Little Saskatchewan River Watershed

Equivalent Agri-Environmental Plan

(EAEP)

OCTOBER 21, 2006

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A. Executive Summary

Background

The Environmental Farm Plan (EFP) program under the Agricultural Policy Framework (APF) is intended to reduce farm-related environmental risks through a combination of awareness and financial incentives. The awareness component of the EFP program takes the form of facilitated workshops and a take-home *Environmental Farm Plan Workbook*. The workbook leads individual landowners through an exercise in environmental asset and risk assessment, priority setting, and helps them create farm-based action plans for reducing environmental impacts related to the national objectives of air, soil, water and biodiversity.

Manitoba has decided to offer the Equivalent Agri-Environmental Plan (EAEP) option as an alternative to individual EFPs. The EAEP identifies a single, high-priority environmental risk that is common among a group of farmers who may live in the same watershed, farm on similar soils in a geographic area, or even produce the same commodity. When landowners unite to adopt management practices intended to reduce a single type of risk, (rather than each landowner mitigating a different risk) cumulative environmental benefit is achieved and significant change on the landscape is possible.

Like EFPs, EAEPs have a strong agri-environmental awareness component. Each plan requires that a resource inventory be prepared. Such an inventory requires a scan of the area that will identify such physical features as water resources, soil types, geography and climate. Since agricultural risks are associated with how landowners manage their farms within the physical environment, the scan will also include information on tillage practices, land use and land cover, and other relevant farming practices in the area.

The individual EFP and the EAEP are convergent pathways to on-farm implementation of Beneficial Management Practices (BMPs). Cost-shared incentive funding is available to enable landowners to implement their action plans through adopting appropriate BMPs. This funding is available through the Canada-Manitoba Farm Stewardship Program (CMFSP).

While the EAEP process is intended to identify the highest priority issues that may be common throughout a given area, individual landowners are responsible for creating and implementing their own farm-based action plans. For the purposes of an EAEP landowners will be eligible only for CMFSP incentives that fund BMPs that directly reduce the high priority risk that was identified through the equivalent agri-environmental planning process.

Watershed Overview

The Little Saskatchewan River Watershed Study Area, in southwestern Manitoba, is approximately 414 551 ha in size and is comprised of three smaller sub-watershed units. The watershed drains into the Little Saskatchewan River, which meanders its way south through the watershed to the Assiniboine River. Two large man-made lakes are located along the River: Lake Minnedosa and Lake Wahtopanah. Numerous lakes of varying sizes exist towards the northern portion of the watershed, including Sandy Lake, Clear Lake, Lake Audy, and Whitewater Lake. Numerous wetlands and prairie potholes are located within the watershed as well.

Conservation Districts within the watershed include the Little Saskatchewan River Conservation District, in the southeast, and the Upper Assiniboine River Conservation District in the northwest corner. Part of the northern portion is not in any conservation district.

Fourteen Rural Municipalities (RMs) are contained within the watershed bounds and include Rossburn, Park South, Rosedale, Strathclair, Harrison, Clanwilliam, Minto, Blanshard, Saskatchewan, Odanah, Daly, Elton, and Whitehead. Larger towns located within the watershed include Minnedosa, Erickson, Rivers, and Rapid City. Agriculture is the basis for the local economy within the watershed, however, Riding Mountain National Park, Lakes Minnedosa and Wahtopanah, and Minnedosa’s regular music and sporting events, also bring an important source of tourism revenue to the region.

Little Saskatchewan River Community Consultation Overview

A community issue identification and BMP selection process will be conducted to obtain community buy-in and direction for the EAEP process. Further details will be provided after the session.

Proposed Activities

The proposed activities will be identified after the community issue identification and BMP selection process.

Expected Outcomes

Specific outcomes will depend on the particular issue selected by the community. Issue selection is pending.

Cost and Schedule

Activities of the LSR Watershed EAEP will occur in 2006-2008. Future workshops will be organized to inform potential participants of the plan and how they may become involved.

B. Environmental Issue Description

Priority Issue

Consultations with LSR representatives have not yet been completed. In the LSR watershed, surface water management has been suggested as the highest priority issue. Discussions in the consultation phase will confirm this as the EAEP priority issue. See Appendix A for a summary of existing information and risk assessment rating.

Table 1 – Issue selection for the LSR Watershed

Issue:	Issues assessed as high	LSR watershed ranking	Provincial priority[1]	Overall ranking
Soil			N/A	
Water			N/A	
Air			N/A	
Biodiversity			N/A	

[1] Provincial scan document (which will provide priorities) has not been completed to date

Extent of the issue

The extent of the surface water management issue will be discussed in the consultation phase.

Provincial Priorities

Manitoba and Canada have agreed, under section 25.4 of the APF to jointly conduct a scan of environmental issue facing agriculture in Manitoba. The scan will be a geographical assessment of the location, extent and severity of environmental issues associated with the primary production sector of agriculture in Manitoba. It will address concerns affecting air, water, soil and biodiversity at scales appropriate to targeting priority areas for implementing Environmental Farm Planning (EFP), Equivalent Agri-Environmental Farm Planning (EAEP) and Beneficial Management Practice (BMP) incentive funding in Manitoba.

The Scan in Manitoba is being finalized, and will incorporate physical resource and farm management information, technical expertise and local knowledge.

In the Canada-Manitoba Agriculture Policy Framework (APF) Agreement, Manitoba agreed to the goal of reducing agricultural risks and providing benefits to the health of soils, with priority areas being to increase soil organic matter content, reduce soil erosion caused by water, wind and tillage, reduce residual soil nitrogen concentrations on farmland, reduce greenhouse gas emissions, and increase habitat availability. It was further agreed that federal and provincial governments would work together to promote adoption of environmentally beneficial agricultural practices, as appropriate to the needs of individual farms and regions, including land and water management. This was subsequently reinforced by the various programs and funding provided in the Canada-Manitoba implementation agreement.

Existing reports/recommendations

To be completed.

C. Implementation Strategy

Participant List

A list of producers participating in the EAEP will be submitted. Producers will be contacted in the implementation phase of the EAEP, and the report will be updated at that time.

Identified Activities

Activities will be determined after the issue identification and BMP selection.

Application to the Canada-Manitoba Farm Stewardship Program (CMFSP)

Participants identified in the EAEP will receive a Statement of Completion to certify that they have participated in the equivalent agri-environmental planning process. The Statement of Completion is required in order for individual farmers to be eligible for incentive funding through the CMFSP. Once this letter is received, they can then apply as individuals to access incentive funding for the BMP's identified in the plan. Payment for implementation of BMP's will be paid directly to the producers.

Scheduling and Budgeting

To be completed

Appendix A – Scan of the LSR Watershed

Introduction

Watershed overview

The Little Saskatchewan River Watershed Study Area, in southwestern Manitoba, is approximately 414 551 ha in size and is comprised of three smaller sub-watershed units (refer to Figure 1.0). The watershed drains into the Little Saskatchewan River, which meanders its way south through the watershed to the Assiniboine River. Two large man-made lakes are located along the River: Lake Minnedosa and Lake Wahtopanah. Numerous lakes of varying sizes exist towards the northern portion of the watershed, including Sandy Lake, Clear Lake, Lake Audy, and Whitewater Lake. Numerous wetlands and prairie potholes are located within the watershed as well.

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Topography

Significant changes in elevation occur throughout the watershed, with values ranging from 755 metres above sea level (masl) in the northeastern portion of the watershed, down to 359 masl at the southern tip of the watershed. An area of lower elevation is also seen directly adjacent to the Little Saskatchewan River.

Surface Water Characteristics

The Little Saskatchewan River Watershed Study Area, in southwestern Manitoba, is comprised of three smaller sub-watershed units. The watershed drains into the Little Saskatchewan River, which meanders its way south through the watershed to the Assiniboine River. Two large man-made lakes are located along the River: Lake Minnedosa and Lake Wahtopanah. Numerous lakes of varying sizes exist towards the northern portion of the watershed, including Sandy Lake, Clear Lake, Lake Audy, and Whitewater Lake. Numerous wetlands and prairie potholes are located within the watershed as well.

Climate

The Little Saskatchewan River (LSR) watershed is situated in the Prairie Region of the Canadian Climate Regions. This region has been classified as having a continental semi-humid climate, which essentially means that there are extensive variations in seasonal and annual temperatures and precipitation amounts. There may also be extensive variations with temperatures on a day to day basis as well as between temperatures between the day and night.

Despite weather similarities within the watershed, localized temperature and precipitation variations occur. Based on climate data for the ecoregions within the Little Saskatchewan River Watershed, mean annual precipitation ranges from 440 to 530 mm, while mean annual temperature ranges from 0.0 to 2.8 °C (refer to Table 2). The average number of growing season days ranges from 171 to 183 and the average number of growing degree days range from 1400 to 1700. Mean annual moisture deficit ranges between 100 to 300 mm (Ecoregions Working Group 1989).

Table 2: Climate data for ecoregions within the Little Saskatchewan River Watershed

Ecozone	Ecoregion	Mean Annual Air Temp (°C)	Mean Growing Season (days)	Mean Growing Degree Days	Mean Annual Precipitation (mm)	Mean Annual Moisture Deficit (mm)
Boreal Plains	Boreal Transition	0.6	171	1400	480	150
	Mid-Boreal Uplands	0.0	173	1400	508	100
Prairies	Aspen Parkland	1.2-2.8	173-183	1442-1700	440-530	140-300

Note: Climate data is based on eco-climatic data (Ecoregions Working Group, 1989)

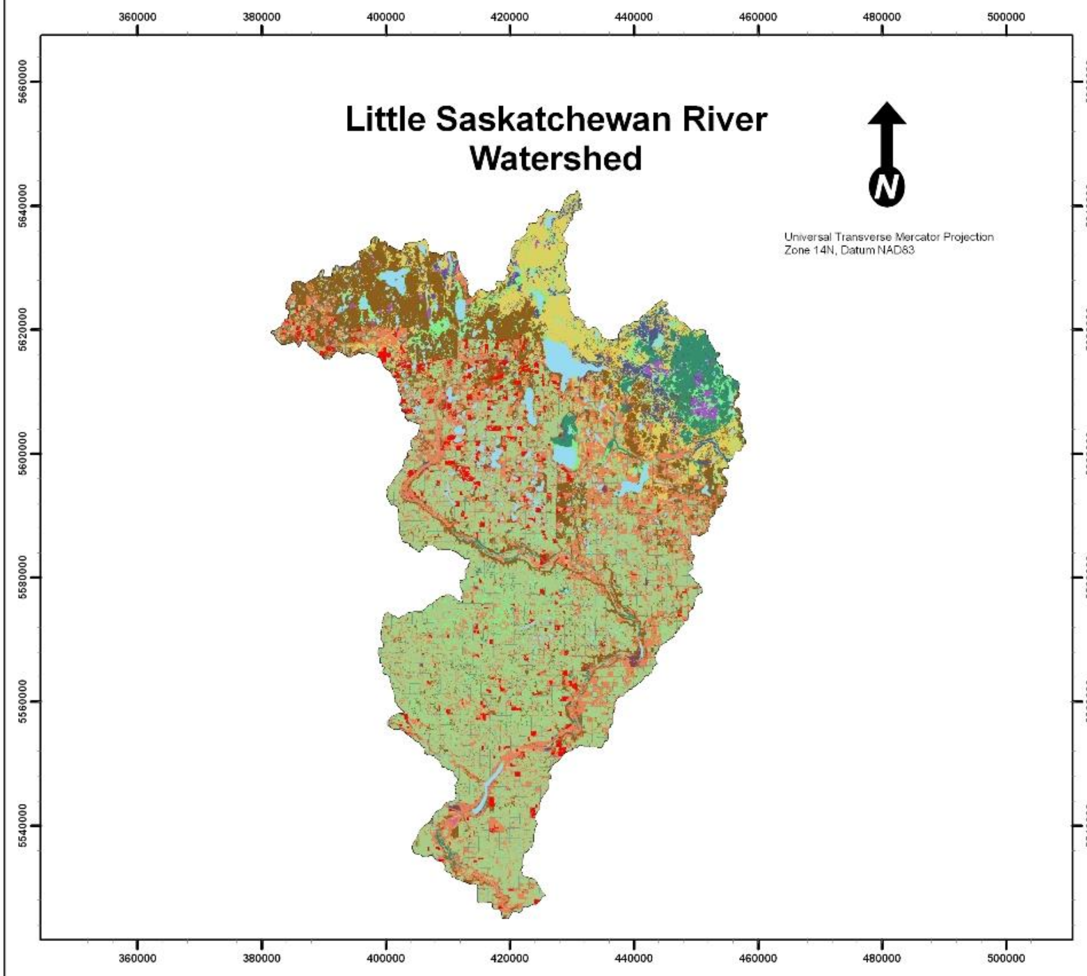
Land Use

Land use in the Little Saskatchewan River watershed in classified in the following categories according to Landsat imagery: agriculture, deciduous forest, water, grassland (including pasture), mixedwood forest, marsh/fens, bogs, conifer forest, open deciduous forest, forage crops, cultural, bare rock/sand/gravel, and roads and trails. The number of acres of each land cover type and the percentage of the watershed covered appears in Table 3 and Figure 1. Landsat information is based on the predominant landscape type in a 30 metre pixel. Actual land patterns are far more complex. Therefore although the information is valuable to obtain overview information, it is general and cannot be used for site specific analysis.

Table 3: Land Use/Land Cover in the Little Saskatchewan River watershed

Land Use/Land Cover	Area (acres)	% of LSR Watershed
Agriculture	359798.9	35.1
Deciduous Forest	156505.1	15.3
Water	55467.4	5.4
Grassland	181672.4	17.7
Mixedwood Forest	86195.4	8.4
Marsh/Fens	63595.9	6.2
Bogs	6362.6	0.6
Conifer Forest	25024.2	2.4
Open Deciduous Forest	39966.4	3.9
Forage Crops	25833.9	2.5
Cultural	2321.8	0.2
Bare rock/sand/gravel	485.2	0.1
Roads/trails	21072.3	2.1

Predominant land cover types are agriculture (35.1%), deciduous forest (15.3%) and grassland (17.7%). Forested areas are most common is the north of the watershed, in Riding Mountain National Park. Grassland and forage are abundant in the areas immediately south of the park and along watercourses. Agricultural land is more abundant in the south of the watershed.



Land Use/Land Cover	Area (Acres)	% of Watershed
Agriculture	359798.8550	35.1200
Deciduous Forest	156505.1230	15.2800
Water	55467.4240	5.4100
Grassland	181672.3580	17.7400
Mixedwood Forest	86195.3560	8.4100
Marsh/Fens	63595.9340	6.2100
Bogs	6362.6180	0.6200
Conifer Forest	25024.1590	2.4400
Open Deciduous Forest	39966.3950	3.9000
Forage Crops	25833.9030	2.5200
Cultural	2321.8460	0.2300
Bare rock/sand/gravel	485.2450	0.0500
Roads/Trails	21072.3140	2.0600

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Figure 1. Land Use / Land Cover information in the LSR Watershed

Issue Scan – Little Saskatchewan River Watershed

1. Soils

Soil Associations

Soils data is a critical component of land-use planning. Soil characteristics can be used to determine agricultural capability and to predict risks of erosion, leaching, and run-off. This type of information is important for determining suitable land uses, identifying sensitive areas, and targeting land-use improvement efforts.

Soils data is available for all areas within the watershed, with the exception for Riding Mountain National Park. The soils data used in this report was mapped at a reconnaissance scale of 1:126,720, and is published in Manitoba soil survey reports # 6, #7, and #8 (Rossburn and Virden, Carberry, and West-Lake map sheet areas). Soils information provided in this report is based on the characteristics of the dominant soil series within the soils polygon.

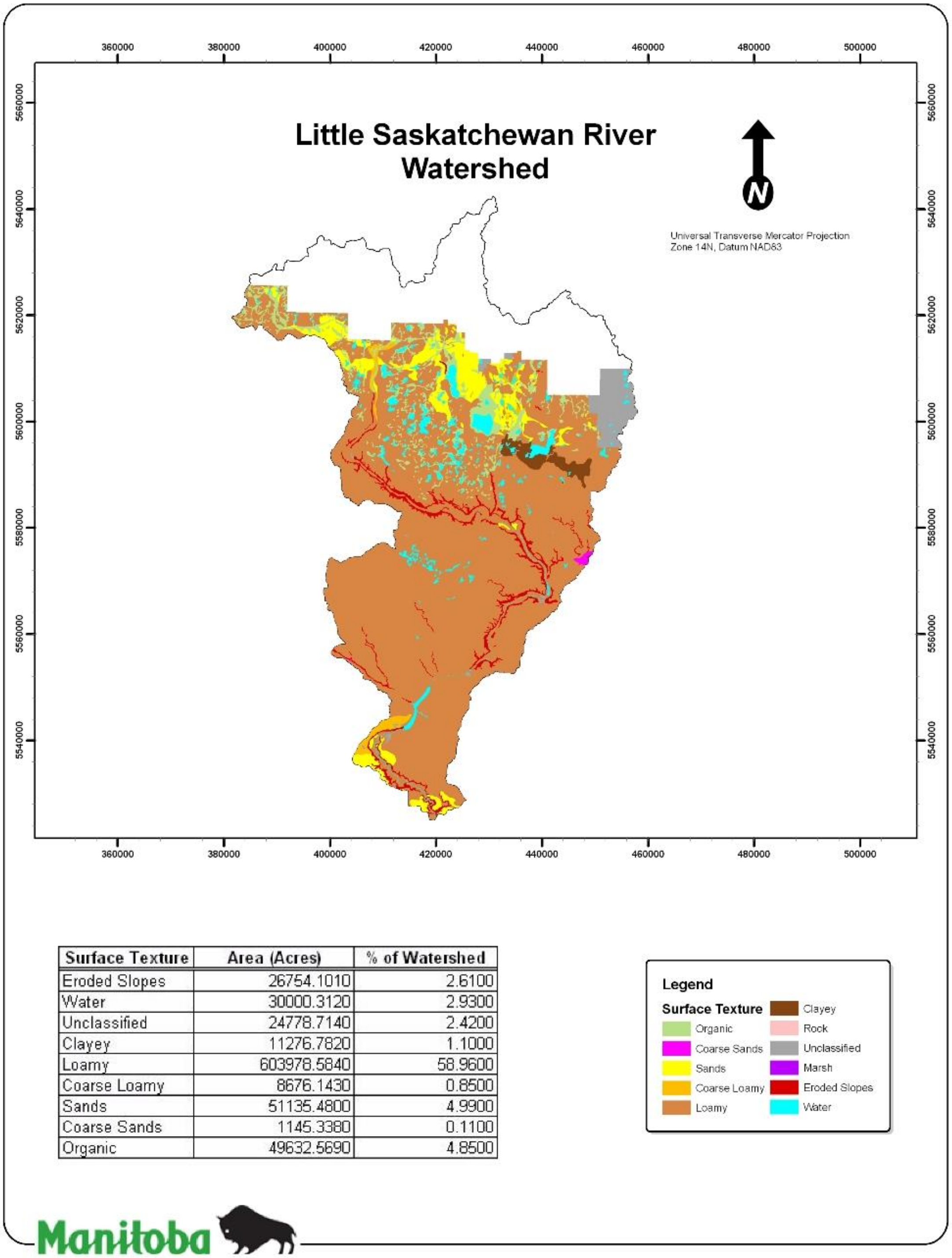
The majority of the soils in the watershed are derived from glacial till deposits. Glaciofluvial and lacustrine deposits occur in areas south of the Park as well as in the southern portion of the watershed, which lies on the edge of what used to be the Lake Souris Basin. Alluvial deposits are also present and occur in the flood plain of the Little Saskatchewan River.

The predominant soils within the watershed are part of the Chernozemic Order with the Black Chernozems occurring in the southern portions of the watershed. Dark Gray Chernozems occur midway through the watershed in parts of the RM's of Harrison, Strathclair, Minto and Clanwilliam. Dark Gray Luvisols occur in areas just south of the RMNP. Localized areas of poorly-drained soils (Gleysols) are found throughout most of the watershed. Depressional areas within the northern half of the watershed contain shallow to deep deposits of organic (peat) soils.

Surface Texture

Soil surface texture strongly influences the soil's ability to retain moisture, its general level of fertility, and the ease or difficulty of cultivation. For example, water moves easily through coarse-textured (sandy) soils, so little moisture is retained and these soils dry out more quickly than fine-textured (clayey) soils. Sandy soils are often characterized by a loose or single-grained structure which is very susceptible to wind erosion. On the other hand, clay soils have a high proportion of very small pore spaces which hold moisture tightly. Clay soils are usually fertile because they are able to retain plant nutrients better than sandy soils. However, they transmit water very slowly and are therefore susceptible to excess moisture conditions.

The predominant soil surface texture within the watershed is fine loamy (59%) (refer to Figure 2). Sands predominately occur in the northern portion (5%). Scattered pockets of organic soil are found throughout. Eroded slopes occur along the Little Saskatchewan River and associated waterways (3%).



Surface Texture	Area (Acres)	% of Watershed
Eroded Slopes	26754.1010	2.6100
Water	30000.3120	2.9300
Unclassified	24778.7140	2.4200
Clayey	11276.7820	1.1000
Loamy	603978.5840	58.9600
Coarse Loamy	8676.1430	0.8500
Sands	51135.4800	4.9900
Coarse Sands	1145.3380	0.1100
Organic	49632.5690	4.8500

Figure 2. Surface Texture for the Little Saskatchewan River Watershed.

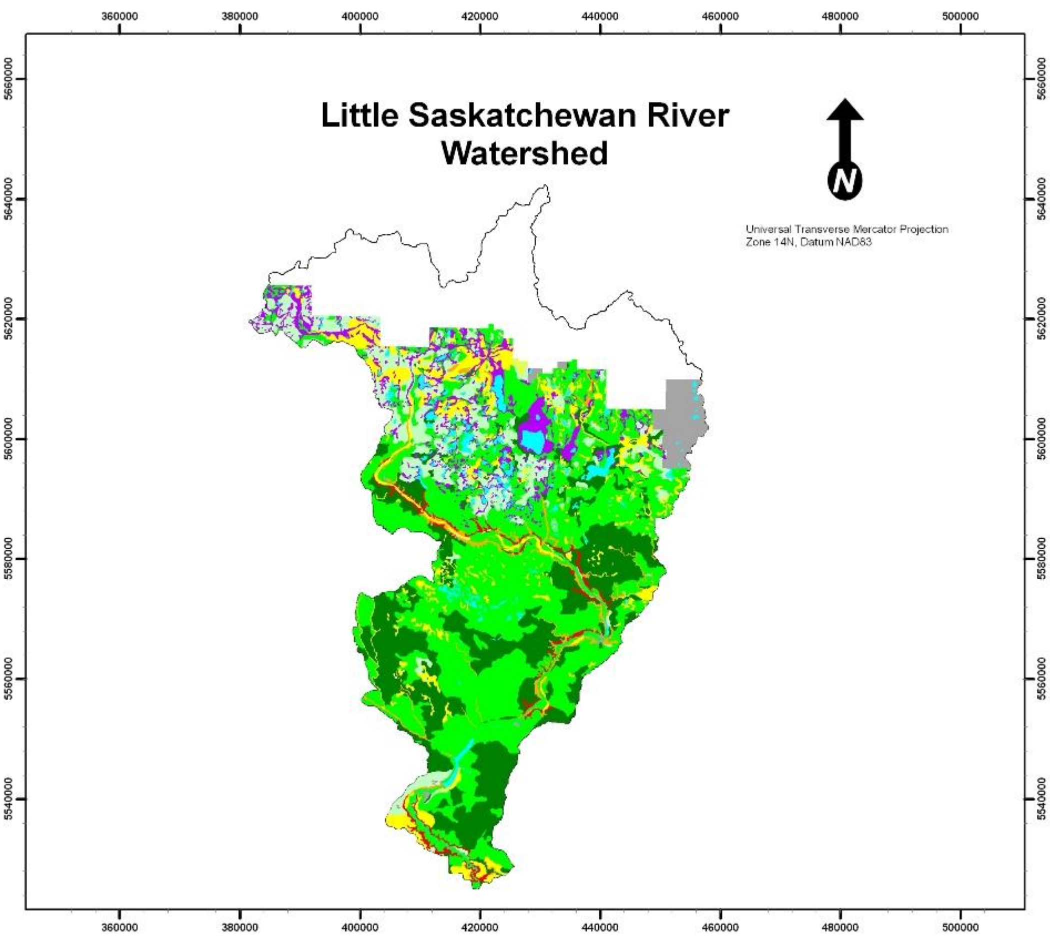
Agriculture Capability

Agriculture capability can best be described as the ability of the land to support the appropriate type of crops and agriculture management techniques. Not all land can be used in the same manner and it varies according to soil type, topography, stoniness, soil moisture deficiency and low fertility, to name only a few of the limitations. Classes have been established and range from 1 to 7 with each class having its own characteristics. Class 1 land is capable of producing the most expansive variety of crops with soil and climate conditions being favourable. Class 2 land is capable of producing a wide variety of crops, however there may be some minor limitations due to restrictions with soil and climate. Class 3 land is capable of producing a variety of crops under proper management techniques with soil and climate causing a higher rate of limitation. Class 4 land is capable of producing a limited variety of crops and must take into consideration special management techniques for the land. Class 5 land has limited capabilities and is recommended only for the production of perennial forages. Soil and climate causes severe restrictions to the agriculture capacity of the land. Improvements to the land are considered feasible, depending on location. Class 6 land should only produce native vegetation and pasture, with a heavy emphasis on no cultivation due to high soil and climate limitations. Improvements to the land are not considered feasible for agriculture capabilities. Class 7 is considered unsuitable for dry-land/soil bound agriculture.

Within the LSR watershed the majority of the land is classified as CLI class 2, 3 and 4 with 171,435, 345,712, and 83,948 acres, respectively. The amount of land within each CLI class for each sub-watershed is displayed in Table x and is shown geographically in Figure 3.

Table 4. Area (acre and hectares) and percent (%) of land in each class for CLI agriculture land capability in the Little Saskatchewan River watershed.

	Little Saskatchewan River		
Canada Land Inventory Class	Area (acres)	Acre (hectares)	Percent (%)
Water	29,982	12,143	2.9
Unclassified	24,627	9,974	2.4
1	1	0	0.0
2	171,435	69,431	16.7
3	345,712	140,013	33.8
4	83,948	33,999	8.2
5	74,479	30,164	7.3
6	16,245	6,579	1.6
7	12,149	4,920	1.2
Organic	48,801	19,764	4.8
Total	**807,378**	**326,988**	**78.9**



Agriculture Capability	Area (Acres)	% of Watershed
Water	29981.8360	2.9300
Unclassified	24626.7340	2.4000
Class 1	1.2140	0.0000
Class 2	171434.7000	16.7400
Class 3	345712.0950	33.7500
Class 4	83947.4770	8.2000
Class 5	74478.9800	7.2700
Class 6	16245.2970	1.5900
Class 7	12149.2200	1.1900
Organic	48800.4700	4.7600

Figure 3: Canada Land Inventory – Agricultural Capability for the Little Saskatchewan River Watershed

Water Erosion

The risk of water erosion was estimated using the Universal Soil Loss Equation (USLE) developed by Wischmeier and Smith (1965). The USLE predicted soil loss (tonnes/hectare/year) was calculated for each soil component in each soil map polygon. Water erosion risk factors used in the calculation include mean annual rainfall, slope length, slope gradient, vegetation cover, management practices, and soil erodibility (Eilers et al. 2002). Erosion risk classes were assigned based on the weighted average soil loss for each map polygon. The five classes of soil erosion risk (ranging from negligible to severe) are based on soils that are a bare, unprotected soil condition. These practices can significantly reduce this risk depending on crop rotation, soil type, and landscape features. Basing the soil erosion risk on the bare soil case helps to identify areas dominated by sensitive, erosive soils which may otherwise be masked if a land use or surface vegetation cover factor was considered (Eilers et al. 2002).

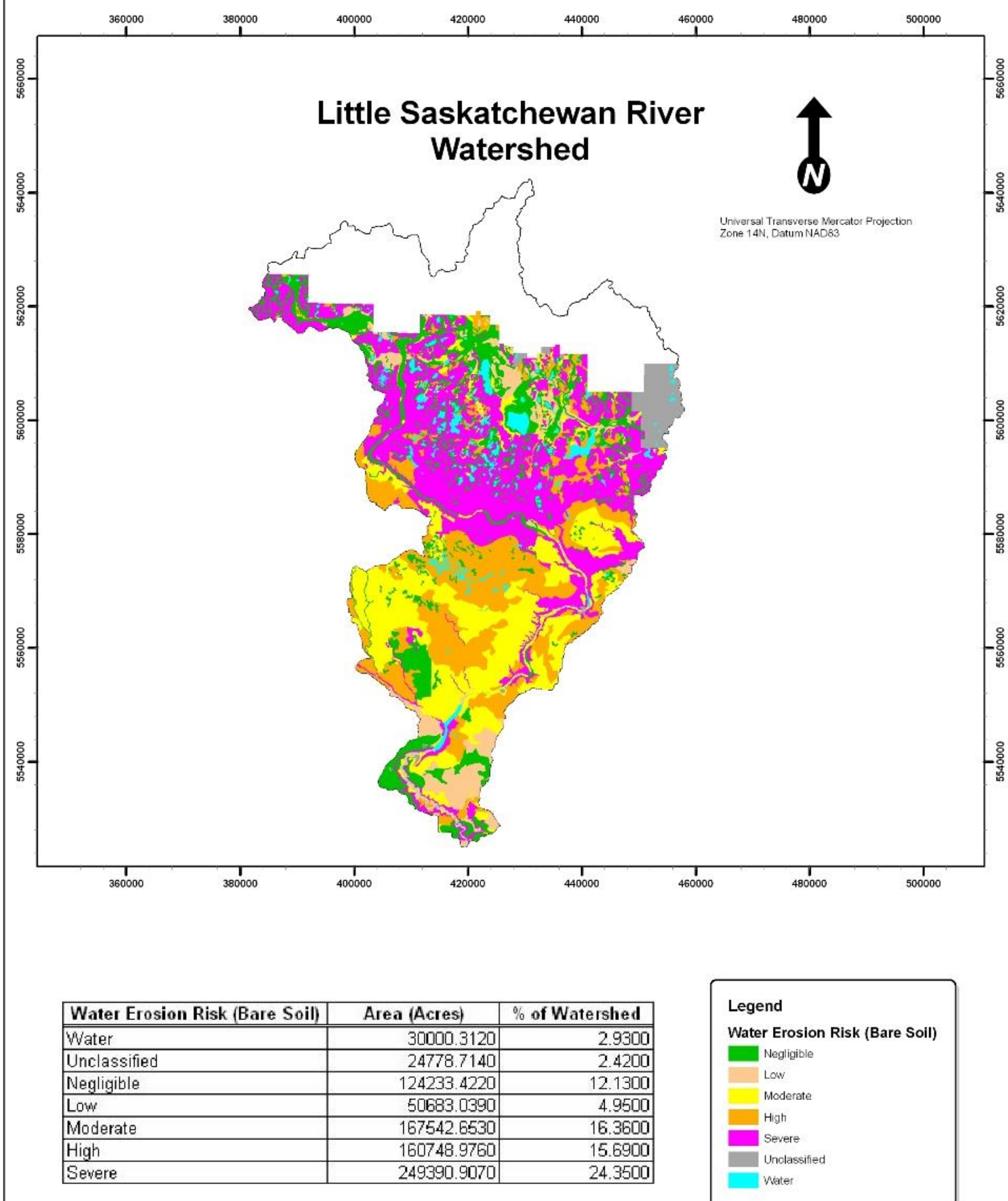
According to the interpreted water erosion risk classification for soils, water erosion can be a concern within this watershed, with 40% of the watershed falling in the high to severe risk category (refer to Figure 4). Just over 16% of the watershed falls into the moderate category, while approximately another 17% of the watershed is classified as having a low or negligible risk for water erosion.

Water Erosion Risk – Cropland

Basing the soil erosion risk on the cropland soil case helps provide a more accurate picture of the current land practices, and provides a more realistic portrayal of the risks associated with these lands. If a cropland cover is used for cropland soils, water erosion would be reduced significantly; just over 18% of the watershed rated with a high to severe risk (Figure 5). This would be associated with lands located in upper reaches of the watershed where the land is rolling with steep slopes and is near Riding Mountain National Park and the Little Saskatchewan River Valley. Just over 10% of the watershed falls into the moderate risk category, these being the lands that are rolling in nature with imperfect drainage. Another 6% of the watershed is classified as having a low to negligible risk for water erosion.

Water Erosion Risk – Grassland and Forage Crop

Similarly, the risk of water erosion was also calculated for lands using grasslands or forages as a land management practice for the watershed (Figure 6). The establishment of grass land and forage crops within the severe or moderate water erosion risk lessen the concern. Areas with moderate risk would be just under 3% of the total watershed, and approximately 11% of the watershed would also be rated with a high to severe risk.



Water Erosion Risk (Bare Soil)	Area (Acres)	% of Watershed
Water	30000.3120	2.9300
Unclassified	24778.7140	2.4200
Negligible	124233.4220	12.1300
Low	50683.0390	4.9500
Moderate	167542.6530	16.3600
High	160748.9760	15.6900
Severe	249390.9070	24.3500

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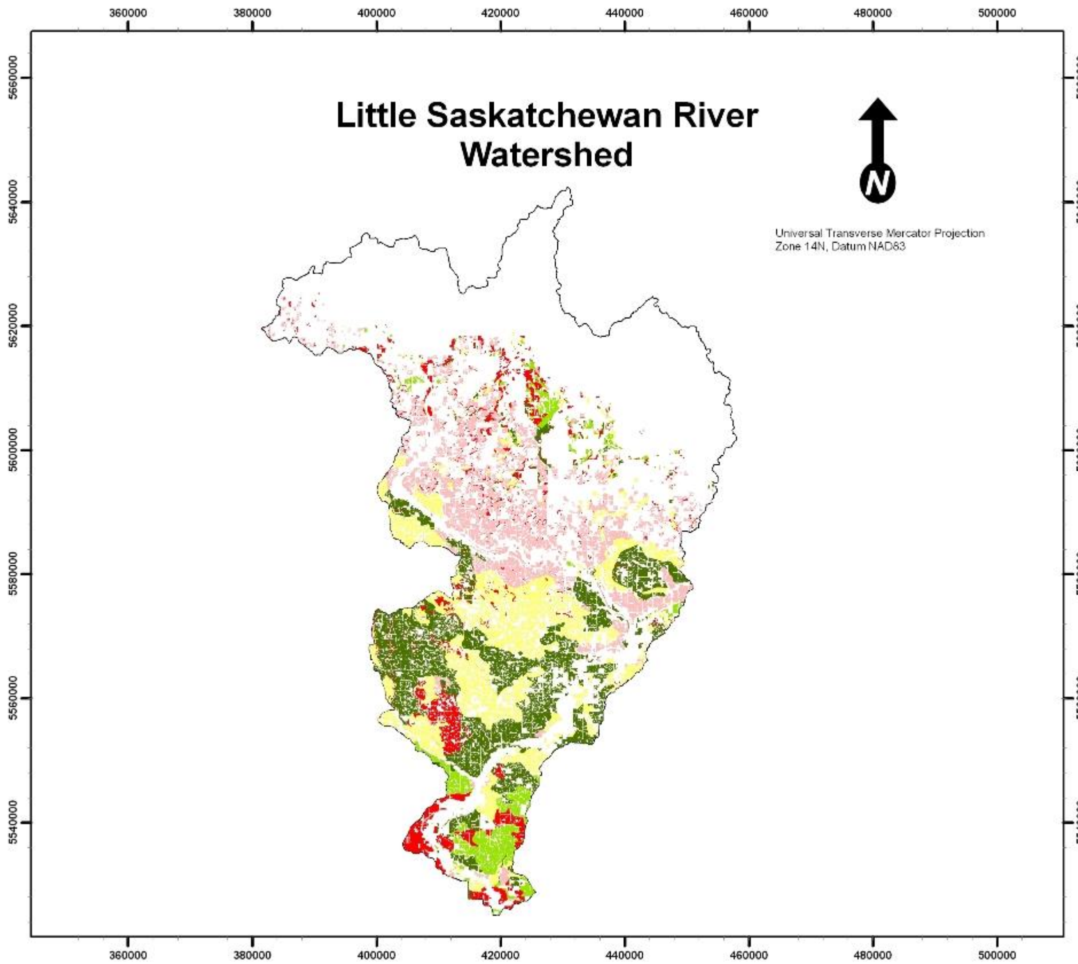
Figure 4. Water Erosion Risk in the Little Saskatchewan River Watershed.



Cropland with Risk of Water Erosion (Bare Soil)	Area (Acres)	% of Watershed
Negligible Risk	40536.6630	3.9600
Low Risk	27943.6230	2.7300
Moderate Risk	103579.0060	10.1100
High Risk	93269.8980	9.1100
Severe Risk	93516.8340	9.1300

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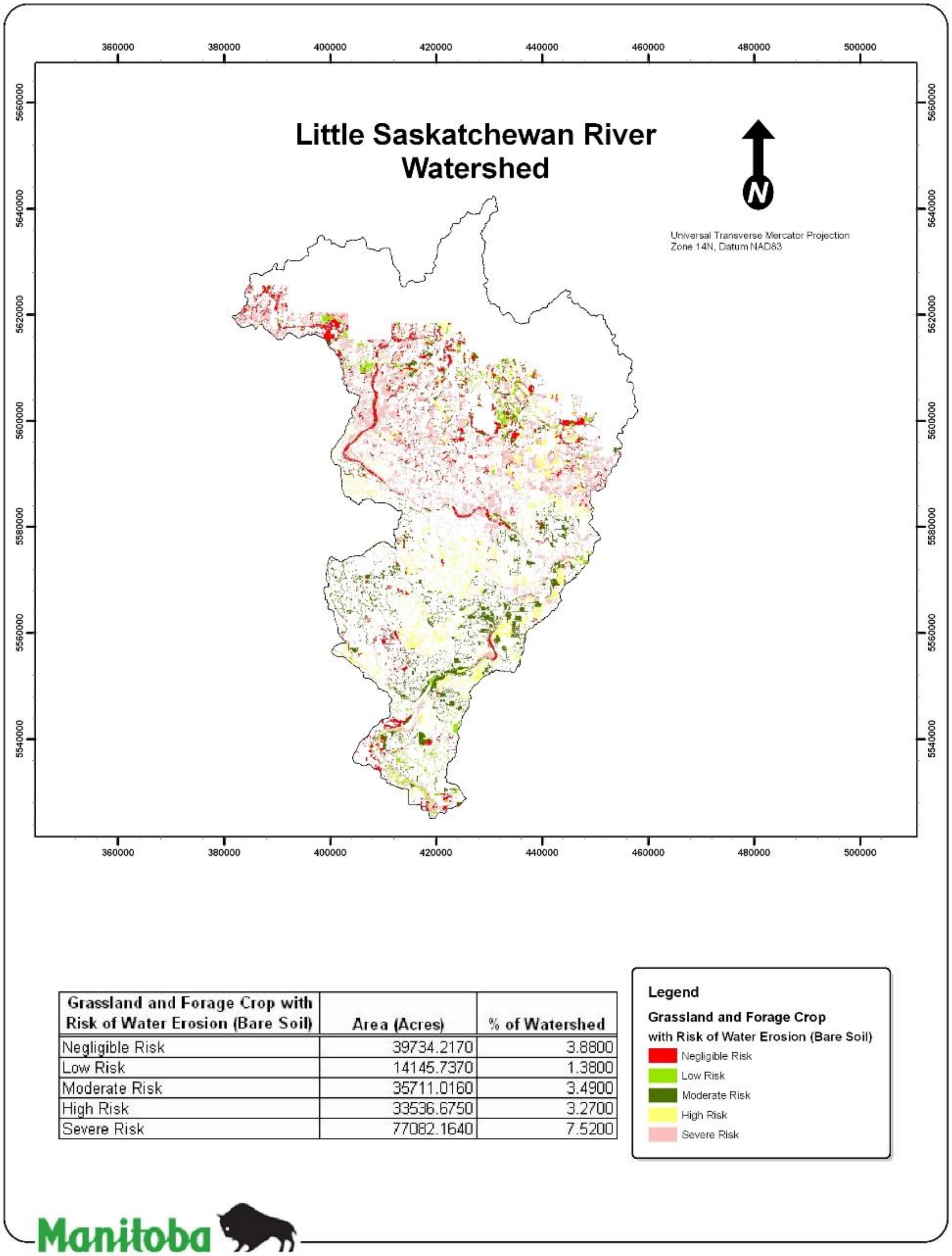
Figure 5. Water Erosion Risk (Cropland) in the Little Saskatchewan River Watershed.



Grassland and Forage Crop with Risk of Water Erosion (Bare Soil)	Area (Acres)	% of Watershed
Negligible Risk	39734.2170	3.8800
Low Risk	14145.7370	1.3800
Moderate Risk	35711.0160	3.4900
High Risk	33536.6750	3.2700
Severe Risk	77082.1640	7.5200

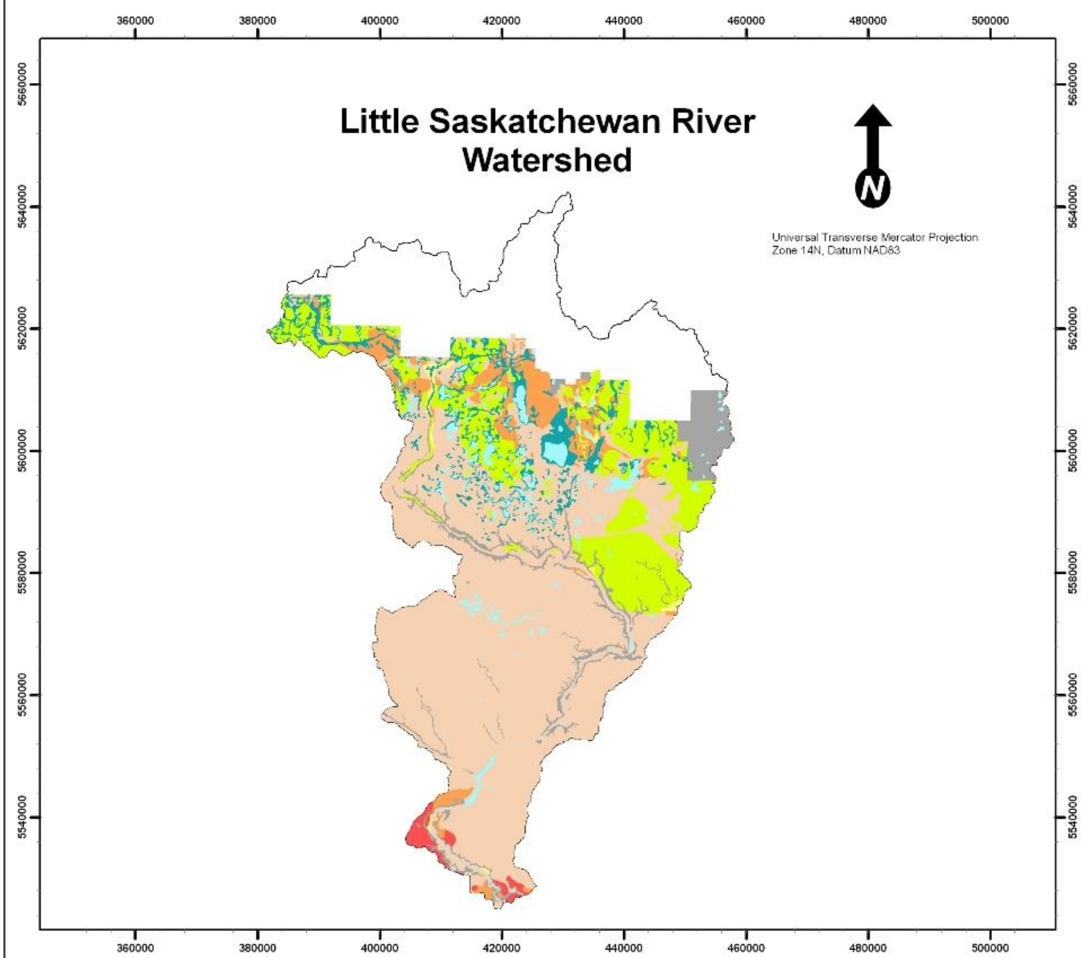
Figure 6. Water Erosion Risk (Grassland and Forage) in the Little Saskatchewan River Watershed.

Wind Erosion Risk

The wind erosion risk data was provided by Agriculture and Agri-Food Canada (PFRA) by using the Manitoba soils layer and the Soil Landscapes of Canada. Wind erosion risk is based on bare soil conditions and is dependant on surface texture, structure, soil erodibility, sheltered distance and wind velocity.

As a means of determining areas with potential wind erosion risks a grading system was established and a map created to illustrate where the varying wind erosion risk areas are within the LSR watershed (Figure 7). The grading system includes five classes, which have been based on bare unprotected soil; Negligible, Low, Moderate, High and Severe.

The majority of the LSR watershed falls in the low wind erosion risk category or neglible categories. Areas with high erosion risk exist in the northern part of the watershed in areas with sandy soils. High and severe erosion risks exist in the southern part of the watershed in areas with sandy soils. Agricultural practices like zero-tillage and permanent cover can reduce the risk of wind erosion in these areas and protect the soil resource.



Wind Erosion Risk (Bare Soil)	Area (Acres)	% of Watershed
Low	477220.1490	46.5900
High	47846.6480	4.6700
Moderate	5501.7230	0.5400
Negligible	137569.0310	13.4300
Organic Soil	49247.0620	4.8100
Severe	8296.9810	0.8100
Unclassified	51532.7860	5.0300
Water	30163.5430	2.9400

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Figure 7. Wind Erosion Risk in the Little Saskatchewan River Watershed.

2. Water

<u>Water Resources in the Watershed</u>

<u>Surface Water</u>

The Little Saskatchewan River Watershed Study Area, in southwestern Manitoba, is comprised of three smaller sub-watershed units. The watershed drains into the Little Saskatchewan River, which meanders its way south through the watershed to the Assiniboine River. Two large man-made lakes are located along the River: Lake Minnedosa and Lake Wahtopanah. Numerous lakes of varying sizes exist towards the northern portion of the watershed, including Sandy Lake, Clear Lake, Lake Audy, and Whitewater Lake. Numerous wetlands and prairie potholes are located within the watershed as well.

Hydrology

The Little Saskatchewan River Watershed Study Area is part of the larger Nelson River Basin. Surface water within the watershed basin drains into the Little Saskatchewan River. The river, fed by headwaters out of Whitewater Lake in RMNP, meanders south through the basin to eventually join up with the Assiniboine River, approximately ten km west of Brandon. The Little Saskatchewan River ranges from 8 to 40 m in width, and averages less than 2 m in depth. Three dams have been constructed on the river, located near the towns of Rapid City, Rivers, and Minnedosa. Based on the 1:50,000 National Topographic Series data, the watershed contains approximately 4,269 km of river and stream shoreline (both sides of the waterways are included in the calculation), and 5,490 km of waterbody shoreline. This value will be underestimated due to the fact that numerous small wetlands and potholes are not captured in the NTS data sheets. A more detailed survey was carried out by Ducks Unlimited Canada (DUC) in the mid 1980's using LANDSAT Imagery. According this habitat inventory, total area of wetlands in the study area was five times of that found in the NTS sheets. Therefore, in reality, total length of shoreline will be much higher. Most of the waterbody shoreline in the study surrounds wetlands and prairie potholes.

Hydrometric gauging stations within the province provide surface water level and stream-flow data that is used for the operation of water control works, flood forecasting, water management investigations, and hydrologic studies (Manitoba Conservation 2003). A network of 23 hydrometric gauging stations have been installed within the watershed. Mean annual flow rate out of the watershed, as measured by gauging station 05MF018 downstream of Lake Wahtopanah is 4.55 m3/s. Table 5 depicts the mean annual monthly flows as measured from this gauging station over a 52-year period. Spring discharge, along with spring and summer rain events, create higher flow rates from April through to July, with the peak flow generally occurring in May.

Table 5: Mean stream flow on the Little Saskatchewan River as recorded by hydrometric station 05MF018, located south of Lake Wahtepanah (1944-1996)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan-Dec
Discharge (m3/s)	1.29	1.22	1.32	11.3	16.0	9.41	6.50	3.07	2.54	2.62	1.97	1.49	4.55

<u>Groundwater</u>

Groundwater resource information is currently in development.

<u>Surface Water Quality</u>

Phosphorus and nitrogen occur naturally and are important plant nutrient sources in water bodies. However, several human factors have created an excess of nitrogen and phosphorus in many water bodies. Factors contributing to excess nitrogen and phosphorus concentrations include:

- Inadequate sewage treatment
- Malfunctioning private septic systems
- Accelerated soil erosion
- Application of inorganic field and lawn fertilizers
- Runoff from animal manure
- Enhanced drainage and reduced riparian vegetation
- Use of household cleaning products than contain phosphorus
- Decomposing vegetation (i.e., leaves) deposited in rivers and streams

While the Little Saskatchewan River is considered to be in good condition when compared to similar agricultural prairie rivers, water quality monitoring along the river over the past thirty years shows elevated coliform and nutrient concentrations, as well as the presence of pesticides. Coliforms in the river are generally low, with nutrients at moderate concentrations; however, elevated areas of concentration have been reported near livestock holding areas and lagoon discharge points. While pesticides have been detected in the river, concentrations were below drinking water guidelines (Aquatic and Environmental Consultants, 1998).

Long term water quality monitoring data are available from sampling station WQ0105, located in proximity to hydrometric gauging station 05MF018, near Rivers, Manitoba. Using water quality monitoring data from station WQ0105, along with flow data from hydrometric station 05MF018, Jones and Armstrong (2001) determined that from 1973 to 1996, Total Nitrogen (TN) concentrations decreased, while Total Phosphorus (TP) concentrations increased. The increasing trend in TP concentrations was attributed to increased non-point source and point source loading from agricultural activity and municipal wastewater lagoon effluent. The decrease in TN was thought to be at least partly influenced by the alteration in flow and nutrient concentration caused by the Rivers Reservoir, located directly upstream of the sampling station. The Little

Saskatchewan River is one of four main tributary streams contributing to the Assiniboine River. According to Bourne, et al. (2002), the Little Saskatchewan River contributed to 8% of the total Nitrogen load and 6.4% of the total Phosphorus load of the Assiniboine River in 2001.

Wetlands and potholes are prevalent throughout the study area. Wetlands have an important function on the landscape. They are natural water filters; the soil and the plants in a wetland absorbs chemicals, nutrients, sediments and other impurities from the water as it passes through. In the Little Saskatchewan River watershed, according to the DUC Habitat Inventory, there were over 49,000 wetlands in 1986 (of which 74% are under 1 ha in size). The trend has been to drain wetlands for improved crop production. This loss of filtering capacity may reduce surface water quality in the lakes and rivers of Manitoba.

Although riparian areas occupy only a small percentage of the area of the watershed, they represent an important component of the overall landscape. They are the transitional areas between the aquatic and surrounding upland area. These "green zones" are one of Manitoba's most ecologically diverse ecosystems. A healthy riparian area can perform a number of ecological functions, including trapping sediment, building and maintaining streambanks, storing floodwater and energy, recharging groundwater, filtering and buffering water, reducing and dissipating stream energy, maintaining biodiversity and creating primary productivity. These functions are essential for sustaining a majority of fish and wildlife species, maintaining functioning watersheds, providing forage for livestock, supporting people on the landscape and providing good water quality. Disturbance and alteration of a riparian area will impact its ability to carry out these ecological functions.

It must be recognized that many sectors contribute to the alteration of riparian areas, including agriculture, recreation, urban and residential development, and forestry.

The health of a riparian area determines the extent to which the riparian area can perform its functions. Riparian health is generally determined by onsite assessment and evaluation; however this information is time consuming to obtain and was not available for this process. Instead, land cover in a 50 m buffer around waterbodies and water courses (both permanent and intermittent) within the watershed was analyzed, since these areas will have a greater likelihood of influencing water quality. Although this method cannot determine management practices occurring in the riparian areas (i.e. livestock use of riparian areas, nutrient and pesticide management practices, etc), land cover within the buffered area could give some indication of possible health of riparian areas as well as potential impacts to water quality. For example, trees and shrubs are an important part of the riparian area. Tree and shrub roots help to stabilize banks and hold the soil in place while canopy cover provides protection from rain drops. Their sparse presence could be an indication of declining riparian health. Another indicator of potential decline in riparian health is the presence of annual crop land in the buffer area. Annual crop land can potentially impact water quality by allowing contaminated runoff to enter surface water. However, good management practices in the riparian area can mitigate or eliminate water quality concerns.

Landsat imagery indicates that 29.2% of the land within 50 metres of watercourses is grassland, which includes pasture land. Good riparian management is critical in riparian pastures. Healthy riparian zones can be maintained in pastures if the areas are well managed. Fencing and off stream watering systems are examples of tools that can be used to manage these areas. Riparian areas should not be grazed when the soil is saturated and the area subject to pugging, hummocking and rutting. Good management is critical to maintain good water quality.

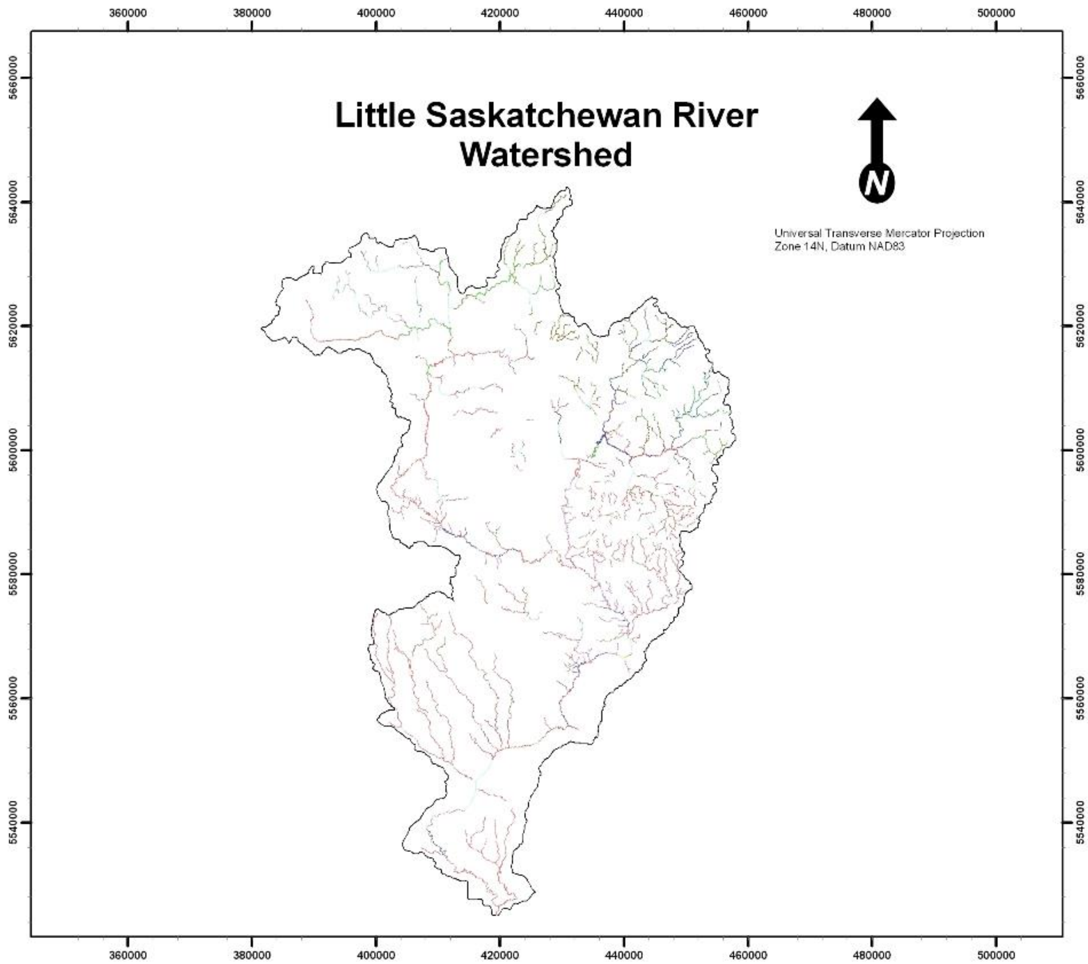
16.4% of the area within 50 metres of surface watercourses bodies is classified as agricultural. This area is generally used for annual crop production. Appropriate management of riparian areas is critical in annual cropland to avoid nutrient and sediment losses to surface water. Grassed waterways can be an effective tool to maintain surface water quality in many areas. These areas can filter and buffer water and trap sediment to enhance water quality. Good management of these intermittent watercourses will improve water quality for all downstream users.

27.2% of the area within 50 metres of surface watercourses is classified as deciduous forest, mixedwood forest, conifer forest, or open deciduous forest. Treed areas, depending on management, may support good riparian health and enhance water quality. For example, trees and shrubs tend to provide root systems which strengthen stream banks and resist erosion.

Appropriate management of livestock confinement areas is also important to maintain good water quality. Appropriate siting of confinement areas, regular cleanout of manure accumulation, managed manure land application, control of runoff and other beneficial management practices will reduce the potential introduction of nutrients and pathogens into watercourses.

Table 6: Land Use/Land Cover within 50m of Watercourses

Land Use/Land Cover	Area (acres)	% of 50m buffer
Agriculture	7528.8	16.36
Deciduous Forest	4827.5	10.49
Water	4857.3	10.55
Grassland	13441.7	29.2
Mixedwood Forest	3169.0	6.89
Marsh/Fens	5956.8	12.9
Bogs	441.5	0.96
Conifer Forest	926.1	2.01
Open Deciduous Forest	3578.6	7.78
Forage Crops	428.7	0.93
Cultural	100.9	0.22
Bare rock/sand/gravel	5.7	0.01
Roads/trails	763.3	1.66



Land Use/Land Cover	Area (Acres)	% of 50m Buffer
Agriculture	7528.8000	16.3600
Deciduous Forest	4827.5100	10.4900
Water	4857.3060	10.5500
Grassland	13441.7010	29.2000
Mixedwood Forest	3169.0010	6.8900
Marsh/Fens	5956.7940	12.9400
Bogs	441.4780	0.9600
Conifer Forest	926.0730	2.0100
Open Deciduous Forest	3578.5540	7.7800
Forage Crops	428.6700	0.9300
Cultural	100.9480	0.2200
Bare rock/sand/gravel	5.7180	0.0100
Roads/Trails	763.3230	1.6600

Manitoba

Figure 8: Land Use/Land Cover within 50 metres of Watercourses in the Little Saskatchewan River watershed

Groundwater Quality

Groundwater quality information is pending.

Water Conservation

Accurate water conservation information is not currently available.

3. Air

Little information is available to quantify air quality in the LSR watershed. Crop residue burning does occur in the watershed though it is not usually a major concern with most residents. Zero and minimum tillage practices have reduced wind erosion and particulate concerns.

According to the 2001 Census of Agriculture, 219 operations spread solid in the watershed. A further 7 spread liquid manure on the land surface and 4 injected liquid manure. Odours from manure application may be an issue at certain times of the year (cleanout and application). Proper management practices can reduce these odours.

Greenhouse gases (GHG) are released during agricultural production. Although the GHG contribution of the LSR watershed to global GHG emission is extremely low, some GHG are released. Information about the amount of GHG released is not available.

Air quality is not perceived to be a major issue of concern.

4. Biodiversity

Biodiversity refers to the variety of life on our planet, measurable as the variety within species, between species, and the variety of ecosystems. One of the major goals of the APF is to ensure compatibility between biodiversity and agriculture. Key priorities are the maintenance of wildlife habitat, including habitat for species at risk, and the economic damage to agriculture from wildlife.

Habitat Inventory

Riparian Areas

Although riparian areas occupy only a small percentage of the area of a watershed, they represent an extremely important component of the overall landscape. They are the transitional areas between the aquatic and surrounding upland area. These “green zones” are one of the most ecologically diverse ecosystems. A healthy riparian area can perform a number of ecological functions, including trapping sediment, building and maintaining streambanks, storing floodwater and energy, recharging groundwater, filtering and buffering water, reducing and dissipating stream energy, maintaining biodiversity and creating primary productivity. These functions are essential for sustaining a majority of fish and wildlife species, maintaining functioning watersheds, providing good water quality, forage for livestock and supporting people on the landscape. Disturbance and alteration of a riparian area will impact its ability to carry out these ecological functions. Impacted riparian areas will have a reduced capacity to trap and store sediment and nutrients and stabilizing streambanks (important for surface water quality), provide fish and wildlife habitat, etc.

Recognizing that many sectors contribute to the alteration of riparian areas, including agriculture, recreation, urban and residential development, and forestry, this report will focus on the agricultural impacts to riparian areas in an attempt to provide information that can be used by the agricultural industry to begin to address the issue of riparian health.

In 1998, a study conducted by John Donetz entitled Little Saskatchewan River: A Watershed Study was consulted over the Little Saskatchewan River. The study objectives were to compile existing data, survey the Little Saskatchewan River riparian corridor to identify agricultural, municipal, or natural occurrences that may affecting water quality, valuable fish and wildlife habitat, and recreational opportunities in the watershed. The study was to also identify potential sites that would contribute to improving water quality.

Fifty projects were identified during the study, 15 were deemed a high priority and another 22 as medium priority. Approximately 35 of these proposed sites involved agricultural projects that ranged from riparian fencing and watering systems, to moving full livestock operations away from the riparian corridor. Since 1995, a number of these projects were completed through local stakeholder groups, Fisheries Enhancement Initiatives, and conservation districts.

<u>Wetland Areas</u>

To determine the extent of wetlands in the Little Saskatchewan River watershed, information was collected from Ducks Unlimited Canada (DUC) and analysis work done by Dave Dobson. Information regarding wetland and sizes was extracted from the 1986 DUC Habitat Inventory data. This data was developed by Ducks Unlimited Canada to form a comprehensive wetland inventory for the greater part of Prairie Canada using landsat imagery. Image used was captured on May 27, 1986. The image was classified with a strong focus to classify all wet/water pixels. The data collected was attributed to the quarter section, and delineated individual wetlands, identified small wetlands (less than 2 acres) and large wetlands (greater than 2 acres).

Ducks Unlimited recognize that each of these types of wetlands are important for waterfowl habitat. The small more temporal ponds that are usually small in size provide valuable feed and stopover points for migratory birds in spring. The larger ponds provide valuable habitat year round for waterfowl for production. Wetlands that provide habitat for 20 pairs of ducks or more are considered target areas for DUC.

Table 7: Waterfowl Counts and Wetland Acres in the LSR watershed

Wetlands	Number of Wetlands	Acres	20 Pairs associated with wetlands	Acres-Duck Pairs
Small (less than 2 acres)	36,155	29,307	32,396	21,971
Large (greater than 2 acres)	12,819	146,629	11,561	125,224
Total	48,974	170,936	43,957	147,195

Within the Little Saskatchewan River Watershed, there are over 170, 936 acres (16%) that are associated with wetlands. Approximately 86% of those wetlands are wetlands that are greater than 2 acres in size. It was also observed that waterfowl densities were higher in the smaller wetlands (1 pair every 0.67 of an acre) than the larger ones (1 pair every 10.8 acres), suggesting the waterfowl prefer the smaller wetlands than the larger ones.

Waterfowl Priority

The Decision Support System data, is a statistical model which was developed for the Prairies by DUC, using CLI, CWS habitat transect data, DUC 1986 habitat data, landcover data, Palmer Drought sensitivity index and wetland/waterfowl production modelling formula. This formula helped Ducks Unlimited Canada identify where large number of duck pairs would be associated to specific wetlands, in efforts to assist their habitat conservation programming efforts to areas that has an estimated breeding pair density of 20 or higher.

Within the Little Saskatchewan River watershed, there is significant waterfowl numbers associated with those wetlands described above. These acres are considered to be a high priority for the waterfowl production. See Table 8 and Figure 9.

Table 8: Waterfowl Production in the Little Saskatchewan River Watershed

	Pairs	Area (acres)	% of watershed
0	0-10	36,558	3.6
1	10-20	140,347	13.7
2	20-30	263,716	25.7
3	30-40	356,574	34.8
4	40-50	207,020	20.2
5	50-60	20,125	2.0

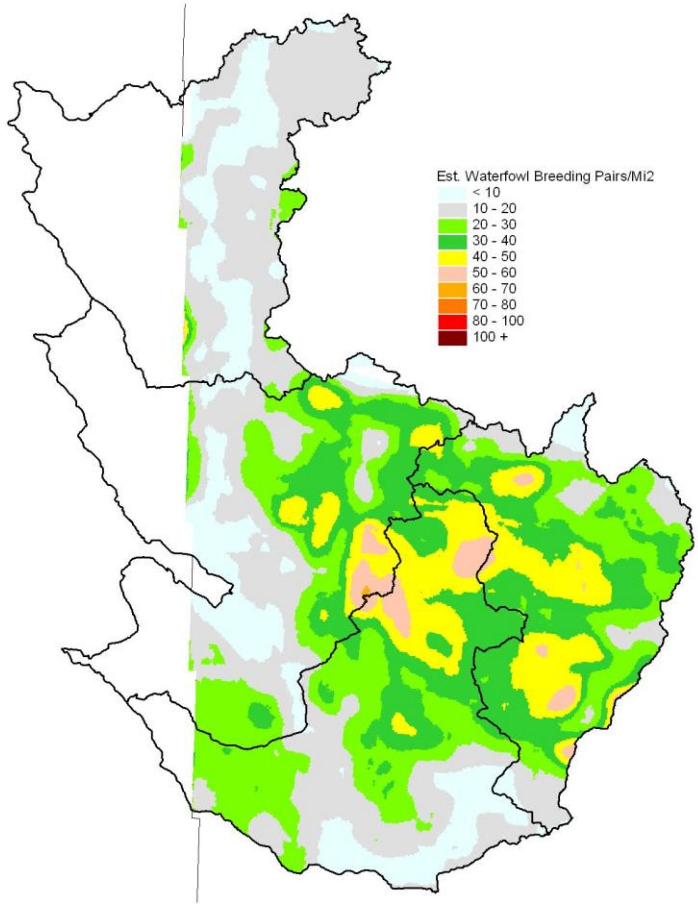


Figure 9: Waterfowl production in the Four Assiniboine watershed.

<u>Fisheries Resources</u>

Information gained for the scan was primarily identified through existing literature, the 1998 study done by Jon Donetz. Within his study, Donetz conducted small mesh netting along different stretches of the Little Saskatchewan River. Table 9 shows recorded species.

Table 9: Small Mesh Netting Summary Capture Record - Little Saskatchewan River, 1997

Species	Site 1	Site 2	Site 3	Site 4	Composition %
Brook Stickleback	3	2			8.7
Fathead Minnow	5	1	2	2	17.54
Shiner	5	5	16	2	49.12
Rock Bass	1		1	1	5.26
Walleye		3		1	7.02
White Sucker		1			1.75
Trout Perch	1	1	2	1	8.77
River Darter	1				1.75

Within the Little Saskatchewan River watershed there are 4 man-made dams that have served as an impediment to fish migration throughout the watershed. These include, Rivers Dam (Lake Wahtopanah), Rapid City Dam, Minnedosa Dam, and Lake Audy. Each of the structures are a man made lake within the watershed, and have developed into being an important recreational and domestic water source (Lake Wahtopanah) for the communities around them.

Lake Wahtopanah, one of the largest lakes on the watershed, has historically been a successful lake for stocking walleye and northern pike fingerling fish successfully. As early as 1999, efforts were taken to make some of these structures more fish friendly, as identified in Donetz reports as a high priority. With support received from the Fisheries Enhancement Initiative, efforts were taken to improve the fish migration through some of these structures. Two fish ladders were constructed Rapid City (1996) and Minnedosa Dam (1998), allowing for fish mobility from Lake Wahtopanah to the headwater areas of the watershed.

Areas of Risk

Habitat Availability

The following is a list of issues that pertain to the conservation and maintenance of habitat and the opportunities that exist to address these issues.

Wetland Drainage

Despite the multitude of ecological and societal values that wetlands provide wetlands continue to be drained. It is estimated that more than 70% of the wetlands in the Canadian prairies have been altered lost and the greatest threat to wetlands is drainage. As noted, the loss of wetlands and adjacent upland areas can result in reduced biodiversity and wildlife habitat, increased flood potential, reduced ground water recharge, increased sedimentation, and a reduced ability for the ecosystem to control the effects of pathogens and pesticides. Although a variety of activities can impact wetlands the greatest threat remains the influence of agricultural drainage.

Land-use Practices and Development

Land-use practices and infrastructure development located remotely from wetlands including water diversions, the improper sizing of road culverts and agricultural practices can indirectly impact wetlands. These activities can promote increased runoff and erosion, increased flood frequency and drainage of wetland systems. The results of these activities can result in similar impacts to those noted above.

Riparian Habitat Protection

Riparian areas, which are the area of transition between terrestrial and aquatic ecosystems, are important components of the landscape and provide a variety of ecological and societal values. Riparian refers not only to river and stream systems but standing water areas such as lakes and wetlands. The loss or degradation of riparian areas is an issue primarily on agricultural lands where clearing for annual cropping and grazing can have significant impacts. Riparian zones are natural buffers between upland and wetland habitats providing erosion control and reducing the input of sediments into streams and wetlands and provide natural water quality protection measures. Riparian zones provide significant biodiversity and wildlife habitat values and serve as linkages and corridors for wildlife to travel from one area to another.

Species at Risk

"Species at Risk" are the plants and animals in danger of extinction or extirpation. Habitat destruction is a major factor in the decline of many species. Other factors include genetic and reproductive isolation, suppression of natural events, contamination, overharvesting, climate change, disease, and invasive species.

Table 10 lists the scientific and common names of species at risk in the watershed, and the sub-watersheds in which each is found. Species are listed by sub-watershed and as a result may appear multiple times in the list.

Table 10: Species at Risk in the Little Saskatchewan River Watershed.

Scientific Name	**Common Name**
Ammodramus bairdii	Baird's Sparrow
Anthus spragueii	Sprague's Pipit
Asio flammeus	Short-eared Owl
Botrychium minganense	Mingan Moonwort
Bromus pubescens	Canada Brome Grass
Carex hystericina	Porcupine Sedge
Carex microptera	Thick-spike Sedge
Carex prairea	Prairie Sedge
Castilleja pallida ssp. septentrionalis	
Coturnicops noveboracensis	Yellow Rail
Cygnus buccinator	Trumpeter Swan

Erigeron annuus	White-top Fleabane
Euphagus carolinus	Rusty Blackbird
Festuca hallii	Plains Rough Fescue
Festuca hallii-(stipa spp.) herbaceous vegetation	Plains Rough Fescue-(Spear Grass) Herbaceous Vegetation
Hesperia dacotae	Dakota Skipper
Impatiens noli-tangere	Western Jewelweed
Lemna minor	Lesser Duckweed
Lotus purshianus	Prairie Trefoil
Matricaria maritima	Scentless Chamomile
Melanerpes erythrocephalus	Red-headed Woodpecker
Milium effusum	Millet Grass
Oryzopsis canadensis	Canadian Rice-grass
Osmorhiza depauperata	Blunt-fruited Sweet Cicely
Platanthera orbiculata	Round-leaved Bog Orchid
Potamogeton strictifolius	Pondweed
Ruppia cirrhosa	
Selaginella selaginoides	Northern Spike-moss
Sisyrinchium campestre	White-eyed Grass
Snake hibernacula	
Solidago simplex	
Stipa richardsonii	Richardson Needle Grass
Stipa viridula	Green Needle Grass
Strix varia	Barred Owl
Strophitus undulatus	
Vaccinium caespitosum	Dwarf Bilberry
Wolffia columbiana	Water-meal
Lanius ludovicianus excubitorides	Loggerhead Shrike

Ranking of Issues

a) Soil

Agri-environmental factor	**Risk assessment in Coleman watershed**	**Provincial priority[1] in reference to Coleman watershed**	**Ranking**
Water erosion		N/A	
Wind erosion		N/A	
Organic matter		N/A	
Tillage erosion		N/A	

[1] Provincial Scan document (which will provide priorities) has not been completed to date

b) Water

Agri-environmental factor	Risk assessment in Coleman watershed	Provincial priority[1] in reference to Coleman watershed	Ranking
Surface water – point source		N/A	
Surface water- Non-point source		N/A	
Groundwater- point source		N/A	
Groundwater – non-point source		N/A	
Water conservation		N/A	

c) Air

Agri-environmental factor	Risk assessment in Coleman watershed	Provincial priority[1] in reference to Coleman watershed	Ranking
Odours		N/A	
GHG emissions		N/A	
Particulate emissions		N/A	

d) Biodiversity

Agri-environmental factor	Risk assessment in Coleman watershed	Provincial priority[1] in reference to Coleman watershed	Ranking
Habitat availability		N/A	
Species at risk		N/A	
Economic damage by wildlife		N/A	

[1] Provincial Scan document (which will provide priorities) has not been completed to date

Issue Identification

a) Risk Comparison

Issue:	Issues assessed as high	Coleman watershed ranking	Provincial priority[1]	Overall ranking
From soil			N/A	
From water			N/A	
From air			N/A	
From biodiversity			N/A	

b) Other issues to consider