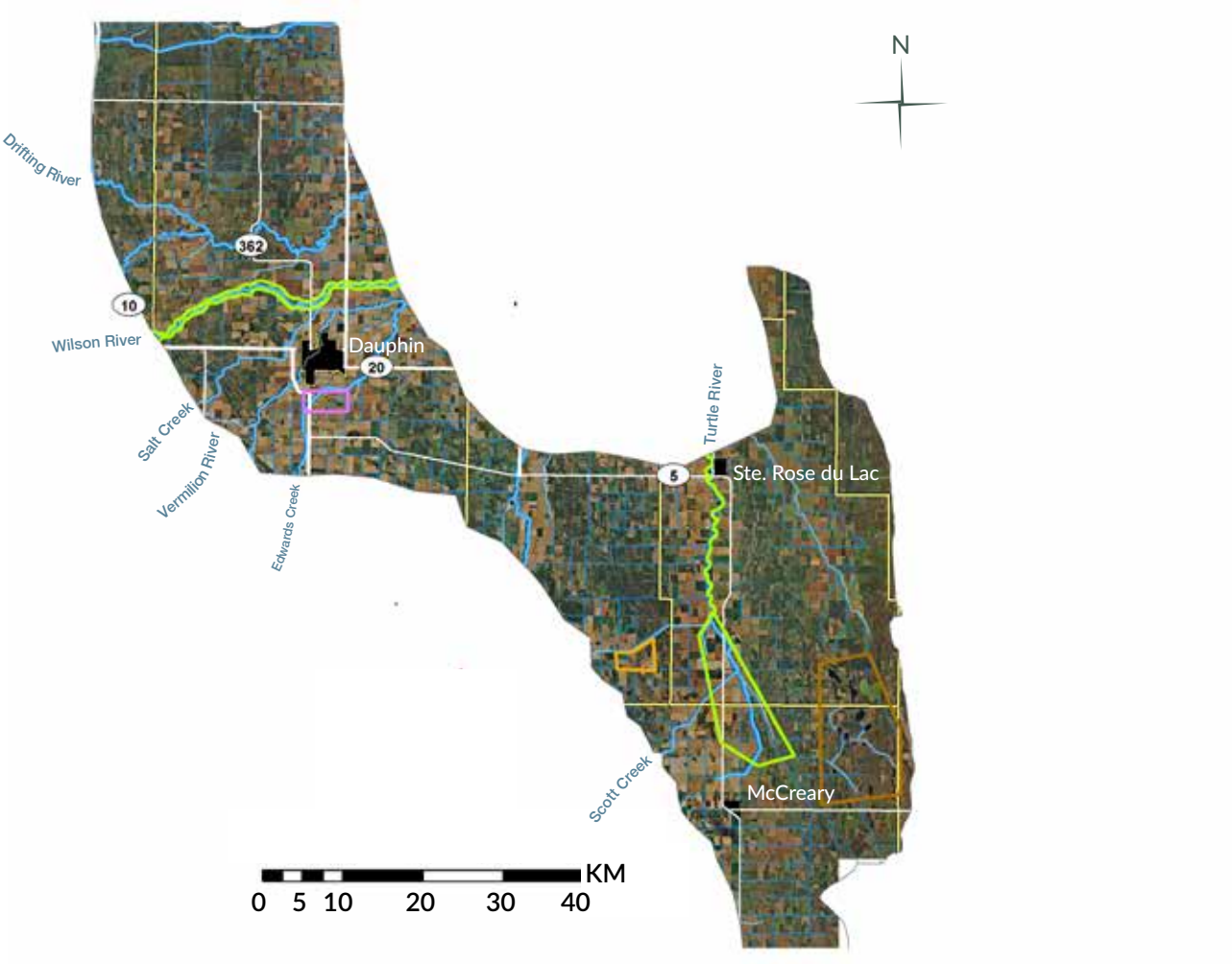


Figure 13. Surface water management features of the Lowland Agriculture Zone

Legend	Issue	Recommendations
	Streambank erosion - the Wilson and Turtle Rivers are characterized by eroded streambanks, due to both natural hydrological processes and upstream modifications	• Landowners should be encouraged to re-vegetate riparian areas • Conservation districts should promote the use of riparian bufferstrips along first, second and third order streams • Conservation districts should work with partners to prioritize streambank restorations • Conservation districts should be actively working in upstream areas and zones (i.e., mid-elevation agricultural zone) to slow runoff
	Potential alluvial fan restoration	• Turtle River Watershed Conservation District should work with local landowners and Crown land leaseholders to restore water retention capacity
	Natural water retention area	• Every effort should be made to maintain the natural water retention capacity of this area; Turtle River Watershed Conservation District should work with landowners to promote the benefits of this area through incentives, education and demonstrations

Legend	Issue	Recommendations
	Channelization of the Turtle River	• When this section of the Turtle River was channelized decades ago, it caused increased flows and erosion downstream; Turtle River Watershed Conservation District and Province of Manitoba should work with local landowners to develop a fair and equitable land-purchase program for low-lying, flood-prone lands, and to restore natural channel migration where possible
	The Edwards Creek diversion has caused siltation downstream, including the formation of a new delta in Dauphin Lake	• Municipalities should ensure that the Edwards Creek shale trap is maintained to minimize the amount of siltation downstream. • Re-connecting the diversion to the original Edwards Creek channel should be considered along with alternate means of flood protection for the City of Dauphin.

Lake and Marsh Zone

Our intent is to protect and restore the ecological and recreational integrity of Dauphin Lake and its lakeshore marshes. Land use practices within this zone should be able to withstand periodic fluctuations in water levels.

Challenges of this Zone:

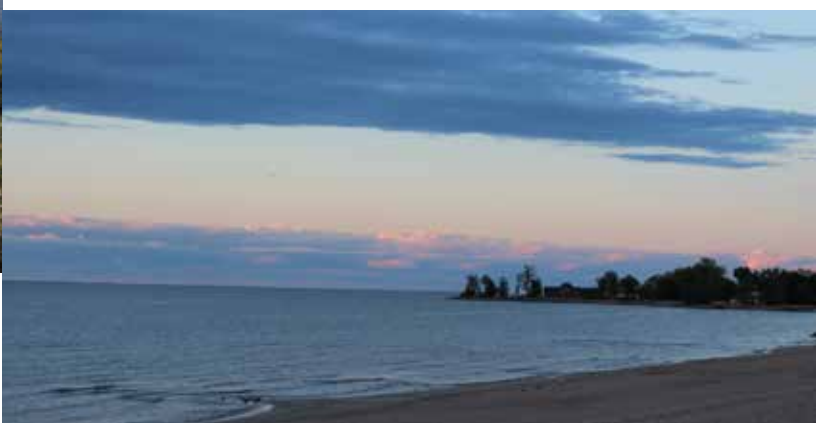
- High water levels on Dauphin Lake have eroded many of the sandy beaches along the southwest shoreline, damaged property during recent flood events (2011, 2013, 2014), and eliminated kilometres of forested buffer zones along the south shoreline.
- Increased sedimentation along tributaries flowing into Dauphin Lake has impacted spawning habitat and added to the sediment load reaching Dauphin Lake. Siltation at the mouths of the tributaries has impaired access for both spawning fish and boat traffic.
- Seven tributaries flow into Dauphin Lake, whereas the Mossy River is the only outlet channel that moves water out of Dauphin Lake. Construction of a second outlet or emergency spillway has been studied in the past, but barriers to implementation include cost and lack of a project champion (page 26).
- Once - healthy lakeshore marshes (Wilson River Marsh, Turtle River Marsh, Valley River Marsh) are in decline due to extended high water levels. Lakeshore marshes are dependent on the natural cycle of fluctuating periods of high and low water levels, which have been trending toward higher lake levels in recent decades.
- Lakeshore marshes form the transition zone between agriculturally productive uplands and the lake, and they were once suitable for grazing and forage production. Extended high water levels on Dauphin Lake have inundated hundreds of acres of former pasture and hay lands, allowing cattails and other water- and salt-tolerant plants to take over.

Implementing objectives 11a, b, c and d will ensure that land use practices are able to withstand periodic fluctuations in water levels. A land purchase program will reduce stressors on agricultural producers and provide compensation for lost income. Coordination with development criteria for residential and cottage areas will reduce disaster payments in future flood years, and ensure new developments are sited appropriately. An **emergency spillway** to enhance outflow from Dauphin Lake during high water years will reduce disaster payments, lessen stressors for lakeshore property owners, and reduce flood damages to municipal infrastructure. Restoration of flood impacted shorelines will help to halt beach erosion and re-establish normal sand deposition patterns. Actions to address these challenges are highlighted in Table 10.

Table 10. Lake and Marsh Zone objectives and implementation plan (lead partner appears in **bold**)

	Objective	How? Or- Tools to achieve our objective	Who?	Measure of Success?
11a	Develop a program to purchase floodprone agricultural land surrounding Dauphin Lake	Financial resources are dedicated to a "buy-out" program, to be developed fairly and equitably, based on the successes and limitations of the Shoal Lakes buyout program	**Province**, RMs	A program is available by 2020
11b	Update development criteria to prevent flood impacts to residential and cottage developments (based on recent flood events)	Establish a development criteria working group to ensure future developments are adequately sited and protected from high water events	**Province (MMG, MIT, MCWS), RMs, Planning districts**	Development criteria are updated and adopted
11c	Establish a working group of affected RMs (Dauphin, Lakeshore, Mossey River), CDs, and the Province to develop an action plan to construct an **emergency spillway** (page 26)	Establish an action plan, including cost benefit analysis, to construct an **emergency spillway**, in light of recent flood studies for the Assiniboine River and Lake Manitoba drainage basin	**RMs; CDs**, **Province**, **(MIT),** federal government	**Emergency spillway** is constructed by 2020
11d	Restore flood-impacted shorelines	Engineering and ecological approaches to shoreline re-enforcement are implemented once upstream water retention and a spillway are underway (Actions 8 and 11c)	**Province**, (MIT, MCWS), CDs	Approaches are scoped out by 2017; implementation begins by 2020


Flooding at Wilson River boat launch



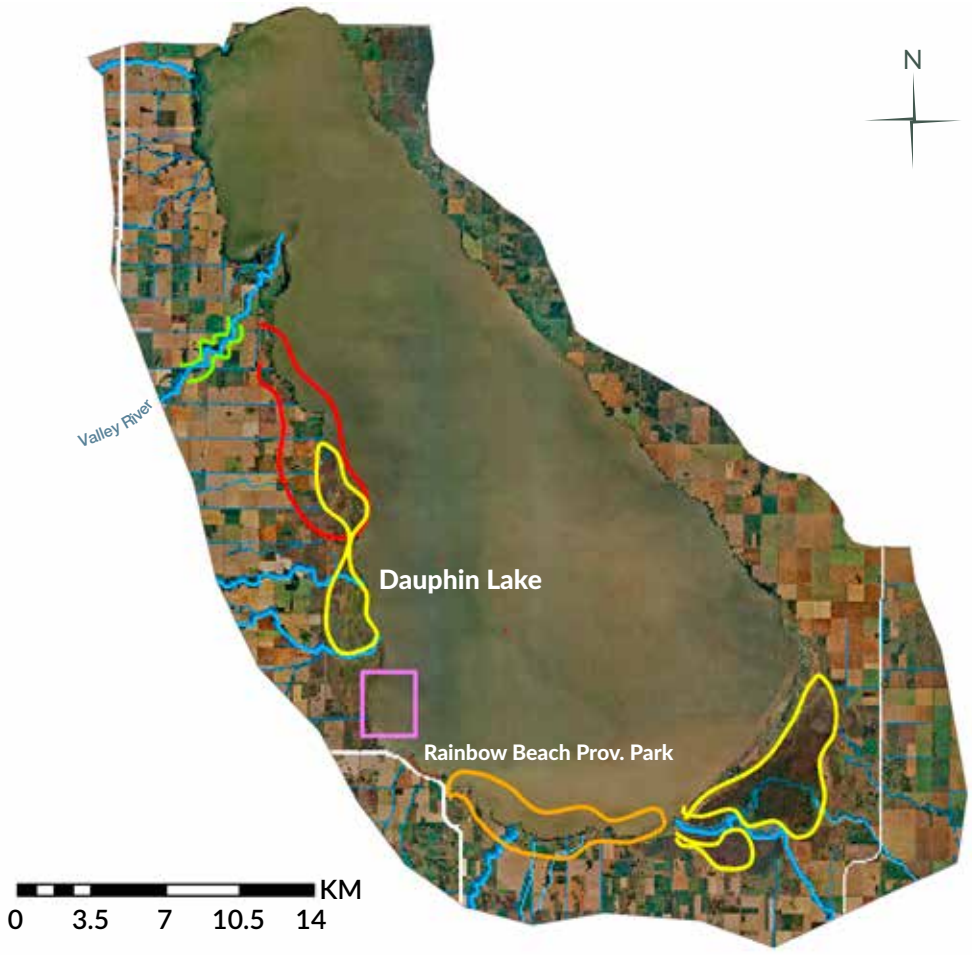


Figure 14. Surface water management features of the Lake and Marsh Zone

Legend	Issue	Recommendations
	Streambank erosion – the Valley River is characterized by eroded streambanks in this zone	• Landowners should be encouraged to re-vegetate riparian areas • Conservation districts should promote the use of riparian bufferstrips along first, second and third order streams • Conservation districts should work with partners to prioritize streambank restorations • Conservation districts should be actively working in upstream areas and zones (i.e., mid-elevation and lowland agricultural zones) to slow runoff
	Flooding of shoreline areas and inundation of agricultural land	• Construction of a much-needed spillway to manage outflow from Dauphin Lake, to work in conjunction with the Mossy River Dam, should be a priority for the Province and Municipalities (Objective 11c)
	Extended high water levels on Dauphin Lake have inundated the Turtle, Wilson and Valley River Marshes, reducing their natural capability to provide waterfowl habitat and pasture lands (through fluctuating periods of high and low water levels)	• Establish a working group of provincial, municipal, local, and NGO stakeholders to identify solutions

Legend	Issue	Recommendations
	The Edwards Creek Delta formed after the diversion was constructed (Lowland Agricultural Zone)	• Maintain shale trap and re-connect original channel (see page 48)
	High water levels on Dauphin Lake have eroded the sandy beaches along the southwest shoreline, damaged property during recent flood events, and eliminated forested buffer zones	• Municipalities and the province should partner to restore shorelines and provide flood protection for cottages and residential properties

PRIORITY: Healthy Fisheries and Wildlife Habitat

GOAL Protect and restore the integrity of natural and riparian areas to maintain healthy wildlife and fisheries habitat in the Dauphin Lake Watershed.

Natural areas are threatened by agricultural, industrial and residential development throughout southern Manitoba, and this watershed is no different. Protecting and restoring the integrity of natural areas including riparian areas, woodlands and wetlands will preserve the ecosystem services they provide. Focusing programming on natural areas will not only preserve their integrity, but will also enhance local awareness of their values. Specific outcomes of these objectives include improved ability of riparian areas to filter runoff, enhanced fish spawning success and restored marsh functions and benefits (waterfowl habitat, water storage, water quality improvement).These outcomes will ensure that commercial and traditional use harvesting of fish continues to support First Nations, Métis, and other local harvesters, and that healthy animals and medicinal plants continue to be available to First Nations and other harvesters.

Table 11. Objectives and actions for healthy fisheries and wildlife habitat in the Dauphin Lake Watershed (lead partner appears in **bold**)

	Objectives	How?	Who?	Measure of Success?
12	Restore degraded aquatic/ riparian habitat sites, as prioritized in riparian/ habitat assessments for the Turtle, Valley, Vermilion and Wilson Rivers	Restore degraded sites in each sub-watershed	**CDs**, RMs, First Nations, Intermountain Sport Fishing Enhancement, other local groups	3-4 projects are implemented each year
13	Conduct riparian assessment of the remaining 3 subwatersheds (Ochre River, Edwards Creek and Mink Creek)	Complete assessments	**CDs**, RMs, First Nations, Intermountain Sport Fishing Enhancement, other local groups	Completed by 2017
14	Provide access to land protection programs that maintain natural habitat and/or permanent cover. Focus on at-risk areas characterized by shelterbelts, woodlands, wetlands, and riparian areas	Work with conservation agencies to develop conservation agreements; provide incentives to landowners to seed perennial forages; work with RMs to implement taxation easements (e.g., RM of Dufferin wetland tax credit); and develop other programs that maintain ecological goods and services (e.g., Pembina Valley Conservation District's Sustainable Slopes initiative)	**NCC**, **MHHC** **CDs**, RMs	Conservation agreements are signed in each zone each year; innovative programs are offered in each CD by 2018

	Objectives	How?	Who?	Measure of Success?
15	Protect and restore lakeshore marshes (Turtle River Marsh, Valley River Marsh and Wilson River Marsh) that form valuable transition zones between agricultural land base and the lake	Natural water level fluctuations are established (see Action 11c.) Investigate options for ensuring periodic low water levels required for healthy lakeshore marshes	**Province (MCWS)**, First Nations, RMs, federal government, DUC	A committee is established to examine options, learning from ongoing research at Delta and Netley-Libau Marshes
16	Enhance fish habitat, spawning success, and protect the Dauphin Lake fishery	Maintain spawning shoals/ riffles to be effective at varying flows, improve fish passage to prime spawning areas, re-establish channel meanders	**CDs**, RMs, Landowners, First Nations, provincial & federal departments	1-3 projects are implemented in each zone each year
17	Ensure wildlife populations and natural habitats continue to thrive throughout the watershed	Work with stakeholders to monitor populations of interest (e.g., moose) and develop protection plans as needed	**Province (MCWS)**, First Nations, RMNP, Riding Mountain Biosphere Reserve	Monitoring data is shared with the public on a routine basis
18	Prevent the spread of aquatic invasive species (AIS), such as Zebra Mussels	Develop partnerships to monitor AIS movement and educate the public on the most effective means of limiting their spread	**Province (MCWS)**, **CDs,** Intermountain Sport Fishing, Riding Mountain Liaison Committee	Educational campaign (Clean, Drain, Dry and Dispose) is offered within the watershed by 2017

Spawning walleye

PRIORITY: Drinking Water Quality and Quantity

GOAL Protect groundwater quantity and quality in the Dauphin Lake Watershed.

Groundwater provides base flow for streams and is also the primary water source for rural, municipal and agricultural water users in the Dauphin Lake Watershed. Natural areas, forested uplands, wetlands, ponds and lakes are critical recharge areas for groundwater sources; protection and management of these areas (as described in previous objectives and actions) will provide many benefits including maintenance of groundwater quality and quantity.

As groundwater is the main source of drinking water in the watershed, activities that protect sources and reduce risks to aquifers are important. Outcomes include reduced risk of contamination of groundwater through abandoned well sealing, better awareness of groundwater quality, well safety and risks, and reduced risk of contamination of source water protection zones (see page 19 and Table 13).

Table 12. Objectives and actions for drinking water quality and quantity in the Dauphin Lake Watershed (lead partner appears in **bold**)

	Objectives	How?	Who?	Measure of Success?
19	Develop an abandoned well inventory, and seal all known abandoned wells	Incentive programs for landowners	**CDs**, MCWS – Groundwater Management	An inventory is completed by 2020; five wells are sealed each year
20	Offer groundwater quality testing, well head assessments and private well water protection throughout the watershed	*Well Aware* booklets are distributed to well owners throughout the watershed; technical and financial support are provided to well owners	**CDs**, MCWS – Groundwater Management	*Well Aware* booklets are distributed to well owners by 2016
21	Implement recommendations from the Source Water Protection Assessment (Table 13)	Partnerships and awareness	**CDs**, MCWS – Office of Drinking Water Municipalities	All recommendations are implemented by 2020

Table 13. Source water protection plan for public water systems (PWS) in the Dauphin Lake Watershed

Sugarloaf PWS - The possibility of contaminant transfer to the aquifer through the well is low – the wellhead is in good condition, surrounded by a grass buffer, and is in a rural area adjacent to only one private yard site. The well owner (RM of Grandview) should consider installing a backup well.

Potential threat	Distance	Risk	Recommendations	Partners
Private Septic field or tank	100 m	Possible leak and subsequent infiltration into aquifer	Provide maintenance information to homeowner	Conservation District
Private well	100 m	Possible exposure to contamination	Complete wellhead assessment with homeowner	Conservation District

G-3 PWS - The possibility of contaminant transfer to the aquifer through the well is low – the wellhead is in good condition, and is in a rural area with agricultural land use.

Potential threat	Distance	Risk	Recommendations	Partners
Roadway	10 m	Possible spill of hazardous materials, followed by infiltration into aquifer	Establish permanent grass buffers; install bollards between all operational and observational wells and roadway to prevent accidental vehicular impact	Conservation District; G-3 Water Cooperative
Fuel tank	100 m	Possible leak and subsequent infiltration into aquifer	Contact landowner to discuss maintenance, or possible relocation	Conservation District
Septic Field	800 m	Septic field located near WTP (800 m from wellheads) - possible exposure to contamination	Provide maintenance information to PWS owner (G-3 Water Cooperative)	Conservation District

City of Dauphin PWS - The possibility of contaminant transfer to the Vermilion River Reservoir is low – the entire subwatershed upstream of the reservoir is located within Riding Mountain National Park.

Potential threat	Distance	Risk	Recommendations	Partners
Livestock	500 m	Possible runoff from livestock	Determine number of livestock operations immediately surrounding reservoir; meet with operators to discuss best management practises	Conservation District
Wastewater treatment ponds	100 m	Waste sludge from WTP is treated in ponds on site	Review *Environment Act* Licence to ensure best practices in the maintenance and operation of wastewater treatment ponds are followed	Conservation and Water Stewardship; City of Dauphin

Rainbow Beach Provincial Park PWS - A new water treatment plant began operating in 2015, removing iron, manganese and arsenic. The possibility of contaminant transfer to the aquifer through the wells is moderate – although the wellhead is in good condition, floodwaters inundated the site in 2011. An abandoned, capped well is located on site.

Potential threat	Distance	Risk	Recommendations	Partners
Floodwaters	On site (when applicable)	Possible infiltration of floodwaters into aquifer	Additional water quality sampling to be conducted after floodwaters recede, when necessary	MCWS - Parks Branch
Vehicular Traffic	10 m	2nd well located near maintenance shed and parking lot	Install bollards between 2nd well and parking lot	MCWS - Parks Branch

Ste. Rose du Lac PWS - The possibility of contaminant transfer to the aquifer through the well is low – the wellheads are in good condition, and are located in a rural area.

Potential threat	Distance	Risk	Recommendations	Partners
Roadway	10 m	Possible spill of hazardous materials, followed by infiltration into aquifer	None – permanent grass buffer already in place	
Livestock	50 m	Possible runoff from concentrated livestock operation	Contact landowner to discuss options for BMP implementation to reduce nutrient and contaminant movement off-site	Conservation District

Ste. Rose South Water Co-op PWS - The wellhead is in good condition; however, due to an arsenic water quality advisory issued in June 2014, the system will be connected to the Ste. Rose du Lac PWS in 2016.

Potential threat	Distance	Risk	Recommendations	Partners
Livestock	50 m	Possible runoff from concentrated livestock operation	Contact landowner to discuss options for BMP implementation to reduce nutrient and contaminant movement off-site	Conservation District

Laurier PWS - The possibility of contaminant transfer to the aquifer through the well is low – the wellheads are in good condition, and are located in a rural area.

Potential threat	Distance	Risk	Recommendations	Partners
Floodwater	25 m	Possible infiltration of floodwater into aquifer	None – well head is located well above grade on existing dike	N/A

McCreary PWS - The possibility of contaminant transfer to the aquifer through the well is low – the wellhead is in good condition, is located in a rural area and is located well back from the road. The well owner should consider installing a backup well. No threats identified.

Linking IWMP to Development Plans in the Dauphin Lake Watershed

The *Planning Act* of Manitoba (C.C.S.M. c. P80) received Royal Assent on June 16, 2005. It provides the legal basis upon which development plans are enacted by Manitoba municipalities. Revisions to the *Planning Act* came into effect on January 1, 2006 and mandated that all municipalities enact development plans.

Development plans that have been enacted by municipalities and planning districts (P.D.) throughout the Dauphin Lake Watershed include: Agassiz P.D. (encompassing McCreary municipality), Dauphin (City), Dauphin (municipality), Lakeshore P.D. (Mossey River and Lakeshore municipalities), Mountainview P.D. (Grandview, Gilbert Plains and Ethelbert municipalities), and Ste. Rose P.D. (Ste. Rose municipality).

Provincial Planning Regulation

Manitoba's Provincial Planning Regulation (Regulation 81/2011) was registered June 20, 2011. This regulation promotes sound land use planning and expresses the government's interest in the sustainable development of land, resources and infrastructure. Provincial Land Use Policies (PLUPs) are detailed in the Provincial Planning Regulation and serve as a guide to planning authorities in preparing, reviewing and amending development plans. They are intended to give general guidance and ensure that provincial interests are addressed. A development plan or regional strategy must be generally consistent with the PLUPs. The policies by their nature are general and cannot account for all local situations, special circumstances and exceptions. In recognition of this variability it is intended that they be applied to reflect local needs, so long as provincial interests are not undermined.

For planning resource guides and other resources, see the Provincial Planning Regulation website at www.manitoba.ca/ia/plups.

IWMP & Development Plans

Policies of development plans and integrated watershed management plans are interconnected, and are required to be implemented in a mutually beneficial fashion as stated in the *Water Protection Act* (C.C.S.M. W65). The Provincial Planning Regulation takes an integrated approach to water protection by promoting land use planning that considers the entire watershed, including the protection of riparian areas, ground and surface water. Riparian and floodplain area policies are contained in Provincial Land Use Policy Area 5: Water. Development plans in the Dauphin Lake Watershed have addressed riparian setbacks, erosion, flood hazard areas, and maintenance of riparian vegetation to varying degrees, depending on the age of the development plan. Specific recommendations that strengthen the recommendations of the Provincial Land Use Policies, targeted to municipalities, conservation districts, or for inclusion in Development Plans, are outlined below.

Source Water Protection

- **For Development Plans:** Developments, activities, land uses and structures that have a high risk of causing pollution and include, but are not limited to chemical and fertilizer storage facilities, septic fields and tanks, fuel tanks, waste disposal grounds and sewage treatment facilities should be restricted in source water protection areas for all public drinking water sources. Where restriction is not possible, development must be limited and may be subject to:
  - Demonstration by the proponent that no significant negative effect on water is likely to occur;
  - The implementation of mitigation measures and alternative approaches that protect, improve or restore these areas; and
  - The preparation of a strategy for mitigation in the event that negative impacts do occur.
- **For Development Plans:** All new development should be required to seal all known abandoned wells in public water system source water protection areas.

- **For Municipalities:** Ensure an emergency response plan is developed for each public drinking water system to address spills, accidents, and other emergencies that may affect public drinking water sources.
- **For conservation districts:** CDs will provide technical advice to each planning district and municipality on the location of source water protection zones, and work with stakeholders to implement recommendations of the source water protection plan (pages 56-57).

Riparian Areas

- **For Development Plans:** Land should not be cleared, cultivated or developed to the water's edge of creeks, streams, and lakes. A buffer (15-30 metres) of undisturbed native vegetation shall be retained to reduce erosion and sedimentation, protect water quality, fish habitat and provide wildlife cover.
- **Example:** Ste. Rose Planning District policy 2.3.7.4: "…. In considering the riparian area or the reserve in .3 above, the area should consist of an undisturbed native vegetation area, located upslope from the ordinary high water mark. The width should be a minimum of fifty (50) ft (15 metres) of undisturbed vegetation for lands adjacent to first and second order drains and a minimum of one-hundred (100) ft (30 metres) of undisturbed native vegetation of lands adjacent to third or higher order drains and waterbodies. Boat docks, boat houses and the like, within the undisturbed native vegetation area, are limited to a maximum of twenty-five percent (25%) of the shoreline length of each lot."

Avoiding Flooding and Erosion

- **For Development Plans:** Enhance Provincial Land Use Policy 5.2 - Promote land use patterns and development that minimize risks to people, property and water quality from hazards and nuisances related to flooding, erosion or bank instability.
- **Example:** Ste. Rose Planning District policy 2.3.6.2: Land subject to significant flooding, erosion or bank instability should be left in its natural state or only developed for low intensity uses such as cropping, grazing, forestry or open space recreational activities which are generally acceptable within hazard areas. Best management practices for agricultural activities within riparian areas should be adopted. Annual cropping and unmanaged grazing activities can adversely affect riparian areas…. The Planning District Board will consult with and coordinate their land use and development activities with the Turtle River Watershed Conservation District (TRWCD) Board since they are in the business of managing and conserving natural resources for the long-term benefit of everyone.
- **For Development Plans:** Development should be located outside of designated flood prone areas. The limits of the designated flood prone area should be determined by the implementing authority, in consultation with Manitoba Conservation and Water Stewardship. Development within this area should take appropriate measures reduce the impact of flood waters on buildings and infrastructure.
- **Example:** Ste. Rose Planning District policy 2.3.6.1: "Development will generally be directed away from environmentally sensitive areas. Sensitive lands include the following: (a) lands subject to flooding – all lands which would be flooded by the 100 year flood, or by a recorded flood exceeding the 100 year flood level, or a flood specified by Manitoba Water Stewardship in areas protected by flood control works….."
- **For Development Plans:** Require all new construction development along Dauphin Lake to be built above the 2011 flood of record elevation (860.7 ft a.s.l.) plus 2 ft or any subsequent flood of record.
- **For conservation districts:** CDs will provide technical advice to municipalities and planning districts to implement the recommendations of the surface water management plan (pages 37-52).

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