

# ANNUAL REPORT • 1995

CANADA ALBERTA SASKATCHEWAN MANITOBA

**PRAIRIE  
PROVINCES  
WATER  
BOARD**





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PROVINCES  
WATER  
BOARD**



**ANNUAL REPORT**

FOR THE YEAR ENDING MARCH 31, 1996

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## LETTER OF TRANSMITTAL

September 1996

Honourable Sergio Marchi  
Minister of the Environment  
Ottawa, Canada

Honourable Eldon Lautermilch  
Minister Responsible for  
Saskatchewan Water Corporation  
Regina, Saskatchewan

Honourable Ty Lund  
Minister of Environmental  
Protection  
Edmonton, Alberta

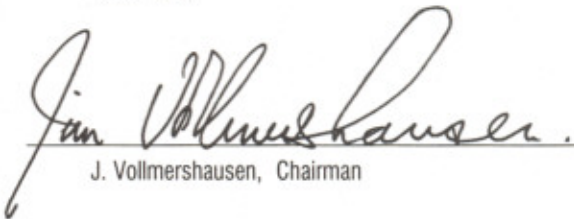
Honourable Albert Driedger  
Minister of Natural Resources  
Winnipeg, Manitoba

Honourable Ralph Goodale  
Minister of Agriculture and Agri-Food  
Ottawa, Ontario

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 ending March 31, 1996.

Yours truly,

  
\_\_\_\_\_  
J. Vollmershausen, Chairman

## MESSAGE FROM THE EXECUTIVE DIRECTOR

During 1995/96, Alberta and Saskatchewan met all apportionment requirements for interprovincial streams. On the South Saskatchewan River, Alberta delivered 85% of the total annual natural flow and met the minimum flow criteria at all times. Alberta also met its apportionment obligations for Cold Lake by passing 98% of the natural outflow of the lake to Saskatchewan.

The time period for which flow apportionment is accounted for is important, particularly for small interprovincial streams where runoff primarily occurs between March and June. Because of the various problems with using the water year (April 1 to March 31 of the following year), the Board agreed that apportionment monitoring for streams crossing the Manitoba-Saskatchewan boundary should now be on the calendar year, as is done with streams crossing the Alberta-Saskatchewan boundary. This change is reflected in the apportionment balance results shown in this annual report.

In response to reductions in available funding, the Committee on Hydrology continued its efforts to make the PPWB hydrometric monitoring more efficient. Last year, as a result of a comprehensive review of the South Saskatchewan River basin, monitoring program adjustments were made to the monitoring station list. This year the committee agreed to use a water balance model instead of the more complex Qu'Appelle River SSARR model to compute the annual apportionment balance for the

Qu'Appelle River system. The committee also agreed, as an interim measure, to reduce the number of stations for the Qu'Appelle River basin from 22 to 12. Further analysis of the Qu'Appelle network was continuing at year end. Three stations on the Saskatchewan River system were also eliminated as a result of an evaluation of that system.

The Board approved the Committee on Hydrology's report entitled "Interprovincial Lakes Apportionment Study". The report identifies 101 interprovincial lakes situated on the Alberta-Saskatchewan and Saskatchewan-Manitoba boundaries. The report recommends an apportionment procedure to use, if apportionment is needed for any of the lakes in the future. Currently, Cold Lake on the Alberta-Saskatchewan boundary is the only interprovincial lake that is being apportioned.

The Committee on Groundwater completed its report on including groundwater in the apportionment calculations for Cold Lake. The report concluded that, although groundwater is a significant component of the water balance in the basin, the apparent lack of observed impacts from recent withdrawals, indicated no need at this time to include groundwater use in the apportionment computations. The report goes on to recommend, in the event that significant groundwater withdrawals are allowed, that a re-evaluation of including groundwater in the apportionment calculations be undertaken.

Water quality of interprovincial streams continued to be good, with 94% adherence to the PPWB Water Quality Objectives.

Because of the increasing importance of nutrient related issues in the region, the Committee on Water Quality decided to organize with the National Hydrology Research Institute and Environment Canada, a workshop to develop a strategy to address these issues and develop more appropriate water quality objectives for nutrients. The workshop will be held next fiscal year.

In June, 1995 the Secretariat to the Board was disbanded. Coordination and support responsibilities that were previously handled by the Secretariat are now provided by Environment Canada through the office of the PPWB Executive Director. While this change is not yet a year old, in general, the transition has gone well. Most people recognize the need to find more efficient ways to do business and, in the long-established PPWB tradition of cooperation, people have been working to make this new arrangement a success.

As we enter the next quarter century under the 1969 Master Agreement, there will be many new challenges for the Board. These challenges will no doubt be met in a similar successful manner as the Board faced past challenges.



R.L. Kellow  
Executive Director

## INTRODUCTION

This report summarizes the activities and the progress of the Prairie Provinces Water Board (PPWB), its committees, and the Secretariat for the period April 1, 1995 to March 31, 1996.

The Board met twice during 1995/96; on October 18, 1995 in Regina, Saskatchewan and on March 22, 1996 in Edmonton, Alberta.

A total of four committee meetings were held throughout the year: the Committee on Hydrology (COH) met twice, while the Committee on Water Quality (COWQ), and the Committee on Groundwater (COG) each met once during the year.

### HISTORY

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. During the next 22 years (1948 to 1969 inclusive), the Engineering Secretary to the Board was a Prairie Farm Rehabilitation Administration (PFRA) employee. The support staff for studies, and office accommodation during these years were provided by the PFRA in Regina at no charge.

On October 30, 1969, Canada and the three provinces entered into an agreement to share the flow and to

consider the quality of eastward flowing interprovincial streams. Under Schedule C of that Master Agreement on Apportionment, the Prairie Provinces Water Board was reconstituted and was given the responsibility to administer 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, rules and procedures also became effective on this date.

The PPWB currently has federal spending authority up to an annual maximum of \$625,000 from funds provided under the Canada Water Act administered by Environment Canada. The provincial governments' share of expenditures are recovered each fiscal year.

On April 2, 1992, the Master Agreement on Apportionment was amended to include a water quality agreement which became

Schedule E to the Master Agreement. The agreement sets water quality objectives at 11 interprovincial 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 the Secretariat functions will be provided by Environment Canada. The process of disbanding the PPWB Secretariat and integrating its functions into Environment Canada was done during 1995/96. The Board, as shown in the organization chart in Appendix II, now operates through the Executive Director, supported by three standing committees.

### PPWB SUPPORT

The PPWB office is located in Room 201, 2050 Cornwall Street, Regina, Saskatchewan. Technical and administrative support are provided through the staff of Environment Canada, Prairie and Northern Region.

## BOARD AND COMMITTEE ACTIVITIES

### WATER QUANTITY

#### MONITORING RESPONSIBILITIES

The 1969 Master Agreement on Apportionment directs "...that the Prairie Provinces Water Board shall monitor and report on the apportionment of waters set out in the provisions of the first and second agreements and ratified by the Master Agreement".

In fulfilling the terms of this agreement, Environment Canada on behalf of the Prairie Provinces Water Board, monitors streamflow at several hydrometric sites. Data gathered are used by the PPWB to determine natural streamflows for apportionment purposes.

During 1995/96 the Committee on Hydrology (COH) reviewed the hydrometric network to ensure changing use patterns were appropriately monitored to allow computation of natural flow. As of March 31, 1996, 105 stations were required for computational purposes. These are plotted on the map at the end of this report.

The committee also confirmed the continuing need for 21 Environment Canada meteorological monitoring stations in the three prairie provinces. These sites provide information for computing natural flow at the interprovincial boundaries.

At its March 22, 1996 meeting, the Board approved the 1996/97 list of PPWB hydrometric and meteorological monitoring stations as recommended by the COH. They also agreed that the apportionment period for streams crossing the Saskatchewan-Manitoba boundary should be changed to the calendar year.

Quarterly reports on natural flows, consumptive uses and storage changes for the South Saskatchewan River basin in Alberta were prepared and distributed. The total annual recorded flow of 10 014 000 cubic decameters ( $\text{dam}^3$ ) in the South Saskatchewan River, at the point below its junction with the Red Deer River, represented 85 percent of the total annual natural flow of 11 748 000  $\text{dam}^3$ . A summary of recorded and natural flow volumes for 1995 at this apportionment point is shown in table and graph form on pages 20 and 21.

The natural flow of the Qu'Appelle River at the Saskatchewan-Manitoba boundary between January 1, 1995 and December 31, 1995 was 430 000  $\text{dam}^3$ . Recorded flow augmented by releases of 109 000  $\text{dam}^3$  from Lake Diefenbaker, was 441 000  $\text{dam}^3$ . Recorded and natural flows for the year 1995 are shown on page 22.

Environment Canada continued to provide the Board with hydrometric information needed for computing natural flow of Battle, Lodge and Middle Creeks for apportionment purposes. Apportionment balance reports were prepared and distributed to PPWB agencies three times during 1995. More than 75 percent of natural flow at the interprovincial boundary for Battle, Lodge and Middle Creeks was passed to Saskatchewan. Flow data for these three creeks are shown on page 23.

Natural flows for the South Saskatchewan River basin were calculated using the Project Depletion Method, while natural flows for the Qu'Appelle River basin were determined using the Annual Water Balance Method. Both procedures have been approved by the Board.

The Board, at its March 1994 meeting, reviewed a COH report entitled "Interprovincial Lakes Apportionment Study" and agreed that the Rational Method and accompanying provisions described in that report be used for apportioning the Cold Lake basin. In accordance with the Rational Method, the computed percentage of Cold Lake's natural outflow that each province is entitled to is 31.6% for Alberta,



43.4% for Saskatchewan, and 25% for Manitoba.

Natural outflow at the outlet of Cold Lake was computed periodically during 1995 to determine if Saskatchewan had received its fair share of flow from Cold Lake. Based on the information provided by Environment Canada and Alberta Environmental Protection, recorded outflow for the period January to December of 1995 was 339 707 dam<sup>3</sup>, 98.3% of the natural outflow of 345 441 dam<sup>3</sup>.

Natural flows (or apportionment flow) were also calculated for the North Saskatchewan River, Saskatchewan River and Churchill River at the interprovincial boundaries. Monthly recorded and natural flows (or apportionment flows) at these sites, as well as recorded flows at five additional boundary sites, are shown in the tables on pages 22 and 23.

In addition to the apportionment monitoring activities described above, the Secretariat periodically checked the apportionment balance of the Pipestone Creek at the Saskatchewan-Manitoba boundary. This information was provided to the Saskatchewan Water Corporation and Manitoba Water Resources Branch for management purposes.

## COMMITTEE ON HYDROLOGY

The Committee on Hydrology met twice during the year, on September 11-12, 1995 in Winnipeg, Manitoba and on February 20-21, 1996 in Edmonton, Alberta.

During these meetings, the committee discussed a draft report entitled "Qu'Appelle River Apportionment Review" prepared by Sask Water. The report evaluates the apportionment monitoring network requirements for the Qu'Appelle River basin. While the report needed further revisions at year end, the Committee on Hydrology did accept the recommendation that an Annual Water Balance Method be used to replace the existing SSARR Natural Flow Model in the computation of annual natural flow of the Qu'Appelle River at the Saskatchewan-Manitoba boundary.

The committee noted that Environment Canada, in 1991, completed the updating of Design Wind data for selected stations in the prairie provinces to 1985. Since the last update, an additional 10 years of records have become available. Because the data is needed by each member agency, the committee recommended that the Design Wind data be updated

to 1995 by Environment Canada at a cost of \$4 000.

Under the direction of the committee, the Transboundary Waters Unit of Environment Canada prepared a report entitled "Apportionment Period for Eastward Flowing Streams Crossing the Saskatchewan-Manitoba Boundary". The report provides background information as to why different apportionment time periods were specified in Schedules A and B of the Master Agreement on Apportionment, as well as an analysis on the effect of changing the apportionment period from water year to calendar year. The report concluded that the calendar year is a more effective, practical and consistent approach for apportionment monitoring of all eastward flowing interprovincial streams, and recommended that Section 3 of Schedule B of the Master Agreement on Apportionment be revised to change the apportionment period from the water year to the calendar year. The Board, at its March 1996 meeting, agreed with the report's recommendations.

At its September 1995 meeting, the committee discussed the hydrometric network needed for apportionment monitoring of Pipestone Creek, and how the

waters of this creek can be shared more equitably between Saskatchewan and Manitoba. The committee agreed that a water management plan for the Pipestone Creek basin be developed through a bilateral discussion between Saskatchewan and Manitoba to deal with water management issues in the Pipestone Creek basin.

As a follow-up of the COH report entitled "Hydrometric Monitoring Strategy" (PPWB Report #127), the committee conducted an evaluation on the two criteria in the report to determine if they are adequate for initiating of designating apportionment monitoring networks in small interprovincial basins. The results of that evaluation showed that, if the proposed criteria was applied, seven of the small interprovincial streams would require apportionment monitoring, six would require advanced networks and more monitoring gauging stations would be needed to monitor major diversions and consumptive uses of each stream. To provide a more practical approach for identifying apportionment monitoring requirements of small interprovincial streams, the committee concluded that the two criteria be revised. A revised version of the report has been

prepared and circulated to the Board.

The committee discussed a draft report, prepared by the Transboundary Waters Unit of Environment Canada, entitled "An Evaluation of Apportionment Monitoring Networks for the Saskatchewan River at the Saskatchewan-Manitoba Boundary". The report provides an assessment on the effect of major water use projects on the apportionment flow of the Saskatchewan River at the Saskatchewan-Manitoba boundary. The committee agreed that some of the existing apportionment monitoring gauging stations can be discontinued and still provide an adequate network for apportionment monitoring of this river basin. Further revisions of this report are required.

In response to the 1995 flood in the South Saskatchewan River and the upper Assiniboine River basin, the committee discussed the feasibility of having a workshop or a series of papers for these two flood events. The committee endorsed the idea of having reports prepared documenting the 1995 flood for both the Assiniboine River and the South Saskatchewan River. The committee agreed that since some workshops were held in

Manitoba regarding the 1995 flood event on the Assiniboine River, another workshop to deal with this flood event is not needed. A workshop dealing with the 1995 flood event of the South Saskatchewan River should be considered at a later date.

The committee noted that Alberta Environmental Protection in cooperation with Environment Canada is undertaking a channel loss study in the Middle Creek basin. The results of the study will be used to develop a new set of channel loss equations. The channel loss study will be completed in 1996/97. The committee agreed that the completion date for the Lodge and Middle Creeks natural flow study be postponed until the channel loss study has been completed.

With respect to PPWB hydrometric monitoring list for 1996/97, the committee suggested two additions, and 13 deletions from the previous list. They also agreed that the 1996/97 meteorological list be the same as 1995/96.

## STUDIES

### Lodge and Middle Creeks Natural Flow Study

As suggested by the Committee on Hydrology, the Surface Water Assessment Branch of Alberta Environmental Protection is conducting a natural flow study for the Lodge and Middle Creeks basin to provide a more accurate estimate of historical monthly natural flows for these two creeks. A first draft report was reviewed by the COH at its March 1993 meeting. It is anticipated that a revised draft report will be prepared in 1996/97 after a channel loss study is completed. The results of the study will be used by the COH to determine strategies to minimize apportionment problems in these basins.

### Concept of Equitable Apportionment

Because the Master Agreement does not define the word "equitable", there has been some uncertainties as to what "equitable apportionment" means and how it is achieved. Therefore, the Board, at its March 1994 Meeting, directed the COH to prepare a report on the interpretation of the concept of equitable apportionment as set out in the Master Agreement on Apportionment. For the preparation of this document, the

committee was requested to consider legal views and international law. The committee also decided it would be useful to consult some previous Board and COH Members for advice. The Board at its October 1995 meeting approved the COH report entitled "Equitable Apportionment: A Primer."

### Hydrometric Monitoring Network Evaluation Studies

The Board, at its March 1994 meeting, approved a COH report entitled "Hydrometric Monitoring Strategy" and agreed with the report's recommendations that an apportionment network analysis be conducted for the South Saskatchewan River basin, and for the Qu'Appelle River basin. Alberta Environmental Protection, in January 1995, completed a report entitled "Assessment of Natural Flow Computation Procedures and Monitoring Network for Administering Apportionment of the South Saskatchewan River Basin at the Alberta-Saskatchewan Boundary". The report was reviewed and approved by the COH at its January 1995 meeting. Saskatchewan Water completed a draft report entitled "Qu'Appelle River Apportionment Review" which was reviewed by the COH at its September 1995 and February 1996 meetings. It is anticipated

that this report will be finalized in 1996/97.

In addition to the above two monitoring network studies, the committee also conducted a review on the Saskatchewan River's apportionment monitoring network. A draft report, prepared by the Transboundary Waters Unit of Environment Canada, entitled "An Evaluation of Apportionment Monitoring Network for the Saskatchewan River at the Saskatchewan-Manitoba Boundary" was reviewed at the February 1996 COH meeting. It is anticipated that the report will be finalized in 1996/97.

### Apportionment of Interprovincial Lakes

In response to concerns raised in 1991 regarding low water levels on Cold Lake, the Board at its spring 1992 meeting, directed the COH to review the Master Agreement on Apportionment and make recommendations on its applicability to interprovincial lakes. At the October 1995 meeting, the Board approved the COH report entitled "Interprovincial Lakes Apportionment Study". The Board agreed, at this time, apportionment of interprovincial lakes will be done informally through the Board minutes. The Board also agreed that apportionment monitoring of Cold

Lake should be continued until the Cold Lake Water Management Plan has been completed.

#### **Apportionment Period for Streams Crossing the Saskatchewan-Manitoba Boundary**

The Board, at its October 1995 Meeting, agreed that the COH should proceed to prepare a report on the implications of changing the apportionment period on the Saskatchewan-Manitoba boundary from the water year to the calendar year. A COH report entitled "Apportionment Period For Eastward Flowing Streams Crossing the Saskatchewan-Manitoba Boundary" was submitted to the Board at its March 1996 meeting. The Board approved the report and agreed that the apportionment period for streams crossing the Saskatchewan-Manitoba boundary should be based on the calendar year, and this decision should take effect immediately.

#### **Natural Flow Studies on Small Interprovincial Basin**

In 1975, the Board requested the Secretariat to define natural flow on small interprovincial river basins. Natural flow studies have since been carried out on all 21 small interprovincial basins. These basins are listed below. Updating of natural flow data for these rivers or creeks at interprovincial boundaries is carried out on a continuing basis.

#### **ANNUAL WATER USE REPORT BOXELDER CREEK BASIN**

Boxelder Creek is part of an internal drainage basin straddling the Alberta-Saskatchewan boundary midway between Maple Creek, Saskatchewan and Medicine Hat, Alberta. Because of the complexity of the basin, including numerous diversions and the high percentage of natural flow allocated for water use, the PPWB has agreed that Boxelder Creek be

treated as a special interprovincial basin. Available flow in this basin is to be jointly managed by Alberta and Saskatchewan.

Alberta and Saskatchewan annually collect sufficient water use data to provide an estimate of total consumption in the Boxelder Creek basin. This data is reported to the Board.

Total irrigation and municipal water use in the Alberta portion of the basin for 1995 was 782 dam<sup>3</sup>. During the same period, the four provincial reservoirs stored 962 dam<sup>3</sup> and released 1041 dam<sup>3</sup> to the Boxelder Creek system. Based on the responses of the 1995 water use survey, conducted by Sask Water, 46 dam<sup>3</sup> were diverted for irrigation purposes in the Saskatchewan portion of the Boxelder Creek basin.

.....

Antler River  
Assiniboine River  
Battle River  
Beaver River  
Big Gully Creek  
Birch River  
Bosshill Creek

Boxelder Creek  
Elm Creek  
Eyehill Creek  
Gainsborough Creek  
Gopher Creek  
Graham Creek  
Jackson Creek

Mackay Creek  
Overflowing River  
Pipestone Creek  
Red Deer River (Sask.)  
Stony Creek  
Swan River  
Woody River

.....

## **ANNUAL REPORT ON INTERPROVINCIAL DRAINAGE PROJECTS**

The Board accepted the Committee on Hydrology report "A Recommended Procedure to Deal with the Impact of Artificial Drainage on Downstream Flows" at its November 1983 meeting. Board members agreed the COH should provide reports on drainage activities at future Board meetings.

In 1995 Saskatchewan licensed two new drainage projects. Manitoba reported no projects with the potential to affect streams crossing interprovincial boundaries. The Board agreed to have the Committee on Hydrology evaluate the need for Alberta to provide information on drainage projects.

### **WATER USE**

In 1982 the PPWB completed a study of historical water uses in the prairies for the period 1951-1978. Information collected was used to establish a data base containing six sectors: regional economic base; municipal and industrial; agriculture; power generation; recreation; and environmental considerations.

The data base has been updated to 1991. This update provides information on population trends, as well as water use data for

municipal, industrial, power and agricultural purposes.

In 1995, the responsibility for maintaining the data base was transferred to the Environmental Economics Section, Canadian Wildlife Service in Ottawa.

### **ACTIVITIES RELATED TO WATER QUANTITY**

The staff of the Transboundary Waters Unit (TWU), Environment Canada, in June 1995 took over most of the work previously handled by the PPWB Secretariat. During 1995/96, the TWU completed and distributed the audit and final apportionment balance reports for the South Saskatchewan River, Lodge Creek, Middle Creek and the Battle Creek at the Alberta-Saskatchewan boundary.

To certify the terms of the 1969 Master Agreement on Apportionment was met, the TWU also computed the natural flow or apportionment flow (flow that is subject to apportionment) at the interprovincial boundary for the North Saskatchewan River, Churchill River, Qu'Appelle River, and the Saskatchewan River. In addition to the above, the TWU also compute the apportionment balance of Cold Lake for 1995 using a FORTRAN computer program developed by the Surface

Water Assessment Branch of Alberta Environmental Protection.

## **GROUNDWATER**

### **COMMITTEE ON GROUNDWATER**

The Committee on Groundwater met once during the year; on June 5, 1995 in Edmonton, Alberta.

The committee met with Mr. McNaughton of Environment Canada to discuss a project proposal for modelling the surface water/groundwater system in the Cold Lake/Waterhen River region to provide a sensitivity analysis of forces acting on groundwater levels in the region. The committee suggested the need to conduct a detailed review of hydrogeological records to better understand the physical relationships of basin hydrogeological system before proceeding with modelling. The committee noted that the best way to address questions regarding groundwater response in the Cold Lake area is to conduct a drilling program to see if there is an aquifer blockage west of the Marie Lake.

With respect to a request by the Committee on Hydrology regarding the possibility of including groundwater in the apportionment of Cold Lake, the committee at its June 1995 meeting reviewed a

second draft of the report entitled "Groundwater Apportionment in the Cold Lake Basin", and agreed to incorporate several editorial changes suggested by the COH in the final version of the report. These changes were subsequently made and the final report provided to the COH.

In response to a concern raised at the March 1995 Board Meeting, regarding the production well casing failures in the Cold Lake area, the committee discussed the possible impact of this incidence. The committee noted that the closest production well is about 30 kilometres from the Alberta-Saskatchewan boundary. Given the distance, the failures do not appear to present serious concerns to Saskatchewan over the short term. Also impacts in Alberta would become more serious long before they become apparent in Saskatchewan. However, because the well casing failures occurred in interprovincial aquifers, the committee agreed that Saskatchewan should be notified of failures when they do occur.

During the year, the committee completed its groundwater vulnerability mapping reports. The project consisted of mapping the contamination potential of the upper most aquifer from surface or near surface source using an methodology prepared for the

PPWB by the National Hydrology Research Institute. The project resulted in the preparation of 10 coloured map sheets, six along the Alberta-Saskatchewan boundary and four along the Saskatchewan-Manitoba boundary.

Although there are no current groundwater apportionment issues, the committee agreed that the concept of apportionment of transboundary aquifers should be considered by the COG. The committee will consider possible approaches to apportionment at future meetings.

The development and support of an effective, long-term groundwater management policy requires high quality, relevant management data. The committee in discussing a procedure to develop a comprehensive and consistent groundwater data base for the prairie provinces agreed that PFRA is the agency most familiar with the groundwater data bases in the prairie provinces, and therefore agreed to request PFRA to prepare a report outlining the essential parameters that should be included in the provincial groundwater data bases. The committee noted that maps are important tools for groundwater management, and suggested that a review of a series of frequently used groundwater related maps be conducted to determine what data

parameters are needed to produce the required information.

## STUDIES

### Groundwater Vulnerability Mapping

The Board, at its October 20, 1992 meeting approved the preparation of groundwater vulnerability maps as outlined in the Committee on Groundwater report "Proposed Implementation Plan for Recommendations in the 1991 COG Report on Evaluation of Groundwater Legislations." The objective of this project is to publish a series of maps at the interprovincial boundaries showing the potential for groundwater contamination from surface activities. The project uses a methodology developed by the National Hydrology Research Institute (NHRI) for the PPWB. The NHRI coordinated the project using data supplied by the provinces. Printing of the two reports "Groundwater Vulnerability Mapping Along the Alberta-Saskatchewan Boundary" (PPWB Report No. 128), and "Groundwater Vulnerability Mapping Along the Manitoba-Saskatchewan Boundary" (PPWB Report No. 137) was completed in 1995.

### Groundwater Apportionment in the Cold Lake Basin

The Board, at its March 1994

meeting, reviewed a Committee on Hydrology report entitled "Interprovincial Lakes Apportionment Study" and agreed with the report's recommendations that the Committee on Groundwater should conduct an evaluation of the effect of groundwater withdrawals on Cold Lake and comment on the feasibility of including groundwater in the apportionment of Cold Lake. The Committee on Groundwater completed the report entitled "Groundwater Apportionment in the Cold Lake Basin" in March 1996 (PPWB Report #142). The report provides an overview of geology and hydrogeology of the Cold Lake area, and potential groundwater withdraw impacts. The report recommends that groundwater use not be included in apportionment computations under current flow conditions in the basin. This report was reviewed and accepted by the COH.

## **WATER QUALITY**

### **COMMITTEE ON WATER QUALITY**

The Committee on Water Quality (COWQ) met once on November 22-23, 1995 in Regina, Saskatchewan.

The COWQ reviewed the details of the Edmonton storm assessment study on the North Saskatchewan

River planned to be conducted in 1996 by Alberta Environmental Protection. The committee also reviewed the status of the Shellmouth Reservoir-Assiniboine River study and preparation of the final report which is expected in 1996.

The COWQ reviewed and investigated water quality concerns (high turbidity) in the Carrot River and determined they were a direct result of erosion caused by extreme rainfall events in the Pasqua Hills.

Committee Members reviewed Dioxin and Furan fish tissue results for 1994. Most results were undetectable and any that were above the detection limit were an order of magnitude below any concentrations that would cause acute toxicity. The committee agreed to produce a report in 1996/97 summarizing fish tissue results at PPWB sites.

The COWQ discussed measures taken at Grand Centre and Cold Lake to improve waste discharges to the basin and reviewed spills reported under the PPWB Water Quality Contingency Plan. Details of any spills that were reported under the plan are noted under the heading "Interprovincial Water Quality Contingency Plan".

The Committee reviewed and approved the 1994 Excursion

Report to the PPWB Water Quality Objectives. A discussion of the excursions to the PPWB objectives is summarized in the "Water Quality Conditions" section of this report.

The status of studies, as a result of excursions to the objectives, to be carried out by the PPWB and its member agencies was reviewed. The agencies said they would strive to complete these studies as time and money permits.

The COWQ reviewed the last of the eleven Draft PPWB Water Quality Trend reports and approved the reports for distribution in a Draft form as funds and staff time were not available to finalize the reports. A brief summary of the results is included under the heading "Trend Assessment Study".

The COWQ reviewed the results and the final report on the PPWB Monitoring Frequency Study on the North Saskatchewan River. The study was a joint study with Alberta Environmental Protection. The report was prepared by Dr. Florence, Biometrics Section, Alberta Environmental Centre. The results of the report were used to assist the COWQ in its annual review of the PPWB multi-media monitoring program.

The committee approved the PPWB Water Quality Monitoring

Program for 1996/97. This program is virtually identical to last year's monitoring program.

#### **ANALYTICAL METHODS TASK FORCE**

The task force was established in 1980, by the Committee on Water Quality, to determine comparability of water quality and analytical results from federal and provincial laboratories. Last year the task force redesigned the PPWB Quality Assurance Program and continued to review data results to assess laboratory comparability. The present program includes biological tissue samples. These samples will be used to assess laboratory comparability of mercury in fish tissues. The Task Force has requested NWRI to prepare a summary report on the performance of PPWB laboratories over the last five years.

#### **WATER QUALITY DATA BASE**

The PPWB has maintained a water quality data base on major interprovincial streams since 1974. Data at these locations is presented in graphical form in the report entitled "Interprovincial Water Quality Data at PPWB Monitoring Stations - April 1974 to December 31, 1991".

Automated statistical procedures can prepare high resolution graphic outputs for all water

quality variables. A summary of the PPWB water quality data base from 1974 to 1995 has been installed in a GIS spreadsheet enabling the production of color geographical information maps. These maps are used to help interpret water quality conditions at the interprovincial boundaries.

#### **MONITORING RESPONSIBILITIES**

Environment Canada has conducted monthly and quarterly monitoring for the Prairie Provinces Water Board since 1974. The results of the multi-media program are used to determine if the PPWB Water Quality Objectives are being met and to determine long-term trends in water quality variables at PPWB monitoring sites. The results are also used to identify interprovincial water quality concerns and provide information required to establish baseline characteristics in water, sediment and biota. PPWB monitoring locations are shown on the map in Appendix 3.

#### **WATER QUALITY CONDITIONS**

The PPWB Water Quality Agreement was signed on April 2, 1992 by the Governments of Alberta, Saskatchewan, Manitoba, and Canada. The agreement established water quality objectives at eleven interprovincial river reaches. The PPWB Water

Quality Objectives are used to promote effective interprovincial water quality management, protect the users in downstream jurisdictions, evaluate the quality of interprovincial waters and advise the Board on potential interprovincial water quality concerns.

Annually, the Committee on Water Quality continually reviews the results of the PPWB Water Quality Monitoring Program and compares the data to PPWB Water Quality Objectives.

This year's review of the water quality data collected at PPWB monitoring stations in 1995 indicates that most objectives were met in the calendar year. The percent adherence to the PPWB Water Quality Objectives for each site in 1995 is shown on the following page. Caution must be taken in comparing these results with previous years' results, since the monitoring frequency and parameter list for some PPWB stations change periodically.

In 1995, the PPWB reach specific water quality objectives, on average, were adhered to 94% of the time. This average percent adherence was identical to last year. The Churchill River (100%), the South Saskatchewan River (99%), the Red Deer River Sask/Man. (99%), and the



Saskatchewan River (98%) stations show the greatest adherence to the PPWB objectives. The Qu'Appelle River showed the least adherence to the objectives (86%). This was mainly due to excursions to the chloride, sodium, sulphate, total phosphorus and mercury objectives. There were however less exceedances this year than last.

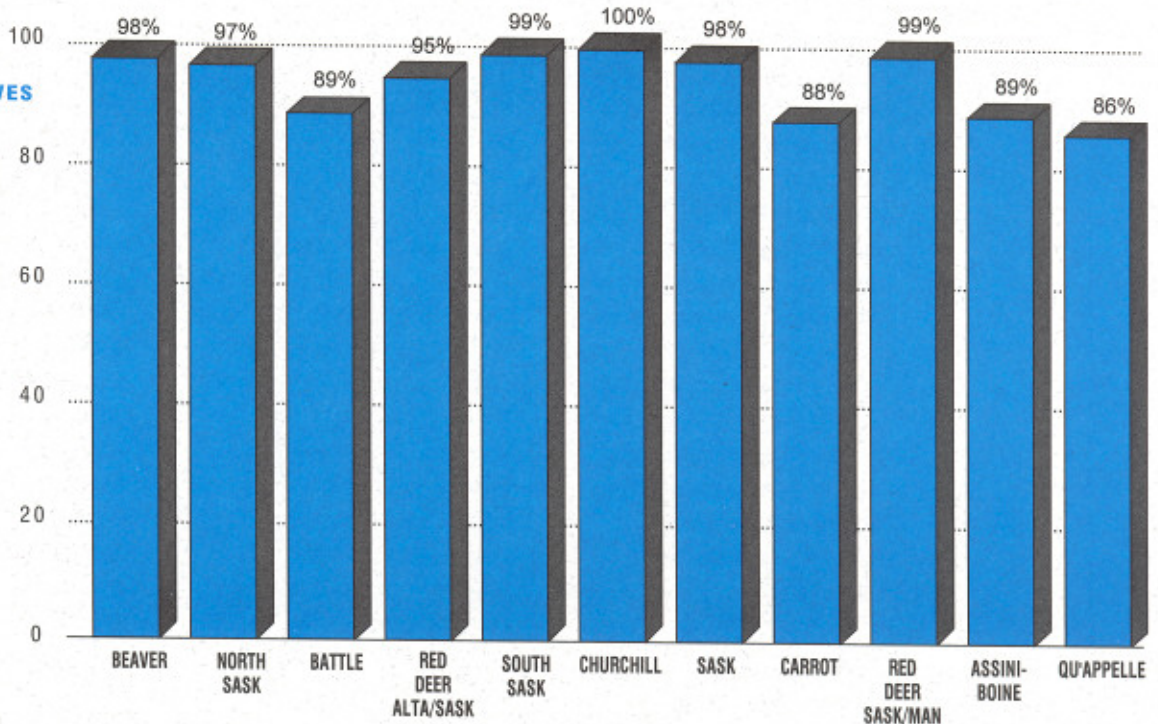
The dissolved oxygen objective level of 6.0 to 6.5 mg/litre was maintained at most PPWB locations during the open water period. The Assiniboine, the

Carrot and the Saskatchewan Rivers were the only sites which periodically displayed low dissolved oxygen levels under open water. Some sites experienced low dissolved oxygen levels under ice conditions but were not below the objective.

The PPWB objectives for barium, boron, sulphate, cadmium, chromium, cobalt, nickel, vanadium, fluoride, lead, nitrate plus nitrite, ammonia, pH, sulphate and zinc were met at all sites where the objectives apply.

PPWB Major Ion objectives for chloride and sodium were met 100% of the time at most interprovincial river reaches. The objectives for these two constituents were exceeded on several occasions in the Battle, Qu'Appelle and Carrot Rivers. The sodium objective was exceeded in the Battle River (11 times), the Carrot River (4 times), and the Qu'Appelle River (10 times). It is thought that these excursions are the result of groundwater input to the systems.

**1995 PERCENT ADHERENCE TO PPWB OBJECTIVES**



The total dissolved solids objective was met 100% of the time at all PPWB sites with the exception of the Battle River. The total dissolved solids objective (500 mg/litre) for the Battle River was exceeded on ten occasions.

The PPWB objectives for zinc and lead were not exceeded at any sites in 1995. The manganese dissolved objectives were exceeded several times in the Assiniboine, the Beaver, the Battle and the Qu'Appelle Rivers.

The dissolved iron objectives were adhered to 100% of the time at most locations. The two exceptions where they were exceeded once were in the Assiniboia and Carrot River. The percent adherence to the PPWB total mercury objective in the Qu'Appelle River was 58%. The total copper objectives were adhered to 100% of the time at all sites with the exception of the Battle River, the North Saskatchewan River and the Red Deer River near Bindloss locations. The adherence of copper total in the Battle River was 83%, in the Red Deer River was 58% and in the North Saskatchewan River was 43%. No other trace metal objectives were exceeded at PPWB sites.

Relatively high nutrient levels are typical of prairie streams.

Adherence to the nitrate plus nitrite and ammonia objectives was 100% for all PPWB river reaches. The percent adherence to the PPWB total phosphorus objective (0.05 mg/litre) ranged from 100% for the Churchill River, 75% for the Red Deer River at Erwood, 64% for the Saskatchewan River, 42% for the Carrot River and as low as 0% for the Qu'Appelle and Assiniboine Rivers.

The PPWB conducts studies to investigate the cause of frequent deviations from the PPWB Water Quality Objectives. These studies are designed to determine if downstream users are at risk and what corrective action may be required to mediate any potential problems. A study was initiated in 1991/92 to look at excursions to the PPWB objectives in the Assiniboine River. The study determined that most of the excursions to the PPWB objectives are not a result of municipal discharges from Kamsack but are a result of activities upstream from the town site or natural conditions. Further study is required to identify the specific causes of these excursions on the Assiniboine River. A data review of excursions on the Saskatchewan River will be carried out by the PPWB Secretariat in 1995/96. A data review of nutrients in the Qu'Appelle River and excursions at

the PPWB site is also being proposed.

As part of the multi-media monitoring program, in 1995 fish tissue samples were collected from four PPWB locations. Fish samples were collected from the Churchill River, Round Lake on the Qu'Appelle River, Red Deer Lake and the Lake of the Prairies on the Assiniboine River. Two species of fish were collected from these sites; one representing predator fish and the other representing bottom feeding fish. Ten fish samples of each species were collected from the locations and analyzed. The reported fish tissue results are the average values for ten fish.

The average mercury concentration (n=10) in walleye from Lake of the Prairies on the Assiniboine River at the Saskatchewan/Manitoba boundary was above the consumption guidelines of 0.50 parts per million (mg/kg). The mean concentration in walleye at this site was 0.655 mg/kg. Triplicate samples from these fish confirmed the mercury levels in walleye. However, it should be noted that these samples were from relatively large walleye weighing from 1553 grams to 2325 grams. These mercury concentrations in walleye fish tissue are, however, lower

than levels reported by Manitoba Environment, for walleye of similar size collected in 1988 to 1992. Manitoba Environment reported levels generally over 1.00 mg/kg. Mean mercury levels in walleye from the Churchill River below Island Falls (0.432 mg/kg) and from northern pike in Red Deer Lake on the Red Deer River near the Saskatchewan/Manitoba boundary (0.069 mg/kg) and from Round Lake on the Qu'Appelle River (0.222 mg/kg) were all below the consumption guidelines.

The average mercury concentration from suckers in Round Lake was 0.047 mg/kg, in the Lake of the Prairies was 0.153 mg/kg and in the Churchill River below Island Falls was 0.122 mg/kg.

These levels are well below concentrations detected in predator fish (walleye and northern pike) at these sites.

Analysis for trace metals such as chromium, copper, zinc, arsenic, selenium, cadmium and lead were performed on composite (n=10) tissue samples from both the walleye and the suckers collected from the same four PPWB sites. Lead, chromium and arsenic levels in fish tissue were at or below the detection limit at all sites. Trace levels (0.010 to 0.021 mg/kg) of cadmium were found in suckers from Round Lake and the Churchill

River and in predator fish from the Lake of the Prairies and Red Deer Lake. Copper levels in all fish tissue were generally above the detection limit at these sites. Copper levels ranged from 0.20 mg/kg to 0.54 mg/kg. Zinc and selenium were present in all samples, but not at levels expected to affected fish populations or consumptive use.

Suspended sediment samples at PPWB locations in 1995 were not collected because of cutbacks in the monitoring budget.

#### **INTERPROVINCIAL WATER QUALITY CONTINGENCY PLAN**

The PPWB Interprovincial Water Quality Contingency Plan continues to be an effective method of informing Board agencies of spills or unusual water quality conditions in interprovincial streams. The plan was updated last year to include spills or unusual water quality conditions which have the potential to affect groundwater. Two spills were reported to member agencies during the year. Both of these events occurred during the spring flood on the South Saskatchewan River.

On June 8, 1995, Saskatchewan Environment and Resource Management phoned the PPWB office with information that the Lethbridge Treatment Plant went

down on June 8th at 2:30 p.m. Chemicals from the plant were split to the Oldman River and eventually entered the South Saskatchewan River. The pollution control plant was out of commission for approximately one month. It was anticipated that this spill would have little effect on the quality of water at the interprovincial boundary.

The second event occurred at Lethbridge on June 9, 1995. The Alberta Environment Protection office phoned and reported two propane tanks were headed for the Alberta-Saskatchewan boundary but disappeared in heavy sludge downstream. Sharp shooters were used to puncture the tanks to avoid possible explosions. The tanks were not sited in Saskatchewan.

#### **STUDIES**

##### **Trend Assessment Study**

Determining water quality trends at the interprovincial boundaries is an essential component of the PPWB monitoring program. The results of the trend studies assist in identifying, at an early stage, potential interprovincial water quality concerns.

Completed draft water quality trend reports for all eleven interprovincial

water quality monitoring locations are now available.

A series of 16 non-parametric trend analysis tests were performed along with time series plots and best fit lines to determine trends in water quality at the PPWB sites. The reports summarize the trend results and excursions to the PPWB objectives.

In general, water quality conditions at PPWB sites improved in the last fifteen to twenty years with more variables decreasing in concentration than those that increased. For instance, in the Saskatchewan River, nine variables decreased in concentrations for the period 1974 to 1992 while only one variable increased slightly in concentration.

The results indicate that alpha BHC has decreased in concentration at all PPWB sites. This trend is probably a result of the recent limited use of alpha BHC in the provinces. Nitrogen levels have also decreased at all sites in the region. This may be a result of improved municipal treatment facilities on prairie streams.

In general metal levels decreased at most sites but are still a potential concern for aquatic life or municipal water use in Red Deer River at the Alberta-Saskatchewan boundary (iron and copper), the

Beaver River (manganese and iron), the Battle River (manganese, iron, copper, and zinc), and the North Saskatchewan River (Manganese and copper). Manganese has the potential to be a concern with municipal water users on the Assiniboine and Qu'Appelle Rivers. These metals could be a concern because they are present at levels which periodically exceed the PPWB objectives.

#### **Monitoring Frequency Study**

In 1993 a Monitoring Frequency Study was initiated by the Prairie Provinces Water Board and Alberta Environmental Protection to determine optimum monitoring frequencies for water quality variables in the North Saskatchewan River. The final report was reviewed by the Committee on Water Quality at the November 1995 meeting. The report evaluated and recommended alternative statistical sampling methods which could be used to detect changes in water quality in the North Saskatchewan River. The report helped the COWQ reassess the PPWB monitoring program.

#### **Geographical Information System Mapping Activities**

Environment Canada maintains a GIS system (Spans Map) that is capable of creating color maps

that can display water quality variables in graphical form which are tied to longitude and latitude locations. Water Quality summary data for all PPWB locations can now be displayed simultaneously on a map of the prairie provinces. Plans are to import land use and eventually point source discharge information into the GIS system. This will assist in the interpretation of water quality data and potential sources of excursions to the PPWB objectives. Summarized sediment data at the interprovincial boundaries is also being included in the GIS software.

#### **WATER QUALITY ACTIVITIES**

In addition to the activities previously described for 1995/96 :

- updated the PPWB Water Quality Monitoring Program for 1996/97;
- verified water quality data results for all PPWB monitoring sites and updated data files for water, sediment and fish on Environment Canada's computer system;
- met with the Assiniboine River Management Advisory Board.

## PPWB WATER QUALITY MONITORING 1995 PARAMETER LIST

### Water (Monthly collection at all sites)

Alkalinity, phenol.  
Alkalinity, total  
Aluminum, diss.  
Aluminum, total  
Boron, diss  
Barium, total  
Bicarbonate, calc.  
Cadmium, total  
Calcium, diss.  
Carbon, diss., organic  
Carbon, organic, particulate  
Carbonate, calc.  
Chloride, diss.  
Chlorophenolics  
Chromium, total  
Cobalt, total  
▲ Coliforms, fecal  
▲ Coliforms, total  
Color, true  
Copper, total  
Fluoride, diss.  
Free CO<sub>2</sub>  
Hardness, non-carbonate  
Hardness, total CaCO<sub>3</sub>  
Iron, diss.  
Lead, total

Manganese, diss.  
Magnesium, diss.  
Mercury, total  
Nickel, total  
Nitrogen, diss., NO<sub>3</sub>+NO<sub>2</sub>  
Nitrogen, particulate  
Nitrogen, total Ammonia  
Nitrogen, total, calc.  
Nitrogen, total, diss.  
Oxygen, diss., DO  
pH  
Phosphorus Ortho as P  
Phosphorus, part. calc.  
Phosphorus, total diss.  
Phosphorus, total as P  
Potassium, diss.  
Residue, fixed, non-filterable  
Residue, non-filterable  
Silica, reactive  
Sodium, percent  
Sodium, diss.  
Solids, total diss., calc.  
Specific Conductance  
Sulphate, diss.  
Temperature  
Turbidity  
Vanadium, total  
Zinc, total

### Fish (Fall collection at 3 sites \*)

Arsenic & Selenium  
Chlorophenolics  
Lipids  
OC's/PCB's  
Mercury total  
Total Metals  
Molybdenum, total

▲ Collected 6 to 12 times a year at 8 locations

\* Collected from Churchill, Assiniboine and Qu'Appelle Rivers

**1995 FLOW DATA**



**RECORDED AND NATURAL FLOWS, CONSUMPTIVE USE, DIVERSION, AND STORAGE  
(in Cubic Decametres) FOR THE 1995 APPORTIONMENT PERIOD**

**SOUTH SASKATCHEWAN RIVER - ALBERTA-SASKATCHEWAN BOUNDARY**

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED DISCHARGE	189 270	185 590	263 140	147 520	751 520	3 011 650	1 322 970	569 630	403 570	391 450	390 630	354 920	7 982 660
COMSUMPTIVE USE	-970	-980	-920	185 020	170 790	310 880	301 650	230 630	157 930	26 710	360	150	1 381 250
CHANGE IN RESERVOIR STORAGE	-76 110	-43 870	-17 970	-107 430	340 120	303 410	116 610	10 510	-74 370	-37 050	-15 910	-87 950	309 990
DIVERSION FROM BASIN	0	0	0	2 480	14 060	31 470	38 750	35 860	22 040	15 640	0	0	160 300
NATURAL FLOW ALTA - SASK. BOUNDARY	113 830	133 550	251 390	188 430	1 257 010	3 636 090	1 813 910	852 660	526 760	413 740	370 430	287 180	9 844 960

**RED DEER RIVER - ALBERTA-SASKATCHEWAN BOUNDARY**

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED DISCHARGE	37 022	35 303	73 397	100 362	177 163	489 430	455 760	276 731	156 851	116 580	66 943	44 885	2 030 427
COMSUMPTIVE USE	0	0	0	-5 130	530	5 290	6 360	4 900	4 360	750	0	0	17 060
CHANGE IN RESERVOIR STORAGE	-2 376	-2 410	-14 460	-5 380	28 480	35 310	16 410	18 810	11 480	4 540	-5 800	-25 210	16 320
DIVERSION INTO BASIN	0	0	0	2 480	-14 060	-31 470	-38 750	-35 860	-22 040	-15 640	0	0	-155 340
NATURAL FLOW ALTA - SASK. BOUNDARY	12 302	10 973	55 287	85 582	187 453	502 620	442 690	263 201	147 961	108 520	63 383	22 125	1 902 097

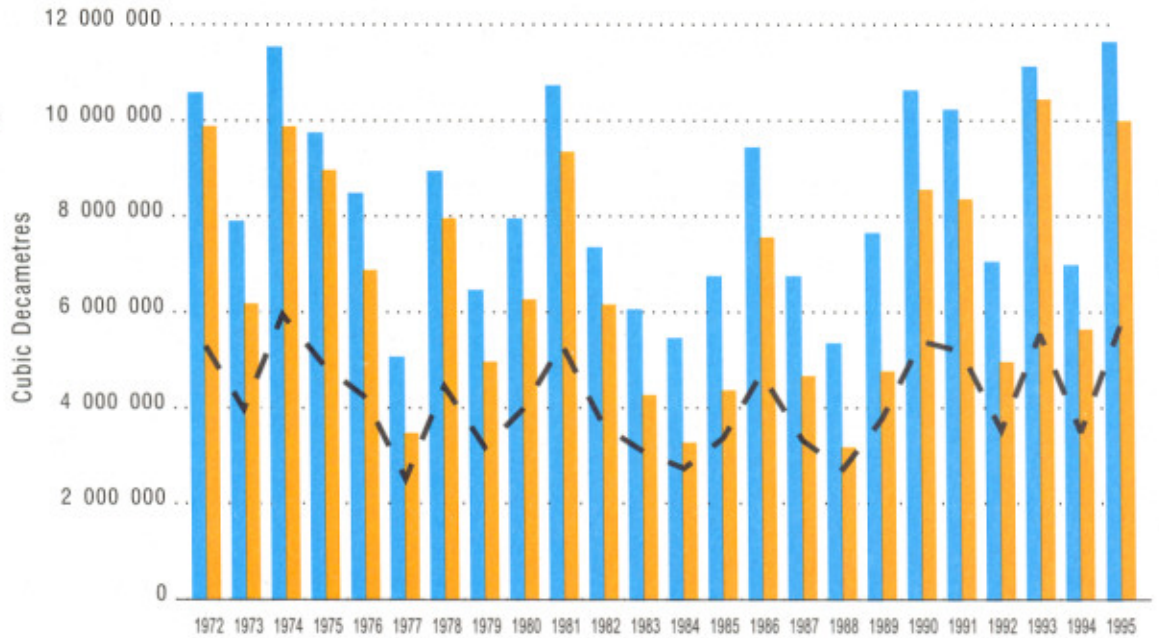
**SOUTH SASKATCHEWAN RIVER - BELOW JUNCTION WITH RED DEER RIVER**

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	226 000	221 000	337 000	248 000	929 000	3 501 000	1 779 000	847 000	560 000	506 000	458 000	400 000	10 014 000
NATURAL FLOW	126 000	145 000	307 000	274 000	1 444 000	4 139 000	2 257 000	1 116 000	675 000	522 000	434 000	309 000	11 748 000

Natural flows for the South Saskatchewan and Red Deer Rivers have been calculated using preliminary data and the methodology described in a report entitled "South Saskatchewan River Below Red Deer River — Natural Flow", April 1985 (PPWB Report No. 45).

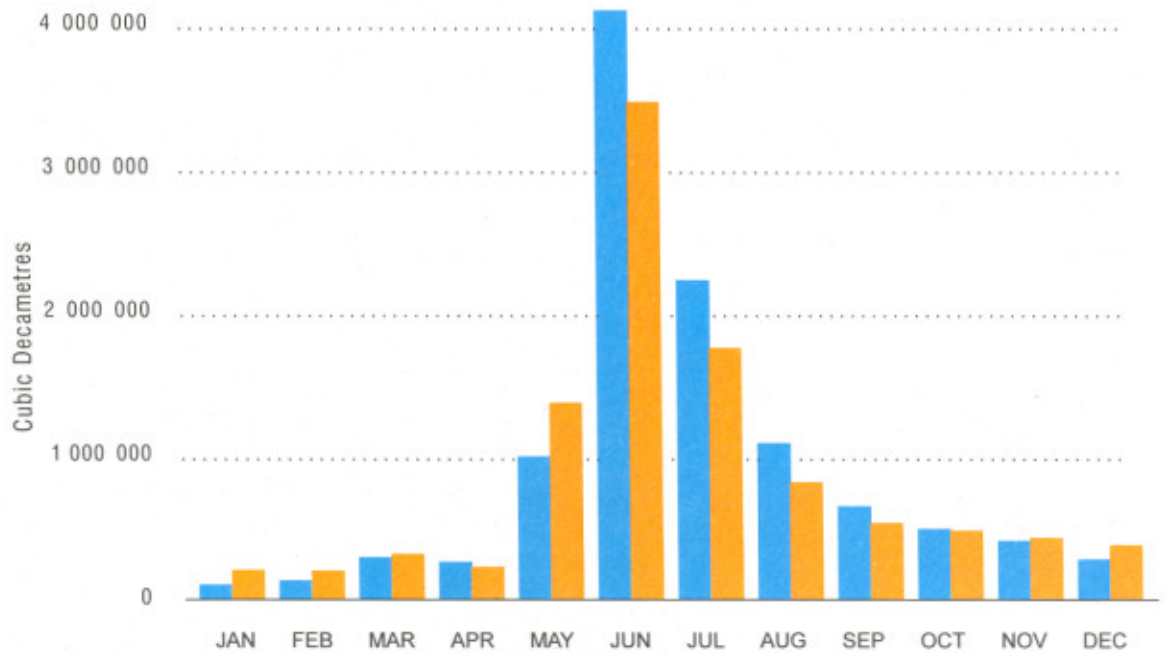
**ANNUAL FLOWS OF THE SOUTH SASKATCHEWAN RIVER NEAR ALBERTA — SASKATCHEWAN BOUNDARY (INCLUDES RED DEER RIVER)**

■ NATURAL  
 - - 50% NAT.  
 ■ RECORDED



**1995 MONTHLY FLOWS OF THE SOUTH SASKATCHEWAN RIVER NEAR ALBERTA — SASKATCHEWAN BOUNDARY (INCLUDES RED DEER RIVER)**

■ NATURAL  
 ■ RECORDED





**RECORDED AND NATURAL FLOWS - SUMMARY OF SELECTED STREAMS CROSSING THE SASKATCHEWAN-MANITOBA BOUNDARY (in Cubic Decametres) FOR THE 1995 APPORTIONMENT PERIOD**

JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. TOTALS

**CHURCHILL RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (At SANDY BAY)**

RECORDED FLOW	1 560 000	1 400 000	1 580 000	1 540 000	1 520 000	1 100 000	1 050 000	1 260 000	1 250 000	1 380 000	1 340 000	1 400 000	16 400 000
NATURAL FLOW	1 160 000	1 020 000	1 080 000	1 070 000	1 407 000	1 180 000	1 289 000	1 530 000	1 680 000	1 840 000	1 800 000	1 880 000	16 900 000

**SASKATCHEWAN RIVER - SASKATCHEWAN-MANITOBA BOUNDARY**

ESTIMATED FLOW	777 000	868 000	860 000	1 452 000	2 103 000	2 032 000	2 834 000	2 711 000	2 175 000	1 645 000	1 304 000	1 187 000	19 948 000
APPORTIONMENT FLOW	310 000	434 000	608 000	1 505 000	2 521 000	3 527 000	3 599 000	2 840 000	2 089 000	1 514 000	841 000	957 000	20 745 000

**QU'APPELLE RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (NEAR WELBY)**

RECORDED FLOW	13 100	9 910	28 500	186 000	60 800	28 900	8 490	7 390	17 600	26 700	30 100	23 800	441 000
NATURAL FLOW	-	-	-	-	-	-	-	-	-	-	-	-	430 000

**CARROT RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (NEAR TURNBERRY)**

RECORDED FLOW	3 340	2 770	3 350	50 500	36 200	92 900	25 300	77 200	61 100	25 200	14 200	8 170	726 000
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**RED DEER RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (NEAR ERWOOD)**

RECORDED FLOW	4 140	3 090	5 510	199 000	253 000	71 300	37 700	104 000	45 200	15 400	10 400	6 960	756 000
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**ASSINIBOINE RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (At KAMSACK)**

RECORDED FLOW	1 670	1 530	3 760	373 000	318 000	56 800	29 200	42 400	22 200	15 400	19 300	8 250	892 000
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Apportionment period for streams crossing the Saskatchewan-Manitoba boundary was changed from water year to calendar year.

**RECORDED AND NATURAL FLOWS - SUMMARY OF SELECTED STREAMS AND LAKE CROSSING THE ALBERTA-SASKATCHEWAN BOUNDARY (in Cubic Decametres) FOR THE 1995 APPORTIONMENT PERIOD**

JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. TOTALS

**NORTH SASKATCHEWAN RIVER - ALBERTA-SASKATCHEWAN BOUNDARY (NEAR DEER CREEK)**

RECORDED FLOW	299 000	246 000	320 000	506 000	551 000	1 190 000	1 390 000	1 180 000	493 000	395 000	416 000	276 000	7 260 000
NATURAL FLOW	26 000	59 000	116 000	301 000	584 000	1 615 000	1 845 000	1 517 000	701 000	373 000	227 000	66 000	7 430 000

**BATTLE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY**

RECORDED FLOW	-	311	1 340	2 339	1 559	1 163	692	411	621	776	-	-	9 212
NATURAL FLOW	-	311	1 340	2 432	1 578	1 178	692	432	676	801	-	-	9 440

**LODGE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY**

RECORDED FLOW	-	2	270	291	119	1 566	82	14	5	10	-	-	2 359
NATURAL FLOW	-	2	258	304	270	1 839	110	2	7	4	-	-	2 796

**MIDDLE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY**

RECORDED FLOW	-	4	41	33	31	24	13	8	14	26	-	-	194
NATURAL FLOW	-	5	47	38	45	15	2	4	4	24	-	-	184

**BEAVER RIVER - ALBERTA-SASKATCHEWAN BOUNDARY (AT COLD LAKE RESERVE)**

RECORDED FLOW	4 260	4 000	6 000	27 900	18 600	7 930	5 680	35 000	35 500	15 000	9 660	5 450	175 000
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**BATTLE RIVER - ALBERTA-SASKATCHEWAN BOUNDARY**

RECORDED FLOW	1 800	1 560	15 700	27 200	16 000	7 810	3 610	5 740	3 440	2 300	1 770	1 340	88 500
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**COLD LAKE - ALBERTA-SASKATCHEWAN BOUNDARY (AT OUTLET OF COLD LAKE)**

RECORDED FLOW	15 300	14 265	17 622	20 719	2 768	26 076	24 461	35 432	50 518	44 470	32 746	30 490	339 707
NATURAL FLOW	16 264	14 732	18 106	21 162	28 053	26 520	24 915	35 884	50 963	44 762	33 066	31 014	345 441

**APPENDIX I**

**STATEMENT OF  
EXPENDITURES  
AND FINAL CLAIM**

**PRAIRIE PROVINCES WATER BOARD  
STATEMENT OF EXPENDITURES AND  
FINAL CLAIM**

**FINANCIAL YEAR  
1995/96**

For expenditures in accordance with the Prairie Provinces Water Board Agreement dated October 30, 1969 (see Section 10, Schedule C and Section 15 of the By-Laws).

<b>ITEMS</b>	<b>BUDGET FOR 95/96</b>	<b>EXPENDITURES</b>
<b>Salaries:</b>		
(01) Permanent Staff	\$ 267 200	\$ 179 769
(02) Temporary Staff	0	0
(03) Overtime/Other Pay	1 300	0
<b>TOTAL SALARIES</b>	<u>\$ 268 500</u>	<u>\$ 179 769 (1)</u>
<b>O &amp; M:</b>		
(07) Travel	\$ 15 200	\$ 10 972
(09) Postage	1 200	611
(10) Telecommunications	5 000	3 474
(15) Printing	4 600	6 269
(18) Profess. Services	0	0
(19) Training	0	0
(20) Temporary Help	500	0
(21) Personal Services	0	0
(22) Other Services	1 650	526
(25) Rentals	38 100	33 185
(28) Equipment Repair	500	527
(33) Purchased Materials	3 500	4 300
(35) Parts & Consumables	1 750	1 620
(41) Equipment Acquisition	0	3 797
<b>TOTAL O &amp; M</b>	<u>\$ 72 000</u>	<u>\$ 65 281</u>
<b>TOTAL SALARIES AND O &amp; M</b>	<u>\$ 340 500</u>	<u>\$ 245 050</u>
<b>FRINGE BENEFITS (2)</b>	<u>\$ 24 048</u>	<u>\$ 16 179</u>
<b>TOTAL EXPENDITURES</b>	<u>\$ 364 548</u>	<u>\$ 261 229</u>
Less Revenue from Books Sales		-464
		<u>\$ 260 765</u>

(1) Includes Pay Equity

(2) 9% of Permanent Salaries

Each Province's share (one-sixth of the total amount of \$260 765) is \$43 461.

**FINAL CLAIM**

**\$ 43 461**

## **APPENDIX II**

### **BOARD/COMMITTEE MEMBERSHIP**

## PPWB MEMBERS

<b>CHAIRMAN</b>	J. Vollmershausen	Regional Director General Prairie and Northern Region Environment Canada
	H.M. Hill (Sept/77-Oct/95)	Director General Prairie Farm Rehabilitation Administration Agriculture Canada
	R. J. Wettlaufer (Mar. 4/96)	Director Prairie Farm Rehabilitation Administration Agriculture Canada
	J.W. Thiessen (Nov/93-Oct/95)	Assistant Deputy Minister Natural Resources Services Alberta Environmental Protection
	D.A. Tupper (Mar. 20/96)	Director Water Management Division Natural Resources Service Alberta Environmental Protection
	W.L. Dybvig	Vice President Water Management Division Saskatchewan Water Corporation
	L.J. Whitney	Water Resources Branch Manitoba Natural Resources
.....		
<b>SECRETARY</b>	J.D. Rogers (June 1/95)	Transboundary Waters Unit Environment Canada

## PPWB ALTERNATE MEMBERS

G. McKeating	Director Prairie and Northern Region Environmental Conservation Branch Environment Canada
A.F. Lukey (Aug/81-Sept/95)	Director Engineering and Sustainability Service Prairie Farm Rehabilitation Administration Agriculture and Agri-Food Canada
P. Valentine (Dec/93-Oct/95)	Director Technical Services and Monitoring Division Alberta Environmental Protection
B.G. Collins	Manager, Integrated Resources Water Management Division Saskatchewan Water Corporation
Vacant	Manitoba Natural Resources

## COMMITTEE ON HYDROLOGY

### TERMS OF REFERENCE

At the request of, and under the direction of the PPWB, the Committee on Hydrology 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.

Approved: October 17, 1972  
PPWB Minute 7-11

### MEMBERS

<b>CHAIRMAN</b>	R.L. Kellow	Executive Director Prairie Provinces Water Board
	R.G. Boals	Monitoring Operations Division Environment Canada
	F.R.J. Martin	Prairie Farm Rehabilitation Administration Agriculture and Agri-Food Canada
	R.A. Bothe	Surface Water Assessment Branch Alberta Environmental Protection
	R.J. Bowering	Water Resources Branch Manitoba Natural Resources
	A.B. Banga	Water Management Division Saskatchewan Water Corporation
	R.F. Hopkinson	Atmospheric and Hydrologic Science Division Environment Canada
	.....	
<b>SECRETARY</b>	A.J. Chen	Operations Engineer Transboundary Waters Unit Environment Canada



## COMMITTEE ON WATER QUALITY

### TERMS OF REFERENCE

Under the direction of the Prairie Provinces Water Board, the Committee on Water Quality shall investigate, oversee, review, report, recommend and advise the Board on matters pertaining to the water quality 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, 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 recommend remedial or preventative measures for avoiding and resolving water quality issues.

The Committee shall foster an awareness and an 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 Committee shall also assist the Committee on Groundwater in the development of interprovincial groundwater programs by identifying water quality monitoring needs for interprovincial groundwater aquifers.

### MEMBERS

<b>CHAIRMAN</b>	R.L. Kellow	Executive Director Prairie Provinces Water Board
	W.D. Gummer	Ecosystem Quality Division Environment Canada
	M. Morelli	Environmental Quality Standards Branch Manitoba Environment
	R.G. Ruggles	Municipal Branch Saskatchewan Environment and Resource Management
	D.O. Trew	Water Quality Section Surface Water Assessment Branch Alberta Environmental Protection
	B.G. Fairley (Nov/95)	Water Quality Prairie Farm Rehabilitation Administration Agriculture and Agri-Food Canada

### SECRETARY

.....  
Secretary provided by host agency

## COMMITTEE ON GROUNDWATER

### TERMS OF REFERENCE

Recognizing the interrelationship 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 will 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.

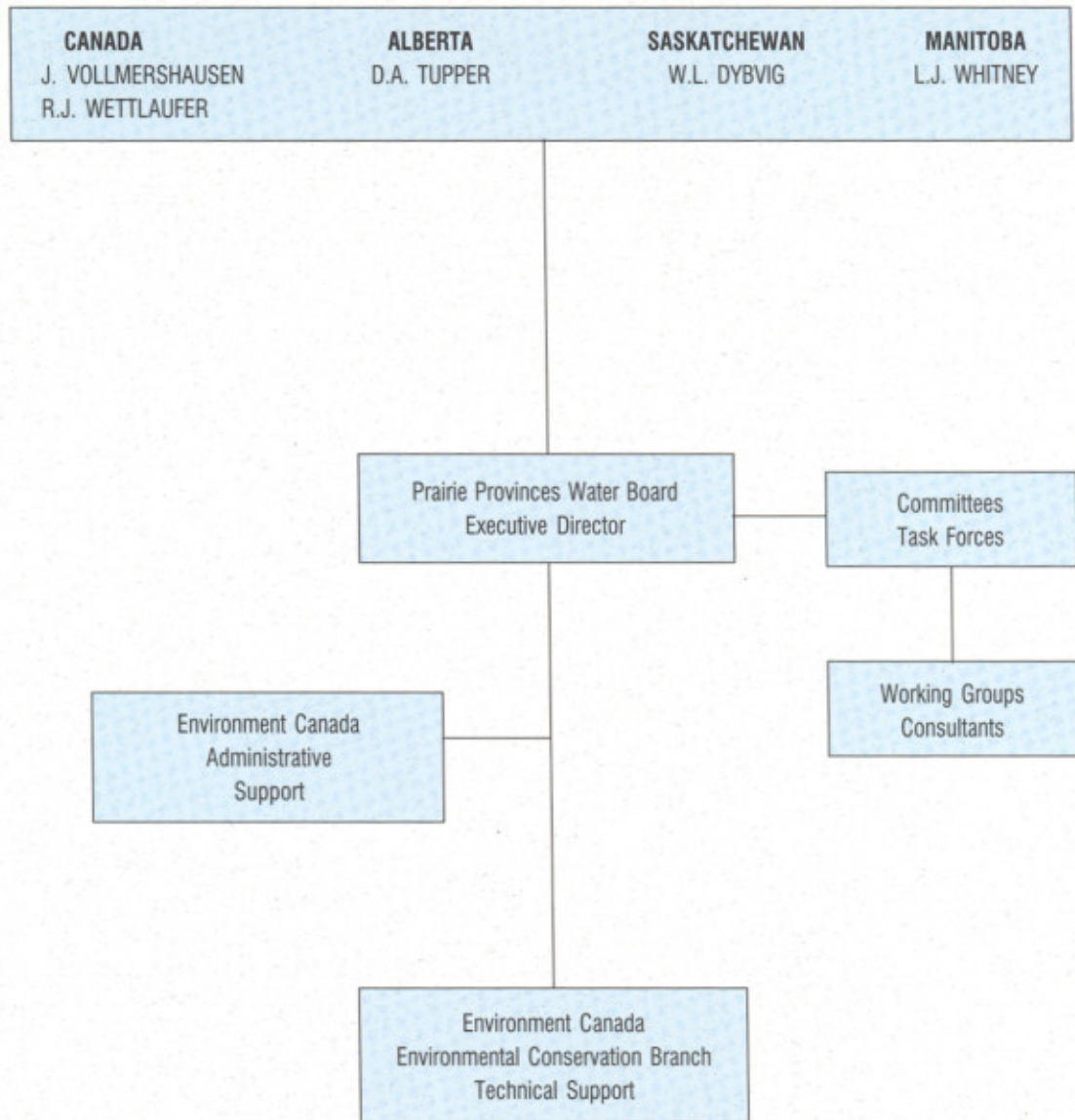
Approved: November 18-19, 1981  
PPWB Minute 26-25

### MEMBERS

<b>CHAIRMAN</b>	R.L. Kellow	Executive Director Prairie Provinces Water Board
	G.D. Grove	Environmental Sciences Division National Hydrology Research Institute Environment Canada
	J. Lebedin	Earth Sciences Division Prairie Farm Rehabilitation Administration Agriculture and Agri-Food Canada
	R.C. Hardick	Hydrogeology Branch Technical Services and Monitoring Division Alberta Environmental Protection
	N. Shaheen	Water Management Division Saskatchewan Water Corporation
	L. Gray	Hydrotechnical Services Manitoba Natural Resources
	.....	
<b>SECRETARY</b>	A.J. Chen	Operations Engineer Transboundary Waters Unit Environment Canada

# ORGANIZATIONAL CHART

PRAIRIE PROVINCES  
WATER BOARD



**APPENDIX III**

**PPWB MONITORING  
LOCATIONS MAP**



## PPWB MONITORING LOCATIONS MAP



### ● PPWB Water Quantity and Quality Monitoring Locations

1. Cold River
2. Beaver River
3. North Saskatchewan River
4. Battle River
5. Red Deer River (Alta./Sask.)
6. South Sask. River
7. Churchill River
8. Saskatchewan River
9. Carrot River
10. Red Deer River (Sask./Man.)
11. Assiniboine River
12. Qu'Appelle River

● Hydrometric Sites used for apportionment monitoring