Second Annual Progress Report
to the
International Joint Commission

INTERNATIONAL RED RIVER BOARD

October 2001

PREFACE

This report documents water quality trends and exceedences of objectives, effluent releases, and control measures for the Red River basin for the 2000 Water Year (October 01, 1999 through September 30, 2000). In addition, this report describes the activities of the International Red River Board during the reporting period October 01, 2000 to September 30, 2001 and identifies several current and future water quantity and quality issues in the basin.

The units of measure presented in this report are those of the respective agencies contributing to this report.

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October 24, 2001

Commissioners:

The International Red River Board is pleased to submit the Second Annual Progress Report to the International Joint Commission.

Respectfully submitted,

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Co-Chair, Canadian Section

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1. SUMMARY

1.1 Water Quantity & Quality

Wet watershed conditions and sustained high flows in the Red River in the fall of 1999 raised concerns that wide-spread flooding could occur in the basin in the spring of 2000. The flood potential was significantly attenuated by below average winter snowfall and a more typical spring melt cycle, which resulted in a generally lower than average freshet peak along the Red River and its tributaries. However, the Red River and many of its tributaries rose to above normal levels later in the summer as a result of above average precipitation over much of the basin. Rainfall runoff caused some localized agricultural flooding to occur.

As a result of the excess summer rainfall, the 2000 Water Year (October 01, 1999 to September 30, 2000) concluded with elevated groundwater tables and generally wet watershed conditions throughout. These conditions persisted well into late fall of 2000. However, as in the previous year, succeeding snow accumulations and effective spring rain were again below average over most of the basin. As a result, major flooding did not occur in most areas in the spring of 2001 except in the extreme southern portions of the basin where localized flood protection activities were required.

Based on the established water quality objectives, water quality conditions at the international boundary remained about the same, or were marginally better than in the 1999 Water Year. The total dissolved solids and dissolved oxygen objective was exceeded marginally in one month during the reporting period, while there were no observed exceedences of the chloride and sulfate objective. The fecal coliform objective was also exceeded marginally in one month during this reporting period. However, it is noted that a complete series of continuous monitoring data at the international boundary is not available for the 2000 Water Year. The available continuous data were augmented with instantaneous monthly samples comprising a generally coherent database with some data gaps. A permanent installation of an auto-monitor at the international boundary is scheduled for the winter of 2001-2002.

A number of exceedences of alert levels established for pesticides, herbicides, and heavy metals at the international boundary by the former International Red River Pollution Board occurred in the 2000 Water Year. However, only the organochlorine pesticide *lindane* exceeded the Canadian Aquatic Life Guideline level. The Board has continued to closely monitor exceedence levels during the 2001 Water Year.

Facilities in the United States with current National Pollution Discharge Elimination System (NPDES) discharge permits from North Dakota and Minnesota were generally in compliance with their permits during the 2000 Water Year. Incidents of spills and releases were associated with localized flooding which inhibited wastewater treatment and interfered with effluent management. Although wet watershed conditions were experienced during the reporting period, fewer bypasses and lagoon overflows were reported compared to the past several years. No new pollution point sources that would have potential impacts at the international boundary were introduced within the Red River basin.

All treated municipal effluents discharged to the Red River or its tributary streams within the basin in Manitoba are licensed under Manitoba's Environment Act. Three municipalities with populations greater than 1000 (Morris, Selkirk and Winnipeg), discharge treated effluents directly to the Red River, while most tributary streams also receive treated effluents from nearby communities. The volumes and quality of effluent has not changed significantly from previous years.

1.2 Basin Activities

The International Red River Board investigates and reports on other activities in the Red River basin that have a potential to affect the waters and aquatic ecosystems of the Red River and its transboundary tributaries and aquifers. This information exchange alerts the International Joint Commission of current and emerging water-related issues and contributes to the prevention and resolution of disputes on an ongoing basis. The International Red River Board also reports on the Poplar and Big Muddy River basins, which were under the responsibility of the former International Souris-Red Rivers Engineering Board.

The basin activities and issues monitored by the Board are summarized in Table 1.

Table 1: Current Issues in the Red River Basin

Project	Transboundary Issue	Status	Action
Devils Lake	Potential outlet to the Red River could cause water quality deterioration, biota transfer, and changes in the flow regime at the boundary.	Corps of Engineers doing EIS, with draft to be completed by February 2002 and final EIS by September 2002. North Dakota hired consultant to design state interim outlet. Construction of interim outlet is scheduled to start May 2002.	Project being monitored by Garrison JTC. JTC will keep IRRB informed of any changes in project status.
International Border Zone	Intensive livestock operations near boundary could be potential water quality concern.	Manitoba, ND & Minnesota are to meet to develop a plan to exchange information and to allow timely input into decisions concerning intensive livestock operations in the border region.	Members will keep the Board informed on decisions and assessments of proposals.
Pembina River - Aux Marais	Embankment along boundary in Manitoba prolongs agricultural flooding in North Dakota.	Joint committee of Manitoba & North Dakota officials is evaluating expansion of the capacity of transboundary streams. Red River Task Force suggested a consultative group to resolve lower Pembina issues.	Manitoba & N.D. will keep the Board informed on progress of Pembina consultative group and capacity expansion discussions.
	Embankments along the Pembina R. & parallel to the international boundary increase water volumes flowing toward Manitoba.		
Pembina River	Water use/development are increasing, no apportionment agreement.	Manitoba licenses water use from the river.	Monitor total water use upstream of boundary.
	Agricultural and tributary flooding in Manitoba.	Drainage into upper Pembina R. tributaries in North Dakota blamed for increased flooding.	Manitoba & N.D. will keep the Board informed on negotiations.
Poplar River	Bilateral Monitoring Agreement expired March 2001.	Request to extend agreement to be made soon.	Monitored by Poplar R. Bilateral Monitoring Committee.
	No formal apportionment formula exists.	Sask. & Mont. considering reestablishing negotiations for a new apportionment agreement arrangement.	Maintain watch on agreement negotiations.
	Water quality concerns	Continue to be close to long-term TDS objective.	Bilateral committee reviewing how the TDS objective is calculated
Garrison Diversion Unit	Diversion of water from Missouri River to Hudson Bay drainage could transfer non-native biota, change water quality & increase flows.	Dakota Water Resources Act (2000) increased funds for MR&I, and directed a Red River Water Supply Study (RRWSS) and provided that a feature that would provide water from the Missouri were selected, specific authorization will be required. The RRWSS has been initiated and is anticipated to take 3 years to complete.	Project being monitored by the IRRB.

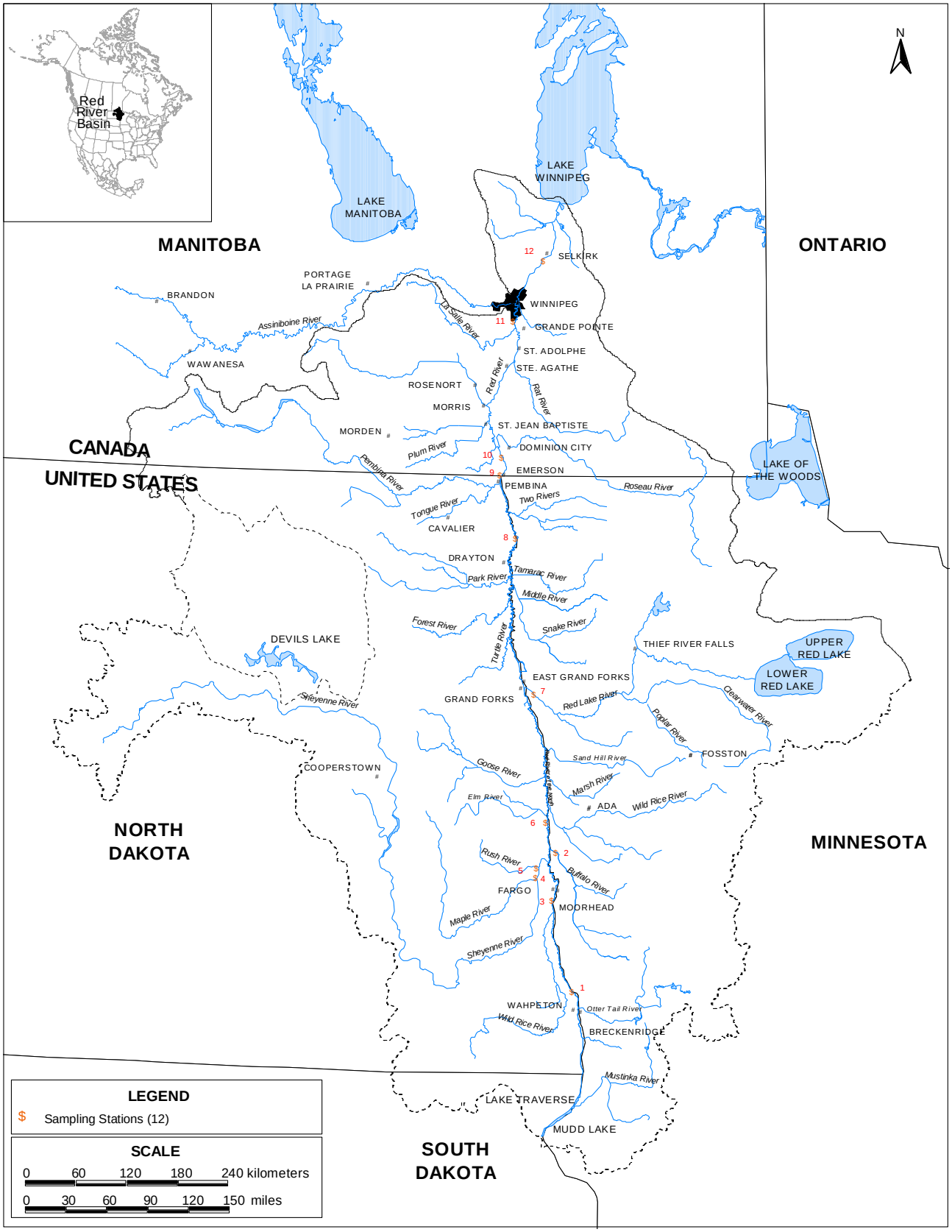
2. INTRODUCTION

In April 2000 the International Joint Commission (IJC) formally merged its International Red River Pollution and Souris-Red Rivers Engineering Boards to form the International Red River Board (IRRB). The Commission's directive to the IRRB consolidated the water quantity and water quality responsibilities of the former boards and called for an assessment of the new Board's ability to undertake additional flood-related responsibilities in the Red River basin.

In its November 2000 report to governments *'Living with the Red'*, the IJC recommended that the governments assign certain flood-related tasks to the IJC for implementation by its IRRB. The Commission held consultations and hearings throughout the basin to receive public comment on the proposed expanded directive to the IRRB. Based on its investigation into flooding in the Red River basin, and public consultations, the Commission requested the Minister of Foreign Affairs and International Trade (Canada) and the Secretary of State (United States) to have the governments confirm its Red River mandate and approve the inclusion of the proposed flood-related tasks in the IRRB directive. In June 2001, Canada and United States formally notified the IJC that they had approved the new directive as proposed. The approved directive is included in Appendix A.

In summary, the IRRB is responsible for assisting the Commission in avoiding and resolving transboundary disputes regarding the waters and aquatic ecosystem of the Red River and its tributaries and aquifers. This is accomplished through the application of best available science and knowledge of the aquatic ecosystem of the basin and an awareness of the needs, expectations and capabilities of residents of the basin. The geographic scope of the Board's mandate is the Red River basin, excluding the Assiniboine and Souris Rivers. The mandate presently includes the Poplar and Big Muddy River basins, previously the responsibility of the International Souris-Red Rivers Engineering Board, until such time that another appropriate IJC board can be established. The Red River basin is illustrated in Figure 1.

Figure 1. Red River and its Tributaries


Red River Basin
N
LAKE MANITOBA
LAKE WINNIPEG
MANITOBA
ONTARIO
SELKIRK
PORTAGE LA PRAIRIE
BRANDON
WINNIPEG
Assiniboine River
La Salle River
GRANDE POINTE
ST. ADOLPHE
WAWANESA
STE. AGATHE
ROSENORT
Red River
Rat River
MORRIS
ST. JEAN BAPTISTE
MORDEN
Plum River
DOMINION CITY
CANADA
Pembina River
EMERSON
UNITED STATES
PEMBINA
Roseau River
LAKE OF THE WOODS
Two Rivers
Tongue River
CAVALIER
DRAYTON
Tamarac River
Park River
Middle River
Forest River
Snake River
DEVILS LAKE
Turtle River
THIEF RIVER FALLS
UPPER RED LAKE
LOWER RED LAKE
EAST GRAND FORKS
Sheyenne River
GRAND FORKS
Red Lake River
Clearwater River
Poplar River
FOSSTON
Sand Hill River
COOPERSTOWN
Goose River
Marsh River
Elm River
ADA
Wild Rice River
NORTH DAKOTA
MINNESOTA
Rush River
Buffalo River
FARGO
MOORHEAD
Maple River
Sheyenne River
WAHPETON
Otter Tail River
Wild Rice River
BRECKENRIDGE
Mustinka River
LAKE TRAVERSE
MUDD LAKE
SOUTH DAKOTA
LEGEND
$ Sampling Stations (12)
SCALE
0 60 120 180 240 kilometers
0 30 60 90 120 150 miles

3. INTERNATIONAL RED RIVER BOARD MEMBERSHIP

In addition to the need to bring best available water quantity and quality science and knowledge to bear on transboundary issues, the IJC also emphasized the importance of increasing coordination with groups and agencies at all levels in the basin. To facilitate this coordination and greater stakeholder involvement, Board membership was expanded to include non-government participation. Currently, the full complement of nine members have been appointed on the United States side, and seven members have been appointed to the Board on the Canada side. The latter outstanding appointments are expected to be made in the coming months.

Richard L. Kellow Canadian Co-Chair Executive Director Transboundary Waters Unit Environment Canada	Maryanne C. Bach U.S. Co-Chair Regional Director Great Plains Region U.S. Bureau of Reclamation
William D. Gummer Associate Science Director Environmental Conservation Branch Environment Canada	Max H. Dodson Assistant Regional Administrator Office of Ecosystems Protection & Remediation, Region 8 U.S. Environmental Protection Agency
Dwight Williamson Manager, Water Quality Management Section Manitoba Conservation	Colonel Robert L. Ball District Engineer, St. Paul District U.S. Army Corps of Engineers
Dr. Joseph O'Connor Director, Fisheries Branch Manitoba Conservation	Gregg J. Wiche District Chief, Bismark Office U.S. Geological Survey
Steven Topping Director, Water Resources Branch Manitoba Conservation	Francis (Fritz) J. Schwindt Chief, Environmental Health Section North Dakota Department of Health
Alain Vermette Manager, Regional Water Programs Prairie Farm Rehabilitation Administration Agriculture and Agri-Food Canada	Dr. Gale Mayer Red River Coordinator Minnesota Department of Natural Resources
R.S. (Bud) Oliver Mayor, City of Selkirk, Manitoba	Randy Gjestvang Red River Water Resource Engineer North Dakota State Water Commission
Vacant Position	Jeff Lewis Regional Director, Detroit Lakes Office Minnesota Pollution Control Agency
Vacant Position	Bruce Furness Mayor, City of Fargo, North Dakota
Michael Kowalchuk Canadian Secretary Hydrologic Issues & Policy Advisor Meteorological Service of Canada Environment Canada	Kent Heidt U.S. Secretary Resource Management Coordinator U.S. Bureau of Reclamation

4. INTERNATIONAL RED RIVER BOARD ACTIVITIES

The International Red River Board presented its first annual report to the IJC at the October 2000 IJC Semi-Annual meeting. At this meeting, the Board identified a number of issues that require discussion or further guidance from the Commission, or that need discussion with governments. The Board met again with the Commission in April 2001 where decisions and progress on these issues was exchanged. To provide continuity, the status of specific issues is captured in the following discussion.

4.1 Annual Board Meeting

The International Red River Board met on June 06-08, 2001 in Winnipeg, Manitoba, Canada, to discuss the 2000 Water Year (October 01, 1999 through September 01, 2001) monitoring results, and exceedences of IJC water quality objectives and alert levels. The Board also discussed emerging issues, implementation of its directive, funding and public consultation, and work plan development. The meeting was attended by IJC Chair M. Gusella and Commissioner J. Blainey (Canadian Section), and IJC staff G. Galloway, M. Clamen, T. Bailey, and L. Bourget.

The Board also conducted two public meetings on June 07 and 08, 2001 in Gimil and Winnipeg, Manitoba, respectively, to hear the concerns of the residents of the basin regarding existing and potential transboundary water issues. The Board invited the Lake Winnipeg Research Consortium to present the findings of its research on the impacts of human activity on Lake Winnipeg to the Gimli meeting, and the Red River basin Flood Research Partnership to present a report on its work to the Winnipeg meeting. The International Coalition for Land/Water Stewardship in the Red River Basin also made a presentation to the Board and attendees, expressing support for the IJC and the Board with encouragement to become proactively involved in a number of basin issues.

4.2 Hydrology and Aquatic Ecosystem Health Committees

At its June 2001 annual meeting, the Board determined that to effectively address its expanded mandate and to maintain a capacity to assist the Commission in preventing and resolving transboundary disputes, a focused effort through the application of best available science and knowledge of the hydrology and aquatic ecosystems of the basin was required. As a result, the Board established two committees, a Hydrology Committee and an Aquatic Ecosystem Health Committee under which access to expertise could be consolidated with the capacity to undertake specific investigations and tasks at the request of the Board. The Board also recognized that the work of these specialized committees will intersect where integrated interpretation and understanding of watershed issues is required.

Further, the Board assigned certain tasks to these committees to address some of the functional responsibilities of the combined Board and its added responsibilities with respect to flood mitigation. The Board directed the committees to prepare two-year work plans that identify what can be achieved with existing resources and commitment of member agencies, and what, if any, additional activities could be undertaken with additional resources. These activities include establishing natural flow and water usage databases, evaluating current water quality monitoring and reporting protocols, developing biological monitoring strategies, and developing recommendations on an interjurisdictional drainage policy for the basin.

The Committees met in September, 2001 to develop operating terms-of-reference and to initiate coordinated work planning. The work plans are currently being developed and are expected to be sufficiently complete to enable the Board to report on the details of the proposed work and on issues of current and longer-term capacity and resources to the Commission at the Fall Semi-annual meeting.

A listing of Committee members is provided in Appendix E

4.3 Secretariat

The Board determined, with the concurrence of the IJC, that a secretariat to support the Board's activities was required. To ensure a guaranteed future for the secretariat, sustainable funding for the position would also be required.

Effective October 01, 2001, a secretariat position was formally established complementing and supplementing the traditional functions of the existing Secretaries to the Board. In total, one half person-year and corresponding salary has been allocated to this position. A substantial portion of salary costs to March 31, 2002, is provided by the IJC and, subject to the availability of funds, a similar level of funding from the IJC is anticipated for the period April 01, 2002 to March 31, 2003. The secretariat position will be filled by Michael Kowalchuk of the Environment Canada office in Winnipeg, Manitoba. These arrangements are to be reviewed annually.

The duties of the secretariat include keeping the Board apprised of activities/policies in the basin affecting its mandate, moving action items arising from Board decisions forward to completion, preparing a communications plan in coordination with the Water Information Network (WIN) project, and developing and maintaining effective relations with key water organizations in the basin.

The Board will continue to be supported by its Secretaries for both the United States and Canada sides.

4.4 Communications Strategy

The IRRB recognizes that as the role of governments change (federal, provincial, state, local), regional entities need to become more involved with intra-basin environmental and water issues, and transboundary issues as well. Efforts of such an entity, the Red River Basin Board (RRBB), have focussed on providing a coordinating structure to facilitate basin-wide partnership efforts with respect to water management. With grant funding from the US Environmental Protection Agency (EPA), the RRBB has recently proposed to develop a Water Information Network (WIN) that would serve a coordination, communications, education, and research dissemination function in the basin. As advocated by the IJC, the IRRB can complement and contribute to initiatives of this nature by bringing bi-national perspectives to regional issues, and by representing transboundary neutrality and authority.

A meeting with RRBB staff is planned to clarify appropriate levels of alignment and differentiation, and how a communications strategy might be developed that contributes to the mutual benefit of the respective Boards and the residents of the basin. This will be a key undertaking by the secretariat in the coming months.

4.5 Other Actions

At the June, 2001 meeting the Board discussed the issue of access to IRRB data and information by Board members, and more broadly, by decision makers in the basin. In follow-up to this discussion, the EPA has determined that the agency's computer storage and retrieval system STORET can be accessed and utilized by Board members to facilitate common formats and a consolidation of the Board's water quality data sets. Further, the EPA is proposing to discuss access to STORET in the context of the WIN project over the coming months.

5. WATER QUALITY – INTERNATIONAL BOUNDARY

The water quality of the Red River at the international boundary as described in this section of the report is based on continuous monitoring and instantaneous grab samples obtained during the 2000 Water Year (October 01, 1999 – September 30, 2000). The parameters for which the IJC has approved objectives, and the streamflow and pH characteristics for a corresponding time period, are discussed below.

Although water quality at the international boundary is of primary concern, the characteristics of the river at other locations (Figure 1) are also referenced in subsequent sections of this report to provide a more complete spatial representation of water quality in the watershed.

5.1 Hydrology, pH and Temperature

Streamflow

During the 2000 Water Year, the mean discharge of the Red River at the international boundary was 164.5 m^3/s. Daily flows ranged from a minimum of 45.5 m^3/s on February 22, to a maximum of 900.0 m^3/s on July 02. Unlike most years where maximum flows are associated with the spring freshet, streamflow patterns during the 2000 water year were dominated by summer rainfall events over much of the basin. This demonstrates the range of hydrological conditions that can occur in the watershed with implications for widely variable watershed response and observed water quality patterns.

The streamflow characteristics of the Red River at the international boundary for the water years 1971 through 2000, are illustrated in Figures 2a and 2b included in Appendix D.

pH and Temperature

The observed pH and temperature values for the Red River remained within the normal range and no unusual rates of change were noted. However, some short term variability may not have been detected during the period that the continuous auto-monitor was not operational. The operational status of the auto-monitor at the international boundary at Emerson, Manitoba is discussed in Section 6.4.

5.2 Water Quality Objectives

In 1969, the IJC established objectives for a limited number of water quality variables for the Red River at the international boundary. These variables are *dissolved oxygen, total dissolved solids, chloride, sulphate, and fecal coliform bacteria*. The established objectives provide a method for determining the acceptability of the water quality in the Red River, while detected exceedences provide a trigger mechanism for agencies to take action to resolve or to mitigate potential problems, and to minimize the risk of future reoccurrence. The objectives provide direct guidance to jurisdictions such that water management or development can only occur in a way that does not cause exceedences. Given the utility of this approach, the IJC has requested the IRRB to monitor and to report on compliance with the objectives. The objectives for the five variables are defined in Appendix B.

Because rainfall runoff was unusually high in the basin during the summer of 2000, additional water quality sampling was conducted on June 30 augmenting the regular sampling program and providing two samples for the month of June.

Dissolved Oxygen

During the 2000 water year, dissolved oxygen (DO) field measurement values remained well above the IJC objective (5.0 mg/L) except for the July reported value, which was marginally below (4.3 mg/L). DO values were not available for December, 1999, and May 2000.

Specific Conductance and Total Dissolved Solids

Total dissolved solids (TDS) were determined from continuous monitoring and from instantaneous samples collected monthly when the auto-monitor at the international boundary was not operational. One exceedance of the TDS objective (500 mg/L) was observed during the reporting period at 511 mg/L (April, 2000). The remaining observed values ranged from 310 mg/L (June, 2000) to 470 mg/L (May, 2000). No TDS value was available for February, 2000. Historical TDS values are illustrated in Figure 3 of Appendix D.

Chloride

The chloride objective (100 mg/L) was not exceeded during the 2000 Water Year. The highest value recorded was 50 mg/L (March, 2000). Ground water discharge is the predominate source of chloride in the Red River basin with concentrations in the Red River at the international boundary tending to be higher during the winter months when surface inflows are reduced. The historical record of observed chloride concentrations is provided in Figures 4a and 4b of Appendix D.

Sulfate

The sulfate objective (250 mg/L) was not exceeded during the 2000 Water Year. Observed dissolved sulfate concentrations ranged from 68 mg/L (February, 2000) to 160 mg/L (April, 2000).

Bacteriological Characteristics

The bacteriological characteristics of the Red River are assessed on the basis of observed fecal coliform bacteria for which an IJC objective has been defined. Coliforms are generally monitored on a monthly basis making short term variability and seasonal trends difficult to discern. During the reporting period, fecal coliform counts ranged from 10 colonies per 100 ml (December, 1999) to 44 colonies per 100 ml (August, 2000) with a maximum value of 206 colonies per 100 ml observed in September, 2000. The IJC objective for fecal coliform bacteria is 200 colonies per 100 ml. No observed values were available for October and November, 1999.

The IRRB will continue to monitor coliform concentrations and to evaluate the nature and uncertainties inherent in analyzing this biological parameter. Historical fecal and total coliform values are illustrated in Figures 5 and 6 of Appendix D.

5.3 Alert Levels

In November, 1984, the International Red River Pollution Board introduced the concept of alert levels to complement the existing water quality objectives. Alert levels for the most significant water chemistry variables were developed and approved by the Pollution Board in January, 1986. A compendium of the analytical methods used by the member agencies was prepared in 1990 and is included in Appendix B.

A total of six pesticides with 37 exceedences (detectable concentrations) were recorded during the October 01, 1999 to September 30, 2000 reporting period. Mercury also exceeded the alert level in 5 of 13 samples. The concentration of mercury and pesticides will be closely monitored during the 2001 water year. Low levels of cadmium, copper, lead, nickel and zinc are endemic to the Red River. Exceedence level data for the 2000 Water Year are summarized in Table 2.

Table 2. Exceedences of Alert Levels, Red River at Emerson, Manitoba

Parameter	Units	Alert Level	Number of Exceedences	Exceedence Values		Canadian Aquatic Life Guidelines
				Min	Max	
Alpha-HCH	ng/L	DL*	9 of 11 (no values for January and April, 2000)	0.16	0.72	10
G-HCH (Lindane)	ng/L	DL*	9 of 11 (no values for January and April, 2000)	0.12	17.8	10
2,4-D	ng/L	DL*	7 of 12 (no value for January, 2000)	14.7	325.0	4 000
2,4-DB	ng/L	DL*	0 of 7 (no value for October, November, and January, 1999, and March and July, 2000)		<47.0	4 000
PICLORAM	ng/L	DL*	6 of 12 (no value for January, 2000)	15.5	124.0	26 000
2,4,5-T	ng/L	DL*	0 of 12 (no value for January, 2000)		< 31.8	
MCPA	ng/L	DL*	3 of 12 (no value for January, 2000)	16.2	140.3	2 600
DICAMBA	ng/L	DL*	3 of 12 (no value for January, 2000)	7.6	81.2	10 000
Mercury	µg/L	DL*	5 of 13	0.005	0.012	0.0001

*Detection Level

5.4 Summary of Water Quality Conditions

Concentrations of water quality constituents such as total dissolved solids and chloride have generally remained below the objective level. This is largely attributed to the dilution capacity from the higher flows that occurred in the Red River during the 2000 Water Year. This trend was observed in all of the recent higher flow years.

Bacteriological conditions are routinely monitored at the international boundary. During the 2000 Water Year the observed fecal coliform bacteria and total coliform counts were generally well below the IJC objective level. One marginal exceedence of the objective level for fecal coliform was observed in late summer of 2000. This observation coincided with an above normal rainfall period experienced in the basin and is likely associated with agricultural and storm water runoff.

Given that the Red River basin is an agriculturally dominated region, detection of pesticides in the Red River at low concentrations is expected. During the 2000 Water Year, six of the pesticides for which alert levels have been established by the Board were detected at low levels and generally well below the Canadian Aquatic Life Guideline. The pesticide *lindane* marginally exceeded the Guideline in one observed sample taken in June 2000. This occurrence is likely associated with the above normal rainfall runoff experienced in the basin.

The IRRB recognizes that there is very little scientific information available to assess the implications of long-term exposure to low concentrations of pesticides by aquatic organisms and humans. The IRRB continues to closely monitor trends in pesticide concentrations and their frequency of detection with a view to updating its assessment as new scientific information becomes available.

6. WATER QUALITY SURVEILLANCE PROGRAM

The data obtained by each agency with representation on the IRRB and that monitor water quality within the Red River basin at the locations as shown on Figure 1, are assembled for the preparation of the annual report to the IJC. US-supplied data are entered into STORET, the computer storage and retrieval system of the EPA. All Environment Canada data are entered into ENVIRODAT, Canada's data management and retrieval system. A brief description of the monitoring activities of each agency, including the monitoring which is peripheral to the IRRB's direct interest, is described below. Discussions are currently underway for entry of relevant Red River water quality data from Environment Canada and Manitoba into STORET.

For the purpose of annual reporting of the IRRB, data collected by the continuous monitor and monthly grab samples at Emerson, Manitoba, had been the primary focus. Environment Canada is responsible for the collection of these data. Continuous monitor and monthly grab samples are analyzed for physical parameters, pH, chloride, sulfate, major ion chemistry, nutrients, metals and pesticides. Mobile field laboratories and Environment Canada laboratories in Saskatoon, Saskatchewan and Burlington, Ontario perform the analyses.

Annual reports, which provide a summary of water quality highlights, a synthesis of monitoring data, and recent laboratory results, are distributed to all IRRB members. Other data considered by the IRRB in preparation of this report were collected by USGS, Minnesota Pollution Control Agency (MPCA), North Dakota Department of Health (NDDH), and Manitoba Conservation.

6.1 Minnesota

Ambient Water Quality Monitoring Program

The Minnesota Pollution Control Agency (MPCA) monitors water quality on the main stem of the Red River at four long-term water quality sampling stations and on tributaries to the Red River at six stations. All of these monitoring stations are part of the Minnesota Milestones sampling program, a program that includes fixed station stream monitoring sites throughout the state of Minnesota.

MPCA Water Quality Milestone Sites are sampled monthly for ten months of two nonconsecutive years in a five-year period for each major basin in the state. The sites sampled by MPCA in the Red River basin during 2000 are listed in Table 3.

The parameters measured at the Minnesota Milestone Sites include: *Ammonia, Dissolved Oxygen, Turbidity, pH, Fecal Coliform, E-Coliform, Chloride and Specific Conductance*. In addition, where stream flow records are available, Chlorophyll-A, Pheophyty-A, Total Suspended Solids, Total Volatile Solids, Total Phosphorus and BOD were also sampled. Data from water quality sampling at these sites is entered into the US EPA's STORET database upon receipt from the laboratory. Results of the Milestone Sampling for Water Year 2000 are available from MPCA.

Table 3. Minnesota Milestone Sites in the Red River Basin

SITE	DESCRIPTION
OT-1	Otter tail R bridge on 4th St. N at Breckenridge
OT-49	Otter tail R bridge on CSAH-15 West Of Fergus Falls
RE-300	*Red River at Almonte Ave S in Grand Forks, ND
RE-403	Red River at bridge on Csah-39, 1 mi. W of Perley
RE-452	Red River bridge on Main Ave at 3rd St., In Moorhead
RE-536	Red River at bridge on Csah-18 0.5 mi. W of Brushvale
RL-0.2	Red Lake R downstream of MN-220 bridge in E Grand Forks
RL-23	Red Lake River at bridge on Csah-15 at Fisher
SK-1.8	Snake River at bridge on MN-220 N of Big Woods
TMB-19	Two Rivers middle bridge on US-75, 1 mi. N of Hallock

** Sampling is now performed at RE-298 to improve access to the river channel; the record is considered continuous with RE-300.*

Monitoring Network Enhancement

Resource managers in the Red River basin are working cooperatively through the Red River Basin Water Quality Plan process to develop a coordinated water quality-monitoring network. The working goals of this effort are:

- Promote water quality monitoring as a way to provide long-term trend analysis for water quality and to help people understand how land use affects water quality of the Red River basin;
- Establish a means of measuring the effectiveness of non-point source reduction measures being installed in the Red River basin;
- Provide the opportunity for local government and citizen involvement in the collection, analysis, and management of water quality sampling in the Red River basin.

This effort was advanced in the years 2000-1 (some of these accomplishments occurred after 10/1/00) in the following ways:

- Publication of draft Red River Basin Water Quality Monitoring Standard Operating Procedures for Field and Lab;
- Development of Red River Basin Quality Assurance Project Plan
- Water quality monitoring and special studies conducted by U.S. Geological Survey in the mid-basin (Wild Rice, Red Lake, Middle and Snake River watersheds)
- Extension of River Watch program to the Wild Rice Watershed
- Implementation of pre-construction monitoring at four Flood Damage Reduction Projects in Bois de Sioux (North Ottawa), Wild Rice (Dahlen Coulee), Middle-Snake River (Agassiz Valley) and Roseau River (Hay Creek) watersheds.
- Creation of a Red River Water Quality Monitoring Coordinator and Technical staff positions, to be managed by the Red River Watershed Management Board, with advice from MPCA and the Minnesota Department of Natural Resources (MDNR);
- Initiation of Impaired Waters studies in the Upper Red River Basin (Bois De Sioux and Ottertail watersheds).

The following parameters were measured from the samples collected:

Temperature - C - field	pH	Nitrite+Nitrate
Dissolved Oxygen - field	Conductivity	NH3+NH4
Total Suspended Solids	Total Phosphorus	Chloride

The following Minnesota standards (Table 4.) have been established for the waters sampled at the listed stations, and compared with IJC objectives:

Table 4. Minnesota Water Quality Standards and IJC Water Quality Objectives

Parameter	MN Standard	IJC Objective
Dissolved Oxygen	5 mg/l minimum	5 mg/L minimum
pH	6.5 – 8.5 allowable range	n/a
Conductivity	1,000 mg/l maximum	n/a
Chloride	100 mg/l maximum	100 mg/L
Total Suspended Solids	25 mg/l maximum	n/a
Total Dissolved Solids	500mg/L	500 mg/L
Sulfate	n/a	250 mg/L
Fecal coliform	200 colonies/100 ml	200 colonies/100 ml

6.2 North Dakota

Ambient Water Quality Monitoring Program

During the reporting period October 1, 1999 to September 30, 2000, the Department conducted ambient chemical monitoring at 17 sites in the Red River Basin (Table 5.). Sixteen of the sites were sampled during the previous reporting period while one site, the Wild Rice River near Abercrombie (380031) is new for this reporting period.

Sites were sampled during the open water period at six-week intervals beginning in April of each year and concluding in November. In addition, one sample was collected in February under ice. This schedule resulted in a maximum of seven samples collected at each site during the reporting period. Stations that were inaccessible due to flooding or road construction, or sites with no flow, were not sampled.

Samples collected by the Department were analyzed for major cations, anions, trace elements (total recoverable), nutrients, and suspended solids (Table 6.). In addition, each site was sampled and analyzed for fecal coliform and fecal streptococcus bacteria.

The Department enters all of its water quality results in the Surface Water Quality Management Program's Sample Identification Database (SID). Each year data is then exported to EPA Region 8 into EPA's recently released STORET database (STORET Version 1.1).

Table 5. Red River Basin Ambient Stream Monitoring Sites

Station I.D.	Description
385055	Bois de Sioux River near Doran, MN [1]
380083	Red River near Brushville, MN
380031	Wild Rice River near Abercrombie, ND [1]
385040	Red River near Harwood
380010	Sheyenne River near Warwick[1]
380009	Sheyenne River near Cooperstown[1]
380153	Sheyenne River below Baldhill Dam[1]
380007	Sheyenne River at Lisbon
385001	Sheyenne River near Kindred[1]
384155	Maple River at Mapleton[1]
380156	Goose River at Hillsboro[1]
384156	Red River at Grand Forks [1]
380037	Turtle River at Manvel
380039	Forest River at Minto[1]
380157	Park River at Grafton[1]
380158	Pembina River at Neche[1]
384157	Red River at Pembina[1]

[1] Department site co-located with USGS flow gauging station.

Table 6. North Dakota Water Quality Variables Analyzed

Field Measurements	Laboratory Analysis			
	Trace Element	General Chemistry	Nutrients	Biological
Temperature pH Dissolved Oxygen	Aluminum Antimony Arsenic Barium Beryllium Boron Cadmium Chromium Copper Lead Nickel Selenium Silver Thallium Zinc	Sodium Magnesium Potassium Calcium Manganese Iron Chloride Sulfate Carbonate Bicarbonate Hydroxide Alkalinity Hardness Total Dissolved Solids Total Suspended Solids	Ammonia Nitrate-nitrite Total Kjeldahl Total phosphorus Nitrogen	Fecal coliform bacteria Fecal streptococcus

6.3 Manitoba

Ambient Water Quality Monitoring

Water quality continues to be monitored monthly at two sites on the Red River within Manitoba by Manitoba Conservation. These sites are located upstream and downstream of the City of Winnipeg (Floodway control structure and Selkirk, respectively). Variables measured include physical, general chemistry, suspended sediment, bacteria, industrial organics, trace elements, plant nutrients, and agricultural chemicals. The City of Winnipeg normally monitors six sites on a bi-weekly basis. These sites are located upstream, within, and downstream of the City of Winnipeg. Variables monitored by the City of Winnipeg include general chemistry, plant nutrients, suspended sediment, bacteria, and chlorophyll *a*.

Manitoba Conservation also conducts routine monitoring on six tributary streams to the Red River. Samples are collected four times per year and analyzed for a wide range of variables including physical, general chemistry, suspended sediment, bacteria, industrial organics, trace elements, plant nutrients, and agricultural chemicals. Locations and variables monitored are shown in Table 7. In addition, beginning in 1995, benthic macroinvertebrates have been collected at each routine monitoring site on the tributary streams once each year. Macroinvertebrate data have been assessed as indicators of ecosystem health, with results from 1995 to 1998 now available.

Manitoba Conservation has also developed partnerships with a number of local community volunteer stewardship groups within the Red River basin. Support, in many cases, is also provided by a number of other provincial government departments as well as both municipal and federal governments. Water quality studies continue on localized reaches of the Rat and Roseau rivers, Joubert Creek, as well as Bunn's, Truro, Omand's, and Sturgeon creeks within the City of Winnipeg. A joint study is being conducted in the South Tobacco Creek watershed with a number of agencies to examine differences in runoff water quality between fields on which animal manure has been applied and fields on which commercial inorganic fertilizer has been applied. The final year of the three year study has been completed. Information is presently being assessed.

Manitoba Nutrient Management Strategy

Manitoba Conservation has developed a Nutrient Management Strategy. The Strategy includes an initial scientific phase in which available water quality data are being assessed for trends, nutrient loadings are being calculated, and new information is being collected to fill data gaps, with the goal being to develop better water quality objectives for both streams and lakes. Considerable focus is being placed on Lake Winnipeg. An implementation phase will follow the scientific phase.

Water Quality Status of Red River in Manitoba

During this reporting period, water quality in the Manitoba reach of the Red River main stem remained relatively comparable to past years. Dissolved oxygen concentrations were relatively good with the average level being 10.3 mg/L downstream of the City of Winnipeg and 9.8 mg/L upstream of Winnipeg. The lowest value recorded of 4.7 mg/L occurred in July, 2000 upstream of the City of Winnipeg. This concentration occurred during a period of heavy rainfall events in which large masses of organic material would have been transported into the stream. The same phenomenon resulted in a large zone of anoxia occurring on Sturgeon Creek, a tributary to the Assiniboine River, within the City of Winnipeg during the same period.

Densities of fecal coliform bacteria continued to remain elevated downstream of the City of Winnipeg. Average density downstream of the City of Winnipeg was 261 organisms / 100 ml, down slightly from the previous reporting period, while density in the upstream reach was 19 organisms / 100 ml. The exceedance rate of the Manitoba Water Quality Standards, Objectives, and Guidelines for the protection of recreation was 75 % downstream of the City of Winnipeg, while no exceedances were observed immediately upstream of Winnipeg. This was the same rate as in the previous reporting period.

During this reporting period, 2,4-D was the only pesticide detected and it was detected on only one occasion upstream of the City of Winnipeg (July 2000) and on three occasions downstream of Winnipeg (July, August, and September 2000). None of the detections exceeded water quality guidelines for the protection of surface water used as sources of drinking water supply, habitat for aquatic life and wildlife, or agricultural uses.

Water quality was assessed on seven tributaries to the Red River within Manitoba for the period 1995 to 1998 using both the Canadian Water Quality Index and a combination of eight biological metrics. Results are summarized in Table 7.

Preliminary results from the Nutrient Management Strategy indicated that total phosphorus has increased by slightly over 20 % during the period of record in the Red River at both Emerson and downstream of the City of Winnipeg (Figures 7. and 8.). Nitrogen has increased by nearly 60 % during the same period downstream of Winnipeg (Figure 9.***)***. Nitrogen data from Emerson are not suitable for trend analyses.

Table 7. Summary of water and biological quality at seven sites on tributaries to the Red River within Manitoba for the period 1995 – 1998

Stream	Location	Site	Year	Biological Score (% of Highest Score)	Biological Condition (Relative Impairment)	Canadian Water Quality Index Score	Canadian Water Quality Index Rating
Boyne River	PR 029	WQ 0029	1995	59.9 %	Moderate - Slight	77	Fair
Boyne River	PR 029	WQ 0029	1996	76.5 %	Slight	89	Good
Boyne River	PR 029	WQ 0029	1997	58.8 %	Slight	77	Fair
Boyne River	PR 029	WQ 0029	1998	52.9 %	Moderate - Slight	73	Fair
La Salle River	PR 068	WQ 068	1995	47.9 %	Moderate	61	Fair
La Salle River	PR 068	WQ 068	1996	41.2 %	Moderate	65	Fair
La Salle River	PR 068	WQ 068	1997	41.2 %	Moderate	62	Fair
La Salle River	PR 068	WQ 068	1998	17.6 %	Severe - Moderate	64	Fair
Rat River	PR 303	WQ 031	1995	100.0 %	Non-impaired	83	Good
Rat River	PR 303	WQ 031	1996	88.2 %	Non-impaired	81	Good
Rat River	PR 303	WQ 031	1997	88.2 %	Non-impaired	75	Fair
Rat River	PR 303	WQ 031	1998	94.1 %	Non-impaired	82	Good
Roseau River	West of PR 200	WQ 153	1995	76.5 %	Slight	88	Good
Roseau River	West of PR 200	WQ 153	1996	88.2 %	Non-impaired	79	Fair
Roseau River	West of PR 200	WQ 153	1997	123.5 %	Non-impaired	81	Good
Roseau River	West of PR 200	WQ 153	1998	100.0 %	Non-impaired	79	Fair
Seine River	PTH 100	WQ 166	1995	64.7 %	Slight	43	Poor
Seine River	PTH 100	WQ 166	1996	47.1 %	Moderate	71	Fair
Seine River	PTH 100	WQ 166	1997	41.2 %	Moderate	81	Good
Seine River	PTH 100	WQ 166	1998	29.4 %	Moderate	78	Fair
Marsh River	PR 365	WQ 365	1995	58.8 %	Slight	51	Marginal
Marsh River	PR 365	WQ 365	1996	41.2 %	Moderate	48	Marginal
Marsh River	PR 365	WQ 365	1997	47.1 %	Moderate	48	Marginal
Marsh River	PR 365	WQ 365	1998	47.1 %	Moderate	57	Marginal
Cooks Creek	Boundary Road	WQ 643	1996	70.6 %	Slight	63	Fair
Cooks Creek	Boundary Road	WQ 643	1997	82.4 %	Slight - Non-impaired	74	Fair
Cooks Creek	Boundary Road	WQ 643	1998	82.4 %	Slight - Non-impaired	79	Fair
Cooks Creek	Near Millbrook	WQ 644	1996	52.1 %	Moderate - Slight	83	Good
Cooks Creek	Near Millbrook	WQ 644	1997	47.1 %	Moderate	73	Fair

Figure 7. **Long-term phosphorus data in the Red River at Emerson Showing statistically significant increasing trend.**

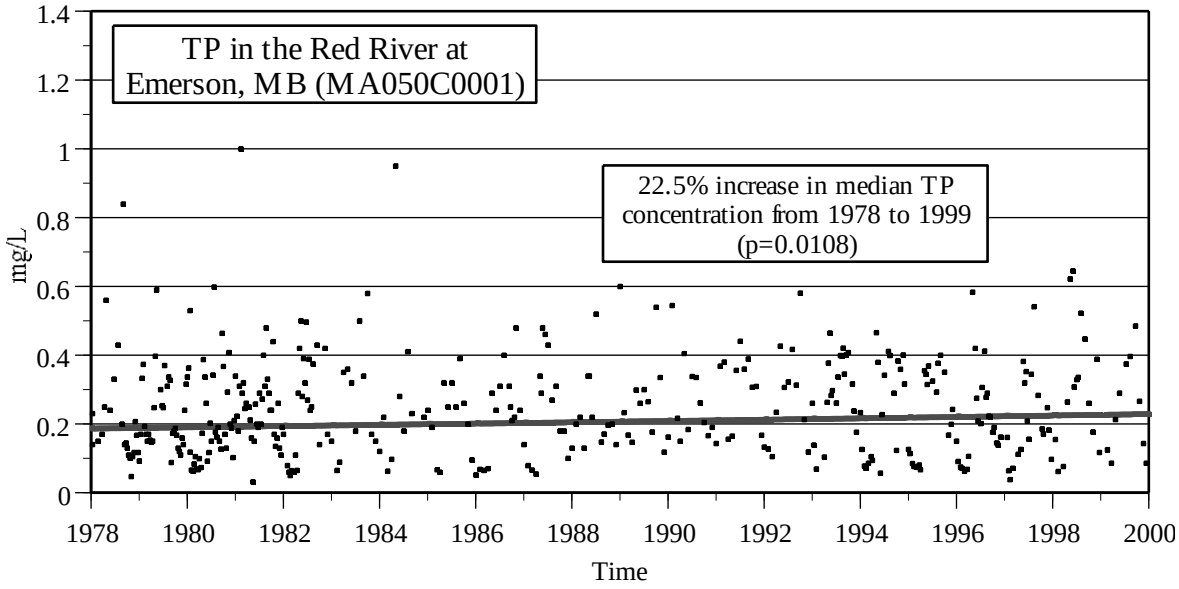


Figure 8. **Long-term phosphorus data in the Red River at Selkirk Showing statistically significant increasing trend.**

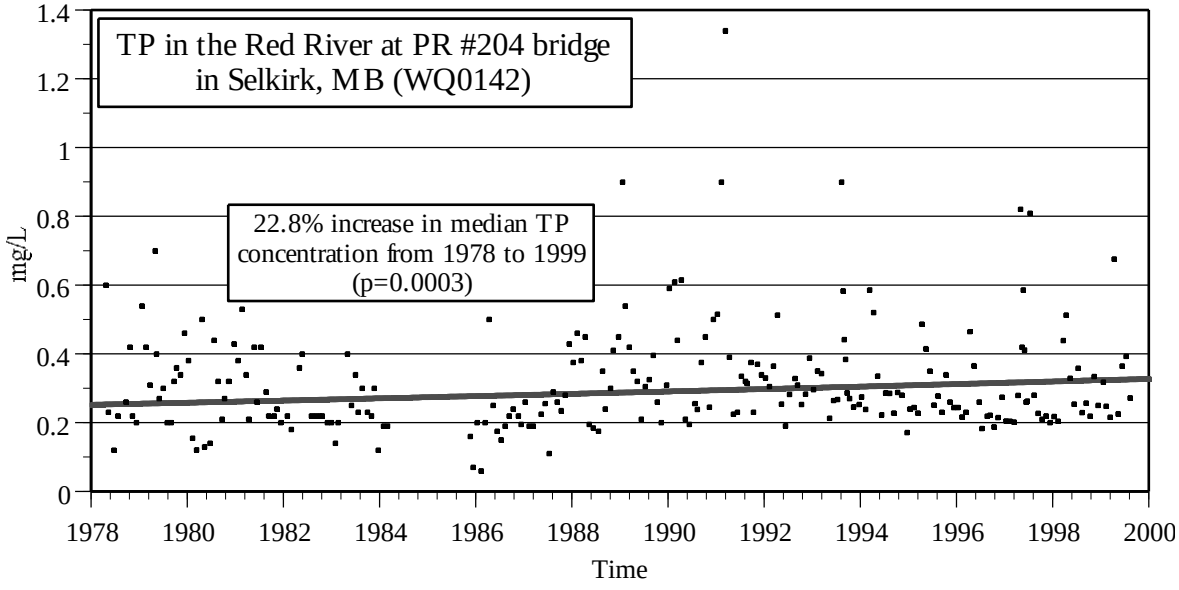
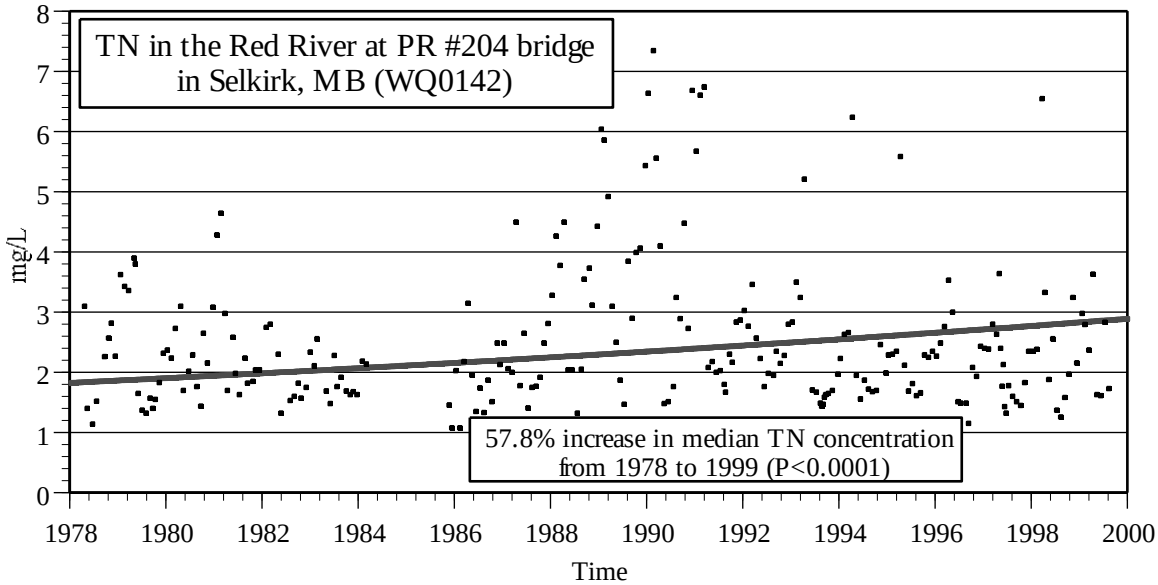


Figure 9. **Long-term nitrogen data in the Red River at Selkirk Showing statistically significant increasing trend.**



6.4 Environment Canada

Auto Monitor At Emerson, Manitoba

Environment Canada carries the responsibility for providing continuous water quality monitoring at the international boundary at Emerson, Manitoba. The data are used to determine compliance with established water quality objectives at the boundary and in meeting the provisions of the Boundary Waters Treaty of 1909. Detection of exceedences of the objectives serves as a triggering mechanism for agencies to take appropriate action to prevent or to mitigate potential problems, and to minimize the potential for reoccurrence. Because the water quality of the Red River has considerable seasonal as well as short-term variation, an automated, continuous monitoring capability is essential at this location.

During the 2000 Water Year (October 01, 1999 – September 30, 2000), a continuous water quality data series was not achieved at the international boundary. As result of bank erosion and damage sustained by the facility during the1997 spring flood, monitoring equipment and site location alternatives were initially investigated. Resolution of the problem was further exacerbated by persistent high water levels preventing bank stabilization work and permanent installation of intake lines to take place. However, during the spring of 2000, a new water quality auto-monitor was collocated on a temporary basis at the existing hydrometric monitoring station at Emerson and was operated throughout the remainder of the 2000 water year and until river freeze-up. The auto-monitor was reinstalled on a temporary basis in June 2001. During the period that the auto-monitor was not operational, manual sampling was undertaken providing a discontinuous, or monthly record of parameters at the site.

Environment Canada has rescheduled the necessary bank stabilization work and permanent installation of the intake lines and auto-monitor to take place during the winter of 2001-2002 to coincide with the return to normal low water levels in the river and favorable ice conditions.

7. WATER POLLUTION CONTROL

7.1 Contingency Plan

The contingency plan was adopted by the former International Red River Pollution Board (IRRPB) on January 1,1981. Contacts and telephone numbers have been updated for 2001, and are included in Appendix C. The Contingency Plan is available from the IRRB.

7.2 Spills and Releases

Minnesota

Municipal and industrial facilities in Minnesota discharging directly to the Red River were generally in compliance with the National Pollution Discharge Elimination (NPDES) permits during this reporting period. There were 11 incidents (Table 8.) where wastewater bypassed the wastewater treatment system. This reflects the wet cycle of this reporting period. Localized flooding occurred at several locations in the Buffalo, Wild Rice, and Red Lake watersheds.

Table 8. Minnesota Bypasses at NPDES Facilities

Facility	Incident Type	Date	Quantity
Audubon WWTP	Wastewater bypass	6/20/00	Unknown
Glyndon WWTP	Wastewater bypass	6/19/00	Unknown
Georgetown WWTP	Wastewater bypass	6/20/00	Unknown
Ada WWTP	Wastewater bypass	6/20/00	Unknown
ACS-Moorhead	Wastewater bypass	6/19/00	782,500 gal.
Moorhead WWTP	Wastewater bypass	6/19/00	35.2 million gal.
Moorhead WWTP	Wastewater bypass	6/20/00	1.6 million gal.
Hawley WWTF	Wastewater bypass	6/27/00	Unknown
Ulen WWTF	Wastewater bypass	7/6/00	Unknown
Pelican Rapids WWTF	Wastewater release	7/22/00	Unknown
Bagley WWTF	Wastewater bypass	9/13/00	190,000 gal.

North Dakota

The eastern one third of the state continued in the wet cycle for this reporting period. Most of this precipitation was in the form of rainfall. Localized flooding in several areas of the state continued which has inhibited wastewater treatment and storage at select facilities. Even though the state continues in the wet cycle, fewer bypasses and lagoon overflows were reported compared to the past several years. The number of discharges and total volume of water discharged for this reporting period was similar to that of 1999.

7.3 Pollution Abatement

Minnesota

Municipal and industrial facilities in Minnesota discharging directly to the Red River were generally in compliance with their NPDES permits during this reporting period. There were 32 incidents where effluents exceeded limits of the permit. These did not necessarily constitute permit violations. Facilities reporting exceedences are listed in Table 9.

Table 9. NPDES Water Quality Exceedences from October 1999 to September 2000

Facility Name	Limit	Reported Value	Date	Parameter Name	Limit Units Description Abbreviation	Major/ Minor	Major Watershed Name
Borup WWTP	6.0	3.90	7/31/00	pH	SU	minor	Wild Rice River (MN)
Climax WWTP	26.2	40	4/30/00	5 Day BOD	kg/day	minor	Red River –Sandhill Riv
Climax WWTP	26.2	60	6/30/00	5 Day BOD	kg/day	minor	Red River – Sandhill Riv
Fosston WWTP	554.	789	11/30/99	Solids (TSS)	kg/day	minor	Red River – Sandhill Riv
Fosston WWTP	45	64	11/30/99	Solids (TSS)	mg/L	minor	Red River – Sandhill Riv
Glyndon WWTP	200	458	6/30/00	Fecal Coliform	#100ml	minor	Buffalo River
Grygla WWTP	200	2152	6/30/00	Fecal Coliform	#100ml	minor	Thief River
Gygla WWTP	9.0	11.1	6/30/00	PH	SU	minor	Thief River
Halstad WWTP	11.3	36.19	12/31/99	5 Day BOD	kg/day	minor	Red River (Hillsboro)
Halstad WWTP	25	75	12/31/99	5 Day BOD	kg/day	minor	Red River (Hillsboro)
Halstad WWTP	0.1	0.9	10/31/99	total residual Chlorine	mg/L	minor	Red River (Hillsboro)
Halstad WWTP	200	428	7/31/00	Fecal Coliform	#100ml	minor	Red River (Hillsboro)
Halstad WWTP	200	455	8/31/00	Fecal Coliform	#100ml	minor	Red River (Hillsboro)
Hawkes Co Inc	30	54	4/30/00	Solids (TSS)	mg/L	minor	Snake River (Red River)
Hawkes Co Inc	25	60	8/31/00	turbidity	NTU	minor	Snake River (Red River
Hendrum WWTP	15.4	22.7	11/30/99	5 Day BOD	kg/day	minor	Wild Rice River (MN)
Hendrum WWTP	27.7	50.8	11/30/99	Solids (TSS)	kg/day	minor	Wild Rice River (MN)
Hendrum WWTP	27.7	44.59	6/30/00	Solids (TSS)	kg/day	minor	Wild Rice River (MN)
Lake Bronson "	200	280	5/31/00	Fecal Coliform	#100ml	minor	Two Rivers
Lancaster "	69.3	107	11/30/99	Solids (TSS)	kg/day	minor	Two Rivers
Middle River "	36.9	252	6/30/00	5 Day BOD	kg/day	minor	Snake River (Red River)
Middle River "	60	90	6/30/00	Solids (TSS)	kg/day	minor	Snake River (Red River)
Middle River "	45	64	10/31/99	Solids (TSS)	mg/L	minor	Snake River (Red River)
Middle River "	45	80	5/31/00	Solids (TSS)	mg/L	minor	Snake River (Red River)
Pelican Rapids "	.038	.1	4/30/00	Total Chlorine Residual	mg/L	minor	Otter Tail River
Rothsay WWTP	44	76.7	4/30/00	Solids (TSS)	kg/day	minor	Red River (upper)
Stephen WWTP	45	92.3	10/31/99	Solids (TSS)	mg/L	minor	Red River (Tamarack)
Thief River Falls	30	47	4/30/00	Solids (TSS)	mg/L	minor	Red Lake River
Thief River Falls	30	46	6/30/00	Solids (TSS)	mg/L	minor	Red Lake River
Ullen WWTP	200	736	7/31/00	Fecal Coliform	#100ml	minor	Wild Rice River (MN)
Wheaton WWTP	45	66	5/31/00	Solids (TSS)	mg/L	minor	Mustinka River

Impaired Waters/TMDL

The Minnesota Pollution Control Agency has identified 27 locations in Minnesota's Red River Basin where river reaches exceed federal and state water quality standards. These reaches have been classified as impaired under Section 303 (d) of the National Clean Water Act. The Agency has identified a timetable to establish Total Maximum Daily Load studies for these reaches.

Work begins on the upper basin tributaries of the Rabbit River, Ottertail River and Whiskey Creek in the summer of 2001. The MPCA will coordinate these studies. A team of local resource managers has been designated to lead the planning decisions, and the U.S. Geological Survey will conduct the technical portion of the work, including additional water quality monitoring and modeling of scenarios to achieve pollutant reduction goals.

On the Rabbit River, non-point sources are adversely affecting dissolved oxygen, ammonia, nitrogen, high pH, fecal coliform suspended solids, nutrient levels, and biological oxygen demand. Agricultural chemicals are causing eutrophication, sedimentation, toxicity and turbidity.

On the Ottertail River, monitoring data showed use impairment in the short segment from Breckenridge Lake down to the confluence with the Red River of the North and threatened water quality from Breckenridge Lake upstream to the Wilkin County 17 crossing. Long-term data on the Ottertail River at Breckenridge indicate a slight upward trend in total dissolved solids and a more convincing pattern in chloride. Possible explanations for increasing chloride include increased use of potash fertilizers, increased groundwater withdrawal for irrigation and water supply, increased use of road salt, and reduced storage of runoff (i.e., wetland drainage). Non-point sources are adversely affecting the river with high pH, fecal coliform, suspended solids, and nutrient levels resulting in non-support of swimming and overall use on a 21-mile reach below Orwell Dam.

The Whiskey Creek water quality assessment survey reported that crop production, livestock holding, and agricultural chemicals cause oxygen depletion, sedimentation and turbidity.

Total Maximum Daily Load studies will be completed in three phases. Phase 1 will include: Data Collection, review, assessment and design of a monitoring plan. Phase 2 will include specific parameter modeling and Phase 3 will include the development of implementation strategies to address the various impairments. Further specific information on TMDLs is available on MPCA's webpage. The proposed TMDL studies for the Minnesota portion of the Red River Basin are listed in Table 10.

Table 10. MN Red River Basin List of Impaired Waters & TMDL Schedule

River Reach	Affected Use	Pollutant/ Stressor	Start/End
Rabbit River, Unnamed Ditch to Bois de Sioux River	Aquatic Life	Ammonia	2001/2005
Rabbit River, Wilkin Co Line to Bois de Sioux River	Aquatic Life	Turbidity	2001/2008
Bois de Sioux River Rabbit R to Ottertail River	Aquatic Life	Low Oxygen	2001/2004
Ottertail River, Breckenridge Lake to Bois de Sioux River	Swimming	Fecal Coliform	2001/2004
	Aquatic Life	Turbidity	2001/2004
Ottertail River, Pelican River to Dayton Hollow Reservoir	Aquatic Life	Turbidity	2001/2004
Ottertail River, Height of Land Lake to Big Pine Lake	Aquatic Life	Low Oxygen	2001/2004
Stony Creek , Hay Creek to S. Br. Buffalo River	Aquatic Life	Turbidity	2005/2007
Red River of the North, Breckenridge Dam to Whiskey Creek	Aquatic Life	Turbidity	2002/2004
Whiskey Creek, Headwaters to Red River	Aquatic Life	Turbidity	2006/2008
Buffalo River, Headwaters to Red River	Aquatic Life	Turbidity	2005/2007
Red River, Buffalo River to Elm River	Aquatic Life	Turbidity	2006/2008
Red River, Wild Rice River to M/F Dam	Aquatic Life	Turbidity	2005/2007
Red River ,Moorhead/Fargo Dam A to Sheyenne River	Aquatic Life	Ammonia	1998/1999
	Swimming	Fecal Coliform	2001/2004
Red River, Wild Rice River to Goose River	Aquatic Life	Turbidity	2005/2007
Red Lake River, Burnham Cr to Unnamed Cr Seg 2	Aquatic Life	Turbidity	2006/2008
Red Lake River, Headwaters to Gentilly River	Aquatic Life	Turbidity	2006/2008
Red River, Pembina River to Canada Border	Aquatic Life	Turbidity	2005/2007
Roseau River, Hay Creek to Canada border	Aquatic Life	Low Oxygen	2001/2010

Regional Nutrient Standards

Sites in the Red are being sampled as part of a statewide nutrient/chlorophyll-A study to examine the links between phosphorus and in-stream algae concentrations (Table 11.). This sampling is part of a national study to develop nutrient criteria for rivers, as recommended by the Clean Water Action Plan. EPA expects States and Tribes to use these water-body type guidance documents and nutrient target ranges as a guide in developing and adopting numeric levels for nutrients that support the designated uses of the water-body as part of State water quality standards. EPA will work with States to support and assist in this process. States should have adopted nutrient criteria that support State designated uses by the end of 2003.

Table 11. MPCA Red River Sites for 2000 Nutrient/Chlorophyll-A Study

Ecoregion	Rivers	Site	River Mile	Watershed (mi^2)
WCBP/NGP	Red River	Brushvale *	RE-536	4,050
WCBP/NGP	Red River	Moorhead *	RE-452	
WCBP/NGP	Red River	Perley	RE-403	~ 15,000
WCBP/NGP	Red River	East Grand Forks$_1$ *	RE-298	~ 22,000

(1) Upstream of Red Lake River inflow.
(*) Corresponds to, or in close proximity to, USGS flow gauge sites
NLF= Northern Lakes and Forests, NCHF= North Central Hardwoods Forests, WCBP= Western Corn Belt Plains, NGP = Northern Glaciated Plains.

North Dakota

The North Dakota Pollutant Discharge Elimination System (NDPDES) permit program regulates the release of wastewater and storm water from point sources into waters of the state. All point source dischargers, both municipal and industrial, are required to obtain a permit. These permits outline technology-based and water quality-based limits for wastewater discharges.

Toxic pollutants in wastewater discharges are an important concern, particularly for the larger cities and industries in the state. They are regulated through the industrial pretreatment program that is administered in North Dakota by EPA Region VIII. Grand Forks, Fargo, and West Fargo have approved Pretreatment programs in the eastern part of the state. The department is seeking delegation for the Pretreatment program and has submitted a program package to EPA.

All waters of the state shall be free from substances attributable to municipal, industrial, or other discharges in concentrations or combinations which are toxic or harmful to humans, animals, plants, or resident biota. This standard is enforced in part through appropriate Whole Effluent Toxicity (WET) requirements. All major permittees, both municipal and industrial, must monitor their discharge for WET on a regular basis. Should the results from these tests indicate the effluent is toxic to aquatic organisms, a toxicity identification evaluation (TIE) may be required. TIEs have resulted in minor as well as major wastewater upgrades to select municipalities and industries.

Wastewater discharge data during the reporting period October 1, 1999 to September 30, 2000 are presented in Table 12.

TABLE 12.
Waste Discharge Data for North Dakota during the Reporting Period October 1, 1999 to September 30, 2000

Source*	Length of Discharge Days	Total Flow M^3	Discharge Quality - mg/l						Discharge Rate Avg. M^3/day	BOD-5 Loading Avg. kg/day	TSS Loading Avg. kg/day	Time in Permit Compliance Percent
			BOD-5			TSS						
			High	Low	Avg.	High	Low	Avg.				
Drayton	10	103845	6.0	6.0	6.0	5.0	5.0	5.0	10384.5	62.3	51.9	100.0
Fargo	340	15926326	30.4	3.0	10.3	39.0	5.2	13.4	46842.1	481.0	626.2	97.3
Grafton	14	562451	27.6	5.4	14.0	58.0	14.2	29.8	40175.1	563.7	1199.2	98.1
Grand Forks	101	8565076	24.0	6.0	13.4	32.0	8.8	20.5	84802.7	1133.4	1734.6	98.1
Grand Forks AFB[1]	0	0	---	---	---	---	---	---	0	0	0	100.0
Wahpeton	41	1597270	52	6.0	14.4	143.0	14.0	48.1	38957.8	561.6	1872.1	92.1
West Fargo	70	1770737	15.4	3.3	8.6	28.6	5.5	20.8	25296.2	217.8	527.2	100.0
ACS-Drayton	137	396592	47.0	3.0	18.0	51.0	3.5	12.7	2894.8	52.1	36.9	96.2
ACS-Hillsboro	211	568609	28.0	6.0	11.0	32.0	12.6	17.1	2694.8	29.6	46.2	100.0
Minn Dak	27	816273	14.6	6.0	11.8	25.5	3.3	10.8	30232.3	357.7	325.5	100.0
Cargill Inc	364	1868730	30.0	4.0	9.9	59.0	4.0	20.1	5133.9	50.6	103.3	98.1

* Source -- Population greater than 1,000 or P.E. greater than 1,000

[1] The facility's lagoons were discharged extensively prior to the beginning of the report period. The next discharge began in October 2000.

The City of Fargo wastewater treatment plant is consistently providing quality effluent on a continual basis to the Red River of the North. Wastewater treatment consists of pretreatment and odor control, primary clarification, trickling filters, nitrification filters, final clarification and disinfection. The recent improvements to the residuals management (additional digesters, sludge drying beds and belt presses) have given the City more flexibility in addressing the sludge and wastewater treatment. Fargo still maintains six, 90-acre wastewater stabilization ponds that can be used for storage during times of flooding or an upset in treatment plant.

Cargill Corn Milling (ProGold) produces high fructose corn syrup at their facility near Wahpeton. The plant discharges to the Red River on a continuous basis with storage ponds available to store wastewater when treatment is inadequate or when the river would be adversely affected. Wastewater high in total dissolved solids is stored in two of the ponds onsite. The discharges from these ponds must be coordinated with the conditions in the Red River, downstream users and discharges from MinnDak Farmer's Cooperative in order to meet the requirements of their permit. The background water quality in the Red River has been the most limiting factor for coordinating discharges from the ponds, particularly when flows are predominantly from Lake Traverse. During this reporting period, the department re-issued Cargill's NDPDES permit. Like the original permit, the requirements in the new permit will protect water quality standards and reflect the comments and concerns expressed by federal, state, municipal and citizen entities in North Dakota and Minnesota.

American Crystal Sugar uses a combination of lagoons and constructed wetlands for wastewater treatment and polishing at both Hillsboro and Drayton. The final effluent from both of these facilities surpasses the federal effluent criteria for suspended solids and oxygen demand. The new 1.5 million gallons per day (MGD) anaerobic digester and clarifier at the Hillsboro plant maximize the performance of the existing aerobic digester resulting in a reduction of the feed water strength while maintaining a constant temperature throughout the season. This high quality water is routed to the wetland earlier in the season, maximizing the wetland's ability to treat the wastewater prior to discharge.

The MinnDak Farmer's Cooperative sugar beet processing plant uses both mechanical and facultative lagoons for wastewater treatment at the Wahpeton facility. The wastewater receives additional polishing in a newly constructed reservoir from which discharges are made through an in-stream diffuser to the Red River. The recent addition of the nitrification/de-nitrification system has resulted in significantly decreased ammonia levels in the discharge. MinnDak continues to coordinate its discharges with Cargill, since both facility permits contain receiving stream quality requirements for sulfate, chloride, and total dissolved solids.

The City of Grand Forks is in the process of a major upgrade to their wastewater treatment facility. The new treatment plant will consist of a high level activated sludge plant using a European technology of Micro-Bubble Flotation. The plant is designed for 10 MGD and 40,000 pounds of BOD-5. The treatment facility is approximately 85% complete and should be on line late fall 2001 or early spring 2002. Treatment and operational practices have also been modified in the water treatment plant residuals handling facility that should reduce the need of pumping any residuals during flood conditions in the Red River.

Manitoba

Manitoba Water Quality Standards, Objectives, and Guidelines are applicable to streams within the Red River basin. In addition, site-specific water quality objectives have been established for the Red River within and downstream of the City of Winnipeg. Water uses protected in the Red River include domestic water supply source, habitat for aquatic life and wildlife, industrial uses, irrigation, livestock watering, and water-related recreation.

All treated municipal effluents discharged to tributary streams within the Red River basin in Manitoba are licensed under Manitoba's Environment Act. Approximately nine private facilities located within the City of Winnipeg boundary are not yet licensed (out of the original 21 facilities un-licensed when the Environment Act came into effect in 1998). The nine facilities will receive licenses within the next couple of years. Disinfection using ultra-violet light technology has been installed and is operational at the South End Water Pollution Control Centre. Disinfection works are being developed for the North End Water Pollution Control Centre with construction planned for fall, 2001 and implementation scheduled for spring, 2002. Disinfection likely is not required at the West End Water Pollution Control Centre. At the West End Centre, lagoons are utilized to polish the effluent. Data indicate that effluents from the polishing lagoons contain acceptable densities of bacteria during the open water season. The City of Winnipeg, with input from an advisory committee including Manitoba Conservation, is nearing completion of a major study on combined sewer overflows. The final report is expected later in 2001. A study into the impacts of un-ionized ammonia on the Red River began in late 1998 and will be completed in mid-2001. The purpose of the study is to develop a site-specific water quality objective for ammonia and to identify applicable technologies to reduce ammonia levels in the wastewater prior to discharge. Scientific workshops have been scheduled for summer, 2001 to discuss the findings and their applicability to the Red and Assiniboine rivers.

7.4 Pollution Sources

Minnesota

Point Source Control Program

The Minnesota National Pollutant Discharge Elimination System (NDPDES) permit program regulates the release of wastewater and storm water from point sources into waters of the state. All point source dischargers, both municipal and industrial, are required to obtain a permit. These permits outline technology based and water quality based limits for wastewater discharges. In addition, all construction projects disturbing five acres or more of land, require a General NPDES Storm Water Permit.

The Minnesota Pollution Control Agency has permitted 124 facilities to discharge into the Red River or its tributaries. Of these facilities, 93 are municipal permits, 22 are industrial permits and 9 are other. The Minnesota portion of the Red River basin has 12 major permits (average design flow over 1 million gallons per day), 6 municipal and 6 industrial.

In the 2000 Water Year, renewal was completed for discharge permits for 18 municipal wastewater treatment facilities, three of which were majors (termed "major" since discharge exceeds one million gallons per day) including Thief River Falls, Moorhead and Crookston. Permits issued during the 2000 Water Year are listed in Table 13.

Table 13. NPDES Permits Issued – 10/1/99 to 9/30/00

Facility Name	Permit Number	City Name	County Name	Major Watershed
Bagley WWTP	MN0022691	Bagley	Clearwater	Clearwater River
Bejou WWTP	MN0064688	Bejou	Mahnomen	Wild Rice River (MN)
Borup WWTP	MNG580004	Borup	Norman	Wild Rice River (MN)
Crookston WWTP	MN0021423	Crookston	Polk	Red Lake River
Elbow Lake WWTP	MN0051535	Elbow Lake	Grant	Mustinka River
Elizabeth WWTP	MNG580012	Elizabeth	Otter Tail	Otter Tail River
Frazee WWTP	MN0022021	Frazee	Becker	Otter Tail River
Goodridge WWTP	MNG580022	Goodridge	Pennington	Red Lake River
JOWCT Inc	MNG960018	Pelican Rapids	Otter Tail	Otter Tail River
Kennedy WWTP	MNG580028	Kennedy	Kittson	Red River-Tamarack River
Lake Bronson WWTP	MNG580029	Lake Bronson	Kittson	Two Rivers
McIntosh WWTP	MNG580031	McIntosh	Polk	Clearwater River
Moorhead WWTP	MN0049069	Moorhead	Clay	Red River of the North (Upper)
Oklee WWTP	MNG580038	Oklee	Red Lake	Clearwater River
Roseau WWTP	MNG580039	Roseau	Roseau	Roseau River
Thief River Falls WWTP	MN0021431	Thief River Falls	Pennington	Red Lake River
Wheaton WWTP	MNG580044	Wheaton	Traverse	Mustinka River
Winger WWTP	MNG580045	Winger	Polk	Red River - Sandhill Riv

North Dakota

Point Source Control Program

The North Dakota Pollutant Discharge Elimination System (NDPDES) permit program regulates the release of wastewater and storm water from point sources into waters of the state. All point source dischargers, both municipal and industrial, are required to obtain a permit. These permits outline technology based and water quality based limits for wastewater discharges.

Toxic pollutants in wastewater discharges are an important concern, particularly for the larger cities and industries in the state. They are regulated through the industrial pretreatment program that is administered in North Dakota by EPA Region VIII. Grand Forks, Fargo, and West Fargo have approved pretreatment programs in the eastern part of the state. The department is seeking delegation for the pretreatment program and has submitted a program package to EPA.

All waters of the State shall be free from substances attributable to municipal, industrial, or other discharges in concentrations or combinations which are toxic or harmful to humans, animals, plants, or resident biota. This standard is enforced in part through appropriate Whole Effluent Toxicity (WET) requirements. All major permittees, both municipal and industrial, must monitor their discharge for WET on a regular basis. Should the results from these tests indicate the effluent is toxic to aquatic organisms, a toxicity identification evaluation (TIE) may be required. TIEs have resulted in minor as well as major wastewater upgrades to select municipalities and industries.

Wastewater discharge data during the reporting period October 1, 1999 to September 30, 2000 are presented in Table 12 of previous section.

Manitoba

Three municipalities, with populations greater than 1000, discharge treated effluents directly to the Red River within Manitoba. The Town of Morris discharges for a short period of time each spring and fall, while the City of Winnipeg's South End Water Pollution Control Centre, the North End Water Pollution Control Centre, and the Town of Selkirk discharge continuously. Volumes and quality of effluent has not changed significantly from previous years. In addition to the two major wastewater treatment facilities within the City of Winnipeg, discharges also occur from 21 private wastewater treatment plants, 41 combined sewer outfalls, and 75 major land drainage outfalls. Most tributary streams also receive treated wastewater effluents from nearby communities.

8. AQUATIC ECOSYSTEM HEALTH

8.1 Biological Monitoring and Assessment

Biological measures of water quality have been proven to provide a holistic picture of the overall health of the aquatic resource. Using organisms residing in aquatic systems as indicators of water quality has numerous benefits over water chemistry indicators:

1.) Aquatic organisms provide a direct measure of aquatic life use support unlike surrogate measures such as chemical concentration data;
2.) The biology of aquatic systems are responsive to a wide range of pollution sources including both physical (i.e. sedimentation, channelization) and chemical pollutants (non-point pollutants, industrial and municipal discharges);
3.) Aquatic organisms integrate the effects of pollution over time and are therefore responsive to the cumulative effects of numerous stressors;
4.) Biological sampling and analysis techniques have proven to be cost effective, and;
5.) The public intuitively understands that the health of biological communities reflects the health of the ecosystem as a whole.

Index of Biotic Integrity

The Index of Biotic Integrity (IBI) was developed in the early 1980s to evaluate rivers and streams in the US Midwest using fish communities as indicators. The premise behind the development of the index was that many attributes of aquatic communities vary in a predictable way to human disturbance. Measuring these attributes of aquatic communities using standardized and proven techniques indicates the degree to which human disturbance has altered the natural stream environment. The attributes once verified to respond in a predictable fashion to a gradient of human disturbance are termed metrics and may be incorporated into a multi-metric index such as IBI. Metrics in IBIs for fish represent different structural and functional attributes of the fish community that may be placed into three categories;

1.) Species richness and composition;
2.) Trophic structure, and;
3.) Fish abundance and health.

A typical IBI is comprised of 10 to 12 metrics. Each metric measures a different attribute of the fish community. For instance, a commonly used metric in a fish IBI sums the number of fish species found in the sample. The premise that supports the metric is that species richness in warm or cool water streams is reduced when the stream is altered either physically or chemically. Another metric, this one related to fish health, is the proportion of obvious external anomalies on fish within the sample. Anomalies have been found to occur in higher proportions in stream systems influenced by industrial pollutants.

Since its introduction, multi-metric indices like the IBI have been used to assess the biological quality of rivers and streams throughout the world using biological indicators ranging from plants to fish to aquatic macro-invertebrates. Modifications of the metrics can be made to account for regional differences in indicator communities. To interpret the results of biological assessments it is necessary to know what the aquatic communities would be expected to look like in the absence of human disturbance. The benchmark information is obtained through the selection of reference

sites. By sampling reference sites that are known to be relatively free of human disturbance, the information necessary to develop regional expectations for a given area may be obtained.

A cooperative project between the North Dakota Health Department, Minnesota Pollution Control Agency, Minnesota Department of Natural Resources, USGS, and EPA focused on the Red River Basin for IBI development and assessment. Sampling in the US portion of the basin of fish communities was conducted at 112 sites (58 in Minnesota and 54 in North Dakota) during the summers of 1993 and 1994. Most of the sites were chosen to represent reference quality conditions within the basin. The rivers ranged in size from small first order streams to the Red River itself. The sampling encompassed the portion of the basin from the Mustinka River in the south, to the Roseau and Pembina Rivers in the north. Information collected from these sites together with available historical data was used to develop IBI metrics for most of the basin (that portion within the Lake Agassiz Plain ecoregion). IBI scores have been calculated for each of the sites sampled during the project and are reported in a recently released EPA document entitled "Development of Index of Biotic Integrity Expectations for the Lake Agassiz Plain Ecoregion" (EPA 905-R-96-005). The study found that the main-stem Red River generally supported a more biologically diverse fish community than did its headwaters streams.

Environmental Monitoring and Assessment Program

The Environmental Monitoring and Assessment Program (EMAP) is a research program to develop the tools necessary to monitor and assess the status and trends of national ecological resources. EMAP's goal is to develop the scientific understanding for translating environmental monitoring data from multiple spatial and temporal scales into assessments of ecological condition and forecasts of the future risks to the sustainability of our natural resources. EMAP's research supports the National Environmental Monitoring Initiative of the Committee on Environment and Natural Resources (CENR).

EMAP objectives are to advance the science of ecological monitoring and ecological risk assessment, guide national monitoring with improved scientific understanding of ecosystem integrity and dynamics, and demonstrate the CENR framework through large regional projects. EMAP will develop and demonstrate indicators to monitor the condition of ecological resources, and investigate multi-tier designs that address the acquisition and analysis of multi-scale data including aggregation across tiers and natural resources.

EPA's Environmental Monitoring and Assessment Program (EMAP) assesses ecological conditions of coastal waters, waters on land, and land areas across large portions of the United States. In the future, this snapshot can be compared with a new one. This comparison will show if ecosystems are improving or getting worse. Results from EMAP will also identify activities or substances that affect the condition of ecosystems. EMAP helps those responsible for managing lands, water, and air to determine the best ways to keep these resources in good condition.

EMAP sampling design:

EMAP uses a statistical sampling design with three major components: the EMAP grid, a two-tier sampling approach, and a rotating sampling schedule. EMAP uses a systematic grid covering the coterminous United States, Alaska, Hawaii, and the Caribbean. The uniform spatial coverage provided by a grid ensures that each ecological resource is sampled in proportion to its geographical presence across the country. The EMAP grid consists of a set of points that, if

connected, would form a series of adjacent equilateral triangles. The base density of the grid is one grid point per 635 square kilometers (a linear point-to-point distance of 27 km), resulting in 12,600 grid points in the coterminous United States. The grid's placement is determined by a formal randomization to ensure strict adherence to requirements for probability sampling. The base density can be easily intensified for sub regional studies (such as R-EMAP projects).

The EMAP approach:

EMAP is "a new way of doing business." It addresses the larger scale, longer term environmental problems occurring at regional and national scales. Instead of taking the traditional single-chemical or single-site approach to environmental assessment, EMAP adopts a comprehensive, multimedia perspective of the environment to answer questions about overall ecological condition. EMAP has been designed to serve ultimately as "America's Ecological Report Card."

Biocriteria and Ecological Health:

Currently, the majority of the data used to support decision making efforts (i.e. water quality standards) are that of chemical data and physical data. Chemical data measure concentrations of pollutants and other chemical conditions that influence aquatic life, such as pH and dissolved oxygen concentrations. Physical data include measurements of temperature, turbidity, and solids in the water column. Traditional water quality criteria are derived from stress-response relationships and related models that predict adverse impacts when thresholds are exceeded.

Biological data measure the health of aquatic communities. Biological data include counts of aquatic species that indicate healthy aquatic conditions. Biocriteria are being incorporated into water quality standards to extend the protection offered by traditional chemical water quality criteria for non-chemical stresses to aquatic communities. While chemical and physical data may be used to predict poor and uninhabitable conditions, neither are direct measures of ecosystem or organism health. The multitude of interactions that can occur under varying physical and chemical conditions make it almost impossible to predict the effects of water quality on aquatic life given only physical and chemical data. Biological criteria can provide a direct measure of aquatic health.

Of extreme importance in using biocriteria is the selection of a reference condition. A reference condition is defined by a set of criteria that define the best potential water quality that can be realistically obtained under natural conditions for a given body of water. The reference condition is used as a measuring stick by which deviations from the reference condition are used to determine ecosystem health.

The final goal of most biological monitoring in this context is formation of a multimetric index. A multimetric index is a single variable derived from numerous physical and biological parameters. Multimetric biological indexes calculated from ambient biological monitoring data provide an integrative approach for "diagnosing" the condition of complex ecological systems. This approach applies in compiling multimetric economic, health, or biological indexes. First, reliable and meaningful response variables are noted through testing. The variables are then measured and evaluated against the system expectations. Finally, the measured values are interpreted in terms of an overall assessment of system condition. The resulting index (for economic or biological resources) or diagnosis (for patients) allows people without specialized expertise to understand overall condition and to make informed decisions that will then affect the health of the determined ecosystem.

Ecological Indicators:

EMAP combines its statistical sampling strategy with indicators of the condition of ecological resources. Traditionally, monitoring programs have measured pollutants in the environment to determine good or poor ecological condition. EMAP takes a different approach: It examines the condition of plant and animal communities through biological and ecological indicators. This approach recognizes that ecological resources are affected by multiple stressors in all environmental media (water, air, and soil), and these stressors can produce cumulative effects on entire populations and communities. EMAP measures two types of ecological indicators:

- Condition indicators, which are characteristics of the environment that provide quantitative estimates of the state of ecological resources and that are important to society. Examples include tree crown density and the number of species and individuals in fish communities.
- Stressor indicators, which are characteristics of the environment that are suspected to elicit a change in the state of ecological resources. They include both natural and human-induced stressors. Examples include acid deposition rates and ambient pollutant concentrations.

EMAP scientists then determine whether statistical associations exist between indicators of ecosystem condition and indicators of natural and anthropogenic stress, including stressors. Through these correlation studies, scientists can formulate hypotheses about potential causes of change for furthers study.

A limited number of randomly selected EMAP sites have been chosen and sampled on the U.S. portion of the Red River. These sites will continue to be part of ongoing studies and comparisons.

IRRB Aquatic Ecosystem Health Activities

The IJC Directive to the IRRB states: "The Board's mandate is to assist the Commission in preventing and resolving transboundary disputes regarding the waters and aquatic ecosystem of the Red River and its tributaries and aquifers. This will be accomplished through the application of best available science and knowledge of the aquatic ecosystem of the basin and an awareness of the needs, expectations and capabilities of residents of the Red River basin".

During the IRRB's annual meeting held June 6–8, 2001 in Winnipeg, Manitoba, The Board established an Aquatic Ecosystem Health Committee with the following instructions:

1.) Provide recommendations and implementation details for biological monitoring in the watershed;
2.) Provide recommendations and implementation details for monitoring non-native aquatic species in the watershed;
3.) Provide recommendations on integrated monitoring in the watershed, and;
4.) Provide recommendations and implementation details on establishing and maintaining a central water quality database.

The Aquatic Ecosystem Health Committee intends to evaluate the applicability of the EMAP program, and the associated Index of Biotic Integrity (IBI) as part of it's responsibility in undertaking the Board's mandate to assist the Commission in preventing and resolving transboundary disputes regarding the waters and aquatic ecosystem of the Red River.

8.2 Fish Consumption Advisory

Minnesota

The Minnesota Department of Health updated its fish Consumption Advisory in May 2000. The Department simplified its reporting procedure to emphasize the fish consumed. The advisory is available electronically at www.health.state.mn.us

For most people, most fish caught in Minnesota are safe to eat. Yet chemicals such as mercury, polychlorinated biphenyls (PCBs), toxaphene, and dioxin have been found in some fish from certain waters. The levels of these chemicals are usually low and in Minnesota there are no known cases of illness from these contaminants. To ensure the continued good health of Minnesota anglers, the Minnesota Department of Health has guidelines for how often these fish can be safely eaten. This advisory is not intended to discourage anglers from eating fish, but should be used as a guide for choosing fish that are low in contaminants. If you eat just a few meals of sport-caught fish each year, you probably don't need to be concerned. But if you eat fish more than once a week, or are pregnant or planning to be pregnant, then you should consult this advisory before eating your catch. Meals for children under six should also be prepared according to this advice.

The Department of Natural Resources (DNR), the Minnesota Pollution Control Agency (MPCA), and the Minnesota Department of Health collaborate in producing this advisory. Each year, the DNR collects fish from lakes and rivers for testing. Minnesota has 6000 fishable lakes. Fish from 856 lakes and 51 streams in Minnesota have been tested for contaminants. Testing fish from every lake and stream is too expensive. Sampling sites are selected where angling is popular, where pollution source is known or suspected, or where fish contaminant trends are being tracked.

The current advisory provides specific regulations for only four waters in the Red River Basin: the Red River itself and Dayton Hollow Reservoir, Ottertail Lake and Pelican Lake in Ottertail County.

The Minnesota Department of Health says that anglers should eat pan fish, perch or bullheads taken from Dayton Hollow Reservoir or Ottertail Lake no more than once a month.

North Dakota

The North Dakota Fish Consumption Advisory was updated in April 2000. No changes occurred to the advisory when compared to 1999. Of the 22 water bodies listed in the April 2000 Fish Consumption Advisory, only the following three; Brewer Lake, Lake Ashtabula, and Devils Lake; are located in the Red River basin.

9. ADDITIONAL ISSUES AND OTHER MATTERS REQUIRING CONSIDERATION

9.1 Devils Lake Sub-basin

Devils Lake, located in a closed sub-basin of the Red River watershed, drains a 3,814 square mile area of north-central North Dakota. The landscape is generally flat with some low hills and ridges and numerous prairie potholes, depressions, wetlands and small lakes. The basin includes nine watersheds, most of which are drained by coulees. Natural discharge from the Devils Lake basin to the Sheyenne River in the Hudson Bay drainage would only occur if the water level reaches an elevation of 1,459 feet above mean sea level. Water levels in the lake have historically fluctuated from completely dry (el. 1398 ft) to flood conditions, as presently being experienced. The lake level elevation on September 15, 2001 was 1447.4 feet. Devils Lake is a shallow, naturally saline and hypereutrophic body of water. The concentration of Total Dissolved Solids (TDS) varies from less than 1,000 mg/L in the northwestern end of the lake to greater than 6,000 mg/L in East Devils and Stump Lakes.

Beginning in July 1993, heavy rains throughout the Devils Lake basin caused considerable runoff to Devils Lake. This wet hydrological cycle has continued within the basin, with the lake rising 25 feet. The high lake levels have damaged private homes, businesses, roads and other infrastructure and taken agricultural lands out of production. The President of the United States declared the area a national disaster area.

In 1995, the U.S. Federal Emergency Management Agency (FEMA) established the Devils Lake Basin Interagency Task Force to develop recommendations on how to mitigate the impacts of flooding in the basin. The Task Force used a consensus-building process and a report was completed in 1995 (Report to the Devils Lake Basin Interagency Task Force, 1995).

Corps of Engineers feasibility studies of Devils Lake date back to the 1960s. In 1993, the Corps and the North Dakota State Water Commission agreed to proceed with a cost-shared feasibility study. The ongoing study, authorized by the Energy and Water Development Appropriations Act, 1993, Public Law 102-377, was originally scoped for lake stabilization, encompassing means for adding or eliminating water. Both the inlet and outlet generated controversy during the study. The Limits Study, review completed February 1999, is the most recent product of this study. The 1998 Energy and Water Development Appropriations Act specifically prohibited further consideration of a diversion of water from the Missouri River. The lake stabilization study is generally in abeyance while resources are focused on the outlet design and related environmental work. The Corps accelerated portions of the flood control project selected in the Reconnaissance Report at the request of the North Dakota Congressional delegation. A Contingency Plan, prepared in February 1996, presented options that might be implemented if the lake continued to rise. As a follow-up to the Contingency Plan, an Emergency Outlet Plan prepared in August 1996 presented a plan for an outlet from Devils Lake to the Sheyenne River that could be implemented in an accelerated time frame. The 1997 Emergency Supplemental Appropriations Act provided up to $5 million under the Flood Control and Coastal Emergency account to conduct preconstruction engineering, design (PED) and associated Environmental Impact Statement (EIS) for an emergency outlet at Devils Lake. These funds were not sufficient to complete the PED studies and EIS. Therefore, another $7.7 million was made available, with initial funding in August 2000, for completion of PED and the

EIS. As a part of the ongoing PED and associated EIS effort, the Corps would conduct necessary evaluations in accordance with the National Environmental Policy Act (NEPA) and the Boundary Waters Treaty of 1909. The completion of PED and the EIS is scheduled for September 2002.

Levees around the City of Devils Lake have been raised 4 times since 1996 at a total project cost of $42 million. The levees, which are actually designed as dams to hold back water on a long term basis, are about 7 miles long, designed to provide flood protection to elevation 1450 and built to a top of levee elevation of 1457. The foundations of the levees are wide enough that they could be further raised to an elevation of 1460 if needed. Six pump stations provide interior drainage by pumping the water over the levees that would have previously flowed to the Lake. The community of Church's Ferry had buildings within the flood zone removed under the FEMA program.

The Corps is continuing its Devils Lake outlet study and accompanying EIS. The USGS is providing a statistical water mass-balance model analysis for Devils Lake in support of the EIS.

The State of North Dakota is also studying a Devils Lake outlet to the Sheyenne River. In 2001, the State removed plant growth and restrictions to the flow of water from Devils Lake to west Stump Lake. In August 2001, the State hired a consultant to design an interim outlet, with construction planned to begin in May 2002.

9.2 Garrison Diversion Project

Dakota Water Resources Act

The Dakota Water Resources Act (DWRA) of December 2000 amended the authorizing legislation for the Garrison Diversion project. The legislation outlines a program to meet the Indian and non-Indian water supply needs in North Dakota and authorizes water uses including municipal, rural and industrial (MR&I), fish and wildlife, recreation, irrigation, flood control, stream flow augmentation, and ground water recharge.

The DWRA also authorizes a Red River Valley study and environmental impact statement (EIS) which will include a comprehensive analysis of water quantity and quality needs of the valley and reasonable alternatives for meeting these water needs. The DWRA de-authorized Taayre Reservoir and Sykeston Canal as project features. Lonetree Dam and Reservoir are also de-authorized and the reservoir lands acquired are to be designated as a wildlife conservation area.

Current Funding

Work in fiscal year 2001 is a continuation of ongoing activities related to State and Indian MR&I programs, wildlife mitigation and enhancement, recreation, routine O&M, and special studies. Reclamation's 2002 budget is still under consideration by Congress. These are numbers from the President's budget proposal.

State MR&I Program	$ 10,921,000
Wildlife Program	2,550,000
Recreation	100,000
Indian Irrigation	2,450,000
Supply System OM&R	4,990,000

Northwest Area Water Supply Study

The municipal, industrial and rural (MR&I) component of the Garrison Diversion Unit (GDU) project also includes the Northwest Area Water Supply project (NAWS). NAWS proposes to carry pre-treated water from either Lake Audubon or Lake Sakakawea to the City of Minot where it will be fully treated and then distributed to surrounding communities.

The NAWS project would transfer up to 28 million gallons per day through a pipeline across the continental divide from the Missouri River basin to the Hudson Bay basin. The government of Canada has expressed concern with the potential transfer of non-native biota transfer between the basins. Under the requirements of the 1986 GDU Reformulation, the Secretary of the Interior, in consultation with the Administrator of EPA, and the Secretary of State, must determine that any transbasin water transfer would not violate the 1909 Boundary Waters Treaty. This requirement was fulfilled in June 2001.

The Bureau of Reclamation, project proponent, released the final EA in April, 2001 and a FONSI (Finding of No Significant Impact) was signed in May 2001. In response to the issuance of these documents, Environment Canada and Manitoba Conservation made an Administrative Appeal of the FONSI to the Bureau in August 2001. Subsequently, a revised FONSI was issued in September 2001 ending the NEPA process for NAWS.

Red River Valley Study

The Dakota Water Resources Act (DWRA) directs that the Secretary of the Interior shall conduct a study of the water quality and quantity needs of the Red River Valley in North Dakota and possible options for meeting those needs. The DWRA also directs that the Secretary construct a feature or features to provide water to the Sheyenne River water supply and release facility or such other feature or features as may be selected. If a feature is selected that would provide water from the Missouri River or its tributaries to the Sheyenne River, or from the Missouri River or its tributaries to other conveyance facilities, 90 days after completion of the final Environmental Impact Statement (EIS), the Secretary shall transmit to Congress a comprehensive report which provides:

(i) a detailed description of the proposed project feature;
(ii) a summary of major issues addressed in the EIS;
(iii) likely effects, if any, on other States bordering the Missouri River and on the State of Minnesota; and
(iv) a description of how the project feature complies with the requirements of the Boundary Waters Treaty of 1909.

During 2001, the Bureau of Reclamation, as the lead federal agency in consultation and coordination with the State of North Dakota, has been developing the plan of study for the Red River Valley Water Supply studies.

9.3 Pembina, Aux Marais, and South Buffalo Drainage

Manitoba and North Dakota continued discussing the transboundary implications of drainage activities along the border region (Pembina River, Aux Marais, Buffalo Lake, Boundary Road/Dike). The two jurisdictions are finalizing an agreement for the Pembina-Aux Marais on mitigation

measures to eliminate or reduce the impact of dike removals on Manitoba. Manitoba and North Dakota have agreed on the required design capacities for the South Buffalo Drain, with North Dakota to fund the cost of the increased Manitoba channel capacity to handle the artificial drainage in North Dakota. The Pembina River Advisory Board, a grass roots organization with federal, provincial and state support, has a task group evaluating the issue.

The North Dakota Supreme Court upheld the District Court ruling that a number of the Pembina River dikes were not permitted and had to be removed. All dikes were removed or breached during the late fall and winter of 2000. The Pembina River Water Resource District in North Dakota is pursuing the removal of all non-permitted dikes in their district.

9.4 Roseau River Watershed

International Roseau River Watershed (IRRW) was formed with seven members each from Canada and the U.S. to provide a forum for the exchange of information of common interest on basin water quality and quantity and to identify solutions to flooding and water management problems on both sides of the international boundary. The IRRW is currently examining upstream storage potential in the watershed.

9.5 Red River Reconnaissance Study

The Corps of Engineers is the lead federal agency in a federal-state-local partnership established to address basin wide flood damage reduction, natural resource opportunities and other water resource related issues in the Red River basin.

The Red River of the North, a northward flowing stream, originates at the convergence of the Ottertail River, Minnesota, and Bois de Sioux River, Minnesota and North Dakota, and ends at Lake Winnipeg in Manitoba, Canada. Within the United States, the Red River drains portions of South Dakota, Minnesota and North Dakota and forms the border between the latter two. The basin has lost much of the natural environment that existed in early settlement times, and flooding has repeatedly caused economic and human hardship. Major flood events totaling billions of dollars in damages have occurred in 1826, 1852, 1893, 1897, 1914, 1919, 1950, 1974, 1979, 1985, 1989, 1996, and 1997. Significant floods with substantial documented damages occurred on tributaries on other years as well. Severity of flooding is on the rise. Drainage, river modifications (many by the Corps), and land-use changes for enhancement of agriculture adversely affected the natural ecosystems. Parts of the basin are in state of accelerated deterioration. The study is urgently needed to identify projects, verify federal interests, and establish feasibility in proceeding with flood damage reduction and ecosystem restoration projects using a variety of alternatives, including wetland and stream restorations, to address flooding, drought, erosion and sediment discharge, water quality, and creation of wildlife habitat and connectivity. The goal is to achieve a sustainable, healthy balance between development for communities and agriculture and preservation or enhancement of natural resources through a holistic watershed approach. Solutions will require modifications to most Corps channel projects that are now contributing to ecosystem deterioration. The study will build on initiatives of the International Joint Commission Red River Basin Task Force study, the Red River Mediation Agreement, the International Flood Mitigation Initiative (IFMI) Report, and others in cooperation with the existing and broad-based network of participants. Federal agencies, State agencies in Minnesota, North Dakota, and South Dakota, local units of

government, non-profit environmental organizations, Canadian interests, business and agricultural representatives, and citizens participating and supporting these initiatives see this study as critical to continued basin planning and implementation. The Red River Basin Board passed a resolution supporting this study; the IFMI also showed strong interest; Audubon, Minnesota Center for Environmental Advocacy, and other environmental organizations actively backed this study. Willing cost-share sponsors include the States of North Dakota and Minnesota, watershed entities such as the Red River Watershed Management Board, and local units of government such as the City of Fargo which is at risk during larger flood events. The reconnaissance study will be completed within one year. Feasibility studies will follow for projects that have federal interest.

Fiscal Year 2001 funds are being used to complete the reconnaissance phase at full federal expense. If the reconnaissance report is certified to be in accord with policy, the funds requested for Fiscal Year 2002 will be used to continue into the feasibility phase of the study. The preliminary estimated cost of the feasibility phase is $16,020,000 which is to be shared on a 50-50 percent basis by the federal and non-federal interests. A summary of study cost sharing is as follows:

Total Estimated Study Cost	$16,220,000
Reconnaissance Phase (Federal)	200,000
Feasibility Phase (Federal)	8,010,000
Feasibility Phase (Non-Federal)	8,010,000

The reconnaissance phase is scheduled for completion in December 2001. The feasibility study completion schedule is being determined.

9.6 Turtle River Township - Solid Waste Landfill

On the basis of engineering, environmental, and economic criteria, the City of Grand Forks has identified a potential sanitary landfill site in the Turtle River Township, Grand Forks County, North Dakota. Preliminary issues associated with the proposed landfill include: effects on floodplains and wetlands; ground and surface water quality; ground water movement; surface erosion and sedimentation; traffic, noise, and odors; visual and aesthetic resources; and air quality.

In August 2001, the City of Grand Forks advised the public that it intends to gather information necessary for preparing an Environmental Impact Study for the development of the proposed sanitary landfill. The study would address alternative site analysis as well as various disposal and landfill operation alternatives. The City requested suggestions and information from the public and other agencies on the scope of the issues to be addressed in the Environmental Impact Study. It is noted that because no federal action is required with respect to the City of Grand Forks landfill proposal, an Environmental Impact Statement (EIS), which is legally defined and mandated, is not required. However, it is the proponent's intent that to the greatest extent possible, the Study will comply with the federal NEPA process for the preparation of an EIS and all policy regulations, and will be the functional equivalent of an EIS.

In response to this request for input, Environment Canada and Manitoba Conservation prepared a joint response offering several recommendations related to waters flowing northward to Canada that should be addressed in the Study. These recommendations spoke to the siting of the landfill in relation to a defined flood risk boundary, management of surface drainage, and containment of leachate from the landfill.

9.7 Poplar River Basin

The Poplar River basin is an international basin between Saskatchewan and Montana and was part of the International Souris-Red Rivers Engineering Board (ISRREB) reference area. When the functions of the ISRREB were distributed to the International Souris River and International Red River Boards, the reporting on Poplar River issues was assigned to the latter.

Background

In 1975 the IJC instructed the ISRREB to investigate equitable apportionment alternatives for the Poplar River basin. This was prompted by the construction of a thermal power plant and cooling reservoir on the East Poplar River near Coronach, Saskatchewan, by the Saskatchewan Power Corporation. The ISRREB used the results of its Poplar River Task Force to recommend an apportionment formula in 1976 to the Commission, who in turn recommended an apportionment formula to the governments of Canada and the United States in 1978.

In 1977, the governments of Canada and the United States referred the matter of water quality to the IJC. The IJC Water Quality Task Force report, completed in 1981, was the basis for the water quality objectives recommended to governments that same year. As well, the International Air Pollution Advisory Board provided advice to the Commission on air pollution potential from the power plant.

The Coronach Power station began operation in 1981. While Canada and Saskatchewan have not accepted the IJC apportionment formula and water quality objectives, Saskatchewan has been following them.

Bilateral Monitoring Committee

A Poplar River Bilateral Monitoring Committee was established by governments in 1980 to oversee monitoring programs designed to evaluate the potential transboundary impacts from the thermal generating station and ancillary operations. The Committee consists of representatives from the federal governments, the State of Montana, and the Province of Saskatchewan, as well as one public ex-officio member from both the United States and Canada.

Monitoring data on surface water quantity and quality, groundwater quality, and air quality are collected at or near the international boundary and exchanged annually. The present arrangement under which the Committee operates terminated in March 2001. The Bilateral Committee will be seeking another extension to the arrangement.

Current Issues/Activities

Present concerns are: 1) Saskatchewan believes the current apportionment formula is not equitable; 2) mining activities in Saskatchewan for coal may draw down wells in Montana, and; 3) water quality issues, particularly the closeness of total dissolved solids to the long-term water quality objective proposed by the IJC.

In 2000, the apportionment for the Poplar River was met including the minimum flow criteria. Both Saskatchewan and Montana indicated they may be interested in reopening discussions for a new apportionment arrangement between Saskatchewan and Montana, which has been put on hold for the last few years.

While the long-term objective for TDS was not exceeded in 2000, it remained close to the objective level established by the IJC. The Cookson Reservoir profile studies were carried out in 1999 and 2000 by Saskatchewan. The purpose of the studies was to investigate chemical (TDS) stratification in the reservoir. The studies concluded that there was no chemical stratification. The study report was sent to the Bilateral Committee meeting held on August 28, 2001, in Helena, Montana. The Committee did not agree with one of the five conclusions of the report that generalized that the only source of high TDS was groundwater.

In 2000, the USGS compared the last five years of TDS results and their computations for quality assurance purposes. The analytical methods were checked using probe readings versus on-site readings of major ions from the joint sampling. The findings seem to agree with the results reported by the filed joint sampling.

Questions have been raised about the scientific basis and validity of using flow-weighted concentrations (FWC) to compute TDS and Boron. The issue has been a subject of discussion by the Committee for a few years. At the Bilateral Committee meeting on August 28, 2001, the USGS and Montana have volunteered to investigate other scientifically acceptable methods to replace the FWC approach in the future.

As part of the Bilateral Monitoring Agreement, data collected in both United States and Canada were exchanged in 2001.

Reservoir Levels

Cookson Reservoir water level was at a maximum of 752.28 (87.5% of FSL) on January 2, 2000 and dropped to 751.55 (75.7% of FSL) by November 19, 2000.

9.8 Water Resource Investigations and Activities

Analysis of Surface-Water Storage within Starkweather Coulee Basin

This USGS study demonstrates the utilization of high-resolution digital elevation data, GIS tools, and surface-water runoff modeling software to define flow networks, to calculate surface-water storage capacity within the low-relief landscape, and to simulate precipitation runoff and storage. Final report has been written and reviewed by the cooperator. The report will be published early in 2002.

Mercury in Impoundments, Minnesota part of the Red River Basin

This USGS study has two main components: 1. To determine the potential effect of the Good Lake Impoundment on mercury cycling and methylmercury levels. 2. To compare methylmercury levels in permanent-pool impoundments, dry-dam (or temporary-pool) impoundments, and natural waters (lakes and wetlands). A paper describing the results of the study has been accepted for publication in Water, Air, and Soil Pollution. Author anticipates publication in early 2002.

Sediment Sources to the Wild Rice River Basin, Minnesota

The study is for the USGS to better understand or quantify whether the suspended sediment in streams is primarily from upland erosion or in-channel erosion. Study results were published in USGS Water-Resources Investigation Report 01-4192 authored by Mark Brigham and others.

Evaluation of Contaminant Contributions (Nutrients, Pesticides, and Suspended Sediment) to the Upper Red River of the North Basin

This USGS study will evaluate contaminant contributions in the upper Red River Basin. The objectives of the study are to identify the contributions of contaminants from different sub-basins of the Red River basin. The study area is the upper Red River basin from a point downstream from the junction of the Buffalo River with the Red River (Red River at Perley, MN). The study is based on physical and chemical data collected from the Red River and major tributaries to the Red River starting in May 1997. Physical, chemical, and sediment data were collected from 11 sample sites, and pesticide data were collected from two sampling sites during 1997. In 1998, the number of sites was changed to eight sites. Sampling ended September 1999 and data analysis was started in 2000.

Relations of Runoff Processes to Wetlands and Land Uses within Various Landscapes of the Red River of the North

The USGS is studying the relations that wetlands and land-use have with the hydrology of the Red River basin. The objectives are to establish small-scale basin sites to monitor, to develop hydrologic models to simulate runoff, and to examine the extent to which results from models could be applied throughout the Red River basin. One monitoring site has been established near Detroit Lakes, Minnesota, and another has been established near Harvey, North Dakota. Data collection continued in 2000-01.

Relations between Streamflow and Ground Water in the Sheyenne River Valley from Sheyenne to Kindred, North Dakota

The USGS study is focusing on ground-water/surface-water interactions within 2,000 feet of the Sheyenne River at four locations between Sheyenne and Kindred, North Dakota. The objectives are to: (1) determine how changes in stage in the Sheyenne River affect groundwater close to the river; (2) determine how climatic conditions affect groundwater levels close to the river; and (3) examine how differences in surface slope and geology affect the rate and extent of change in groundwater levels with changes in streamflow and climatic conditions. Two sites were established in the fall of 1998 and another site was established in the fall of 1999. Data collection continued in 2000-01.

McHugh Slough/Lake Loretta

McHugh Slough and Lake Loretta are terminal (closed) lakes within the Stump Lake drainage area. Due to the ongoing wet hydrological cycle within the Devils Lake Basin, these lakes have been rising along with Devils Lake and Stump Lake. A drainage canal has already been constructed from McHugh Slough into Lake Loretta, which is further raising the water level of Lake Loretta. The City of Michigan (pop 400), Nelson County, North Dakota, has proposed building a 33,000-foot channel to drain Lake Loretta into a tributary of the Red River. The canal would drain 16,000 acres of farmland and lower the lake level enough to provide a flow gradient for the town's sewer system into the lake. The town's goal is to prevent inundation of their sewer system and city infrastructure. Concerns have been expressed about the potential of the proposed canal causing increased downstream flooding, water quality issues, and transborder issues. The IRRB will continue to evaluate the issue in the context of water quality at the international boundary.

Minnesota Basin Planning and Management

In the past year, the Red River Basin Water Quality Team continued implementation of the 1999 Red River Basin Water Quality Plan. Primary activities of the Team include:

- Continued organization of local resource managers at the Basin level to implement water quality goals and objectives;
- Successful development of projects for funding, including a stream bank stabilization project for the City of Crookston;
- Campaign to promote the understanding and use of buffer strips on agricultural lands in the Red River Basin;
- Support for protection of drinking water sources, especially surface waters, and
- Expansion of ambient water quality monitoring to help managers better understand conditions of waters of the Red River Basin.

Minnesota Flood Damage Reduction Work Group

The Minnesota Pollution Control Agency participates in the Red River Basin Flood Damage Reduction Work Group and its Technical and Scientific Advisory Group.

In the 2000 water year, the MPCA assisted in development of a natural resources guide for the Red River Basin, participated in the planning and development of flood damage reduction projects in the Bois de Sioux, Buffalo, Sand Hill, Wild Rice, Red Lake, Middle-Snake and Roseau rivers watersheds.

The Technical and Scientific Advisory Committee is developing a monitoring protocol for water resource management projects.

APPENDIX A

DIRECTIVE TO THE INTERNATIONAL RED RIVER BOARD

DIRECTIVE TO THE INTERNATIONAL RED RIVER BOARD

1. Pursuant to the Boundary Waters Treaty of 1909, responsibilities have been conferred on the Commission under a 1948 Reference from the governments of Canada and the United States with respect to the use and apportionment of the waters along, across, or in the vicinity of the international boundary from the eastern boundary of the Milk River drainage basin on the west up to and including the drainage basin of the Red River on the east, and under the May 1969 authorization from the governments to establish continuous supervision over the quality of the waters crossing the boundary in the Red River and to recommend amendments or additions to the objectives when considered warranted by the International Joint Commission.

2. This directive replaces previous directives and instructions provided by the International Joint Commission to the International Souris-Red Rivers Engineering Board, and in the February 8, 1995 Directive to the International Red River Pollution Board. This Directive consolidates the functions of those two former boards into one board, to be known as the International Red River Board (Board).

3. The Board's mandate is to assist the Commission in preventing and resolving transboundary disputes regarding the waters and aquatic ecosystem of the Red River and its tributaries and aquifers. This will be accomplished through the application of best available science and knowledge of the aquatic ecosystem of the basin and an awareness of the needs, expectations and capabilities of residents of the Red River basin.

4. The geographical scope of the Board's mandate shall be the Red River basin, excluding the Assiniboine and Souris Rivers. The Board's activities shall focus on those factors which affect the Red River's water quality, water quantity, levels and aquatic ecological integrity.

5. The Board's duties shall be to:

   A. Maintain an awareness of basin-wide development activities and conditions that may affect water levels and flows, water quality and the ecosystem health of the Red River and its transboundary tributaries and inform the Commission about transboundary issues.

   B. Provide a continuing forum for the identification, discussion and resolution of existing and emerging water-related issues relevant to the Red River basin.

   C. Recommend appropriate strategies to the Commission concerning water quality, quantity and aquatic ecosystem health objectives in the basin.

D. Maintain continuing surveillance and perform inspections, evaluations and assessments, as necessary, to determine compliance with objectives agreed to by governments for water quality, levels and quantity in the Red River basin.

E. Encourage the appropriate regulatory and enforcement agencies to take steps to ensure that agreed objectives are met.

F. Encourage the appropriate authorities, such as resource and emergency planning agencies, to establish and maintain contingency plans, including early warning procedures, for appropriate reporting and action on accidental discharges or spills, floods and droughts. discharges or spills, floods and droughts.

G. Monitor and report on flood preparedness and mitigation activities in the Red River basin and their potential effects on the transboundary aquatic ecosystem, and encourage and facilitate the development and. maintenance of flood-related data and information systems and flood forecasting and hydrodynamic models. In carrying out this responsibility, the Board shall:

i. Monitor progress by the governments (federal, state, provincial, municipal) in implementing the recommendations of the Commission's report on Red River basin flooding, and in maintaining and advancing the work of the Task Force's legacy projects, and to this end provide opportunities for the public to comment on the adequacy of such progress.

ii. Encourage governments to develop and promote a culture of flood preparedness in the Red River valley.

iii. Encourage government efforts to develop and implement a long-term strategy for flood mitigation and emergency preparedness.

iv. Encourage the sharing of accurate and timely transboundary information to support the development of improved flood forecasting techniques and procedures for early flood warnings and to improve communication of flood forecasts.

v. Provide through the activities of the Board a forum for the exchange of best practices and for other flood-related information on preparedness, mitigation, response, and recovery, to assist in transboundary problem solving.

vi. Promote the application of innovative technologies for supporting flood modeling and mapping.

vii. Monitor the adequacy of data and information collection networks (meteorological, hydrometric, water quality) for flood preparedness, forecasting and mitigation, within the larger context of overall water management needs in the basin.

viii. Monitor potential transboundary effects of flood mitigation and other works in the basin, and encourage cooperative studies necessary to examine these effects.

ix. Encourage governments to integrate floodplain management activities in watershed and basin management.

x. Interact with all levels of government to help decision-makers become aware of transboundary flood-related and associated water management issues.

xi. Assist in facilitating a consultative process for resolution of the lower Pembina River flooding issue.

H. Involve the public in the work of the Board, facilitate provision of timely and 'pertinent information within the basin in the most appropriate manner including electronic information networks, and conduct an annual public meeting in the Red River basin;

I. Provide an annual report to the Commission, plus other reports as the Commission may request or the Board may feel appropriate in keeping with this Directive.

J. Maintain an awareness of the activities of other agencies and institutions, in the Red River basin;

6. The Board shall continue to report on the non-Red River geographic areas under the responsibility of the former International Souris-Red Rivers Engineering Board, including the Poplar and Big Muddy basins, but excluding the Souris River basin, until the Commission determines otherwise.

7. The Board shall have an equal number of members from each country. The Commission shall normally appoint each member for a three-year term. Members may serve for more than one term. Members shall act in their personal and professional capacity, and not as representatives of their countries, agencies or institutions. The Commission shall appoint one member from each country to serve as co-chairs of the Board. An alternate member may not act as a co-chair.

8. At the request of any member, the Commission may appoint an alternate member to act in the place of such member whenever the said member, for any reason, is not available to perform such duties as are required of the member.

9. The co-chairs of the Board shall be responsible for maintaining proper liaison between the Board and the Commission, and among the Board members. Chairs shall ensure that all members of the Board are informed of all instructions, inquiries, and authorizations received from the Commission and also of activities undertaken by or on behalf of the Board, progress made, and any developments affecting such progress.

10. Each chair, after consulting the members of the Board, may appoint a secretary. Under the general supervision of the chair(s), the secretary(ies) shall carry out such duties as are assigned by the chairs or the Board as a whole.

11. The Board may establish such committees and working groups as may be required to discharge its responsibilities effectively. The Commission shall be kept informed of the duties and composition of any committee or working group. Unless other arrangements are made, members of the Board, committees, or working groups will make their own arrangements for reimbursement of necessary expenditures.

12. The Commission should also be informed of the Board's plans and progress and of any developments or cost impediments, actual or anticipated, which are likely to affect carrying out the Board's responsibilities.

13. The Commission shall be informed, in advance, of plans for any public meetings or public involvement in the Board deliberations. The Board shall report, in a timely. manner, to the Commission on these meetings, including representations made to the board.

14. The Board shall provide the text of media releases and other public information materials to the Secretaries of the Commission for review by the Commission's Public Information Officers, prior to their release.

15. Reports, including annual reports, and correspondence of the Board shall, normally, remain privileged and be available only to the Commission and to members of the Board and its committees until their release has been authorized by the Commission.

16. If, in the opinion of the Board or of any member, any instruction, directive, or authorization received from the Commission lacks clarity or precision, the matter shall be referred promptly to the Commission for appropriate action.

17. In the event of any unresolved disagreement among the members of the Board, the Board shall refer the matter forthwith to the Commission for decision.

18. The Commission may amend existing instructions or issue new instructions to the Board at any time.

APPENDIX B

B.1 WATER QUALITY OBJECTIVES

B.2 WATER QUALITY ALERT LEVELS

B.1 WATER QUALITY OBJECTIVES

The purpose of the water quality objectives and alert levels is to restore and maintain the chemical, physical, and biological integrity of the waters of the Red River. Five specific objectives were adopted for the Red River by the IJC in 1969.

Water quality objectives are used when necessary to secure government commitment to pollution abatement action. Compliance with the objectives is the primary means by which the Board identifies major water quality issues to the Commission.

The term “exceedence” is used to describe a situation where an objective is not met. A situation is classified as an exceedence if an individual instantaneous sample, obtained from the continuous auto-monitor, or through a grab sample, is equal to or greater than the corresponding water quality objective (except for dissolved oxygen, which must be observed to be equal to or less than the objective). The five specific parameters and corresponding objective are listed below.

Fecal Coliform	200 colonies/100 ml
Chloride	100 mg/L
Sulphate	250 mg/L
Total Dissolved Solids	500 mg/L
Dissolved Oxygen	5 mg/L

B.2 WATER QUALITY ALERT LEVELS

Water quality alert levels are used to complement water quality objectives. If exceeded, alert levels will trigger investigative action on the part of the Board or its representatives. The exceedence is addressed in terms of its magnitude, implications to water uses and possible resolutions. On the basis of alert level exceedences and subsequent investigations, the Board may advance proposals for additional objectives.

Water quality alert levels, for a wide range of parameters, in addition to the five specific parameters noted above, were developed by a working group in 1985. These alert levels were approved by the predecessor International Red River Pollution Board in January 1986. The alert levels that are currently in effect are listed in the following table. Further, the table provides a comparison of alert levels with the North Dakota and Minnesota Water Quality Standards, and with the Manitoba Water Quality Objectives as of 1990. The table has not been updated to reflect recent state or provincial revisions. The Aquatic Ecosystem Health Committee established by the Board in June 2001 will be reviewing the issue of objectives and alert levels with respect to monitoring requirements, analytical methodologies, and reporting protocols.

APPENDIX C

WATER POLLUTION CONTROL
CONTINGENCY PLAN

LIST OF CONTACTS

Notification List
For D.O Depletions, Non-toxic , Oil, and Toxic Spills

United States:

Minnesota Pollution Control Agency – Detroit Lakes, MN

Jeff Lewis
(218) 846-0730 office
(218) 846-0719 fax
1-800-422-0798 (24 hr)

Molly MacGregor
(218) 846-0494 office
(218) 846-0719 fax
1-800-422-0798 (24hr)

Minnesota Department of Natural Resources – Bemiji, MN (fisheries)

Henry Drews
(218) 755-3959 office
1-800-422-0798 (24hr)

North Dakota Health Department – Bismark, ND

Frtiz Schwindt
(701) 328-5150 office
(701) 328-5200 fax
1-800-472-2121 (24hr in-state – ask for REACT Officer)
(701) 328-9921 (24hr out-of-state – ask for REACT Officer)

Dennis Fewless
(701) 328-5150 office
(701) 328-5200 fax
1-800-472-2121 (24hr in-state – ask for REACT Officer)
(701) 328-9921 (24hr out-of-state – ask for REACT Officer)

Environmental Protection Agency – Denver, CO

Max Dodson
(303) 312-6598 office
(303) 312-6897 fax
1-800-424-8802 (24hr National Response Center)

John Giedt
(303) 312-6550 office
(303) 312-6897 fax
1-800-424-8802 (24hr National Response Center)

Canada:

Manitoba Conservation – Winnipeg, MB

Dwight Williamson
(204) 945-7030 office
(204) 948-2357 fax
(204) 256-3706 home
(204) 944-4888 (24hr telephone service emergency number)

Environment Canada- Regina, SK

David Donald
(306) 780-6723 office
(306) 780-6810 fax
(306) 586-1468 home

Environment Canada – Winnipeg, MB

Michael Kowalchuk
(204) 983-5500 office
(204) 983-4884 fax
(204) 256-7784 home

APPENDIX D

HISTORICAL STEAMFLOW AND WATER QUALITY CHARACTERISTICS

APPENDIX E

HYDROLOGY COMMITTEE AND AQUATIC ECOSYSTEM HEALTH COMMITTEE MEMBERSHIP LIST

International Red River Board
Hydrology Committee

Membership:

Name	Organization	Phone	E-mail
Rick Bowering (Chair)	Manitoba Conservation, Winnipeg	(204) 945-6397	Rbowering@gov.mb.ca
Steve Robinson (Chair) Gregg Wiche (Alt.)	USGS, Bismark	(701) 775-7221 (701) 250-7400	Smrobins@usgs.gov gjwiche@usgs.gov
Michael Kowalchuk (Secretary)	Environment Canada, Secretary IRRB, Winnipeg	(204) 983-5500	Michael.Kowalchuk@EC.GC.CA
Alain Vermette	PFRA, Winnipeg	(204) 984-3694	Vermettea@em.agr.ca
Scott Jutila Greg Eggers (Alt.)	Corps of Engineers, St. Paul	(651) 290-5631 (651) 290-5607	Scott.A.Jutila@usace.army.mil Gregory.W.Eggers@usace.army.mil
Maurice Sydor	Environment Canada, Ottawa	(819) 953-1528	maurice.sydor@ec.gc.ca
Randy Gjestvang	N.D. State Water Commission, West Fargo	(701) 282-2318	rgjest@water.swc.state.nd.us
Chuck Fritz	Red R. Basin Board, Moorhead	(218) 291-0422	Chuckr2b2@corpcomm.net
Harold Taylor	The International Coalition, Winnipeg	(204) 982-7254	ticwpg@ilos.net
Ron Harnack Al Kean (Alt.)	Minnesota Board of Water and Soil Resources,	(651) 296-0878	Ronald.harnack@bwsr.state.mn.us Al.kean@bwsr.state.mn.us
Gale Mayer	Minnesota DNR, Bemidji	(218) 755-4482	Gale.mayer@dnr.state.mn.us
Kip Gjerde Amy Ambuehl (Alt.)	U.S. Bureau of Reclamation, Billings	(406) 247-7813 (701) 250-4242 ext. 3615	jgjerde@gp.usbr.gov aambuehl@gp.usbr.gov

International Red River Board
Aquatic Ecosystem Health Committee

Membership:

Name	Organization	Phone	E-mail
John Giedt (Chair)	EPA/Denver	(303) 312-6550	giedt.john@epa.gov
Stacey Eriksen	EPA/Denver	(303) 312-6692	eriksen.stacey@epa.gov
Mike Sauer	NDHD/Bismarck	(701) 328-5237	msauer@state.nd.us
Mike Ell	NDHD/Bismarck	(701) 328-5214	mell@state.nd.us
Rick Nelson	USBR/Bismarck	(701) 250-4242	rnelson@gp.usbr.gov
Wayne Berkas	USGS/Bismarck	(701) 250-7429	wrberkas@usgs.gov
Molly MacGregor	MPCA/Detroit Lakes	(218) 846-0494	molly.macgregor@ pca.state.mn.us
Gale Mayer	MNDNR/Bemidji	(218) 755-4482	gale.mayer@ dnr.state.mn.us
Lance Yohe	RRBB/Moorhead	(218) 291-0422	lancer2b2@corpcomm.net
Chuck Fritz	RRBB/Moorhead	(218) 291-0422	chuckr2b2@corpcomm.net
Angela Whitney	RRBB/Moorhead	(218) 291-0422	angelar2b2@corpcomm.net
David Donald (Chair)	EnvironmentCanada/ Regina	(306) 780-6723	david.donald@ec.gc.ca
Dwight Williamson	Manitoba Conservation/ Winnipeg	(204) 945-7030	dwilliamso@gov.mb.ca
Joe O'Connor	Manitoba Conservation/ Winnipeg	(204) 945-7814	joconnor@gov.mb.ca
Terry Shortt	DFO/Winnipeg	(204) 983-5062	shorttt@dfo-mpo.gc.ca
Pat McGarry	PFRA/Winnipeg	(204) 983-4832	mcgarryp@em.agr.ca