PRAIRIE PROVINCES WATER BOARD

2014 ANNUAL REPORT

CANADA · ALBERTA · SASKATCHEWAN · MANITOBA

PRAIRIE PROVINCES WATER BOARD

ANNUAL REPORT

FOR THE FISCAL YEAR

APRIL 1, 2014 TO MARCH 31, 2015

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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LETTER OF TRANSMITTAL

December 14, 2015

Honourable Catherine McKenna
Minister of the Environment and
Climate Change
Ottawa, Ontario

Honourable Shannon Phillips
Minister of Alberta Environment and Parks
Edmonton, Alberta

Honourable Lawrence MacAulay
Minister of Agriculture & Agri-Food
Ottawa, Ontario

Honourable Thomas Nevakshonoff
Minister of Manitoba Conservation
and Water Stewardship
Winnipeg, Manitoba

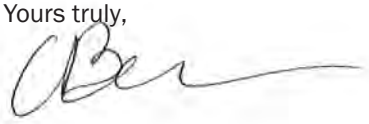
Honourable Herb Cox
Minister Responsible for the
Saskatchewan Water Security Agency
Regina, Saskatchewan

Honourable Steve Ashton
Minister of Manitoba Infrastructure and Transportation
Winnipeg, Manitoba

Honourable Ministers:

On behalf of the members of the Prairie Provinces Water Board, it is my pleasure to submit herewith the Annual Report of the Prairie Provinces Water Board for the fiscal year from April 1, 2014 to March 31, 2015.

Yours truly,



Cheryl Baraniecki
Chair
Prairie Provinces Water Board

MESSAGE FROM THE CHAIR

The Prairie Provinces Water Board (PPWB) continues to be a vital institution of governance in the prairies that facilitates sound and collaborative management of shared water resources.

In 2014 - 2015, the PPWB continued to be guided by its Strategic Plan, approved in 2006, and revised in 2012. This Strategic Plan ensures the PPWB delivers on its mandate to monitor whether the commitments made in the *Master Agreement on Apportionment (MAA)* have been met by the Signatory Parties.

Further to its core mandate, the PPWB continued to track and respond to other important influences. In response to a growing interest in climate variability, climate change and water resources, the PPWB determined that the formation of a standing "Committee on Flow Forecasting" would help to improve collaboration, coordination and communications between jurisdictions on flow forecasting. Work on nutrient investigations continues to be a priority and an investigation on quantifying non-point and point nutrient sources in two watersheds has begun. The PPWB continues its discussion on the development of an Agreement on Transboundary Aquifers to be proposed for addition to the *MAA*. Finally, the PPWB continues to provide a cooperative forum for discussion of transboundary water issues including the growing risk of invasive species in Prairie watersheds.

I wish to thank Richard Smith for his representation as the PPWB Chair in his role as the Environment Canada Member while I was away on parental leave in 2014-2015.

Brian Yee has been acting as the Board Member for Alberta since January 2014 and in July 2014 was officially appointed in that role. In August 2014, Carmen de la Chevrotière, was appointed as the Alternate Board Member for Alberta. I welcome them to the Board and look forward to working with them.

The success of the PPWB is dependent on the work of the Secretariat and the three standing committees, including the Committee on Hydrology (COH), the Committee on Water Quality (COWQ), and the Committee on Groundwater (COG). Dedication and engagement by board members, jurisdictional representatives on committees, and the Secretariat are essential, and much appreciated.

Cheryl Baraniecki
Chair

MESSAGE FROM THE EXECUTIVE DIRECTOR

During 2014 - 2015, the work of the PPWB Secretariat and three standing committees focused on achieving the goals outlined in the PPWB Strategic Plan and activities listed in the 2012 - 2017 Work Plan.

During 2014, agreed transboundary apportionment of flows on all eastward flowing streams was achieved for all river reaches. Adherence to the *MAA*'s water quality objectives was good.

The COH continued work on its modernization of computational infrastructure that is used to calculate apportionable flows. In November 2014, the COH received the final version of the customised apportionable flow calculation software called the River Basin Assessment Tool (RBAT). The goal is to utilize the software to calculate apportionable flow for certain basins in 2015.

Evaporation estimates are an important part of apportionment calculation. In 2014, the COH continued to investigate a variety of methods of estimating evaporation in order to improve these estimates. Other work included publication of a report titled “Evaluation of Lake Evaporation in the North Saskatchewan River Basin” as a PPWB technical report, in February 2015.

The Committee on Groundwater (COG) prepared a draft Agreement on Transboundary Aquifers to be added as Schedule F to the *MAA*. A legal review of the proposed agreement by all jurisdictions is underway.

The transboundary water quality objectives (WQOs) are descriptions of water quality conditions that are known to protect specific water uses and are acceptable to upstream and downstream provinces. In October 2012, the comprehensive review of the PPWB WQOs was completed. In 2014 each jurisdiction completed an extensive policy and management review of the recommended changes to the WQOs. The next step is to recommend approval to the PPWB Ministers.

The Committee on Water Quality (COWQ) has identified that nutrient pollution is a priority and it will be undertaking a review of non-point and point sources of nutrient pollution on transboundary river reaches. The first to undergo an assessment will be the Carrot River (Saskatchewan-Manitoba border) and the Red Deer River (Alberta-Saskatchewan border). The review will be conducted by contracting an external service provider. The work is scheduled to commence in 2015.

In continuing its focus on nutrients, the COWQ is planning a 2 day technical Prairie Water Quality workshop focussing on nutrients and emerging water quality issues in prairie water management. The workshop will be held in Saskatchewan and is proposed for the fall of 2016.

The Board continued its role in helping to ensure coordination of water management and planning that may have transboundary implications. The Board continued to provide a forum for sharing information, including progress on actions to address Saskatchewan - Manitoba drainage issues, and the impacts of sediment transport from the Carrot River on the Saskatchewan River.

Mike Renouf
Executive Director

SUMMARY OF PERFORMANCE RESULTS

During 2014 - 2015, apportionment responsibilities of the Board were met through the following activities:

- Reviewing and approving the apportionment monitoring network comprised of hydrometric and meteorological stations;
- Confirming apportionment obligations were met on Cold Lake, North Saskatchewan River, South Saskatchewan River below the Red Deer River, Battle Creek, Lodge Creek, Middle Creek, Churchill River, Saskatchewan River, Red Deer River (Saskatchewan), Qu'Appelle River, Assiniboine River, and Pipestone Creek;
- Continuing work on the process of reviewing apportionment methods in all basins. Work on the North Saskatchewan River and Cold Lake basin reviews are nearly complete and are expected to be finalized in 2015; and,
- Continuing with initiatives to further study evaporation estimation methods.

In 2014, water quality objectives were adhered to an average of 95% of 2,864 samples on the 11 *Master Agreement on Apportionment (MAA)* river reaches.

- The Committee on Water Quality (COWQ) began the work of quantifying non-point and point nutrient sources in two river basins, the Carrot River (Saskatchewan - Manitoba border) and the Red Deer River (Alberta - Saskatchewan border).
- The COWQ continued with its work on nutrients and begun organizing a Prairie Water Quality Workshop focussing specifically on nutrients and emerging water quality issues in prairie water management. The workshop is expected to be delivered in 2016.
- The COWQ continued to investigate exceedances of water quality objectives at the transboundary reaches using pesticides as a case study to follow through an “Excursion Response Flow Chart”.
- The 2015 water quality monitoring program was reviewed and approved by the Board in October 2014.

During the 2014 - 2015 fiscal year the Committee on Groundwater (COG) prepared a draft Agreement on Transboundary Aquifers to be added as Schedule F to the *MAA*. A legal review of the draft agreement by all jurisdictions has begun and is expected to be completed in the next fiscal year. The proposed agreement will provide a cooperative framework for managing transboundary aquifers using a Risk Informed Management approach.

In accordance with the PPWB Event Contingency Plan, the Board members were informed of three unusual water quality events in 2014 - 2015: two cautionary notifications were received in June 2014 from Saskatchewan’s Water Security Agency. The first was related to a sewage release into Wascana Creek and had no transboundary impacts, and the second was related to raw sewage entering the South Saskatchewan River as a result of a break in an intake main in the City of Medicine Hat, Alberta. In August 2014, Board Members were informed of a third unusual water quality condition found in the Red Deer River upstream of Drumheller, Alberta. There were high concentrations of a number of metals. Sampling was conducted and by October 2014, concentrations returned to normal.

During the year, the PPWB discussed the following transboundary issues:

- Water quality in Lake Winnipeg;
- Downstream impacts of drainage in Saskatchewan upon Manitoba;
- Manitoba's concerns related to sediment transport in the Carrot River; and
- The formation of a new standing Committee on Flow Forecasting.

The PPWB member governments were informed about PPWB activities through:

- Board and Committee Minutes, Quarterly and Annual Reports, brochures/fact sheets, technical reports, and the PPWB website.

Internal communication was enhanced through regular meetings between Board members and their respective Committee members.

1. INTRODUCTION

This report summarizes the activities of the Prairie Provinces Water Board (PPWB), its Secretariat, and three standing committees that supported PPWB activities for the period April 1, 2014 to March 31, 2015.

The PPWB administers the *Master Agreement on Apportionment (MAA),* signed on October 30, 1969 by Canada and the Provinces of Alberta, Saskatchewan, and Manitoba.

The *MAA* provides for an equitable sharing of available waters for all eastward flowing streams that cross interprovincial boundaries, including transboundary lakes. It also serves to protect transboundary aquifers and surface water quality. Schedules to the *MAA* describe the role of the Board, stipulate how the water shall be apportioned, and set water quality objectives for the water passing from Alberta to Saskatchewan and from Saskatchewan to Manitoba.

The Board consists of three provincial members, representing the Provinces of Alberta, Saskatchewan, and Manitoba and two federal members, representing Environment Canada and Agriculture and Agri-Food Canada.

PPWB activities are jointly funded by the provinces and the federal government, with the provinces each contributing one-sixth and the federal government contributing one-half to the annual budget. The *MAA* assigns the responsibility to monitor water quantity and quality in support of the Agreement to the federal government. Environment Canada conducts this monitoring on behalf of the Government of Canada. The Board approves the annual budget and costed work plan. Section 2 of this Annual Report presents the performance results for each of the Goals in the Strategic Plan and 2014 - 2015 activities in the Work Plan. Included in this section is Goal 8, which provides a summary of the administration activities and financial expenditures for the year 2014 - 2015.

Appendices provide detailed information on the PPWB. Appendix I illustrates where monitoring is conducted to assess whether jurisdictions have met their requirements in the *MAA*. Appendix II presents 2014 apportionable flow data. Appendices III and IV present the water quality parameters that were monitored by Environment Canada and the 2014 Report on Excursions to Interprovincial Water Quality Objectives. Appendix V provides the organization chart and Appendix VI lists agency representatives on the board and committees. Appendix VII provides the Financial Expenditure Statement. Finally, Appendix VIII describes the history of the PPWB.

2. PERFORMANCE RESULTS

Update

All activities in the 2012 - 2017 PPWB work plans target achieving the eight goals in the PPWB's Strategic Plan. Progress made in 2014 - 2015 is discussed below for each of these goals.

GOAL 1: Agreed Transboundary Apportionment of Water Is Achieved

The PPWB's Strategic Goal 1 is to achieve transboundary apportionment of water as agreed to in the 1969 *MAA*'s Schedule A and Schedule B.

Apportionment Monitoring of Rivers

The *MAA* states that all eastward flowing streams are subject to apportionment. In 2014, the Board conducted apportionment monitoring of Cold Lake, North Saskatchewan River, South Saskatchewan River below the Red Deer River confluence, Battle Creek, Lodge Creek, and Middle Creek on the Alberta - Saskatchewan border; and Churchill River, Saskatchewan River, Red Deer River, Qu'Appelle River, Assiniboine River, and Pipestone Creek on the Saskatchewan - Manitoba border.

Water Quantity Monitoring

The PPWB is required to assess and report on whether apportionment requirements were met. Environment Canada conducts the water quantity monitoring in accordance with the terms of the *MAA*. In 2014 - 2015, the PPWB Secretariat calculated apportionable flows using monitoring data from 91 hydrometric stations, 20 meteorological stations and other meteorological and water use data (see Appendix I).

In October 2014, the Board reviewed and approved the monitoring stations lists for 2015 - 2016.

There are no changes in the monitoring stations lists from the previous year.

Flows Reported in 2014

Quarterly flow reporting was completed for four basins in 2014. Quarterly reports presented interim recorded and apportionable flows for the South Saskatchewan River, Middle Creek and Lodge Creek for the entire year and from January to June for Cold Lake.

Appendix II presents the monthly and total final apportionment results. All apportionment requirements were met in the 2014 calendar year. For all apportioned rivers and creeks recorded flows were higher than the amounts that Alberta was obligated to deliver to Saskatchewan. The combined daily recorded flows for the South Saskatchewan and Red Deer Rivers at the Alberta - Saskatchewan border exceeded the minimum flow requirement of 42.5 m^3 / sec (1,500 cfs) at all times in 2014.

Saskatchewan also delivered higher recorded flows on all rivers and creeks than the amounts they were obliged to deliver to Manitoba.

Figures 1 and 2 show the flow amounts for the entire record of apportionment data. The black bars show the amount of apportionable flows that were required to be delivered by Alberta to Saskatchewan (Figure 1) and by Saskatchewan to Manitoba (Figure 2). The blue bars show the flow surplus amounts that were delivered in excess of required flows. The red bars indicate amounts of required flows that were not delivered (deficits).

Note: In the PPWB 2013 Annual Report, historic flows for the Churchhill River were incorrect for the year 2013. This error has been fixed.

Figure 1. Historic River Flows on the Alberta - Saskatchewan Border

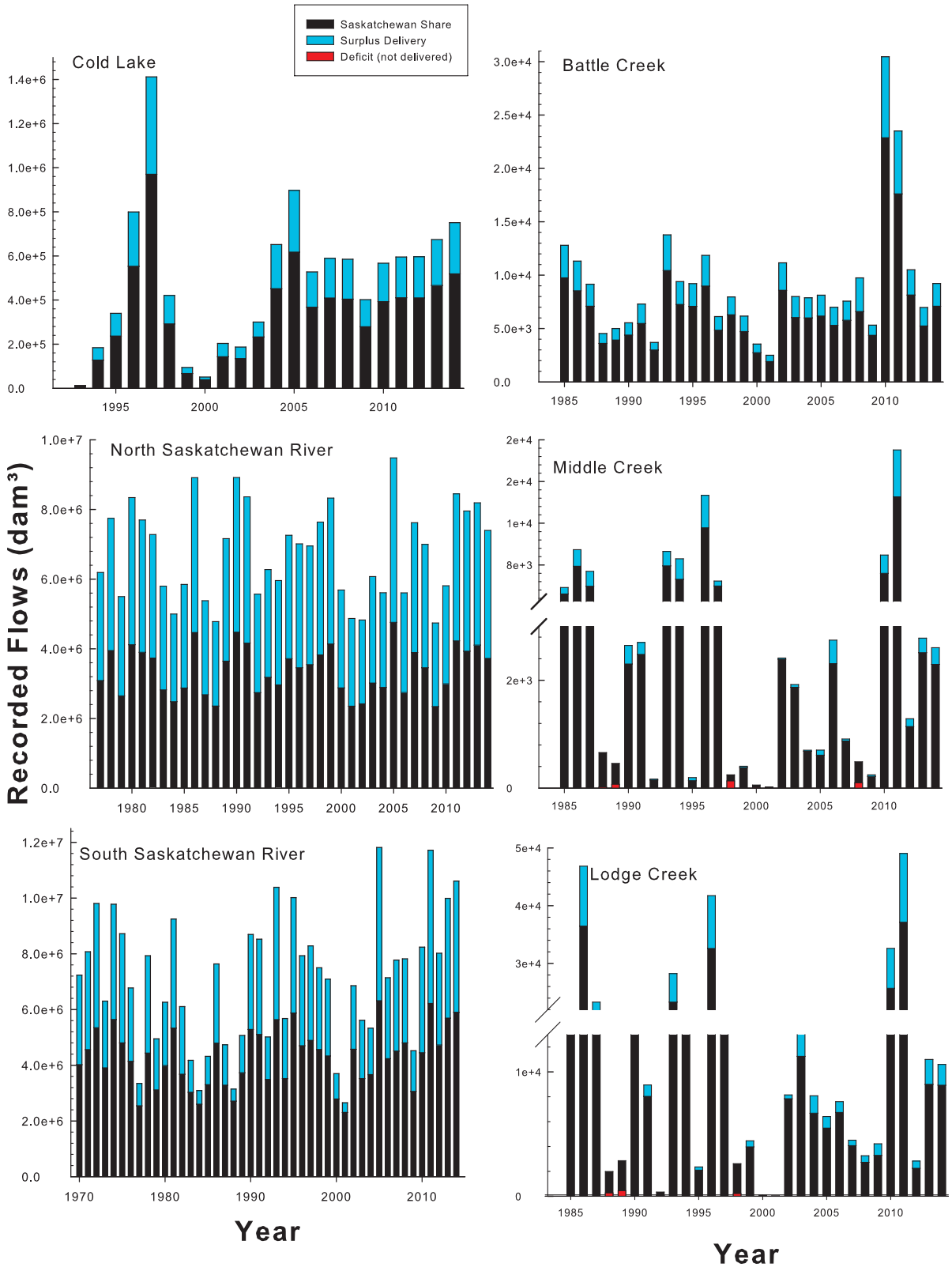
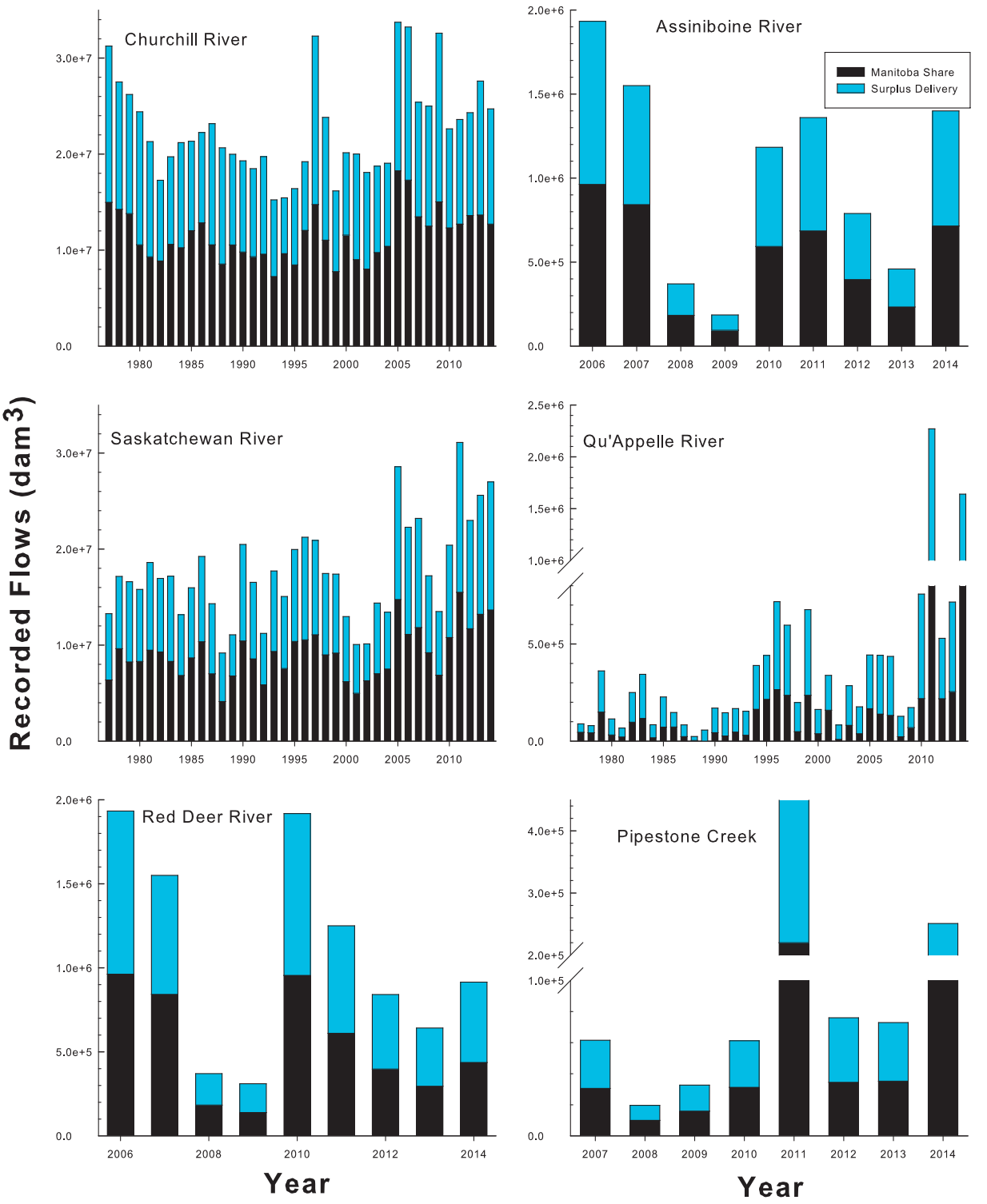


Figure 2. Historic River Flows on the Saskatchewan - Manitoba Border



For rivers with surplus flows, the combined black (provincial share) and blue (surplus) stacked bars show the total recorded flows. The red bars indicate deficits. For rivers showing a deficit, the required provincial share is the combined height of the black and red bars.

Figures 1 and 2 illustrate that the vast majority of delivery requirements were met throughout the entire period of apportionment monitoring. Large surpluses are fairly common for many of the rivers. Annual flow volumes vary considerably over the years. Because flows vary so much, scientific notation[1] is used on the y-axis to show the magnitude of differences of flows across rivers.

Only two streams have experienced deficits throughout the recorded history: Middle and Lodge Creeks. For Middle Creek, five minor deficits were found in 1988, 1989, 1998, 2000 and 2008. Deficits were, however, so small in 1988 and 2000 that they cannot be seen on Figure 1. For Lodge Creek, five minor deficits were found in 1988, 1989, 1992, 1998 and 2000. Deficits were too small to be seen on Figure 1 in 1992 and 2000. Alberta and Saskatchewan worked cooperatively to address these deficits as they occurred. As these creeks are also part of the international agreement between Canada and the United States, Alberta must pass 75% of the flow to Saskatchewan and then Saskatchewan must pass 50% to Montana. This means that any early season use within Alberta puts Alberta at a risk of deficit if the remainder of the year is dry. Alberta and Saskatchewan work cooperatively to address these deficits as they occur and continue to evaluate long-term solutions.

Improving Apportionment Methods

The Committee on Hydrology (COH) continued to be engaged in a review of apportionment methods and associated documentation to ensure apportionment monitoring and calculations are accurate.

The work to examine the apportionable flow calculation methods for the 12 interprovincial basins which PPWB actively apportions is expected to take approximately 10 years.

The North Saskatchewan River basin is the first basin to undergo this review and it is being conducted in-house by the PPWB Secretariat. The project is currently in its final stages and is expected to be tabled for approval by the committee and by the Board in 2015.

In March 2013, the Board indicated its support for contracting external service providers to complete basin reviews, thereby enabling the COH to meet its target review schedule. A generic Statement of Work for basin review contracts was prepared by the Secretariat and approved by the COH. This Statement of Work will form the basis for basin review contracting documents, with only slight modifications required to tailor the assignment requirements for each basin.

The first contract was issued to R. Halliday and Associates Ltd, in October 2014, for the review of the apportionment procedures for Cold River at the Alberta - Saskatchewan boundary. The first draft of the Cold Lake Basin Review report was provided to the COH in January 2015. The committee is currently reviewing the deliverables and the contract is expected to be complete in Fall 2015.

The next basin to undergo an apportionment procedure review will be the Saskatchewan River Basin at the Saskatchewan - Manitoba boundary. The process for the Saskatchewan River Basin review will be similar to that of the Cold River Basin review as the study is proposed to be completed by a consultant.

[1] The number following the e in the Scientific Notation shows how many zeros should be placed before the decimal place.

Modernizing Apportionment Software

The PPWB Secretariat currently uses a suite of FORTRAN programs to compute transboundary apportionable flows. The COH is modernizing this practice through the creation of a customized apportionable flow calculation platform called the River Basin Assessment Tool (RBAT).

Phase I of RBAT was delivered in 2010 and phase II began in December 2012 to enhance certain features of the product such as visual display, ease of use, installation processes, and functionality before the program could be put into use by the PPWB.

In May 2014, the consultant, Optimal Solutions Ltd., provided the COH with a complete version of the software and the PPWB Secretariat began testing the product. On September 30 and October 1, 2014, at the Environment Canada office in Regina, Optimal Solutions Ltd. delivered a training session on the enhanced software for PPWB member agencies. The session provided hands-on training on how to use the software and set up a project.

The PPWB Secretariat received the final version of RBAT in November 2014 which ended the active work by Optimal Solutions Ltd. A warranty and help desk portion of the contract continues for a 2 year period which will end in November 2016.

The PPWB Secretariat continued to work on the RBAT implementation with the goal of utilizing the software to calculate apportionable flow for certain basins in 2015.

Evaporation Investigations

Evaporation estimates are an important part of apportionment calculations used to ensure equitable distribution of water between Alberta, Saskatchewan and Manitoba. The COH has a number of initiatives underway to further study evaporation estimation methods.

In 2013 - 2014, the PPWB supported COH's proposal for the purchase of a Net-Radiometer to be installed at the Lodge Creek AGCM Station. Lodge Creek AGCM is a new station operated by Alberta, and is well located to provide representative data for the upper Lodge and Middle Creek reservoirs. The Net-Radiometer became operational in June 2014. The data that is collected will be used to improve evaporation estimates for reservoirs located in this area which will in turn improve the accuracy of the interprovincial apportionment calculations for these basins.

The COH has an ongoing interest in improving the lake evaporation estimation methods used in the interprovincial apportionable flow calculations. In 2014, the COH agreed to form a discussion group to look at various options to conduct further studies. The discussion group will consist of representative members from each of the jurisdictions as well as the PPWB Secretariat and Meteorological Service of Canada (MSC).

In February 2015, the PPWB approved the "Evaluation of Lake Evaporation in the North Saskatchewan River Basin" Report No. 171 at its Meeting No. 113. This report was prepared for the PPWB - COH by the MSC. The intent of this study was to develop a generic approach for the COH to evaluate lake evaporation by comparing a variety of methods of calculating evaporation from open water, and to estimate the precipitation-evaporation balance over Lake Abraham and Brazeau Reservoir in the North Saskatchewan River basin.

GOAL 2: Transboundary Groundwater Aquifers Are Protected and Used in a Sustainable Manner

The PPWB's Strategic Goal 2 protects groundwater quantity and quality and sustainable use of transboundary aquifers.

The *MAA* currently has a general statement to refer any transboundary groundwater issues to the Board for their review and recommendation. No issues or concerns were identified in 2014 - 2015.

Groundwater Schedule

In October 2007, the Board directed the Committee on Groundwater (COG) to focus on the development of a possible groundwater schedule to the *MAA*. The COG developed a number of potential concepts and principles which were incorporated into an Impact Analysis Statement report. This report also analyzed groundwater uses and stressors, existing groundwater agreements and rationale for the need for a groundwater agreement.

In 2014, the COG prepared a draft "Agreement on Transboundary Aquifers" to be added as Schedule F to the *MAA*. The objectives of the Agreement are to:

- establish a cooperative framework to effectively and efficiently manage transboundary aquifers;
- establish a cooperative framework to ensure the sustainable and equitable use of transboundary aquifers; and
- protect and preserve transboundary aquifers and associated aquatic environments.

A Risk Informed Management (RIM) approach will be used to cooperatively manage transboundary aquifers. The RIM is intended to be an Annex to Schedule F.

The PPWB has concluded an initial legal review of the proposed Agreement with the support of the Department of Justice and Manitoba Justice. An internal legal review by all jurisdictions began in March 2015 and is expected to be completed in 2015.

Environmental Scan of Transboundary Aquifers

The last environmental scan was conducted in 2011 and focussed exclusively on aquifers which are potential sources of potable water. The PPWB, at their Meeting No. 111 held in November 2014, directed the COG to conduct an updated environmental scan of transboundary aquifers. The COG is working toward developing an evaluation criteria and an improved risk analysis process for assessing transboundary aquifers that will support the RIM approach. An updated and comprehensive risk assessment will be required after the proposed Agreement on Transboundary Aquifers is implemented.

Reporting of Transboundary Withdrawals

Provincial COG members have contacted their respective water rights offices to inform them of the need to report groundwater projects with significant withdrawals to the neighbouring province. No transboundary groundwater withdrawal projects were brought to the attention of the PPWB in 2014.

GOAL 3: Agreed Transboundary *MAA* Water Quality Objectives Are Achieved

The PPWB's Strategic Goal 3 is to achieve agreed transboundary water quality objectives that are included in Schedule E of the *MAA* for a number of key watercourses at the Alberta - Saskatchewan and Saskatchewan - Manitoba borders.

Water Quality Monitoring

The *MAA*'s water quality monitoring locations are shown in Appendix I. The *MAA*'s water quality monitoring parameters are shown in Appendix III.

Several changes to the monitoring program were implemented in 2012 to address proposed changes to the water quality objectives. The proposed changes to the water quality objectives include the addition of seasonal nutrient objectives for each of the 12 transboundary rivers and the inclusion of new water quality objectives on Cold River.

A rotational strategy for the sampling of pesticides was developed and implemented in 2006. Sampling of pesticides was switched to rotational sampling at sites with a long data record and where most data points were below detection. Two or three of these sites are sampled each year providing a 5 year return frequency for most PPWB stations. The Carrot and Assiniboine rivers are sampled every year because they are agricultural watersheds and pesticide detections occur frequently.

In 2014, in accordance with the terms of the *MAA,* Environment Canada conducted water quality monitoring at 11 sites as requested by the PPWB. In addition, water quality sampling was conducted on Cold River, although this site does not have objectives under the 1992 agreement. Site specific objectives for Cold river were developed as part of the interprovincial water quality objectives review.

Changes to the 2014 monitoring program from the previous year included:

- Rotational sampling of pesticides at the North Saskatchewan, South Saskatchewan and Cold rivers, at the Alberta - Saskatchewan border;
- Annual sampling of pesticides at the Carrot and Assiniboine rivers, at the Saskatchewan - Manitoba border; and,
- Bacterial monitoring was increased from 8 times a year to 12 times a year for the Beaver, Red Deer (at the Alberta - Saskatchewan boundary), South Saskatchewan, Carrot and the Qu'Appelle rivers;
- The 2014 monitoring program was completed as approved by the Board at their October 25, 2013, Meeting No. 105; with some exceptions due to container breakage, missed and/or anomalous sampling events and results. However, in July 2014, Environment Canada conducted additional sampling events during peak flows for the South Saskatchewan, Assiniboine and Qu'Appelle rivers. Details of the 2014 water quality monitoring field program can be found in the PPWB Report on Excursions of Interprovincial Water Quality Objectives, January-December 2014, in Appendix IV.

Adherence or Excursions to Transboundary Water Quality Objectives

The *MAA* established transboundary water quality objectives for individual parameters based on values that protect human consumption, agricultural and recreational uses and the aquatic environment.

A total of 2,864 water quality samples were compared to the transboundary water quality objectives to determine whether any excursions to the objectives occurred in 2014. The Committee on Water Quality (COWQ) has been developing an action plan to assess the risks and causes of excursions and the potential to mitigate by the respective jurisdiction.

The PPWB report on Excursions of Interprovincial Water Quality Objectives January to December 2014 is shown in Appendix IV. This report was recommended by the COWQ and approved by the Board in November 2015.

In 2014, the transboundary water quality objectives were adhered to an average of 95% of samples (Figure 3). The adherence rate ranged from 88.5% (Carrot River) to 100% (North Saskatchewan and Churchill rivers), indicating that water quality was suitable for the majority of the intended water uses for these rivers. Of the 11 transboundary rivers, the Carrot and the Qu'Appelle rivers (Saskatchewan - Manitoba border) had an overall adherence rate of less than 90% which is attributed to excursions of manganese, total phosphorus and salts (sodium, chloride and sulphate).

Annual adherence rates of rivers have varied only slightly over the last 12 years. The Red Deer River (Alberta-Saskatchewan) and the Qu'Appelle River have shown the greatest fluctuation. Excursions of dissolved oxygen and copper were noted on the Carrot River in 2014. Additionally, fecal coliform bacteria and dissolved oxygen each had one excursion on the Qu'Appelle River which is attributed to an early July peak flow event. However, overall variations in adherence rates are minor and did not highlight significant changes in water quality in 2014.

These variations in adherence rates can occur naturally and can be influenced by a number of factors including climate variability, flow, sediment loading, groundwater and point or non-point inputs into the river.

In 2014, 14 parameters had excursions to the interprovincial water quality objectives. Total phosphorous, manganese, sodium, and total dissolved solids (TDS) were the parameters most frequently exceeded. Concentrations of total phosphorus, manganese and other parameters can be influenced by various natural and anthropogenic factors such as seasonal runoff and flow, land use and point source effluents.

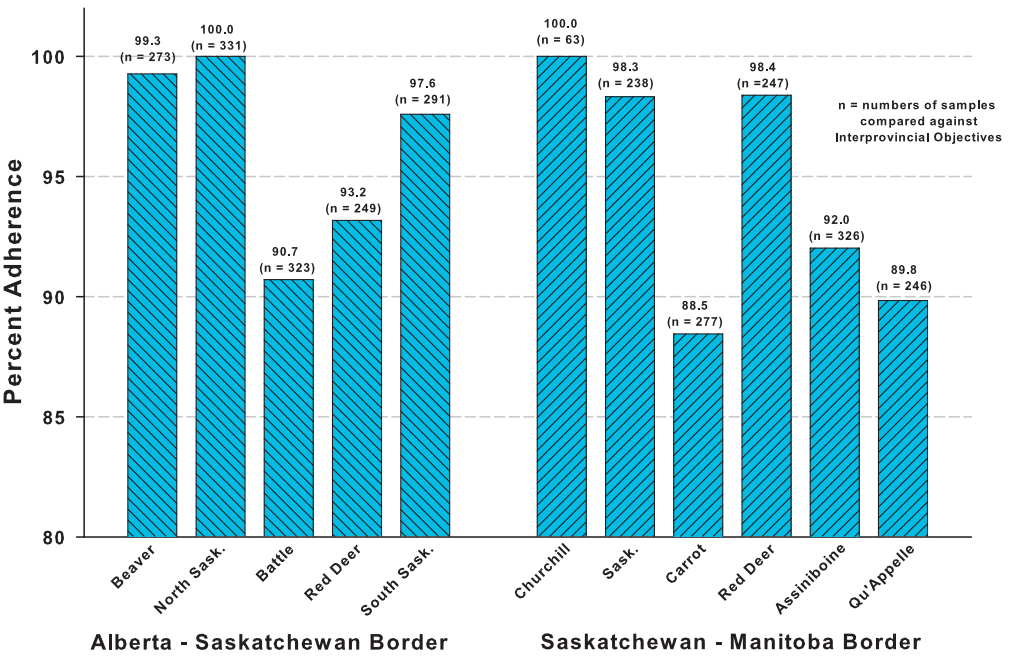


Figure 3. 2014 Percent Adherence to PPWB Water Quality Objectives

Reviewing and Improving Transboundary Water Quality Objectives

The COWQ completed its work on the comprehensive review of the interprovincial water quality objectives in 2012 - 2013. The Board confirmed their support of the work completed by COWQ. In 2014, each PPWB member organization completed an internal review of the recommended changes.

The next step is to recommend approval of the 71 proposed transboundary water quality objectives, on 12 transboundary river reaches, to PPWB Ministers. The PPWB Ministers are required to provide acceptance in writing to approve the changes. The updated interprovincial water quality objectives will come into effect immediately after the PPWB Ministers approve the recommended changes.

Quantifying Non-Point and Point Nutrient Sources in Interprovincial Watersheds

In 2013, the COWQ began setting priorities for the 12 transboundary river reaches. The committee determined that nutrients are a priority for further investigation due to increasing trends at some river reaches and exceedances of water quality objectives. Nutrients are also key to the overall water quality protection of rivers. In 2013 - 2014 the COWQ proposed to examine nutrients on all transboundary river reaches. However, in 2014, the COWQ determined that it would be difficult to assess nutrients at this scale and proposed that the assessment of nutrients should focus on two watersheds, the Carrot River at the Saskatchewan - Manitoba border and the Red Deer River at the Alberta - Saskatchewan border. The objective of the nutrient review work will be to identify point and non-point sources of nutrients and to look at hotspots in both river basins.

In February 2015, the Board indicated its support for contracting external service providers to quantify non-point and point nutrient sources in interprovincial watersheds. A Statement of Work was completed for a contract and a Request for Proposal (RFP) for this work was posted on the Government of Canada Buy and Sell system with a closing date of April 15, 2015.

Case Response to Excursions

In 2013 - 2014, the COWQ considered how to prioritize potential investigations of exceedances of water quality objectives at the transboundary reaches and developed an “Excursion Response Flow Chart”. The COWQ has selected pesticides as a case study to follow through the “Excursion

Response Flow Chart". A literature review on pesticides was completed in 2014 and a report on pesticide exceedances was drafted. The committee is currently reviewing the report.

New Look for Future PPWB Report on Excursions of Interprovincial Water Quality Objectives

The current PPWB Report on Excursions of Interprovincial Water Quality Objectives will be replaced with a new updated report once the updated interprovincial water quality objectives are approved by PPWB Ministers. Changes to the report will include updates of on-going activities identified in previous reports, and any investigations into previous excursions.

Fish Monitoring Program

The COWQ has drafted a fish tissue report based on PPWB historical data from 1992 to 2004. The Fish Tissue Program was once active but has been suspended for a number of years to ensure the program is meeting the needs of the Board and to verify if the sampling program is in need of revision. In January 2015, the committee expressed a continued interest in monitoring the transport of mercury in interprovincial streams, however noted that monitoring the transport of mercury by fish sampling at the boundaries is not helpful and a more targeted approach is necessary. The COWQ is investigating the sampling of sediments as an alternative.

Water Quality Workshop

In 2014, the COWQ discussed hosting a Prairie Water Quality workshop that would focus specifically on nutrients and emerging water quality issues in prairie water management. The workshop will concentrate primarily on nutrients, with a session on emerging chemicals in the environment. This will be a 2 day technical workshop proposed for Fall 2016. The workshop will be held in Saskatchewan although the exact location is yet to be determined.

GOAL 4: Governments Are Informed About Emergency and Unusual Water Conditions

In the PPWB's Strategic Plan, Goal 4 is to inform jurisdictions of emergency and unusual water conditions, facilitating effective and cooperative transboundary water management.

PPWB Contingency Plan

The PPWB Interprovincial Event Contingency Plan is an effective method of informing government agencies of spills or unusual water quality conditions as well as emergency or unusual surface water quantity or groundwater quantity and quality events in transboundary basins.

The PPWB Event Contingency Plan is not meant to replace any jurisdictional Emergency spill response mechanism.

The Event Contingency Plan currently involves a "how to" guide to inform jurisdictions. An Event Notification Report Form is used to inform PPWB and Committee members, providing them sufficient information to investigate whether adequate mitigation efforts are being taken to avoid impacts to neighbouring jurisdictions.

In 2014 - 2015, the Board reviewed and updated the PPWB Interprovincial Event Contingency Plan by enhancing, streamlining and improving communications on emergency and unusual water quantity and quality conditions. The revised Contingency Plan is more detailed and less ambiguous and includes information on: area of coverage, responsibilities, pattern of response and organization structure. The revised Contingency Plan also ensures that proper communication approaches within each jurisdiction is addressed and that the Board will discuss the effectiveness of this communication on a regular basis.

Three unusual water quality events were reported in 2014 - 2015:

- In June 2014, Saskatchewan's Water Security Agency distributed a PPWB Event Notification Report for a sewage release into the Wascana Creek flowing to the Qu'Appelle River. No transboundary impacts occurred.

- In June 2014, Saskatchewan's Water Security Agency distributed notification that an intake main for the waste water treatment lift station in Medicine Hat, Alberta, broke as a result of rising river levels on the South Saskatchewan River. Raw sewage was entering the South Saskatchewan River via Ross Creek.

- In August 2014, an unusual water quality condition was found in the Red Deer River basin upstream of Drumheller, Alberta. There were large exceedances of the Canadian Council of Ministers of the Environment (CCME) guidelines and the Environmental Quality Guidelines for Alberta Surface Waters for a number of metals. Alberta conducted sampling and results indicated that the concentration of most metals returned to normal by October 2014. No transboundary impacts occurred.

The Assiniboine River 2011 and 2014 Flood Events

The Assiniboine River experienced two rare flooding events in 2011 and 2014. Although the 2011 flood was snowmelt driven, and the 2014 flood a rainfall event, the magnitude of the peak flows during the two floods are very similar (Figure 4). At Brandon these two events were much larger than any other peak recorded in the past 100 years. The 2014 peak flow was slightly smaller at Brandon compared to the 2011 peak flow, but a much rarer event considering it was a rainfall event. The 2011 flood required emergency measures to prevent catastrophic damages from occurring along the Assiniboine River. These included emergency raising of dikes in Brandon and along the Lower Assiniboine River, emergency expansion of the Portage Diversion to divert more flow to Lake Manitoba, and an intentional breach of a dike downstream of Portage to allow a small amount of water to flow to the Boyne River. The emergency capacity of the Portage Diversion was used again in 2014, but a breach in the dike was not necessary.

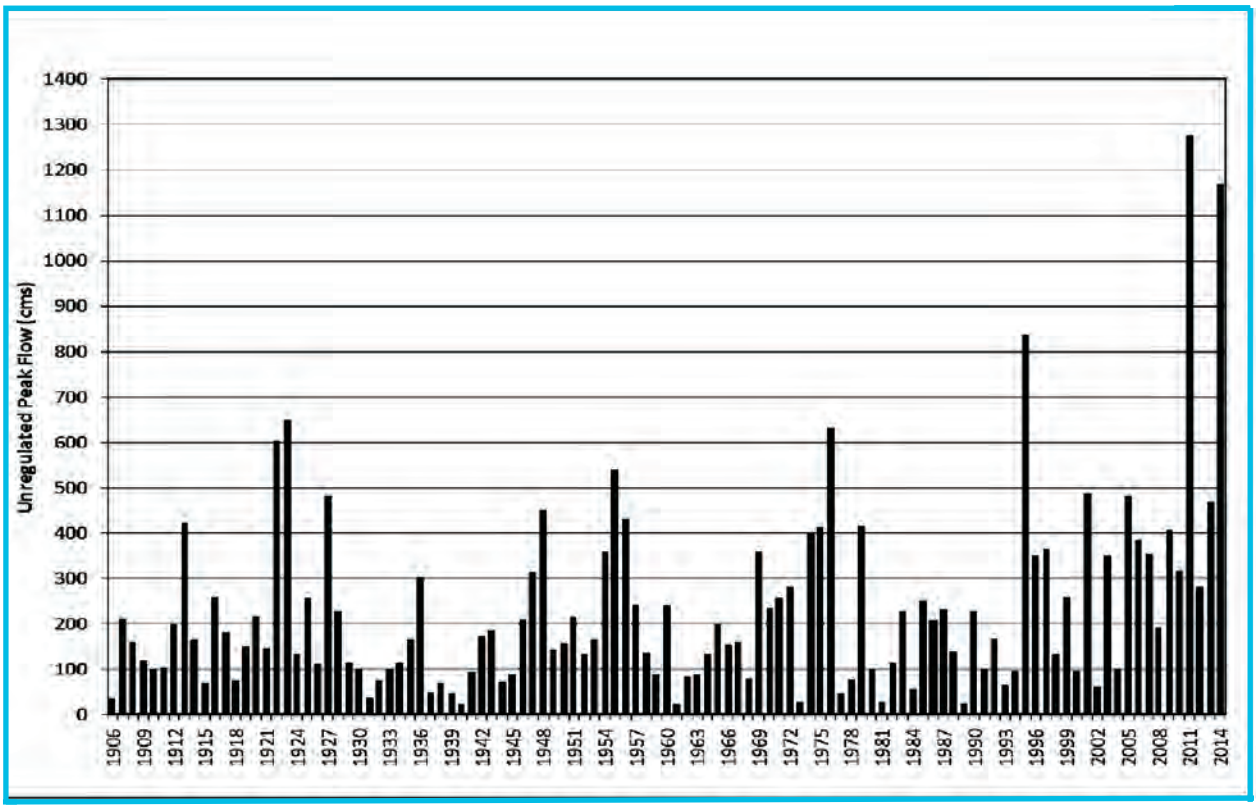


Figure 4. Annual Unregulated Peak Flows of the Assiniboine River at Brandon, Manitoba

GOAL 5: Transboundary Water Issues Are Addressed Cooperatively to Avoid Disputes

The PPWB's Strategic Plan Goal 5 is to avoid conflicts and disagreements over transboundary water issues. During the year, the PPWB discussed issues related to several existing projects of interest to different jurisdictions.

Lake Winnipeg Nutrient Issues

Lake Winnipeg is Canada's sixth-largest freshwater lake, and is fed by a vast international basin covering 960,000 square km, extending over four provinces and four states. Concern over nutrient loading in Lake Winnipeg has risen in recent years, with reports of increased frequency, duration, and intensity of algal blooms. The Province of Manitoba, Environment Canada and many other partners have been engaged in several large initiatives to address water quality issues in Lake Winnipeg.

The PPWB provides a forum to exchange information on Lake Winnipeg initiatives with the Provinces of Saskatchewan and Alberta. Canada and Manitoba signed a Memorandum of Understanding (MOU) in September 2010 to continue their collaborative partnership into the long-term. The goal of this agreement is to establish a long-term collaborative and coordinated approach between two governments to support the sustainability of Lake Winnipeg and its contribution to economic activities, recreation and watershed functions. Specific goals are to coordinate science, information sharing and any activities to further the MOU. An Implementation Steering Committee was formed in October 2010.

In 2014 - 2015, the Steering Committee met on May 26, 2014 and on November 28, 2014. The MOU expires in September 2015 and a management review was conducted to inform the decision to renew the MOU for another five years.

The Board was informed about activities of Environment Canada's Lake Winnipeg Basin Initiative (LWBI). Phase II of the LWBI began in 2012 (2012 - 2017) and builds on the work of Phase I (2008 - 2012). The LWBI focuses on three areas: transboundary partnerships to manage nutrients in the basin; research, information and monitoring; and, a stewardship fund for projects that reduce nutrient loads into the lake.

The Board was also kept informed of Manitoba's actions to reduce nutrient loading. Manitoba is working through the International Red River Board (IRRB). The IRRB is preparing a basin-wide nutrient management strategy and is compiling information on how each jurisdiction is addressing nutrient issues. The development of the Red River nutrient objectives will be coordinated with developing nutrient objectives for Lake Winnipeg.

At its March 2014 meeting, the Board was informed of the new Lake Friendly Accord. In June of 2013, the Government of Manitoba announced a new Lake Friendly Accord and Stewards Alliance, and partnerships and initiatives between the Government and other jurisdictions to better coordinate efforts to improve all waterways in the Lake Winnipeg basin. The Lake Friendly Accord will coordinate action to improve water quality by reducing nutrient pollution. The Lake Friendly Accord is not meant to duplicate the work of other initiatives, but is meant to build on existing transboundary initiatives and agreements, for example, the PPWB, the International Joint Commission, and the Red River Basin Commission.

Manitoba/Saskatchewan Drainage

A bilateral Saskatchewan - Manitoba Task Force was created in 2009 to develop a strategy for dealing with drainage in Saskatchewan watersheds that may affect lands in Manitoba. Manitoba and Saskatchewan, through the Task Force**,** have met on a number of occasions and are jointly investigating drainage issues along the border.

The PPWB will continue to be kept informed of the Task Force's progress.

Both Manitoba and Saskatchewan are introducing long term water management strategies to deal with drainage issues. Saskatchewan has created a 25 Year Water Security Plan which includes the creation of new drainage regulations to address drainage issues including downstream flooding that has the potential to affect Manitoba. Discussions have occurred with Manitoba's Drainage and Water Control Licensing staff for input into the proposed drainage regulations.

Proposed regulatory changes are expected to be implemented in 2015 - 2016. Manitoba has developed a new drainage policy aimed at reducing paperwork and approval times for routine minor drainage, requires more planning and oversight for larger projects and increases fines for illegal drainage. Manitoba's new policy underwent public consultation in July 2014.

In 2014, Manitoba and Saskatchewan developed a Memorandum of Understanding (MOU) to address cross border issues for example, drainage, flood forecasting, and items related to Lake Winnipeg. Consultation with special interest groups took place in February 2015 followed by general public consultation. The Draft MOU is expected to be signed in 2015.

Carrot River Sediment Concerns

Saskatchewan, with the support of Manitoba, continue to explore opportunities to investigate the reduction of channel capacity in the Saskatchewan River near The Pas, Manitoba, as a result of sediment transport from the Carrot River. Terms of Reference for this project were finalized in 2014. Manitoba and Saskatchewan are discussing the path forward in this initiative.

New Committee on Flow Forecasting

In June 2013, southern Alberta was hit by a severe rain event which led to massive flooding which extended from Canmore to Calgary and beyond. In 2011, 2013 and 2014, flooding on the Assiniboine River was caused by above average precipitation in western Manitoba and Saskatchewan. These events brought home the importance of sharing of information between the Prairie Provinces and the potential to develop an interprovincial flood forecasting model.

In 2014, the Board determined that the formation of a standing Committee on Flow Forecasting would improve collaboration, coordination and communication between jurisdictions concerning flow forecasting. The new Committee will have representation from the Governments of Canada, Alberta, Saskatchewan and Manitoba. The mandate of the Committee will be to investigate, oversee, review, report and improve the accuracy of flow forecasting at interprovincial boundaries. The Committee may consider flow forecasting methods, basin forecasting models (hydraulic and hydrologic), tools and techniques, inter-jurisdictional communications, provision and transmission of data, studies and other items of interprovincial interest involving streamflow forecasting.

The Terms of Reference have been drafted and a three to five year workplan will be developed for presentation to the Board. The Committee is expected to be up and running in 2015-2016.

Annual Report on Transboundary Drainage Projects

The COH prepares an annual report on drainage projects approved in Saskatchewan that have the potential for downstream impacts in Manitoba.

The Board agreed that Alberta only needs to provide the PPWB with drainage project information if there is a specific project that could have an impact on Saskatchewan.

No projects were licensed by Saskatchewan in 2014 - 2015 that had the potential for transboundary impacts into Manitoba.

GOAL 6: Ministers, Senior Managers and Appropriate Staff of Governments Are Informed About PPWB Activities

The PPWB's Strategic Goal 6 is to keep jurisdictions informed about PPWB activities. This transparency ensures that cost-shared activities are delivered efficiently and effectively and are consistent with the mandate of the PPWB.

The PPWB member governments were informed about PPWB activities through various means, including the ongoing distribution of Board and Committee Minutes and Quarterly and Annual Reports, as well as through brochures and fact sheets, technical reports, and the PPWB website.

The PPWB website (www.ppwb.ca) exists to inform the public and interested parties of PPWB activities, and provide a means for Member governments to exchange information and facilitate the business of the PPWB. The PPWB website provides access to a complete suite of PPWB publications and fact sheets. A member portal also facilitates the exchange of information.

In 2014 - 2015, the Board continued the practice of inviting senior officials of the host agency to meet with the Board. Senior managers and executives from Environment Canada, Agriculture and Agri-Food Canada, Natural Resources Canada and Aboriginal Affairs and Northern Development Canada met with the Board in February 2015 in Ottawa. This meeting focussed on updating the Executives on PPWB activities, in addition to discussions on the Government of Canada membership on the PPWB, water quality and quantity monitoring, and other initiatives of mutual interest.

This practice began in 2007 - 2008 as Board members recognized that greater efforts were needed to increase general awareness of the PPWB and agency responsibilities related to the implementation of the *Master Agreement on Apportionment*.

GOAL 7: Information, Knowledge and Research Are Shared Among Governments

The PPWB provides a forum to foster effective and cooperative water management on the Prairies. Goal 7 facilitates cooperation by exchanging information and knowledge amongst jurisdictions and participating in research projects of mutual interest and relevance to the PPWB mandate.

Resiliency of the *MAA* to Climate Change

In March 2008, the PPWB initiated a project to assess how resilient the *MAA* would be to changes in water availability resulting from climate change. Paleorecords coupled with historic hydrological records were used to simulate droughts of various lengths and severity. In 2014, simulations on the North Saskatchewan and South Saskatchewan Rivers through to Tobin Lake using drought scenarios provided by Prairie Adaptation Research Collaborative (PARC) were conducted by Saskatchewan's Water Security Agency. However, more input is required before the results can be finalized. Alberta had conducted previous modelling work on the South Saskatchewan River that overlaps with the resiliency of the *MAA* to climate change initiative. This work was sent to the COH for their review.

However, the Board concluded that this initiative may be shifting from a technical project to a more policy direction. The Board will need to determine how to address the policy direction and also the path forward for this initiative.

Drainage Area Delineation

Drainage basins or watersheds consist of a network of stream channels that link from smaller to larger, providing a conduit for surface water runoff and sediment transport on the landscape. Mutually agreed drainage basin boundaries are necessary for purposes of calculating apportionable flows and monitoring interprovincial apportionment. In 2013, Agriculture and Agri-Food Canada (AAFC), announced that it could no longer offer this service because of the change in the department's mandate. AAFC had provided this service to all member agencies since 1975. At COH Meeting No. 130, Water Survey of Canada indicated interest in taking on the service of drainage area delineations on a national basis. However, the service would be for gauges operated by Water Survey of Canada only. This undertaking is in preliminary stages.

Invasive Species

In October 2013 the Board was informed about findings of zebra mussels (*Dreissera polymorpha*) in Lake Winnipeg. Zebra mussels aggressively invade new areas and reproduce at a rapid rate, colonize most hard surfaces, negatively impact essential power and water-based infrastructure, threaten native fish and wildlife species and are a costly nuisance. Manitoba's Conservation and Water Stewardship Fisheries Branch is the lead to coordinate the response to this situation with support from the Department of Fisheries and Oceans and Environment Canada.

At their fall meeting in November 2014, the Board met with Manitoba's Aquatic Invasive Species Programs, Fisheries Branch of Conservation and Water Stewardship. A presentation was provided to the Board on zebra mussels in Lake Winnipeg. The presentation provided information on the activities and eradication/treatment program for zebra mussels.

In 2014, Manitoba enhanced its legislation related to aquatic invasive species. The Aquatic Invasive Species Bill was introduced in the Legislature in December 2014 and is thought to be the most comprehensive legislation in North America addressing the threat of aquatic invasive species.

In 2014, Alberta introduced an invasive species prevention program for *Dreissenid* mussels.

Saskatchewan began and tested a pilot veliger program in 2014. The program is expected to continue in 2015.

Invasive species has become a regular item for discussion at the Board's spring and fall meetings.

GOAL 8: PPWB Business is Conducted Effectively

The PPWB's Strategic Goal 8 focuses primarily on administration, work planning, and financial management. Goal 8 ensures that work planning and budgeting is consistent amongst jurisdictions, day to day activities are administered effectively, there is effective communications, and succession planning is done to ensure continuity of Board, Committee and Secretariat functions.

ADMINISTRATIVE AND FINANCIAL MANAGEMENT

As illustrated by the organization chart in Appendix V, the Board operates through its Executive Director and four technical Standing Committees (Committee on Hydrology, Committee on Groundwater, Committee on Water Quality and Committee on Flow Forecasting). The Committee on Flow Forecasting is a new committee formed in 2014. The Board consists of senior officials engaged in the administration of water resources in the Provinces of Alberta, Saskatchewan, and Manitoba and senior officials from Environment Canada and Agriculture and Agri-Food Canada (Appendix VI). Committee members are managers and technical experts within each member agency. The Board is chaired by the Environment Canada member. The Committees are chaired by the Executive Director.

Secretariat support is provided to the PPWB through the Transboundary Waters Unit, Environment Canada at Room 300, 2365 Albert St., Regina, Saskatchewan. The portion of time each Secretariat staff person spends on PPWB activities is charged to the PPWB and cost-shared by the members. In addition, technical support is provided, as required, by other staff of the Government of Canada and the three Prairie Provinces.

Five Board and eight Committee meetings were held throughout the 2014 - 2015 fiscal year. The Committee on Flow Forecasting did not meet in 2014-2015. The Board invites the various Committee members to participate in Board meetings. This practice is common with all of the Board Committees, thereby improving communication and understanding between the Board and the Committees.

PPWB

- Meeting No. 109. June 12, 2014 - Teleconference
- Meeting No. 110. October 9, 2014 - Teleconference
- Meeting No. 111. November 4-6, 2014 - Winnipeg
- Meeting No. 112. February 17, 2015 - Teleconference
- Meeting No. 113. February 25-26, 2015 - Ottawa

COH

- Meeting No. 129. September 16-17, 2014 - Winnipeg
- Meeting No. 130. February 3-4, 2015 - Saskatoon

COWQ

- Meeting No. 123. September 10-11, 2014 - Saskatoon
- Meeting No. 124. October 20, 2014 - Teleconference
- Meeting No. 125. October 29, 2014 - Teleconference
- Meeting No. 126. November 20, 2014 - Teleconference
- Meeting No. 127. January 27-28, 2015 - Winnipeg

COG

- Meeting No. 67. February 9-10, 2015 - Winnipeg

The Board approves the annual budget for the PPWB. The budget for 2014 - 2015 was $758,000 and final expenditures were $607,015 as shown in Appendix VII. Final expenditures were below the approved budget due to delays in initiating the contracting process for the basin review project and vacancies in the Secretariat in 2014-2015.

The Board conducts budget planning early in the year and has a substantial discussion on the budget at the fall meetings. This discussion facilitates early input by the Board into the budget

processes of the PPWB member governments.

The Board approved the renewal of the 5-year work plan in December 2011. The renewed 5-year work plan provides direction until March 2017.
The purpose of the work plan is to:

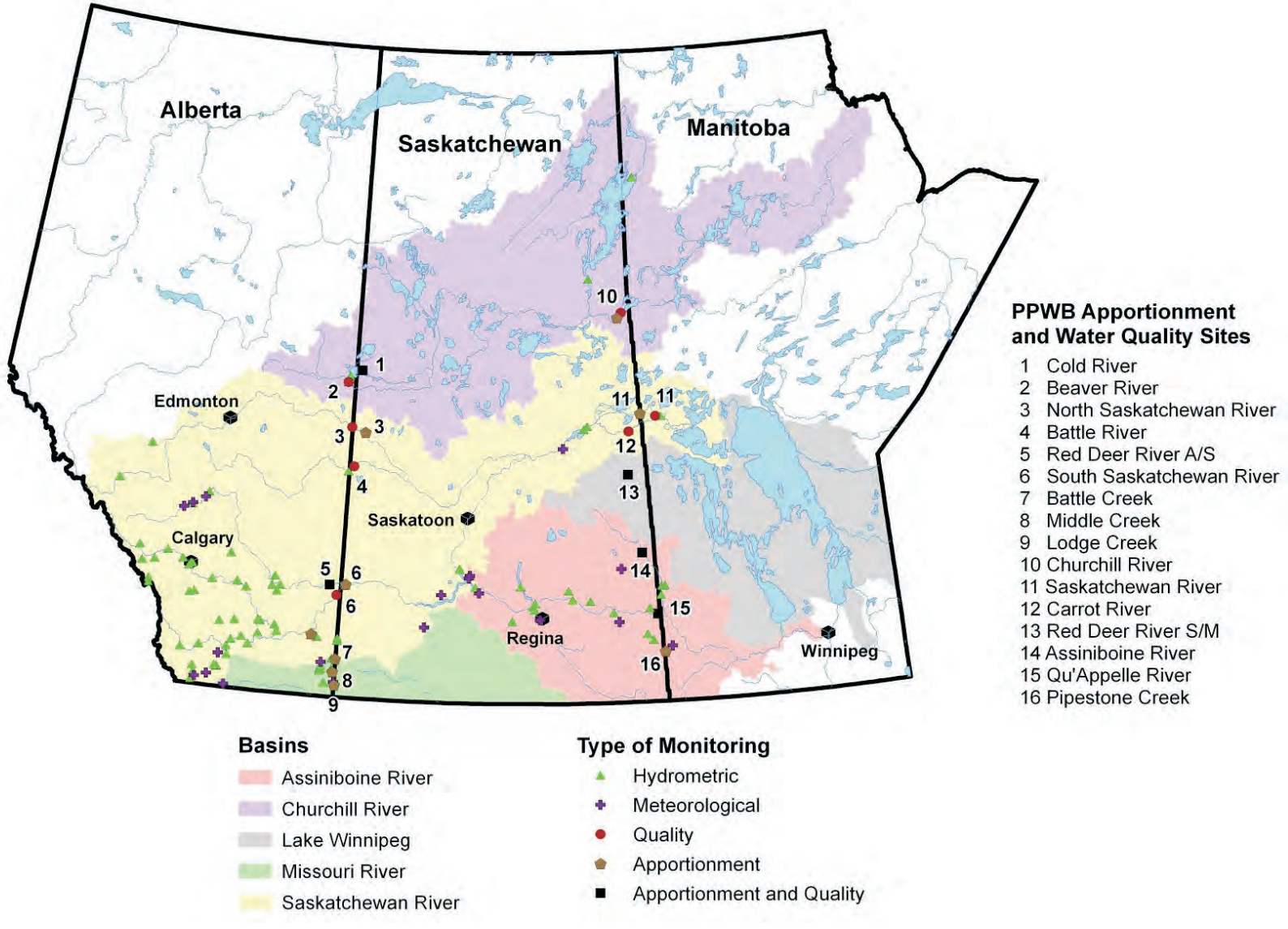
- position the Board to anticipate and plan for future work priorities and resource requirements;
- guide the Board in its work over 5 years, ensuring that activities target fulfilling the Goals in the PPWB Strategic Plan;
- feed into multi-year work plans for the four Standing Committees and the Secretariat; and
- provide the foundation for communication with Ministers and senior officials within each government.

Renewal and Modernizing of PPWB Documents

In order to modernize, enhance, streamline and avoid duplication, the Board reviews PPWB documents periodically. The Board began their review of PPWB documents in 2014 - 2015. This will be a multi year task and the Board expects to complete the review in the next couple of years.

Further information on the history and administration of the PPWB can be found in Appendix VIII.

APPENDIX I: PPWB Monitoring Stations for 2014 - 2015



APPENDIX II: 2014 Recorded and Apportionable Flows

APPENDIX IIA: Flows at the Alberta - Saskatchewan Border (in Cubic Decametres)

SOUTH SASKATCHEWAN RIVER - ALBERTA - SASKATCHEWAN BORDER

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	240000	179000	283000	646000	1130000	2350000	1080000	440000	587000	476000	326000	261000	8000000
CONSUMPTIVE USE	1770	1980	1770	14200	172000	214000	399000	235000	63100	10200	2290	2120	1120000
CHANGE IN RESERVOIR STORAGE	-89600	-74000	-64800	-77800	146000	282000	92000	-69500	-26800	-21800	-330	-34300	61100
INTERBASIN TRANSFER*	0	0	0	78400	24400	35100	26300	24100	24300	12900	0	0	226000
APPORTIONABLE FLOW	159000	102000	241000	630000	1400000	2920000	1580000	653000	664000	472000	339000	244000	9400000

* Irrigation diversions to the Eastern and Western Irrigation Districts which are subsequently returned to the Red Deer River.

RED DEER RIVER - ALBERTA - SASKATCHEWAN BORDER

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	51100	45000	77200	491000	456000	581000	308000	171000	178000	118000	82800	51100	2610000
CONSUMPTIVE USE	0	0	0	0	0	3490	3900	3740	2180	0	0	0	13300
CHANGE IN RESERVOIR STORAGE	-26800	-38500	-40500	21150	6450	46400	33700	14800	1830	810	-6030	-12700	610
INTERBASIN TRANSFER**	0	0	0	-78400	-24400	-35100	-26300	-24100	-24300	-12900	0	0	-226000
APPORTIONABLE FLOW	29400	8600	34200	428300	438000	590000	322000	168000	157000	106000	79200	40700	2400000

** Irrigation return flow from the Eastern and Western Irrigation Districts.

SOUTH SASKATCHEWAN RIVER - BELOW JUNCTION WITH RED DEER RIVER

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	291000	224000	360000	1140000	1580000	2930000	1390000	611000	765000	594000	409000	312000	10600000
APPORTIONABLE FLOW	188000	110000	275000	1060000	1840000	3510000	1900000	821000	822000	578000	418000	284000	11800000
SASKATCHEWAN SHARE (50%)	94000	55000	138000	530000	920000	1750000	952000	411000	411000	289000	209000	142000	5900000
EXCESS (+) OR DEFICIT (-) DELIVERY	197000	169000	223000	608000	664000	1180000	439000	201000	354000	305000	200000	170000	4710000
CUMULATIVE EXCESS OR DEFICIT	197000	366000	589000	1200000	1860000	3040000	3480000	3680000	4030000	4340000	4540000	4710000	4710000

Recorded flow was 90% of apportionable flow. Alberta is required to deliver 50% of the apportionable flow to Saskatchewan. Apportionment of flow in the South Saskatchewan River is specified in Article 4, Schedule A of the *MAA*. Apportionable flow calculations are based on the methodology described in the report entitled "South Saskatchewan River Below Red Deer River - Natural Flow", April 1985 (PPWB Report No. 45) Flows have been routed and, as a result, the values presented in the table cannot be exactly balanced on a monthly basis. Final numbers might differ due to rounding to three significant figures.

NORTH SASKATCHEWAN RIVER - ALBERTA - SASKATCHEWAN BORDER (NEAR DEER CREEK)

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	332000	249000	402000	1100000	1110000	1210000	817000	536000	451000	453000	378000	362000	7400000
APPORTIONABLE FLOW	122000	27900	139000	878000	1140000	1620000	1290000	913000	623000	402000	180000	117000	7450000

Recorded flow was 99% of apportionable flow. Alberta is required to deliver 50% of the apportionable flow to Saskatchewan.

BATTLE CREEK - ALBERTA - SASKATCHEWAN BORDER

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	0	148	751	2350	1280	1500	743	776	1150	529	0	0	9230
APPORTIONABLE FLOW	0	148	752	2510	1280	1530	780	794	1140	528	0	0	9460

Recorded flow was 98% of apportionable flow. Alberta is required to deliver 75% of the apportionable flow to Saskatchewan.

LODGE CREEK - ALBERTA - SASKATCHEWAN BORDER

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	0	23	5030	3320	728	916	80	513	34	5	0	0	10600
APPORTIONABLE FLOW	0	23	5760	3520	728	1230	75	512	34	5	0	0	11900

Recorded flow was 89% of apportionable flow. Alberta is required to deliver 75% of the apportionable flow to Saskatchewan.

MIDDLE CREEK - ALBERTA - SASKATCHEWAN BORDER

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	0	0	1190	883	208	163	52	39	38	34	0	0	2610
APPORTIONABLE FLOW	0	0	1370	1130	243	163	52	39	38	26	0	0	3060

Recorded flow was 85% of apportionable flow. Alberta is required to deliver 75% of the apportionable flow to Saskatchewan.

COLD LAKE - ALBERTA - SASKATCHEWAN BORDER (AT OUTLET OF COLD LAKE)

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	25800	22900	30700	29500	47100	102000	138000	125000	81600	63700	46200	38000	751000
APPORTIONABLE FLOW	26200	23300	31100	29900	47600	103000	139000	126000	82900	64200	46600	38400	758000

Recorded flow was 99% of apportionable flow. Alberta is required to deliver 68.4% of the apportionable flow to Saskatchewan.

APPENDIX IIB: Flows at the Saskatchewan - Manitoba Border (in Cubic Decametres)

CHURCHILL RIVER - SASKATCHEWAN - MANITOBA BORDER

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
ESTIMATED FLOW	2110000	2070000	1940000	1710000	2110000	2260000	2550000	2220000	2060000	1940000	1810000	1940000	24700000
APPORTIONABLE FLOW	1680000	1640000	1640000	1540000	1900000	2510000	3120000	2860000	2500000	2300000	1890000	1820000	25400000

Estimated flow includes recorded flow at Sandy Bay, SK and estimated inflow from Sandy Bay to the Saskatchewan-Manitoba Border. Estimated flow was 97% of apportionable flow. Saskatchewan is required to deliver 50% of the apportionable flow to Manitoba.

SASKATCHEWAN RIVER - SASKATCHEWAN - MANITOBA BORDER

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
ESTIMATED FLOW	1200000	1120000	1220000	2220000	4100000	4170000	4520000	2960000	1750000	1580000	1180000	1020000	27000000
APPORTIONABLE FLOW	769000	764000	991000	2760000	4300000	4930000	4810000	2800000	1840000	1630000	858000	888000	27300000

Estimated flow at the Saskatchewan/Manitoba border is calculated using recorded flow of the Saskatchewan River at The Pas minus 1.31 times the recorded flow of the Carrot River near Turnberry. Estimated flow was 99% of apportionable flow. Saskatchewan is required to deliver 50% of the apportionable flow to Manitoba.

QU'APPELLE RIVER - SASKATCHEWAN - MANITOBA BORDER (NEAR WELBY)

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	10600	7920	12400	125000	204000	156000	541000	181000	146000	111000	86800	59600	1640000
APPORTIONABLE FLOW													1670000

Recorded flow was 98% of apportionable flow. Apportionable flow is calculated on an annual basis for this basin, as such the monthly values are intentionally left blank. Recorded flow includes 46,500 dam^3 of water diverted from the South Saskatchewan River. Saskatchewan is required to deliver 50% of the apportionable flow to Manitoba.

RED DEER RIVER - SASKATCHEWAN - MANITOBA BORDER (NEAR ERWOOD)

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	1690	1650	2050	126000	214000	123000	348000	41000	20100	17300	12300	8300	915000
APPORTIONABLE FLOW	1610	1580	1850	123000	204000	116000	331000	38800	19100	16500	11700	7900	873000

In 2014 recorded flow exceeded the apportionable flow by 5%. Such a result is normal for this basin, due to the contribution of agricultural drainage to the flow of the Red Deer River. Saskatchewan is required to deliver 50% of the apportionable flow to Manitoba.

ASSINIBOINE RIVER - SASKATCHEWAN - MANITOBA BORDER (AT KAMSACK)

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	1610	1230	1330	189000	263000	113000	544000	130000	80700	46500	23200	9560	1400000
APPORTIONABLE FLOW	1640	1290	1390	196000	267000	117000	551000	132000	82200	47100	23200	9630	1430000

Recorded Flow was 98% of apportionable flow. Saskatchewan is required to deliver 50% of the apportionable flow to Manitoba.

PIPESTONE CREEK - SASKATCHEWAN - MANITOBA BORDER

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	689	921	1790	40500	26300	21600	105000	12700	21400	12000	6150	2200	251000
APPORTIONABLE FLOW	813	1060	1850	42700	21300	20900	117000	10500	19700	7190	6160	2240	251000

Recorded flow was 100% of apportionable flow. Recorded flow equaled the apportionable flow in 2014 due to pumping of 14 000 dam^3 of water from Kipling Marsh into Pipestone Lake. Saskatchewan is required to deliver 50% of the apportionable flow to Manitoba.

APPENDIX III: PPWB Water Quality Monitoring 2014 Parameter List

Water is collected monthly at all sites with the exception of the Churchill River (4x/yr)

ALKALINITY, phenol & total
ALUMINUM, diss. & total θ
AMMONIA, total.θ
ANTIMONY, diss. & total
ARSENIC, diss. θ & total
BARIUM, diss. & total θ
BERYLLIUM, diss. & total
BICARBONATE, calc.
BISMUTH, diss. & total
BORON, diss. θ & total
CADMIUM, diss. & total θ
CALCIUM, diss.
CARBON, diss. organic
CARBON, part. organic
CARBON, total organic, calcd.
CARBONATE, calcd.
CHLORIDE, diss.θ
CHROMIUM, diss. & total θ
COBALT, diss. & total θ
COLIFORMS FECAL θ
COLOUR TRUE
COPPER, diss. & total θ
E. COLI
FLUORIDE, diss. θ
FREE CO_2, calcd.
GALLIUM, diss. & total
HARDNESS NON-CARB. (CALCD.)
HARDNESS TOTAL (CALCD.) CACO3
IRON, diss. θ & total
LANTHANUM, diss. & total
LEAD, diss. & total θ
LITHIUM, diss. & total
MAGNESIUM, diss.
MANGANESE, diss. θ & total
MOLYBDENUM, diss. & total
NICKEL diss. & total θ
NITROGEN NO_3 & NO_2, diss.θ
NITROGEN. part.
NITROGEN, total calcd.
NITROGEN, diss.
OXYGEN, diss.θ
pH θ
PHOSPHOROUS ortho, diss.
PHOSPHOROUS, part. calcd.
PHOSPHOROUS, total θ
PHOSPHOROUS, diss.
POTASSIUM, diss.
RESIDUE FIXED NONFILTRABLE
RESIDUE NONFILTRABLE
RUBIDIUM, diss. & total
SELENIUM, diss. θ & total
SILVER, diss. & total
SILICA,
SODIUM ADSORPTION RATIO, calcd.θ
SODIUM, diss.θ
SODIUM PERCENTAGE, calcd.
SPECIFIC CONDUCTANCE
STRONTIUM, diss. & total
SULPHATE, diss.θ
TEMPERATURE WATER
THALLIUM, diss. & total
TOTAL DISSOLVED SOLIDS, calcd.θ
TURBIDITY
URANIUM, diss. & total θ
VANADIUM, diss. & total θ
ZINC diss. & total θ

ACID HERBICIDES*θ♦
NEUTRAL HERBICIDES*
ORGANOCHLORINE INSECTICIDES*

Θ Parameters with PPWB site-specific objectives
* Collected from the Cold, North Saskatchewan, South Saskatchewan, Carrot and Assiniboine Rivers in 2014
♦ Collected from the Battle River in 2014

APPENDIX IV: PPWB REPORT ON EXCURSIONS OF INTERPROVINCIAL WATER QUALITY OBJECTIVES

JANUARY - DECEMBER 2014

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The Prairie Provinces Water Board (PPWB) has been involved in interprovincial water management since the signing of the *Master Agreement on Apportionment (MAA)* in 1969. This agreement signed by the governments of Alberta, Saskatchewan, Manitoba and Canada established an intergovernmental framework to manage transboundary waters. Schedule E of this agreement addresses the water quality mandate of the PPWB which is "to foster and facilitate interprovincial water quality management among the parties that encourages the protection and restoration of the aquatic environment."

Under schedule E of this agreement the PPWB is required to monitor the quality of the aquatic environment and to make annual comparisons with established interprovincial water quality objectives. To ensure the water quality is protected, site specific water quality objectives have been established at 11 major interprovincial eastward flowing river reaches (Table 1). Five of these reaches are along the Alberta-Saskatchewan border and six are along the Saskatchewan - Manitoba border (Figure 1). The objectives were established to protect various water uses including the protection of aquatic life, source water protection, recreation, agricultural uses (livestock watering and irrigation) and fish consumption. Cold River was added to the long term monitoring network in 1994, although there were no interprovincial water quality objectives for the Cold River in 1994.

To fulfill the monitoring requirement for the PPWB, Environment Canada collects and analyzes water quality samples from 12 transboundary river reaches. Monitoring includes nutrients, major ions, metals, fecal coliforms, physical characteristics and pesticides. The Committee on Water Quality (COWQ) annually reviews the results of the water quality monitoring program, with emphasis on the comparisons to interprovincial water quality objectives as part of the water quality program and as the first step to ensuring water quality is protected and maintained in the transboundary river reaches. This report presents the 2014 adherences and excursions to the 1992 interprovincial water quality objectives.

FIELD PROGRAM (2014)

In 2014, Environment Canada undertook the water quality monitoring program for the PPWB which included 12 transboundary river reaches. Eleven of the river reaches have established interprovincial water quality objectives, while the twelfth, Cold River, does not have objectives under the 1992 agreement. Site-specific objectives for Cold River were developed as part of the recent interprovincial water quality objectives review. Monitoring on the Cold River establishes baseline water quality data and will allow future determination of excursions to the new objectives, once adopted.

Table 1 PPWB Water Quality Station Information.

River	Station Number	Latitude	Longitude	Hydrometric Site(s)
Alberta-Saskatchewan				
Battle	SA05FE0001	52° 56’25.008”	109° 52’23.988”	05FE004
Beaver	AL06AD0001	54° 21’15.012”	110° 12’42.984”	06AD006
Cold	SA06AF0001	54° 34’00.000”	109° 50’10.000”	06AF001
North Saskatchewan	AL05EF0003	53° 36’05.004”	110° 00’29.988”	05EF001
Red Deer (Bindloss)	AL05CK0001	50° 54’10.008”	110° 17’48.984”	05CK004
South Saskatchewan	AL05AK0001	50° 44’15.000”	110° 05’44.016”	05AJ001*
Saskatchewan-Manitoba				
Assiniboine	SA05MD0002	51° 31’59.016”	101° 53’20.004”	05MD004
Carrot	SA05KH0002	53° 36’00.000”	102° 07’00.012”	05KH007
Carrot	Alternate site	53° 43’30.000”	101° 48’37.080”	05KH007
Churchill	SA06EA0003	55° 36’29.016”	102° 11’44.016”	06EA002**
Qu’Appelle	SA05JM0014	50° 29’02.004”	101° 32’35.016”	05JM001
Red Deer (Erwood)	SA05LC0001	52° 52’00.012”	102° 10’59.016”	05LC001
Saskatchewan	MA05KH0001	53° 50’30.012”	101° 20’03.984”	05KJ001 ***

* Estimated flow for the PPWB South Saskatchewan site is based on recorded flow at Medicine Hat plus the flow from Seven Person Creek and Ross Creek with a two day lag

** Estimated flow for PPWB Churchill site includes recorded flow at Sandy Bay and estimated inflow from Sandy Bay to the border.

*** Estimated flow for PPWB Saskatchewan site includes recorded flow at 05KJ001 minus flow at the Carrot River 05KH007.

The monitoring program was completed as approved by the Board (Appendix 1) with several exceptions.

On the Alberta/Saskatchewan boundary all 12 monthly samples were collected from all rivers as outlined in the approved monitoring plan. However, on this boundary several fecal coliform bacterial samples were not analyzed including on the Beaver, Red Deer and South Saskatchewan rivers in January and February 2014, as well as, in September for the Battle, Red Deer and the South Saskatchewan rivers. The pesticide Lindane was not sampled in February, April or May for the South Saskatchewan River. For the North Saskatchewan River, the acid herbicide samples were not collected in February and the May 2014 samples were lost in transit due to container breakage.

For the Saskatchewan/Manitoba boundary rivers, the October sampling events were not completed on the Churchill, Carrot, Red Deer and Saskatchewan rivers. In addition, two sampling events, in March and November, were not completed on the Qu'Appelle River. All other sampling events were conducted as planned.

On the Saskatchewan/Manitoba boundary, several metals were omitted from at least one to two of the sampling events. The metals omitted included arsenic, boron, iron, manganese, nickel, selenium and uranium.

For the Churchill River, arsenic, boron, iron, manganese and selenium were missing from the February samples, while for the Qu'Appelle, Carrot, Red Deer and Assiniboine rivers these metals were missing in September. Nickel was also not completed on the Assiniboine River in September. For the Saskatchewan River, aresenic, boron, iron, manganese, selenium and uranium were omitted in both February and September samples in2014.

The fecal coliform bacteria were also not counted on the Saskatchewan and Churchill rivers in February and the Assiniboine, Carrot, Qu'Appelle, Red Deer and Saskatchewan rivers in September. Fecal coliform bacteria were also not counted for the Assiniboine and Qu'Appelle rivers in October.

While the Assiniboine River was sampled in October, pesticides were not sampled during this sampling event and the field pH was not determined. It was also noted that several anomalies were reported for field pH on the Saskatchewan/Manitoba border and were not consistent with laboratory measurements.

The COWQ recommends that field sampling protocols be reviewed with field staff at the beginning of the season to minimize the occurrence of missed and/or anomalous sampling events and results. The amounts of missing and anomalous data in 2014 were unusual and follow up with field staff should help to resolve concerns with the implementation of the monitoring program in 2015.

For the Carrot River, samples were collected from the original monitoring location at Turnberry in January to May, August and December. However, an alternative sampling location was used in June, July, September and November. The alternative sampling location was approximately 35 kilometres downstream and was used due to health and safety concerns caused by high flows, steep slopes, and bank erosion at the Turnberry site. In November 2014, duplicate sampling was conducted at the two Carrot River locations (Turnberry and the alternative location) for comparison purposes but only the alternative downstream location was used in the excursion calculations for this month. Samples for November pesticide analyses were only collected from the Carrot River alternative site, which is why data from the alternative site were selected for inclusion in the excursion report.

Also of note in 2014 was that additional sampling events were conducted by Environment Canada during peak flows for three rivers in early July. This included an extra sample at the South Saskatchewan, Assiniboine and Qu'Appelle rivers. These sample results were reported in the excursion calculations for 2014.

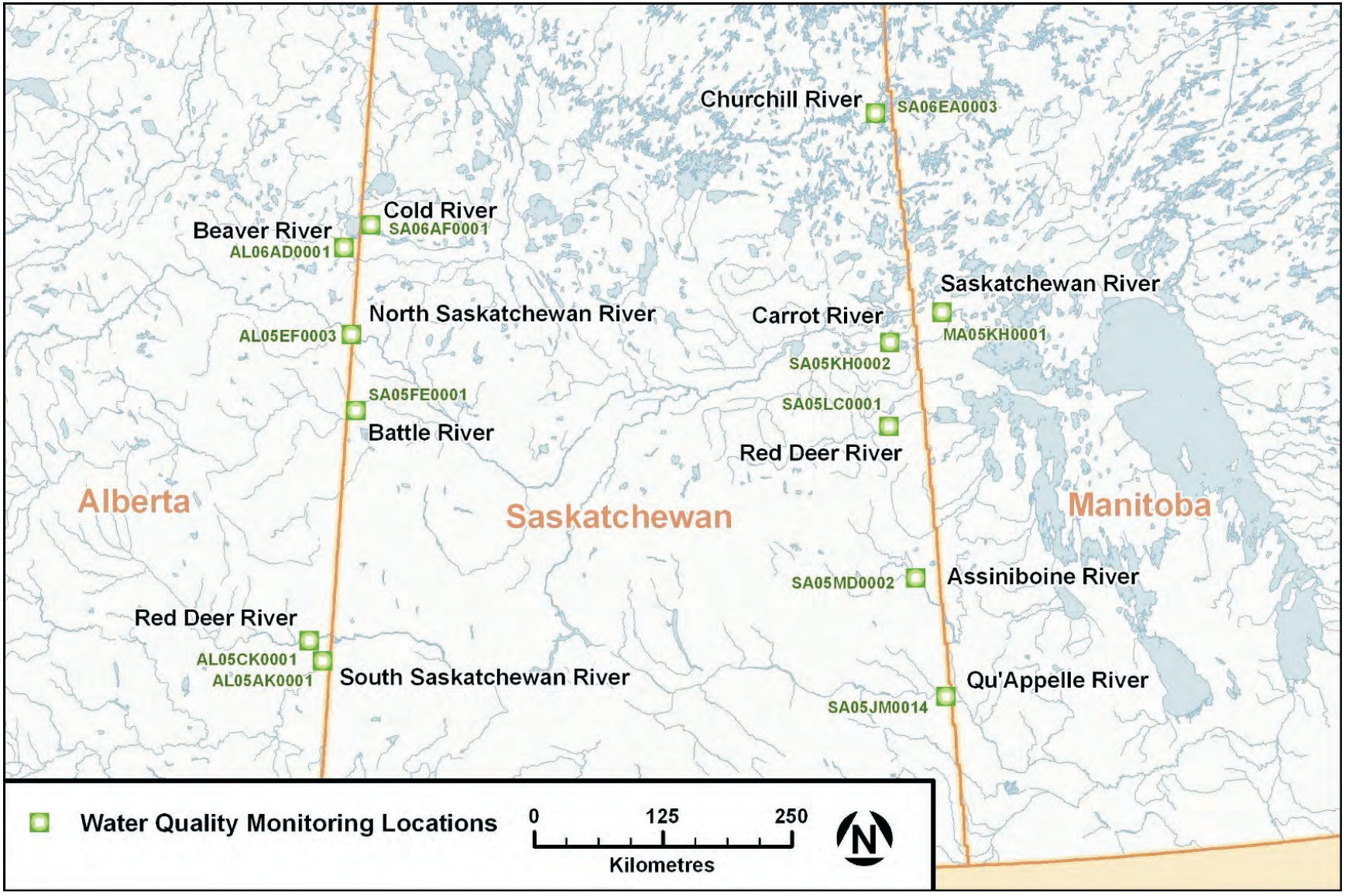


Figure 1 **PPWB Water Quality Monitoring Locations**

RESULTS AND DISCUSSION

Interprovincial water quality objectives have been established at the transboundary river reaches to protect for different water uses: aquatic life, treatability of source water, agricultural uses (irrigation and livestock watering), recreation and consumption of fish (Table 2). In this report, measured values are compared to the water use objectives. The ammonia (total) protection of aquatic life objective varies based on temperature and pH of the sample (Appendix 2).

Fish monitoring is currently not part of the routine monitoring program conducted at the sites. The data set of contaminants in fish for the transboundary sites has been compiled and a report has been drafted and is currently being reviewed. It is anticipated that a final report will be available in 2016.

Overall Adherence to Interprovincial Water Quality Objectives

The overall adherence rate to the interprovincial water quality objectives was, on average, 95% in 2014. The adherence rate is based on the comparison of 2,864 water quality results to water quality objectives. The adherence rates for the 11 rivers ranged from 88.45% for the Carrot River to 100% for the North Saskatchewan and Churchill rivers (Figure 2). Of the 11 transboundary river reaches, only the Carrot and Qu'Appelle rivers (on the Saskatchewan/Manitoba border) had an overall adherence rate of less than 90%. For the Carrot and the Qu'Appelle rivers, the lower adherence rate can be attributed primarily to excursions of manganese, total phosphorus, and salts (sodium, chloride and sulphate). There were also excursions of dissolved oxygen and copper on the Carrot River in 2014. Fecal coliform bacteria and dissolved oxygen each had one excursion on the Qu'Appelle River which occurred during an early July peak flow event.

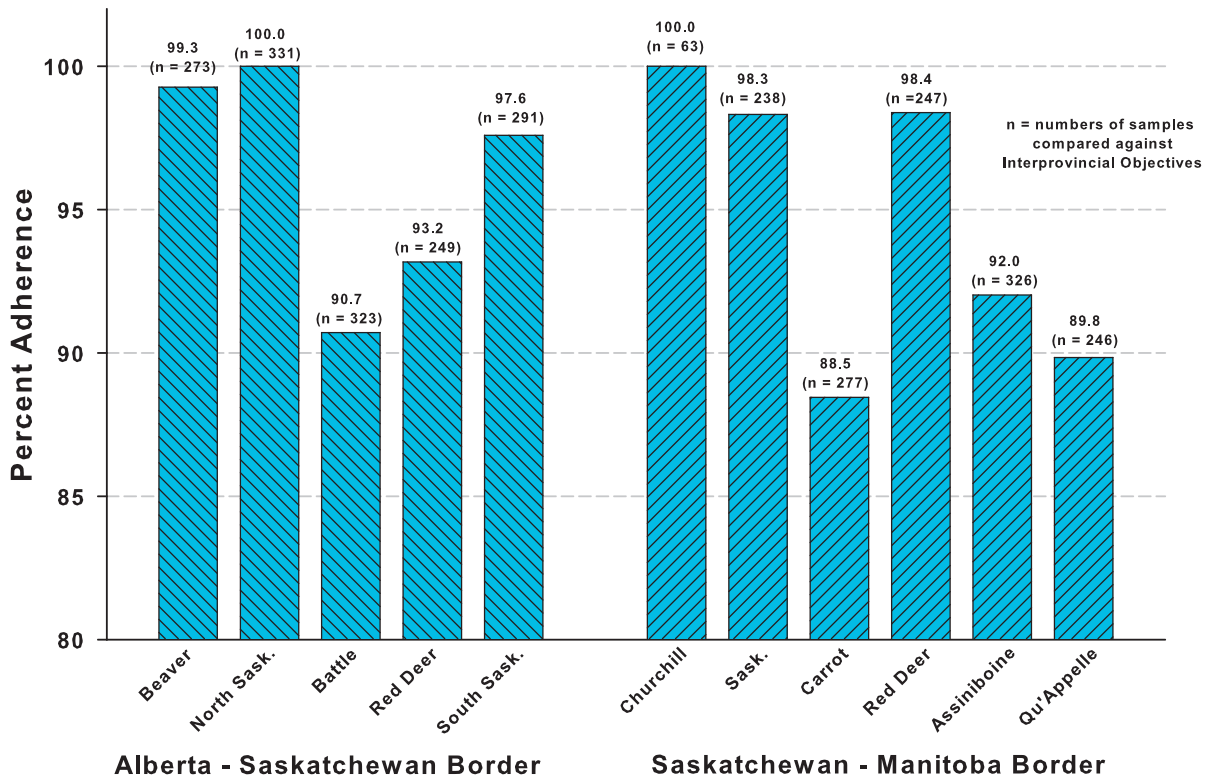


Figure 2 Percent Adherence to 1992 Interprovincial Water Quality Objectives in 2014.

Overall adherence rates from 2014 are similar to previous years (Figure 3). Most rivers show little variation in the adherence rate over the last 12 years (less than 5%). The Red Deer River (Alberta/Saskatchewan boundary) and the Qu'Appelle River have shown the greatest fluctuation in adherence rates among years. For the Red Deer River the greatest range in adherence rate occurred due to a low adherence rate in 2005 (89.3%) and a high adherence rate in 2006 (98.4%). The lower adherence rate in 2005 was attributed to an increase in the number of excursions for certain metals and bacteria. For the Qu'Appelle River the highest and lowest adherence rates over the last twelve years were observed in 2009 and 2004, respectively. The lower adherence rate for the Qu'Appelle River in 2004 was attributed, in part, to excursions in more parameters including total phosphorus, sodium and manganese, as well as, several dissolved oxygen readings were below the objective that year.

The adherence rates to interprovincial water quality objectives in 2014 for each of the 11 transboundary river sites were similar to the 12 year median excursion rates. The overall adherence rates did not highlight significant changes in water quality in 2014.

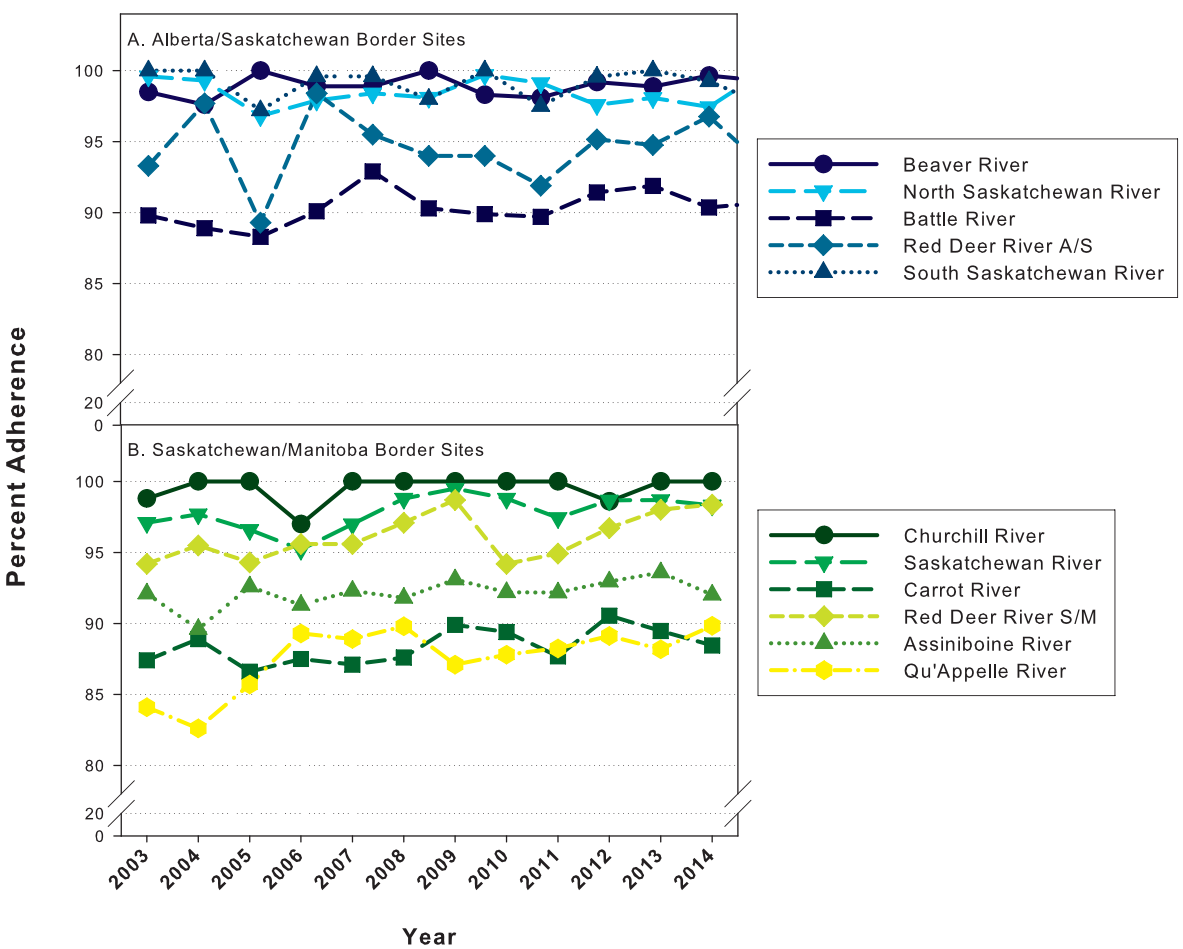


Figure 3 **Percent Adherence to 1992 Interprovincial Water Quality Objectives for the Alberta/Saskatchewan (A) and the Saskatchewan Manitoba (B) borders from 2003 to 2014.**

Parameter Specific Excursions in 2014

In 2014, a total of 14 parameters exhibited excursions to the interprovincial water quality objectives of which 9 exceeded objectives at more than one site (Table 5). Excursions were observed in most groups of variables (i.e. metals, nutrients, major ions, biota and physicals). Of these parameters, total phosphorus, manganese, sodium, and total dissolved solids (TDS) accounted for the majority of excursions (>20% excursions among all 11 river reaches). Total phosphorus concentrations exceeded water quality objectives at the Saskatchewan/Manitoba border at all but one site (Churchill River). Total phosphorus objectives were exceeded 100% of the time on the Assiniboine and Qu'Appelle rivers. This is not unexpected as total phosphorus has historically exceeded the total phosphorous objective of 0.05 mg/L for these two rivers. The Carrot River also showed a high (91%) excursion rate to the total phosphorus objective. This result is similar to the results reported over the last ten years for this river. Fewer total phosphorus excursions were noted on the Saskatchewan and Red Deer rivers. Background concentrations of total phosphorus are often naturally high in prairie river systems. In 2015, PPWB will adopt new interprovincial water quality objectives for nutrients, including seasonal objectives for total phosphorus, total dissolved phosphorus and total nitrogen at all transboundary river reaches including on the Alberta/Saskatchewan border. Nutrients have been identified as a priority for prairie river systems by all jurisdictions; consequently the COWQ will conduct further work to investigate potential sources of nutrients and identify watersheds or sub-watersheds at high risk. The Committee has initiated work on the Red Deer River (AB) and the Carrot River watersheds to assess point and non-point sources of nutrients to these transboundary rivers.

Concentrations of sodium exceeded objectives at three of the transboundary river reaches in 2014 including the Battle River, Carrot River and the Qu'Appelle River. Sodium excursions occurred on most sample dates for the Battle River and on half of the sample dates for the Qu'Appelle River. Excursions to the sodium objective on the Carrot River occurred throughout the ice covered winter months during low flow periods. Similarly, chloride was also observed to exceed the interprovincial water quality objective during low flow periods under ice cover (January, February, March, November and December) on the Carrot River. Sulphate concentrations were also close to the objective for most sample dates on the Qu'Appelle River, ranging from 297 mg/L to 524 mg/L, but only exceeded the objective in February 2014 under ice conditions.

Six metals exceeded interprovincial water quality objectives (copper, manganese, zinc, nickel, lead, and chromium). Manganese (dissolved) exceeded its objective at 6 of the 11 transboundary river reaches monitored in 2014. However, background concentrations of manganese are often naturally high in prairie river systems.

Other metal objective exceedances that occurred on the Alberta/Saskatchewan border included chromium (total), copper (total), nickel (total), lead (total) and zinc (total). For the Red Deer River at Bindloss all five of these metals exceeded water quality objectives in June 2014. Four of these metals (chromium (total), copper (total), nickel (total), and zinc (total)) exceeded water quality objectives on the South Saskatchewan River in June 2014. Excursions to the copper objective also occurred in April, May, August, September and November on the Red Deer River (Bindloss). For the South Saskatchewan River the copper objective was also exceeded in April. On the Red Deer River, zinc and lead also exceeded water quality objectives in April and November 2014. The Battle River also had excursions to copper (May and June) and zinc (May) in 2014.

For the Saskatchewan/Manitoba border, a number of objectives were exceeded in April 2014 on the Carrot River. The April sample was collected as spring flows were increasing (the rising limb of the hydrograph). The suspended solids concentration was substantially higher in April (300 mg/L) compared to the rest of the year (average = 23 mg/L). While total suspended solids does not presently have an objective it can provide insight into concentrations of other parameters, notably some metals and certain nutrients. In April there were excursions of copper, manganese, and total phosphorus on the Carrot River. The increase in total phosphorus in April was largely due to higher concentrations of particulate phosphorus. In

general, comparatively higher concentrations of total metals, as compared to dissolved forms, are observed in prairie rivers during high flow events when total suspended solids are elevated.

In 2014, several anomalies were reported in both the field and laboratory water quality data. This included an ammonia-nitrogen (total) value for the Saskatchewan River in November and several field pH measurements for the Churchill, Saskatchewan and Carrot rivers in February and again for the Carrot River in November.

For the ammonia-nitrogen value this was removed from the dataset since a review of the historical data notes that ammonia (total) has not previously exceeded the water quality objective for the protection of aquatic life in this river, and that the corresponding total nitrogen value was substantially lower that the ammonia nitrogen concentration. The COWQ interprets the ammonia-nitrogen concentration reported for November 2014 from this site as being an error. COWQ will continue to evaluate ammonia results and recommend additional actions if required.

For the pH values these were unexpectedly different from the typical range in pH for those rivers. The COWQ suspects that the field measurements are anomalies since the laboratory readings and other field measurements were within the expected range. The difference in field pH also did not occur in successive months. As a result, the field pH values were replaced with the laboratory values in those cases. The COWQ recommends that the protocol for calibration of field monitoring equipment be reviewed and corrective action implemented to improve confidence in field measurements.

Protective Water Use Excursions in 2014

Of the parameters with protection of aquatic life objectives, seven occasionally exceeded water quality objectives including four metals; copper (total), nickel (total), lead (total) and zinc (total), plus dissolved oxygen. Background concentrations of metals may be naturally high in prairie river systems and, as noted, exceedances of the water quality objectives may occur during high flow events when total suspended solids are elevated. Dissolved oxygen concentrations were occasionally below the interprovincial water quality objectives at three of the six rivers on the Saskatchewan/Manitoba border (Carrot River, Qu'Appelle, and the Assiniboine River). The Carrot River had low dissolved oxygen levels during the open water season in July and August, the Qu'Appelle River had low dissolved oxygen in July, while the Assiniboine River was reported to have low dissolved oxygen values throughout the winter (January, February and March), as well as in July. Periodic excursions of dissolved oxygen objectives have occurred in previous years, but usually in the winter under ice cover. The COWQ will continue to monitor summer dissolved oxygen concentrations in these three rivers and if a pattern of reduced dissolved oxygen concentrations continues during the summer months, the Committee will recommend further study.

Fecal coliform objectives for the protection of irrigation, livestock watering and recreation were occasionally exceeded in 2014. The overall excursion rate for fecal coliform bacteria was 8.7% in 2014. Fecal coliform bacteria exceeded objectives at 4 of the 11 transboundary river reaches, which is fewer than in 2013. On the Alberta/Saskatchewan border, the water quality objective for fecal coliform bacteria for the protection of irrigation/livestock use was exceeded three times each on the Battle River and Red Deer River, and twice on the South Saskatchewan River. For the Saskatchewan/Manitoba border one excursion of the water quality objective for irrigation/livestock watering (fecal coliform) occurred in the Qu'Appelle River. Sources of fecal coliform bacteria are numerous and include wildlife and pet waste, discharge of wastewater and runoff from agricultural activities. Occasional exceedances of fecal coliform objectives are not unexpected in surface waters, particularly in response to rainfall events that can transport fecal bacteria through runoff.

As noted previously, sodium and chloride also exceeded irrigation and livestock watering objectives in 2014. Sodium objectives were exceeded in 22% of samples collected. Excursions occurred at three of the PPWB sites, the Battle, Carrot and Qu'Appelle rivers. Chloride exceeded the irrigation and livestock watering objective in 5.2% of the samples collected in 2014, with all excursions occurring on the Carrot River.

Treatability objectives (for the protection of drinking water sources) for manganese, sulphate and total dissolved solids (TDS) were exceeded in 2014. For the Battle River (AB/SK boundary), TDS exceeded objectives in 10 of the 12 samples collected in 2014 and manganese concentrations were above the treatability objective twice for the Beaver River and three times for the Battle River. For the rivers on the Saskatchewan/Manitoba border, manganese exceedances occurred in 4 of the 6 rivers; the Carrot, Assiniboine, Qu'Appelle and Saskatchewan rivers. Manganese excursions on the Carrot, Assiniboine and Qu'Appelle rivers occurred in 50% or more of the samples. While, historically there has been some variability in the manganese concentrations reported for these three rivers, exceedances of the manganese treatability objective in over 50% of the samples collected within a year is not unusual. Sulphate concentration also exceeded the treatability objective in the Qu'Appelle River in February 2014. An exceedance of the sulphate objective in the Qu'Appelle River was also observed in 2013. Manganese, sulphate and total dissolved solids concentrations can have high background concentrations due to water chemistry and groundwater inputs but can also be influenced by activities in the watershed.

CONCLUSION

Interprovincial water quality objectives are set at the 11 transboundary river reaches to protect water uses for protection of aquatic life, agricultural uses, recreation, treatability of source water and consumption of fish. Interprovincial water quality objectives were met on average 95% of the time in 2014.

The adherence rate to interprovincial water quality objectives ranged from 100 (North Saskatchewan River and Churchill River) to 88.45% (Carrot River), indicating that water quality was suitable for the majority of the intended water uses for these rivers. Generally, each of the 11 transboundary river reaches has shown little variation in their adherence rates over the past 12 years.

Interprovincial water quality objectives were most frequently exceeded for total phosphorus, dissolved manganese, and dissolved sodium (overall excursion rate greater than 20%). In total, interprovincial water quality objectives were exceeded for 14 parameters in 2014. Of these, 9 were exceeded at more than one site.

Concentrations of total phosphorus, dissolved manganese and other parameters can be influenced by various natural and anthropogenic factors (e.g., seasonal runoff and flow, land use and point source effluents).

Interprovincial water quality objectives have been reviewed for all transboundary river reaches. The jurisdictions have undertaken a review of the proposed objectives and implementation of updated water quality objectives is anticipated in 2015. Current activities of the Committee on Water Quality include further review of excursions to the approved interprovincial water quality objectives and prioritization of any potential issues for further consideration or other actions. Several areas have been flagged by the COWQ for further investigation or analysis. Nutrients have been assessed as a priority. While nutrients have been assigned the highest priority in all transboundary watersheds, there is a focus on investigating nutrient levels in two transboundary watersheds as a pilot program; the Red Deer River (AB/SK) and Carrot River watersheds.

Table 2 Summary of 1992 Interprovincial Water Quality Objectives by Transboundary River Reach

INTERPROVINCIAL WATER QUALITY OBJECTIVES: MASTER AGREEMENT SCHEDULE E

1 of 2

LOCATION		ALBERTA / SASKATCHEWAN BORDER				
SITE		BEAVER RIVER	NORTH SASK. RIVER	BATTLE RIVER	RED DEER RIVER A/S	SOUTH SASK. RIVER
PPWB REPORT SITE NUMBER		2	3	4	5	6
METALS	**UNITS**					
ALUMINUM (total)	mg/L	---	5	5	---	---
ARSENIC (diss)	mg/L	0.05	0.05	0.05	0.05	0.05
BARIUM (total)	mg/L	1	1	1	1	1
BORON (diss)	mg/L	5	5	5	5	5
CADMIUM (total)	mg/L	0.001	0.001	0.001	0.001	0.001
CHROMIUM (total)	mg/L	0.011	0.011	0.011	0.011	0.011
COBALT	mg/L	---	0.05	0.05	1	1
COPPER (total)	mg/L	0.004	0.004	0.004	0.004	0.01
CYANIDE (free)	mg/L	0.005	0.005	0.005	0.005	0.005
IRON (diss)	mg/L	1	0.3	0.3	0.3	1
LEAD (total)	mg/L	0.007	0.007	0.007	0.007	0.02
MANGANESE (diss)	mg/L	0.2	0.05	0.05	0.05	0.05
MERCURY (total)	ng/L	---	---	---	---	---
NICKEL (total)	mg/L	0.1	0.1	0.1	0.025	0.025
SELENIUM (diss)	mg/L	0.001	0.001	0.001	0.001	0.002
SILVER (total)	mg/L	0.0001	---	---	---	---
URANIUM	mg/L	0.02	0.02	0.02	---	---
VANADIUM (TOTAL)	mg/L	---	0.1	0.1	0.1	0.1
ZINC (total)	mg/L	0.03	0.03	0.03	0.03	0.05
NUTRIENTS						
AMMONIA (total)	mg/L	APPENDIX 1	APPENDIX 1	APPENDIX 1	APPENDIX 1	APPENDIX 1
NO2+NO3 (as N)	mg/L	10	10	10	10	10
PHOSPHORUS (total)	mg/L	---	---	---	---	---
MAJOR IONS						
CHLORIDE (diss.)	mg/L	100	100	100	---	---
FLUORIDE (diss)	mg/L	1.5	1.5	1.5	1.5	1.5
SODIUM (diss)	mg/L	100	100	100	---	---
SULPHATE (diss)	mg/L	500	500	500	500	500
TOTAL DISS. SOLIDS	mg/L	---	500	500	500	500
BIOTA						
FECAL COLIFORM	MPN/dL	100/100ml	100/100ml	100/100ml	100/100ml	100/100ml
PHYSICALS						
pH	pH Units	6.5-9.0	6.5-9.0	6.5-9.0	---	---
OXYGEN (diss)	mg/L	OW 6.0	6.5	OW 6.0	---	---
SAR	mg/L	---	---	---	3	3
PESTICIDES/CONTAMINANTS						
LINDANE	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001
2,4-D	mg/L	0.004	0.004	0.004	0.004	0.004
2,4,5-TP	mg/L	0.01	0.01	0.01	0.01	0.01
CHLORINE	mg/L	0.002	0.002	0.002	---	---
CHLOROPHENOLS (total)	mg/L	0.001	0.001	0.001	0.001	0.001
PCP	mg/L	0.0005	0.0005	0.0005	---	---
MERCURY IN FISH	ug/g TISSUE	0.5	0.5	0.5	0.5	0.5
PCB IN FISH	ug/g TISSUE	2	2	2	2	2
RADIOACTIVE						
CESIUM-137	Bq/L	---	---	---	---	---
IODINE-131	Bq/L	---	---	---	---	---
RADIUM-226	Bq/L	---	---	---	---	---
STRONTIUM-90	Bq/L	---	---	---	---	---
TRITIUM	Bq/L	---	---	---	---	---

Protection of Aquatic Life
Treatability
Irrigation/Livestock
Recreation
Fish Consumption

Notes:
= --- No PPWB Objectives
OW = Open Water Objectives

Table 2 Summary of 1992 Interprovincial Water Quality Objectives by Transboundary River Reach (continued)

INTERPROVINCIAL WATER QUALITY OBJECTIVES: MASTER AGREEMENT SCHEDULE E

2 of 2

LOCATION		SASKATCHEWAN / MANITOBA BORDER					
SITE		CHURCHILL RIVER	SASK. RIVER	CARROT RIVER	RED DEER RIVER S/M	ASSINIBOINE RIVER	QU'APPELLE RIVER
PPWB REPORT SITE NUMBER		7	8	9	10	11	12
METALS	UNITS						
ALUMINUM (total)	mg/L	---	---	---	---	---	---
ARSENIC (diss)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05
BARIUM (total)	mg/L	1	1	1	1	1	1
BORON (diss)	mg/L	5	0.5	2	5	2	2
CADMIUM (total)	mg/L	0.00058	0.001	0.001	0.00058	0.001	0.001
CHROMIUM (total)	mg/L	0.011	0.011	0.011	0.011	0.011	0.011
COBALT	mg/L	---	---	---	---	---	---
COPPER (total)	mg/L	0.0057	0.01	0.01	0.01	0.01	0.01
CYANIDE (free)	mg/L	0.005	0.005	0.005	0.005	0.005	0.005
IRON (diss)	mg/L	0.3	0.3	0.3	0.3	0.3	0.3
LEAD (total)	mg/L	0.011	0.0061	0.015	0.0118	0.02	0.02
MANGANESE (diss)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05
MERCURY (total)	ug/L	---	---	---	---	---	0.006
NICKEL (total)	mg/L	0.025	0.1	0.1	0.1	0.1	0.1
SELENIUM (diss)	mg/L	0.01	0.01	0.01	0.01	0.01	0.01
SILVER (total)	mg/L	---	---	---	---	---	---
URANIUM	mg/L	0.02	0.02	0.02	0.02	0.02	0.02
VANADIUM (TOTAL)	mg/L	---	---	---	---	---	---
ZINC (total)	mg/L	0.047	0.047	0.047	0.047	0.047	0.047
NUTRIENTS							
AMMONIA (total)	mg/L	APPENDIX 1	APPENDIX 1	APPENDIX 1	APPENDIX 1	APPENDIX 1	APPENDIX 1
NO2+NO3 (as N)	mg/L	10	10	10	10	10	10
PHOSPHORUS (total)	mg/L	0.05	0.05	0.05	0.05	0.05	---
MAJOR IONS							
CHLORIDE (diss.)	mg/L	250	68	100	100	100	100
FLUORIDE (diss)	mg/L	1.5	1	1	1	1	1
SODIUM (diss)	mg/L	300	100	100	100	100	100
SULPHATE (diss)	mg/L	500	250	500	500	500	500
TOTAL DISS. SOLIDS	mg/L	---	---	---	---	---	---
BIOTA							
FECAL COLIFORM	MO/dL	200/100ml	200/100ml	200/100ml	200/100ml	200/100ml	100/100ml
PHYSICALS							
pH	pH Units	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
OXYGEN (diss)	mg/L	6.5	6.5	OW 6.5	6	6	6
SAR	mg/L	---	---	---	---	---	---
PESTICIDES/CONTAMINANTS							
LINDANE	mg/L	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008
2,4-D	mg/L	0.004	0.004	0.004	0.004	0.004	0.004
2,4,5-TP	mg/L	0.01	0.01	0.01	0.01	0.01	0.01
CHLORINE	mg/L	0.002	0.002	0.002	0.002	0.002	0.002
CHLOROPHENOLS (total)	mg/L	0.001	0.001	0.001	0.001	0.001	0.001
PCP	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
MERCURY IN FISH	ug/g TISSUE	0.2	0.2	0.5	0.5	0.5	0.5
PCB IN FISH	ug/g TISSUE	2	2	2	2	2	2
RADIOACTIVE							
CESIUM-137	Bq/L	50	50	50	50	50	50
IODINE-131	Bq/L	10	10	10	10	10	10
RADIUM-226	Bq/L	1	1	1	1	1	1
STRONTIUM-90	Bq/L	10	10	10	10	10	10
TRITIUM	Bq/L	40000	40000	40000	40000	40000	40000

Protection of Aquatic Life
Treatability
Irrigation/Livestock
Recreation
Fish Consumption

Notes:
= --- No PPWB Objectives
OW = Open Water Objectives

Table 3 Summary of Excursions for the Alberta - Saskatchewan Border 2014

LOCATION	ALBERTA / SASKATCHEWAN BORDER				
SITE	BEAVER RIVER	NORTH SASK. RIVER	BATTLE RIVER	RED DEER RIVER A/S	SOUTH SASK. RIVER
PPWB REPORT SITE NUMBER	2	3	4	5	6
	number exursions (number of tests)				
METALS					
ALUMINUM (total)	---	0	0	---	---
ARSENIC (diss)	0	0	0	0	0
BARIUM (total)	0	0	0	0	0
BORON (diss)	0	0	0	0	0
CADMIUM (total)	0	0	0	0	0
CHROMIUM (total)	0	0	0	1 (12)	1 (13)
COBALT	---	0	0	0	0
COPPER (total)	0	0	2 (12)	6 (12)	2 (13)
CYANIDE (free)	ND	ND	ND	ND	ND
IRON (diss)	0	0		0	0
LEAD (total)	0	0	0	3 (12)	0
MANGANESE (diss)	2 (12)	0	3 (12)	0	0
MERCURY (total)	---	---	---	---	---
NICKEL (total)	0	0	0	1 (12)	1 (13)
SELENIUM (diss)	0	0	0	0	0
SILVER (total)	0	---	---	---	---
URANIUM	0	0	0	---	---
VANADIUM (TOTAL)	---	0	0	0	0
ZINC (total)	0	0	1 (12)	3 (12)	1 (13)
NUTRIENTS					
AMMONIA (total)	0	0	0	0	0
NO2+NO3 (as N)	0	0	0	0	0
PHOSPHORUS (total)	---	---	---	---	---
MAJOR IONS					
CHLORIDE (diss.)	0	0	0	---	---
FLUORIDE (diss)	0	0	0	0	0
SODIUM (diss)	0	0	11 (12)	---	---
SULPHATE (diss)	0	0	0	0	0
TOTAL DISS. SOLIDS	---	0	10 (12)	0	0
BIOTA					
FECAL COLIFORM	0	0	3 (12)	3 (9)	2 (10)
PHYSICALS					
pH	0	0	0	---	---
OXYGEN (diss)	0	0	0	---	---
SAR	---	---	---	0	0
PESTICIDES/CONTAMINANTS					
LINDANE	0	0	ND	ND	0
2,4-D	0	0	0	ND	0
2,4,5-TP (Silvex)	0	0	0	ND	0
CHLORINE	ND	ND	ND	---	---
CHLOROPHENOLS (total)	ND	ND	ND	ND	ND
PCP	ND	ND	ND	---	---
MERCURY IN FISH	ND	ND	ND	ND	ND
PCB IN FISH	ND	ND	ND	ND	ND
RADIOACTIVE					
CESIUM-137	---	---	---	---	---
IODINE-131	---	---	---	---	---
RADIUM-226	---	---	---	---	---
STRONTIUM-90	---	---	---	---	---
TRITIUM	---	---	---	---	---
No. Excursion Comparisons	**273**	**331**	**323**	**249**	**291**
Total No. Excursions Observed	**2**	**0**	**30**	**17**	**7**
Sampling Frequency (no./year)	**12**	**12**	**12**	**12**	**13**
Overall Adherence Rate	**99.27**	**100**	**90.71**	**93.17**	**97.59**

"---" = no objective

ND = no data to compare to objective; PPWB approved monitoring plan for 2014 did not include these parameters

*** Fecal Coliform and/or Pesticide sampling frequency reduced to 8X per year during open water.**

Table 4 Summary of Excursions for the Saskatchewan - Manitoba Border 2014

LOCATION	SASKATCHEWAN / MANITOBA BORDER					
SITE	CHURCHILL RIVER	SASK. RIVER	CARROT RIVER	RED DEER RIVER S/M	ASSINIBOINE RIVER	QU'APPELLE RIVER
PPWB REPORT SITE NUMBER	7	8	9	10	11	12
	number excursions / (number of tests)					
METALS						
ALUMINUM (total)	---	---	---	---	---	---
ARSENIC (diss)	0	0	0	0	0	0
BARIUM (total)	0	0	0	0	0	0
BORON (diss)	0	0	0	0	0	0
CADMIUM (total)	0	0	0	0	0	0
CHROMIUM (total)	0	0	0	0	0	0
COBALT	---	---	---	---	---	---
COPPER (total)	0	0	1 (11)	0	0	0
CYANIDE (free)	ND	ND	ND	ND	ND	ND
IRON (diss)	0	0	0	0	0	0
LEAD (total)	0	0	0	0	0	0
MANGANESE (diss)	0	1 (9)	10 (10)	0	9 (12)	5 (10)
MERCURY (total)	---	---	---	---	---	ND
NICKEL (total)	0	0	0	0	0	0
SELENIUM (diss)	0	0	0	0	0	0
SILVER (total)	---	---	---	---	---	---
URANIUM	0	0	0	0	0	0
VANADIUM (TOTAL)	---	---	---	---	---	---
ZINC (total)	0	0	0	0	0	0
NUTRIENTS						
AMMONIA (total)	0	0	0	0	0	0
NO2+NO3 (as N)	0	0	0	0	0	0
PHOSPHORUS (total)	0	3 (11)	10 (11)	4 (11)	13 (13)	11 (11)
MAJOR IONS						
CHLORIDE (diss.)	0	0	5 (11)	0	0	0
FLUORIDE (diss)	0	0	0	0	0	0
SODIUM (diss)	0	0	4 (11)	0	0	6 (11)
SULPHATE (diss)	0	0	0	0	0	1 (11)
TOTAL DISS. SOLIDS	---	---	---	---	---	---
BIOTA						
FECAL COLIFORM	0	0	0	0	0	1 (9)
PHYSICALS						
pH	0	0	0	0	0	0
OXYGEN (diss)	0	0	2 (8)	0	4 (13)	1 (11)
SAR	---	---	---	---	---	---
PESTICIDES/CONTAMINANTS						
LINDANE	ND	ND	0	ND	0	ND
2,4-D	ND	ND	0	ND	0	ND
2,4,5-TP (Silvex)	ND	ND	0	ND	0	ND
CHLORINE	ND	ND	ND	ND	ND	ND
CHLOROPHENOLS (total)	ND	ND	ND	ND	ND	ND
PCP	ND	ND	ND	ND	ND	ND
MERCURY IN FISH	ND	ND	ND	ND	ND	ND
PCB IN FISH	ND	ND	ND	ND	ND	ND
RADIOACTIVE						
CESIUM-137	ND	ND	ND	ND	ND	ND
IODINE-131	ND	ND	ND	ND	ND	ND
RADIUM-226	ND	ND	ND	ND	ND	ND
STRONTIUM-90	ND	ND	ND	ND	ND	ND
TRITIUM	ND	ND	ND	ND	ND	ND
No. Excursion Comparisons	**63**	**238**	**277**	**247**	**326**	**246**
Total No. Excursions Observed	**0**	**4**	**32**	**4**	**26**	**25**
Sampling Frequency (no./year)	**3**	**11**	**11**	**11**	**13**	**11**
Overall Adherence Rate	**100.0**	**98.32**	**88.45**	**98.38**	**92.02**	**89.84**

"---" = no objective

ND = no data to compare to objective; PPWB approved monitoring plan for 2014 did not include these parameters

*** Fecal Coliform and/or Pesticide sampling frequency reduced to 8X per year during open water.**

Table 5 **Summary of 2014 Excursions by Parameter.** *(Parameters and sites with % excursions > 20 are highlighted in grey. Blank cells are parameters with no excursions in 2014).*

		EXCURSION SUMMARY		SITE SUMMARY	
Parameters	**Protective Uses**	TOTAL NUMBER EXCURSIONS (# SAMPLES)	% EXCURSIONS	NUMBER SITES WITH EXCURSIONS (# SITES)	% SITES WITH EXCURSIONS
METALS					
ALUMINUM (total)					
ARSENIC (diss)					
BARIUM (total)					
BORON (diss)					
CADMIUM (total)					
CHROMIUM (total)	**Protection of Aquatic Life**	**2 (121)**	**1.7**	**2 (11)**	**18.2**
COBALT					
COPPER (total)	**Protection of Aquatic Life**	**11 (121)**	**9.1**	**4 (11)**	**36.4**
CYANIDE (free)					
IRON (diss)					
LEAD (total)	**Protection of Aquatic Life**	**3 (121)**	**2.5**	**1 (11)**	**9.1**
MANGANESE (diss)	**Treatability/Irr/Livestock**	**30 (114)**	**26.3**	**6 (11)**	**54.5**
MERCURY (total)					
NICKEL (total)	**Protection of Aquatic Life**	**2 (121)**	**1.7**	**2 (11)**	**18.2**
SELENIUM (diss)					
SILVER (total)					
URANIUM					
VANADIUM (TOTAL)					
ZINC (total)	**Protection of Aquatic Life**	**5 (121)**	**4.1**	**3 (11)**	**27.3**
NUTRIENTS					
AMMONIA (total)					
NO2+NO3 (as N)					
PHOSPHORUS (total)	**Recreation**	**41 (60)**	**68.3**	**5 (6)**	**83.3**
MAJOR IONS					
CHLORIDE (diss.)	**Irrigation/Livestock**	**5 (96)**	**5.2**	**1 (9)**	**11.1**
FLUORIDE (diss)					
SODIUM (diss)	**Irrigation/Livestock**	**21 (96)**	**21.9**	**3 (9)**	**33.3**
SULPHATE (diss)	**Treatability**	**1 (121)**	**0.8**	**1 (11)**	**9.1**
TOTAL DISS. SOLIDS	**Treatability**	**10 (49)**	**20.4**	**1 (4)**	**25.0**
BIOTA					
FECAL COLIFORM	**Irrigation/Livestock/Recreation**	**9 (104)**	**8.7**	**4 (11)**	**40.0**
PHYSICALS					
pH					
OXYGEN (diss)	**Protection of Aquatic Life**	**7 (85)**	**8.2**	**3 (9)**	**33.3**
SAR					
PESTICIDES/ CONTAMINANTS					
LINDANE					
2,4-D					
2,4,5-TP					
CHLORINE		*na*	*na*	*na*	*na*
CHLOROPHENOLS (total)		*na*	*na*	*na*	*na*
PCP		*na*	*na*	*na*	*na*
MERCURY IN FISH		*na*	*na*	*na*	*na*
PCB IN FISH		*na*	*na*	*na*	*na*
RADIOACTIVE					
CESIUM-137		*na*	*na*	*na*	*na*
IODINE-131		*na*	*na*	*na*	*na*
RADIUM-226		*na*	*na*	*na*	*na*
STRONTIUM-90		*na*	*na*	*na*	*na*
TRITIUM		*na*	*na*	*na*	*na*

APPENDIX 1: PPWB 2014 Water Quality Monitoring Program

PPWB MONITORING 2014: A/S Sites

SITE	NUTRIENTS & PHYSICALS	MAJOR IONS/ SAR	METALS (Total and Dissolved)	BACTERIA (Fecal & E. Coli)	PESTICIDES (AH, NH, OC's, Glyphosate)
Site 1 Cold River	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014: 12x / year	2014: 8x/year[1]
	2013 : 12x / year	2013 : 12x / year	2013 : 12x / year	2013 : 12x/ year	2013 : none
Site 2 Beaver River	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014 : 12x/ year	2014 : none
	2013 : 12x / year	2013 : 12x / year	2013 : 12x / year	2013 : 8x/ year [ow]	2013: 8x/year[1]
Site 3 North Sask. River	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014 : 8x/year[1]
	2013 : 12x / year	2013 : 12x / year	2013 : 12x / year	2013 : 12x / year	2013 : none
Site 4 Battle River	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014: 8x/year[2]
	2013: 12x / year	2013 : 12x / year	2013 :12x / year	2013 : 12x / year	2013 : 8x/year[2]
Site 5 Red Deer River A/S	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014 : 12x/ year	2014 : none
	2013 : 12x / year	2013 : 12x / year	2013 :12x / year	2013 : 8x / year [ow]	2013 : none
Site 6 South Sask	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014 : 12x/year	2014 : 8x/year[1]
	2013 : 12x / year	2013 : 12x / year	2013 :12x / year	2013 : 8x/year [ow]	2013 : 8x/year[2]

[ow] = open water sampling only, Apr-Nov;
[1]Months sampled = Feb, Apr, May, June, July, Aug, Oct, Dec
[2]Pesticides = Acid Herbicides (AH) only
Pesticides: (AH = Acid Herbicides; NH = Neutral Herbicides; OC's = Organochlorine)

PPWB MONITORING 2014: S/M Sites

SITE	NUTRIENTS & PHYSICALS	MAJOR IONS/ SAR	METALS (Total and Dissolved)	BACTERIA (Fecal & E. Coli)	PESTICIDES (AH, NH, OC's, Glyphosate)
Site 7 Churchill[1]	2014 : 4x / year	2014 : 4x / year	2014 : 4x / year	2014 : 4x / year	2014: none
	2013 : 4x / year	2013 : 4x / year	2013 : 4x / year	2013 : 4x/ year	2013: 4x /year
Site 8 Saskatchewan River	2014: 12x / year	2014: 12x / year	2014: 12x / year	2014: 12x / year	2014: none
	2013: 12x / year	2013: 12x / year	2013:12x / year	2013: 12 x/ year	2013: none
Site 9 Carrot River	2014: 12x / year	2014: 12x / year	2014: 12x / year	2014: 12x / year	2014: 12x / year
	2013: 12x / year	2013: 12x / year	2013: 12x / year	2013: 8x / year [ow]	2013: 12x / year
Site 10 Red Deer River S/M	2014: 12x / year	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014 : none
	2013: 12x / year	2013 : 12x / year	2013 : 12x / year	2013 : 12x / year	2013 : 8 x / year[2]
Site 11 Assiniboine River	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014 : 12 x / year
	2013 : 12x / year	2013 : 12x / year	2013 : 12x / year	2013 : 12 x/ year	2013 : 12 x/ year
Site 12 Qu'Appelle River	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014 : 12x / year	2014 : none
	2013 : 12x / year	2013 : 12x / year	2013 : 12x / year	2013 : 8x / year [ow]	2013 : none

[ow] = open water sampling only, Apr-Nov;
[1] Months sampled = Feb, May, July, Oct;
[2] Months sampled = Feb, Apr, May, June, July, Aug, Oct, Dec
Pesticides: (AH = Acid Herbicides; NH = Neutral Herbicides; OC's = Organochlorine)

APPENDIX 2: Total Ammonia Objectives Based on Temperature and pH

Total Ammonia Nitrogen (mg/L) **

The toxicity of ammonia relates primarily to the un-ionized form (NH3). The concentration of un-ionized ammonia present in water increases with pH and temperature. The values below represent total ammonia-nitrogen concentrations (at various temperatures and pH levels) above which accompanying NH3 concentrations may be harmful to aquatic life.

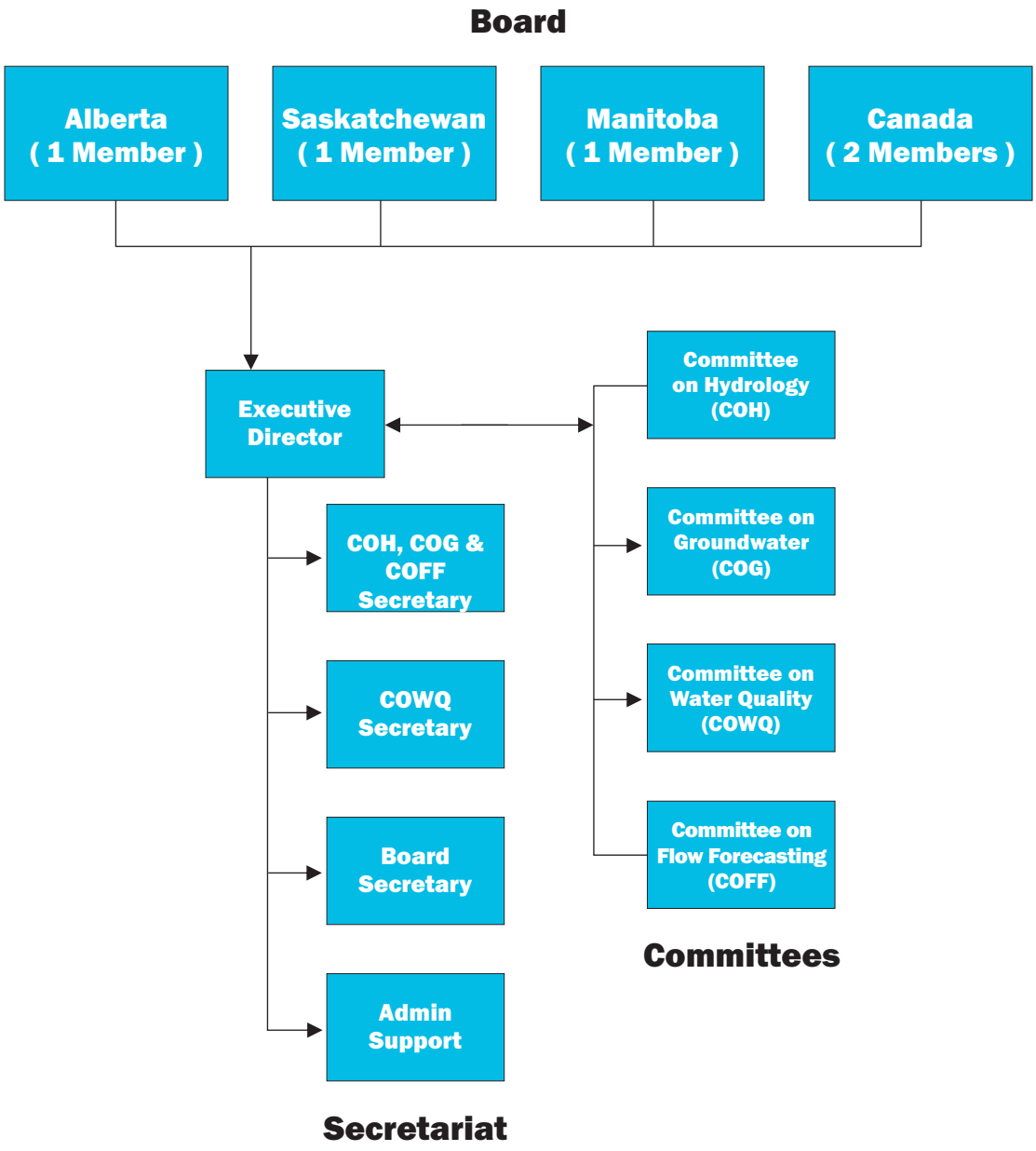
Total Ammonia (NH3 + Nh4+)

(Maximum levels expressed as N at various pH/temperature conditions)

Toxicity of Ammonia under varying Temperature and pH Conditions Water Temperature (°C) / pH (pH units)							
	0°	5°	10°	15°	20°	25°	30°
6.50	2.06	1.97	1.81	1.81	1.22	0.85	0.60
6.75	2.06	1.97	1.81	1.81	1.22	0.85	0.61
7.00	2.06	1.97	1.81	1.81	1.22	0.85	0.61
7.25	2.06	1.97	1.81	1.81	1.23	0.86	0.61
7.50	2.06	1.97	1.81	1.81	1.23	0.87	0.62
7.75	1.89	1.81	1.73	1.64	1.15	0.81	0.58
8.00	1.26	1.18	1.13	1.09	0.76	0.54	0.39
8.25	0.72	0.67	0.64	0.62	0.44	0.32	0.23
8.50	0.40	0.39	0.37	0.37	0.26	0.19	0.15
8.75	0.23	0.22	0.21	0.22	0.16	0.12	0.09
9.00	0.13	0.13	0.13	0.13	0.11	0.08	0.06

** Excerpt from the "Surface Water Quality Objectives", Water Quality Branch Saskatchewan Environment and Public Safety, November, 1988 (WQ 110)

APPENDIX V: PPWB Organizational Chart



APPENDIX VI: Board / Committee Membership 2014 - 2015

PRAIRIE PROVINCES WATER BOARD

Manitoba, Saskatchewan, Alberta and Canada agree to establish and there is hereby established a Board to be known as the Prairie Provinces Water Board to consist of five members to be appointed as follows:

(a) two members to be appointed by the Governor General in Council, one of whom shall be Chairman of the Board, on the recommendation of the Minister of Energy, Mines and Resources,

(b) one member to be appointed by the Lieutenant Governor in Council of each of the Provinces of Manitoba, Saskatchewan and Alberta.

Schedule C, Section 1
Master Agreement on Apportionment

PPWB BOARD MEMBERS

CHAIR	Cheryl Baraniecki (Nov/13 to May/14)	Associate Regional Director General West & North Environment Canada
	Richard Smith (Beginning Jun/14)	A/Associate Regional Director General West & North Environment Canada
	Lynden Hillier	Director General Asset Management and Capital Planning Corporate Management Branch Agriculture and Agri-Food Canada
	Brian Yee (Beginning Jul/14)	Director Transboundary Secretariat Alberta Environment and Parks (formerly Alberta Environment and Sustainable Resource Development)
	Steve D. Topping	Executive Director Hydrologic Forecasting & Water Management Water Management & Structures Division Manitoba Infrastructure and Transportation
	Jim Gerhart	Associate Executive Director Water Security Agency (Saskatchewan)

SECRETARIAT

EXECUTIVE DIRECTOR	Mike Renouf	Transboundary Waters Unit Environment Canada
SECRETARY	Lynne Quinnett-Abbott	Transboundary Waters Unit Environment Canada

PPWB ALTERNATE BOARD MEMBERS

Vacant	Environment Canada
Scott Roy	Director, Water Infrastructure Division Corporate Management Branch Agriculture and Agri-Food Canada
Carmen de la Chevrotière (Beginning Aug/14)	Transboundary Water Quantity Specialist Transboundary Secretariat Alberta Environment and Parks (formerly Alberta Environment and Sustainable Resource Development)
Brian Yee (Mar/11 to Jul/14)	Transboundary Water Specialist Alberta Environment and Parks (formerly Alberta Environment and Sustainable Resource Development)
Bill Duncan	Executive Director Engineering and Geoscience Division Water Security Agency (Saskatchewan)
Nicole Armstrong	Director Water Science and Management Manitoba Conservation and Water Stewardship

COMMITTEE ON HYDROLOGY

Terms of Reference: Mandate

At the request of, and under the direction of the PPWB, the Committee on Hydrology (COH) shall investigate, oversee, review, report and recommend on matters pertaining to hydrology of interprovincial or interjurisdictional basins.

The committee may consider such things as natural flow; forecasting; network design; collection, processing and transmission of data; basin studies and other items of interprovincial interest involving hydrology.

The COH will engage the Committee on Groundwater and the Committee on Water Quality on items of mutual interest or when the expertise of those committees will assist the COH.

PPWB Board Minute 92-65 (Oct. 7, 2009)

CHAIR	Mike Renouf	Executive Director Prairie Provinces Water Board
MEMBERS	Malcolm Conly (Beginning Mar/15)	Hydrometric Operations Environment Canada, Hydrometric
	Ron Woodvine	Corporate Management Branch Agriculture and Agri-Food Canada
	Carmen de la Chevrotière	Transboundary Secretariat Alberta Environment and Parks (formerly Alberta Environment and Sustainable Resource Development)
	Mark Lee	Surface Water Management Section Manitoba Conservation and Water Stewardship
	Bart Oegema	Hydrology Services Water Security Agency (Saskatchewan)
	Anthony Liu	Meteorological Service of Canada Environment Canada, Meteorological
SECRETARY	Megan Garner	Transboundary Waters Unit Environment Canada

COMMITTEE ON WATER QUALITY

Terms of Reference: Mandate

Under the direction of the Prairie Provinces Water Board (PPWB), the Committee on Water Quality (COWQ) shall investigate, oversee, review, report, recommend and advise the Board on matters pertaining to the water quality and aquatic ecosystem integrity of interprovincial waters.

The responsibilities of the committee shall include directing, planning, and coordinating a water quality monitoring and trend assessment program by identifying monitoring requirements and overseeing transboundary monitoring and synoptic surveys. The committee shall promote an ecosystem approach to water quality management and the protection and enhancement of interprovincial waters by ensuring the compatibility of water quality guidelines, objectives, sampling and analytical protocols, monitoring approaches, quality assurance and data bases. It shall interpret data and identify, investigate and define existing and potential interprovincial water quality problems through the application of PPWB Water Quality Objectives, trend assessment and other approaches. The committee shall inform the Board and member agencies, through the PPWB contingency plan, of any spills or unusual water quality conditions that have the potential to adversely affect interprovincial streams. It shall assess the implications of these problems and may recommend remedial or preventative measures for avoiding and resolving water quality issues and if required, additional synoptic water quality monitoring.

The committee shall foster awareness and understanding of the importance of effective water quality management, encourage the use of "state of the art" procedures for evaluating water quality and identify research needs pertinent to water quality management on the prairies. The committee shall facilitate effective water quality management practices through integration of agency initiatives and the promotion of joint planning on interprovincial streams.

The COWQ will engage the Committee on Hydrology and the Committee on Groundwater on items of mutual interest or when the expertise of those committees will assist COWQ.

PPWB Board Minute 92-65 (Oct. 7, 2009)

CHAIR	Mike Renouf	Executive Director Prairie Provinces Water Board
MEMBERS	Paul Klawunn	Science and Technology Branch Environment Canada
	Nicole Armstrong	Water Science and Management Branch Manitoba Conservation and Water Stewardship
	John-Mark Davies	Water Quality Services Water Security Agency (Saskatchewan)
	Gongchen Li (Beginning Jun/14)	Transboundary Secretariat Alberta Environment and Parks (formerly Alberta Environment and Sustainable Resource Development)

	Richard Casey (Oct/04 to Jun/14)	Water Policy Branch Alberta Environment and Parks (formerly Alberta Environment and Sustainable Resource Development)
	Sharon Reedyk	Science and Technology Branch Agriculture and Agri-Food Canada
SECRETARY	Joanne Sketchell	Transboundary Waters Unit Environment Canada

COMMITTEE ON GROUNDWATER

Terms of Reference: Mandate

Recognizing the inter-relationship between surface and groundwater, the Committee on Groundwater shall, at the request of, and under the direction of the Prairie Provinces Water Board, investigate, oversee, review, report, and recommend on matters pertaining to quantity and quality of groundwater at or near interprovincial boundaries.

Responsibilities of the committee may include: exchange of information; compilation and interpretation of existing data; recommendations on groundwater information and monitoring requirements; determination of implications of proposed projects which may impact the quantity and/or quality of waters at interprovincial boundaries; and other items of interjurisdictional interest involving groundwater.

The COG will engage the Committee on Hydrology and the Committee on Water Quality on items of mutual interest or when the expertise of those committees will assist the COG.

PPWB Board Minute 92-65 (Oct. 7, 2009)

CHAIR	Mike Renouf	Executive Director Prairie Provinces Water Board
MEMBERS	Garth van der Kamp	Groundwater Hydrology Water Science and Technology Directorate Environment Canada
	Anthony Cowen	Science and Technology Branch Agriculture and Agri-Food Canada
	Steve Wallace (Beginning Mar/15)	Groundwater Policy Alberta Environment and Parks (Formerly Alberta Environment and Sustainable Resource Development)
	Robert George (Jun/09 to Jan/15)	Water Policy Branch Alberta Environment and Parks (formerly Alberta Environment and Sustainable Resource Development)
	Kei Lo	Hydrology and Groundwater Services Water Security Agency (Saskatchewan)
	Graham Phipps	Water Sciences and Management Branch Manitoba Conservation and Water Stewardship
SECRETARY	Megan Garner	Transboundary Waters Unit Environment Canada

APPENDIX VII: Statement of Final Expenditures 2014 - 2015

	2014/15	
	Budget	**Actual**
Salary Component		
PY's	4.500	4.000
Base Salary	$415,000	$376,331
BPE	$83,000	$75,266
Total Salary	$498,000	$451,597
O&M Component		
Contracts & Students		
Goal 1		
Cont. Improvement	$30,000	$38,410
Modernization*	$50,000	$44,570
Goal 3		
Core Activities		
Cont. Improvement	$90,000	$36,738
Modernization		
Goal 7		
Modernization	$30,000	$0
Sub-total Contracts	$200,000	$119,718
Operating Expenses	$60,000	$35,700
Total O&M	$260,000	$155,418
Grand Total	$758,000	$607,015

*contracted services delivered by Alberta in Lieu of its annual contribution

APPENDIX VIII: History of the PPWB

The Prairie Provinces Water Board was formed on July 28, 1948 when Canada and the Provinces of Alberta, Saskatchewan, and Manitoba signed the Prairie Provinces Water Board Agreement. This Agreement established a Board to recommend the best use of interprovincial waters, and to recommend allocations between provinces.

From 1948 to 1969, the Engineering Secretary to the Board was a Prairie Farm Rehabilitation Administration employee. The support staff for studies and office accommodation during these years was provided by the PFRA in Regina at no charge.

After twenty years, changes in regional water management philosophies resulted in a need to modify the role of the Board. Consequently, the four governments entered into the *MAA* on October 30, 1969. This Agreement provided an apportionment formula for eastward flowing interprovincial streams, gave recognition to the problem of water quality, and reconstituted the Prairie Provinces Water Board.

The *MAA* has five schedules which form part of the Agreement. These Schedules are:

1. Schedule A. An apportionment agreement between Alberta and Saskatchewan.

2. Schedule B. An apportionment agreement between Saskatchewan and Manitoba.

3. Schedule C. The Prairie Provinces Water Board Agreement describes the composition, functions and duties of the Board.

4. Schedule D. A list of Orders-in-Council for allocations of interprovincial waters made before 1969.

5. Schedule E. A Water Quality Agreement describes the role of the PPWB in interprovincial water quality management and established Water Quality Objectives for 11 interprovincial river reaches. This Schedule became part of the Master Agreement in 1992.

Under Schedule C, the Prairie Provinces Water Board was reconstituted and was given the responsibility of administering the agreement. Schedule C also provided for the necessary board staff, accommodation, and supplies to be jointly financed by the four participating governments. Following the reconstitution of the PPWB, the members also agreed to the establishment of a semi-autonomous Board Secretariat.

The PPWB's change in administration policy was implemented when an Executive Director was appointed on July 1, 1972. The By-laws, and Rules and Procedures also came into effect on this date.

On April 2, 1992, the *MAA* was amended to include a Water Quality Agreement that became Schedule E to the Master Agreement. The Agreement sets interprovincial water quality objectives at 11 transboundary river reaches and commits each of the Parties to take reasonable and practical measures to maintain or improve existing water quality.

At the Board's March 1995 meeting, the Board agreed that full time Secretariat staff was no longer necessary and that functional support would be provided by staff of Environment Canada. The process of disbanding the PPWB Secretariat and integrating its functions into Environment Canada was completed during 1995 - 1996. The portion of time each Environment Canada staff person spends on PPWB activities is charged to the PPWB and cost-shared by the members.

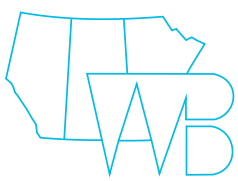
The Board currently operates through its Executive Director, supported by four standing committees the Committee on Hydrology, the Committee on Groundwater, the Committee on Water Quality and the Committee on Flow Forecasting. The Committee on Flow Forecasting was established in 2014, however the committee has not yet met.

The Board approves an annual PPWB budget with one-half the operating budget being provided by Canada and one-sixth by each of the three provinces. The Government of Canada is responsible to conduct and pay for the costs of water quantity and quality monitoring.

In 2008, a costed multi-year Work Plan was approved by the Board to identify activities and projected budgets for 2008 - 2013. The 5-year Work Plan was renewed in December 2011 and covers the period from 2012 to March 2017. Activities in this Work Plan are directed to achieving the goals that were identified in the 2006 Strategic Plan that fulfill the vision, mission and key deliverables that are outlined in the 2006 Charter. Activities are targeted towards assessing whether the commitments made in the *MAA* have been met by the Signatory Parties (Government of Canada, and Provinces of Alberta, Saskatchewan and Manitoba).

The 2006 PPWB Charter and Strategic Plan were reviewed in 2012 as part of the Work Plan review. These documents were approved at the fall 2012 Board Meeting.

In February 2009, the *MAA,* By-laws, and Rules and Procedures were published in an updated document that included all changes made to date. The By-Laws and Rules and Procedures, along with other key PPWB documents began a review in 2014 - 2015. The review is expected to be ongoing for the next couple of years.



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