1. REPORT SUMMARY:

WATER QUALITY & QUANTITY

During the 1999 Water Year (October 1, 1998 to September 30, 1999) the Red River again experienced significant and sustained high flows. Annual flows have remained high in the Red River each year since 1993. Unlike the spring melt of 1997, spring melting during 1998, 1999 and 2000 did not result in large scale flooding. During the 1999 Water Year, a moderate winter and more typical spring melting cycle provided continued relief to basin residents. However, precipitation and ground water tables within the basin remained high during the 1999 Water Year. Several unusual rainfall events occurred during June 2000, resulting in localized flooding, e.g. Fargo, North Dakota. These events will be reported in greater detail in the Year 2000 Water Report.

The International Joint Commission (IJC) objective for total dissolved solids was exceeded in 3 consecutive months at the International Boundary (Boundary) during the 1999 Water Year. Previous to 1997, TDS had been exceeded every year since 1985. Chloride did not exceed the IJC objective during 1999. Fecal coliform bacteria exceeded the IJC objective once during the 1999 Water Year, however, with a value in which we have low confidence. In general, other water quality characteristics at the Boundary have improved relative to the recent historical record, 1988 to present.

The number and concentrations of exceedences of the Boards Alert Levels in the 1999 Water Year were significantly increased from the 1998 Water Year. Mercury (total) was detected in 7 of the 12 months, with the maximum concentration for the water year 0.018 Fg/L. The organochlorine pesticide Lindane was detected in nine grab samples. Low concentrations of cadmium, copper, lead, nickel, and zinc are endemic to the Red River. The Board will continue to closely monitor exceedence parameters during the 2000 Water Year, along with other constituents of concern.

U.S. facilities with current National Pollutant Discharge Elimination System (NPDES) discharge permits from North Dakota and Minnesota were in compliance with their permits most of the time. No new pollution point sources, which would have potential impacts on the Boundary water quality, were introduced within the Red River Basin.

There were some minor spills during high water levels. These were not considered to be significant because of high dilution. Monitoring did not detect additional problems at the boundary.

SUMMARY OF ISSUES

The International Red River Board (IRRB) investigates and reports on projects that have a potential to affect the waters flowing across the boundary. This information exchange alerts the IJC of upcoming issues, and allows the responsible agencies opportunity to ensure that projects do not cause damage to the other. Issues before the IRRB are summarized in Table 1, while details are included in the report.

OTHER MATTERS BEING CONSIDERED BY THE IRRB

(order does not imply priority):
(1) Garrison Diversion Project
(2) Devils Lake Sub-Basin
(3) McHugh Slough and Lake Loretta
(4) Red River Basin Organizations

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.	Congressional authorization of Corps of Engineers funding on hold. North Dakota is pursuing an interim emergency outlet to be funded by the state.	Project being monitored by the Garrison Joint Technical Committee (JTC). JTC will keep the IRRB informed of any changes in project status.
Roseau River	Potential water quality deterioration from intensive livestock operations	Manitoba has been made aware of downstream concerns.	Manitoba will keep the IRRB informed on assessment of livestock production proposals.
Pembina River - Aux Marais	Embankment along the 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.	Manitoba & North Dakota will keep the IRRB informed on progress.
	Embankments along the Pembina River & parallel to the Boundary increase flood water flowing toward Manitoba.	Reviewed by Red River Basin Task Force	Red River Basin Task Force recommendations under consideration by the IJC.
Pembina River	Water use/development is increasing, no apportionment agreement.	Manitoba licenses water use from the river.	Manitoba monitors total water use upstream of Boundary.
	Agricultural and tributary flooding in Manitoba.	Drainage into upper Pembina River tributaries in North Dakota blamed for increased flooding.	Manitoba & North Dakota will keep the IRRB informed on negotiations.
Poplar River	No formal apportionment formula exists.	Bilateral Monitoring Agreement extended from April 1, 1996 to March 31, 2001.	Monitored by Poplar River Bilateral Monitoring Committee.
		Saskatchewan & Montana are. negotiating an agreement on apportionment & quality.	Maintain watch on agreement negotiations.
	Potential use of transboundary aquifer.	Saskatchewan evaluation of the aquifer for supplemental water on hold due to Montana & USGS concerns.	Poplar River Bilateral Monitoring Committee will monitor & keep the IRRB informed.
Garrison Diversion Unit	Diversion of water from Missouri River to Hudson Bay drainage could transfer non-native biota, change water quality & increase flows.	1986 Act removed irrigation features that transferred water into Hudson Bay drainage. MR&I projects remain a concern. Amendment to act introduced.	Monitor project progress.

2. INTRODUCTION

In 1998, the IJC requested the International Souris-Red Rivers Engineering Board (ISRREB) and the International Red River Pollution Board (IRRPB) to report on combining their functions in the Red River basin into one board. The IJC merged the two boards into a single International Red River Board at its April 2000 meeting. The IRRB will be responsible for assisting the IJC in fulfilling its transboundary responsibilities in the Red River Basin. This is the First Progress Report of the International Red River Board.

On January 12th, 1948, in accordance with Article IX of the Boundary Waters Treaty of January 11, 1909, the Governments of Canada and the United States referred to the IJC a request to investigate and report on the water requirements of the existing works or projects located in the waters which are of common interest 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 of the North on the east, to report whether further uses within their respective boundaries by Canada and the United States would be practicable in the public interest, to make advisory recommendations concerning the apportionment between Canada and the United States and to conduct necessary investigations and to prepare a comprehensive plan or plans of mutual advantage to the two countries for the conservation, control, and utilization of the waters under reference. The IJC appointed the International Souris-Red Rivers Engineering Board on April 7, 1948, to carry out the reference.

In 1964, the Governments of Canada and the United States referred to the IJC a request to investigate pollution in the waters crossing the international boundary in the Red River pursuant to the provisions of Article IX of the Boundary Waters Treaty. The IJC established the International Red River Water Pollution Board (IRRWPB) on December 2, 1964, to examine relevant water quality information, identify pollution sources and determine remedial measures. The IRRWPB reported to the IJC in October 1967 and the IJC provided recommendations to the Governments of Canada and the United States on April 11, 1968. In May 1969, the Governments of Canada and the United States authorized the IJC to establish continuous supervision over the quality of waters in the Red River crossing the international boundary and to recommend amendments or additions to the objectives when considered warranted by the IJC. The IJC established the International Red River Pollution Board (IRRPB) on June 10, 1969. In February 1995, the IJC approved a revised Directive to the IRRPB, making two changes in philosophy to move away from simple water chemistry to the concepts of water quality and aquatic ecosystem health.

The International Red River Board (IRRB) includes the functions of the two boards (ISRREB & IRRPB) in the Red River Basin with a residual responsibility of the ISRREB in the Poplar River and Big Muddy Creek basins. In April 2000, the ISRREB responsibilities for the Souris River basin were given by the IJC to the International Souris River Board.

3. IRRB MEMBERSHIP

Letters dated June 14, 2000, to the members of the former International Souris-Red Rivers Engineering Board, and the International Red River Pollution Board, from the respective US/CA Secretaries of the IJC, provided notification that the IJC had agreed to merge the two boards into a single International Red River Board. The letters further noted that during a transition period, the IJC considers that the IRRB is comprised of the total membership of the two previous boards, and has four co-chairs and four secretaries, which consists of the co-chairs and secretaries of the two previous boards.

The International Red River Board, effective April 28, 2000, was made up of the following members and secretaries:

Richard L Kellow
Co-Chair, Canadian Section
Executive Director
Transboundary Waters Unit
Environment Canada

Maryanne C. Bach
Co-Chair, United States Section
Regional Director
Great Plains Region
U.S. Bureau of Reclamation

William. D. Gummer
Co-Chair, Canadian Section
Chief, Ecological Research Division
Environmental Conservation Branch
Environment Canada

Max H. Dodson
Co-Chair, United States Section
Assistant Regional Administrator for
Ecosystem Protection and Remediation
Region 8
U.S. Environmental Protection Agency

Frank J. Quinn
Policy Advisor, Water Issues Branch
Environment Canada

Col. Kenneth S. Kasprisin
District Engineer
St. Paul District
U.S. Army Corps of Engineers

vacant position

Gregg Wiche
District Chief,
Bismarck Office
United States Geological Survey

Dwight Williamson
Manager, Water Quality Management Section
Manitoba Conservation

Jeff Lewis
Regional Director, Detroit Lakes Office
Minnesota Pollution Control Agency

Dr. J. O'Connor
Director, Fisheries Branch
Manitoba Conservation

Francis (Fritz) J. Schwindt, P. E.
Chief, Environment Health Section
North Dakota Department of Health

Jim Rogers, Secretary
Prairie & Northern Region
Environment Canada

Dan Jewell, Secretary
U.S. Bureau of Reclamation,
Great Plains Region

David Donald, Secretary
Prairie & Northern Region
Environment Canada

John Giedt, Secretary
Region 8
U.S. Environmental Protection Agency

4. IRRB ACTIVITIES

Background

This report is the 1st Progress Report of the International Red River Board, dated September 2000. It provides information on the activities of the IRRB from October 1, 1999 to September 30, 2000. However, due to inherent time requirements associated with collection of samples, compilation of field data, and assessment of laboratory analytical results, the technical data presented in this report (except as otherwise noted) is for Water Year 1999, which is for one year prior, and includes the time period from October 1, 1998 to September 30, 1999.

Manitoba

During September 1999, the Manitoba Departments of Environment and Natural Resources were combined into a new Manitoba Department of Conservation. Board members from the former Departments were retained within the new office of Manitoba Department of Conservation.

Actions

Co-Chairs of the former two boards provided a combined annual presentation to the IJC at the November 2, 1999 IJC Semi-Annual meeting. At this meeting, the two boards respective 1999 annual reports were discussed and approved by the IJC. Additionally, the Co-Chairs provided the IJC with an interim report on combining the functions of the two boards in the Red River basin, for which the IJC provided tentative agreement.

At the April 11, 2000 IJC Semi-Annual meeting, the IJC stated that the two boards were considered combined. In follow-up letters dated June 14, 2000 from the respective US/CA Secretaries of the IJC, formal notification was provided that the IJC had agreed to merge the two boards into a single International Red River Board (Board). Following further direction from the IJC during the September 2000 Semi-Annual meeting, an IJC Directive and membership will be completed. Once final, the Directive and membership will be included in future IRRB Progress Reports.

The final report of the International Red River Basin Task Force (Task Force) "*The Next Flood: Getting Prepared*" contained 51 recommendations. The IJC requested the Board provide comments on the Task Force recommendations and indicate how the IRRB would implement those recommendations within its directive. The IRRB provided preliminary comments to the IJC on May 29, 2000, which are currently under consideration by the IJC.

The IRRB held its Year 2000 annual meeting on June 27 through 29, 2000, at Detroit Lakes, Minnesota. Results of this meeting are included within the text of this report.

During the morning of June 29, 2000, a half-day public participation meeting was held in conjunction with the annual IRRB meeting. Approximately 25 individuals attended the meeting, including; representatives from various local and basin-wide organizations, private citizens, and a representative from the news media (see following photograph of meeting attendees).

During the public participation meeting, the IRRB Co-Chairs provided an overview of the IRRB meeting results, and provided opportunity for comments and feed back. The Board's ongoing action to integrate the former ISRREB and IRRPB into a single IRRB, and corresponding emphasis on basin-wide activities was highlighted. Several presentations were provided by meeting attendees, including:

- USGS: Flood Storage & Mercury: A Review of the Good Lake Study.
- River Defense Network: Preparing for & Mitigating Spills of Hazardous Materials.
- Basin-area Public Water Suppliers panel discussion: Drinking Water Issues.
- Red River Basin Board: Update on Board activities and membership addition proposal.
- Pembina River Advisory Board: Update on Board activities.
- International Flood Mitigation Initiative: Status report.

The IRRB will include consideration of these above-noted presentations during it's ongoing and upcoming actions.

The IRRB is currently reviewing the potential for an enhanced role by non-government organizations in IRRB actions, and whether such Basin-affiliated organizations should be members of the Board. Some organizations presently active in the Basin are described in Section 9.

photograph of meeting attendees at public participation session.

5. WATER QUALITY - INTERNATIONAL BOUNDARY

The quality of the Red River at the International Boundary (Boundary) is described using information obtained during the 1999 Water Year (October 1,1998 to September 30, 1999) from instantaneous grab samples. Although the quality of the river at Boundary is of primary concern to the IRRB, the characteristics of the river at other locations (Figure 1) are referred to. The continuous auto-monitor located at Emerson, Manitoba was damaged during the 1997 flood, and subsequently had been inoperative. The primary parameters for which the IJC has approved objectives, as well as discharge (flow) and pH, are discussed in the following sections.

Discharge

The 1999 Water Year (Oct 1, 1998 to Sep 30, 1999) mean discharge for the Red River was 308.5 m^3/s. The mean discharge in m^3/s for recent Water Years was a follows: '98 - 237.8, '97 - 363.1, '96 - 168.7, '95 - 241, '94 - 168.7, '93 - 182.3. The resulting short-term mean discharge for this seven consecutive year wet cycle period is 238.8 m^3/s. The previous long-term mean discharge prior to Water Year 1993 had been 95.9 m^3/s. During the 1999 Water Year, the basin again received significant precipitation during the spring and summer, with corresponding periods of discharge (Figure 2). Daily flows ranged from a minimum flow of 51.2 m^3/s on Oct 3, 1999, to a maximum flow of 1660 m^3/s on April 12 and 13, 1999. The 1999 maximum flow is significantly greater than the 1998 maximum flow of 777 m^3/s. Long-term discharge variability characteristics are illustrated in Figures 2a and 2b.

pH and Temperature

The pH of the Red River remained within the normal range and no extreme values were noted. Since the continuous auto-monitor located at Emerson, Manitoba was inoperative during the period covered by this report, no temperature data was available.

WATER QUALITY OBJECTIVES

Water Quality Objectives, as established for the specific point at which the Red River crosses the Boundary, provide a useful method for determining the acceptability of the Red River water quality. Exceedence of these IJC objectives is a trigger mechanism to prompt the appropriate agencies to take whatever action is deemed necessary in order to mitigate a problem and minimize future reoccurrences. The IJC has recognized the utility of Water Quality Objectives, and has requested the IRRB to assess compliance with the objectives.

A limited set of water quality objectives was adopted by the IJC in 1969 for the Red River. Water quality variables for which objectives have been developed are: **total dissolved solids, chloride, sulfate, dissolved oxygen and fecal coliform bacteria**. If it is deemed necessary, the IRRB may request changes in the Water Quality Objectives from the IJC.

A situation is classified as an exceedence if an individual, instantaneous sample, obtained either from the continuous monitor or through a grab sample, taken at Emerson, Manitoba, is equal to or greater than the corresponding water quality objective or Alert Level.

Dissolved Oxygen

Dissolved oxygen (DO) field measurement values were above the IJC objective (>5.0 mg/L) during the entire 1999 Water Year. The lowest recorded value was 6.9 mg/L (July 1999). Measurement data for June 1999 were not available. A detailed evaluation of dissolved oxygen levels was not undertaken because the Emerson continuous monitor was inoperative.

Specific Conductance and Total Dissolved Solids

Total Dissolved Solids (TDS) were determined from instantaneous samples collected monthly. During the 1999 Water Year there were three exceedences of the TDS objective (<500 mg/L). The maximum exceedence value for TDS was 552 mg/L (December, 1998), with values of 546 and 522 in January '99 and November '98 respectively. Except for 1997 and 1998, the TDS objective had been exceeded every year since 1985. TDS values are illustrated and compared in Figure 3.

Chloride

Chloride exceedences of the IJC objective (100 mg/L) did not occur during the 1999 Water Year. The highest value recorded, 56 mg/L, was from a sample collected during October 1998. In past years, concentrations tended to be higher during the winter months when surface flows were reduced in volume. Ground water discharge is the most common source of chloride in the Red River Basin. Regular exceedences of the IJC objective for chloride were common for the Red River in the past. Based on the long-term record, the absence of exceedences since the 1996 water year may be due to higher flow rates (Figures 4a & 4b).

Sulfate

In most years, sulfate concentrations have a tendency to increase during late fall with concentrations typically in the range of 60 to 100 mg/L. High concentrations of sulfate, in general, coincide with the peaks for TDS. In the 1999 Water Year the highest level (177 mg/L) occurred in June, where there was no data for TDS levels. The IJC objective of 250 mg/L was not exceeded.

Bacteriological Characteristics

The bacteriological quality of the Red River at Emerson is assessed by measurements of both total coliform bacteria and fecal coliform bacteria. Coliforms are generally monitored monthly, so concentrations from month to month can appear to be erratic and seasonal trends difficult to discern. One exceedence of the IJC objective for fecal coliform bacteria (200 colonies per 100 mL) was recorded during August 1999, however this value has low confidence because the recorded value is highly unusual and questionable. As with the 1998 Water Year, the above-noted exceedence recorded for the 1999 Water Year is somewhat unusual. During the 1990s there had been few exceedences of the IJC objective. During the 1999 Water Year, fecal coliform values ranged from a low of 6 colonies per 100mL to a questionable high of 1763 colonies per 100mL The IRRB will continue to monitor coliform concentrations, and evaluate the potential for change from previous trends. Variability of fecal coliforms is illustrated in Figures 5a and 5b, and variability of total coliforms is illustrated in Figures 6a and 6b.

Figure 1: Basin Map

Figure 2a: Discharge

Figure 2b: Discharge, cont.

Figure 3: Total Dissolved Solids

Figure 4a: Chloride

Figure 4b: Chloride, cont.

Figure 5a: Fecal Coliforms

Figure 5b: Fecal Coliforms, cont.

Figure 6a: Total Coliforms

Figure 6b: Total Coliforms, cont.

ALERT LEVELS

At the November 13, 1984 IJC semi-annual meeting held in Winnipeg, the IRRB 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 IRRB at its January 14, 1986, meeting. A compendium of the analytical methods used by the member agencies was prepared in 1990 (See Appendix B).

A total of 8 pesticides with 42 exceedences (detectable concentrations) were recorded during monthly grab samples. Mercury also exceeded the Alert Level in 7 of 12 samples. The concentration of mercury and pesticides will be closely monitored during the 2000 water year. Low levels of cadmium, copper, lead, nickel, and zinc are endemic to the Red River. Those water quality variables which exceeded the Alert Levels for the Red River at the Emerson sampling site during the 1999 Water Year are summarized below in Table 2.

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

Parameter	Units	Alert Level	Number of Exceedences	Exceedence Values		Canadian Aquatic Life Guidelines
				Min	Max	
alpha - HCH	ng/L	LTD*	2 of 12	0.20	0.95	10
G-HCH (Lindane)	ng/L	LTD*	9 of 12	0.17	2.38	10
2,4-D	ng/L	LTD*	2 of 12	39.1	303.0	4,000
2,4-DB	ng/L	LTD*	2 of 12	92.3	105.0	4,000
PICLORAM	ng/L	LTD*	7 of 12	16.6	51.6	26,000
2,4,5-T	ng/L	LTD*	6 of 12	34.4	302.0	
MCPA	ng/L	LTD*	4 of 12	19.4	47.1	2,600
DICAMBA	ng/L	LTD*	4 of 12	7.9	38.2	10,000
Mercury	mg/l	LTD*	7 of 12	0.007	0.01	0.0001

*Less Then Detectable

SUMMARY OF WATER QUALITY CONDITIONS

For the Red River at the Boundary, concentrations of water quality constituents such as total dissolved solids and chloride improved relative to recent years because of high flows. This low frequency for exceedence of objectives has not been reported at the Boundary since 1985 indicating that concentrations of most dissolved constituents improved during the 1999 Water Year in response to higher flows.

Bacteriological conditions are routinely monitored at the Boundary. The slightly increased number of bacteria measurements (fecal coliform bacteria) exceeding the IJC objective during the 1998 Water Year, and now again during the 1999 Water Year, are somewhat unusual. The 1990s previously recorded measurements with low bacteria counts had reflected significant improvements in treatment systems in both Minnesota and North Dakota. The number of fecal coliform bacteria exceedences during 1997 and 1998 and possibly 1999 probably originate from agricultural and storm water runoff, particularly during spring flooding.

Pesticides are occasionally detected in the Red River. Given the extensive agricultural base of the watershed, such detections are not unexpected. However, the IRRB emphasizes that there is very little scientific information available to assess the implications of long-term exposure by aquatic organisms and man (through drinking water) to low concentrations of pesticides. As a result, the IRRB will continue to closely monitor trends in pesticide concentrations and their frequency of detection and periodically update its assessment based on new scientific information, as it becomes available. Historical (pre-1989) monitoring of fish tissue by Manitoba has not indicated human or aquatic health concerns with respect to the bioaccumulation of pesticides.

PCB exceeded the 2 ppm guideline limit in fish, and mercury exceeded the 0.5 ppm limit. North Dakota and Minnesota have issued fish advisories for the Red River that extends from Wahpeton to Pembina. See detailed discussion in Section 8. of this report.

6. WATER QUALITY SURVEILLANCE PROGRAM

The data obtained by each agency represented on the IRRB that monitors water quality within the Red River Basin, at locations as shown on Figure 1, are assembled for the preparation of the annual report to the IJC. All the data for these sites 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.

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 collection of these data. However, during the 1997 Water Year the auto-monitor at Emerson was not functioning to accepted standards, and during the 1998 and 1999 Water Years, it was inoperative. Consequently, no continuous data were collected by the auto-monitor for the 1999 Water Year. 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 performed the analysis.

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 IRRPB in preparation of this report are collected by USGS, Minnesota Pollution Control Agency (MPCA), North Dakota Department of Health (NDDH), and Manitoba Environment.

UNITED STATES

Minnesota

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.

In keeping with the sampling schedule for the Minnesota Milestones program these sites were last monitored in the 1999 Water Year and will be sampled again in the 2000 Water Year (October 99 - September 00). This report uses data from the 1999 Water Year.

The MPCA assesses stream water quality biennially and reports to the Congress of the United States. For the 1998 report, 149 river reaches on the Red and its tributaries were assessed, either using actual monitoring data or a survey of local resource managers.

According to this 1998 report, for 91 of the 149 reaches (74 percent) aquatic life was partially supported, supported but threatened or not supported. Non-point source pollution was considered to be the primary source of river pollution. Turbidity and sedimentation were the symptoms of this problem. It is important to note that 67 of the 149 reaches were actually monitored, and the remaining

sites were assessed qualitatively by local resource managers. It is a goal of resource managers in Minnesota to expand water quality monitoring in the Red River to cover all tributaries and the main-stem river adequately.

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 and citizen involvement in the collection, analysis, and management of water quality sampling in the Red River Basin.

Activities proposed to achieve these goals:

Extend the River Watch program, now helping local resource managers and schools monitor water quality on the Roseau, Middle, Two Rivers, Joe, Clearwater, Red Lake, Thief and Sand Hill Rivers, to local resource managers and schools for monitoring on the Wild Rice, Buffalo, Ottertail, and Bois de Sioux rivers.

Extend the MPCA's Citizen Stream Monitoring Program (transparency tubes) to all River Watch projects in the Red River Basin.

Establish partnerships between local River Watch projects and public water suppliers to augment the parameters analyzed.

Establish a Web site about water quality monitoring on the Red River, reporting by watershed the following information: map and list of sampling locations, goals for monitoring, parameters measured, frequency of monitoring, results, contact for monitoring, and summary report of results.

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 water quality data results were entered into STORET upon receipt from the laboratory.

The following Minnesota standards have been established for the waters sampled at the listed stations, and compared with IJC 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

A New Approach:

The federal Clean Water Act requires states to adopt water quality standards to protect the nation's waters. These standards define how much of a pollutant can be in a surface and/or ground water while still allowing it to meet its designated uses, such as for drinking water, fishing, swimming, irrigation or industrial purposes. Many of Minnesota's water resources cannot currently meet their designated uses because of pollution problems from a combination of point and non-point sources. For each pollutant that causes a water body to fail to meet state water quality standards, the federal Clean Water Act requires the MPCA to conduct a Total Maximum Daily Load (TMDL) study. A TMDL study identifies both point and non-point sources of each pollutant that fails to meet water quality standards. Water quality sampling and computer modeling determine how much each pollutant source must reduce its contribution to assure the water quality standard is met. Rivers and streams may have several TMDL's, each one determining the limit for a different pollutant.

Rivers with TMDLs:

Minnesota's published list includes about 27 locations in Minnesota's Red River Basin where TMDL's need to be established. See Table 3. for a Red River Basin 303D List of Impaired WatersTMDL schedule. This effort has begun in the Fargo-Moorhead area, where water users and dischargers hope to study the relation between ammonia and flows in the Red (although this effort requires low flow conditions to be completed and the timetable for achieving low flows has been extended by recent rains). The MPCA is proposing a regional strategy for addressing the other TMDL's, which may arise from a variety of circumstances, ranging from natural conditions to human-induced changes. The MPCA proposes to contract with U.S. Geological Survey for the technical portion of the work, and to enlist the assistance of local resource managers and citizens in identifying causes and solutions.

Additional Water Quality Work:

Sites in the Red River will be sampled as part of a statewide nutrient/chlorophyll-a study to examine the links between phosphorus and in-stream algae concentrations (See Table 4.). This is part of a national study to develop nutrient criteria for rivers, as recommended by the Clean Water Action Plan. Nutrients are a concern for Minnesota water quality managers. The City of Moorhead's renewed wastewater discharge permit, issued May 2000, requires a phosphorous management plan be developed within the next five years.

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 3: MN Red River Basin 303 (D) List of Impaired Waters & TMDL Schedule

River Reach	Affected Use	Pollutant/ Stressor	Start/End
Rabbit River, Unnamed DT to Bois de Sioux R	Aquatic Life	Ammonia	2000/2005
	Aquatic Life	Biological	2008/2012
Rabbit River, Wilkin Co Line to Bois de Sioux R	Aquatic Life	Turbidity	2006/2008
Mustinka R, W. Br., Twelve Mile Cr. To Mustinka R	Aquatic Life	Biological	2008/2012
Bois de Sioux R Rabbit R to Ottertail R	Aquatic Life	Biological	2008/2012
	Aquatic Life	Low Oxygen	2000/2004
Ottertail River, Breckenridge Lake to Bois de Sioux R	Swimming	Fecal Coliform	2001/2004
	Aquatic Life	Turbidity	2001/2004
Ottertail River, Pelican R to Dayton Hollow Reservoir	Aquatic Life	Turbidity	2006/2008
Ottertail River, Height of Land Lake to Big Pine Lake	Aquatic Life	Low Oxygen	2000/2004
Stony Creek Hay Creek to S. Br. Buffalo R	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 of the North	Aquatic Life	Turbidity	2006/2008
Buffalo River Headwaters to Red River	Aquatic Life	Turbidity	2005/2007
Buffalo River, S. Br. Deerhorn Cr to Whiskey Cr	Aquatic Life	Biological	2003/2007
Red River of the North, Buffalo R to Elm R	Aquatic Life	Turbidity	2006/2008
Red River of the North Wild Rice River to M/F Dam	Aquatic Life	Turbidity	2005/2007
Red R of the North Moorhead/Fargo Dam A to Sheyenne R	Aquatic Life	Ammonia	1998/1999
	Swimming	Fecal Coliform	2001/2004
Red River of the North 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 Gently R	Aquatic Life	Turbidity	2006/2008
Red River of the North Pembina R to Canada Border	Aquatic Life	Turbidity	2005/2007
Snake River CD7 to CD21	Aquatic Life	Biological	2003/2012
Tamarac River Reservoir S of Florian to Stephen Dam	Aquatic Life	Biological	2008/2012
Roseau River, Hay Creek to Canada border	Aquatic Life	Low Oxygen	2006/2010

Table 4: 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

Ambient Water Quality Monitoring Program:

During the reporting period October 1, 1998 to September 30, 1999, the Department conducted ambient chemical monitoring at 21 sites in the Red River Basin (Table 5). Eight of the 20 sites (including one on the Ottertail River at Breckenridge, MN), were located in the upper Red River Basin, and were sampled by the USGS as part of a cooperative agreement between the USGS, the MPCA, and the Department. Under this agreement, samples were collected by the USGS 11 times during the reporting period. The Department provided chemical analysis of all samples collected, while suspended sediment analysis was conducted by the USGS.

All other sites in the basin were sampled during the open water period at six week intervals beginning in April of each year and concluding in October. In addition, one sample was collected in February under ice. This schedule resulted in a maximum of six samples collected at each site during the reporting period. Stations which 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, 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). All 1993 through 1999 data from SID has also been exported to EPA Region 8 into EPA's recently released STORET database (STORET Version 1.1).

Table 5: North Dakota Red River Basin Ambient Stream Monitoring Sites

Station I.D.	Description
385055	Bois de Sioux River near Doran, MN (USGS 05051300)[2]
388000	Ottertail River at Breckenridge, MN (USGS 05046450)[2]
380083	Red River near Brushville, MN (USGS 05051510)[2]
388000	Red River near Hickson (USGS 05051522)[2]
380154	Red River upstream from Fargo (USGS 05053800)[2]
385054	Red River near Harwood (USGS 05054200)[2]
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]
380155	Sheyenne River at West Fargo (USGS 05060400)[2]
388000	Red River at Perley, MN (USGS 05062150)[2]
380156	Goose River at Hillsboro[1]
384156	Red River at Grand Forks [1]
380037	Turtle River at Manville
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.
[2] Sampled by the USGS as part of cooperative agreement. Water quality analysis conducted by the North Dakota Department of Health.

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 Nitrogen Total Kjeldahl Total phosphorus	bacteria Fecal coliform streptococcus

CANADA

Manitoba

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*.

Routine monitoring is also conducted on six tributary streams to the Red River by Manitoba Conservation. 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. In addition, beginning in 1995, benthic macroinvertebrates have been collected at each routine monitoring site on the tributary streams once each year. Macroinvertebrate data are presently being assessed as indicators of ecosystem health, with results from 1995 to 1999 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, versus fields on which commercial inorganic fertilizer has been applied. The second year of the three year study has been completed.

Canadian Water Quality Index

One of the many challenges facing water quality managers is to communicate complex water quality information to the general public in a manner that is effective and clear. Water quality is typically described by measuring numerous variables, often in excess of 100, then comparing the measured value to available water quality standards, objectives, or guidelines. In other cases, statistical comparisons are made among sites and over time. Over the past several decades, many jurisdictions have developed numerous indices in an attempt to summarize complex water quality information in a meaningful way, but few have found widespread application.

In 1995, the Province of British Columbia, Canada, developed a unique water quality index that overcame some of the disadvantages of previous indices and that offered promise of widespread use among Canadian jurisdictions at least. Following its development, the British Columbia index was used successfully by a number of jurisdictions, including Manitoba. The Water Quality Guidelines Task Group of the Canadian Council of Ministers of the Environment undertook an evaluation of the British Columbia approach, with a goal to undertake trial evaluations on a variety of Canadian waters and to incorporate modifications wherever necessary.

This index mathematically incorporates information on water quality from three factors. The basic premise of the index is that water quality is excellent when all water quality standards, objectives, or guidelines set to protect water uses are met virtually all of the time. When standards, objectives, or guidelines are not met, water quality becomes progressively poorer, depending upon the number of water quality variables for which standards, objectives or guidelines are not met (Factor 1 or Scope), the percentage of time they are not met (Factor 2 or Frequency), and the magnitude of exceedences (Factor 3 or Amplitude). For example, progressively larger index values result when guidelines or objectives are exceeded for more water quality variables (*i.e.,* exceedences for one variable will have less impact on water uses than simultaneous exceedences for many water quality variables), when exceedences occur during longer periods of time (*i.e.,* an exceedence for a brief period will have less impact on a water use than an exceedence for an extended period), and when the magnitude of exceedences increase (*i.e.,* an exceedence slightly above a water quality guideline or objective will have less impact on a water use than an exceedence that is several times higher). Thus, the index logically incorporates information on water quality which is based on comparisons to standards and objectives for protecting important water uses.

Once CWQI values have been determined, water quality can be ranked by relating it to one of the following categories:

Excellent: (CWQI Value 95-100) – water quality is protected with a virtual absence of threat or impairment; conditions very close to natural or pristine levels. These index values can only be obtained if all measurements are within objectives virtually all of the time.

Good: (CWQI Value 80-94) – water quality is protected with only a minor degree of threat or impairment; conditions rarely depart from natural or desirable levels.

Fair: (CWQI Value 60-79) – water quality is usually protected but occasionally threatened or impaired; conditions sometimes depart from natural or desirable levels.

Marginal: (CWQI Value 45-59) – water quality is frequently threatened or impaired; conditions often depart from natural or desirable levels.

Poor: (CWQI Value 0-44) – water quality is almost always threatened or impaired; conditions usually depart from natural or desirable levels.

The resulting information should be useful for tracking water quality changes, and can be used by both the general public and water quality managers to usefully describe a large amount of complex scientific information in terms that are easily understandable.

Manitoba Conservation is presently completing a report on the water quality of 27 major streams in south and central Manitoba for which both five years of macroinvertebrate data and water quality data are available. Macroinvertebrate data are being interpreted using various biotic condition indices while water quality data are being interpreted using the new Canadian Water Quality Index. The approach may be suitable for application to the Red River Basin transboundary region for future reports of the IRRB.

Proposed Revisions to Manitoba's Water Quality Standards, Objectives, and Guidelines and Development of a Nutrient Management Strategy for Surface Waters in Southern Manitoba

Manitoba Conservation released a draft document on April 20, 2000 that proposes revisions to the existing "Manitoba Surface Water Quality Objectives". Released at the same time was a draft Nutrient Management Strategy, intended to provide guidance in the development of more appropriate water quality criteria or targets for plant nutrients such as nitrogen and phosphorus in both Manitoba's prairie streams and Lake Winnipeg. These will form the scientific basis on which allowable future additions, controls, or reductions will be based.

The last major revisions to the Manitoba's water quality objectives were made in 1988. Since 1988, much new scientific information has emerged that warrants consideration. For example, the US Environmental Protection Agency published new criteria in late 1998 for ammonia that supercedes the previous information used to derive Manitoba's 1988 objective. Ammonia is a common pollutant in a number of discharges to waters in southern Manitoba. Similar scientific information has also been recently published for trace metals, suspended sediments, and several other materials. Since 1988, Manitoba Conservation has also gained considerable experience in applying the water quality objectives. As a result of this experience, it has become apparent that some sections could benefit from clarification and that additional information should be provided. For example, there was a need to have the objectives also apply to the protection of ground water rather than only surface water, new sections should be included to protect overall biological integrity, and objectives should be included to protect other aquatic media such as sediments and fish tissue rather than only the water component. In addition, since 1998, new approaches to environmental protection have been developed by the Canadian Council of Ministers of the Environment (CCME). Manitoba is an active member of the CCME. There was a need, therefore, to fully integrate these new approaches into the Manitoba's water quality objectives.

The "Manitoba Water Quality Standards, Objectives, and Guidelines" are not legally binding. However, they are used to provide scientific and policy guidance that may result in legally-binding limits contained in licenses developed under the Manitoba Environment Act. As part of the Environment Act licensing process, developers must identify how they will manage proposed discharges to ensure that the water quality objectives are not exceeded. Thus, they are integral tools used to assess environmental impacts from proposed developments. An extended review and comment period, lasting at least 18 months, has been identified to allow all those with an interest in these revisions an opportunity to participate in the review.

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 concentration being slightly above 9 mg/L both upstream and downstream of the City of Winnipeg. The lowest value recorded of 4.1 mg/L occurred under ice cover in early February 1998 downstream of the City of Winnipeg and exceeded the Manitoba Surface Water Quality Objectives. Dissolved oxygen concentrations in subsequent samples collected during mid-March 1999 had returned again to 9.4 mg/L. Although the aquatic life community may have been under some temporary stress during this period, longer-term consequences probably would not have occurred since levels were above the concentrations at which acute responses would be observed.

Densities of fecal coliform bacteria continued to remain elevated downstream of the City of Winnipeg. Average density downstream of the City of Winnipeg was 546 organisms / 100 mL while density in the upstream reach was 24 organisms / 100 mL. The exceedence rate of the Manitoba Surface Water Quality Objective for the protection of recreation was 75 % downstream of the City of Winnipeg, while no exceedences were observed immediately upstream of Winnipeg.

Three pesticides were detected during this reporting period and included 2,4-D, bromoxynil, and MCPA. The three pesticides were detected in samples collected on one occasion both upstream and downstream of the City of Winnipeg on July 1, 1999. None of the pesticides detected 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.

Environment Canada

Auto-monitor at Emerson, Manitoba

Environment Canada had maintained a continuous water quality auto-monitor at the Boundary, located at Emerson, Manitoba. It was interlaced via overland telemetry to a computer in Regina, Saskatchewan and to Winnipeg, to permit real time data acquisition. The parameters monitored were temperature and specific conductance. By 1997, the auto-monitor was old and obsolete, it was becoming difficult to obtain replacement parts, and due to relocation of the Emerson public water supply intake, the auto-monitor was no longer providing reliable data for key water quality parameters. The auto-monitor was removed in advance of the 1997 Spring flood, but the monitor's site location was damaged during the flood, and became unusable. The auto-monitor was not re-installed after the flood. A new auto-monitor was needed, but difficulties in obtaining funding, and locating a new site delayed set-up of a new auto-monitor.

The auto-monitor is needed to provide accurate and continuous data for providing comparison with the IJC water quality objectives. These water quality objectives provide useful parameters for determining the acceptability of the Red River water quality in meeting provisions of the Boundary Waters Treaty of 1909. Exceedence of these water quality objectives is a triggering mechanism to prompt appropriate agencies to take whatever action is necessary to mitigate a potential problem, and to minimize potential for future reoccurrences. As such, it is important to have a record of both short-term and long-term water quality trends. Since water quality of the Red River has considerable seasonal variations, and some variations of short duration, it is critical to maintain an automated unit.

During the Spring of 2000, Environment Canada co-located a new water quality auto-monitor at an existing hydrometric site located at Emerson, Manitoba. However, the existing station remains unstable as a result of excessive bank erosion in the area. Environment Canada has also had problems with start-up of some of the new sensor probes - especially the pH probe, and the supply line pump. As of September 1, 2000, the auto-monitor was still not permanently installed.

7. WATER POLLUTION CONTROL

CONTINGENCY PLAN

The contingency plan was adopted by the IRRB on January 1,1981. Contacts and telephone numbers have been updated for 1999. The Contingency Plan is available from the IRRB.

SPILLS AND RELEASES

Minnesota

As noted in table 7. there were four reported releases in Minnesota involving wastewater treatment plants in the Red River Basin:

Table 7: Minnesota Wastewater Treatment Plant Releases

Facility	Receiving Water	Date
Thief River Falls WWTP	Ditch on Greenwood	10/21/98
Henning WWTP	Willow Creek	11/4/98
Hendrum WWTP	Wild Rice R	11/10/98
Hendrum WWTP	Wild Rice R	11/13/98

North Dakota

Most of the state continued to be in a wet cycle for this reporting period. The major portion of this precipitation was in the form of rainfall. That makes it seven years in a row that North Dakota has received above normal precipitation. There continues to be localized flooding in several areas of the state and the extra water has compounded the wastewater treatment and storage problems that the state has been experiencing since 1993. This above normal precipitation also has resulted in several bypasses and lagoon overflows. The state has 52 counties of which 37 were declared disaster areas in 1999 which qualified them for federal assistance. As a result, several of the communities initiated major improvements to their wastewater collection and treatment systems. The number of discharges and total volume of water discharged for this reporting period continued the upward trend that started in 1993.

Manitoba

During the reporting period, 177 spills occurred within the Manitoba portion of the Red River Basin. Of these, only two were known to have reached the Red River and none affected the tributaries. Spills affecting the Red River were for waste oil and an unknown petroleum product. Most spills within the basin were contained at site and remediated under the direction of Manitoba Conservation emergency response personnel. Spills involved a variety of materials such as lubricating oils, industrial acids and bases, anhydrous ammonia, transformer oils including some with PCBs, small amounts of radioactive material, insecticides, paint, and cleaning solutions. The majority of spills involved petroleum products

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 65 incidents where effluents exceeded limits of the permit. These did not necessarily constitute permit violations, however, and, in fact, none of the reported exceedences resulted in enforcement action. Facilities reporting exceedences are listed in the following Table 8. (this data may not be complete as the MPCA launched a new computer information management system for its water quality permits in this water year):

North Dakota

The city of Fargo's wastewater treatment plant is consistently providing quality effluent that is discharged to the Red River of the North on a continual basis. The treatment consists of pretreatment/odor control, primary clarification, trickling filters, nitrification filters, final clarification with disinfection. During this reporting period, the city made improvements to the residuals management by installing additional digesters, sludge drying beds, and belt presses. Fargo still maintains their six, 90-acre wastewater stabilization ponds which can be used for storage during times when they experience flood conditions in the Red River or an upset at the treatment plant.

Cargill Corn Milling, formerly 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. Two additional ponds are used to store wastewater high in salt content. The discharges from the ponds must be coordinated with the conditions in the Red River, downstream users and discharges from MinnDak Farmers 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. Near the end of 1999, Cargill and the Department began preparing for the renewal of Cargill's permit which will expire in 2000. Like the original permit, the requirements in the new permit will need to protect water quality standards and reflect the comments and concerns expressed by federal, state, municipal and citizen entities in North Dakota and Minnesota with an interest in the quality of the Red River.

American Crystal Sugar continues to use wetlands for wastewater treatment and polishing at both Hillsboro and Drayton. The wetland's effluent consistently surpasses the federal effluent criteria for suspended solids and oxygen demand by a significant degree. In 1999, construction was completed on a new 1.5 MGD anaerobic digester and clarifier at the Hillsboro plant. Two benefits are expected to be realized from this upgrade. First, performance of the existing aerobic digester can be maximized because the feed water strength and temperature will not fluctuate seasonally. Secondly, higher quality water can be routed to the wetland earlier in the season, maximizing the wetland's ability to treat the wastewater prior to discharge.

Several wastewater treatment upgrades have been completed at MinnDak Farmers Cooperative sugar beet processing plant in Wahpeton since the permit was renewed in 1997. An 80-acre polishing pond/reservoir was completed late in 1997, from which discharges are made through an in-stream diffuser to the Red River. The reservoir's retention time, along with increased treatment via a new nitrification/de-nitrification system (also completed in late 1997), has resulted in significantly decreased ammonia levels in the discharge. Installation of a new mud press in 1998 has resulted in conversion of one of the mud ponds to a storm-water pond. MinnDak continues to coordinate its discharges with ProGold, since both facility permits contain receiving stream quality requirements for sulfate, chloride,

and total dissolved solids.

The city of Grand Forks has initiated 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 will be designed for 10 MGD and 40,000 pounds of BOD-5. The city is using a phased approach for construction of the plant which started in 1998 and will continue for the next three construction seasons. The city is also proposing to upgrade their sludge handling facilities for their water treatment plant which should reduce the possibility of having to send lime sludge to the Red River during breakdowns and flood conditions.

Wastewater discharge data reported for the period October 1, 1998 to September 30, 1999 are presented in Table 9.

Manitoba

Manitoba Surface Water Quality Objectives 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 licenced under Manitoba's Environment Act. A number of facilities within the City of Winnipeg are not yet licenced under this Act. Disinfection using ultra-violet light technology has been installed and is operational at the South End Water Pollution Control Centre. Disinfection works will begin to be developed for the North End Water Pollution Control Centre in the near future. 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 2000. A study into the impacts of un-ionized ammonia on the Red River began in late 1998 and will continue until mid-2000. 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.

Manitoba Conservation is proceeding with a phased approach to licence the 21 private wastewater treatment plants located within Winnipeg's boundary. These private facilities have been prioritized based upon a number of criteria and will be licenced in groups of five. Licencing of the first four have been completed.

See Table 10. for a listing of municipal effluent discharges to the Red River (main stem) within Manitoba, Canada during the period October 1, 1998 to September 30, 1999.

Table 8: Minnesota Red River Numeric NPDES Exceedences for 9/30/98 - 10/01/99

Facility	Receiving Water	Parameter	Date
Alvarado WWTP	Snake R	pH	4/30/99, 5/31/99
American Crystal Sugar – Crookston	Red Lake R	BOD 5 day	9/30/99
American Crystal Sugar – E GF	Red River	BOD 5 day	6/30/99, 9/30/99
Amoco Oil Co. – Moorhead	Red River	Benzene Ethyl Benzene TSS Toluene Xylene	3/31/99, 6/30/99 3/31/99, 6/30/99 3/31/99, 6/30/99 3/31/99, 6/30/99 3/31/99, 6/30/99
Argyle WWTP	Middle R	Coliform TSS	5/31/99 6/30/99
Audubon WWTP	Reep L via DT	BOD 5 day	3/31/99
Breckenridge WWTP	Ottertail R	TSS pH	4/30/99 4/30/00
Climax WWTP	Sand Hill R	BOD 5 day pH	4/30/99 5/31/99
East Grand Forks WWTP	Red R Otn	pH TSS	11/30/98 5/31/99
Fergus Falls WWTP	Ottertail R	Chlorine	9/30/99
Fisher WWTP	Red Lake R	BOD 5 day	11/30/98
Fosston WWTP	Poplar R	BOD 5 day Coliform TSS	6/30/99 9/30/99 6/30/99, 9/30/99
Greenbush WWTP	Two Rivers R	pH	5/31/99
Grygla WWTP	Mud R via DT	pH	6/30/99
Halstad WWTP	Red R OTN	Coliform TSS BOD 5 day Coliform	10/31/98 1/31/99, 4/30/99, 5/31/99, 7/31/99, 8/31/99, 9/30/99, 4/30/99 4/30/99, 7/31/99,8/31/99, 9/30/99
Hendrum WWTP	Wild Rice R	TSS	9/30/99
Lancaster WWTP	Two Rivers	pH	6/30/99
Land O' Lakes - Perham	Land & NC to Ottertail R	Nitrite + Nitrate	10/31/98, 11/30/98, 12/31/98
Glyndon WWTP	Buffalo R via DT	TSS (4)	4/30/99
Pelican Rapids WWTP	Pelican R	BOD 5 day	10/30/98 1/31/99, 2/28/99, 3/31/99, 4/30/99, 5/31/99, 6/30/99, 7/31/99, 9/30/99
Perley WWTP	Red R OTN	pH	6/30/99
Red Lake Falls WWTP	Red Lake R & Clearwater R	BOD 5 day	6/30/99
Rothsay WWTP	CD 6A2 & 6A via CR	pH	9/30/99
Sabin WWTP	Red R OTN via CD 32	pH TSS	11/3098, 4/30/99, 5/31/99 5/31/99
Stephen WWTP	Tamarac R	Coliform	10/31/98, 6/30/99
Thief River Falls Power Plant	Red Lake R	Temperature	9/30/99
Thief River Falls WWTP	Red L R vi DT 70	TSS	4/30/99, 7/31/99
Warren WWTP	Snake R via JD 16	TSS	6/30/99

Wheaton WWTP	Mustinka R	TSS	4/30/99, 5/31/99, 6/30/99

TABLE 9: Waste Discharge Data for North Dakota during the Reporting Period October 1, 1998 to September 30, 1999.

Source*	Length of Discharge Days	Total Flow M^3	Discharge Quality - mg/l						Discharge Avg. Rate M^3/day	Avg BOD-5 Loading kg/day	Avg. TSS Loading kg/day	Percent Time in Permit Compliance
			BOD-5			TSS						
			High	Low	Avg.	High	Low	Avg.				
Drayton	16	162944	6.0	6.0	6.0	10.3	5.0	6.8	10184.0	61.1	68.9	100.0
Fargo	333	14391088	25.7	2.0	8.5	37.9	2.0	18.9	43216.5	366.6	819.0	92.3
Grafton	25	773275	19.0	6.0	11.2	32.3	6.5	22.4	30931.0	346.6	691.6	98.1
Grand Forks	93	6789912	24.0	6.6	13.7	44.0	6.8	22.0	73009.8	1002.3	1604.7	100.0
Grand Forks AFB	31	1300980	20.0	6.0	7.1	25.0	5.0	8.0	41967.1	298.1	333.8	100.0
Wahpeton	48	1763432	14.0	6.0	8.7	40.0	6.0	22.3	36738.2	318.4	820.5	98.1
West Fargo	94	2025808	15.1	4.3	8.6	29.6	4.8	21.0	21551.1	185.4	452.4	100.0
ACS-Drayton	134	746440	42.0	8.0	15.9	40.0	3.3	12.9	5570.4	88.5	72.0	100.0
ACS-Hillsboro	174	673211	247.0	8.0	25.4	75.0	21.0	33.9	3869.0	98.3	131.1	97.8
Minn Dak	21	793336	15.0	7.8	10.0	13.7	2.1	6.2	37777.9	377.8	234.2	100.0
Cargill Inc	365	1498974	30.0	4.0	13.1	44.0	1.0	22.9	4106.8	53.6	94.0	100.0

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

Table 10:

Municipal effluent discharges to the Red River (main stem) within Manitoba, Canada during the period October 1, 1998 to September 30, 1999.

Source	Length of Discharge (days)	Total Volume (ML)	Biological Oxygen Demand (Range) (mg/L)	Biological Oxygen Demand (Average) (mg/L)	Suspended Solids (Range) (mg/L)	Suspended Solids (Average) (mg/L)	Discharge Rate (Range) (ML/day)	Discharge Rate (Average) (ML/day)	Biological Oxygen Demand Loading (Range) (kg/day)	Biological Oxygen Demand Loading (Average) (kg/day)	Suspended Solids Loading (Range) (kg/day)	Suspended Solids Loading (Average) (kg/day)	Compliance with Environment Act Licence (Percent)
Morris	20	350	<6	<6	Not Available	Not Available	17.5	17.5	105	105	Not Available	Not Available	100 %
Winnipeg South	365	20,091	11 – 143	35	2 - 74	18	41.9 - 118	55	623 - 6,646	1,848	97 - 5,040	950	Not Applicable
Winnipeg North	365	83,432	<10 - >96	35	2 - 146	25	125 - 573	228	2,171 - 35,526	7,752	452 - 83,658	5,636	Not Applicable
Selkirk	365	1,594	<6 - 6	6	5 - 41	13	2.1 - 3.3	4.4	16.7 - 54	26.2	13.9 - 368.8	58.5	91.7%

POLLUTION SOURCES

Minnesota

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

In the 1999 water year, renewal began for discharge permits for the six municipal waste water treatment facilities (termed "major" since discharge exceeds one million gallons per day) at Moorhead, Detroit Lakes, East Grand Forks, Thief River Falls, Fergus Falls, and Crookston (Moorhead and Crookston will be issued June 2000) in the water year.

Water quality issues related to these permits are:

1. Additional water quality monitoring for nitrogen and phosphorus between the primary and secondary treatment systems at Crookston,
2. Development of a phosphorus management plan, and a study of ammonia levels compared to flows of the Red River, for Moorhead.
3. Groundwater and spray irrigation limits for phosphorus and nitrogen loading in Detroit Lakes.

Moorhead's phosphorus management plan will include the following summary of recent influent and effluent phosphorus concentrations and mass loadings:

- Identification of sources of high phosphorus loading to the facility and development of a plan for reducing phosphorus loading. This plan shall include an evaluation of industrial contributors and industrial pretreatment facilities. When necessary, require industries to submit phosphorus management plans that include identification of opportunities to reduce phosphorus loads to the wastewater treatment facility.

- Evaluation of how the operation of the facility provides phosphorus removal to the fullest practicable extent.

- Information and data related to potential wastewater treatment expansions or significant modifications, population growth, and potential phosphorus removal plans that will help to evaluate the current and potential effects of the facility on the Red River of the North.

The Moorhead phosphorus plan is due six months before the expiration of the new permit (approximately November 2004).

Water quality permit renewals are pending for the three American Crystal Sugar beet-processing facilities at Moorhead, Crookston and East Grand Forks. Issues relating to odor and hydrogen sulfide levels and solid waste are being addressed in these permit negotiations.

New permits are pending for the following minor wastewater treatment facilities in the Red River Basin:

Name	Receiving Water	Type of Project
Seven Clans Casino	DT to Thief River	Expansion
Hendrum	Wild Rice River	Expansion
Bejou	Marsh River	New Construction
Vergas	wetland complex	Expansion
Hawley	Buffalo River	Expansion

North Dakota

The North Dakota Pollutant Discharge Elimination System (NDPDES) permit program regulates the release of wastewater and stormwater 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 which is administered in North Dakota by EPA Region 8. Grand Forks, Fargo, and West Fargo have approved pretreatment programs in the eastern part of the state. The Department has submitted and is waiting for approval of the pretreatment program package submitted 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 municipalities and industries, 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, 1998 to September 30, 1999 are presented in Table 9.

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. Discharge information is shown in Table 3. 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

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 1980's to evaluate rivers and streams in the 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 we may obtain the information necessary to develop regional expectations for a given area.

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. Basin-wide sampling 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 from in size from small first order streams to the Red River itself. The sampling encompassed the entire basin from the Mustinka River in the southern portion of the basin, 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.

Minnesota Index of Biotic Integrity

The average IBI score for headwater streams was 29.1, which was significantly lower than either moderate streams (mean = 34.1) or large rivers (mean = 35.3). Fifty five percent of all headwater streams were rated poor or very poor. This contrasted with the better rating of moderate sized streams and large rivers. Only 28 percent of moderate sized streams were rated poor or very poor and only 12 percent of large rivers were rated poor.

"There are a number of plausible explanations for the low biotic integrity of headwater streams in the Lake Agassiz Plain eco-region. Stream channelization, particularly prevalent in headwater stream reaches, limits ecological quality of streams. Negative effects may be most pronounced on small headwater streams where many have been straightened and rerouted to serve as field drainage systems for row crops. Stream channelization reduced habitat quality by reducing pool depth and substrate heterogeneity, altering riffle-pool sequences, increasing turbidity, and reducing the retention time for water remaining in the stream channel. Many headwater sites, although not channelized, were often surrounded upstream and downstream by large segments of channelized stream. These unaltered stream segments, while certainly not pristine, represented the best conditions found in many of these streams and provided an important refuge for biota, the report stated.

"The importance of headwater streams cannot be over emphasized. Although headwater streams in this eco-region did not typically support year-round game fish populations, they did serve an important function in providing many game fish species with suitable spawning habitat. In addition, headwater streams were important components in river drainage networks and served as an entry point for pollutants from the terrestrial environment. Therefore, the report states; "the condition of moderate sized streams and large rivers was intimately tied to the condition of headwater streams".

North Dakota Index of Biotic Integrity

As stated in the previous section, the final report "Development of Index of Biotic Expectations for the Lake Agassiz Plain Ecoregion" was published September 1998. This was the first attempt at biological assessment for the Red River Valley. Since that initial project, sampling efforts in 1995, 1996 and 1997 focused on the Red River Basin in North Dakota and included an assessment of the Sheyenne River. The Department has recently completed an update to this report. The updated report provides a reevaluating of the metrics and an assessment of the biological condition in the Red River Basin including all the data from 1993 thru 1997.

Metrics were reevaluated using ecological dose-response curves where metrics were compared to measures of human influence, in this case the condition of the instream and riparian habitat. The original metric analysis and Index of Biotic Integrity (IBI) categorized streams into three size classes, headwater streams, moderate sized streams, and large rivers. With the addition of more sites sampled in 1995, 1996, and 1997, it was found that metrics differed significantly between habitat types (glide/pool vs. riffle/run), therefore, streams are now categorized by size and by habitat type (i.e., headwater glide/pool, headwater riffle/run, etc.). Most metrics and most stream categories show a correlation with human influence.

Table 11. shows metrics used for the new Index of Biological Integrity (IBI). New metrics include "dominant two taxa" which is a replacement for the original "evenness" and "catch per unit effort" metrics. "Percent fathead minnows" replaces "pioneer individuals" in the headwater category. Originally, "number of sucker species" and "percent subterminal mouth minnow" metrics were alternative metrics in the first report. They are used now as viable metrics with "percent subterminal mouth minnows" changing to "number of subterminal mouth minnow species".

Table 11:
List of Metrics Used in the Updated Red River Basin, North Dakota, Index of Biological Integrity

Total Number of Species	Number of Simple Lithophils
Number of Headwater/Sucker Species	Proportion of Tolerant Individuals
Proportion of Dominant Two Taxa	Number of Sensitive Species
Number of Minnow Species	Number of Benthic Insectivore Species
Proportion of Omnivore Individuals	Proportion of Fathead Minnows
Proportion of Insectivore Individuals	Number of Subterminal Mouth Minnows
Percent DELT	

A total of 149 samples from 85 stations were assessed using the revised IBI (Figure 7). Scoring criteria was divided into five categories of biotic integrity, excellent, good, fair, poor and very poor. Figure 8. shows the frequency distribution of IBI scores for sites sampled between 1995 and 1997. The frequency distribution shows that approximately 40% of the sites were assessed poor to very poor and 50% were fair to good. Less than 10% of the sites assessed showed an excellent rating.

The distribution of IBI scores is similar to the first metric analysis with the exception of sites in the excellent category. The original IBI did not stratify sites based on habitat type, in other words glide/pool sites were combined with riffle/run sites for the same stream size, headwater, moderate and large. When glide/pool sites are separated from riffle/run type sites, many emerge as excellent. These sites naturally have fewer taxa when compared to riffle/run type sites. By re-calibrating the metrics for stream habitat type, glide/pool sites previously assessed as fair or good are now assessed as excellent.
Plans call for future biological assessment in the Red River Basin in 2001. During this time, goals are to revisit previously sampled sites and to intensively survey the basin by adding additional sites. Other

goals are to study potential reference sites and describe reference condition in the Red River Basin for all stream sizes and habitat types.

Figure 7: North Dakota Biological Assessment Sites in the Red River Basin, 1993-1997.

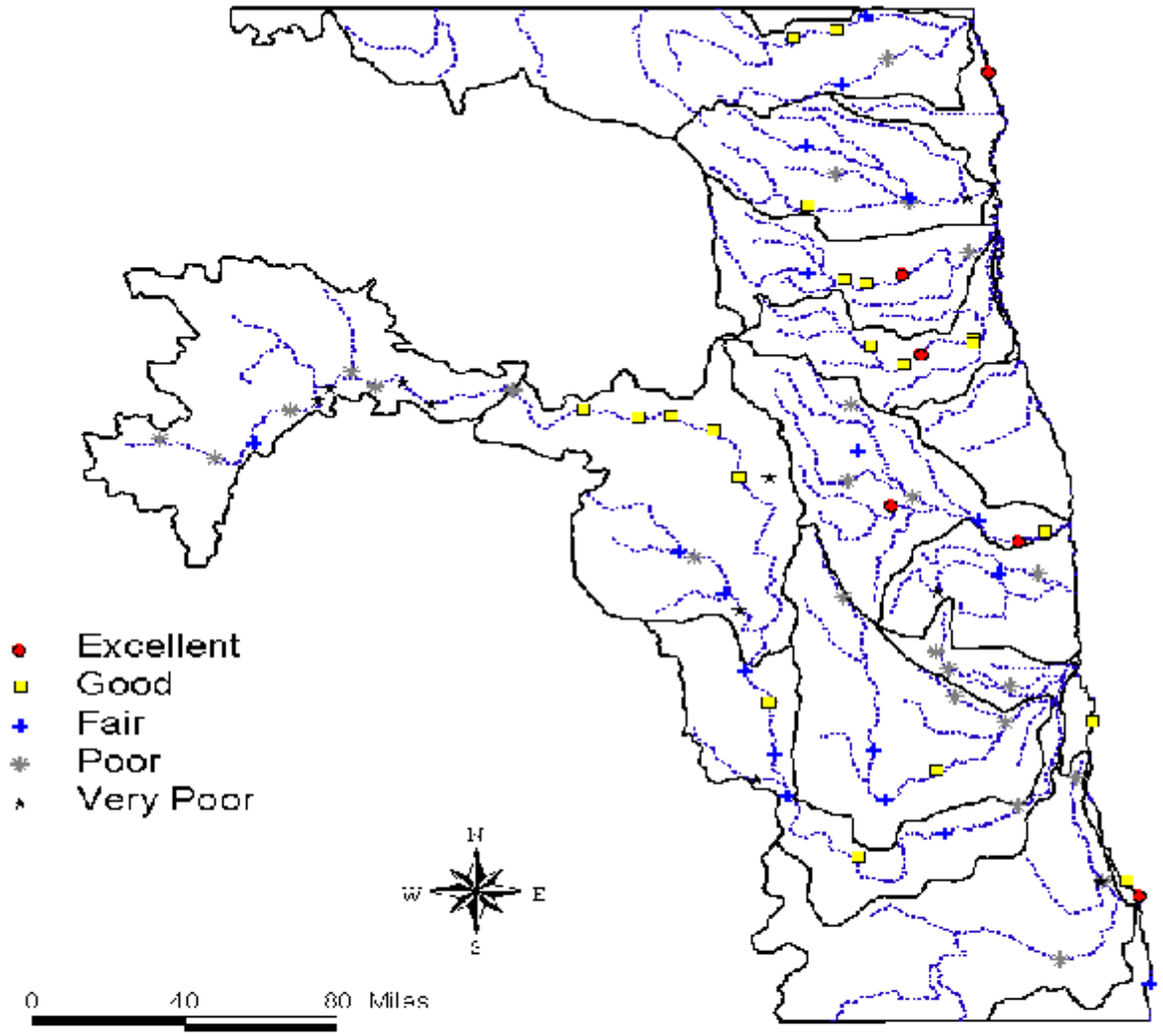
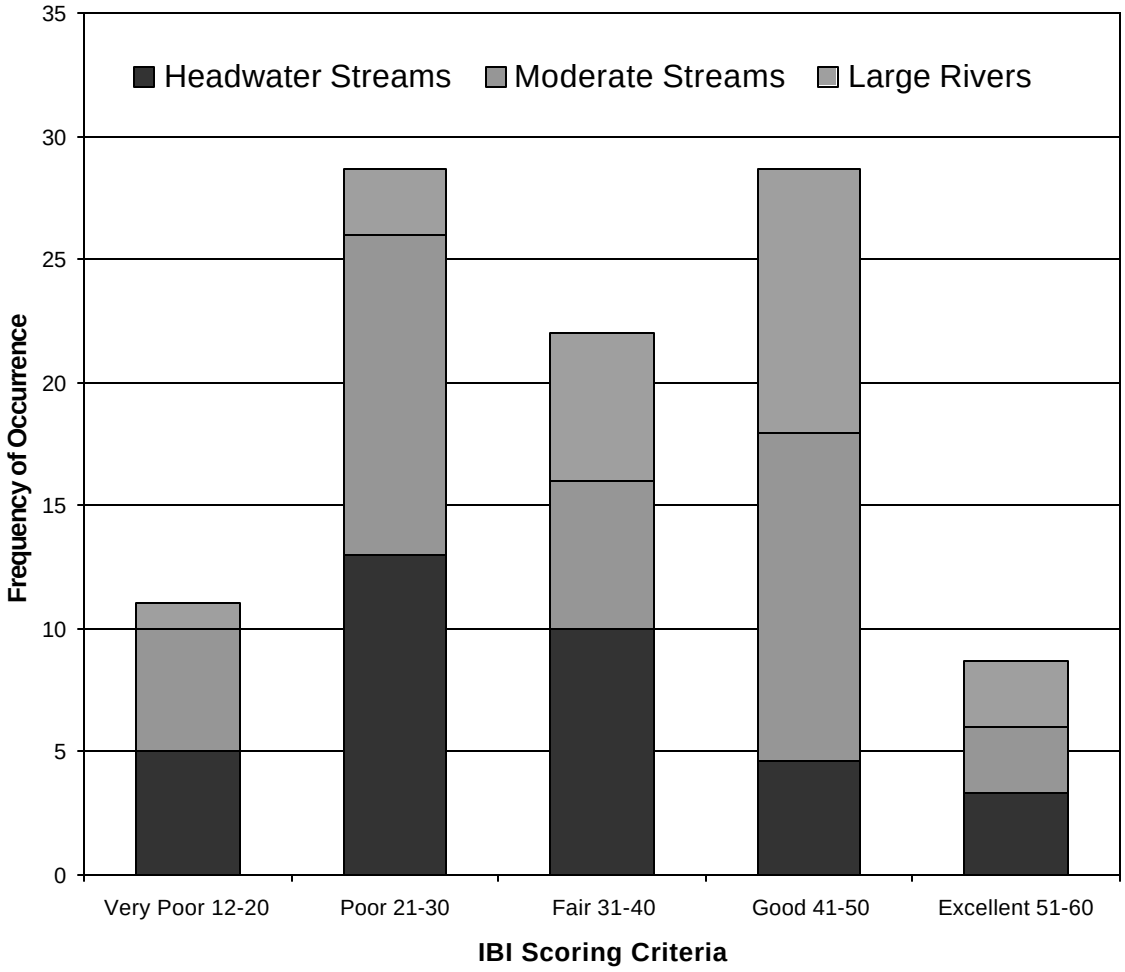


Figure 8: Frequency Distribution of IBI Scores for the Red River Basin, North Dakota.



LAKE WINNIPEG

In surface area, Lake Winnipeg is the world's tenth largest freshwater lake (23,750 km^2 or 9,173 square miles). It receives drainage from a catchment area of 977,800 km^2 (377,674 square miles), of which 116,500 km^2 (44,998 square miles) is the Red River basin. The lake provides recreational opportunities to thousands of people each year; it has excellent beaches, and provides livelihood to about 850 licensed commercial fishers. For many fishers of the First Nations origin, the lake fishery provides the primary or sole source of income.

Following is some background information:

- An eight year decline in pickerel/sauger catches from 1989 – 1997 caused concerns that stocks had been fished beyond sustainable levels
- Three species quota, whitefish, pickerel and sauger, causes fishermen to hi-grade for higher priced pickerel and sauger
- Reduced mesh sizes, whitefish roe fisheries and bushing (culling) may all be contributing to reduced whitefish production
- In 1997 additional conservation measures were applied to pickerel /sauger harvests including basing spring opening on spawning condition (pickerel 80% spawned), reduction and ultimate elimination of "retirement" quotas, and introduction of pickerel / sauger tolerances on large quotas held by whitefish fleet fishing the north basin

Current status:

- In 1999 fishermen harvested over 2.7 Mkg. of walleye, the heaviest catch since 1955
- Walleye harvest went from a 25 year low of under 1.0 m kg in 1996 to a 44 year high three years later
- This year's harvest is heavier to date than over the same period last year
- The year classes in the fishery were produced during the period of low production in the mid-1990s
- Lake total inflows were well below average from the 1987 to 1991 period and generally above average since 1991
- Extensive algae blooms in the south basin and channel area in October 1999 caused many fishermen to pull out
- Primary and secondary biological production in the lake have reached levels comparable to Lake Erie before phosphorus control
- Smelt populations in the north basin, as determined from anecdotal information on extensiveness of spring die-offs, continue to expand and have become an important food source for commercial sized walleye
- Scientific assessment on Lake Winnipeg should focus on correlating increasing eutrophy, spring flows and temperature, changing species community, harvesting effort and the percid community.

The Board will continue to monitor the aquatic health of Lake Winnipeg in an effort to determine possible trends.

FISH CONSUMPTION ADVISORY

Minnesota

Forty-one lakes and five river reaches in the Red River Basin have been tested for the Fish Contaminants Program. Forty of the forty-one lakes (98%) and 100% of the river reaches tested have advisories to restrict consumption due to elevated mercury concentrations. There were no lakes among those tested in the Red River Basin that had advisories due to elevated PCBs. Elevated PCB concentrations resulted in advisories on one of the five river reaches that were tested. One of the forty-one lakes (2%) and none of the river reaches tested in this basin had fish contaminant concentrations below the level that triggers advice to the general consumer to restrict fish consumption. The individual lakes and stream reaches that have been tested for fish contaminants in the Red River Basin are listed in Table 12. All tested water bodies are listed in the Minnesota Fish Consumption Advisory even if there is no advice to restrict consumption. Anglers should check the Advisory for the specific advice issued for each waterbody.

It is important to remember that the lakes and rivers tested for fish contaminants are not meant to be representative of the lakes and rivers in the Red River Basin. As discussed above, these waterbodies are often selected for testing because of suspected contaminant issues. The Minnesota Pollution Control Agency in cooperation with the Department of Natural Resources and the Department of Health is developing a program to coordinate fish contaminant research for the purposes of collecting representative data for determining and interpreting temporal and spatial trends in fish contaminants in Minnesota. However, the current data should be evaluated as biased data, and not representative of waterbodies in Minnesota.

Table 12: Minnesota Fish Consumption Adivisory for Lakes & Rivers Reaches

Lake Name	County	Lake Name	County
Battle, East	Otter Tail	Maple	Polk
Battle, West	Otter Tail	Medicine	Beltrami
Big Cormorant	Becker	Minerva	Clearwater
Big Floyd	Becker	Muskrat	Becker
Big Pine	Otter Tail	North Lida	Otter Tail
Blackduck	Beltrami	Otter Tail	Otter Tail
Clearwater	Beltrami	Pebble	Otter Tail
Clitherall	Otter Tail	Pelican	Otter Tail
Cotton	Becker	Pickerel	Otter Tail
Dayton	Otter Tail	Red, Upper	Beltrami
Dead	Otter Tail	Rush	Otter Tail
Detroit	Becker	Sallie	Becker
Florian Reservoir	Marshall	Star	Otter Tail
Hayes	Roseau	Strawberry	Becker
Ida	Becker	Toad	Becker
Julia	Beltrami	Traverse	Traverse
Little Floyd	Becker	Walker	Otter Tail
Little McDonald	Otter Tail	Wall	Otter Tail
Lizzie	Otter Tail	West Olaf	Otter Tail
Lomond	Clearwater	White Earth	Becker
Many Point	Becker		

River Name	Location
Clearwater	Red lake County
Red Lake	Above Thief River Falls Dam
	Below Thief River Falls Dam
Red River of the North	Breckenridge to Pembina

North Dakota

The North Dakota Fish Consumption Advisory was updated in April 1999. When compared to the 1998 advisory four lakes/reservoirs located in the Red River Basin were removed from the advisory list. Fordville Dam, Mount Carmel Dam, Silver Lake, and Tolna Dam were removed from the advisory list in 1999 because the data on which the consumption advisory was based exceeded five years. It is the Department's belief that consumption information based on data greater than five years old is no longer representative. Factors such as varying reservoir pool elevations and changes in fish population structure cause temporal variations in mercury accumulation in fish and ultimately mercury concentrations in fish flesh. As a result, it is the Department's policy to, within five years, either collect additional fish and update the consumption advisory or to remove the water body from the list.

9. ADDITIONAL ISSUES AND OTHER MATTERS REQUIRING CONSIDERATION

DEVILS LAKE SUB-BASIN

Devils Lake is located at the end of a 3,814 square mile closed basin. The landscape is generally flat with some low hills and ridges and numerous prairie potholes, depressions, wetlands and small lakes. Agriculture is the predominant land use, and there has been extensive conversion of native grasslands to crops, and also extensive wetland drainage within the basin.

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 could 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 as of September 1999 was el. 1447 ft.

Devils Lake is a shallow, naturally saline and hypereutrophic body of water. The TDS concentrations vary from less than 1,000 mg/L in the northwestern end of the lake to greater than 6,000 mg/L in East Devils Lake.

Beginning in July 1993, heavy rains throughout the Devils Lake Basin caused considerable runoff to Devils Lake. This was the beginning of the ongoing wet hydrological cycle within the basin. Rising lake levels have extensively damaged agricultural lands, private homes, businesses, roads and other infrastructure. The President of the United States has 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). These efforts continue.

Corps of Engineers feasibility studies of Devils Lake date back to the 1960's. 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 water or eliminating it. Both the inlet and outlet have 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. This study is generally abeyant while resources are focused on the outlet design and related environmental work. Due to increasing lake levels since 1993 and the threat of further flood damages, 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, there is a current proposal in Congress to seek funds for completion of the 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.

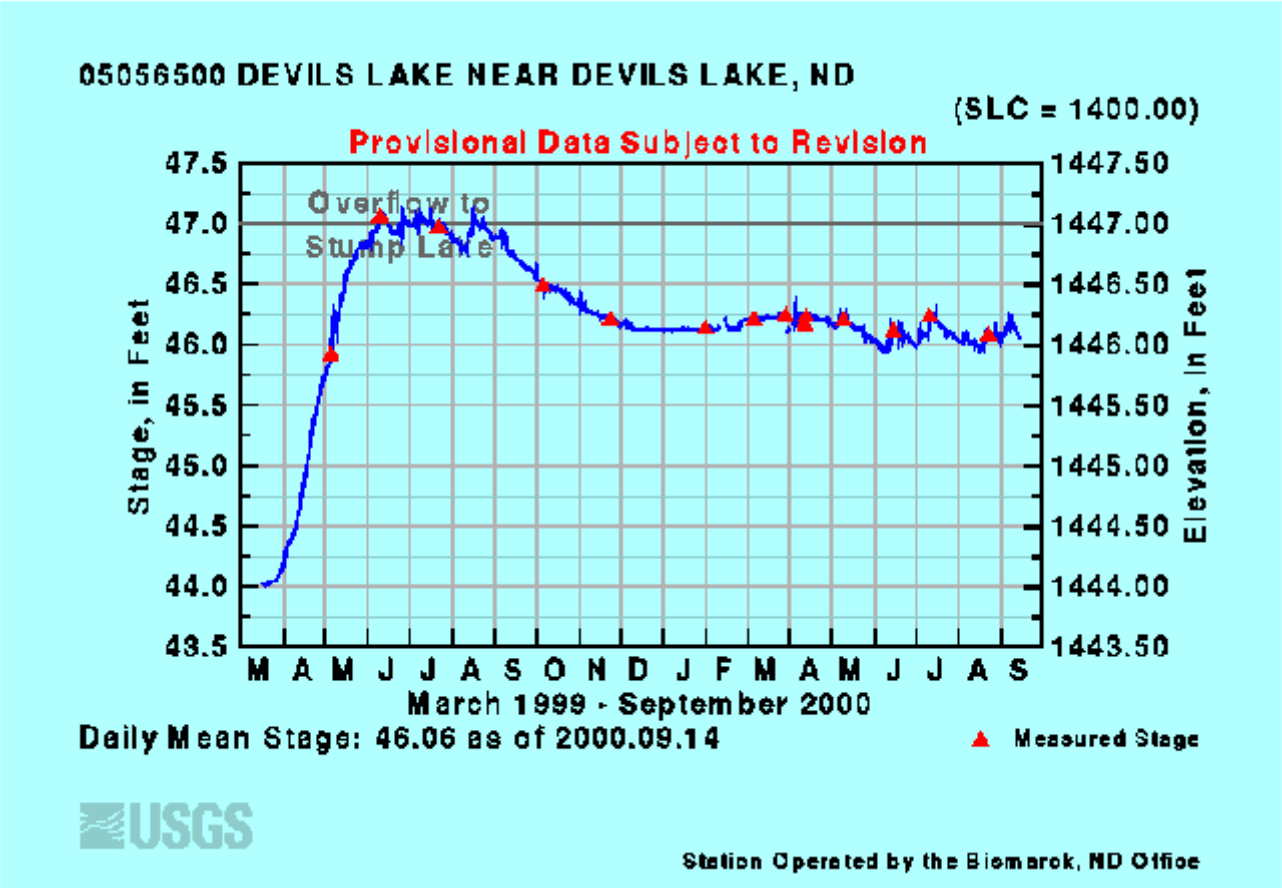
Levees around the City of Devils Lake have been raised 4 times since 1996 at a total project cost of $42 million. The levees, which are actually designed as dams to hold back water on a long term basis, are now 7 miles long, designed to provide flood protection to elevation 1450 and built to a top of 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.

There has been widespread devastation around Devils Lake over the last six years caused by the rising lake levels. In addition to providing technical assistance, the Corps has been involved in several other emergency actions. The 1997 and 1998 Emergency Supplemental Appropriations Acts (Public Laws 105-18 and 105-74) provided up to $850,000 in Federal funds for repairs and preventive measures for the rural sewer system. Emergency levees have been constructed for the community of Churches Ferry and for the Spirit Lake Tribe. The Corps is currently providing technical assistance on the issue of roads that are acting as dams but are not designed to dam safety standards.

The USGS is continuing a Devils Lakes outlet feasibility study which consists of modifying a statistical water mass-balance model for Devils Lake to include an outlet to the Sheyenne River. The modified model was used as a preliminary decision tool to analyze the effect of various outlet designs on future lake levels of Devils Lake and on discharge and water quality for the Sheyenne River near Warwick. To reduce uncertainty in simulated future dissolved sulfate concentrations for Devils Lake, a bottom-sediment flux component is being incorporated in the model and the effects of internal sulfate cycling are being evaluated. Final report is being prepared.

See Figure 9. for Devils Lakes water levels for the period of March 1999 through September 2000.

Figure 9: Devils Lake water levels for the years 1999 and 2000



Legislation was introduced in Congress to amend the authorizing legislation for the Garrison project. The legislation would no longer provide funding for irrigation projects, and would focus on diverting Missouri River water to the Red River Valley and other areas for municipal, tribal, industrial, and rural uses. As part of the process, the Bureau of Reclamation has completed a Red River water supply needs assessment.

The proposed Northwest Area Water Supply pipeline project (NAWS) would carry pre-treated water from either Lake Audubon or Lake Sakakawea to the City of Minot and vicinity communities. The Canadian government has expressed concern with the acceptability of proposed biota transfer controls.

Current Activities on GDU

A. United States Funding:

Work in fiscal year 2000 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. At the time of this report, Reclamation's 2001 budget was not finalized. Differences in the House and Senate versions necessitate a Conference Committee. The estimated fiscal year 2001 budget based on the President's request follows. These are preliminary numbers and are subject to change but provide an idea of priority of ongoing activities.

State MR&I Program	$ 4,850,000
Indian MR&I Program	$ 0
Indian Irrigation	$ 3,000,000
Supply System O&M	$ 4,650,000
Oakes Test Area	$ 0
Fish and Wildlife	$ 3,100,000
Recreation	$ 100,000
Special Studies	$ 700,000
Misc./General Expenses	$ 1,000,000
Total Federal Funds	$17,400,000

Consistent with Administration policy, no funds were requested for the operation and maintenance of the Oakes Test Area. No funds were requested for the Indian MR&I Program since expenditures have reached the authorized spending ceiling.

The Senate bill adds an additional $4,000,000. If that amount is enacted, $500,000 would be made available for Oakes Test Area O&M, $1,500,000 would be applied to the State MR&I Program, and $2,000,000 would be made available to the Indian MR&I Program.

B. Red River Valley Study:

Phase I, Part A of the Red River Valley MR&I Water Needs Assessment was released in April 1998. Phase I, Part B, Instream Flow Needs Assessment Report, was completed and distributed in September 1999. The Part A report shows both Reclamation's and municipalities' estimated water needs and shortages in the future. The Part B report presents the incremental benefits of various flows in the Sheyenne River and the Red River at Fargo.

The Phase II Alternatives Analysis has been completed and distributed for review. Comments and

responses to those comments were distributed as an addendum to the report in August 2000. The report presents an array of both in-basin and out-of-basin alternatives to meet future MR&I water needs in the Red River Valley. Both the Phase I and II studies were prepared in conjunction with a steering committee consisting of representatives of the North Dakota State Water Commission, North Dakota State Health Department, The Garrison Diversion Conservancy District, Fargo, Grand Forks, Moorhead (Minnesota), rural water systems, the environmental community, and the Bureau of Reclamation.

Reclamation, the North Dakota State Water Commission and the Garrison Diversion Conservancy District have signed a Memorandum of Understanding establishing a framework for conducting a more detailed feasibility-level analysis of alternatives for a Red River Valley water supply. At a minimum, all of the alternatives identified in the Phase II study will be included in the analysis. In addition, an environmental analysis or environmental impact statement will be prepared. Letters are being sent to interested parties requesting participation on either a Technical Team, which will be responsible for data analysis and report preparation, or a Study Review Team. This effort is scheduled to begin in the Fall of 2000.

WATER RESOURCE INVESTIGATIONS

Analysis of Surface-Water Storage within Starkweather Coulee Basin:
This USGS study demonstrates the utilizations 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 is being prepared.

National Water Quality Assessment (NAWQA) Program - Red River of the North Study Unit:
The goals of the USGS National Water Quality Assessment (NAWQA) Program are to describe the status and trends in the quality of a large, representative part of the nation's surface- and ground-water resources and to provide scientific understanding of the primary natural and human factors affecting the quality of these resources. The Red River of the North (Red River) Basin in the United States is one of the first 20 study areas that was started in 1991 under the NAWQA program.

The fifth year of the low-intensity monitoring for the study continued as stream water samples were collected from two sites: the Red River at Emerson, Manitoba, and the Turtle River at Turtle River State Park, North Dakota. Stream water samples were analyzed for nutrients and major ions at both sites, and for pesticides at the Red River at Emerson, Manitoba. The Red River of the North Study Unit is scheduled to be discontinued at the end of this year.

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). Interpretation, summarization, and data will be presented in a journal article, which is in preparation.

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. A journal article is in preparation.

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

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

This 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 ground water close to the river; (2) determine how climatic conditions affect ground-water levels close to the river; and (3) examine how differences in surface slope and geology affect the rate and extent of change in ground water 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.

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 and water quality issues, and transborder issues. IRRB will continue to evaluate the issue in the context of water quality at the international boundary.

WATER RESOURCE PROJECTS

Sheyenne River Flood Control Project:
The Sheyenne River project was authorized by the Water Resources Development Act of 1986. Construction of the Horace to West Fargo and West Fargo units is complete. The projects were both operational in the fall of 1992 and were initially operated during the spring flood of 1993. The flood damage reduction provided by these projects to the areas being protected has been significant. Repairs to the two diversion channels were made due to erosion. Construction of an additional pump station for the West Fargo project is being recommended due to an increase in damages due to interior drainage.

The authorized project also calls for a five foot raise of the flood control pool at Baldhill Dam. The project consists of replacement of the dam's existing service spillway gates, and acquisition of occasional flowage easements and lands in fee around the reservoir. The five foot raise would double the dam's flood control storage capacity, and increase the total reservoir capacity to 100,000 acre-feet. The project would reduce flood damages downstream, primarily at Valley City. A project cooperation agreement was signed on May 31, 2000. The initial construction contract is scheduled for award in August 2000 and completion of construction is scheduled for December 2002.

Baldhill Dam – Dam Safety and Major Rehabilitation:
The Dam Safety project is essentially complete except for some minor remaining instrumentation installation. The fourth stage, upgrading of the gate operation machinery and replacement or rehabilitation of several maintenance and office buildings, was started in December 1988, and is scheduled for completion in December 2000. Funds to initiate construction of the Baldhill Pool Raise were provided in FY 2000. The Project Cooperation Agreement is scheduled for execution in May 2000. The first construction contract, for replacement of the existing spillway gates, is scheduled for award in July 2000.

East Grand Forks, MN / Grand Forks, ND Local Flood Protection Project:
The Corps of Engineers in May 1997 initiated preconstruction engineering and design and associated environmental studies for a Local Flood Damage Reduction project for the East Grand Forks, MN and Grand Forks, ND communities building upon an authorization that was in place for East Grand Forks MN since 1970. The resulting General Re-Evaluation Report and Environmental Impact Statement was signed in February 1999. The Project Cooperation Agreement was signed on January 31, 2000. The local cost share for the project is almost 50 percent of the total estimated project cost of $350 million. Project construction began in 2000, and is scheduled for completion in 2005-2006.

Red River Disaster Information Network:
The IJC's International Red River Basin Task Force helped launch the Red River Disaster Information Network. The Network consists of a growing list of individuals and organizations who use several tools incorporated into an Internet Web Page, including; a searchable catalogue of available databases, Virtual Forum, Bulletin Board, Documents Library, searchable lists of organizations and points-of-contact, and other information resources. These tools are intended to enhance and facilitate interaction with one another and make possible the direct and continual exchange of information and ideas between people in the Basin. Goals include finding a long-term host for the Network, expanding it beyond flood-related issues, and include all Basin-wide interests.

International Flood Mitigation Initiative for the Red River (IFMI):
The International Flood Mitigation Initiative for the Red River (IFMI) is a FEMA-funded effort facilitated by the Consensus Council located at Bismarck, North Dakota. The workgroup is exploring opportunities for long-term flood disaster prevention and mitigation.

FEMA asked the Consensus Council to assemble and facilitate the workgroup involving senior officials from Manitoba, Minnesota, North Dakota, and U.S. and Canadian federal agencies.

Beginning in December 1998, and continuing until November 2000, IFMI will work to build agreement on strategies and policies for flood prevention and mitigation on the Red River and its tributaries. It affords the region a critical opportunity to shape and implement a comprehensive long-term approach to mitigation and to capitalize on the public concern and media scrutiny of flood issues following the 1997 flood disaster.

IFMI recently sponsored a Farmland Stewardship Initiative now being considered for funding by the U.S. Congress. It would include demonstration projects across the country that provide for a farm policy shift toward more payments for flood control and conservation benefits. If successful, the initiative would build support for a broader shift toward single agricultural compensation for multiple benefits, including; flood mitigation, conservation easements, and other land management practices.

Red River Basin Board (R2B2):
Representatives from Manitoba, North Dakota, Minnesota, South Dakota and Indian Tribes created the Red River Basin Board on July 24, 1997. The purposes of the Board are as follows: support development and coordination of comprehensive water management and land use plans, evaluate proposals for impact on the overall basin, provide public awareness and education, provide a public forum to discuss issues, and facilitate and pursue resolution of interjurisdictional issues.

The Board of Directors is comprised of 21 people; seven from Manitoba, five from Minnesota, five from North Dakota, two from South Dakota, and two from First Nations, Tribes, and Aboriginals. Currently, R2B2 is considering expanding their membership by inviting federal agencies and environmental groups to join the board.

The International Coalition for Land/Water Stewardship in the Red River Basin (TIC):
TIC was formed in 1981, and is a non-profit organization to serve as an international model for communication, cooperation, and active participation. It is dedicated to grassroots solutions, and its stated mission is to promote wise stewardship of land and water resources in the basin through

information and education. TIC's activities are performed through task forces that have provided research on wetlands, water retention, land use, water supply, and hazardous waste. TIC was involved in the formation of R2B2, and their current activities include joint ventures with agencies, counties, rural municipalities, and other organizations in accomplishing both specific tasks and establishing contacts.

TIC recently released a directory of agencies and organizations involved with activities in the Red River Basin. Both printed and website versions of the directory are available.

Energy & Environmental Research Center -Red River Water Management Consortium:
In 1996, the Energy & Environmental Research Center (located at the University of North Dakota) teamed with major stakeholders in the Red River Basin to develop the Red River Water Management Consortium. The overall goal of the program is to develop a long-term watershed management strategy focusing on water quantity, water quality, and flood mitigation. It is expected that the program will become a model for watershed management that can be used by others for responding to environmental and water quantity concerns, while allowing for economic development. Consortium members direct the research, development, and demonstration activities. Involvement in the Consortium by representatives of municipalities, industry, and other entities within the basin is intended to provide a balanced perspective on watershed issues. An annual contribution of the members is pooled to leverage funding for projects. Membership gives each participant direct access to research projects, and provides opportunity for exchange of information in an open, nonpolitical form.

Red River Watershed Management Board:
The Red River Watershed Management Board was created by Minnesota legislative act in 1976. it's purpose is to institute, coordinate, and finance projects to alleviate flooding and to assure the beneficial use of water in the watershed of the Red River and its tributaries. The Board membership consists of representatives of nine Minnesota Watershed Districts.

The Watershed Districts are authorized to levy up to 2.0 mil tax for use in carrying out its mission. The Board's activities have historically centered on flood control. The Board promotes a basin-wide perspective for water management, with an emphasis on reducing flood flows. Other activities include promotion of basin planning, water quality studies and educational programs – including development of a functional GIS for addressing watershed management issues.

Minnesota Basin Planning and Management:
As this report states, nonpoint source pollution is the No. 1 threat to water quality for the Red River Basin. Managing nonpoint source pollution requires coordinating a variety of management strategies, from regulation to information.

Recognizing that nonpoint source pollution can not be addressed from the top down, the Minnesota Pollution Control Agency initiated a basin planning process in the Red River Basin in 1996. A Basin Information Document, listing water resources and threats to water quality, was published in 1997.

Participants were recruited from throughout the basin, representing nonprofits, agencies and academe, to develop a basin management plan, listing water quality goals and suggesting strategies and objectives. The "Basin Team" met almost monthly from Fall 1997 through September 1999. Their plan was published by the MPCA in November 1999. In January, the planning team was reconvened as an implementation team, which is meeting almost monthly. The Red River Basin Water Quality Plan Implementation Team has defined the following five activities for the year through June 30, 2001:

1. Support and develop basin organization to lead plan implementation;

2. Identify opportunities to achieve goals of the plan through specific projects, prepare a basin wide list of projects that address goals of the plan and develop a fund-raising strategy to support these projects;

3. Develop basin wide water quality monitoring, incorporating ambient and compliance monitoring, with special attention to water impairments and development of biological monitoring protocols, and coordination with other monitoring efforts, especially in North Dakota;

4. Develop a Red River Defense Network, an ad hoc group of public water suppliers concerned about drinking water protection, especially spills of hazardous materials, storage of hazardous materials in the valley, notification of spills and water impoundment releases, source water protection planning, and addressing nonpoint source issues that affect drinking water quality (especially total organic carbons and emerging issues such as protozoans, pharmaceuticals, etc);

5. Design and implement a non-point source pollution reduction information and education campaign, targeting specific stakeholders such as township officers and appointed officials, including workshops, communication materials and presentations.

In May 2000, the MPCA St. Paul's office re-evaluated the Red River Basin planning process by interviewing selected members of the Basin Team. They reported on the following five areas related to the basin planning process that should receive additional consideration:

1 Coordinating multiple planning processes. In designing a basin planning effort, the MPCA needs to recognize that many planning processes are underway at the local, regional and state level.

2. Evaluating the need for measurable goals. Many interviewees indicated that setting specific, quantitative or narrative goals was not necessary for a first planning cycle. In fact, some of those interviewed felt strongly that pursuing specific goals would have been counterproductive – due to the inherent skepticism in the process and the fear of regulatory program development to meet such goals. It may be more important to develop more general goals in the plan that can be translated into more specific goals during implementation.

3. Managing expectations on future funding. Many, if not most, of those interviewed expect that additional funding will be available for water quality initiatives as a result of adoption of the basin plan. From a participant's perspective, money can be an important motivator for participating in a planning process. This perspective needs to be balanced with MPCA's policies and systems related to funding priorities. MPCA should examine its funding policies and systems and develop accurate and clear communications about expectations regarding future funding.

4. Helping participants through the process. The MPCA needs to be ready in basin planning processes to provide participants with additional knowledge and background information to allow them to effectively participate in the process. This can be accomplished in a variety of ways, including up-front training for all participants, one-on-one communications with individuals, or training for one or more committees where appropriate. Such assistance can be focused on water quality technical issues, process issues or both, depending on the needs

of a particular group or individual.

5. Implementing components of the plan. Finally, whether or not the plan is implemented "on the ground" is an important consideration to interviewees. In fact, many of those interviewed indicated that their view of the success or failure of the plan was tied to whether or not it is implemented, and that MPCA needs to recognize the importance of implementation to the participants, and work with them toward implementation.

Minnesota Flood Damage Reduction:
As a result of the controversy over an Environmental Impact Statement (EIS) concerning flood damage reduction projects in the Minnesota portion of the Red River Basin, the Minnesota Legislature authorized funding in 1997 for a process to seek resolution to disputed issues concerning flood damage reduction projects in the Red River Basin. A mediation process was set up to resolve issues in a positive manner, and which allows for implementation of the most effective and environmental friendly alternatives that would accomplish flood damage reduction.

Minnesota Department of Natural Resources, Water Control Structure Construction, Red River Watershed Management Board (RRWMB), and other participants, including the Corps, reached agreement on broad goals for flood damage reduction and natural resource enhancement and a process for implementation in December 1998, which is commonly known as the "Red River Mediation Agreement". Implementation of this agreement is underway, and designs for the first series of projects emerging from the new process have been well received by regulators and agencies funding the projects. The process is still maturing and undergoing revision based on experience gained.

Activities in the 1999 water year, pursuant to the mediated Red River Mediation Agreement include the following:

- Monthly meetings of the Flood Damage Reduction Work Group, and

- Occasional meetings of the Technical and Scientific Advisory Committee, which developed the following data collection and research activities:
  (1) Monitoring flood damage reduction projects
  (2) Develop design guidelines for wetland restoration with flood control and natural resource objectives
  (3) Research hydrology of wetlands, and impact of "bounce" of water levels on wildlife habitat and biodiversity
  (4) Accelerated stream sampling for the Bois de Sioux, Wild Rice and Roseau Rivers
  (5) Funding for facilitators for the flood damage reduction planning process at the watershed level.

In 1999, the Minnesota Legislature provided a $3 million funding appropriation to the Flood Damage Reduction Work Group, which included:

- Deerhorn Creek Flood Control Levees: Setback levees to provide flood protection and flood storage on nine miles of channel in the Buffalo Red River Watershed; total project is $1.1 million;

- Dahlen Coulee: Three-mile channel restoration and flood storage in the Wild Rice River Watershed; total project is $1.2 million;

- Angus-Oslo #4: 6,500 acre-feet of off-channel flood storage reservoir, of which 330 acre is

permanent pool, in the Middle-Snake Watershed.

In addition, the 2000 Minnesota Legislature appropriated $1 million for future activities of the Flood Damage Reduction Work Group and $5.6 million for projects.