Shell River Watershed
Water Quality Report

August, 2007

Prepared by:

Manitoba Water Stewardship

Shell River Watershed Water Quality

Water Quality Data Available for the Shell River Watershed:

A number of studies examining surface water quality in the Shell River watershed have been conducted by Manitoba Water Stewardship's Water Quality Management Section over the past 34 years. Table 1 illustrates the location of where water quality samples have been collected including the period and frequency of sampling.

Table 1: Water quality monitoring stations within the Shell River watershed.

Station Number	Location	Period of Record	Sampling Frequency
MB05MDS018	ASSINIBOINE RIVER AT BELOW SPILLWAY OF SHELLMOUTH DAM	1973-1978, 1992-1994	1-46 x/year
MB05MDS022	ASSINIBOINE RIVER AT KAMSACK	2001-2002	10-11x/year
MB05MDS009	ASSINIBOINE RIVER AT NEAR KAMSACK (ENV. CANADA)	1978-present	11-24 x/year
MB05MDS023	ASSINIBOINE RIVER AT OUTLET FROM SHELLMOUTH	2001-2003	7-18 x/year
MB05MDS027	ASSINIBOINE RIVER AT PR 357 BRIDGE IN SASKATCHEWAN	1993, 2001-2002	3-11 x/year
MB05MDS016	ASSINIBOINE RIVER AT SASK. PR #369, SOUTH OF TOGO	1973-1977	4-7 x/year
MB05MDS014	ASSINIBOINE RIVER DOWNSTREAM OF DAM OUT (AR-1), SHELLMOUTH RESERVOIR	1995	1 x/year
MB05MDS032	BOGGY CREEK WEST SHELLMOUTH MILE RD CULVERT CLOSE TO MAN/SASK BORDER	1992-1993	7-20 x/year
MB05MDS037	CHILDS LAKE @ CREEK MOUTH AT NE CORNER	2002-2003	1-8 x/year
MB05MDS038	CHILDS LAKE @ CREEK MOUTH AT SE CORNER	2002-2003	1-8 x/year
MB05MDS034	CHILDS LAKE MID BASIN AT NORTH END	2002	8 x/year
MB05MDS036	CHILDS LAKE MID BASIN AT SOUTH END	2002-2003	1-8 x/year
MB05MDS035	CHILDS LAKE MID BASIN IN NARROWS AT LAKE CENTRE	2002	8 x/year
MB05MDS033	CUPAR CREEK AT OUTLET TO SHELLMOUTH RESERVOIR	1992-1993	8-20 x/year
MB05MDS039	EAST BLUE LAKE, APPROX 200 M N OF MID BASIN	2003	8 x/year
MB05MDS017	EAST GOOSE LAKE	1992	1x/year
MB05MDS025	SHELL R @ ~ 0.5 KM U/S OF ROBLIN EFFLUENT DITCH - TCP CROSSING	2001	8 x/year
MB05MDS026	SHELL R @ ~ 50 M D/S OF ROBLIN EFFLUENT DITCH CONFLUENCE	2001	8 x/year

Station Number	Location	Period of Record	Sampling Frequency
MB05MDS024	SHELL R @ ~0.4 KM W OF ICE CREEK ROAD (SR1)	2001	8 x/year
MB05MDS006	SHELL RIVER AT 8PR #591, NORTH EAST OF ROBLIN	1973	2 x/year
MB05MDS004	SHELL RIVER AT PR #367, NORTH EAST OF SAN CLARA	1973	2 x/year
MB05MDS005	SHELL RIVER AT PR #483, NORTH WEST OF MERRIDALE	1973	2 x/year
MB05MDS002	SHELL RIVER AT PR #583, SOUTH OF ROBLIN	1973-1977	2-3 x/year
MB05MDS008	SHELL RIVER AT PR #589, SOUTH EAST OF ROBLIN	1973, 1980-1984	1-12 x/year
MB05MDS001	SHELL RIVER AT PR #594, SOUTH OF BOGGY CREEK (SR5)	1973-1977, 2001	1-8 x/year
MB05MDS013	SHELL RIVER AT PR 583 AT SHEVLIN	1980-1984	2-12 x/year
MB05MDS007	SHELL RIVER AT PTH #5, EAST OF ROBLIN	1973	2 x/year
MB05MDS003	SHELL RIVER AT PTH #83 (SR4)	1973-1984, 1992-1993, 2001, 2006 - present	3-12 x/year
MB05MDS010	SHELLMOUTH RESERVOIR ABOVE DAM LP1	1979-1980, 1992-1993	8-23 x/year
MB05MDS040	SHELLMOUTH RESERVOIR AT ASESSIPPI PARK DOCK	2003	3 x/year
MB05MDS019	SHELLMOUTH RESERVOIR LP1F OPPOSITE HOLLYWOOD BEACH	1992	1 x/year
MB05MDS028	SHELLMOUTH RESERVOIR LP2 @DROPMORE	1992-1993	8-24 x/year
MB05MDS029	SHELLMOUTH RESERVOIR LP3 @PYOTT'S LANDING	1992-1993	3-20 x/year
MB05MDS030	SHELLMOUTH RESERVOIR LP4 NORTH OF CUPAR CR	1992-1993	3-20 x/year
MB05MDS031	SHELLMOUTH RESERVOIR LP5 @MAN/SASK BORDER	1992-1993	3-20 x/year
MB05MDS011	SHELLMOUTH RESERVOIR SHELL RIVER MOUTH	1979-1980	15-16 x/year
MB05MDS012	SHELLMOUTH RESERVOIR SOUTH OF PTH 5	1979-80, 2001-2003	1-16 x/year
MB05MDS015	THUNDER CREEK AT PTH 482 XING	1997	1 x/year
MB05MDS021	WEST GOOSE LAKE	1992	1 x/year

Long-term Water Quality Monitoring Stations:

Prairie Provinces Water Board Monitoring Stations:
The Shell River Watershed straddles the Manitoba Saskatchewan Border. Water Quality conditions in the Assiniboine River entering Manitoba is monitored by the Prairie Provinces Water Board (PPWB, 2007). The PPWB is made up of one representative each from Alberta,

Saskatchewan and Manitoba, and two from the Federal Government. The Board is responsible for promoting continued cooperation and consultation among the three provinces and Canada on water matters. More information about the work of the Prairie Provinces Water Board can be found on their web site: http://www.mb.ec.gc.ca/water/fa01/fa01s01.en.html . The Board is currently reviewing the water quality objectives at the interprovincial boundary sites.

Trend Assessment:

In December 2001, a comprehensive technical report was completed that describes the findings from an assessment of trends over about the past 30 years for nitrogen and phosphorus concentrations at 46 water quality monitoring sites on 33 streams in Manitoba. In 2001, total phosphorus (TP) and total nitrogen (TN) from the long-term water quality station were analyzed for trends using a relatively complex statistical model (Jones and Armstrong 2001). The model identified trends in concentrations of TP and TN after accounting for variations due to river flow.

There was not sufficient data available from any sites within the Shell River Watershed to undertake this trend assessment. However two long term water quality stations, one upstream of the watershed on the Assiniboine River at Kamsack, SK and one downstream of the watershed on the Assiniboine River at Brandon have a long term record available. While sampling at Kamsack began in 1974 for total phosphorus (TP) at a frequency of one sample every 3 months, sampling at Brandon began in 1970 for total nitrogen (TN) and 1974 for TP. Unfortunately, the Environment Canada TN data for Kamsack is not reliable, and therefore only the phosphorus trends are available at this site. The phosphorus data collected from the Environment Canada station located at Kamsack, SK have been used to analyze the trend at the Manitoba – Saskatchewan border.

TP did not show a statistically significant increasing trends in concentration on the Assiniboine River at either Kamsack or Brandon ($p=0.0777$ and $p=0.2290$ respectively) from 1970 to 1999 (Figure 1 & 2). TN did show a statistically significant increasing trend in the Assiniboine River at Brandon ($p=0.0147$, Figure 3).

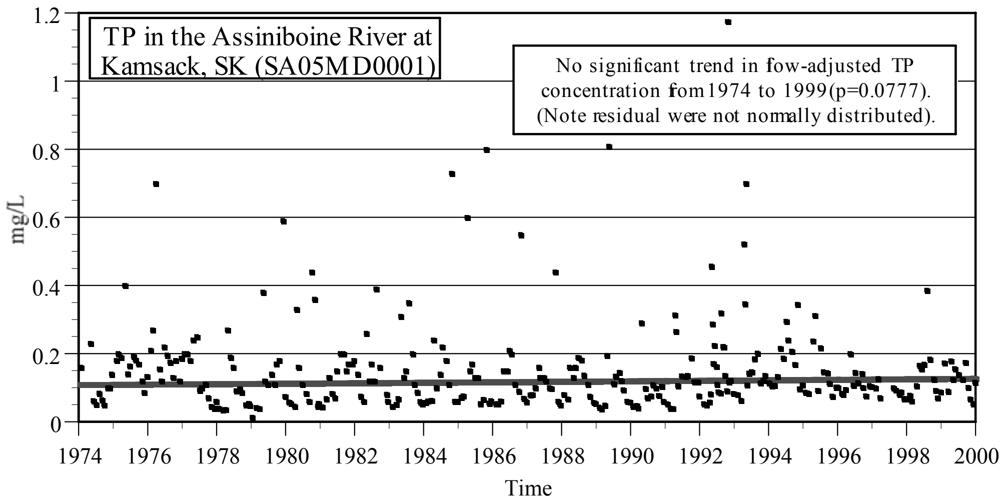


Figure 1: Total phosphorus (TP) in the Assiniboine River at Kamsack, SK. The % change in median concentration refers to the median concentration of flow adjusted trend line.

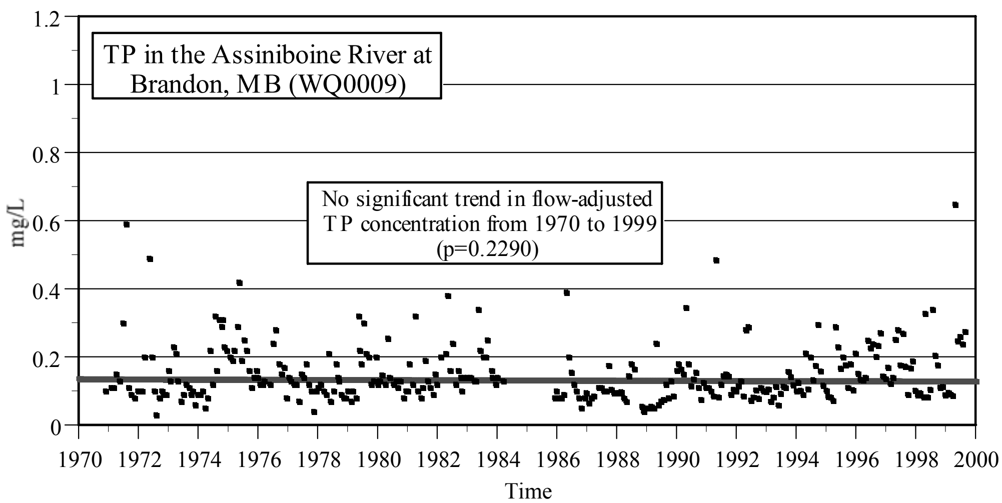


Figure 2: Total phosphorus (TP) in the Assiniboine River at Brandon. The % change in median concentration refers to the median concentration of flow adjusted trend line.

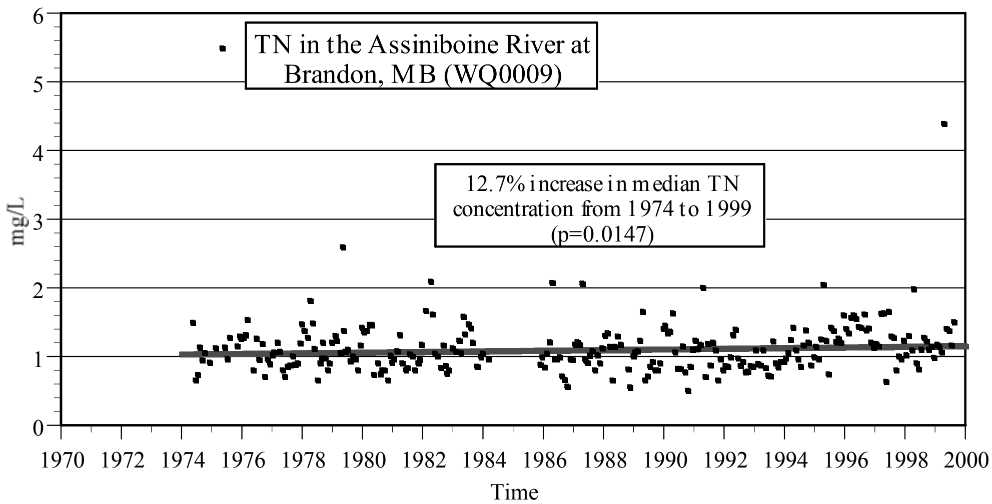


Figure 3: Total nitrogen (TN) in the Assiniboine River at Brandon. The % change in median concentration refers to the median concentration of flow adjusted trend line.

The trend of increasing TN at Brandon could be attributed to increased non-point source and point source loading from land-use practices such as agricultural activities and municipal wastewater discharges.

In 2006 a long-term monitoring station was established on the Shell River at PTH #83 (site: MB05MDS003). This site will be monitoring four times year. Over time, this station will provide information on trends in water quality conditions in the Shell River.

Water Quality Index:

Water quality at long-term water quality monitoring stations can be assessed with the Canadian Council of Ministers of the Environment (CCME) Water Quality Index (CCME 2000). The Water Quality Index is used to summarize large amounts of water quality data into simple terms (e.g., good) for reporting in a consistent manner. Up to twenty-five variables are included in the Water Quality Index (Table 2) and are compared with water quality objectives and guidelines contained in the Manitoba Water Quality Standards, Objectives, and Guidelines (Williamson 2002, Table 2).

Table 2: Water quality variables and objectives or guidelines (Williamson 2000, Williamson 1988) used to calculate Water Quality Index (CCME 2000).

Variables	Units	Objective Value	Objective Use
Fecal Coliform MF	Bacteria/100mL	200	Recreation
Ph	Ph Units	6.5-9.0	Aquatic Life Greenhouse
Specific Conductivity	uS/cm	1000	Irrigation
Total Suspended Solids	mg/L	25 (mid range)	Aquatic Life
Dissolved Oxygen	mg/L	5 (mid range)	Aquatic Life
Total or Extractable Cadmium*	mg/L	Calculation based on Hardness (7Q10)	Aquatic Life
Total or Extractable Copper*	mg/L	Calculation based on Hardness (7Q10)	Aquatic Life
Total Arsenic	mg/L	0.025	Drinking Water, Health
Total or Extractable Lead*	mg/L	Calculation based on Hardness (7Q10)	Aquatic Life
Dissolved Aluminium	mg/L	0.1 for pH >6.5	Aquatic Life
Total or Extractable Nickel*	mg/L	Calculation based on Hardness (7Q10)	Aquatic Life
Total or Extractable Zinc*	mg/L	Calculation based on Hardness (7Q10)	Aquatic Life
Total or Extractable Manganese	mg/L	0.05	Drinking Water, Aesthetic
Total or Extractable Iron	mg/L	0.3	Drinking Water, Aesthetic
Total Ammonia as N	mg/L	Calculation based pH	Aquatic Life
Soluble or Dissolved Nitrate-Nitrite	mg/L	10	Drinking Water, Health
Total Phosphorus	mg/L	0.05 in Rivers or 0.025 in Lakes	Nuisance Plant Growth
Dicamba	ug/L	0.006 where detectable	Irrigation
Bromoxynil	ug/L	0.33	Irrigation
Simazine	ug/L	0.5	Irrigation
2,4 D	ug/L	4	Aquatic Life
Lindane	ug/L	0.01	Aquatic Life
Atrazine	ug/L	1.8	Aquatic Life
MCPA	ug/L	0.025 where detectable	Irrigation
Trifluralin	ug/L	0.2	Aquatic Life

The Water Quality Index combines three different aspects of water quality: the 'scope,' which is the percentage of water quality variables with observations exceeding guidelines; the 'frequency,' which is the percentage of total observations exceeding guidelines; and the 'amplitude,' which is the amount by which observations exceed the guidelines. The basic premise of the Water Quality Index is that water quality is excellent when all guidelines or objectives set to protect water uses are met virtually all the time. When guidelines or objectives are not met, water quality becomes progressively poorer. Thus, the Index logically and mathematically incorporates information on water quality based on comparisons to guidelines or objectives to protect important water uses. The Water Quality Index ranges from 0 to 100 and is used to rank water quality in categories ranging from poor to excellent.

- **Excellent (95-100)** - Water quality never or very rarely exceeds guidelines
- **Good (80-94)** - Water quality rarely exceeds water quality guidelines
- **Fair (60-79)** - Water quality sometimes exceeds guidelines and possibly by a large margin
- **Marginal (45-59)** - Water quality often exceeds guidelines and/or by a considerable margin
- **Poor (0-44)** - Water quality usually exceeds guidelines and/or by a large margin

While water chemistry has been monitored at the long-term monitoring stations for several periods between 1973 and 2007, certain pesticides that are required to calculate the WQI were not monitored at most of these locations. There was sufficient data collected at the Shell River at Hwy 83 (Site: MB05MDS003) during 2006 and 2007 to calculate the water quality index at this site. The Water Quality Index was calculated as 91 for the Shell River at Hwy 83 suggesting that water quality is “good” and is protected with only a minor degree of threat or impairment; and that conditions rarely depart from natural or desirable levels.

Variables that exceeded the water quality objectives (Figure 2) at this site were manganese, iron, and phosphorus. Three of the four manganese samples exceeded the aesthetic objective set for drinking water, Manganese is strongly associated with iron in water and is also naturally found in water from weathering of minerals. High concentrations of manganese can impart an unpleasant taste, and as such, the water quality guideline for manganese is an aesthetic guideline. Exceedences can be mitigated through treatment of the water for drinking.

Three of the four iron samples were found to exceed the guideline of 0.03 mg/L. Iron is naturally released to surface waters through weathering of iron bearing minerals, but significant amounts are also released through industrial processes, corrosion of iron and steel, and discharges from mining operations. Iron concentrations in freshwater on the Canadian prairies can range as high as 14 mg/L. This, however, is rare. Levels of iron in water above 0.3 mg/L can lead to staining of laundry and plumbing fixtures, while higher concentrations can impart a metallic taste and yellow precipitate in the water. Other metals were all within the objectives set to protect aquatic life and drinking water supplies.

Finally, total phosphorus exceeded the narrative guideline of 0.05 mg/L in the Shell River in three of the four sampling periods. The province-wide narrative phosphorus guideline of 0.05 mg/L provides general guidance on phosphorus concentrations but will need to be replaced with more ecologically-relevant objectives. Phosphorus levels in the Shell River are relatively low compared to most other monitoring sites in southern Manitoba. These lower phosphorus levels would translate into lower densities of algae and other aquatic plants in the river. Other nutrients (ammonia and nitrate/nitrite nitrogen) were within guidelines for the entire period of record.

Pesticides concentrations at this site were all below objectives set for irrigation water and aquatic life protection. Dissolved oxygen and suspended solid concentrations were all within levels necessary to protect aquatic life in the Shell River.

Since routine water quality monitoring is now underway at this location on the Shell River, it will be possible to update the Water Quality Index values each year.

Short-term Studies Undertaken in the Shell River Watershed:

1. Shellmouth Reservoir Study:

A short-term study was undertaken on the Shellmouth Reservoir between April 1, 1991 and April 1, 1993 (Fortin, R and S. Gurney, 1998). The objectives of this study were:

1. To construct a mass balance phosphorus budget for the Shellmouth Reservoir.
2. To determine the trophic status of the Shellmouth Reservoir.
3. To develop oxygen and temperature profiles to evaluate the potential existence of anoxic conditions within the reservoir.
4. To establish a better understanding of the factors limiting algal biomass (phosphorus, nitrogen, light, or others).
5. To compare existing water quality with Manitoba Surface Water Quality Objectives to assess the ability of Shellmouth Reservoir to support current water uses.

The study concluded that the annual phosphorus load to the reservoir ranged from 88,700 to 127,700 kg during the study. Internal phosphorus loading (58 -61%) and tributary loading (26-28%) were found to be the main phosphorus sources. Phosphorus release from the sediments was estimated to be 8.2 and 22.0 mg/m2/day for the 1991-1992 and 1992-1993 period respectively. The relatively high phosphorus levels in the reservoir suggested the phosphorus was unlikely limiting algal production. More likely, a combination of factors such as light, zooplankton grazing, and nutrients are responsible for limiting algal production in Shellmouth

Reservoir. The reservoir was found to mostly eutrophic with periods of mesotrophic conditions present near the dam.

2. Assiniboine River Studies:

The Water Quality Management Section participated in a multi-stakeholder study of the Assiniboine River as it flows through Manitoba. A major part of this effort was focused towards the development of a water quality model for the Assiniboine River between Lake of the Prairies and the City of Brandon. The water quality model developed for this reach of the Assiniboine River can be linked to similar models being developed for other reaches of the Assiniboine River as well as for Lake Winnipeg.

In November 2002, a preliminary study report entitled *Assiniboine River Water Quality Study: Nitrogen and Phosphorus Dynamics May 2001 to May 2002* (Armstrong, 2002) was released and is available at: http://www.gov.mb.ca/waterstewardship/water_quality/quality/assiniboine_river_water_quality_report_2002_10.pdf . The report describes seasonal and longitudinal trends in nitrogen and phosphorus concentrations in the Assiniboine River between Lake of the Prairies and the City of Brandon.

In March 2005, the development of water quality models for the Assiniboine River between Lake of the Prairies and the City of Brandon was completed. A study report entitled *Assiniboine River Water Quality Study: Lake of the Prairies to the City of Brandon Water Quality Model* (Armstrong, 2005) is available as at: http://www.gov.mb.ca/waterstewardship/water_quality/quality/assiniboine_river_water_quality_modelling_report_2005_01.pdf . The report describes the development, calibration, and testing of four water quality models representing three open water seasons (spring, summer and fall), and one ice-covered season. Water quality models include nutrients (total nitrogen and phosphorus and associated inorganic and organic fractions), dissolved oxygen, chlorophyll a, total suspended solids, and conductivity. An assessment of water quality and nutrient loading in the Assiniboine River between Lake of the Prairies and the City of Brandon was also included in the study report. The resulting water quality models for the Assiniboine River can be used to predict water quality impacts that may occur as a result of climate changes, future development or river management.

3. Monitoring on the Assiniboine River and its smaller tributaries:

There are several monitoring stations along the Assiniboine River within the Shell River Watershed (Table 1). Within Manitoba, stations have been established at several locations along the length of the Shellmouth Reservoir and two tributaries entering the reservoir (i.e. Boggy Creek, Cupar Creek). Much of this data was collected during in 1992 – 1993 in conjunction with the Shellmouth Reservoir Study (Fortin and Gurney, 1998). Other data has been collected on the reservoir in 2001 –

2003. Due to the comparatively higher concentrations of nutrients and the containment of the water in a reservoir, significant densities of algal blooms are frequently observed in the reservoir in late summer and early fall. These conditions favour the growth of blue-green algae. Some species of blue-green algae produce potent nerve and liver toxins, which can be harmful to people, livestock, pets, wildlife and aquatic life.

Water quality data collected at the outlet of the reservoir (site: MB05MDS023) in 2001 – 2003 show a seasonal trend in phosphorus concentrations (Figure 4), with highest phosphorus levels appearing in late summer and early fall. These levels consistently exceed the phosphorus guideline of 0.05 mg/L. Oxygen concentrations at this site are generally good, and rarely are below the aquatic life objective of 5.0 mg/L.

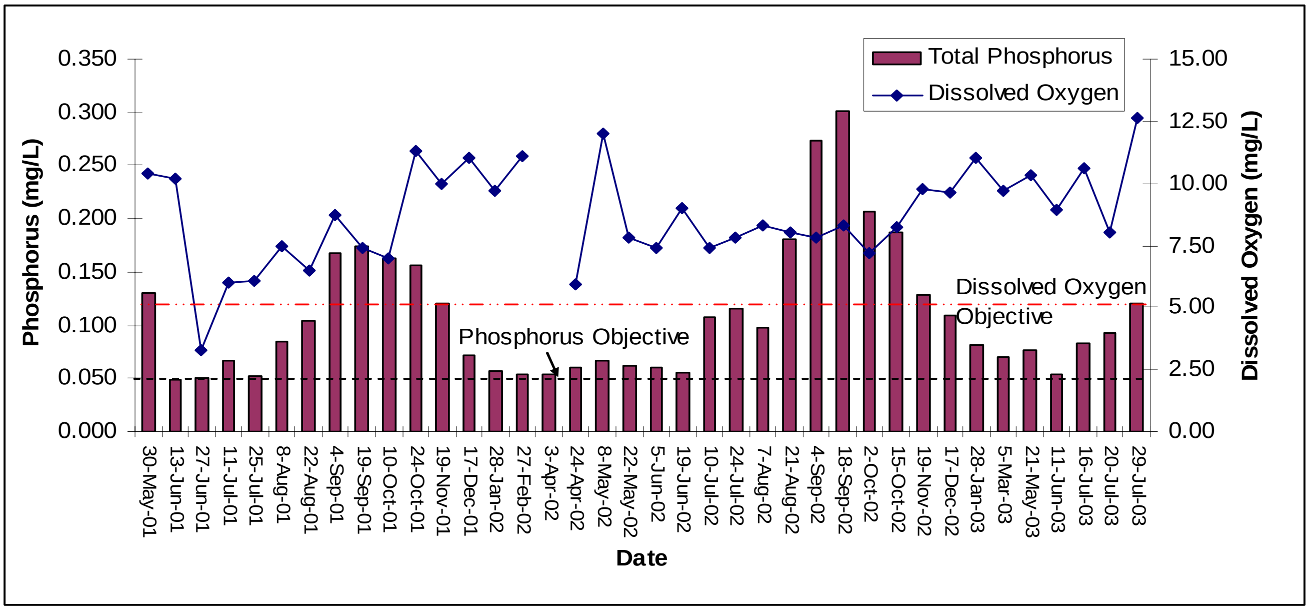


Figure 4: Concentrations of total phosphorus and dissolved oxygen downstream of the Shellmouth Reservoir in 2002 – 2003 (Site: MB05MDS023).

4. Lake Studies:

Within the Shell River watershed, short term water quality data collections have been conducted on Childs Lake, East Blue Lake, West Goose Lake and East Goose Lake.

Data from Childs Lake was collected in 2002-2003. Phosphorus levels were all found to be well below the phosphorus objective of 0.025 mg/L. The secchi depth clarity was very good with measurements ranged between 4.6 and 6.3 m.

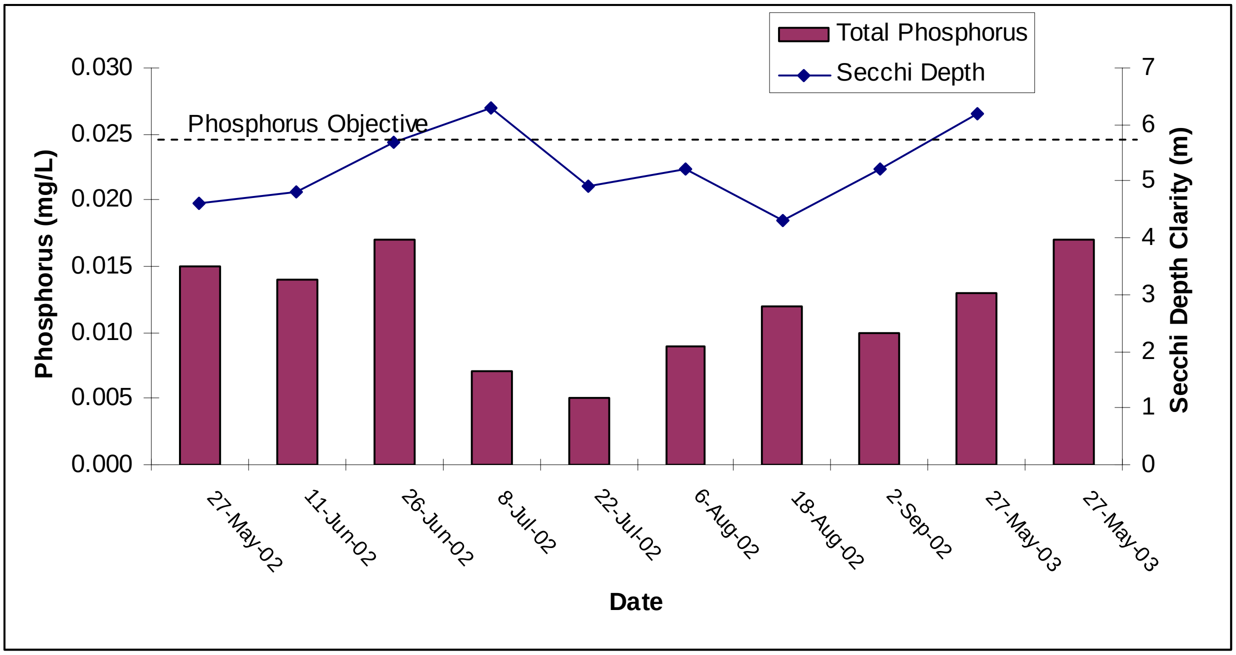
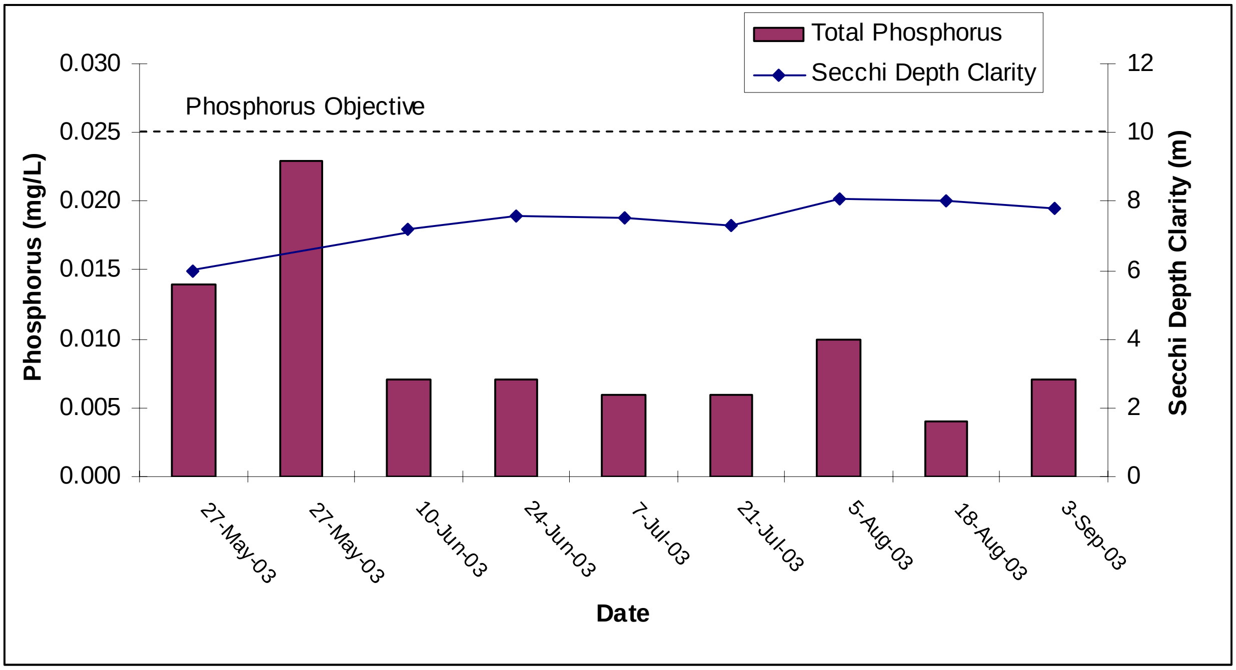


Figure 5: Total phosphorus and secchi depth clarity in water samples collected from the mid basin of Childs Lake in 2002 – 2003 (Site: MB05MDS035).

East Blue Lake was sampled in 2003. As was found in Childs Lake, phosphorus levels were all found to be well below the phosphorus objective of 0.025 mg/L. The secchi depth clarity was excellent with measurements ranged between 6.0 and 8.1 m. (Figure 6).



Nutrients

Nutrient enrichment or eutrophication is one of the most important water quality issues in Manitoba. Excessive levels of phosphorus and nitrogen fuel the production of algae and aquatic plants. Extensive algal blooms can cause changes to aquatic life habitat, reduce essential levels of oxygen, clog fisher's commercial nets, interfere with drinking water treatment facilities, and cause taste and odour problems in drinking water. In addition, some forms of blue-green algae can produce highly potent toxins.

Studies have shown that since the early 1970s, phosphorus loading has increased by about 10 per cent to Lake Winnipeg and nitrogen loading has increased by about 13 per cent (Bourne et. al. 2003). A similar phenomenon has also occurred in many other Manitoba streams, rivers, and lakes.

As part of Lake Winnipeg Action Plan, the Province of Manitoba is committed to reducing nutrient loading to Lake Winnipeg to those levels that existed prior to the 1970s. The Lake Winnipeg Action Plan recognizes that nutrients are contributed by many different activities occurring within the drainage basin, and that reductions will need to occur across all sectors. Reductions in nutrient loads across the Lake Winnipeg watershed will benefit not only Lake Winnipeg but also improve water quality in the many rivers and streams that are part of the watershed including waterbodies within the Shell River watershed.

The Lake Winnipeg Stewardship Board prepared their report and recommendations on how to reduce nutrient loading to Lake Winnipeg, in December 2006 (Lake Winnipeg

Stewardship Board, 2006). This report (see: www.lakewinnipeg.org) to the Minister of Water Stewardship, details 135 recommendations related to reducing nutrients to Lake Winnipeg and its watershed.

Reducing nutrient loading to the Shell River watershed, and to Lake Winnipeg, is a challenge that will require the participation and co-operation of all Manitobans and efforts will involve:

- Implementing controls on nutrients in municipal and industrial wastewater treatment facilities.
- Developing scientifically-based measures to regulate the appropriate application of inorganic fertilizers, animal manure, and municipal sludge to agricultural lands.
- Reducing nutrient contributions from individual cottagers and homeowners.
- Working with upstream jurisdictions to reduce nutrients levels crossing into Manitoba.

Individual Manitobans can help by taking the following steps:

- Maintain a natural, riparian buffer along waterways. Natural vegetation slows erosion and helps reduce the amount of nitrogen and phosphorus entering lakes, rivers and streams.
- Value and maintain wetlands. Similar to riparian buffers along waterways, wetlands slow erosion and help reduce nutrient inputs to lakes, rivers, and streams. Wetlands also provide flood protection by trapping and slowly releasing excess water while providing valuable habitat for animals and plants.
- Don't use fertilizer close to waterways. Heavy rains or over-watering your lawn can wash nutrients off the land and into the water.
- Use phosphate-free soaps and detergents. Phosphates have been regulated in laundry detergents but many common household cleaners including dishwasher detergent, soaps, and other cleaning supplies still contain large amounts of phosphorus. Look for phosphate-free products when you are shopping.
- Ensure that your septic system is operating properly and is serviced on a regular basis. It's important that your septic system is pumped out regularly and that your disposal field is checked on a regular basis to ensure that it is not leaking or showing signs of saturation.

Macroinvertebrates

Another indicator of water quality is the density, abundance and diversity of macroinvertebrates. Good water quality is indicated by high taxa richness. Taxa richness is defined as the number of taxa observed at a density of at least one per sample and is considered to be low with a score of 1-4, moderate, 5-24, and high 25+ (Hughes, 2007). There has not been any macroinvertebrate monitoring conducted in the Shell River Watershed.

Nutrient Management Regulation

Manitoba is proposing a Nutrient Management Regulation under *The Water Protection Act*. The purpose of the proposed regulation is to protect water quality by encouraging responsible nutrient planning, regulating the application of materials containing nutrients and restricting the development of certain types of facilities in environmentally sensitive areas. When nitrogen and phosphorus are applied to land surfaces in greater amounts than can be used by growing plants, excess nutrients can leach into ground water or run-off into surface water with heavy rainfall, floods, and melting snow.

Manitoba's landscape has been separated into five zones. Zones N1, N2, and N3 consist of land that ranges in agricultural productivity while Zone N4 is generally unproductive land that represents a significant risk of nutrient loss to surface and groundwater. Zone N4 land consists of Canada Land Inventory soil classification 6 or 7 or unimproved organics. Zone N5 consists of urban and rural residential areas.

The proposed regulation also describes a Nutrient Buffer Zone with widths outlined below:

Water Body	A (1)	B (1)
o a lake or reservoir designated as vulnerable	30 m	35 m
o a lake or reservoir (not including a constructed stormwater retention pond) not designated as vulnerable o a river, creek or stream designated as vulnerable	15 m	20 m
o a river, creek or stream not designated as vulnerable o an order 3, 4, 5, or 6 drain or higher o a major wetland, bog, swamp or marsh o a constructed stormwater retention pond	3 m	8 m

(1) Use column A if the applicable area is covered in permanent vegetation. Otherwise, use column B.

Under the proposed regulation, no nitrogen or phosphorus can be applied within Zone N4 or the Nutrient Buffer Zone.

More information on the proposed *Nutrient Management Regulation* is available at http://www.gov.mb.ca/waterstewardship/wqmz/index.html.

Drainage

Although it is recognized that drainage in Manitoba is necessary to support sustainable agriculture, it is also recognized that drainage works can impact water quality and fish habitat. Types of drainage include the placement of new culverts or larger culverts to move more water, the construction of new drainage channels to drain low lying areas, the draining of potholes or sloughs to increase land availability for cultivation and the installation of tile drainage. Artificial drainage can sometimes result in increased nutrient (nitrogen and phosphorus), sediment and pesticide load to receiving drains, creeks and rivers. All types of drainage should be constructed so that there is no net increase in nutrients (nitrogen and phosphorus) to waterways. To ensure that drainage maintenance, construction, and re-construction occurs in an environmentally friendly manner, the following best available technologies, and best management practices aimed at reducing impacts to water quality and fish habitat are recommended.

The following recommendations are being made to all drainage works proposals during the approval process under *The Water Rights Act*:

- There must be no net increase in nutrients (nitrogen and phosphorus) to waterways as a result of drainage activities. Placement of culverts, artificial drainage and construction and operation of tile drains can sometimes result in increased nutrient (nitrogen and phosphorus), sediment and pesticide loads to receiving drains, creeks and rivers.
- Synthetic fertilizer, animal manure, and municipal wastewater sludge must not be applied within drains.

Culverts

- Removal of vegetation and soil should be kept to a minimum during the construction and the placement of culverts.
- Erosion control methodologies should be used on both sides of culverts according to the Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat.
- A strip of vegetation 1 to 3 metres wide should be maintained along drainage channels as a buffer. This will reduce erosion of channels and aid in nutrient removal.
- The proponent should revegetate exposed areas along drainage channels.

Surface Drainage

- Surface drainage should be constructed as shallow depressions and removal of vegetation and soil should be minimized during construction.
- Based on Canada Land Inventory Soil Capability Classification for Agriculture (1965), Class 6 and 7 soils should not be drained.
- There should be no net loss of semi-permanent or permanent sloughs, wetlands, potholes or other similar bodies of water in the sub-watershed within which drainage is occurring.
- Erosion control methodologies outlined in Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat should be used where the surface drain intersects with another water body.
- A strip of vegetation 1 to 3 metres wide should be maintained along surface drainage channels as buffers. These will reduce erosion of channels and aid in nutrient removal.

- The proponent should revegetate exposed areas along banks of surface drainage channels.

Tile Drainage

- Discharge from tile drainage should enter a holding pond or wetland prior to discharging into a drain, creek or river.

Manitoba Water Stewardship is working towards the development of an environmentally friendly drainage manual that will provide additional guidance regarding best management practices for drainage in Manitoba.

Contact Information

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And visit the Department's web site: http://www.gov.mb.ca/waterstewardship

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