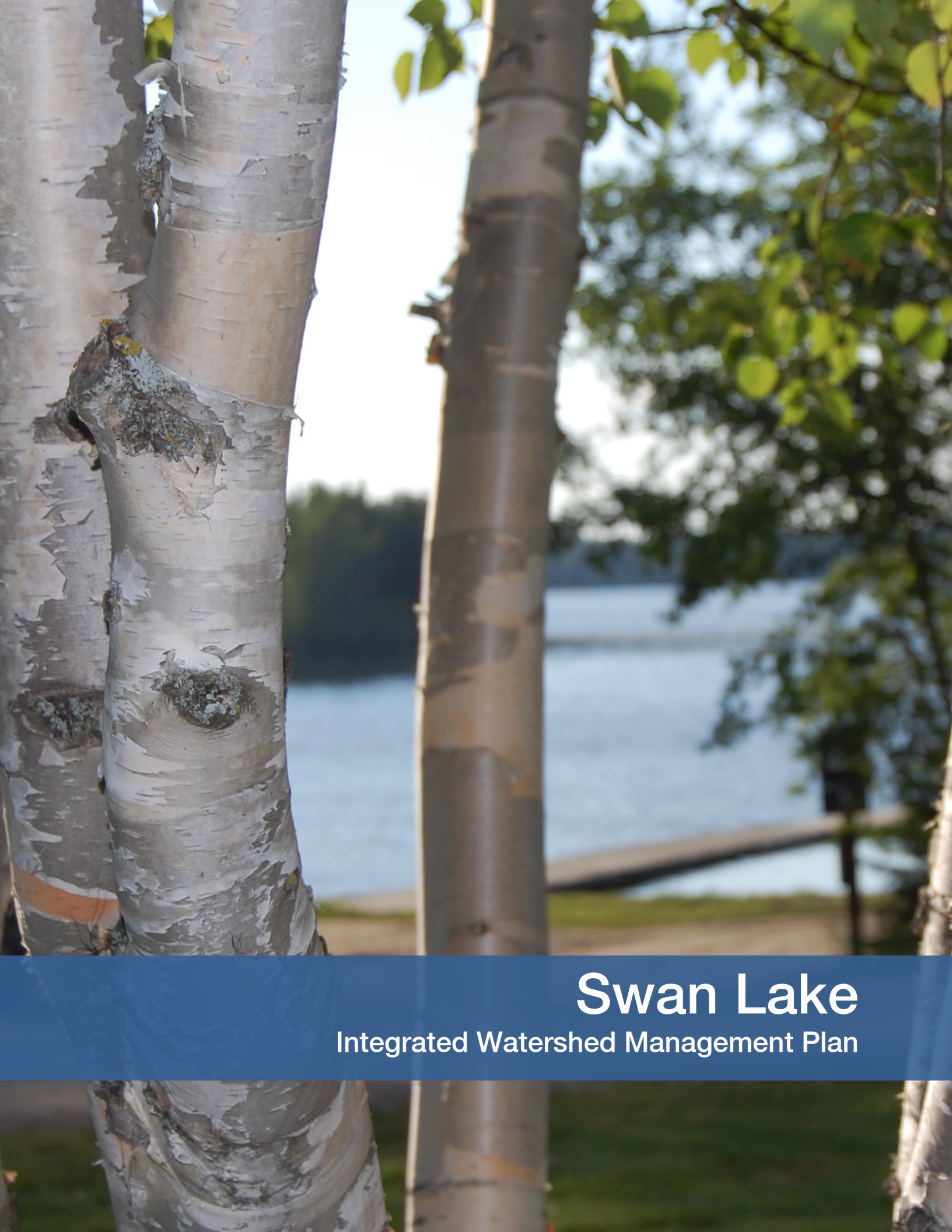

Swan Lake

Integrated Watershed Management Plan

ACKNOWLEDGEMENTS

The Swan Lake Watershed Conservation District, as the water planning authority for the Swan Lake Watershed, would like to acknowledge and thank their watershed residents and partners for their support, input and participation in the development of the Swan Lake Integrated Watershed Management Plan.

A special thank you to the members of the Project Management Team (PMT):

Walter Pacamaniuk (PMT Chair and Chair of Swan Lake Watershed Conservation District Board)
Bob Davies (PMT Vice Chair and watershed resident)
Andy Miller (watershed resident)
Wade Cable (Louisiana Pacific Canada Ltd.)
Craig Stevens (Wuskwi Sipihk First Nation)
Brent Erlendson (District Manager, Swan Lake Watershed Conservation District)
Kendra McFadyen (Financial Administrator, Swan Lake Watershed Conservation District)
Sharla Boychuk (Watershed Planner, Manitoba Conservation and Water Stewardship)
David Jones (Former Watershed Planner, Manitoba Conservation and Water Stewardship)
Andrea McLean (Senior Watershed Planner, Manitoba Conservation and Water Stewardship)

Many thanks to the following members and organizations for their support in the development of this plan, including Agriculture and Agri-Food Canada, Fisheries and Oceans Canada, Cindy Boychuk for the many pictures she contributed to this plan, Louisiana Pacific Canada Ltd., Manitoba Habitat Heritage Corporation, Manitoba Conservation and Water Stewardship, Manitoba Municipal Government, Manitoba Food and Rural Development, Nature Conservancy Canada, Regional Initiative for a Strong Economy, Spruce Products Ltd., Whitefish and Wellman Lake Associations, Wuskwi Sipihk First Nation, local rural municipalities, the local planning district and community watershed residents.

Buddy Brass was a voice for building bridges between First Nations and non First Nation people. The knowledge he contributed as an elder of the Wuskwi Sipihk First Nation was important to understanding First Nation issues in regards to water. He played an integral role in developing the First Nations component of this watershed plan. He was a champion of his people as well as all First Peoples in Canada when it came to standing up for the rights of First Nations people. Buddy was humble, caring, and selfless when it came to helping his people. He was a voice of reason during trying times and his wisdom and guidance will never be replaced. He had a big heart for the youth of the Nation and always had a word of encouragement for you in times of distress. He showed that there were no barriers when it came to fighting for what is right.

We will miss you Buddy, may the creator keep you and watch over you.

Ekosi, Meegwetch.
That is all, Thank you.

WATERSHED PLAN SUMMARY

The Swan Lake Integrated Watershed Management Plan was developed as a partnership between Swan Lake Watershed Conservation District, Manitoba Conservation and Water Stewardship, First Nations, local municipalities, community stakeholders and watershed residents. The plan outlines watershed priorities and objectives for the protection, restoration and improved management of water, aquatic ecosystems and drinking water sources (Figure 1).

The recommendations included in this plan ensure programming dollars are prioritized and directed to having the greatest impact in improving the health and sustainability of the watershed. Each stakeholder in the watershed has a role in ensuring this plan is successfully adopted and implemented.

Figure 1 provides an outline of some key actions of the plan. All actions of the plan fall under one of the three watershed priorities.

3 Watershed Priorities

were developed to address key concerns within the watershed:

1. Surface Water Management

- Monitor integrity of retention structures in Mountain Zone.
- Monitor inputs and sedimentation into Swan Lake.
- Conduct riparian and aquatic assessments.

2. Groundwater Preservation

- Implement Source Water Assessment.
- Establish SLWCD as a central resource for private groundwater water quality testing.

3. Habitat Protection

- Promote the development of a designated area for conservation and traditional purposes along Swan Lake.

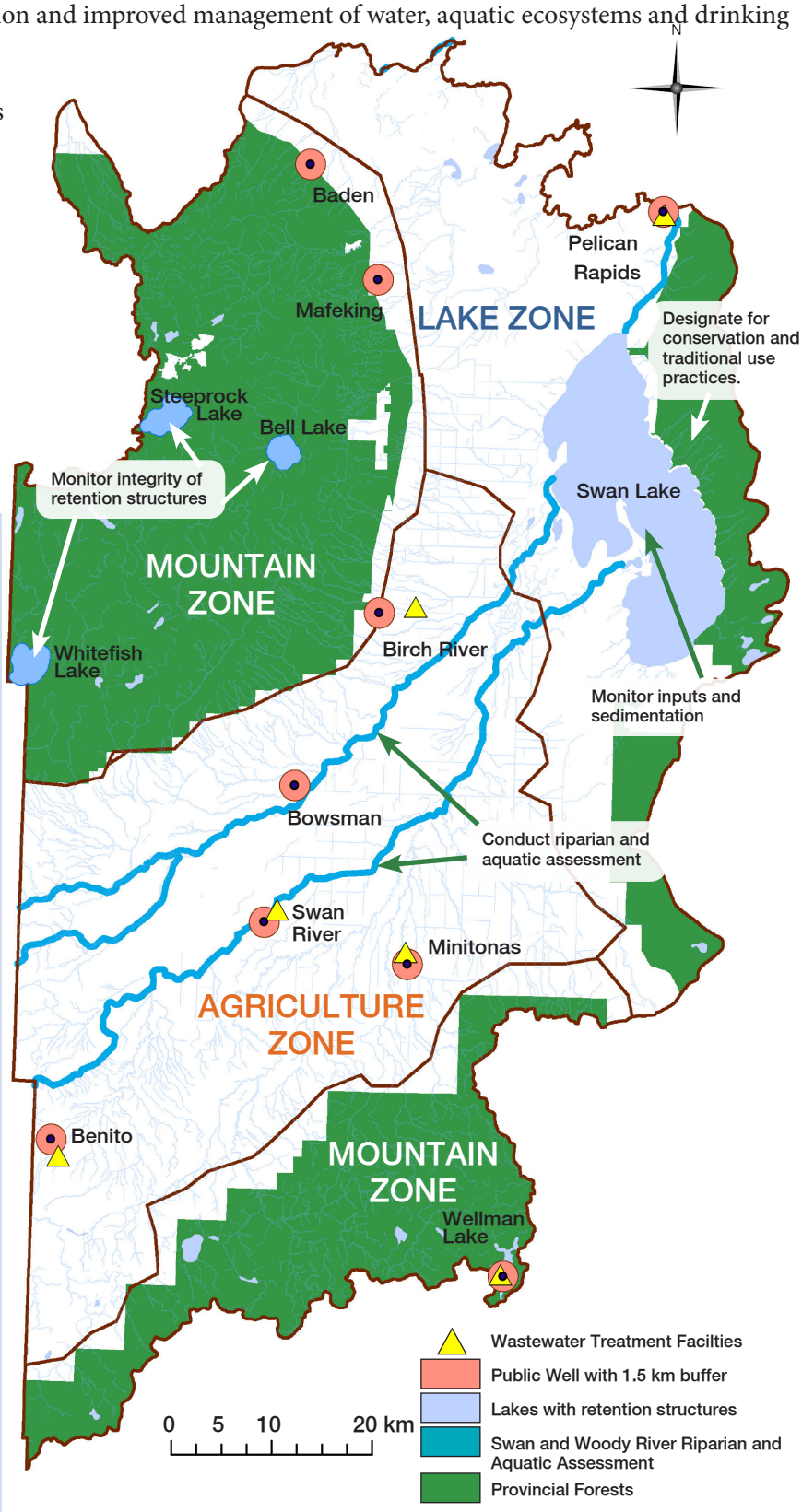

Figure 1: Key actions in the Swan Lake Watershed

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INTRODUCTION

The Swan Lake Watershed is one of the most topographically diverse watersheds in Manitoba. The flow of water through this unique topography has defined local industry, society and culture of the region. The watershed is home to approximately 10,000 residents and supports recreational tourism, agriculture, forestry and commercial fishing.

In November 2008, the Province of Manitoba designated the Swan Lake Watershed Conservation District (SLWCD) as the water planning authority for the Swan Lake Watershed, granting SLWCD the authority to create an integrated watershed management plan (IWMP) for the Swan Lake Watershed. This 10 year plan outlines goals and actions to manage land and water resources on a watershed basis. It is a shared effort through the cooperation of multiple organizations including the conservation district, all levels of government, First Nation communities, non-government conservation agencies and watershed residents.

Watersheds are considered the most ecologically and administratively appropriate unit for managing water. A watershed can be defined topographically as an area of land in which all water drains to a common point. Planning based on a watershed provides the opportunity to address water quality, water quantity and cumulative impacts of land and water management practices beyond the scope of single jurisdictions. A locally led IWMP is a document which outlines actions to address land and water priorities. This plan serves as a tool for residents, government agencies and other stakeholders to simplify and coordinate decision making across the watershed. It is designated to help influence how decisions are made on water management, land development, drainage, and where conservation dollars are focused. Each integrated watershed management plan is unique and reflects local goals and priorities for the watershed.

Many people and organizations have contributed to the development of this plan and will be involved in its implementation. Lead and partnering organizations for each recommended action are listed in the plan. The Swan Lake Water Planning Authority will meet every three years to assess plan implementation and review measurements of success.

KEY PLAYERS

Watershed residents are the most important group of individuals in the creation and implementation of the watershed plan. The Swan Lake IWMP is a reflection of collective local values of watershed residents. Throughout the development of the plan, watershed residents outlined their concerns relating to land and water resources and shared their vision for a healthy, sustainable watershed in the future.

The **Water Planning Authority (WPA)** is the organization designated under *The Water Protection Act* with the responsibility of developing an integrated watershed management plan.

The **Project Management Team (PMT)** is the key decision maker during the development of the IWMP. The PMT met regularly, developed communication materials, prepared and hosted the public consultations, and finalized content of the watershed plan.

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

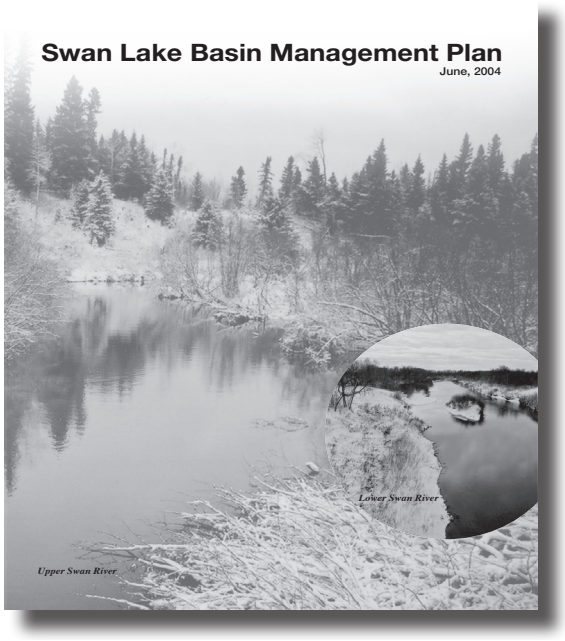
Local **First Nations** have been involved throughout the development of the IWMP. Representatives from Wuskwi Siphik First Nation have provided valuable content to this plan.

HISTORY OF PLANNING

In 2000, the Government of Manitoba initiated a process to develop a management plan for the Swan Lake Basin (Figure 2). The purpose was to bring together Manitoba and Saskatchewan agencies to develop a plan to preserve the Swan Lake Basin environment, economy and society. In 2004, the plan was finalized and included the following guiding principles:

BASIN EDUCATION PLAN

- Raise awareness of the Swan Lake Basin.
- Distribute information on the basin and on the state of the basin's water resources.
- Encourage and assist study of the water resources in the Swan Lake Basin.



SURFACE WATER RUNOFF PLAN

- Encourage the use of best soil and water management practices to reduce sediment, nutrient, and chemical contributions to the water regime.
- Provide complimentary surface water management recommendations to interested landowners.
- Assist interested landowners with projects that reduce the amount of runoff water or improve water quality.

WATER REPORT PLAN

- Compile water related data on a basin basis.
- Complete an annual report on the state of the basin's water resources, including a discussion of the current year's monitoring data and any current trends in the data.
- Distribute the annual water report to interested agencies and newspapers throughout the basin.

RIPARIAN ENHANCEMENT PLAN

- Conserve and enhance riparian environments and associated wetlands, in conjunction with cooperative landowners throughout the basin.
- Compile an inventory of the basin's riparian and associated wetland areas, with respect to their health.
- Recommend riparian and associated wetland areas for protection or enhancement.
- Assist interested landowners with riparian and associated wetland protection and enhancement projects.

ACTIONS COMPLETED TO DATE:

The SLWCD has been instrumental in advancing the principles of the Swan Lake Basin Management Plan. When the Swan Lake Basin advisory board disbanded it was recommended that all information and resources be given to SLWCD, to further implement recommendations identified in the basin plan. Actions completed to date include:

- Developed and carried out incentive programming for grassed waterways, bank stabilization, fishway habitat improvements, and surface water testing.
- Hosted educational programming, youth involvement and educational workshops.
- Initiated a riparian and aquatic assessment for the Swan and Woody Rivers.
- Partnered with Manitoba Habitat Heritage Corporation (MHHC) on conservation agreements to conserve riparian areas.
- Increased uptake on riparian and winter site management beneficial management practices (BMPs) offered to landowners.

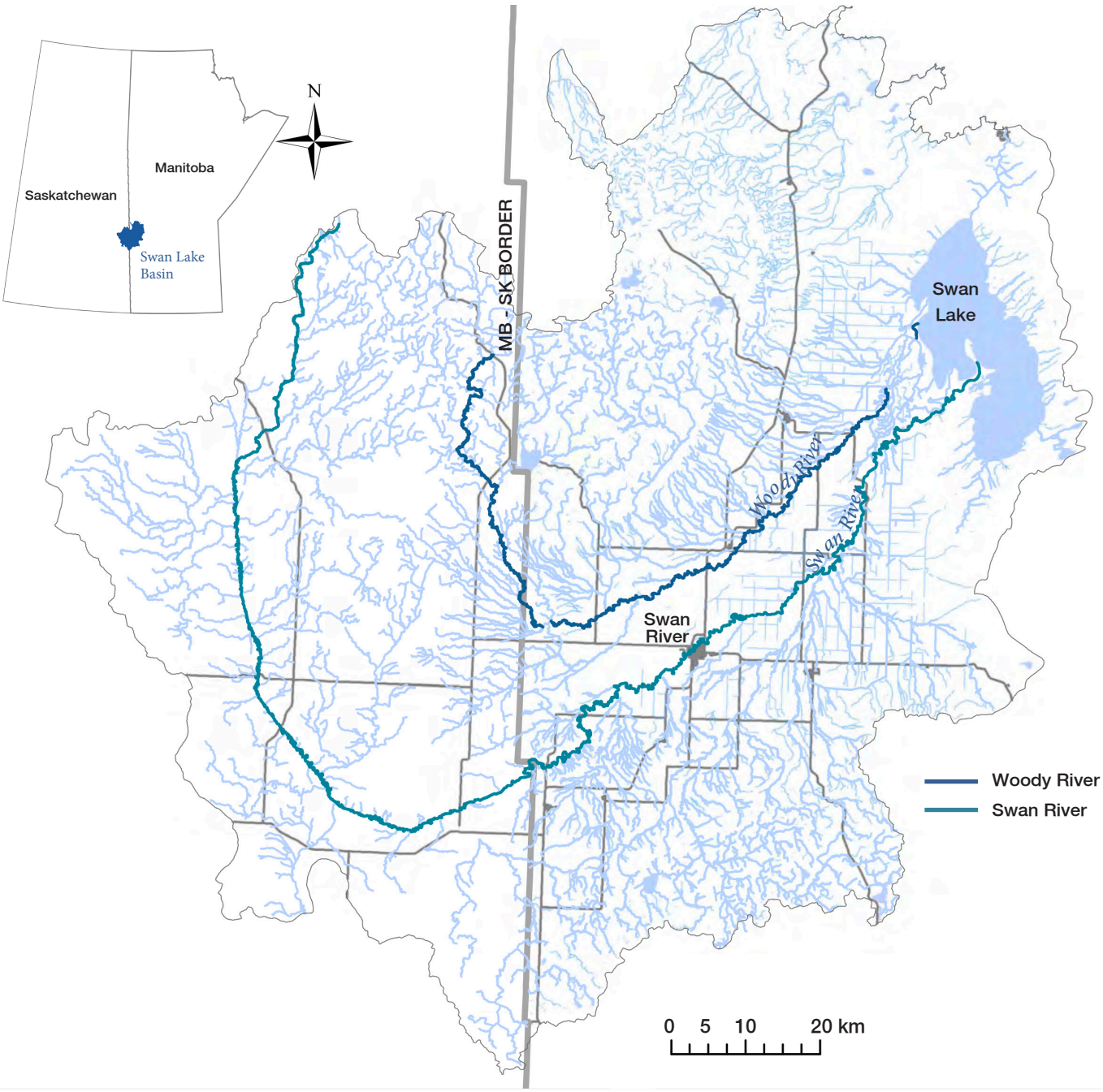


Figure 2: Swan Lake Basin, inclusive of Manitoba and Saskatchewan

TRANS-BOUNDARY LIMITATIONS

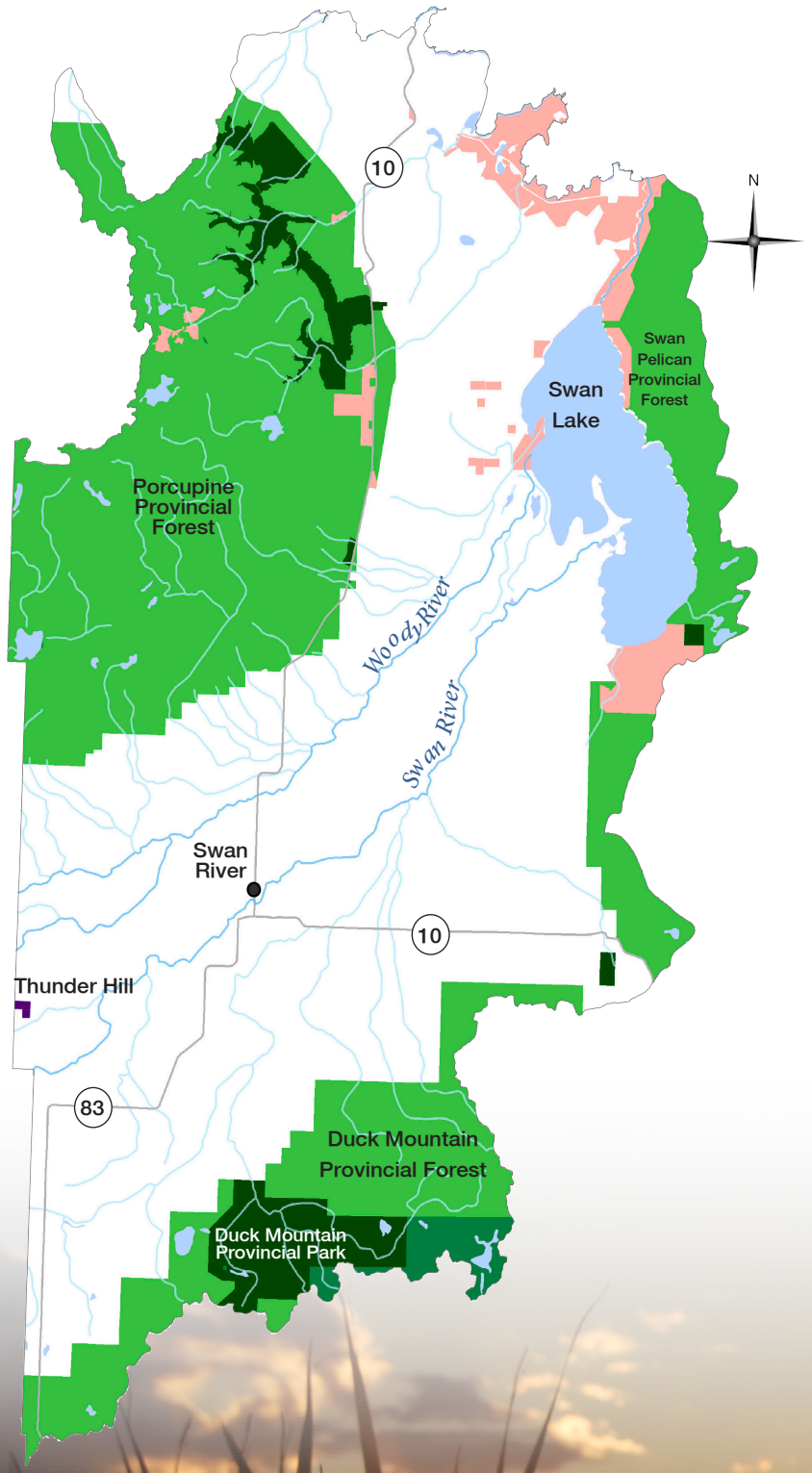
A significant portion of the Swan Lake Basin is located upstream of the IWMP planning boundary, in Saskatchewan. While this plan considers impacts of upstream activities, the inter-jurisdictional nature of the basin has limited the extent of discussion on the upstream (Saskatchewan) portion of the basin. Increased trans-boundary communication and cooperation on activities in the basin is integral to the success of many actions identified in this IWMP.

IWMP AREA: SWAN LAKE WATERSHED

The Swan Lake IWMP focuses on the Manitoba portion of the Swan Lake Basin. This plan reviews recommended actions from the Swan Lake Basin Management Plan and considers what actions have been implemented since 2004. The Swan Lake IWMP (Figure 3) identifies priorities for the watershed today and enhances the list of actions to further improve watershed health into the future.

This diverse watershed covers an area of approximately 7,199 km^2 and is one of many watersheds that contribute to the greater Lake Winnipegosis and Lake Manitoba Basins. Soils and topography within the Swan River Watershed were largely affected by the previous ice age. Soils in the lower portions of the Swan River Valley, along Swan Lake, are mostly lacustrine. They were formed by glacial lake deposits and consist of layers of clay, silt and sand. Along the base of the Porcupine Hills and south of Swan Lake sand was deposited by the ancient beaches of Lake Agassiz. To the west of Swan Lake deposits of unconsolidated alluvial and organic materials are found overtop of the glacial and lacustrine sediment layers. Topographically significant features of the watershed include the Porcupine Hills, the Duck Mountains, Thunder Hill, the Swan River Valley and the Swan Lake Plain. Two major rivers run parallel to each other, the Woody and the Swan River. Both of the rivers originate west of the Porcupine Hills, flowing across the border through Saskatchewan to Manitoba and then into Swan Lake. Other rivers of the watershed include the Birch, Roaring, Sinclair, West Favel and East Favel rivers. The Bell and Steeprock rivers are also located within the IWMP area, however they are located north of Swan Lake and do not drain directly into Swan Lake.

The Swan Lake Basin Management Plan took a broader look at the entire Swan Lake Basin, inclusive of both Manitoba and Saskatchewan. The Swan Lake IWMP takes the guiding principles of this basin plan and builds on it for a more detailed watershed plan, specific to the Manitoba portion of the basin.



Lakes
First Nations
Protected Areas
Provincial Forests

Figure 3:
Features of the Swan Lake Watershed

0 5 10 20 km

A FIRST NATIONS VIEW OF THE WATERSHED

For First Nations people water is viewed as the source of life for all living things and essential to both physical and cultural survival. Water is alive and is a spirit. In seeking traditional knowledge and views of the watershed, elders and community members were asked about their concerns, values and challenges for the watershed. When asked, water was cited as most important watershed value for them.

Connections to water are felt close to home for First Nations people and are closely tied to traditional ways, in hunting, trapping, or gathering of medicines and food. Water plays an intrinsic role and is an important part of the natural environment. Wherever traditional practices occur, this closeness to water is felt. It is known that all plants and animals require water if they are to survive. In turn, these plants and animals provide food for traditional hunting and gathering.

WUSKWI SIPIHK FIRST NATION

Wuskwi Sipihk First Nation is a community situated at the base of the Swan Lake Watershed, along Swan Lake. At 32 years old, Wuskwi Sipihk is a break off from its parent community of Sapotaweyak Cree Nation. Wuskwi Sipihk First Nation has a population of approximately 180 people on-reserve, with a total of 556 band members or registered members. The area surrounding Wuskwi Sipihk is diverse and rich in natural resources.

Representatives from Wuskwi Sipihk First Nation played an integral role in the development of this watershed plan. Traditional knowledge was collected and incorporated into the values, concerns and actions of this IWMP.

CHANGES TO OUR WATERSHED

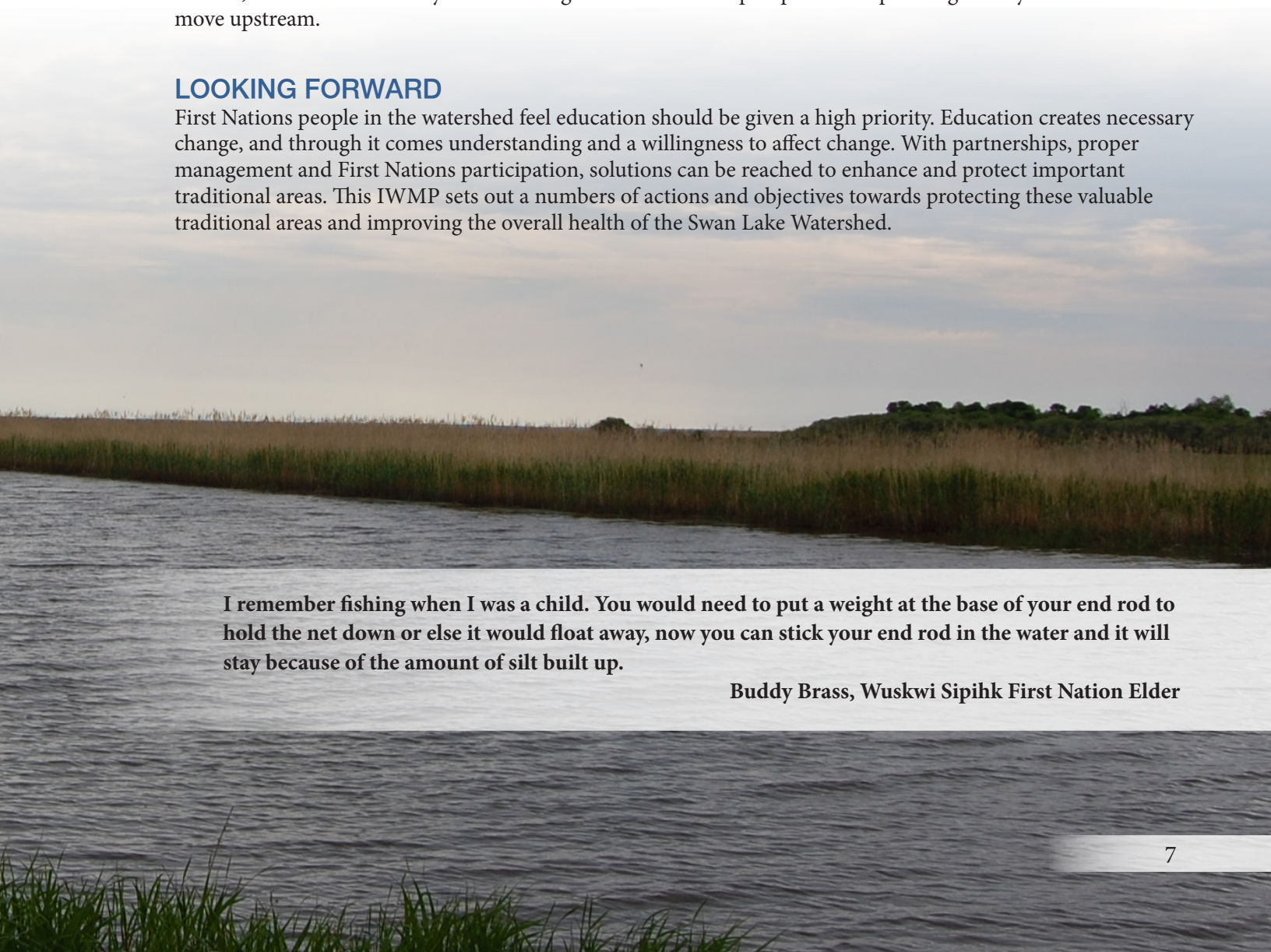
First Nation traditional use and harvesting include hunting of moose, elk and deer, berry picking, and medicinal herb gathering. Traditional use spans a large area of the watershed, along Swan Lake to the Kettle Hills and into the Duck Mountains and Porcupine Hills. Traditional areas near Swan Lake have been impacted by upstream development and land use activities. Erosion, drainage and habitat loss have contributed to increased sediments and nutrients flowing downstream through the watershed. First Nations have become concerned about the resources utilized and those lost through development upstream. Some are concerned that traditional lifestyles are being disrupted and even erased completely.

Local traditional knowledge views water as a critical indicator of change in the environment. It is impacted by development as flows are changed and water retention on the land is impacted. These changes are often not all felt at once, they are felt over a period of time. First Nation people have begun to notice these changes through the movement of creeks, streams and wildlife. Changing the natural environment changes how the area is utilized and lived in. Wildlife and habitat is lost or dispersed, and valuable plants used in medicine and as food staples are lost or altered.

Erosion, siltation, habitat loss, and changes in wildlife movements are all concerns for the community. These changes have affected the quality of water travelling downstream, as well as the water quality of Swan Lake. Silt has built up over time and accumulated on the bottom of Swan Lake. Elders recall that the lake once had a hard bottom, it now has a thick layer of silt along it. The silt build-up impacts fish spawning as they are not able to move upstream.

LOOKING FORWARD

First Nations people in the watershed feel education should be given a high priority. Education creates necessary change, and through it comes understanding and a willingness to affect change. With partnerships, proper management and First Nations participation, solutions can be reached to enhance and protect important traditional areas. This IWMP sets out a numbers of actions and objectives towards protecting these valuable traditional areas and improving the overall health of the Swan Lake Watershed.



I remember fishing when I was a child. You would need to put a weight at the base of your end rod to hold the net down or else it would float away, now you can stick your end rod in the water and it will stay because of the amount of silt built up.

Buddy Brass, Wuskwi Sipihk First Nation Elder

TOPOGRAPHY

Topography describes the surface shape of the watershed and is one of the primary elements influencing local water movement. Topography of the Swan Lake Watershed was shaped thousands of years ago by the previous ice age. The retreat of glacial Lake Agassiz formed the Swan River Valley. The Porcupine Hills and the Duck Mountains mark the old shoreline of Lake Agassiz. Together, the Porcupine Hills and the Duck Mountains form the most northern extent of the Manitoba Escarpment. Elevation levels reach up to 730 meters above sea level (masl) in the Porcupine Hills, and up to 700 masl in the Duck Mountains. Overall the watershed experiences an elevation range of 533 m.

Vertical relief in this watershed is quite substantial in some areas. Significant relief changes are most evident along the edges of the Porcupine Hills and the Duck Mountains (highlighted in burgundy in Figure 4). This can be problematic in surface water management planning, especially during spring melting or significant rainfall events.

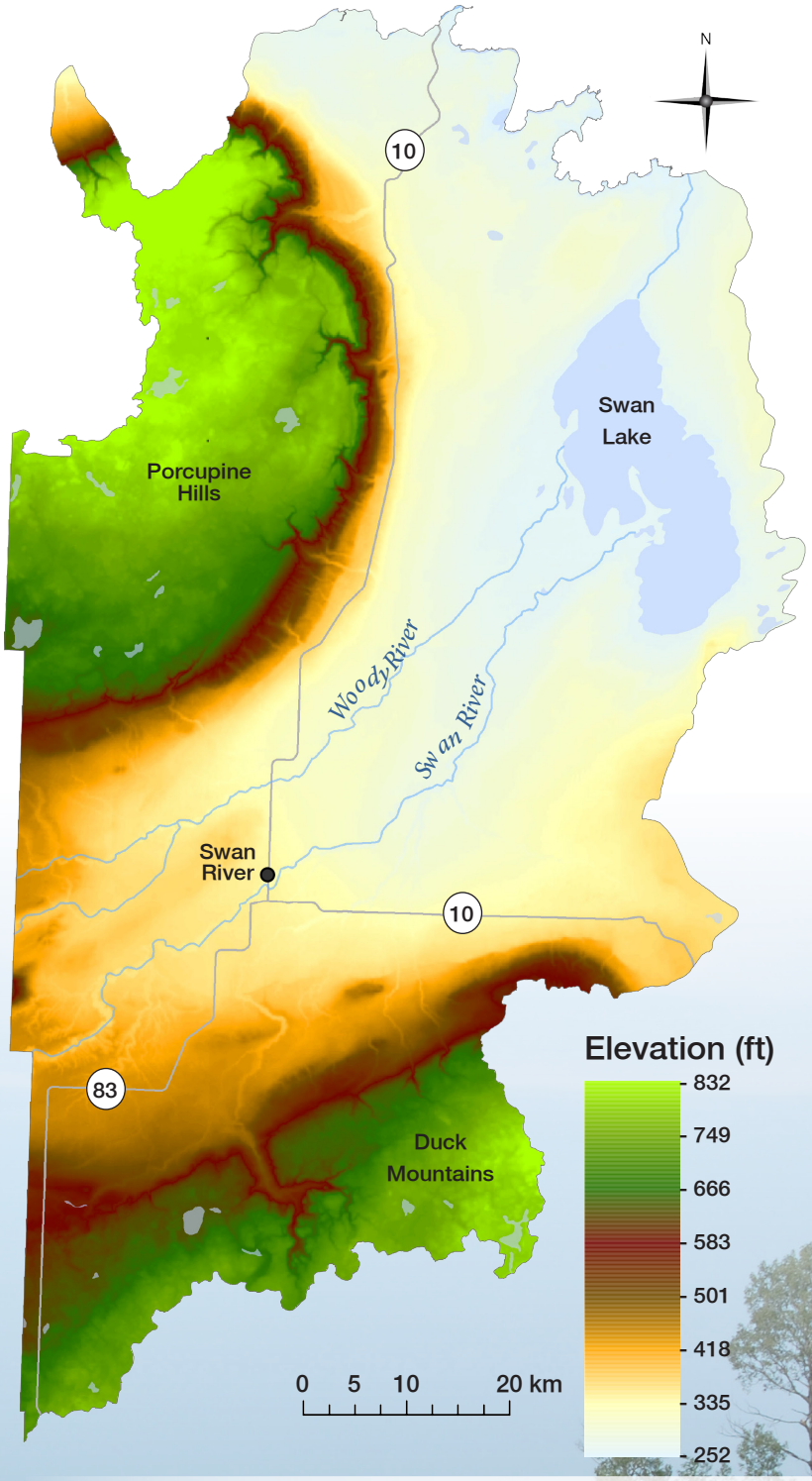


Figure 4: Topography of the Swan Lake Watershed

WATER EROSION RISK

Water erosion risk of an area is calculated based on mean annual rainfall, slope length, slope gradient, soil type, and is based on bare unprotected soils. The steep slopes of the Swan Lake Watershed are the largest influencing factor for erosion risk from overland water flows. Approximately 31% (189,900 ha) of the Swan Lake Watershed is considered moderately to severely susceptible to water erosion and sediment transport. Approximately half of this is considered severely susceptible to water erosion risk.

Tillage of agricultural lands can increase water erosion rates, resulting in sedimentation and nutrification of waterways within the watershed. Crop and residue management activities may significantly reduce the risk of soil and water erosion in spring thaw and rainfall events, and must be carefully considered in areas prone to severe water erosion.

HYDROLOGY

The Swan and Woody Rivers originate in the northwest corner of the watershed. The Woody River captures tributaries on the west and southwest sides of the Porcupine Hills and the Swan River captures tributaries from the north side of the Duck Mountains. These rivers flow parallel to each other through the Swan River Valley and eventually flow into Swan Lake.

The Swan and Woody Rivers typically have continuous flow throughout the year. Peak flows are usually seen in April and May. Many of the contributing waterways and tributaries are characterized by flows typically limited to spring snowmelt or high rainfall events. Often all tributaries are dry by the fall. Major flooding events include those in 1988, 1995, 2006, and 2012 (Figure 5). They resulted in significantly eroded soils, and increased sedimentation and nutrient runoff. With agricultural expansion, drainage, changes in land use practices, and realized impacts from climate change, increases in the variability of flow may be further experienced in this watershed.

Local traditional knowledge notes an increase in water flows through the watershed. Overall water is moving faster now through the ditches and waterways, as land and vegetation are being cleared.

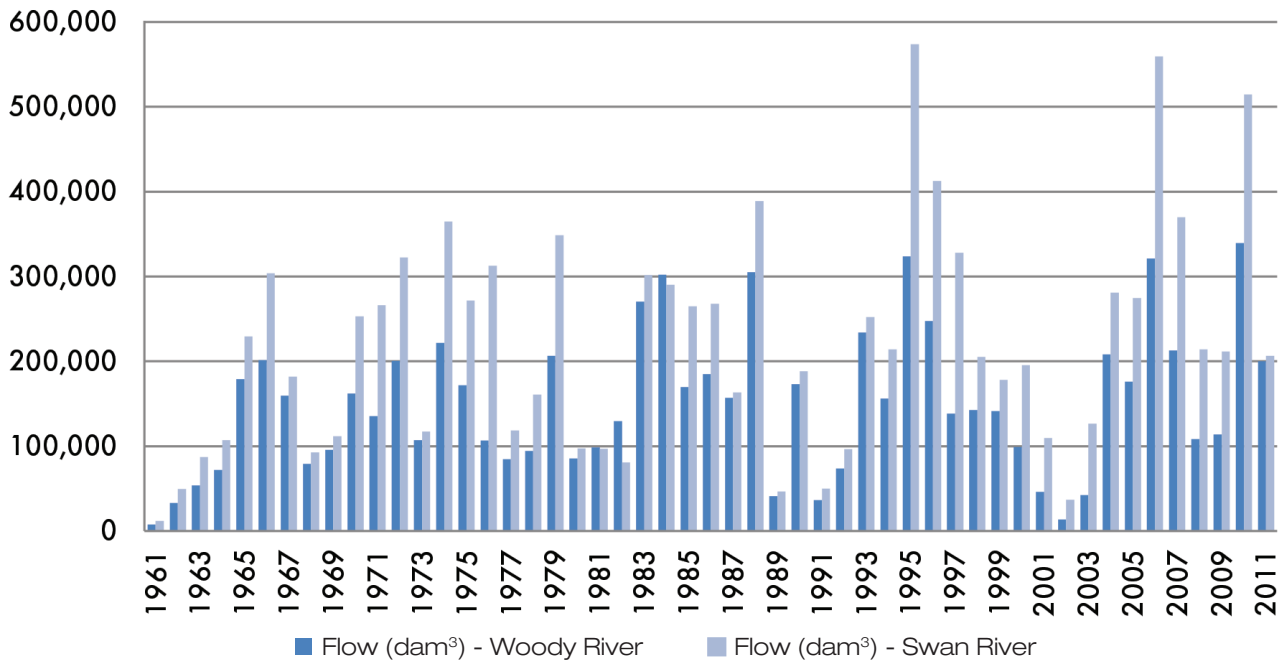
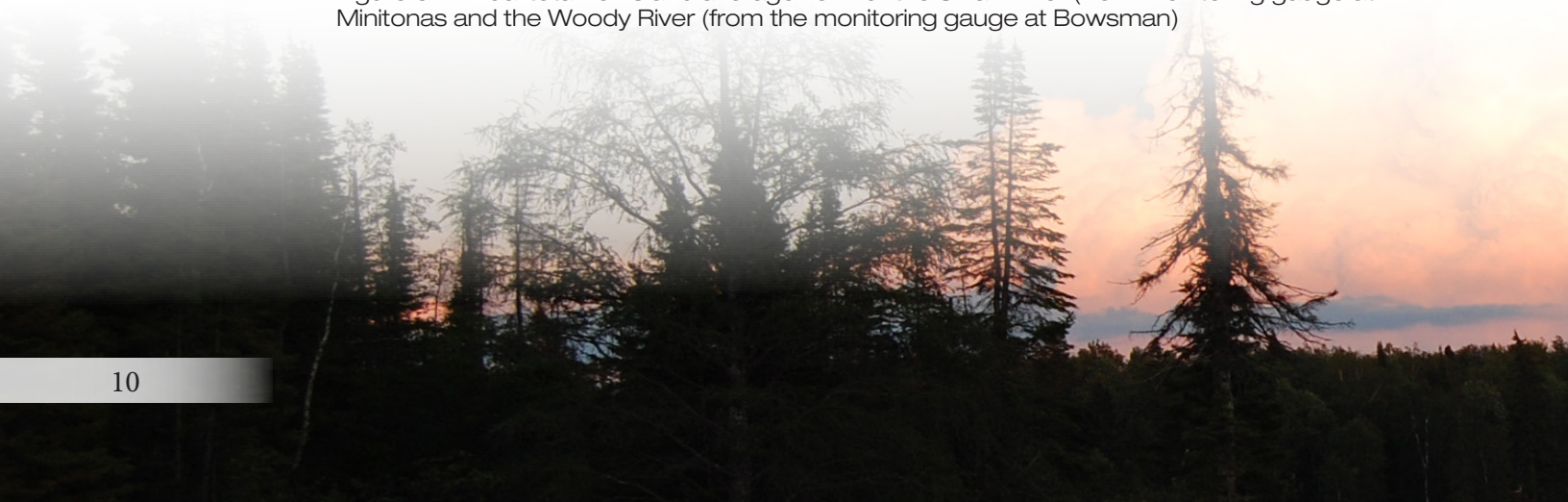


Figure 5: Annual total flows and average flow for the Swan River (from monitoring gauge at Minitonas and the Woody River (from the monitoring gauge at Bowsman)



SWAN LAKE

At 310 km^2, and with an average depth of 2.3 m, Swan Lake is the largest lake in the watershed. The lake is relatively shallow and is characterized by a large marsh complex along its western shore near the outlet of the Swan and Woody Rivers. Originally named after the Trumpeter Swans found in the region, Swan Lake and its marsh complex is a significant area for migrating birds.

ELEVATION AND RUNOFF TIMING

Climate is influenced by a number of factors, including elevation. In the spring, lower elevations tend to experience higher temperatures earlier on than those of higher elevation. This means that in the Swan Lake Watershed, elevation changes result in slightly different average temperatures from the agricultural valley to the mountainous areas. As a result of these temperature differences, snow melt occurs first in the Swan River Valley and second in the Duck Mountains and Porcupine Hills. Due to this, waterways of the Swan Lake Watershed have historically had two distinct peak flows. However, recent local observations have led people to believe that forest harvesting, drainage of agricultural areas, and additional factors such as climate change have affected the timing of the peak flows from these two areas, bringing the two peak flowers closer together. Peak flows realized closer together have a greater impact on in-stream flow capacity and overland flooding downstream.

Manitoba Conservation and Water Stewardship analysed the historical hydrological regime against recent data. To review past peak flow timing, an analysis of daily flow levels from 1960 to 2012 was conducted. Generally, only one or two years per decade illustrated a clear separation of two peak flows. In many years the data did not distinguish between two distinct peaks, as significant or numerous rainfall events occurred during the spring melt. Each spring melt is unique and is influenced by antecedent soil moisture conditions, snow pack, melt rate, and rain fall events. Overall there was no significant trend in the lag time between the two peaks during the years of analysis. Future data may reveal trends in spring runoff and timing, and can be monitored if necessary for surface water management purposes. Increased runoff, excess precipitation and more recent flooding may have influenced local observations, making it appear that the peak flows were occurring closer together than previously.

WATER QUALITY

The Water Quality Index (WQI) is used for reporting technical information in a consistent, easy to understand manner. It uses 25 variables to calculate the rating. Examples of variables include: pH, dissolved oxygen, total phosphorus, and nitrate-nitrite. The index ranges from 0 to 100 and summarizes data into categories of excellent, good, fair, marginal and poor. According to recent analysis, the WQI for both the Swan and Woody Rivers at the Provincial Road 268 sampling sites typically range between 'fair' to 'good' (Figure 6). This indicates water quality occasionally exceeded water quality guidelines for some variables.

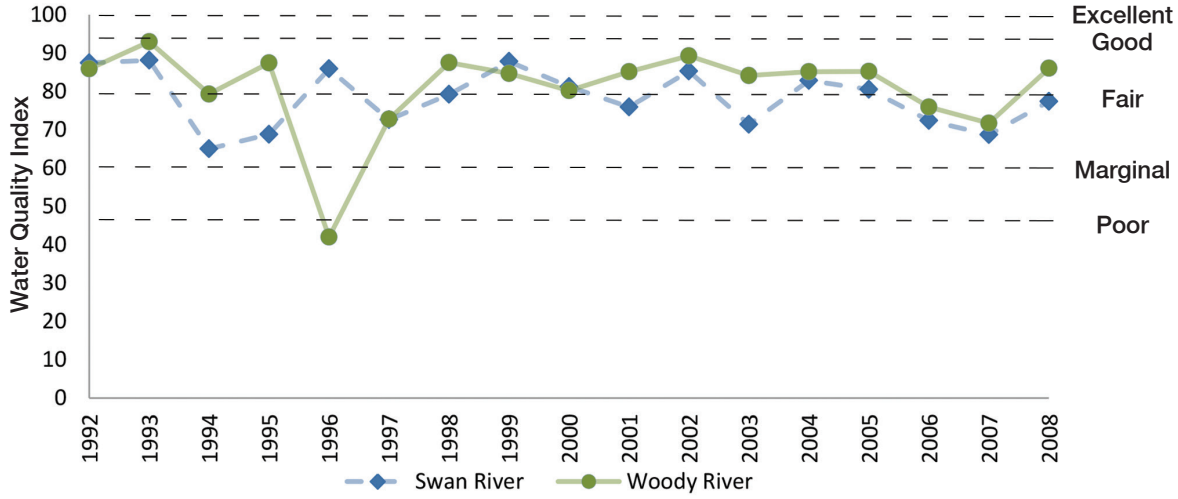


Figure 6: Water Quality Index calculated from 1992 to 2008 for the Swan River and Woody River at PR 268

Due to the significant changes in elevation, along with soils which are higher water erosion risk, Swan Lake is subject to siltation and sedimentation. Silt and sediments are carried through waterways and deposited into the Swan River Delta and then Swan Lake, compromising the storage capacity of the lake. Total suspended solids (TSS) concentrations are a measurement used to identify the amount of sediments in a waterway. Since 1974 there has been an increase in TSS concentrations in the watershed. Data indicates an increasing trend for TSS in the Swan River and relatively consistent TSS concentrations in the Woody River (Figure 7). The measurement of TSS can assist in identifying the amount of sediments carried in a river. Total TSS levels may result from increased flow volumes, soil and stream bank erosion, and land use activities upstream. High concentrations of TSS absorb light, increasing water temperatures and reducing the ability of water to hold oxygen. Oxygen is necessary for aquatic life, therefore higher TSS concentrations may be an indication of deteriorated water quality, affecting the overall health of Swan Lake.

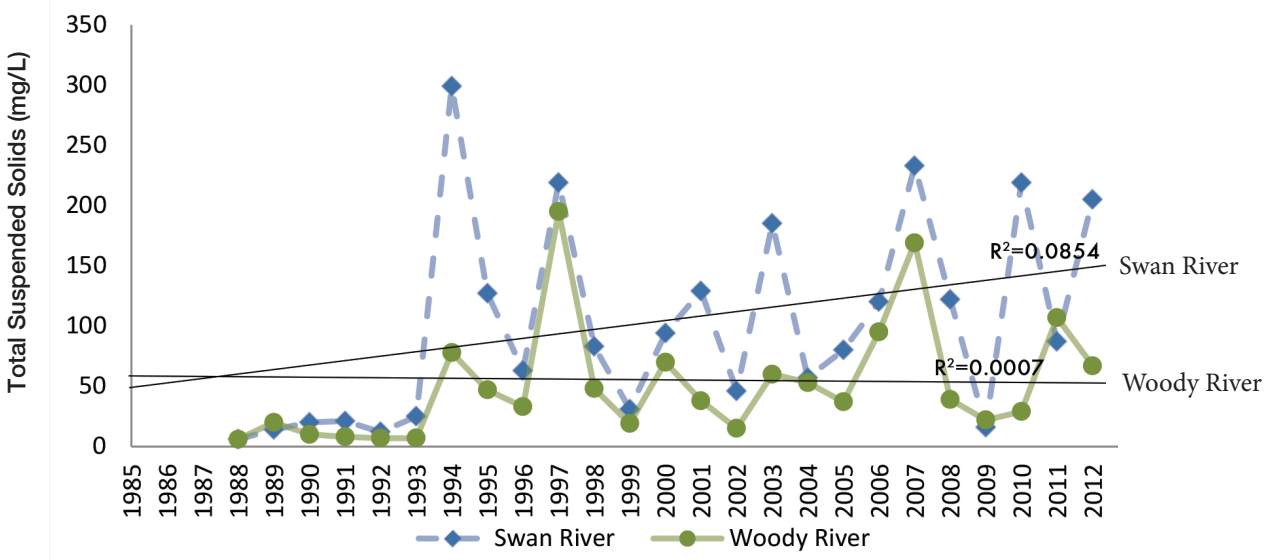


Figure 7: Annual mean total suspended solids (mg/L) from two long term water quality monitoring stations in the Swan Lake watershed between 1974 and 2012.

Phosphorous is a key element necessary for plant development in aquatic ecosystems. However, when in excess, elevated levels of phosphorous can disrupt an aquatic environment. The concentration of total phosphorus in the Swan and Woody Rivers was consistently above the river objective of 0.05 mg/L. (Figure 8). Total phosphorus is typically responsible for driving down the Water Quality Index. Although some water bodies do contain naturally elevated concentrations of nutrients due to their watershed characteristics, an excess of nutrients are known to have detrimental effects on aquatic ecosystems. Increased nutrient levels, particularly phosphorous may promote excess algae growth, impair drinking water quality and limit recreational activities.

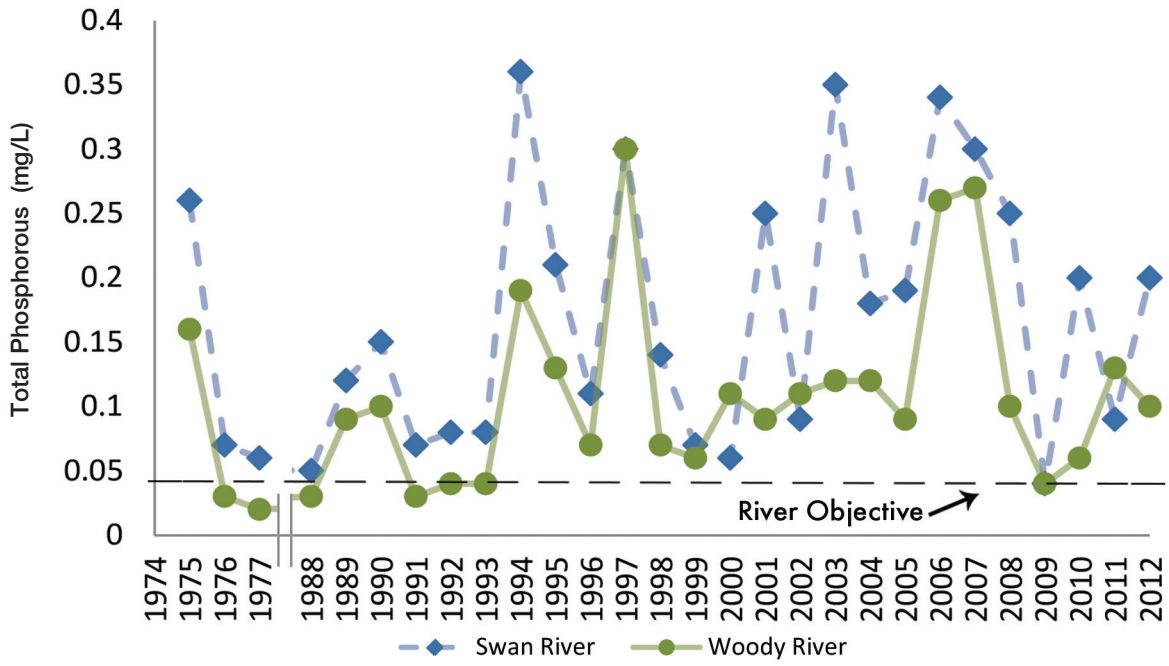


Figure 8: Annual total phosphorous (mg/L) concentrations from two long term water quality monitoring stations in the Swan lake watershed between 1974 and 2012. Please note data is not available for the period of 1978-1987.

Without good, clean water, many things die.
Local Traditional Knowledge

GROUNDWATER

Groundwater provides base flow to rivers and creeks in the watershed and is an important component in sustaining many local wetlands. It is also the primary source of rural, municipal and industrial water supply in the Swan Lake Watershed. Most rural residents own private wells, which tap into one of three local aquifers: the Swan River Sandstone Aquifer, sand and gravel aquifers, and the Carbonate Aquifer.

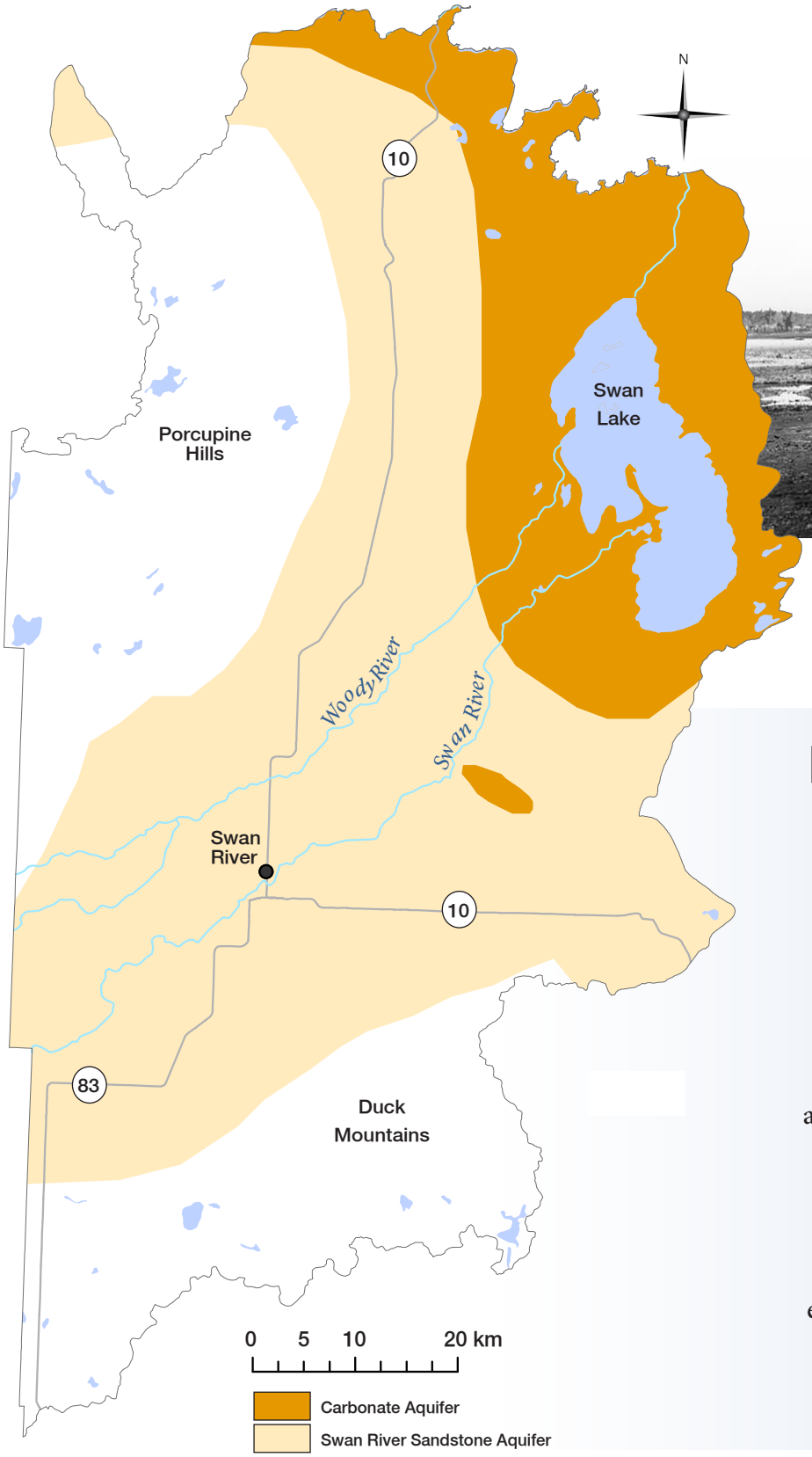
The Swan River Sandstone Aquifer is the most widely used aquifer in the watershed. It is accessible throughout the agricultural area and the lower parts of the Manitoba Escarpment. The aquifer supplies rural residents, the Town of Minitonas, the Village of Bowsman and the Louisiana Pacific forest products plant. Well yields are reported from 1 to 100 gallons per minute. Water quality may be fresh to somewhat saline, is soft, and in most cases exceeds Canadian Drinking Water Guidelines for total dissolved solids.

Sand and gravel aquifers are widely distributed through much of the watershed. Shallow sands are common in the Swan Valley and at the base of the Porcupine Hills. Yields from shallow sands are often low and require a large diameter well to aid in storage. Deeper sands and gravels are found in some areas and may have substantial yields, such as the thick gravels which supply the Town of Swan River. Groundwater quality is variable for the sand and gravel aquifers, but generally good. Shallow sands may have total dissolved solids less than 600 mg/L, while deeper sands and gravels range from 500 to 3,000 mg/L depending on location.

The Carbonate Aquifer is accessible beneath surficial materials in the Swan Lake area, and beneath the Swan River Formation in the remainder of the area. Well yields are reported at 1 to 40 gallons per minute. Water quality in the Carbonate Aquifer is marginal to poor. Total dissolved solids are in the 1,000 to 3,000 mg/L range and hardness may be an issue. As a consequence, few wells are completed in this aquifer.

Groundwater quality constraints in the watershed include overall elevated total dissolved solids (TDS) in many areas, which may impact the usefulness of the water, or its potability. Water with over 1,000 mg/L of TDS is usually considered undesirable from an aesthetic standpoint because of elevated sodium, sulphate and chloride levels. A few wells have exceeded maximum acceptable concentrations for the Guideline for Canadian Drinking Water Quality for fluoride or boron in the Swan River sandstone, or for nitrate in the Carbonate or sand and gravel aquifers. Iron and manganese also affect the aesthetic water quality in some wells.

Manitoba Conservation and Water Stewardship continuously records water levels at six groundwater observation wells within the watershed. The wells indicate stable water supplies which is able to meet current demands. Shallow, large diameter wells may be susceptible to contamination from bacteria. In general, where there is less than six metres of clay or glacial till aquifers, they are considered more vulnerable to contamination. This is the case for some sand and gravel aquifers in the Swan Valley and along the base of the escarpment, as well as in the Carbonate Aquifer near Swan Lake. Poorly maintained or abandoned wells may provide a conduit for contaminants. Sources of contaminants may result from development activities or poor land use practices.



The ruins of the Monkman Saltworks in 1889, at the time of a visit by federal geologist Joseph Burr Tyrrell.

Source: Archives of Manitoba, J. B. Tyrrell Collection 3, N9306

DID YOU KNOW?

Numerous salt springs occur along the west side of Swan Lake and north of the watershed in Dawson Bay. The springs discharge directly from surface exposures of the Carbonate Aquifer or in areas where the Carbonate Aquifer is covered by shallow overburden. It is believed that the springs are associated with ancient reef structures in the bedrock which allow upwelling of deeper saline waters. These remarkable natural features have similar salinity levels to sea water. It is recorded that from 1818-1874 residual salts from evaporated water were shipped south by York Boats and Red River carts to settlement areas near Portage la Prairie and Winnipeg.

Figure 9: Groundwater Aquifers

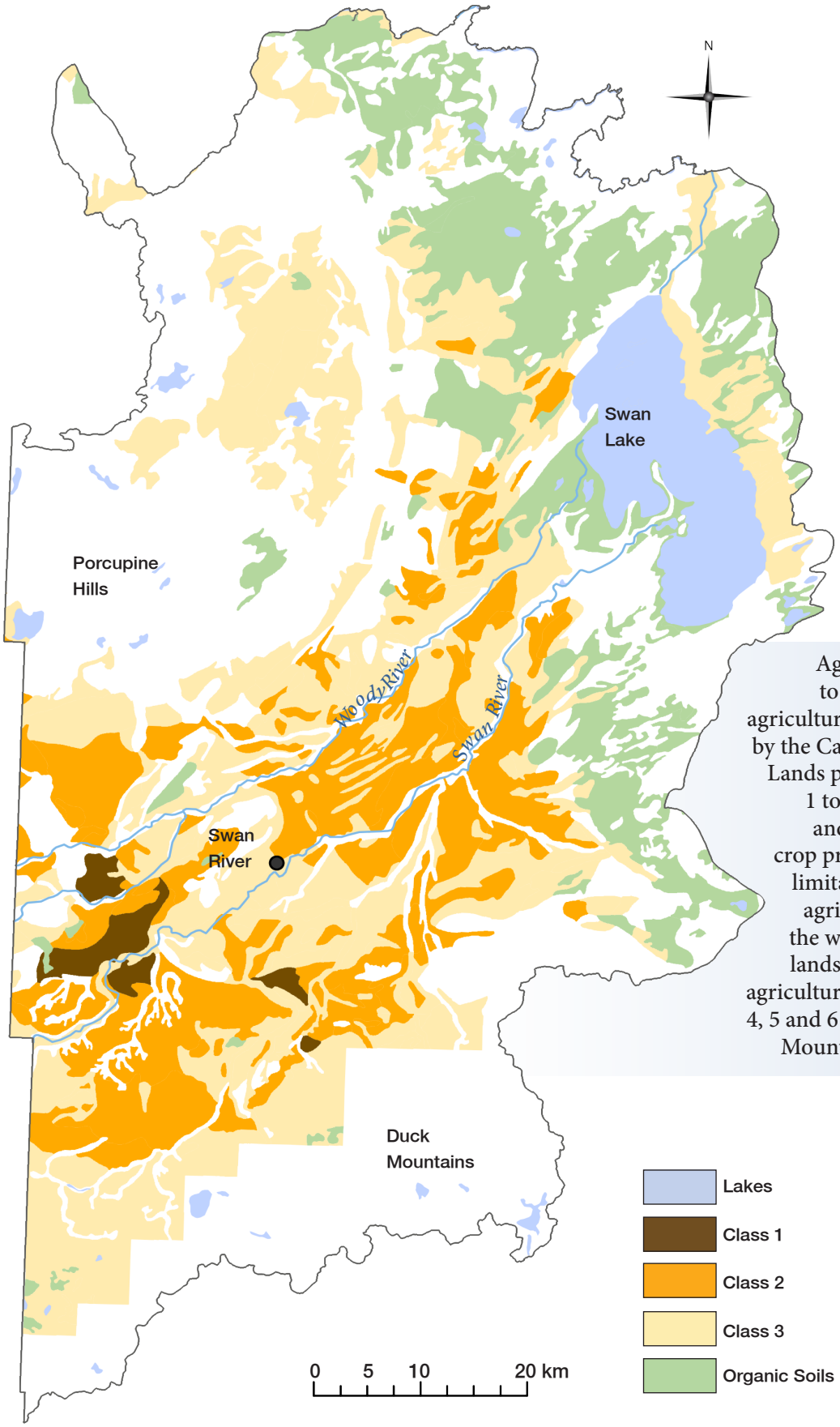
SOILS & AGRICULTURE

Factors determining soil formation, including climate, vegetation, topography and drainage, are also factors which govern how soils should be managed. The watershed's most striking feature is topography, which in combination with snowmelt and rainfall pre-disposes the area to water erosion. Geologically, in the area where most of the annual crop production occurs, surface deposits are largely the result of lacustrine deposits of glacial Lake Agassiz and are medium to fine-textured, with somewhat imperfect internal drainage. This loamy textured soil makes up 31% of the watershed and is ideal for agriculture. It retains nutrients and water, while still allowing excess water to drain away. Soils in the eastern edge of the watershed closer to Swan Lake have poor internal drainage. This area exhibits level terrain, slow runoff, and flooding is frequent in the lower parts of the watershed. These soils are underlain by strongly calcareous till at shallow depths. Gravel ridges at the edge of the glacial lake beaches occur at 381 masl along the southeastern and eastern slopes of the Porcupine Hills. Topography and the ancient beaches of glacial Lake Agassiz have had a large influence on soil formation along the edge of the escarpment and the Swan River Valley. Soil surface texture strongly influences soil fertility, its ability to retain moisture, and the ease of cultivation. This also influences agricultural capability. There is a range of agricultural capability within the watershed, with 41% being considered as prime Class 1, 2 and 3 lands, which are well suited to annual crop production.

The Swan Lake Watershed sustains a productive agricultural community. Land use data indicates that agricultural use accounts for 42% of the entire watershed. Overall annual crop production accounts for approximately 30% of the watershed with most of the cropland on prime Class 1, 2, and 3 soils (Figure 10). Lands which may not be suited to annual crop production are often well suited to grazing management. Livestock production, especially as cattle are often combined with annual crops on the farm. Approximately 8% of the watershed supports grazing and forage production. Since 1994, the amount of lands dedicated to forage production has increased, removing many pockets of marginal lands from annual cropping. While grazing is a more suitable land use for these lands, the large number of streams and tributaries in the watershed mean that riparian management for cattle is an important concern for aquatic and livestock health.

To reduce topsoil loss and maintain soil health, successful agricultural producers of the valley manage crop residues, use reduced tillage practices, and select crops well suited to local soil conditions. Certain soil types, including imperfectly drained soils affect crop production as plants are not able to grow properly. These soils make up 23% of the watershed and are found when moisture content is high in the soil and the plant root zone is saturated. Drainage infrastructure and agricultural land improvements including surface and tile drainage provide significant improvements, however this infrastructure has also increased water flows and altered much of the natural landscape within the valley to suit the expanding agricultural industry.

The single largest change in soil management in the region has been the adoption of reduced tillage practices. Reduced tillage decreases soil compaction, reduces topsoil loss, improves organic matter, increases seedbed moisture, and prevents soil temperature extremes. Producers are also adopting many other changes, such as trying different crop rotations, fertilizer placement systems, and utilizing livestock where possible to manage the range of soils. According to the Census of Agriculture data the Swan Lake Watershed has experienced a decrease in livestock numbers (1990 to 2005), and a reduction in the number of farms (2001 to 2011), suggesting a shift towards larger farms focusing on annual crop production. Notable land price increases have accompanied this trend. Agricultural land use practices are diverse and often change over time. Factors affecting changes in land use practices include commodity prices, land values, input costs, equipment size, incentive programming, changing demographics and environmental awareness. Changes in land use trends can assist in understanding initiatives which encourage sustainable resource management.

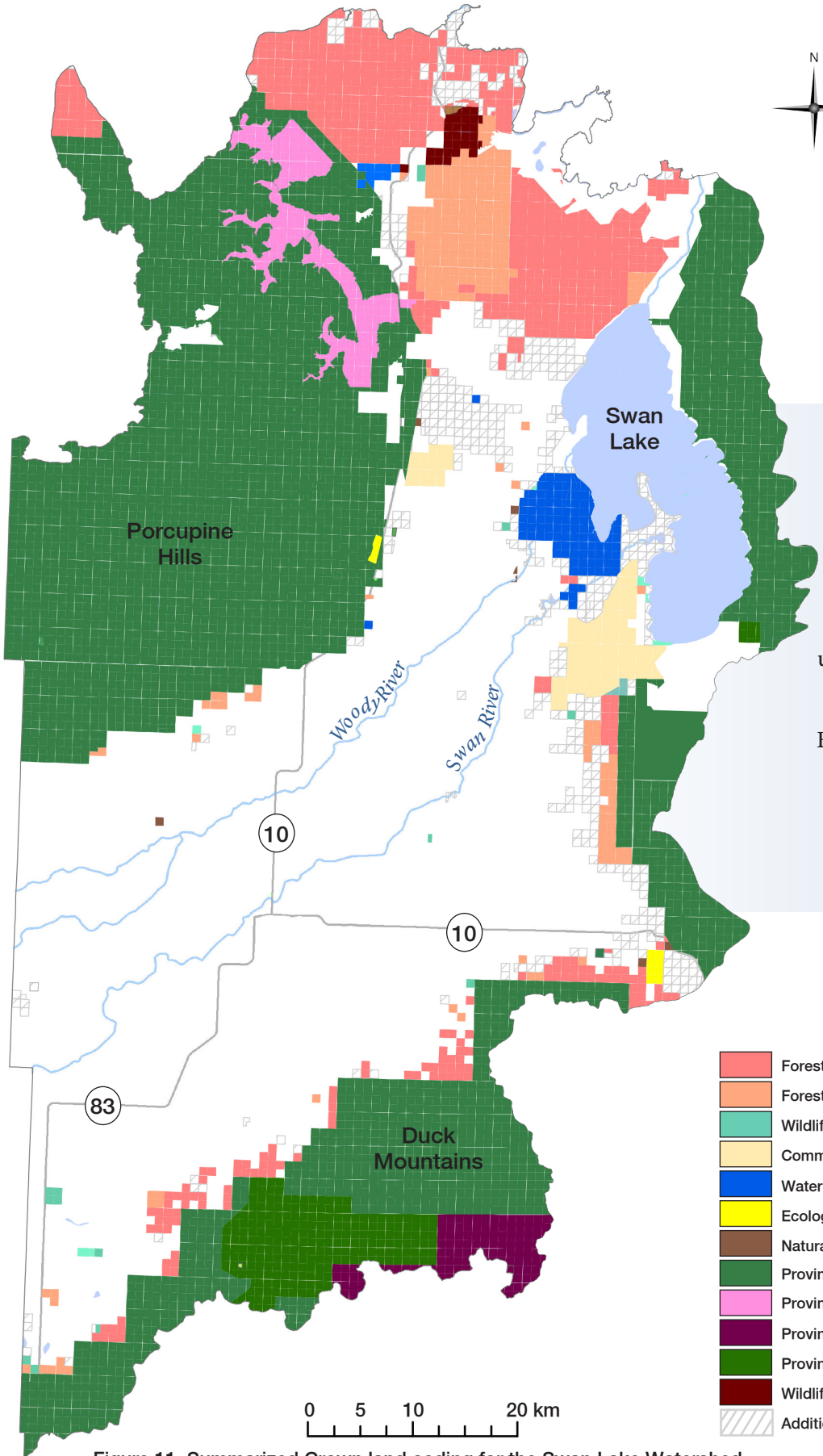


Agricultural capability indicates to what extent land can support agricultural activities. Land is classified by the Canada Land Inventory System. Lands progressively move from Class 1 to 7. Class 1 is rated the highest and has no limitations to annual crop production. Class 7 have severe limitations and are not suitable for agriculture. Forty-one per cent of the watershed is classed as 1, 2 or 3 lands and is considered productive agricultural lands. The majority of class 4, 5 and 6 lands are located in the Duck Mountains and the Porcupine Hills.

Figure 10: Agricultural capability of soils in the Swan River Valley

CROWN LANDS

At 46% of the landscape, Crown lands make up a significant portion of the Swan Lake Watershed. These lands are found primarily within the Duck Mountains and the Porcupine Hills, primarily outside of municipal areas. The Crown lands are rich in biodiversity and are managed by the Province of Manitoba. The vast majority of the Crown lands are coded for wildlife and forestry (Figure 11), with 9% available for agricultural use through long term lease, casual permits and provincial pastures.



Crown Land Coding

The Crown Lands Act allows the provincial government to code or designate Crown lands for specific purposes. Crown lands are coded to prescribe limits to land use, permit development, specify multiple use requirements, identify length of commitments and outline the nature of permissions required. Every proposal for a use different than those specified by code must be considered individually and there are regulations governing activities which can take place on Crown lands.

Figure 11: Summarized Crown land coding for the Swan Lake Watershed

FORESTRY

The watershed lies at a transition zone between the southern limit of the boreal forest and the northern extent of the aspen parkland. Most of the forest has been cleared from the agricultural area of the watershed in the Swan River Valley. The majority of forested areas lie in the Duck Mountains and the Porcupine Hills. Overall, forests cover 37% of the watershed. Common forest stands include aspen, a mixture of aspen and white spruce, mixed-wood, and black spruce. Other species include balsam poplar, jack pine, larch, birch, and balsam fir.

Photo courtesy of Louisiana Pacific Canada Ltd.

The forestry industry has utilized forest resources of the watershed since the early 1880's. The expansion of the railway and agricultural development locally created a demand for lumber in the early 1900's. Early sawmills of the area were a mixture of portable, semi-portable and stationary mills. Many of the smaller mills were operated part-time by local residents who farmed in the summer and produced lumber in the winter.

BEST MANAGEMENT PRACTICES FOR OPERATING NEAR WATER BODIES

1. Remove only merchantable timber
2. Retain all shrub understory, non-merchantable and immature timber
3. No operation of machinery within identified Machine Free Zone
4. Slash must not be deposited in stream or on stream banks
5. Timber must be felled away from the stream, not across
6. Road development near riparian areas must refer to Forest Practices Guidelines Forestry Road Management
7. Where it is necessary to cross a stream, a designated crossing established perpendicular to the stream must be used
8. Crossings are removed in accordance with MB guidelines once access to the other sides of the stream is no longer required
9. Soil disturbance in a riparian area requires temporary and permanent erosion and sediment control measures

As outlined in the Manitoba Conservation Forest Practices Guidebook.

Forest management includes all activities relating to forest access, harvesting, forest renewal, and forest protection. Harvesting practices typically involve clear-cutting, retention, or selective harvesting. A clear-cut is an even-aged practice where all growth in an area is harvested. Clear-cutting provides light and heat opportunities for seedlings and saplings. This practice is used in more homogenous forest stands of black spruce, jack pine and aspen. Variable retention harvesting practices retain juvenile understorey and patches of mature trees for wildlife habitat and riparian buffers. Selective cutting is used in uneven aged stands or if harvesting is limited to specific tree species and sizes.

Forest management 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. The provincial guidebook, *Manitoba Conservation Forest Practices Guidebook: Forest Management Guidelines for Riparian Management Areas*, sets standards for sustainable forest management practices adjacent to riparian and aquatic systems in permitted zones. Harvesting practices are permitted, restricted or prohibited in different riparian 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 in the development of a riparian zone.

The guidebook also outlines a number of best management practices that can be used by forest planners and logging supervisors when working around sensitive water features.

Forestry companies develop and implement sustainable forest management plans within their approved Forest Management License Areas, as outlined in *The Forest Act*. Plans incorporate provincial forest management policies, local community input, technical expertise and current forestry knowledge and research to develop long-term sustainable forest management strategies.

Pipe bundles for short term access to minimize impacts over wet areas.
Photo courtesy of Louisiana Pacific Canada Ltd.

BIODIVERSITY

Natural habitat is critical in supporting the integrity of our land and water ecosystems. The quality of these ecosystems is dependent on complex interrelationships between the physical, chemical and biological characteristics of a watershed. In this plan, the term 'natural areas' is used to refer to terrestrial and aquatic habitat, including riparian areas, wetlands, forests, grasslands and aquatic ecosystems. Awareness of the value of existing natural areas is important to their protection and preservation.

PARKS & CONSERVATION AREAS

The Duck Mountain Provincial Park was established in 1961, prior to this it was part of the Duck Mountain Forest Reserve. In 1997, the boundaries changed and the park was subdivided into park categories of backcountry, recreation, resource and road access. The park is characterized by forested hills, small lakes and wetlands. Duck Mountain is one segment of a long series of highlands in western Manitoba, collectively known as the Manitoba Escarpment. Irregular glacial deposits left the region with a hilly terrain. With an area of 1,424 km^2, Duck Mountain Provincial Park preserves habitat representative of the Western Upland Natural Region and accommodates a diversity of recreational opportunities and resource uses. Local vegetation cover include: boreal forest, deciduous trees and upland meadows. Animals within the region include moose, elk, white-tailed deer, black bear, fox, lynx, coyote, wolves and a variety of birds. Species at risk located within the park include the barred owl, Canadian warbler, trumpeter swan, as well as numerous plant species.

The Porcupine Provincial Forest has a long history in Manitoba. The forest began as a timber reserve more than a 100 years ago and is now one of the many provincial forests in Manitoba. The Porcupine Hills make up the most northern extent of the Manitoba Escarpment and boast the second highest elevation in Manitoba at Hart Mountain, where elevation reaches 823 masl. The Porcupine Provincial Forest covers 2,070 km^2 of boreal forests, rough terrain, sand banks, bogs, wetlands, lakes and rivers. The area is home to numerous migratory birds, moose, elk, white-tailed deer and black bears. Species at risk in the area include the olive-sided flycatchers, rusty blackbird, barred owl, whip-poor-will, as well as a few plant species.

Protected Areas (Figure 12) within the Porcupine Forest include the Birch River Ecological Reserve, and the Bell and Steeprock Canyons Protected Area. The Bell and Steeprock Canyons are located at the northernmost extent of the Manitoba escarpment. The canyons were carved from glacial melt water and exhibit a complex landscape with a high degree of biodiversity within a relatively small area. Upper portions of the area are home to mature spruce and pine trees. Steep sandy slopes give way to aspen stands, then wetland complexes and river valleys along the bottom of the canyons.

Ecological reserves protect unique and rare ecosystems, plants and wildlife. They are established on Crown land and set aside for preservation, research and educational study. The Birch River Ecological Reserve sits on three shorelines of the former Glacial Lake Agassiz. The area supports diverse and complex plant communities. Several rare species thrive here, including seventeen orchid species, representing 40% of Manitoba's orchid flora.

Bell & Steeprock Canyons Protected Areas
Photo courtesy of Manitoba Conservation and Water Stewardship, Parks and Protected Spaces Branch

Everything in nature has a right to exist, whether it is a rock, a blade of grass, a moose, or people

Local Traditional Knowledge

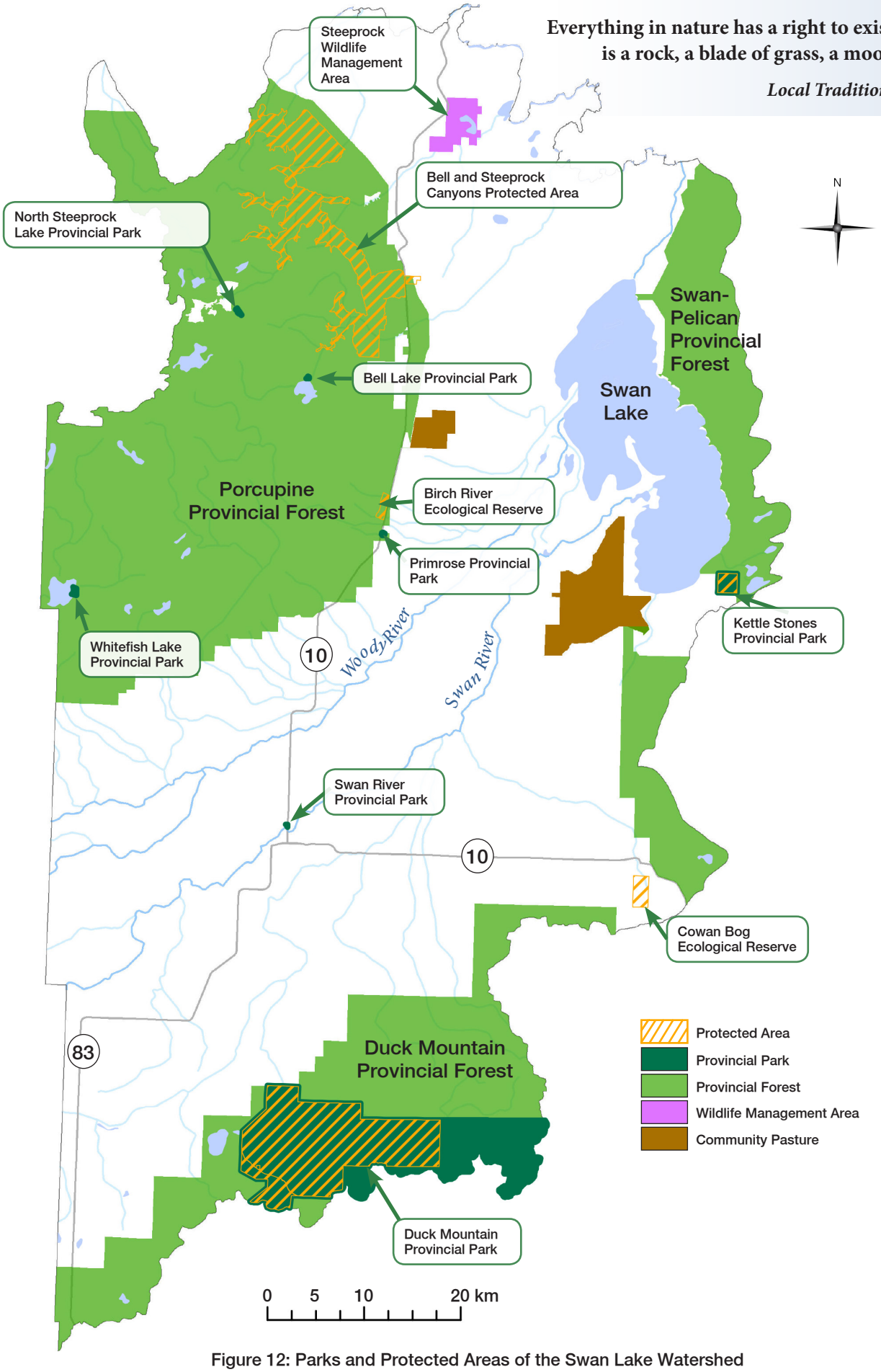


Figure 12: Parks and Protected Areas of the Swan Lake Watershed

Photo courtesy of Manitoba Conservation and Water Stewardship

MOOSE POPULATION TRENDS

Declining moose populations have become a concern within the watershed. Manitoba Conservation and Water Stewardship has taken a number of actions in researching population trends and mitigating against further population declines. These actions include increased enforcement efforts, hunting restrictions, disease monitoring, predator management, and the establishment of a moose advisory committee consisting of local groups, Aboriginal organizations and government to aid in moose recovery efforts. The Wildlife Enhancement Initiative provided funding to support aerial moose surveys to assess moose populations and monitor the effectiveness of current management activities. These management actions are necessary to assist with the recovery of moose populations. The success of the recovery is dependent on co-operative efforts of all Manitobans.

DID YOU KNOW?

At only four square kilometres in size, Kettle Stones Provincial Park is a locally significant Protected Area. The park features significant sandstone concretions known as the kettle stones. Formation of the kettle stones began 135 million years ago during the Cretaceous Period, where a layer of sandstone was deposited by an ancient sea, forming the Swan River Formation. Regional uplift raised the sandstone above sea level, and groundwater began to percolate through the sediments. Calcium carbonate dissolved in the groundwater started to harden into a cement, filling spaces between the sandstone grains. Glacial Lake Agassiz eroded away the softer surrounding rock, freeing the cemented concretions which we call kettle stones. The park is the only known location of these concretions in Manitoba. The Kettle Hills are used by local First Nations for traditional hunting, trapping and gathering, and the kettle stones themselves are considered to be sacred.


Kettle stones

AQUATIC ECOSYSTEMS

The Swan Lake Watershed is home to a wide array of aquatic species and ecosystems. Resident fish populations occur in the Swan River and the Woody River. Large bodied fish which utilize these waterways include northern pike, white sucker, burbot, walleye and yellow perch. These species will swim long distances to find suitable spawning habitat. Northern pike prefer shallow vegetated areas for spawning, while white sucker and walleye prefer shallow running water over gravel and cobble. These fish species are important for the local economy as they support recreational and commercial fishing opportunities, as well as First Nations fisheries interests. Since the Swan Lake Basin Management Plan was completed, Manitoba Conservation and Water Stewardship's Fisheries Branch has stocked over 1,000,000 walleye fry and hundreds of mature walleye into the Swan River. Over that period of time, recreational fishing for walleye has improved in the Swan River. Recent telemetry studies indicate a resident walleye population in the Swan River, however there is also some movement between the river and Swan Lake. To assist in fish movement along the river, two recent improvements to ford crossings have been completed. These improvements have allowed fish to travel an additional 50 km upstream to spawning habitat that would have otherwise not been accessible during the spawning period.

RIPARIAN HABITAT

Riparian areas are the transitional zones found along waterways, lake shores, and wetlands. Healthy riparian areas include trees, shrubs and grasses. They support a variety of species of wildlife, birds, fish and aquatic invertebrates. These areas are highly valuable as they connect land to water and provide many critical ecosystem functions, including trapping sediments, reducing shoreline erosion, and filtering surface runoff. Many riparian areas in the agricultural areas of the watershed are located on private property and used for agricultural purposes. Economic pressures often discourage preservation of riparian habitat and in some cases these important areas are used for grazing or replaced with annual crops. Riparian areas in the mountainous areas of the watershed are either managed through forest management practices or largely left in their natural state.

CLIMATE CHANGE

There is a consensus among scientists that climate change is occurring, and in some cases effects are already being felt. Although changes to date may seem relatively small, long term impacts may be much larger. Periods of increased precipitation or prolonged drought may increase with climate change and affect agricultural resiliency. 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 predict an increased frequency in severe rainfall events accompanied by a greater likelihood of drought. These factors would modify the timing of stream flows, water table levels and the availability of stored water. Periods of extended drought may contribute to an increase in soil erosion and waterways may become more degraded from increased flows associated with more extreme rainfall events.

In terms of agriculture, warmer and longer growing seasons could be beneficial for crop growth, and subsequently shorter and milder winters may be positive for livestock. However, extreme rainfall events, drought occurrences, and the emergence of new invasive species could significantly decrease agricultural productivity. Water storage and drainage systems may not be suited to handle future climatic conditions. The Swan Lake Watershed may appear very different from its now water-rich state. Adaptive techniques and water conservation strategies, such as those applied in a Water Soft Paths approach, and increased water retention initiatives may be required to instill climate change resilience in the watershed.

Honoway Fishway
Photo courtesy of Swan Lake Watershed Conservation District

ISSUES AND CONCERNS IN THE WATERSHED

This plan is largely based on the issues and concerns specific to the Swan Lake Watershed community. To identify local land and water issues and concerns, watershed residents and stakeholders were asked to identify and prioritize local land and water issues at four public meetings held throughout the watershed. Public priorities were weighted, ranked and formed core actions in the implementation section of the plan. Public meetings were also held with local, provincial, and federal technical experts and stakeholder groups through a watershed team meeting. Representatives were invited to provide information about issues of concern and to suggest practical solutions. These local priorities, along with concerns identified in technical submissions and input provided at watershed team meetings, framed the development of the watershed priorities.

LOCAL CONCERNS & PRIORITIES FROM THE PUBLIC CONSULTATIONS

- Groundwater protection should be a priority and the conservation district could be a one-stop resource for water testing.
- Protect aquatic ecosystems.
- Nutrient runoff from agricultural and municipal sources can have adverse impacts. Management of riparian areas and streams adjacent to these sources is important for water conservation.
- Allow for burning of stubble at night so the fire would burn only the rows, thus leaving the stubble in the runs, to catch snow, hold the water, and keep the soil from eroding.
- Review beaver management practices.
- Make protection of existing riparian areas a priority.
- Preserve natural habitat.
- Heritage resources need to be considered in all development plans.
- Educate the public on the importance of conserving our watershed.
- Promote grassed waterways to reduce soil erosion.
- Clean water is essential to life.

IMPLEMENTATION

To ensure the watershed priorities are met, an outline of specific recommended actions and associated measures of success are identified. Issues, recommended actions, lead and partnering organizations, specific target areas and measures of success are provided within this section of the IWMP. As a local leader in implementing this plan, the SLWCD will review and align its budget and programming to move towards achieving the priorities and objectives of the Swan Lake Integrated Watershed Management Plan.

Without considering implementation and measures of success, the plan does not deliver its objectives and goals. A concerted effort from all watershed residents, stakeholder organizations and all levels of government is necessary to ensure the recommendations outlined in this plan are implemented successfully. Progress of the plan's implementation will be evaluated annually by the SLWCD. The PMT will review the plan every three years. After five years the plan may be revised if watershed issues or priorities have changed or if new actions are required. A new plan will be developed in ten years.

WATERSHED PRIORITIES

Watershed residents, previous watershed plans, including the Swan Lake Basin Management Plan, stakeholders and technical experts assisted in the development of three watershed priorities:

#1 SURFACE WATER MANAGEMENT

#2 GROUNDWATER PROTECTION

#3 HABITAT PRESERVATION

GOAL

REDUCE OVERLAND FLOODING BY PROVIDING AND MAINTAINING ADEQUATE AND WELL-PLANNED INFRASTRUCTURE, MAINTAIN BUFFERS ALONG CREEKS AND PROMOTE AND SUPPORT AGRICULTURE LAND MANAGEMENT PRACTICES TO REDUCE SOIL EROSION, WITH THE OVERALL GOAL OF IMPROVING SURFACE WATER QUALITY.

SURFACE WATER MANAGEMENT PLAN

In Manitoba, surface water management typically refers to the management of water to reduce or prevent flooding of agricultural, industrial and residential land. It also affects water quality and the function of aquatic ecosystems.

Currently surface water is largely managed for flood protection and in drainage activities for removing water off agricultural lands as quickly as possible. Incorporating a more holistic approach to surface water management considers aquatic health, water quality, potential climate change impacts, recreational opportunities and flood mitigation protection measures.

Surface water management is an important goal for the watershed (Figure 13). Steep topography and soil variances contribute to erosion concerns. Protecting natural water retention areas in the upstream regions of the watershed may help to reduce impacts of severe flood events for downstream residents.

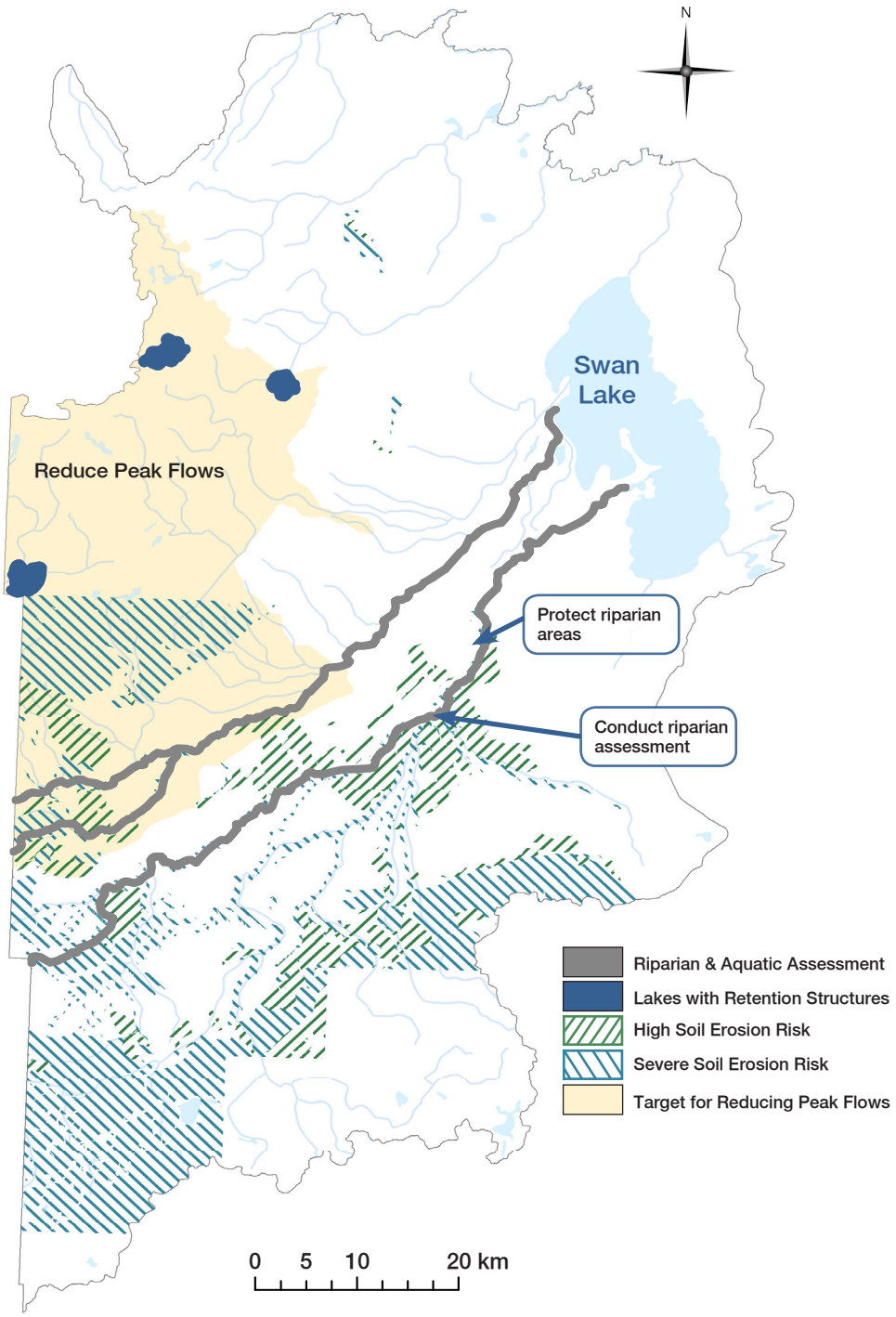


Figure 13: Highlighted surface water management actions

WATERSHED WIDE ACTIONS

Recommended Action	Organizations Involved		Measure of Success
	Lead	Support	
1.1 Conduct a riparian and aquatic assessment of the Swan and Woody Rivers for ecosystem improvement and projects that decrease erosion.	SLWCD	SVSFE, MCWS, First Nations	30 km of the Swan and Woody Rivers are surveyed and aquatic and riparian improvement projects are prioritized.
1.2 Utilize riparian assessment of Swan and Woody Rivers to further investigate upstream creeks and streams for sites to reduce flows and downstream surface water erosion and flooding.	SLWCD	MCWS (Surface Water Management), municipalities, landowners	30% of projects identified in riparian and aquatic assessment are completed.
1.3 Provide education, technical assistance and financial support to agricultural producers on the implementation of BMPs for minimizing stream bank erosion in critical areas as defined through the assessment in 1.1.	SLWCD	MAFRD	40 surface water management BMPs to reduce soil and bank erosion are implemented.
1.4 Promote agricultural land management BMPs to restore degraded and preserve existing wetlands and riparian areas through incentives, education and technical assistance.	SLWCD	MAFRD	6 riparian and wetland incentive BMP projects are implemented.
1.5 Develop a Swan River Water Festival.	SLWCD	Local schools, First Nations	A Swan River Water Festival is held by 2016.
1.6 Educate on watershed issues and concerns. Host annual public workshops and use the CD website and educational materials to disseminate information to watershed residents.	SLWCD		Public workshop are held and educational materials are distributed to watershed residents annually.
1.7 Provide technical advice and recommendations for surface flow management to partnering municipalities on a sub-watershed basis.	SLWCD	Municipalities	Increased coordination of municipal surface water management planning based on sub-watershed boundaries.

WATERSHED ZONES

In considering the unique topography of the area, the watershed has been divided into three zones (Figure 14), each with its own surface water management goal. Unique land management practices for each zone are recommended to achieve a more balanced approach to surface water management overall.

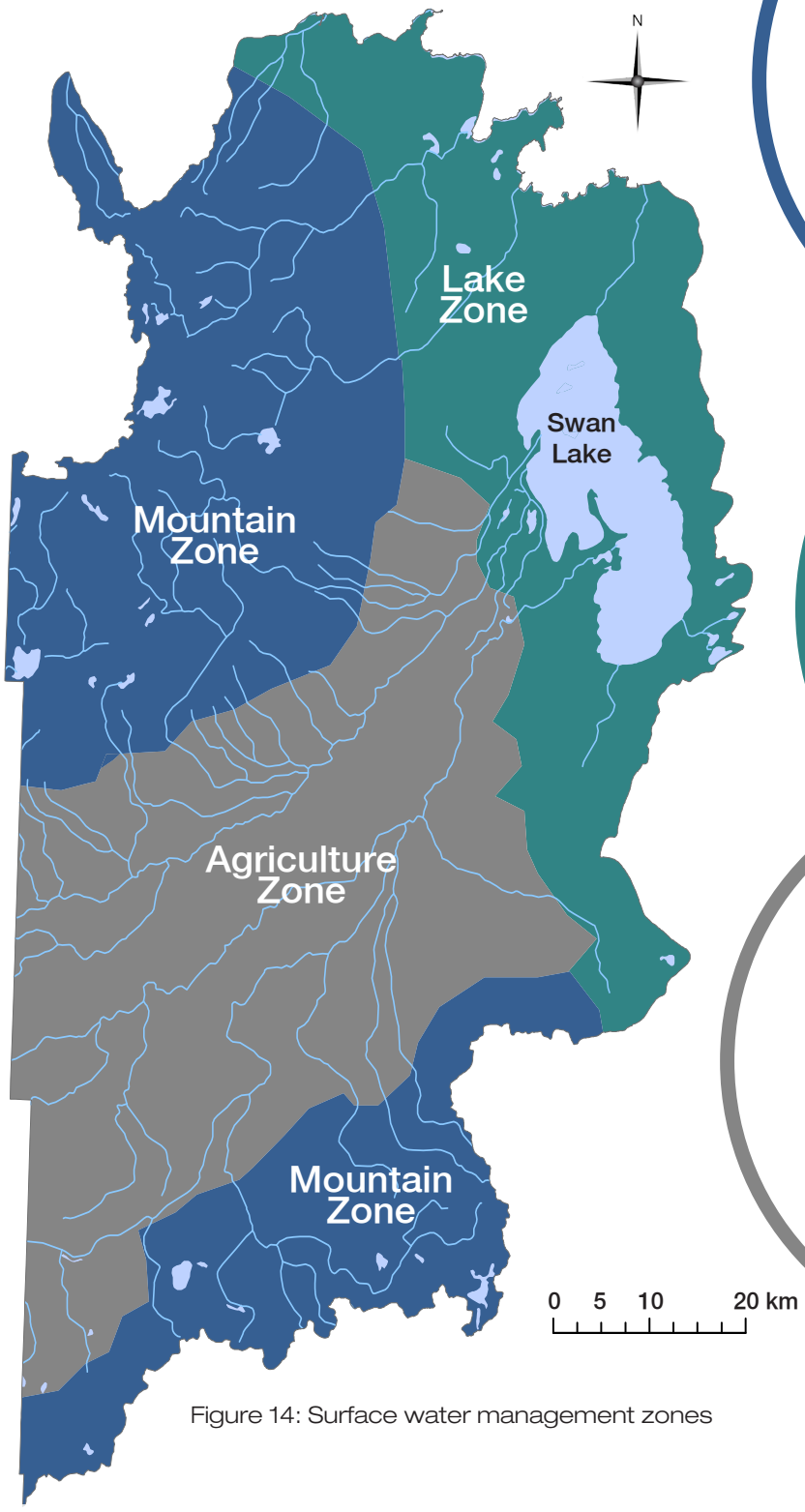


Figure 14: Surface water management zones

Mountain Zone: This zone is characterized by higher topography and is primarily forested, with many lakes and waterbodies. The area exhibits a fairly steep change in elevation and there are two main parts to this zone.

Lake Zone: This zone is located at the base of the watershed and is where all of the water in the watershed eventually flows to. The zone is low-lying and features Swan Lake, the largest lake in the watershed.

Agricultural Zone: This zone is low-lying and includes the Swan River Valley. The Swan and Woody Rivers flow through this zone, in an eastward direction.

Land use activities supported in this zone include forestry, recreation and cottage development.

Land use activities supported in this zone include recreation, limited agriculture, protected areas (Kettle Stones Provincial Park) and First Nation communities.

Land use activities supported in this zone include agriculture, local communities and recreation.

MOUNTAIN ZONE ACTIONS

SURFACE WATER MANAGEMENT CHALLENGES IN THIS ZONE:

- Stream bank erosion along waterways, due to steep changes in elevation.
- Increased surface water flow velocity and erosion challenges during the spring melt.

OBJECTIVE: TO PREVENT DOWNSTREAM FLOODING AND EROSION

Recommended Action	Organizations Involved		Measure of Success
	Lead	Support	
1.8 Identify and implement priority area projects to reduce peak flows upstream.	SLWCD	MCWS, MIT, Industry	Average peak flows are reduced.
1.9 Expand existing surface water quality monitoring to include class 4 waterways in the Mountain Zone, as partnerships arise.	SLWCD	Industry	Collected data is analyzed and targeted BMPs are recommended for future programming.
1.10 Make recommendations for focused beaver management programming with increased incentives specific to the Mountain Zone.	MCWS (Crown lands, Wildlife)	MIT, municipalities	Impacts resulting from beaver dam washouts are reduced.
1.11 Encourage forest management companies to continue to follow forest BMPs	Forestry Companies		Current healthy riparian habitat in the Mountain Zone is maintained.

PEAK FLOW REDUCTION

To address flow reduction objectives, reduce erosion, and mitigate against effects of flooding, peak flow reduction targets may be established for a watershed. Some watersheds in Manitoba have established a 10% reduction as a target for flood reduction goals. The Swan Lake Watershed exhibits steep topography, at times resulting in very fast flows. This means the design and construction of water retention structures in the watershed would need to be of considerable size to begin to approach a 10% reduction goal. Even with a more modest goal of reducing peak flows by 5% for 1 in 10 year flood event, 11,770 acre-feet of water storage would be required. This is approximately equivalent to the amount of water in Bell Lake, or the amount held in 5,885 Olympic-sized swimming pools.

While this goal may seem unachievable given the landscape of the watershed, any efforts to store water will be a benefit for downstream landowners. It is also important to note that benefits of water retention may be realized closer to the retention site. Landowners located near water retention sites may experience larger benefits than those that live further downstream. Through the surface water managemnment actions outlined in this plan, SLWCD will continue to identify project opportunities to reduce peak flows through upstream water retention. Stakeholders in the watershed should also work towards increasing current water storage capacity to help in mitigating the frequency and extent of flooding in the Swan Lake Watershed.

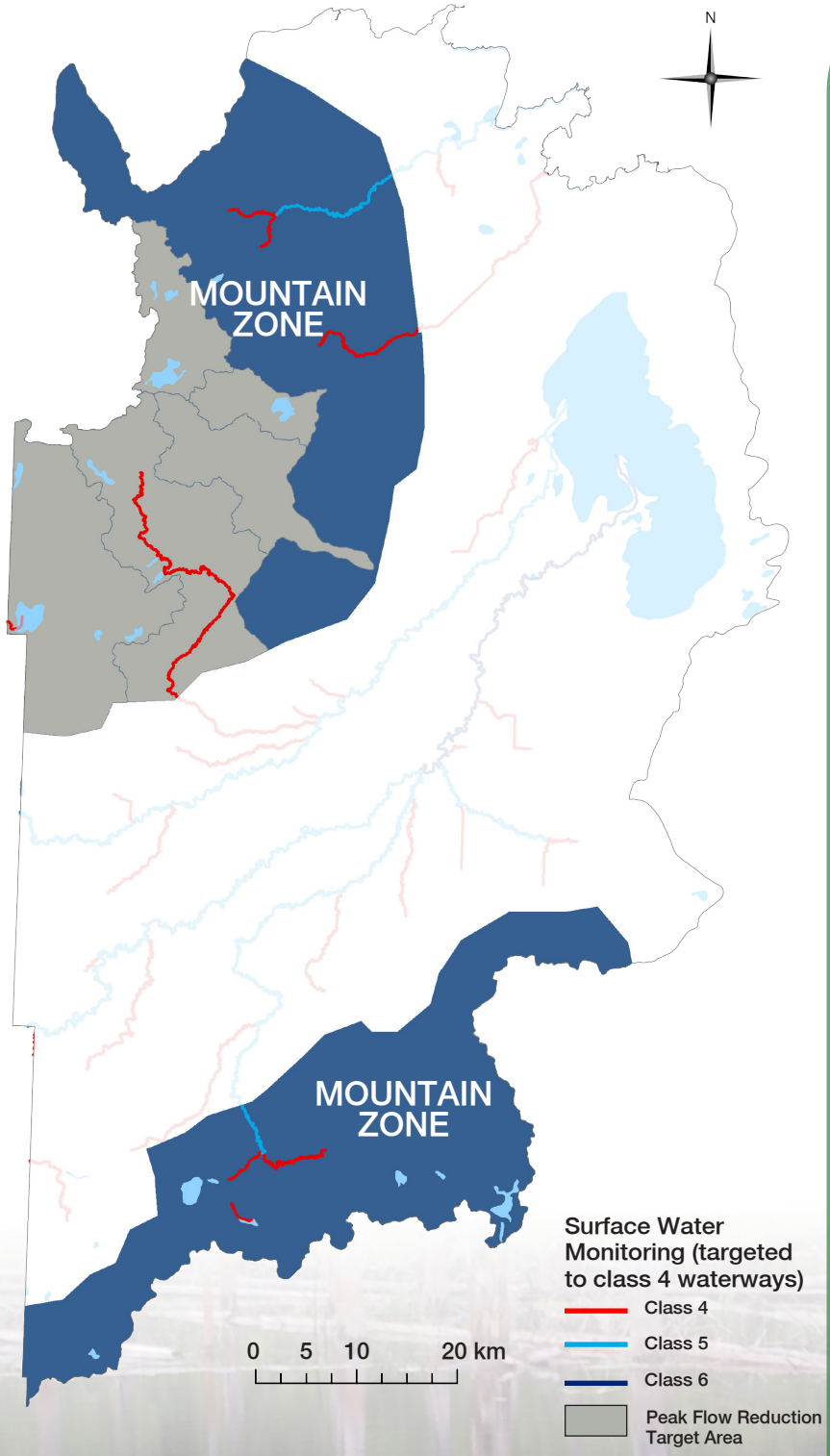


Figure 15: Surface water management action areas in the Mountain Zone

BEAVER MANAGEMENT IN MANITOBA

Beavers can provide valuable benefits to the watershed as they create water retention sites and provide wetland habitat for wildlife, however they can also cause immense damage to private property, agricultural lands and public infrastructure.

In 1993 Manitoba Conservation and Water Stewardship (MCWS) introduced the Municipal Problem Beaver Subsidy Program to assist municipalities experiencing significant beaver-related problems. This program initially operated during the summer months and subsidized a municipality for their local beaver programs. As pelt prices continued to decline the subsidy was viewed as an ineffective incentive for summer trapping, and the beaver population continued to grow. In 2001 MCWS implemented the Winter Beaver Subsidy Program. Trappers were encouraged to remove beaver pelts when they were at their prime and of higher value in the winter. The program offered an incentive of $15 per beaver harvested from designated problem areas. In 2010 the subsidy was increased to $20 per beaver.

In 2011 MCWS initiated a pilot program to intensively manage beavers and increased the problem beaver subsidy to $50 per beaver in two areas of the province. Most problems occur in rural municipalities adjacent to Duck Mountain Provincial Park and Riding Mountain National Park, as well as in the Interlake of Manitoba. Since the subsidy program began in 1993 more than 128,000 beavers have been removed.

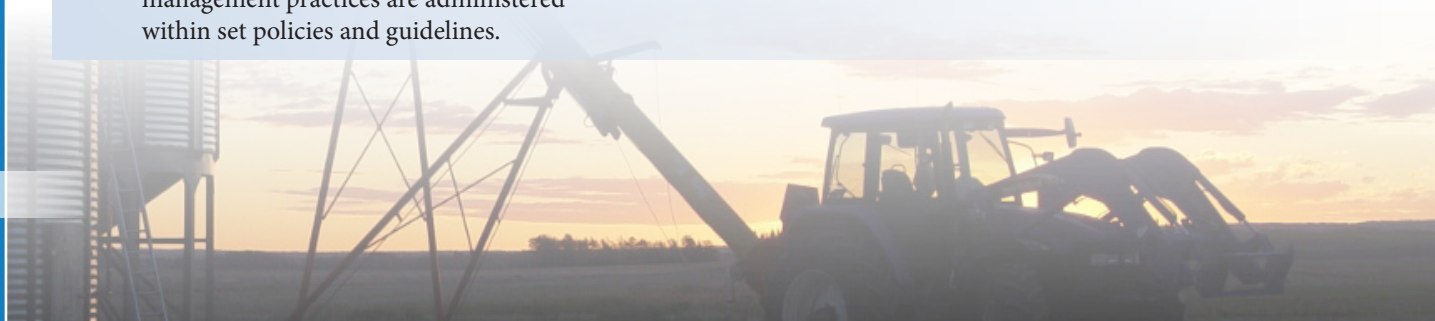
AGRICULTURAL ZONE ACTIONS

SURFACE WATER MANAGEMENT CHALLENGES IN THIS ZONE:

- Exposed and vulnerable topsoil susceptible to erosion.
- Nutrient and sediment runoff as a result of agricultural crop burning.
- Livestock operations located in close proximity to waterways, adversely affecting riparian areas and water quality.
- Crop production management practices which may have detrimental impacts to waterways and soil health.

OBJECTIVE: ENCOURAGE MANAGEMENT PRACTICES WHICH IMPROVE WATER QUALITY

Recommended Action	Organizations Involved		Measure of Success
	Lead	Support	
1.12 Restore degraded waterways by promoting grassed buffers.	SLWCD	Landowners, MCWS (Drainage & Water Control Licensing), MAFRD	20 km of grassed waterways are established to reduce erosion.
1.13 Communicate with the Province the need for night time straw burning as a residue management option for the Swan Lake Watershed, including the development of an online pilot program for night time burning to demonstrate its ability to minimize nutrient runoff.	SLWCD	Landowners, municipalities	A pilot project to assess the viability of a coordinated night time residue burning program in the watershed and determine the best options for straw residue management is initiated.
1.14 Explore alternatives for crop burning practices, as identified in *Tomorrow Now - Manitoba's Green Plan*	MCWS		Alternatives to stubble burning, including crop residue reclamation, direct seeding and crop rotation will be explored and promoted.
1.15 Preserve existing shelterbelts on lands susceptible to high wind erosion by providing an incentive program for landowners to maintain healthy shelterbelts.	SLWCD	Landowners	Maintenance of current shelterbelts.
1.16 Identify opportunities to minimize livestock access to waterways and promote associated BMPs through education, demonstration, incentives and technical support.	SLWCD	MAFRD, landowners	BMP uptake by livestock producers is increased by 10% (based on 2011 census data).
1.17 Ensure municipal lagoon management practices are administered within set policies and guidelines.	MCWS	Municipalities	Policies and guidelines are met.



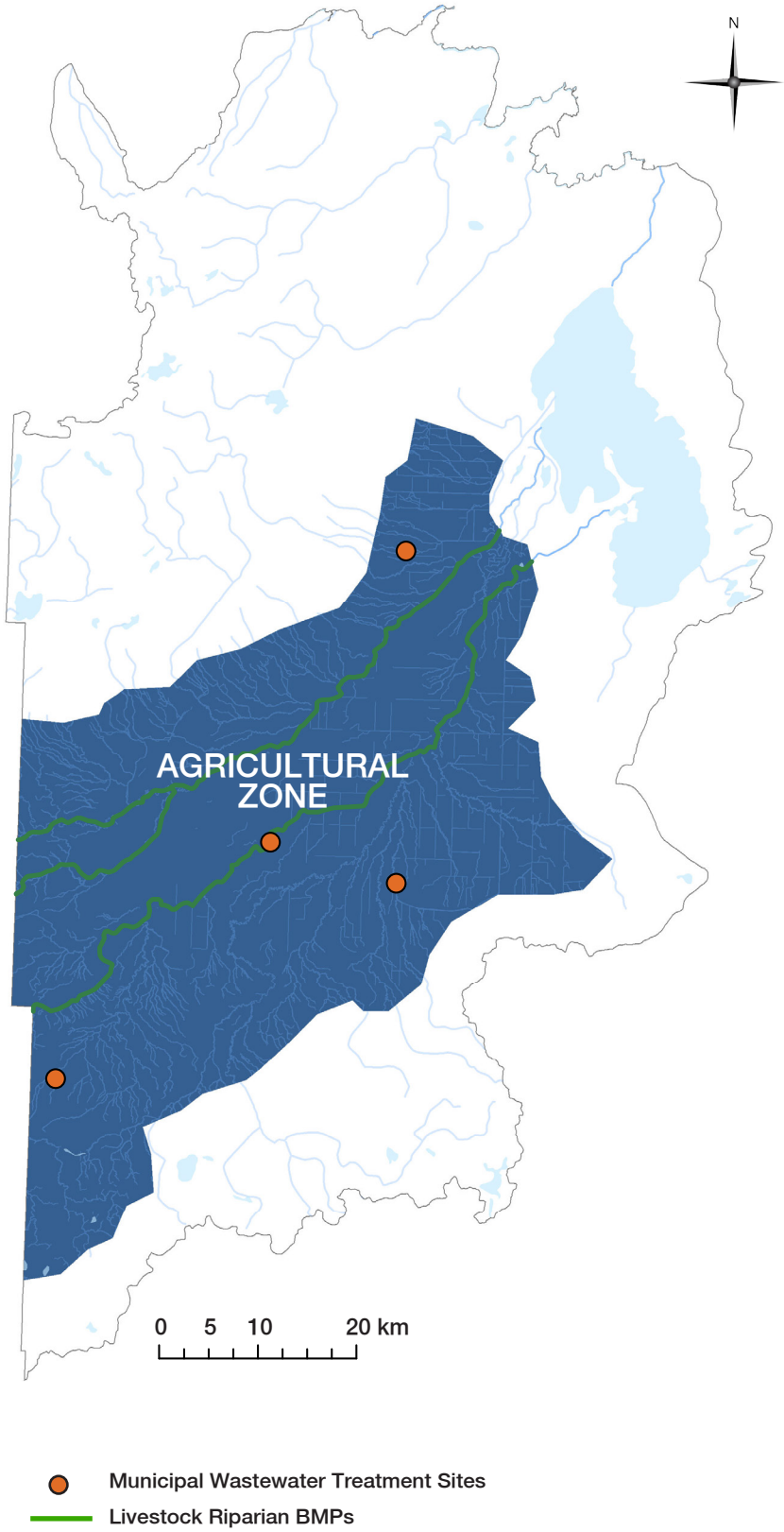


Figure 16: Surface water management action areas in the Agricultural Zone

AGRICULTURAL CROP RESIDUE BURNING

Agricultural crop residue burning is the practice of using fire to reduce crop residue after harvest. In 1992, the Red River Valley area of Manitoba experienced higher agricultural yields, wetter conditions and a later harvest. The combination of these factors resulted in a greater percentage of producers choosing to burn their crop residue. As a result of high rates of burning and heavy smoke conditions, significant public health concerns arose. These concerns lead to the enactment of the *Burning of Crop Residue and Non-Crop Herbage Regulation* under *The Environment Act* in 1993. Regulations under this Act place restrictions on daytime burning and prohibits night burning of crops in Manitoba (Manitoba Agriculture, Food and Rural Development).

Wind conditions, air quality, soil health and erosion are factors in crop residue burning practices. During the day high pressure systems often push smoke higher into the atmosphere, burning fields more intensely. Winds are often higher and moisture levels are lower during the day. Combined, these conditions make it harder to control the burning area. This may result in a greater area of the field being burned during the day, leaving minimal vegetative cover. Exposed topsoil is susceptible to erosion and may lead to nutrient and sediment runoff, a process which can impact surface water quality. During the night, winds are lower and moisture levels are higher, allowing agricultural burning to be more easily confined to windrows. The burnt windrows are buffered by vegetation on each side and have a lower topsoil erosion risk, potentially reducing negative impacts to surface water quality. Allowing for night time burning would require legislative changes to the *Burning of Crop Residue and Non-Crop Herbage Regulation*. As night time burning is explicitly prohibited, Manitoba Conservation and Water Stewardship is committed to exploring alternatives for crop burning practices.

LAKE ZONE ACTIONS

SURFACE WATER MANAGEMENT CHALLENGES IN THIS ZONE:

- Increased sedimentation along waterways flowing into Swan Lake.
- Sensitive riparian habitat located along the Swan and Woody Rivers upstream of Swan Lake.

OBJECTIVE: ENCOURAGE MANAGEMENT PRACTICES WHICH IMPROVE LAKE QUALITY

Recommended Action	Organizations Involved		Measure of Success
	Lead	Support	
1.18 Provide incentives to protect riparian areas on the Swan River through off-site watering and fencing BMPs.	SLWCD	Landowners, MAFRD and MCWS (Crown lands)	5 km of the Swan River is protected by minimizing livestock access through BMPs.
1.19 Promote and support the designation of an area along the east side of Swan Lake for conservation and traditional use purposes.	First Nations	MCWS (Crown lands Protected Areas Initiative), SLWCD	Area identified by First Nations along the east side of Swan Lake is designated for conservation and traditional purposes.
1.20 Monitor lake depth by collecting bathymetry data on Swan Lake and making available by 2019	SLWCD		Data is collected and used for future management considerations.
1.21 Identify areas to reduce sedimentation into Swan Lake. Provide incentives for BMPs that reduce sediment loading to Swan Lake.	SLWCD	MCWS (Surface Water Management), MIT	Sedimentation is reduced through BMP implementation.

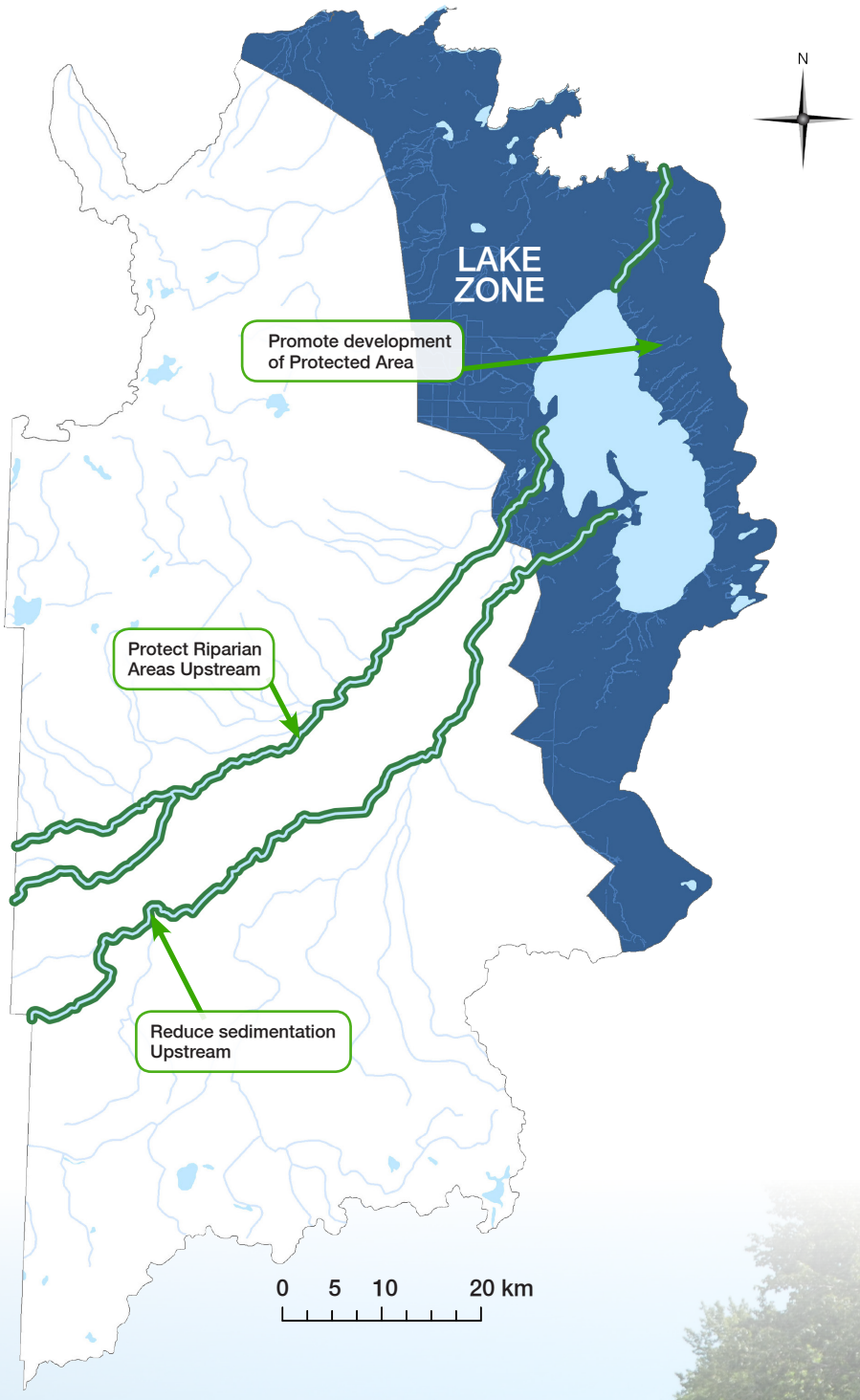


Figure 17: Surface water management action areas in the Lake Zone

GOAL

PROTECT GROUNDWATER QUALITY AND QUANTITY

Groundwater provides the base flow for rivers and creeks and is an important component in sustaining many of the watershed's wetlands. It is also the primary water source for rural, municipal and industrial water uses. Most rural residents use private wells as their water supply. Previous assessments of private well water quality indicate that due to high nitrate and total coliform levels, some wells have failed to meet drinking water guidelines. As groundwater is the main source of drinking water in the watershed, activities that protect sources and educate residents for groundwater preservation are essential (Figure 18).

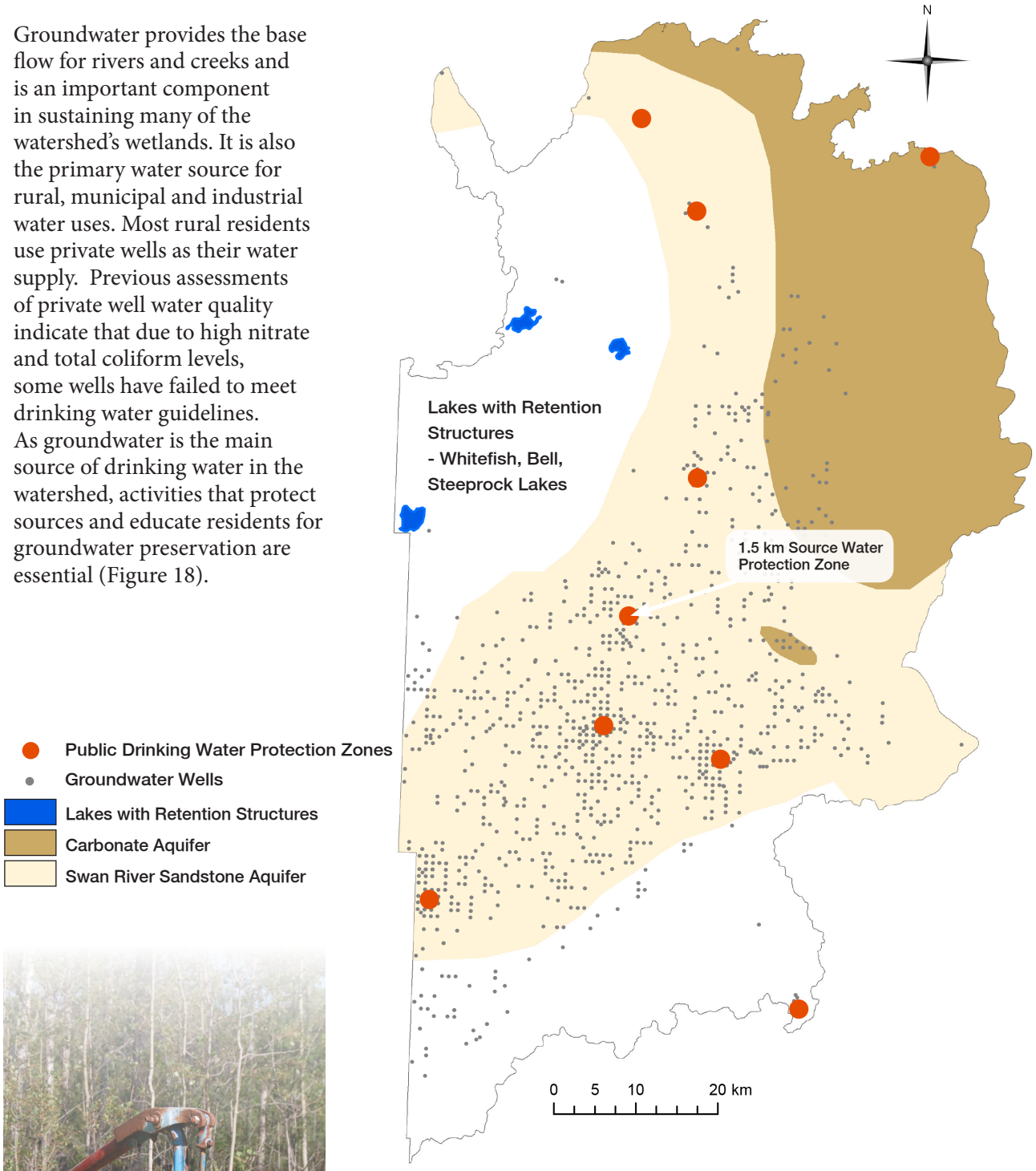


Figure 18: Actions to protect groundwater

Recommended Actions	Target Area	Organizations Involved		Measures of Success
		Lead	Support	
2.1 Ensure existing retention structures are stable and maintained for adequate aquifer recharge, flood protection and recreation. Conduct biannual inspections following runoff and prior to freeze up.	Whitefish, Steeprock and Bell Lakes in the Porcupine Hills	MIT	SLWCD, MCWS (Surface Water Management)	Existing retention structures are inspected biannually.
2.2 Develop an abandoned well inventory database, and seal all known abandoned wells.	Public drinking water systems within Source Water Protection Zones	SLWCD	MCWS (Groundwater Management)	An abandoned well inventory is developed and incentives are provided annually to seal abandoned wells.
2.3 Identify and protect natural spring water for a drinking water source at Wuskwi Sipihk First Nation.	Adjacent to Porcupine Hills, along PTH 10 near Wuskwi Sipihk First Nation	Wuskwi Sipihk First Nation	SLWCD	A suitable long term groundwater source is developed for Wuskwi Sipihk First Nation.
2.4 Make accessible current and long-term groundwater level monitoring from provincial observation wells within the watershed.	Watershed-wide	MCWS (Groundwater Management), SK WSA		Provincial observation well data is accessible and summarized.
2.5 Compile an annual report on the state of the watershed's groundwater resource. Include a summary of the previous year's monitoring data and any data trends.	Watershed-wide	SLWCD		An annual groundwater report is circulated to watershed residents to increase awareness of groundwater resources.
2.6 Provide financial assistance for groundwater quality testing, well head assessments, well sealing and private well water protection centrally.	Watershed-wide	SLWCD		Water testing and well assessment resources are used by 40% of watershed residents.
2.7 Provide increased education and awareness on well water quality, well development, maintenance, and well head protection.	Watershed-wide	SLWCD	MCWS (Groundwater Management)	"Well Aware" booklets are distributed and awareness of proper well maintenance is increased.
2.8 Implement recommendations from the Source Water Protection Assessment.	Source Water Protection Zones	Municipalities	SLWCD, MCWS (Office of Drinking Water)	Site-specific recommendations are carried out and implemented.

SOURCE WATER PROTECTION ASSESSMENT

The approach to source water protection planning varies widely across Canada. Manitoba has adopted a grassroots approach to source water protection where source water assessments are conducted by a group of technical experts and local representatives.

During the development of this plan, a Source Water Assessment was conducted for the six public drinking water sources in the watershed. In Manitoba, public water systems are defined as a potable supply of drinking water with 15 or more connections.

To assess the drinking water sources a Source Water Assessment Team was formed. The group consisted of a regional drinking water officer, a Watershed Planner, conservation district representatives, and the treatment plant operator for each system.

The team visited each of the six public drinking water systems, assessed plant operations, identified and ranked potential sources of contamination, and developed a list of recommendations to address significant threats to public drinking water sources (Table 1).

Public System	Site-Specific Recommendation
Benito	• Build up and slope the ground surrounding the well head to facilitate proper runoff. • Protect the well head by installing four steel posts with reflective tape 106 cm above ground around the well head. • Install a back siphon valve on tank loader to prevent contamination of source water. • Add new cover or extend casing to above the height of 40.6 cm for well number two.
Birch River	• Build up and slope the ground surrounding the well head to facilitate proper runoff. • Protect the well head by installing four steel posts with reflective tape 106 cm above ground around the well head.
Bowsman	• Build up and slope the ground surrounding the well head to facilitate proper runoff. • Protect the well head by installing four steel posts with reflective tape 106 cm above ground around the well head. • Add new cover or extend existing casing to above the height of 40.6 cm for well number one.
Mafeking	• Build up and slope the ground surrounding the well head to facilitate proper runoff. • Protect the well head by installing four steel posts with reflective tape 106 cm above ground around the well head. • Add new cover or extend casing to above the height of 40.6 cm for well number two.
Minitonas	• Build up and slope the ground surrounding the well head to facilitate proper runoff. • Protect the well head by installing four steel posts with reflective tape 106 cm above ground around the well head. • Relocate waste water disposal site to a location away from the source wells. • Seed the area surrounding the well heads. • Add new cover or extend casing to above the height of 40.6 cm for well number one.
Swan River	• Build up and slope the ground surrounding the well head to facilitate proper runoff. • Protect the well head by installing four steel posts with reflective tape 106 cm above ground around the well head.

Table 1: Site Specific Recommendations for Public Drinking Water Sources in the Swan Lake Watershed

Bowsman Well

Birch River Water Plant

Benito Well Valve

GOAL

PROTECT AND RESTORE NATURAL AREAS AND ECOSYSTEM FUNCTION FOR CONSERVATION OF BIODIVERSITY, WATER RESOURCES AND SOCIAL VALUES

Agriculture, industry and residential development may threaten natural habitat. Programming focused on the protection and establishment of riparian areas and wetlands will preserve the integrity of these areas, and may also enhance local awareness regarding the value of these types of habitat. Natural areas are to be preserved and maintained to enhance fisheries, support agricultural use and preserve sensitive aquatic ecosystems. Strong partnerships are vital to successful habitat protection initiatives and incentive programming.

Recommended Actions	Target Area	Organizations Involved		Measures of Success
		Lead	Support	
3.1 Protect natural habitat by securing conservation agreements with private landowners to maintain or restore riparian areas, wetlands, woodlands and grassland areas.	Natural areas	SLWCD to coordinate	Implemented by partnering habitat preservation organizations (i.e. NCC, MHHC).	640 acres of natural habitat is protected through conservation agreements.
3.2 Promote development of an annual payment program which provides payments for ecological goods and services.	Agriculture Zone	SLWCD	MAFRD	An ecological goods and services program is established to preserve wetland and riparian areas within the watershed.
3.3 Provide two workshops and deliver outreach activities to enhance public awareness regarding beneficial values and management of riparian areas.	Agricultural zone	SLWCD	MAFRD	Two workshops are hosted and two outreach activities are completed.

PLAN LINKAGES

Development plans are local policy documents which incorporate both provincial land use policies and local policies to ensure the organized development of local land resources. Development plans identify development restrictions and zoning by-laws for residential, commercial, recreational and industrial land uses. Through cooperative planning and the consideration of respective planning processes, the Swan Lake Integrated Watershed Management Plan and the Swan Valley Planning District can work together to improve the health and sustainability of the watershed in an economically viable manner.

CONSIDERATIONS FOR FUTURE DEVELOPMENT PLANS

1) ENSURE HERITAGE AND CULTURAL RESOURCES ARE CONSIDERED IN ALL DEVELOPMENT PLANS

2) RECOMMENDATIONS FOR ALL PUBLIC DRINKING WATER SOURCES

2.1 Intensive and high-pollution risk development activities, (land uses and structures that have a high risk of causing pollution and include, but are not limited to chemical/ fertilizer storage facilities, disposal fields, fuel tanks, waste disposal grounds, wastewater treatment facilities) should be restricted in public drinking water source zones. Where restriction is not possible, development may be considered in public drinking water source zones provided:

- the proponent can prove by adequate engineering or hydro-geological investigation that the proposed activity will not cause pollution of the public drinking water supply or;
- appropriate precautionary measures have been taken to sufficiently mitigate the risk of endangering the quality of the water supply for public drinking water supply purposes.

2.2 To prevent significant surface water quality and drinking water quality deterioration, developments in or near surface waters and riparian areas will be restricted, or limited, if they:

- lead to the contribution of nutrients, pathogenic organisms, deleterious chemicals or materials to these waters;
- accelerate erosion and bank instability;
- cause the removal of natural vegetative cover; and/or
- may have an impact on in-stream flows needed to maintain healthy aquatic ecosystems.

2.3 Seal unused, abandoned and poorly constructed wells that are located within a source water protection zone for all public drinking water.

2.4 Ensure an emergency response plan is developed for each public water system.

3) INCORPORATE TRADITIONAL KNOWLEDGE INTO DEVELOPMENT PLANS THROUGHOUT THE WATERSHED. INPUT FROM LOCAL FIRST NATIONS WOULD OUTLINE TRADITIONAL USE OF THE LAND AND INTEGRATE SUSTAINABILITY OF DEVELOPMENT.

4) ADOPT POLICIES FOR A MINIMUM 90 METER BUFFER FOR NEW DEVELOPMENTS OR BUILDINGS ALONG THE WOODY RIVER AND THE SWAN RIVER, AS WELL AS ADOPT POLICIES TO PROTECT NATURAL VEGETATION ALONG SHORELINES.

GLOSSARY

Aquatic Ecosystem: The components of the earth related to, living in or on water or the beds or shores of a water body, including but not limited to; (a) all organic and inorganic matter, and (b) All living organisms and their habitat, and their interacting natural systems.

Aquifer: geologic unit which can provide useful quantities of water to wells

Canada Land Inventory: A federal – provincial multi-disciplinary land inventory project that produced maps indicating the capability of land to sustain agriculture, forestry, recreation and wildlife.

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

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

Groundwater: The water located beneath the surface in soil pores and between the fractures of rock formations.

Kettle Stones: Large, round sandstone concentrations formed through sandstone deposition, regional uplift, percolating groundwater, and chemical precipitation of the sandstone, resulting in large 'stones' seen in Kettle Stones Provincial Park.

Machine Free Zone: Located within a *Riparian Management Area*, this zone is located adjacent to a riparian area, in which no ground disturbance can take place. Harvesting can only be carried out by reaching in with harvesting equipment.

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

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

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

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

Protected Area: Land, freshwater, or marine areas where logging, mining, hydroelectric development, oil and gas development, and other activities that significantly and adversely affect habitat are prohibited by law.

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

Reserve Zone: Located in a *Riparian Management Area*, adjacent to a riparian area. No harvesting, mechanical or ground disturbance is to take place in this zone. The width of the zone depends on the feature or function being protected.

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

Riparian Management Area: Forested area adjacent to the riparian area where forest management activities can be approved.

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

Stakeholder: A person or group with an interest in and is affected by the outcome of a process.

Traditional Knowledge: The knowledge gathered through observation, direct experience, testing, teaching and recording in the collective memory about local communities, plants, wildlife, and water and landscapes, as well as the relationships between them. Each community may have a different definition of what constitutes Local Traditional or Aboriginal Knowledge, and may manage and share this knowledge in different ways.

Water Soft Paths (Assessment): A water resource analysis that documents where water is being used currently and extrapolates that use into future values while identifying and respecting ecological limits on water sources. The process involves developing a series of scenarios that identify ways to better use water resources, including non-potable sources.

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

ACRONYMS

AAFC: Agriculture and Agri-Food Canada

IWMP: Integrated Watershed Management Plan

MAFRD: Manitoba Agriculture, Food and Rural Development

MIT: Manitoba Infrastructure and Transportation

MCWS: Manitoba Conservation and Water Stewardship

MHHC: Manitoba Habitat Heritage Corporation

PMT: Project Management Team

PR: Provincial Road

PTH: Provincial Truck Highway

RM: Rural Municipality

SLWCD: Swan Lake Watershed Conservation District

SVSFE: Swan Valley Sport Fishing Enhancement

TLE: Treaty Land Entitlement

TSS: Total Suspended Solids

TDS: Total Dissolved Solids

WQI: Water Quality Index

WPA: Water Planning Authority

WSA: Water Security Agency

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