IRRB

THE

INTERNATIONAL RED RIVER BOARD

Fifth Annual Progress Report

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International Joint Commission
Commission mixte Internationale

PREFACE

This report documents water quality trends and exceedences of objectives, effluent releases, and control measures for the Red River basin for the 2003 Water Year (October 01, 2002 through September 30, 2003). In addition, this report describes the activities of the International Red River Board during the reporting period October 01, 2003 to September 30, 2004 and identifies several current and future water quality and water quantity issues in the basin.

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

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Commissioners:

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

Respectfully submitted,

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1. SUMMARY

1.01 Water Quantity and Water Quality

Water Quantity

The Red River basin experienced a generally dry summer in 2003 with flows in the Red River and its international tributaries reaching the lower decile level by early fall. The dry conditions resulted in low soil moisture levels and increased depression storage capacity throughout the basin. Although snowfall was somewhat above average over parts of the basin in January 2004, total winter snow cover was generally below average. Further, mild weather during March resulted in considerable depletion of the accumulated snowpack. By the end of March 2004 spring runoff was underway in the U.S. portion of the basin and the flood outlook assuming normal weather conditions indicated an average to below average spring runoff for the basin.

However, on March 27-28, 2004, heavier than normal spring rains occurred [rain on snow] with observed amounts ranging from 50-80 mm (2-3.1 in.) in some parts of the basin. Frozen soil conditions combined with snow-clogged channels and culverts contributed to extensive flooding of agricultural lands. For the most part, streamflows remained in-channel, however, flood alerts were issued to a number of communities along the Red River and its tributaries. Sandbagging of homes occurred in several communities, most notably in Grafton, North Dakota. Numerous roads and bridges in the upper U.S. portion of the basin were closed due to overland flooding and high river levels. Flood levels on a number of rivers and streams were particularly high with levels on the Forest River, for example, being greater than in all previous events except for the floods in 1948 and 1950. Tributaries to Devils Lake ranged from 60 to 70% of the 1997 levels, and in one case, exceeding the peak of record. In Manitoba, as a precaution, some 13 homes were sand-bagged in the City of Winnipeg.

On April 3rd a major ice jam occurred on the Red River downstream of Selkirk, Manitoba causing water levels to rise some 5.7 feet in 24 hours. The jam moved northward by end of day causing flooding of cottages near the mouth of the Red River. Some 40 residences were evacuated as a result. Flood levels crested at Emerson on April 7th and at Winnipeg on April 10th.

Major spring storms in May 2004 occurred over much of the basin causing the Red River and many of its tributaries to rise again. Low soil moisure conditions throughout the basin initially attenuated surface runoff. However, by early June soil moisture conditions had become high in many parts of the basin resulting in ponding of agricultural lands and delay of normal planting activities. While localized showers continued throughout the month, the Red River began to recede until substantial precipitation occurred again in early August. Significant rainfall in the order of 50-75 mm over many parts of the basin occurred again in early September causing overland flooding in some areas. Flows on the Red River and many of its tributaries were generally above the upper decile level at this time. Persistent showers throughout September maintained high river levels and outflows.

The above average precipitation throughout the summer of 2004 caused Devils Lake to reach a new record high of about 1449.1 feet asl by mid June. The previous high of about 1448.1 feet asl was experienced in August 2002. The lake level is slowly receding and is presently at about 1447.9 feet asl (November 28, 2004).

Water Quality

During the reporting period October 01, 2002-September 31, 2003, no unusual deviations or significant exceedances of the International Joint Commission (IJC) water quality objectives were observed at the international boundary. *Sulphate* concentrations, while not exceeding the objective, were elevated from May through July of 2003, and *chloride* concentrations marginally exceeded the objective in September of 2003. Marginal exceedances of the *total dissolved solids* objective were also observed from June through September 2003. The elevated concentrations can be attributed in part to low flow conditions in the Red River and reduced dilution capacity.

Given that the Red River basin is an agriculturally dominated region, detection of pesticides and herbicides in the Red River at low concentrations is expected. Eleven of the pesticides and herbicides for which alert levels have been established by the former International Red River Pollution Board were detected at the international boundary during the reporting period at low levels and well below the Canadian Aquatic Life Guidelines.

1.02 International Red River Board Activities

Responsibilities stemming from the November 2000 IJC report to governments *'Living with the Red'*, direct the International Red River Board (IRRB) to monitor progress made by governments in implementing the IJC recommendations, and to provide encouragement for continued preparedness and mitigation activities in the basin. A basin-wide survey and analyses of flood preparedness and mitigation activities undertaken by the IRRB indicates that significant progress has been made, however, considerable effort is still required to achieve the level of inter-agency and intergovernmental cooperation needed to assure cohesion on flood management and long-term resiliency in the basin. Further, IRRB members have indicated that a comprehensive flood mitigation plan as proposed by the IJC in January 2003 would provide an appropriate mechanism to mobilize the multi-jursidictional cooperation and commitment necessary to effectively address these challenges. Strategies to move forward with such a comprehensive plan are being formulated collaboratively with the IJC and the Red River Basin Commission.

In July 2003, the Pembina River Basin Advisory Board requested assistance from the IRRB to resolve a long standing drainage and flooding issue along the international boundary. In response, a Pembina Study Team was assembled by the IRRB to report objectively on the issue and to recommend strategies for moving toward a resolution. In September 2004, the Study Team presented its final report to the IRRB containing eight conclusions with respect to a potential long-term solution to the drainage and flooding problem, and six recommendations for action by the IRRB and government agencies. The IRRB fully endorses the Study Team conclusions and recommendations and has asked the Pembina River Basin Advisory Board for their response. In the near term, the IRRB has identified specific short term actions that would greatly advance progress in this matter. These include, hydraulic modelling of bridge structures at the international boundary, inventory of culvert structures and their conveyance capacity along the boundary road-dike and County Road 55, and Lidar mapping of the lower Pembina River basin. The IRRB has requested financial support from the IJC for these activities.

In 2003, Manitoba proposed that water quality objectives for nitrogen and phosphorus be estabished for the Red River at the international boundary. The Manitoba proposal reflects concerns about the continued eutrophication of Lake Winnipeg. The IRRB Aquatic Ecosystem Health Committee (AEHC) considered the Manitoba proposal and in July 2004 provided recommendations that set nutrient reduction targets for the basin. These recommedations have the support of participating agencies in the basin and are fully endorsed by the IRRB and IJC.
A priority initiative for the IRRB is the development of biological monitoring and implementation strategies for the basin. With IJC funding and co-sponsorship support from the Red River Basin Institute and U.S. Bureau of Reclamation, the AEHC held a workshop in March 2004 focussed on developing a framework for basin-wide biological monitoring based on reference sites. The workshop acheived acceptance of the approach by participating agencies and resulted in further recommendations to develop specific monitoring protocols and implementation work plans. The recommendations have been endorsed by the IRRB and funding opportunities for these initiatives are being explored with the IJC.

The IRRB also reports on the Poplar and Big Muddy basins, which were the responsibility of the former International Souris-Red Rivers Engineering Board. No major apportionment or water quality concerns were encountered in these basins during the reporting period. Some adjustments to the water quality sampling schedules in Saskatchewan and Montana were implemented contributing to the efficiency and information content of the monitoring programs.

The IRRB also investigates and reports on other activities in the Red River basin that have a potential to affect the waters and aquatic ecosystems of the Red River and its transboundary tributaries and aquifers. The Devils Lake outlet channel presently under construction, continues to be a concern to downstream communities in

North Dakota, Minnesota and Manitoba with respect to water quality and biota transfer, and may be in violation of the Boundary Waters Treaty. State and federal permits for the project have been challenged. In April 2004, Canada formally asked that the issue be referred to the IJC.

Table 1: Current Issues in the Red River Basin

Project	Transboundary Issue	Status	Action
Devils Lake	Construction of outlet channel from Devils Lake, a closed basin, could cause possible introduction of non-native fish species and pathogens to Lake Winnipeg, and water quality deterioration and increased deviations from IJC water quality objectives at international boundary.	U.S. Corps of Engineers released final EIS, with Pelican Lake outlet as preferred alternative, in April 2003. In mid-October, theCorps signed a Record of Decision recommending construction of federal project provided that all legal requirements are met. North Dakota is proceeding with less costly State outlet. Permits have been obtained and construction is scheduled for completion in late 2004 with operations to commence in spring of 2005. Permits have been challenged by Manitoba and others. In 2004, Canada requested IJC reference.	Project being monitored by IRRB.
International Border Zone	Intensive livestock operations near boundary could be potential water quality concern.	Manitoba, ND, and Minnesota have developed and implemented a notification protocol. A number of proposals have been received resulting in effective exchange of information and review of concerns.	Members will keep the IRRB informed on notifications. As a courtesy, IRRB will share notification information with RRBC.
	Table 1 Continued		
Lower Pembina River Flooding	Embankment along boundary in Manitoba prolongs agricultural flooding in North Dakota. --- Embankments along the Pembina increase water volumes flowing toward Manitoba	Manitoba and North Dakota have reached agreement to improve capacity of road-dike crossings #2 &#3. In May 2004, Pembina County and communities served statement of claim on Manitoba for damages resulting from road-dike. --- Non-permitted levees in ND have been removed and set-back levees proposed. --- In July 2003 Pembina River Basin Advisory Board (PRBAB) asked IRRB for assistance in resolving long-standing lower Pembina drainage and flooding problem.	Manitoba and ND will keep the IRRB informed on progress of bilateral discussions. --- IRRB established 3-person Study Team to work with PRBAB. Sept 2004 Study Team recommendations are endorsed by the IRRB. IRRB has proposed follow-up strategy and short term actions to the PRBAB and IJC.

Poplar River	IJC apportionment formula not ratified. --- Water quality concerns.	Current Bilateral Monitoring Agreement extended to March 31, 2007. Saskatchewan and Montana considering renegotiation of agreement on apportionment and water quality. --- No significant upward trends in parameters sampled over 20 years. Reduced water quality monitoring starting in 2004.	IRRB to maintain watch on negotiations when they resume. --- Bilateral Monitoring Committee will continue to monitor and review water quality conditions at the international boundary.
Garrison Diversion Unit	Importing water from Missouri R. to Hudson Bay drainage could cause transfer of non-native fish species and pathogens, change water quality, and increase flows.	Dakota Water Resources Act (2000) increased MR&I funds. Feasibility level engineering report on Red River Valley Water Needs and Options underway with final report scheduled for November 2005. Options considered include importation of Missouri River water to the Red River basin. Reclamation and Garrison Diversion Conservancy District jointly preparing EIS for three groups of alternatives.	Project being monitored by the IRRB.

2. INTRODUCTION

In April 2000 the International Joint Commission (IJC) formally merged its International Red River Pollution and Souris-Red Rivers Engineering Boards, consolidating the water quality and water quantity responsibilities of the former boards, to form the International Red River Board (IRRB). This consolidation formalized the already emerging cooperative efforts of the former boards towards an integrated approach to transboundary water issues in the basin. Further, in its November 2000 report *Living with the Red*, the IJC recommended that the governments assign certain flood-related tasks to the IJC for implementation by its IRRB. In June 2001, Canada and the United States formally approved a new expanded directive for the IRRB. The directive is included in Appendix A.

In April 2003, the IJC requested further discussions with the IRRB on how to achieve a more ecosystemic approach and a capacity to respond to the range of environmental and water-related challenges of the 21st century. In April 2004, the IJC adopted guiding principles aimed at broadening the partnership efforts of its international boards with other watershed entities for a more inclusive approach. The IJC refers to this effort as the 'international watersheds initiative'. The various water management organizations in the Red River basin appear receptive to the initiative while at the same time recognizing the independent, impartial and objective role of the IJC and its boards in providing advice to governments.

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

This report is the fifth IRRB annual report to the IJC.

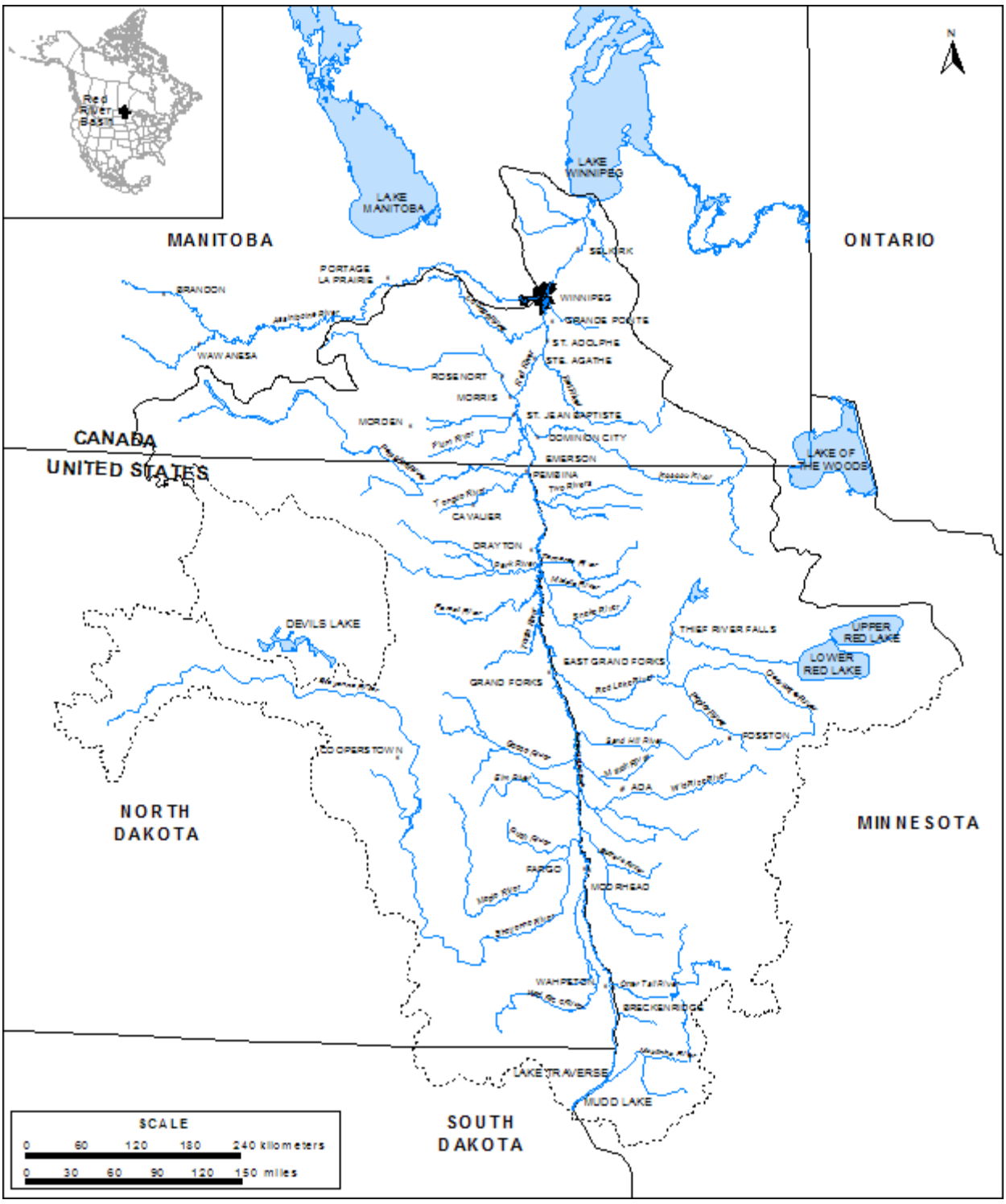

Figure 1. Red River and its Tributaries

3. INTERNATIONAL RED RIVER BOARD MEMBERSHIP

In its 1997 report *The IJC and the 21st Century,* the IJC proposed comprehensive international watershed boards as an improved mechanism for avoiding and resolving transboundary disputes. The intent was to broaden the scope of information upon which decisions relating to water and air are being made. While the IJC has experienced some difficulty in advancing the approach, the approach continues to have promise and is being pursued as discussed in Section 4.05.

In the interim, through the continued integration of the water quality and water quantity responsibilities of the former Red River boards, and through efforts to increase stakeholder involvement, many of the goals of a comprehensive approach are being achieved. To facilitate these objectives, Board membership was expanded in 2000 to include non-government participation. At present, from a full complement of nine members each, there are eight members appointed to the Board on the United States side and eight members on the Canada side. The outstanding appointments are expected to be made in the coming months. This large membership, listed below, reflects widely distributed water management mandates in the basin.

During the reporting period, Colonel Robert Ball, U.S. Army Corps of Engineers, William Gummer, Environment Canada, and Jeff Lewis, Minnesota Pollution Control Agency, retired from the Board. These members were replaced respectively by Colonel Michael Pfenning, Dr. Kevin Cash, and Molly MacGreggor as interim designate. Don Buckhout, Minnesota Department of Natural Resources was also appointed to the Board replacing the late Dr. Gale Mayer.

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Senior Engineer Advisor
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Further, during the reporting period, John Giedt, U.S. Environmental Protection Agency, resigned as U.S. Co-Secretary, and Jaralyn Beek, U.S. Co-Secretary, U.S. Bureau of Reclamation, was replaced by CJ McKeral.

4. INTERNATIONAL RED RIVER BOARD ACTIVITIES

During the reporting period October 01, 2003 - September 30, 2004, the International Red River Board (IRRB) met with the IJC at the October 2003 Fall Semi-Annual Meeting, at which it presented its third annual progress report as an amalgamated board. The Board discussed its priorities and funding requirements for the coming year as well as specific basin projects and their transboundary implications.

Further, during this reporting period, the Board Co-chairs and Secretaries met in teleconference on February 13, 2004 to review progress being made in implementing the IRRB work plan, including the work and accomplishments of its two technical committees. The IRRB held its annual meeting and public forum on July 13-15, 2004 at Devils Lake, North Dakota.

These activities are discussed further in the following sections.

4.01 Annual Board Meeting

The IRRB held its annual meeting on July 13-14, 2004 in Devils Lake, North Dakota to review water quality monitoring results and issues of compliance with IJC water quality objectives and alert levels for the 2003 water year. Other key activities discussed included: progress being made in implementing the recommendations contained in the IJC report *Living with the Red*; resolution of the Pembina River basin drainage and flooding dispute; engagement of First Nation communities; development of a comprehensive flood mitigation plan framework, and; development and implementation of biological monitoring and nutrient management strategies for the basin. The nature and outcome of these discussions is presented in subsequent sections and chapters of this report.

Except for a half-day executive session, the meeting was open to the public in a spirit of information sharing and collaboration. This was undertaken in recognition that there are many local, regional, state/provincial, federal and natural resource management entities operating in the basin with whom connective links would be mutually beneficial.

The IRRB also conducted a public meeting on July 15, 2004 in Devils Lake, North Dakota to hear the perspectives of local residents on the issue of rising Devils Lake water levels and the construction of an emergency outlet. Ramsey County, People to Save the Sheyenne, and Spirit Lake Nation were invited to present their views and concerns. Representatives from these groups, except Spirit Lake Nation, participated in the public forum.

Greenway on the Red and *Rivers West* were also invited to provide an overview of their activities to the public forum. Both entities represent an important contribution to riparian management along the Red River and its tributaries serving many interdependent purposes such as flood damage reduction, conservation, restoration, and recreation.

In light of the IRRB flood-related responsibilities in the basin, the Minnesota Red River Basin Flood Damage Reduction Work Group was invited to share its experience with Board members and others in attendance. The insights, approaches and achievements of the Work Group were well received.

In addition, the Lake Winnipeg Stewardship Board addressed the public forum with a brief overview of its goals and objectives and current activities, sharing with attendees its downstream basin perspectives.

The July 13-15 meetings were attended by IJC Commissioners J. Blaney and A. Olsen, Secretaries L. Bourget and M. Clamen, and Advisors T. Bailey, R. Trowbridge, and M. Colosimo.

4.02 Living with the Red

In January 2003, the IJC requested the IRRB to provide a written report on actions taken by governments at all levels in implementing the recommendations contained in *Living with the Red*. With external Canadian

funding, a basin-wide survey and analysis of flood preparedness and mitigation activities was conducted by R. Halliday & Associates Ltd. in cooperation with the Canadian Water Resources Association. The preliminary results were presented to the IRRB annual meeting in July 2003 and a draft report was circulated to IRRB members for review and comment. The final report titled *Flood Preparedness and Mitigation in the Red River Basin* was received in October 2003. Subsequently, the IJC gave approval for the Board to release the report so that it is available for discussion and use throughout the basin.

The survey results indicate that expenditures since 1997 relating to the IJC recommendations are in the order of hundreds of millions of dollars and that similar amounts will be spent in the next five years. Although considerable progress has been made in increasing preparedness for major floods and in mitigating potential harm from future floods, not all recommendations have been implemented. Further, it is unlikely that a few of the recommendations will be implemented. Recommendations involving construction of structural features, and those aimed at single agencies, have achieved greatest success, while those recommendations involving multiple agencies and multiple objectives, have achieved less success. The results also indicate that it may take considerable effort to achieve the level of inter-agency and intergovernmental cooperation needed to assure cohesion on flood management and long-term resiliency in the basin.

Following receipt of the final survey report, the IRRB undertook an assessment of the findings:

- to ascertain its satisfaction with regard to progress being made in implementing the IJC recommendations;
- to identify, with supporting discussion, which activities as reflected in the survey results, current and future, are deemed most important; and
- to evaluate the specific follow-up activities proposed for the IRRB in the survey report.

This assessment indicates IRRB agreement with the Halliday survey analysis and conclusions. Members are also satisfied with the progress that has been made to-date, noting that additional progress has been made since the survey was completed, particularly with respect to flood protection for major communities such as Grand Forks and Winnipeg, and toward resolution of the Pembina River flooding issue.

Member responses to the Halliday report further emphasised the need for continued and concerted effort to address those IJC recommendations entailing multiple objectives and inter-jurisdictional cooperation. The latter recommendations relate to initiatives such as: development of resiliency measures; development of elevation and hydrological models; continued development of a 'decision information network'; and, development of a binational integrated flood mitigation strategy for the basin. Members indicated that a comprehensive flood mitigation plan as proposed by the IJC in January 2003 would provide an appropriate mechansim to mobilize the multi-jurisdictional cooperation and commitment necessary to effectively address these challenges. The proposed comprehensive flood mitigation plan is discussed in Section 4.03.

4.03 Comprehensive Flood Mitigation Plan

In its report *Living with the Red*, the IJC noted that there is no single solution to reduce, mitigate and prevent harm from future flooding, and that comprehensive, integrated, binational approaches must be pursued and implemented. The report follows with the recommendation - "Governments immediately take steps, on a binational basis, to begin development of a comprehensive flood damage reduction plan for the Red River basin".

In January 2003, in cooperation with the IRRB and Red River Basin Commission (RRBC), the IJC organized a meeting of senior officials to discuss a strategy to move forward with development of a comprehensive plan for flood mitigation. Subsequent to this meeting, the IJC identified a number of specific activities integral to the development of such a plan. These included a status report on actions taken by governments with respect to flood mitigation as discussed in Section 4.02, and a framework document setting out the vision and agreed-upon approach for the development of the comprehensive plan. Following completion of these steps, a meeting with the Governors of North Dakota, Minnesota and South Dakota and the Premier of Manitoba would be sought to endorse the vision and framework and to initiate the real work of developing the comprehensive plan.

At the request of the IJC, a draft framework document was prepared by the RRBC in September 2004 in

consultation with the IRRB, and further refined by the IJC for limited distribution and comment. The proposed flood mitigation plan is intended to build on the Memmorandum of Understanding For Flood and Drought Mitigation on the Red River that was signed by the Governors of North Dakota, Minnesota and South Dakota and the Premier of Manitoba in April 2004. Further, the plan would recognize current efforts lead by the RRBC to develop a Natural Resources Framework Plan (NRFP) for the basin that encompasses flood mitigation. Hence, while addressing the flood mitigation challenges outlined in Section 4.02, the proposed plan would contribute to and become an integral part of the NRFP.

At present, the draft framework document is under review by the RRBC and IRRB to ensure that it appropriately captures the elements of a basin-wide and binational plan for flood mitigation.

4.04 Towards Measures of Resiliency in the Red River Basin

Living with the Red presents two specific recommendations dealing with basin resiliency - the ability of communities to resume normal activity following a disaster. The recommendations state that "Measures of flood resiliency should be developed, and a system should be established to monitor resiliency in the Red River basin", and "To improve resiliency in the basin, governments should support enhanced research into the various social dimensions of the flood, including economic, psychological, public health and sociological impacts".

While expenditures since 1997 clearly leave basin communities less vulnerable to future floods and hence more resilient, the concepts of flood resilience, as opposed to flood resistance, require further exploration. Intuitively, a better understanding of these concepts would contribute to more effective and efficient flood plain management.

In 2004, with Environment Canada external funding, the IRRB commissioned a discussion paper on the subject of flood resiliency and its interpretation for the Red River basin. The paper titled *Towards Floodplain Resiliency in the Red River Basin*, which was presented at the July 2004 annual meeting by water resources consultant and author R. Halliday, proposed a basis for characterizing flood plain resiliency and for defining measures that can be monitored over time. Board members were encouraged to engage in further discussion regarding this matter and to contribute to the establishment of resiliency measures that can serve the responsible basin agencies in a practical manner. The Board is committed to making further advances in this area, particularly within the context of integrated flood plain management and the [IJC] watersheds initiative discussed in Section 4.05.

4.05 IJC International Watersheds Initiative

A vision for watershed boards, or councils, to provide an improved mechanism for avoiding and resolving transboundary disputes was proposed by the IJC in its 1997 report *The IJC and the 21st Century*. In 1998, governments accepted in principle the Commission's proposal and directed the IJC to further define how the watershed boards would operate, provide cost projections and funding sources, and make recommendations for the first binational watershed board(s). In its December 2000 progress report to governments *Transboundary Watersheds*, the IJC recommended the IRRB as a pilot watershed board and recommended sufficient funds be provided by governments.

Subsequently, the IJC engaged the IRRB in discussions to determine how the concept could be moved forward. In 2003, discussion papers were prepared by the IRRB and IJC identifying the challenges that may arise and how these may be addressed, as well as to outline more explicitly a vision for the basin. Overall, the merger of the former IJC boards to create the IRRB, with expanded mandate and membership, has greatly contributed to the achievement of the goals of a watershed board. The IJC has recognized that it needs to work closely with the IRRB to ensure appropriate structure and process for the Board, and that sufficient resources are available to support the necessary activities.

Principles For The Commission And Its Boards Regarding The Watersheds Initiative

The IJC, with the assistance of its Boards, will:

1. *Provide independent and objective advice to the governments in keeping with its role under 1909 Boundary Waters Treaty.*
2. *Apply independence, impartiality, and participation by Canada and the United States in arriving at recommendations in the context of the watershed initiative, as they do in all aspects of the IJC's work and process.*
3. *Maintain a key role in monitoring transboundary water issues and will continue to undertake the activities assigned to the Commission by the governments under references.*
4. *Pursue partnerships and improve collaboration and information sharing to avoid duplication with other groups and will assist in preventing and resolving disputes related to transboundary water resources. These arrangements should in no way compromise the IJC's independence and impartiality.*
5. *Seek consensus in developing advice for resolution of transboundary issues.*
6. *Promote understanding and capacity-building at the watershed level to better anticipate and respond to the range of water-related and other environmental challenges.*
7. *Address transboundary water issues in an integrative manner, including both biophysical and human considerations.*
8. *Provide neutral forums in which federal, state, provincial and other interests meet to discuss issues, develop ideas, coordinate activities, and reconcile differences in the common interest of both countries.*
9. *Encourage bringing knowledge, experience and resources from the two countries to bear on local cross-border issues.*

The IJC is currently preparing its second report to governments under the International Watershed Board reference of November 1998. In the interim, the IJC has approved *Principles For the Commission and its Boards Regarding the Watersheds Initiative*. The watersheds initiative recognizes that organizations within watersheds are interdependent, that many have unique monitoring, coordination or management responsibilities, but no organization currently has a comprehensive transbounday watershed management mandate. The 'principles' included herein suggest broadening outreach and cooperation with other basin entities to enhance the work of the IRRB and to assist in building local capacity to address current and emerging issues. Determined application of these principles will enable the IRRB to better serve its mandate in the basin and to support the IJC.

It is anticipated that governments will provide tangible support to the IJC and its Boards to enhance the the current efforts toward implementation of the watersheds initiative.

4.06 Lower Pembina River Flooding

The Pembina River originates in the Turtle Mountains area of south central Manitoba, flowing easterly than southerly into North Dakota, entering the Red River about three kilometres south of the international boundary. There is very little gradient in the lower reaches of the system and flooding has been a natural and common occurrence. The natural flood pattern is for breakout flows from the main stem of the Pembina River in the vicinity of Neche, North Dakota to move away from the river and overland into the Tongue River watershed to the south, or north toward Canada and eastward to the Red River. To some extent, these flow regimes are influenced by the timing and magnitude of flood levels on the Red River. Going back as early as the 1940s, control works such as dikes and raised roads have been implemented in the lower reaches of the Pembina River in an effort to mitigate flood impacts. These works cumulatively have changed the natural flow patterns in the basin reducing flooding in some areas and increasing flooding in others.

The IJC investigations on measures to develop the water resources of the Pembina River basin in the early 1960s resulted in a number of recommendations regarding flood control for the basin. Over the intervening years various follow-up studies and negotiations between Manitoba and North Dakota have taken place to improve drainage in the United States and to increase the capacities of the receiving channels such as the South

Buffalo and Aux Marais systems in Manitoba. Issues related to cost-sharing of projects and differences regarding the efficacy of projects have militated against resolution of the problem. More recently, non-permitted levees along the Pembina River in North Dakota were removed and alternative set-back levees from the City of Niche to near the confluence with the Tongue River have been proposed. There is concern that these actions may exacerbate flooding in some areas if provision for the storage of water along the system, or diversion of water across the international boundary is not provided. Further, in May 2004, Pembina County communities served a statement of claim on the government of Manitoba for damages resulting from the boundary road-dike.

In July 2003, in light of the long-standing unresolved nature of the drainage and flooding issues in the watershed, the Pembina River Basin Advisory Board (PRBAB) formally requested the assistance of the IRRB to find an effective and acceptable solution. In response to this request, and with funding support from the IJC and Environment Canada, the IRRB assembled a three-person Pembina Study Team comprising one member from North Dakota, one member from Manitoba, and an independent team chairperson, to work with the PRBAB and its appointees. The Study Team was asked to define the drainage and flooding issues in objective terms and to recommend strategies for moving toward a resolution.

In April 2004, the Pembina Study Team submitted a draft report to the IRRB Secretariat. The report titled *Lower Pembina River Flooding - A Report to the International Red River Board* provided an historical review of drainage and flooding mechanisms in the basin, an assessment of flood control measures recommended in previous investigations and those that have been implemented, and an overview of the prevailing perceptions. The report presented eight conclusions with respect to a potential long-term solution to the flooding problem, and six recommendations for action by the IRRB and government agencies.

At its July 2004 annual meeting, the IRRB discussed the draft report with the Study Team and PRBAB. As a result of these discussions, the Study Team was asked to meet with affected local communities for additional input, to consider all comments received, and to submit a final report to the Board. In September 2004, a final report representing the end result of this effort was submitted to the IRRB.

The conclusions and recommendations identify three potential components to any solution to lower Pembina River flooding:

- the first is to flood-proof urban centres and rural buildings to a specified flood protection level, most likely the 100-year flood. To a considerable extent, this has already been accomplished. In effect, this flood-proofing transforms the problem to one of farmland and road protection.
- the second component would be set-back levees along a critical reach of the Pembina River to provide primarily summer flood protection to farmland.
- the third component would be adjustments to openings in the boundary road-dike and County Road 55, and to associated drainage systems, to accommodate natural flows.

The IRRB fully endorses the Study Team conclusions and recommendations. The IRRB further agrees with the Study Team that the recommendations represent a significant undertaking that encompasses a number of elements, including the determination of acceptable agricultural flood risk, development of watershed elevation models, development of hydrological models and reassessment of drainage patterns, design of set-back levees and drainage infrastructure, and implementation. The IRRB proposes to continue to work with the PRBAB and to lend its support to the US Army Corps of Engineers for a planning study that would define the details of a solution. The IRRB also supports the Study Team recommendation that relevant agencies be prepared to participate in such a planning study and to contribute to the funding of solutions. The IRRB has indicated this approach to the IJC and has asked the PRBAB for their response and suggestions.

In the near term, the IRRB has identified specific actions that would greatly advance progress in this matter. These actions include:

- hydraulic modelling of bridge crossings on the Red River at the international boundary. This modelling effort would confirm the hydraulic effect of the structures on water levels upstream;

- inventory of culvert structures and their conveyance capacity along the boundary road-dike and County Road 55; and
- Lidar mapping of lower Pembina River basin to facilitate hydrological model development and determination of drainage patterns and overflow requirements.

The IRRB has requested financial support from the IJC to initiate some of these short term activities with the expectation that appropriate funds will be available in early 2005.

4.07 International Red River Board Technical Committees

The IJC Directive to the IRRB assigns responsibility for recommending appropriate strategies to the Commission concerning water quality, water quantity and aquatic ecosystem health objectives in the basin. To effectively address this responsibility and to maintain a capacity to assist the Commission in preventing and resolving transboundary disputes, the Board established two committees, a Hydrology Committee and an Aquatic Ecosystem Health Committee. Specific activities assigned to the Committees include establishing natural flow and water usage databases, evaluating current water quality monitoring and reporting protocols, developing biological monitoring strategies, and developing recommendations on an interjurisdictional drainage policy for the basin. Section 4.07 provides a status report on progress being made within these activity themes during the current reporting period.

4.07.1 Biological Monitoring and Nutrient Management

At its annual meeting in July 2004, the IRRB endorsed a number of recommendations put forward by its Aquatic Ecosystem Health Committee (AEHC). These efforts constitute a significant part of the IRRB work plan and represent important progress with respect to biological monitoring and nutrient management in the basin. The recommendations follow.

<u>Biological Monitoring</u>

With IJC funding and co-sponsorship support from the Red River Basin Institute and US Bureau of Reclamation, the AEHC held a workshop in March 2004 focussed on developing a framework for basin-wide biological monitoring based on reference sites. The AEHC reported acceptance of the approach by participating agencies and outlined the following recommended next steps, including funding requirements.

1. Conduct two biological assessment workshops to develop specific monitoring protocols and final work plan proposals:
   - wadeable tributaries - US $20,000
   - mainstem Red River - US $20,000

2. Conduct basin-wide aquatic ecosystem health assessment comprising:
   - 30 sites per jurisdiction (Minnesota, North Dakota, and Manitoba for a total of 90 sites)
   - estimated total cost of US $300,000
   - request 50% financial support from IJC (US $150,000)

Cost share options and time lines will require further exploration in recognition that there is a level of compatible monitoring activity presently occurring in the basin.

<u>Nutrient Management</u>

In May 2004 the AEHC met to consider the Manitoba proposal that water quality objectives for nitrogen and phosphorus be established for the Red River at the international boundary. The Manitoba proposal reflects concern about the continued eutrophication of Lake Winnipeg.

Given the current knowledge of the factors contributing to the trophic state of Lake Winnipeg and the technical challenge of establishing meaningful long-term nutrient objectives at the international boundary, the AEHC provided the following three recommendations which have the support of the participating agencies.

1. Protect/restore Lake Winnipeg trophic status.

2. Participating jurisdictions and water management agencies work towards reducing Red River nutrient loading to meet the interim goal of reducing nutrient loading into Lake Winnipeg by 10% over the next five years.

3. Participating jurisdictions and water management agencies work toward replacing the interim goal with a science based goal/targets.

The AEHC will report to the IRRB in July 2005 on progress being made.

As evidenced by the work of the AEHC, there is a high level of cooperation and collaboration amongst participating agencies with respect to biological monitoring and nutrient management in the basin. The IRRB is exploring funding opportunities with the IJC, and other facilitation opportunities to enable tangible progress with respect to these recommendations.

4.08 Notification Protocol for Intensive Livestock Operations

In 2002, at the direction of the IRRB, a Notification Protocol for Intensive Livestock Operations proposing to locate near the international boundary was developed and approved by the Board. The purpose of the protocol is to share information on issues of mutual concern and to resolve transboundary issues associated with intensive livestock operations prior to operation.

During the present reporting period, concerns regarding a proposed 6,000-hog farm operation located approximately one kilometre north of the international boundary in the Municipality of Stanley, were brought to the attention of Manitoba Water Stewardship and North Dakota Department of Health through the Notification Protocol. The hog farm proposal was withdrawn following public hearings in Manitoba and as a result of the significant opposition to the proposal expressed by local communities and residents from both sides of the international boundary.

To enable a wider sharing of information on issues of mutual concern, technical materials and other correspondence associated with the Notification Protocol will be provided to the Red River Basin Commission.

4.09 Poplar River Basin

Although not geographically in the Red River basin, the mandate of the IRRB includes the Poplar River, previously the responsibility of the International Souris-Red Rivers Engineering Board (ISRREB). This responsibility originates with the 1975 IJC instructions to the ISRREB to investigate equitable apportionment alternatives on the East Poplar River near Coronach, Saskatchewan in consideration of the thermal power station and cooling reservoir being constructed by the Saskatchewan Power Corporation. In 1976, the ISRREB recommended an apportionment formula to the IJC. Subsequently, in 1978, the IJC recommended an apportionment formula to governments for the East Poplar River.

Further, in 1977 the governments refered the matter of water quality to the IJC. The IJC Water Quality Task Force completed its report in 1981 providing the basis for flow-weighted objectives of numerous water quality parameters including *total dissolved solids* (TDS) and *boron*. The International Air Pollution Advisory Board provided advice to the Commission about air pollution potential from the power plant.

The Coronach power station began operation in 1981. Although Canada and Saskatchewan have not accepted the IJC apportionment formula and water quality objectives, both formula and objectives have been followed by Saskatchewan throughout the intervening years.

Bilateral Monitoring Committee

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

Monitoring data on surface water quantity and quality, groundwater quality, and air quality are collected at or near the international boundary and exchanged annually. The Bilateral Monitoring Agreement, which was extended for another five years by the Department of Foreign Affairs & International Trade and the State Department in April 2002, will expire in March 31, 2007.

Current Issues/Activities

In 2003, apportionment of the Poplar River was met including the minimum flow criteria.

The long-term objectives for TDS and *boron* were not exceeded in 2003. Concerns over an upward trend in the concentrations of TDS in the East Poplar River between the late 1980s and 1995 were investigated in a report to the Committee prepared in May 2002. This report indicated that the temporal changes in TDS concentration were most likely linked to natural drought events.

Two of the primary concerns in recent years include: (1) Saskatchewan believes that the current apportionment formula is not equitable, and (2) Montana is concerned about water quality issues, particularly the closeness of TDS to the long-term water quality objective proposed by the IJC.

In regard to the apportionment concerns, Saskatchewan and Montana agree that it would be useful to reopen discussions from a few years ago on this matter but do not feel there is immediate urgency to do so. In the meantime, Saskatchewan is still committed to following the arrangement as recommended by the IJC.

At its annual meeting held in Helena, Montana on June 18, 2003, the Bilateral Monitoring Committee reviewed its water quality monitoring data and concluded that there were no immediate water quality issues. With regard to *boron* and TDS, monitoring information since the mid 1970's shows both parameters below the short-term water quality objectives of 3.5 mg/L and 1,500 mg/L, respectively. Further statistical analysis of the data by Montana concluded that the temporal changes in *boron* and TDS are most likely linked to persistent drought conditions and that there is no statistical difference between TDS concentrations in the 1976 -1985 time frame compared to the 1986-1995 period.

As a result of this review of the data, the Bilateral Monitoring Committee agreed that in 2004 it would reduce surface water quality sampling at the East Poplar River station at the international boundary and that monitoring of *specific conductance* using an in situ auto-monitor would be sufficient. The US Geological Survey (USGS) will supplement the *specific conductance* information with four grab samples per year. In 2003, Environment Canada collected six *boron* and TDS grab samples and the USGS collected four samples.

In 2004, the number of *boron* and TDS samples collected was reduced further, with the USGS continuing to collect four samples and Environment Canada collecting none.

The Bilateral Monitoring Committee also agreed that three major "red flags" should be established – events that would indicate that increased sampling is again required: 1. Changes in the operation of the power plant; 2. *Specific conductance* values show an apparent increasing trend (this may require 5-year reviews of statistical relationships to confirm actual changes vs. flow-related changes); 3. Increased development in the basin.

Reservoir Levels

Cookson Reservoir water level was at an elevation of 751.26 m (72.0 % of FSL) on January 1, 2004 and remained at 752.44 m (87.5 % FSL) by September 27, 2004, as well.

Environmental Assessment

In 2004, Environment Canada received a proposal from Luscar Ltd. to expand its coal mining operation in the Poplar River basin. The coal will be used to run SaskPower's thermal power plant near Coronach, Saskatchewan. Luscar has been operating a surface strip mine in the Poplar River North mine since 1994. This proposal would be an extension of that mining operation. Mining of the expanded area would begin in 2008 with construction of powerline infrastructure, haul road, and the start of overburden removal. Pit development would begin in 2010 and be completed in 2017. The extension would cover an area of 12 sections with three open pits. The Province of Saskatchewan has determined that this proposal meets their definition of a "development", hence, an Environmental Impact Assessment (EIA) is required. Saskatchewan is the lead agency and the provincial assessment process would be followed. Environment Canada could provide advice and comments as required.

5. WATER QUALITY AT THE INTERNATIONAL BOUNDARY

The water quality of the Red River at the international boundary, as described herein, is based on continuous monitoring and instantaneous grab samples obtained during the 2003 water year (October 01, 2002 - September 30, 2003). The data are used to determine compliance with established IJC water quality objectives at the boundary and in meeting the provisions of the Boundary Waters Treaty of 1909. Detection of exceedences of the objectives serves as a trigger mechanism for agencies to take appropriate action to prevent or to mitigate potential problems, and to minimize the potential for reoccurrence. Environment Canada carries the responsibility for providing this monitoring service for the IRRB and maintains a permanent water quality and water quantity data collection site at Emerson, Manitoba.

The five parameters for which the IJC has approved objectives are discussed below along with streamflow and *pH* characteristics for a corresponding time period.

Water quality characteristics at other locations throughout the basin are referenced in subsequent chapters of this report to provide a more complete spatial representation of water quality and aquatic ecosystem health conditions in the Red River basin.

5.01 Hydrology, *pH* and Temperature

Streamflow

During the 2003 water year, the Red River basin experienced a mild and dry winter followed by a generally dry summer. Daily flows ranged from a maximum of 402 m^3/s (14 196.0 ft^3/s) in July 2003 as a result of summer rains, to a minimum of 12.8 m^3/s (452.0 ft^3/s) and lower decile condition in September 2003. The mean discharge of the Red River at the international boundary during the 2003 water year was approximately 86.0 m^3/s (3 036.0 ft^3/s). The long term mean discharge is about 108 m^3/s (3 813.0 ft^3/s).

The streamflow characteristics of the Red River at the international boundary for the water years 1971 through 2003, are illustrated in Figure 2 of Appendix D.

pH and Temperature

During the reporting period, the observed *pH* and temperature values for the Red River remained within the normal range. However, some inconsistencies were again observed between the auto-monitor and grab sample *pH* values that would suggest calibration and/or reliability problems with the auto-monitor. The latter may be attributed to the maintenance procedures employed, which are being evaluated.

The operational status of the auto-monitor during the reporting period is described in detail in Section 6.04.

5.02 Water Quality Objectives

As described in Appendix B, in 1969, the IJC established objectives for a limited number of water quality variables for the Red River at the international boundary. These variables are *dissolved oxygen*, *total dissolved solids*, *chloride*, *sulphate*, and *fecal coliform* bacteria. The IRRB is responsible for monitoring and reporting on compliance with these objectives.

Dissolved Oxygen

During the 2003 water year, *dissolved oxygen* (DO) field measurements remained well above the IJC objective of 5.0 mg/L. DO values ranged from 17.7 mg/L in December 2002 to 6.42 mg/L in June 2003.

Total Dissolved Solids and Specific Conductance

A number of marginal exceedences of the *total dissolved solids* (TDS) objective of 500 mg/L were observed from June through September 2003. The observed values ranged from 513 mg/L to 612 mg/L coinciding with

the unusually low water conditions in the Red River. Flows in the Red River were estimated at the lower decile level during this time period. Observed TDS in the preceding months were also elevated approaching the IJC objective with a low of 393 mg/L in October of 2002.

Chloride

The *chloride* objective (100 mg/L) was exceeded very marginally in September 2003 at the observed value of 101 mg/L. Typically, *chloride* values during the 2003 water year were significantly lower than the objective ranging from 38.6 mg/L in October 2002 to 71.3 mg/L in February 2003.

Sulphate

The *sulphate* objective (250 mg/L) was not exceeded during the 2003 water year; however, elevated levels ranging from 227 mg/L to 247 mg/L were observed from May through July of 2003. The remaining observations ranged from 84.9 mg/L in October 2002 to 185 mg/L in October 2003.

Bacteriological Characteristics

The bacteriological characteristics of the Red River are assessed on the basis of observed *fecal coliform* bacteria for which an IJC objective (200 colonies per 100 ml) has been defined. During the 2003 water year, fecal coliform counts were well below the IJC objective typically ranging from 6 to 13 colonies per 100 ml. A singular high value of 92 colonies per 100 ml was observed in June 2003.

There is a consensus in the science community that the presence of *e-coli* bacteria provides a more appropriate measure of bacteriological conditions. Environment Canada has undertaken *e-coli* monitoring for the 2004 water year and will report on these findings, in addition to the established *fecal coliform* procedures, in the next [2005] IRRB annual report.

5.03 Alert Levels

The concept of alert levels was introduced in November 1984 by the former International Red River Pollution Board to complement the existing IJC water quality objectives. Subsequently, alert levels for the most significant water chemistry variables were developed and approved by the Pollution Board in January 1986. Further, a compendium of the analytical methods used by the member agencies was prepared in 1990 and is included in Appendix B. This compendium will be reviewed and updated in the coming months by the Aquatic Ecosystem Health Committee.

Based on a total of 12 water samples, 11 pesticides and/or herbicides with a total aggregate of 76 exceedences (>detection concentration) were recorded during the October 01, 2002 - September 30, 2003 reporting period. The exceedence level data are summarized in Table 2.

The presence of pesticides/herbicides and heavy metals in the Red River will continue to be closely monitored. It is noted that low levels of cadmium, copper, lead and zinc are endemic to the Red River.

Table 2. Exceedences of Alert Levels, Red River at International Boundary (Emerson, Manitoba)

Parameter	Units	Alert Level	Number of Exceedences	Exceedence Values		Canadian Aquatic Life Guidelines
				Min	Max	
Lindane	ng/L	DL*	7	0.15	1.50	10
Clopyralid	ng/L	DL*	11	2	272	NG
Dicamba	ng/L	DL*	9	2	64	10,000
MCPA	ng/L	DL*	10	3	176	2,600
2-4-D	ng/L	DL*	12	16	132	4,000
Bromoxynil	ng/L	DL*	3	3	63	5,000
Atrazine	ng/L	DL*	11	10	698	NG
Desethylatrazine	ng/L	DL*	8	57	161	1,800
Metolachlor	ng/L	DL*	3	25	285	7,800
Imazethapr	ng/L	DL*	1	-	2.2	NG
Picloram	ng/L	DL*	1	-	10.7	29,000

*DL = Detection Limit
NG = No Guideline Established

5.04 Summary of Water Quality Conditions

During the reporting period, no unusual deviations or significant exceedences of the IJC water quality objectives were observed. However, *sulphate* concentrations, while not exceeding the objective, were elevated from May through July of 2003, and *chloride* concentrations marginally exceeded the objective in September of 2003. More pervasive exceedences of the TDS objective, although marginal, were observed from June through September 2003. The elevated concentrations can be attributed in part to low flow conditions in the Red River and reduced dilution that more normal flows would provide.

Dissolved oxygen field measurements remained well above the IJC objective throughout the 2003 water year, and *fecal coliform* counts were generally well below the IJC objective.

Given that the Red River basin is an agriculturally dominated region, detection of pesticides and herbicides in the Red River at low concentrations is expected. Eleven of the pesticides and herbicides for which alert levels have been established by the former International Red River Pollution Board were detected during the reporting period at low levels and well below the Canadian Aquatic Life Guidelines.

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

6. WATER QUALITY SURVEILLANCE PROGRAM

As noted in Chapter 5, data collected at Emerson, Manitoba, are used to determine compliance with established IJC water quality objectives at the international boundary. It is noted that in 1995, the IJC approved a revised Directive to the former International Red River Pollution Board broadening the focus of Board responsibilities from water chemistry to concepts of water quality and ecosystem health. The present IRRB Directive (Appendix A) embodies this broadened scope of responsibility.

Chapter 6 contains a synthesis of data and information contributed by IRRB member agencies to provide a more complete spatial representation of water quality and aquatic ecosystem health conditions in the Red River basin. The data and information were distributed to all IRRB members for review and discussion during the July 2004 IRRB annual meeting.

U.S. Water Quality Standards Program

In the United States, the statutory basis for the current Water Quality Standards (WQS) program is the Clean Water Act. Under Section 303 of this Act, the Environmental Protection Agency (EPA) issued a Water Quality Standards Regulation (40 CFR Part 131). This regulation specifies the requirements and procedures for developing, reviewing, revising, and approving WQS by the States and Tribal Nations. EPA has approved WQS programs for the States of North Dakota, South Dakota, and Minnesota. No tribal programs in the Red River basin have yet been approved.

WQS define the water quality goals for a water body or portion thereof, by designating the use or uses to be made of the water, and implementation criteria for protecting each of those uses or areas. Additionally, a WQS program must include an anti-degradation policy to protect water quality that is already better than state standards. Designated uses for water bodies may include:

- Aquatic life - protection of fish and other aquatic organisms;
- Recreation - swimming, wading, boating, and incidental contact;
- Drinking water - protection for downstream public water supply intakes;
- Miscellaneous - industrial or agricultural uses, tribal religious use, etc.

Water quality standards are designed to protect the beneficial uses associated with the standards. Based on the assessment of the water quality data and other relevant information compared to the standards for a given pollutant or water quality characteristic, the use may be:

- Fully supported
- Partially supported
- Threatened
- Not supported

6.01 Minnesota

Ambient Water Quality Monitoring Program

To meet its obligations under the federal Clean Water Act, the Minnesota Pollution Control Agency (MPCA) monitors water quality twice every five years at 10 sites on the Red River of the North and at confluences with large tributaries. This monitoring is known as Minnesota Milestone; it will occur next in Spring 2005. The parameters measured at these sites are *ammonia*, *dissolved oxygen*, *turbidity*, *pH*, *fecal coliform*, *e-coliform*, *chloride* and *specific conductance*. In addition, where stream flow records are available, *chlorophyll-A*, *total suspended solids*, *total volatile solids*, *total phosphorus* and *BOD* were also sampled. Data from water quality sampling at these sites is entered into the US EPA's STORET database.

Under the Minnesota Milestone program, 1, 508 stream miles of the 17,838 miles in the basin, were assessed in the current cycle. For the Red River basin, this equates to nearly 10 percent of the streams, which is slightly higher than the statewide average of 5 percent of the streams assessed for water quality

purposes. About 900 miles, or 60 percent, met water quality standards and were found to be supporting aquatic life. About 235 miles of streams, or 16 percent, were fair, or threatened for aquatic life.

This means that at least 10 percent of the samples did not meet state or federal standards. Another 360 miles of streams, or about 24 percent of streams assessed, were poor, or did not support aquatic life; for these streams, at least 25 percent of samples did not meet state standards. The MPCA convened its best professional judgment meeting to assess the attainment of water quality standards in the Red River basin in July 2003, and its report to Congress was released in Winter 2004. Following is a list of standards compared to the International Joint Commission (IJC) water quality objectives established for the international boundary.

Table 3. Minnesota Water Quality Standards and IJC Water Quality Objectives

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

Table 4. Minnesota Milestone Sites in the Red River Basin

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

Minnesota Milestone water quality monitoring does not provide enough information to characterize water quality across a watershed, or basin, and it does not provide data to establish trends in water quality over time. Therefore, the MPCA facilitated the establishment of the Red River Basin Water Monitoring Network to provide more comprehensive information about water quality.
Data gathered by the Red River Basin Monitoring Network is used to:

- assess loadings of sediments and nutrients to tributaries of the Red River;
- establish a baseline to measure trends in water quality over time;
- provide a basis for establishing goals for water quality improvement, and
- help managers assess performance of practices and projects in achieving water quality goals.

Chemical conditions are assessed up to 20 times over the high flow season (typically April through July); these measures include water *temperature*, *dissolved oxygen*, *pH*, *conductivity*, *turbidity*, nutrients and sediments. These parameters are collected at the mouths of the major tributaries (defined as contributing 100 cubic feet per second to the Red River of the North and draining at least 300 square miles in area). The Red River Basin Monitoring Network has professionally credible operating procedures and quality assurance measures to assure high quality information.

This type of monitoring enables managers to statistically analyze the amount of constituents in water over time and space. Monitoring sites have been established in coordination with the existing Minnesota Milestone sites and U.S. Geological Survey staff gage sites.

Members of the Red River Basin Monitoring Network are the organizations and agencies interested in, or responsible for, managing water resources in the Minnesota portion of the Red River basin. This includes, but is not limited to, the following:

- Watershed Districts
- Red River Basin Watershed Management Board
- MPCA
- Minnesota Department of Natural Resources
- Red River Basin Commission
- Red River Basin Institute
- University of Minnesota Crookston
- Energy and Environment Research Center at University of North Dakota

Management is provided by an advisory committee, composed of organizations and agencies interested in water quality of the Red River basin in Minnesota. MPCA is the responsible party for the Network. Fiscal administration is provided by the Red River Basin Watershed Management Board. Day to day coordination is provided by two fulltime staff. MPCA has assigned a monitoring coordinator to provide training for participants, implement the monitoring plan and acquire, distribute and maintain equipment. Network members provide advice on the monitoring plan, data analysis and interpretation. Participating members also provide resources in support of monitoring, including equipment, staff and dollars, where feasible.

Results are entered into a MS Access database by Red River Basin Monitoring Network staff. MS Access reports are provided to MPCA Environmental Outcomes staff for entry into STORET, the national water quality data base. MS Access reports are also provided to the Red River Basin Commission, for entry into the Red River Basin Decision Information Network. The Red River Basin Monitoring Advisory Committee presents annual summaries of monitoring to the Red River basin watershed districts and other resource managers.

Results for the 2003 sampling year indicate that overall conditions were dry. Storm events were associated with elevated levels of nutrients and sediments in the upper basin, particularly the Bois de Sioux watershed. Generally, sampling results showed that loads from the Wild Rice and Red Lake watersheds exceeded ecoregion expectations. On average, the Red River at Hallock carried more than 16,000 pounds of total phosphorus.

Impaired Waters Program

MPCA has initiated a state-wide stakeholder involvement process, which resulted in recommendations for management of the state's impaired waters program, covering policy, public participation and funding.

Regionally, 17 studies are in place in the Red River basin: four to be completed in 2004; 10 to be completed in 2005; three new reaches are recommended for addition in the 2004 list. Following is a list of impaired streams together with the parameters of primary concern and analysis.

- Clearwater River trout stream - fecal coliform; delisting will be recommended as impairment could not be verified. Initial impaired condition was likely due to high water in 1993 and bypasses at City of Bagley; city has upgraded its WWTP and moved its discharge point; illustrates the reactive nature of TMDLs.

- Walker Brook - dissolved oxygen; about 90 percent of the stream is very deep with very anoxic groundwater; there are one or two human sources (feedlot and wetland disturbance due to road building) that will be addressed using farm resources. This stream runs east to west, but ground

water moves laterally through it – entering from a high glacial formation on the river's south side and exiting in wetlands north of the stream. MPCA is working to change the water quality standard for this stream to reflect its glacial geology.

- Upper Red -TMDLs; technical work by U.S. Geological Survey; local input through counties and watershed districts; coordinated by MPCA staff.
  Lower Otter Tail-fecal coliform; another delisting; locals to do a septic survey and work with riparian property owners on upgrades;
  Lower Otter Tail-turbidity; about two-thirds of the samples collected at Breckenridge exceed the state standard for turbidity. The annual load of sediment needs to be reduced by 7,000 tons, from approximately 40,000 tons to 33,000 tons, to achieve the standard. Sediment is delivered to the stream via wind erosion, overland runoff and stream channel erosion.

- Moorhead-TMDLs: two locations, three impairments (two for fecal coliform and one for turbidity); all impairments are being substantiated through monitoring.

6.02 North Dakota

Ambient Water Quality Monitoring Program

During the reporting period October 1, 2002 to September 30, 2003, the North Dakota Department of Health conducted ambient chemical monitoring at 17 sites in the Red River basin (Table 5).

Table 5. North Dakota Department of Health Ambient Water Quality Monitoring Sites within the Red River Basin.

Station Number	Station Description
385055	Bois de Sioux near Doran, MN [1]
380083	Red River at Brushville, MN
380031	Wild Rice River near Abercrombie [1]
385040	Red River near Harwood
380010	Sheyenne River at Warwick [1]
380009	Sheyenne River 3 mi E of Cooperstown [1]
380153	Sheyenne River below Baldhill Dam [1]
380007	Sheyenne River at Lisbon
385001	Sheyenne River near Kindred [1]
384155	Maple River at Mapleton [1]
380156	Goose River at Hillsboro [1]
384156	Red River at Grand Forks [1]
380037	Turtle River at Manville
380039	Forest River at Minto [1]
380157	Park River at Grafton [1]
380158	Pembina River at Niche [1]
384157	Red River at Pembina [1]

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

Sites were sampled during the open water period at six week intervals beginning in April and concluding in October. In addition, one sample was collected in late January 2003 under ice. This schedule resulted in a maximum of eight 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 (total recoverable), nutrients, total suspended solids and pathogens (Fecal coliform, E. coli and Enterococcus sp.) (Table 6). In addition, field measurements for temperature, pH, dissolved oxygen and specific conductance were taken.

Table 6. North Dakota Department of Health Water Quality Variables Analyzed

Field Measurements	Laboratory Analysis			
	General Chemistry	Trace Elements	Nutrients	Biological
Temperature	Sodium	Aluminum	Ammonia	Fecal coliform
pH	Magnesium	Antimony	Nitrate-ntrite	E. coli
Dissolved Oxygen	Potassium	Arsenic	Total Kjeldahl Nitrogen	Enterococcus sp.
Specific Conductance	Calcium	Barium	Total Nitrogen	
	Manganese	Beryllium	Total Phosphorus	
	Iron	Boron		
	Chloride	Cadmium		
	Sulfate	Chromium		
	Carbonate	Copper		
	Bicarbonate	Lead		
	Hydroxide	Nickel		
	Alkalinity	Silver		
	Hardness	Selenium		
	Total Dissolved Solids	Thallium		
	Total Suspended Solids	Zinc		

The Department enters all of its water quality results in the Surface Water Quality Management Program's Sample Indentification Database (SID). Each year data are exported to the U.S. Environmental Protection Agency's STORET database.

6.03 Manitoba

Ambient Water Quality Monitoring

Water quality continues to be monitored monthly at two sites on the Red River within Manitoba by Manitoba Water Stewardship. 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*. Variables and frequency are shown in Table 7.

Routine monitoring is also conducted on five tributary streams to the Red River by Manitoba Water Stewardship. Samples are collected four times per year and analyzed for a wide range of variables including physical, general chemistry, suspended sediment, bacteria, industrial organics, trace elements, plant nutrients, and agricultural chemicals. Locations and variables monitored are shown in Table 8. In addition, beginning in 1995, benthic macroinvertebrates have been collected at each routine monitoring site on the tributary streams once each year. Macroinvertebrate data have been assessed as indicators of ecosystem health. Results have been reported by Hughes (2001). Beginning in 2002, macroinvertebrate samples were also collected from the Red River at Emerson and from the Red River at Selkirk.

Manitoba Water Stewardship continues to work on a province-wide Nutrient Management Strategy. Research completed as part of the Nutrient Management Strategy (Jones and Armstrong 2001, Bourne et al. 2002) lead to the development of the Lake Winnipeg Action Plan. The Lake Winnipeg Action Plan, announced by the Government of Manitoba on February 18, 2003, is a commitment to reduce nitrogen and phosphorus loads to Lake Winnipeg to pre-1970s levels. The Lake Winnipeg Action Plan recognizes that nutrients are contributed by most activities occurring within the drainage basin and that reductions will need to occur across all sectors. Action under the six-point plan includes:

- establishment of a Lake Winnipeg Stewardship Board to help Manitobans identify further actions necessary to reduce nitrogen and phosphorous to pre-1970 levels in the lake by 13 percent or more, subject to further findings of the Nutrient Management Strategy;
- introduction of new measures to help protect natural growth along the Red and Assiniboine rivers to prevent erosion and reduce nutrient run-off into the rivers to complement the Riparian Areas Tax Credit introduced in 2001;
- provision of a program to expand soil testing to ensure appropriate fertilizer application in both rural and urban settings;
- introduction of a new sewage and septic field regulation that will outline clear standards for the placement of systems;
- development of a shoreline protection project in partnership with Manitoba Hydro to help address erosion concerns; and
- commencement of cross-border nutrient management discussions.

As part of cross-border nutrient management discussions, Manitoba has proposed that water quality objectives be set for both nitrogen and phosphorus in the Red River at the international boundary to assist in achieving nutrient reductions to Lake Winnipeg. Similarly, Manitoba will implement reductions in nitrogen and phosphorus from municipal, industrial, agricultural, and other sources within Manitoba to assist in meeting the commitments in the Lake Winnipeg Action Plan.

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 unchanged comparable to past years. Dissolved oxygen levels were relatively good with the average level being 10.3 mg/L downstream of the City of Winnipeg and 9.8 mg/L upstream of Winnipeg. The lowest value rcorded of 6.3 mg/L occurred in July 2003 downstream of the City of Winnipeg.

Densities of *Escherichia coli* bacteria continued to remain elevated downstream of the City of Winnipeg. Average density downstream of the City of Winnipeg was 293 organisms/100 mL, elevated as compared to

the previous reporting period (189 organisms/100mL), while the average density in the upstream reach was 13 organisms/100 mL. The exceedance rate of the Manitoba Water Quality Standards, Objectives, and Guidelines for the protection of recreation was 58% downstream of the City of Winnipeg, while no exceedances were observed immediately upstream of Winnipeg.

During this reporting period, seven pesticides were detected out of the 54 monitored. The herbicide bromoxynil was detected in samples collected both upstream and downstream of the City of Winnipeg on July 2, 2003. The herbicides 2,4-D and dicamba were also detected both upstream and downstream of the City of Winnipeg on April 7, 2003. Downstream of the City of Winnipeg, dicamba was also detected during July and September 2003, and 2,4-D was detected in September 2003. MCPA and MCPP were both detected downstream of the City of Winnipeg with MCPA detected in April and July 2003, and MCPP detected in September 2003. Atrazine was detected once in August 2003 downstream of the City of Winnipeg. Pentachlorophenol was also detected downstream of the City of Winnipeg during October and December of 2002. None of the detections for bromoxynil, 2,4-D, or atrazine 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. However, each detection of dicamba and MCPA exceeded the guideline developed by the Canadian Council of Ministers of the Environment (CCME) for protection of irrigation uses. In addition, concentrations of pentachlorophenal in October 2002 exceeded the guideline developed by the CCME for protection of freshwater aquatic life.

In accordance with recommendations of the IJC to governments following the 1997 flood in the Red River basin, Manitoba Water Stewardship in partnership with Fisheries and Oceans Canada have been monitoring toxaphene concentrations in Lake Winnipeg fish. Data collected for 2003 have not yet been analyzed and will be made available in the next IRRB annual report.

6.04 Environment Canada

Auto-Monitor at Emerson, Manitoba

Water quality monitoring and data collection using an automatic monitor began in May 2002 and has continued to the present. The auto-monitor collects *chloride*, *pH*, *conductivity*, *temperature* and *dissolved oxygen* data which are augmented by monthly grab samples for these and other parameters as noted in Chapter 5. The monitor was inoperable April 7-16, 2003 due to sediment screen problems and again on August 19, 2003 when the pump failed due to sediment abrasion of the impellers. The auto-monitor was operational again on September 19, 2003. During the latter down-time, the intake lines and sediment trap were flushed.

Following the 2004 freshet, the conductivity and pH sensors were upgraded and appeared to work well until about mid May. The prevailing high water levels prevented routine maintenance and calibration of the senors and the data logger. In June the malfunctioning pH sensor was replaced and data collection was resumed. Subsequent data transmission interuptions were also experienced in July and August.

Except for significant discontinuities in the pH data stream in 2004, data for the other parameters were available for the most part in real-time on the USGS website.

Table 7. Surface water quality monitoring activities on the Red River (main stem) within Manitoba, Canada during the period October 1, 2002 to September 30, 2003.

Variables	Floodway Control (Manitoba Water Stewardship)	Floodway Control (City of Winnipeg)	Fort Garry Bridge (City of Winnipeg)	Norwood Bridge (City of Winnipeg)	Redwood Bridge (City of Winnipeg)	Chief Peguis Bridge (City of Winnipeg)	Lockport (City of Winnipeg)	Selkirk (Manitoba Water Stewardship)
Temperature	Monthly	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	Monthly
Turbidity	Monthly	2 times / month				2 times / month	2 times / month	Monthly
Colour	Monthly							Monthly
Dissolved Solids	Monthly							Monthly
Suspended Solids	Monthly	2 times / month				2 times / month	2 times / month	Monthly
Total Solids	Monthly	2 times / month				2 times / month	2 times / month	Monthly
Total Coliform		2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	
Escherichia coli	Monthly	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	Monthly
Enterococcus		2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	
pH	Monthly	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	Monthly
Conductivity	Monthly	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	Monthly
Dissolved Oxygen	Monthly	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	Monthly
Alkalinity	Monthly							Monthly
Calcium	3 times / annum							Monthly
Magnesium	3 times / annum							Monthly
Hardness	3 times / annum							9 times / annum
Sodium	3 times / annum							Monthly
Potassium	3 times / annum							Monthly
Chloride	3 times / annum							Monthly
Sulphate	3 times / annum							Monthly
Total Phosphorus	Monthly	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	Monthly
Dissolved Phosphorus	Monthly							Monthly
Suspended Phosphorus	Monthly							Monthly
Nitrate – Nitrite Nitrogen	Monthly	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	Monthly
Total Kjeldahl Nitrogen	Monthly	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	Monthly
Ammonia Nitrogen	Monthly	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	Monthly
Chlorophyll – *a*		2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	9 times / annum
Total Organic Carbon	Monthly	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	Monthly
Total Inorganic Carbon	Monthly	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	2 times / month	Monthly
Boron	3 times / annum							9 times / annum
Arsenic	3 times / annum							9 times / annum
Aluminum	3 times / annum							9 times / annum

Table 7.Continued.

Variables	Floodway Control (Manitoba Water Stewardship)	Floodway Control (City of Winnipeg)	Fort Garry Bridge (City of Winnipeg)	Norwood Bridge (City of Winnipeg)	Redwood Bridge (City of Winnipeg)	North Perimeter (City of Winnipeg)	Lockport (City of Winnipeg)	Selkirk (Manitoba Water Stewardship)
Manganese	3 times / annum							Monthly
Iron	3 times / annum							Monthly
Hexavalent Chromium	3 times / annum							9 times / annum
Nickel	3 times / annum							9 times / annum
Copper	3 times / annum							9 times / annum
Zinc	3 times / annum							9 times / annum
Lead	3 times / annum							9 times / annum
Cadmium	3 times / annum							9 times / annum
Antimony	3 times / annum							9 times / annum
Barium	3 times / annum							9 times / annum
Beryllium	3 times / annum							9 times / annum
Bismuth	3 times / annum							9 times / annum
Cobalt	3 times / annum							9 times / annum
Cesium	3 times / annum							9 times / annum
Lithium	3 times / annum							9 times / annum
Molybdenum	3 times / annum							9 times / annum
Rubidium	3 times / annum							9 times / annum
Selenium	3 times / annum							9 times / annum
Strontium	3 times / annum							9 times / annum
Thallium	3 times / annum							9 times / annum
Tin	3 times / annum							9 times / annum
Tellurium	3 times / annum							9 times / annum
Titanium	3 times / annum							9 times / annum
Uranium	3 times / annum							9 times / annum
Vanadium	3 times / annum							9 times / annum
Tungsten	3 times / annum							9 times / annum
Zirconium	3 times / annum							9 times / annum
Pentachlorophenol	3 times / annum							9 times / annum
2,4-D	3 times / annum							9 times / annum
2,4-DB	3 times / annum							9 times / annum
2,4-DP	3 times / annum							9 times / annum
2,4,5-TP	3 times / annum							9 times / annum
Bromoxynil	3 times / annum							9 times / annum
Dicamba	3 times / annum							9 times / annum
Dinoseb	3 times / annum							9 times / annum
Fenoxaprop	3 times / annum							9 times / annum
MCPA	3 times / annum							9 times / annum
MCPP	3 times / annum							9 times / annum
Picloram	3 times / annum							9 times / annum
Quizalofop	3 times / annum							9 times / annum
Trichlopyr	3 times / annum							9 times / annum

Table 7. Continued.

Variables	Floodway Control (Manitoba Water Stewardship)	Floodway Control (City of Winnipeg)	Fort Garry Bridge (City of Winnipeg)	Norwood Bridge (City of Winnipeg)	Redwood Bridge (City of Winnipeg)	North Perimeter (City of Winnipeg)	Lockport (City of Winnipeg)	Selkirk (Manitoba Water Stewardship)
Azinphosmethyl	3 times / annum							9 times / annum
Chlorpyrifos	3 times / annum							9 times / annum
Diazinon	3 times / annum							9 times / annum
Dimethoate	3 times / annum							9 times / annum
Malathion	3 times / annum							9 times / annum
Methyl Parathion	3 times / annum							9 times / annum
Parathion	3 times / annum							9 times / annum
Terbufos	3 times / annum							9 times / annum
Deltamethrin	3 times / annum							9 times / annum
Diclofop	3 times / annum							9 times / annum
Diclofop-methyl	3 times / annum							9 times / annum
Eptam	3 times / annum							9 times / annum
Ethafluralin	3 times / annum							9 times / annum
Propachlor	3 times / annum							9 times / annum
Propanil	3 times / annum							9 times / annum
Triallate	3 times / annum							9 times / annum
Trifluralin	3 times / annum							9 times / annum
Chlorthalonil	3 times / annum							9 times / annum
gamma-BHC (Lindane)	3 times / annum							9 times / annum
alpha-Chlordane	3 times / annum							9 times / annum
gamma-Chlordane	3 times / annum							9 times / annum
Methoxychlor	3 times / annum							9 times / annum
Carbofuran	3 times / annum							9 times / annum
Propoxur	3 times / annum							9 times / annum
Alachlor	3 times / annum							9 times / annum
Atrazine	3 times / annum							9 times / annum
Bromacil	3 times / annum							9 times / annum
Metribuzin	3 times / annum							9 times / annum
Simazine	3 times / annum							6 times / annum
Glyphosate	3 times / annum							1 time / annum
Imazethabenz								6 times / annum
Metsulfuron-me								6 times / annum
Thifensulfuron								6 times / annum
Tribenuron								6 times / annum
Methoprene								1 time / annum
Atrazine desethyl	3 times / annum							9 times / annum
Cyanazine	3 times / annum							9 times / annum
Captan	3 times / annum							9 times / annum
Tebuthiuron	2 times / annum							8 times / annum
Chloropyrifos	1 time / annum							5 times / annum

Table 8.Surface water quality monitoring activities on tributaries to the Red River within Manitoba, Canada during the period October 1, 2002 to September 30, 2003.

Variables	Boyne River PTH 13, Carman	La Salle River St. Norbert, PTH 75	Rat River PR 303 near Otterborne	Roseau River PR 200, near Dominion City	Seine River PTH 100 (Perimeter Highway)
Macroinvertebrate community structure	1 time / annum	1 time / annum	1 time / annum	1 time / annum	1 time / annum
Temperature	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Turbidity	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Colour	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Dissolved Solids	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Suspended Solids	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Total Solids	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Escherichia coli	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
pH	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Conductivity	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Dissolved Oxygen	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Alkalinity	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Calcium	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Magnesium	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Hardness	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Sodium	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Potassium	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Chloride	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Sulphate	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Total Phosphorus	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Dissolved Phosphorus	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Suspended Phosphorus	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Nitrate – Nitrite Nitrogen	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Total Kjeldahl Nitrogen	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Ammonia Nitrogen	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Chlorophyll – *a*	1 time / annum	1 time / annum	1 time / annum	1 time / annum	1 time / annum
Total Organic Carbon	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Total Inorganic Carbon	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Boron	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Arsenic	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Aluminum	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Manganese	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Iron	4 times / annum	4 times / annum	4 times / annum	4 times / annum	4 times / annum
Hexavalent Chromium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Nickel	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Copper	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Zinc	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Lead	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Cadmium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Antimony	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Barium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum

Table 8.Continued.

Variables	Boyne River PTH 13, Carman	La Salle River St. Norbert, PTH 75	Rat River PR 303 near Otterborne	Roseau River PR 200, near Dominion City	Seine River PTH 100 (Perimeter Highway)
Beryllium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Bismuth	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Cobalt	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Cesium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Lithium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Molybdenum	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Rubidium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Selenium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Strontium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Thallium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Tin	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Tellurium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Titanium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Uranium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Vanadium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Tungsten	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Zirconium	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Pentachlorophenol	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
2,4-D	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
2,4-DB	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
2,4-DP	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
2,4,5-TP	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Bromoxynil	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Dicamba	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Dinoseb	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Fenoxaprop	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
MCPA	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
MCPP	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Picloram	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Quizalofop	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Trichlopyr	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Azinphosmethyl	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Chlorpyrifos	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Diazinon	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Dimethoate	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Malathion	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Methyl Parathion	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Parathion	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Terbufos	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Deltamethrin	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Diclofop	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Diclofop-methyl	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Eptam	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum

Table 8.Continued.

Variables	Boyne River PTH 13, Carman	La Salle River St. Norbert, PTH 75	Rat River PR 303 near Otterborne	Roseau River PR 200, near Dominion City	Seine River PTH 100 (Perimeter Highway)
Ethafluralin	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Propachlor	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Propanil	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Triallate	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Trifluralin	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Chlorthalonil	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
gamma-BHC (Lindane)	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
alpha-Chlordane	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
gamma-Chlordane	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Methoxychlor	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Carbofuran	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Propoxur	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Alachlor	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Atrazine	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Bromacil	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Metribuzin	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Simazine	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Glyphosate	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Atrazine desethyl	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Cyanazine	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Captan	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Chlorpyrifos	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum
Tebuthiuron	3 times / annum	3 times / annum	3 times / annum	3 times / annum	3 times / annum

7.0 WATER POLLUTION CONTROL

7.01 Contingency Plan

The contingency was adopted by the former International Red River Pollution Board on January 1, 1981. Contacts and telephone numbers are included in Appendix C.

The purpose of the contingency plan is to ensure that positive coordinated action is taken to minimize public health hazards and environmental damage in the event of a spill. This plan does not supersede any local or national contingency plans in existence but rather serves to coordinate these activities. The plan becomes effective whenever the discharge of a pollutant within the Red River basin has the potential to adversely impact the Red River. The plan also becomes effective at any time when exceedances of either water quality objectives or alert levels as described in Chapter 5 are observed at the international boundary.

The contingency plan, presently under review, is available from the IRRB.

7.02 Spills and Releases

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. Compliance with technical review criteria in water quality permits is monitored monthly by permittees. MPCA staff review reported exceedances. In some cases, enforcement action is required. Five of the basin's permitted municipal wastewater treatment plants reported bypasses during the water year. Of these, two resulted in elevated enforcement actions. Some of the bypasses were attributed to weather conditions.

North Dakota

There was minor localized flooding in the state compared to the last several years. Most of the state experienced near normal to dry conditions. There were nine bypasses/lagoon overflows reported to the department in the Red River Valley. The total number of discharges and total volume of water discharged for this reporting period resembled near normal conditions.

Manitoba

Three municipalities with populations greater than 1000 discharge treated effluents directly to the Red River within Manitoba. The Town of Morris discharges for a short period of time each spring and fall, while the City of Winnipeg's South End Water Pollution Control Centre, the North End Water Pollution Control Centre, and the Town of Selkirk discharge continuously. Volumes and quality of effluent has not changed significantly from previous years. In addition to the two major wastewater treatment facilities within the City of Winnipeg, discharges also occur from 21 private wastewater treatment plants, 79 combined sewer outfalls, and 90 major land drainage outfalls.

Most tributary streams also receive treated wastewater effluents from nearby communities.

On September 16, 2002, a valve failed at the City of Winnipeg's North End Water Pollution Control Centre allowing about 462,500 cubic metres of untreated sewage to flow to the Red River during a period of approximately 60 hours. As a result of this incident, the Minister of Conservation asked the Manitoba Clean Environment Commission to hold public hearings and to investigate the causes of the spill, its consequences, and other matters related to discharge limits for the City of Winnipeg's sewage treatment facilities. Public hearings were held in January and April 2003.

The Clean Environment Commission released a final report on the public hearings in August 2003. The main recommendations included immediate steps in support of the nutrient reduction targets of the Lake

Winnipeg Action Plan, planning for nutrient removal at all three treatments plants, combined sewer upgrades within 20-25 years, and public notification of raw sewage releases into the river by 2004. Both Manitoba and the City of Winnipeg support the recommendations of the Clean Environment Commission. The City of Winnipeg has committed to meeting the nutrient targets of the Lake Winnipeg Action Plan as recommended by the Clean Environment Commission (10 % reduction in phosphorus and 13 % reduction in nitrogen) by the end of 2006. Consistent with the Clean Environment Commission recommendations, Manitoba is working with the City of Winnipeg on a much greater nutrient reduction with the upgrade of all three wastewater treatment plants.

7.03 Pollution Abatement and Advisories

Minnesota

Point Source Control Program

The Minnesota National 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.
The Minnesota Pollution Control Agency has permitted 109 facilities to discharge wastewater into the Red River or its tributaries. Of these facilities, 85 are municipal permits, and 22 are industrial permits. There are 14 facilities discharging more than 1 million gallons per day in the Minnesota portion of the Red River basin. These facilities are split between those discharging municipal wastes and those discharging industrial wastes.
In the 2003 water year, 18 water quality permit actions occurred as follows:

Nine wastewater treatment facilities were reissued permits to discharge; five were municipal and four were industrial.

- One new minor municipal wastewater treatment facility was issued a permit.
- One minor wastewater treatment facility, and one minor industrial wastewater treatment facility, were reissued general permits to discharge;
- One minor municipal and one minor industrial wastewater treatments facility were issued new general permits to discharge;
- One minor municipal facility was issued a major modification to their permit;
- Two minor facilities, received administrative modification to permits;
- One major industrial facility received a minor permit modification; and
- Four major industrial wastewater treatment plants (discharging more than 1 million gallons daily) were reissued a permit.

Stormwater Permits

Construction projects disturbing one acre or more of land require a General NPDES Storm Water Permit. The objective of this permitting program, which is a part of the National Pollutant Discharge Elimination System (NPDES), is to reduce the amount of sediment/pollution entering surface waters both during and after construction projects.
Construction activities requiring a permit include landscape clearing, grading, excavation, road building, and construction of homes, office buildings, industrial parks, landfills and airports.

Customers of this program include anyone involved in construction in Minnesota. This includes developers, builders, architects, design engineers, surveyors, city/county highway departments, and the Minnesota Department of Transportation. During this reporting period, XX construction stormwater permits were issued in the Red River Basin.

Feedlots

The MPCA is the principal agency for regulating feedlots in Minnesota. In addition, 55 counties (as of February 2003) administer some of the MPCA's feedlot program responsibilities. There are approximately 29,000 registered feedlots in Minnesota, of which approximately 1,570 are located in the thirteen Red River basin counties. As of October 2001, the MPCA has focused much of its resources on providing National Pollutant Discharge Elimination System (NPDES) permit coverage to the large feedlots (1,000 or more animal units). As a result, over 500 NPDES permits have been issued statewide, with 15 issued in the Red River basin. The MPCA has made it a goal to expand its field presence by making site inspections a priority. Between 2001 and 2003, the MPCA staff conducted over 1,300 inspections. Other areas the MPCA has made a priority are education, compliance and enforcement and land application of manure. Future challenges for the MPCA's feedlot program include managing a voluntary compliance effort for smaller feedlots, maintaining a strong county feedlot program, and developing new approaches for bringing feedlots into compliance with state regulations.

Toxics - *Mercury*

There have been no changes to Minnesota's approach to monitoring and managing the effects of mercury on aquatic ecosystems.

Power plants and other sources of air pollution from outside Minnesota account for about 90 percent of the mercury entering the state. Using an effective combination of voluntary and legislative approaches, Minnesota has reduced mercury emissions by 68 percent since1990 and expects that figure to be at least 70 percent by next year. Two of the major power companies serving communities in the Red River basin have had voluntary agreements to reduce mercury for more than five years.

MPCA also sponsors a mercury research program in partnership with other state agencies and the Science Museum of Minnesota to analyze the effects of mercury on lakes of the state. More than two-thirds of the state's waters listed as impaired are polluted with mercury. Most of these have fish consumption advisories. Minnesota will use the results of its mercury research to develop restoration plans for these impaired waters.

Water Quality Programs and Initiatives

In 2003, Governor Tim Pawlenty announced a Clean Water Initiative, which included establishment of a "Clean Water Cabinet", the development of a proposal for the next generation of Minnesota's Conservation Enhancement Program (CREP), and the creation of a series of regional pilot projects across the state that represent a "watershed approach" to enhancing water quality.

Two pilot projects are currently being developed in the Red River basin. One project is located in the Red Lake River Watershed and involves Grand Marais Creek. The project includes wetland restoration, storage of flood waters and, eventually, restoration of streambanks where the Grand Marais enters the Red Lake River. The second project is located in the Buffalo River Watershed near Moorhead. It involves protection of Manston Slough, part of an extensive wet marsh and wetland area that supports several wildlife areas and a trout stream.

MPCA assessed its basin planning program defining new directions for release in December 2003. The overall objectives are to restore water quality impairments and to use the health of Lake Winnipeg as the water quality objective.

The Red River Basin Water Quality Team identified sediment transported via tributaries to the Red River of the North as its critical issue for the first planning period. The goal of the plan is to find ways to reduce the amount of sediment entering the Red River of the North via its tributaries.

Impaired Waters Program

MPCA has initiated a stakeholder involvement process resulting in recommendations for the management of the State's impaired waters program, covering policy, public participation and funding.

Seventeen studies are currently in place in the Red River basin: four to be completed in 2004; 10 to be completed in 2005; three new reaches recommended for addition in the 2004 list.

Special Studies

MPCA funds approximately 20 water quality initiatives annually, using money provided by the State of Minnesota and under Section 319 of the Clean Water Act. Projects funded in the Red River basin recently include the Red River Basin Buffer Initiative, which helps local government recruit staff to work with farmers to buffer stream corridors, and the Restorable Wetlands Project, which is led by the U.S. Fish and Wildlife Service, with cash contributed by the U.S. Army Corps of Engineers, St. Paul District, and the Minnesota Pollution Control Agency. The project uses aerial photography to identify drained, but restorable, wetlands. This documentation will aid the state and federal government in making decisions related to watershed planning, identifying and prioritizing wetland restorations for wildlife habitat, water quality enhancement and floodwater reduction benefits.

North Dakota

Point Source Control Program

The North Dakota Pollutant Discharge Elimination System (NDPDES) program regulates the release of wastewater and storm water from point sources into waters of the state. Permitted municipal and industrial point source dischargers must meet technology and water quality based limits.

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

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 municipal and industrial permittees 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. TIE's have resulted in minor and major wastewater upgrades to select municipalities and industries.
Wastewater discharge data during the reporting period October 1, 2002 to September 30, 2003 are presented in Table 9. In addition, the average BOD_5 and TSS values from permitted facilities for the years 1985 to 2003 are presented in Figure 2.

Pollution Abatement

The City of Fargo's wastewater treatment plant continues to provide a quality effluent on a continual basis to the Red River. Wastewater treatment consists of pretreatment/odor control, primary clarification, trickling filters, nitrification filters, final clarification and disinfection. The residuals management (biosolids) consists of digesters, sludge drying beds and belt presses, with the processed solids being used as cover at the municipal landfill. The city continues to explore several options to address the biosolids issue. Fargo still maintains their six, 90-acre wastewater stabilization ponds which can be used for storage during times of flooding or an upset in treatment plant. During this reporting period, the City experienced a heavy spring rain (2003) that resulted in an overflow from two lift stations to the Red River.

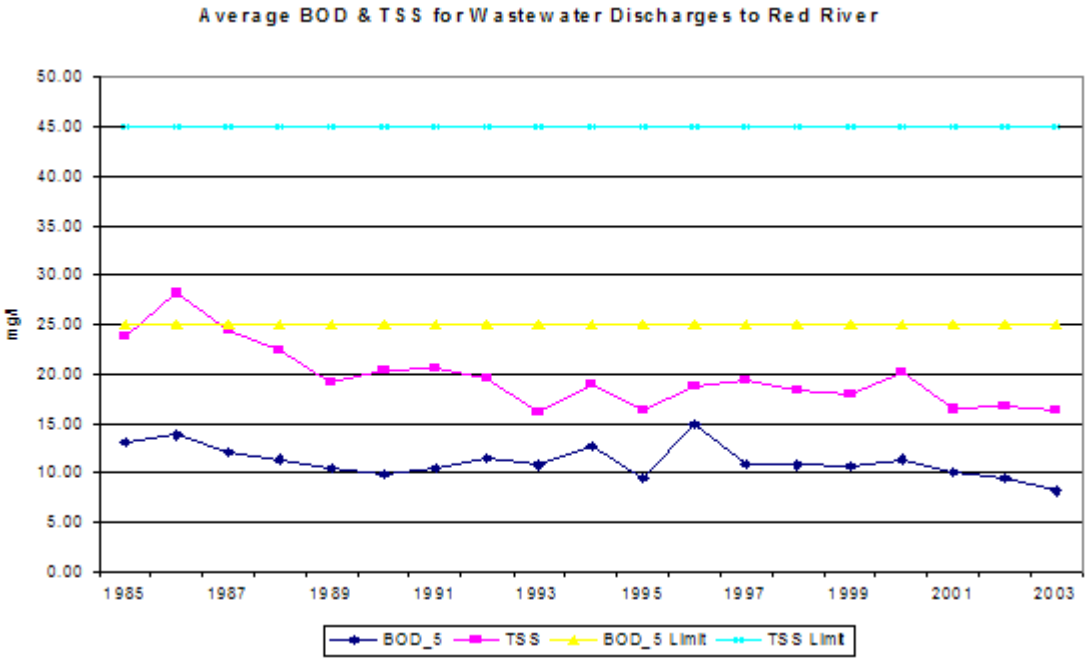


Figure 2. North Dakota Average BOD and TSS Values from Permitted Facilities for the Years 1985 to 2003

Cargill Corn Milling (ProGold) produces high fructose corn syrup at their facility near Wahpeton. The plant discharges select waste streams to the Red River on a continuous basis with storage ponds available to store
wastewater when treatment is inadequate or when the river would be adversely affected. Wastewater high in total dissolved solids is stored in two ponds on site. The discharges from these ponds must be coordinated with the conditions in the Red River, downstream users and discharges from Minn-Dak Farmer's Cooperative in order to meet the requirements of their permit.

American Crystal Sugar uses a combination of lagoons and constructed wetlands for wastewater treatment and polishing/finishing at both Hillsboro and Drayton. The final effluent from both these facilities surpasses the federal effluent criteria for sugar beet processing plants. The 1.5 MGD anaerobic digester and clarifier at the Hillsboro plant maximizes the performance of the existing aerobic digester resulting in a reduction of the feed water strength while maintaining a constant temperature throughout the season. This high quality water is routed to the wetland earlier in the season, maximizing the wetland's ability to treat the wastewater prior to discharge.

The Minn-Dak Farmer's Cooperative sugar beet processing plant uses both mechanical and facultative lagoons for wastewater treatment at the Wahpeton facility. The wastewater receives additional treatment/polishing in the large discharge reservoir from which the final effluent is discharged through an in-stream diffuser to the Red River. Minn-Dak continues to coordinate its discharges with Cargill, since both facility permits contain receiving stream quality requirements for sulfate, chloride, and total dissolved solids.

The City of Grand Forks started operation of their new wastewater treatment facility late fall 2002. The activated sludge plant uses a European technology of Micro-Bubble Flotation and is designed for 15 million gallons per day (MGD). After startup, the ground settled/shifted in the vicinity of the main conduit between two sections of the plant. A temporary repair was made, which allowed the plant to resume full-scale operation while a permanent solution is selected. Plant operations staff and the contractors are

Table 9. Waste Discharge Data for North Dakota during the Reporting Period October 1, 2002 to September 30, 2003

Source*	Length of Discharge Days	Total Flow M^3	Discharge Quality - mg/l						Discharge Rate Avg. M^3/day	BOD-5 Loading Avg. kg/day	TSS Loading Avg. kg/day	Time in Permit Compliance Percent
			BOD-5			TSS						
			High	Low	Avg.	High	Low	Avg.				
Drayton	10	105725.84	6	6	6	5	5	5	10572.584	63.4355	52.8629	100
Fargo	351	14624116	19	2.9	8.608	16.9	7.6	11.1	41664.148	358.659	462.472	100
Grafton	16	702874.52	6.9	6	6.1	14.5	7.8	10.043	43929.657	267.971	441.2	100
Grand Forks	70	5909331.3	20	6	9.506	25.2	6.84	15.213	84419.019	802.508	1284.22	100
Grand Forks AFB	25	389930.71	6.8	6	6.217	27	5	12.5	15597.228	96.9628	194.965	100
Wahpeton	32	1297498	21.1	9.27	13.24	127	4	46.66	40546.812	536.759	1891.91	93.4
West Fargo	65	1624749.1	13.1	4.95	8.1	29.2	8.3	19.95	24996.14	202.469	498.673	100
ACS-Drayton	122	622254	17	4	7.4	40	7.6	9.7	5100.4426	37.7433	49.4743	100
ACS-Hillsboro	145	492110.56	6	3	3.667	26.8	6.4	9.9	3393.866	12.4442	33.5993	100
Minn Dak	23	530959.8	16.8	4.9	9.433	25	4.4	13.467	23085.209	217.77	310.881	100
Cargill Inc	365	1794165.7	38.4	2	11.68	68	7	22.046	4915.5225	57.4215	108.367	96.2

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

continuing to fine tune the process controls to provide optimal wastewater treatment from the facility. Water from the treatment plant is routed to the stabilization ponds which the city continues to operate. In the future, the City should be discharging on a continual basis to the river. Work continues on the flood protection dike alignment which runs through the water treatment plant site and isolates the residuals handling facility from the rest of the plant. Treatment and operational practices have also been modified in the water treatment plant residuals handling facility. A lift station and force main to pump lime sludge out to the sludge storage ponds is now in operation at the residuals handling facility. The City continues to move forward on activities associated with a new water treatment plant which will be built east of Interstate 29 in the new industrial park. The raw water intake and transmission line from the river to the proposed treatment plant location has been completed and a large clearwell/reservoir has been constructed near the site also.

Manitoba

Pollution Abatement

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

All treated municipal effluents discharged to tributary streams within the Red River basin in Manitoba are licenced under Manitoba's Environment Act. Approximately nine private facilities located within the City of Winnipeg boundary are not yet licenced (out of the original 21 facilities un-licenced when the Environment Act came into effect in 1988). The nine facilities will receive licences within the next couple of years. Disinfection using ultra-violet light technology has been installed and is operational at the City of Winnipeg's South End Water Pollution Control Centre. Disinfection works have been developed for the City of Winnipeg's North End Water Pollution Control Centre and construction will occur in 2006. The City of Winnipeg, with input from an advisory committee including Manitoba Water Stewardship, has completed a major study on combined sewer overflows. A study into the impacts of un-ionized ammonia on the Red River began in late 1998 and was completed in mid-2001. The purpose of the study is to develop a site-specific water quality objective for ammonia and to identify applicable technologies to reduce ammonia levels in the wastewater prior to discharge. Discussions are underway to incorporate the findings of these studies into the Environment Act Licences for the City of Winnipeg that are currently under development by Manitoba Conservation.

8.0 BIOLOGICAL MONITORING IN THE RED RIVER BASIN

The International Red River Board (IRRB) and its predecessor, the International Red River Pollution Board, have been monitoring aquatic environmental conditions in the Red River basin for more than three decades. This long-term environmental monitoring has focused primarily on the chemical characteristics of the mainstem Red River, its tributaries, and Lake Winnipeg. The current Directive to the IRRB indicates the need for a more holistic, ecosystem-based, monitoring approach. To initially meet the requirements of the Directive, Chapter 8 presents a report on some aspects of aquatic biological conditions in the Red River basin. The data for this report have been obtained from a number of agencies and have been collected for a variety of reasons. In the future, other monitoring programs that are more relevant to the mandate of the IRRB need to be implemented to supplement the monitoring activities and available data identified in this report.

The aquatic monitoring report herein includes:

- an initial and preliminary list of the exotic fish species in the Red River basin,
- time trends for the Lake Winnipeg commercial fishery (1880s to present),
- algal blooms in Lake Winnipeg (2004),
- fisheries of the Red River in Manitoba,
- fish species composition at the international boundary on the Red River for 2003,
- macroinvertebrate assessment in tributaries to the Red River in Manitoba (1995 – 2001), and
- macroinvertebrate monitoring in the Red River basin in North Dakota.

8.01 Exotic Species in the Red River Basin

The intent of the IRRB is to provide for each year a complete list of the exotic species that have been found in the Red River basin and Lake Winnipeg. A number of activities have been undertaken recently to begin this task.

The IRRB Aquatic Ecosystem Health Committee work plan recognizes the need to be proactive with regard to monitoring non-native species. The Committee's recommendation to the IRRB in response to the original directive to the AEHC to *"develop recommendations and implementation details for monitoring non-native species in the watershed",* contains two actions items:

1. Full cooperation between participating agencies, universities, and others to report presence of all known and documented foreign, exotic, and non-native species to the IRRB at each annual meeting, and

2. Establishment of sampling protocols and reporting mechanisms for collection and identification of new non-native species.

In accordance with the direction given to the Committee by the IRRB, and as a first step in meeting the recommended course of action, the U.S. Bureau of Reclamation is undertaking work designed to examine invasive species. At the request of the North Dakota Health Department, the Bureau of Reclamation is using internal funds to complete an extensive literature review of exotic, invasive, and non-native species in the basin.

The original intent of this work was to complete the literature survey for the U.S. portion of the basin. However, during discussion at the July 2003 meeting of the AEHC in Winnipeg the Committee strongly recommended that the review cover both the U.S. and Canadian portions of the basin. The Bureau of Reclamation agreed to expand the scope of the work and increase the budget for the project and include the Canadian portion of the basin. Canadian members of the Committee agreed to provide relevant information from their respective agencies to the Bureau.

The objective of this work is to use existing data sources and literature to determine the spatial distribution of exotic, non-native and invasive species in the basin. The results of this work will be used to develop specific short term and long term monitoring strategies for existing species and for new species known to exist in other watersheds that could impact the Red River basin.

Work on the literature review is underway and is scheduled for completion in the spring of 2005. A report on the

results will be provided to the IRRB at the annual meeting in July 2005.

A number of exotic fish species have been recorded from the Red River and its tributaries in Manitoba and from Lake Winnipeg. Some of these fish species may not reproduce and therefore will or have become extinct. Two species, brook trout and lake trout, are native to the Nelson River and its tributaries in northern Manitoba. The list of exotic species include:

Goldfish (*Carassius auratus*)
Carp (*Cyprinus carpio*)
Rainbow smelt (*Osmerus mordax*)
Rainbow trout *(Oncorhynchus clarki*)
Brown trout (*Salmo trutta*)
Brook trout (*Salvelinus fontinalis*)
Lake trout (*Salvelinus namaycush*)
Arctic char (*Salvelinus alpinus*)
White bass (*Morone chrysops*)
Pumpkinseed (*Lepomis gibbosus*)
Bluegill (*Lepomis macrochirus*)
Smallmouth bass (*Micropterus dolomieui*)
Largemouth bass (*Micropterus salmoides*)
White crappie (*Pomoxis annularis*)

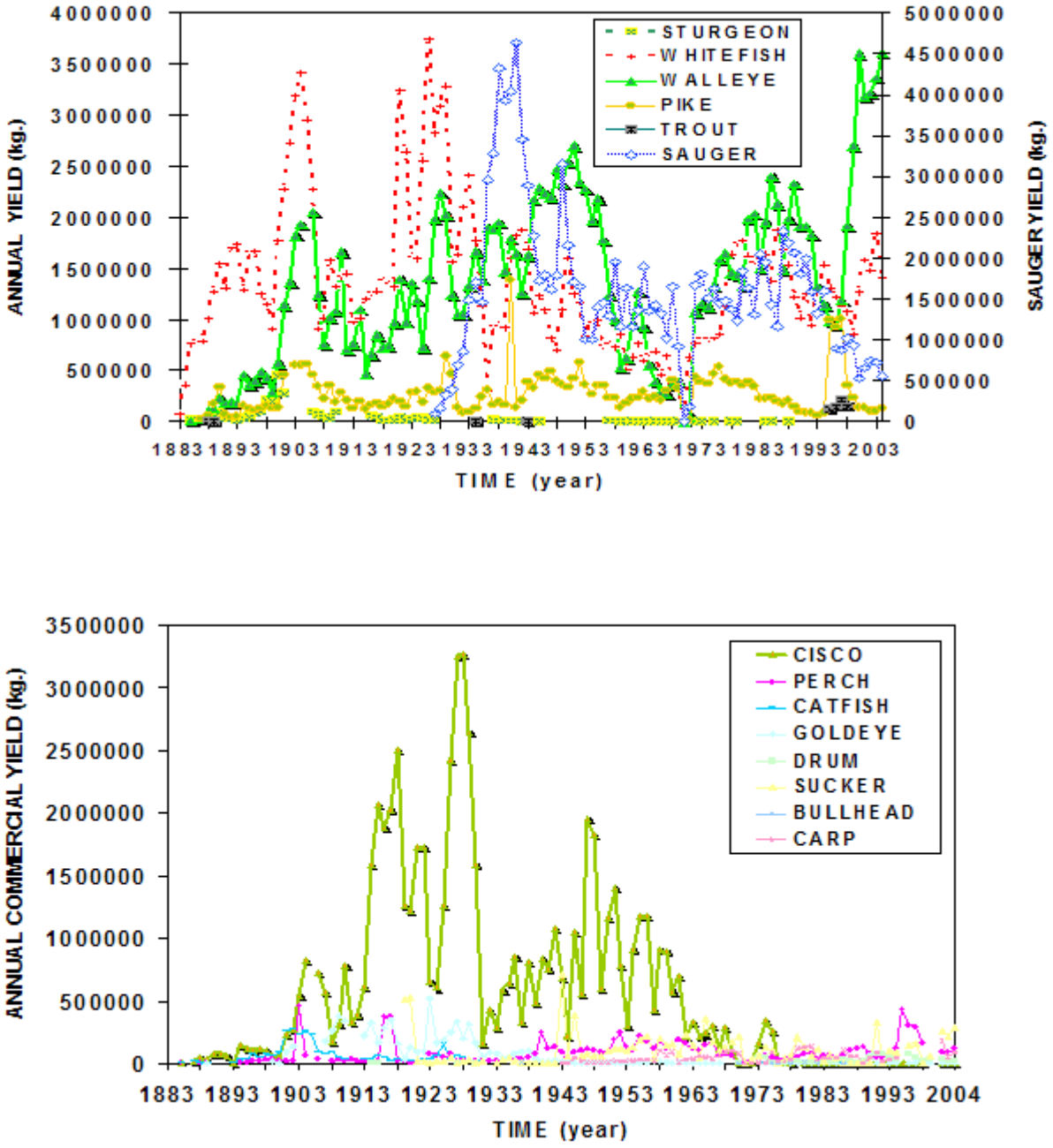
8.02 Lake Winnipeg Commercial Fishery

Lake Winnipeg has been commercially gillnetted since the 1880s. Sturgeon was the first species to collapse due to its biological inability to cope with excessive fishing effort. Annual yields of whitefish were highest in the 1920s and declined until the mercury closure in 1970. After the mercury closure, whitefish yields again increased until the mid-1980s and then declined erratically. The harvest of whitefish roe increased during the mid-1990s. Walleye and sauger yields were the highest after whitefish first began declining. Sauger yields declined from the mid-1980s to the present while walleye yields attained a historical maximum in 2000. Until 1970, yields were recorded as marketed weight. After 1970, yields were recorded as round equivalent weight by the Freshwater Fish Marketing Corporation (FFMC).

An annual quota of 6,400,000 kg is currently applied to the combined commercial fishery yield of walleye, sauger and whitefish. Walleye provide the greatest financial value and whitefish provide the least value. Quota entitlements were created in 1985. There are about 1649 quota entitlements for the summer, fall and winter commercial fisheries. Quotas can be “rolled” forward and backward. The current annual quota has never been attained. A temporally increasing number of “special dealer” permits allow fishers to sell their catch directly to consumers or retailers. Domestic and illegal fishing activities harvest unknown amounts of fish.

Cotton and linen gillnets were replaced by multifilament nylon nets in the early 1950s. Nylon nets were replaced by monofilament nets in the early 1990s. This has quadrupled the efficiency of a typical gillnet. Both trap nets and gillnets were permitted during the late 1960s. Minimum commercial mesh sizes range from 3 inch (stretched measure) in the southern basin to 3.75 inches in the northern basin. The minimum mesh size in the northern basin was 4.25 inches until 1991. Since 1992, the summer fishery in the southern basin does not commence until 80% of the walleye have spawned. Whitefish spawning does not control the opening date of the fall fishery.

Walleye yield declined after each time that it surpassed 1 kg. ha. $^{-1}$ (1950 and 1985). This is thought to be the upper limit of sustainable walleye yield in Lake Winnipeg. The sustainable yield formula developed by Baccante and Colby (1996) estimates that Lake Winnipeg can sustain an annual walleye harvest of 0.66 kg. ha. $^{-1}$ (1567500 kg.). Annual walleye yields are positively related to annual fishing effort.



Figures 3A and B. Annual yields of Lake Winnipeg commercial fishery

The extent of algal blooms in Lake Winnipeg can be monitored from satellite imagery. Figure 4 provides an example of a MODIS image taken on September 25, 2004 showing the algal blooms (dark) in the northern basin and the suspended sediment (light) in the southern basin.

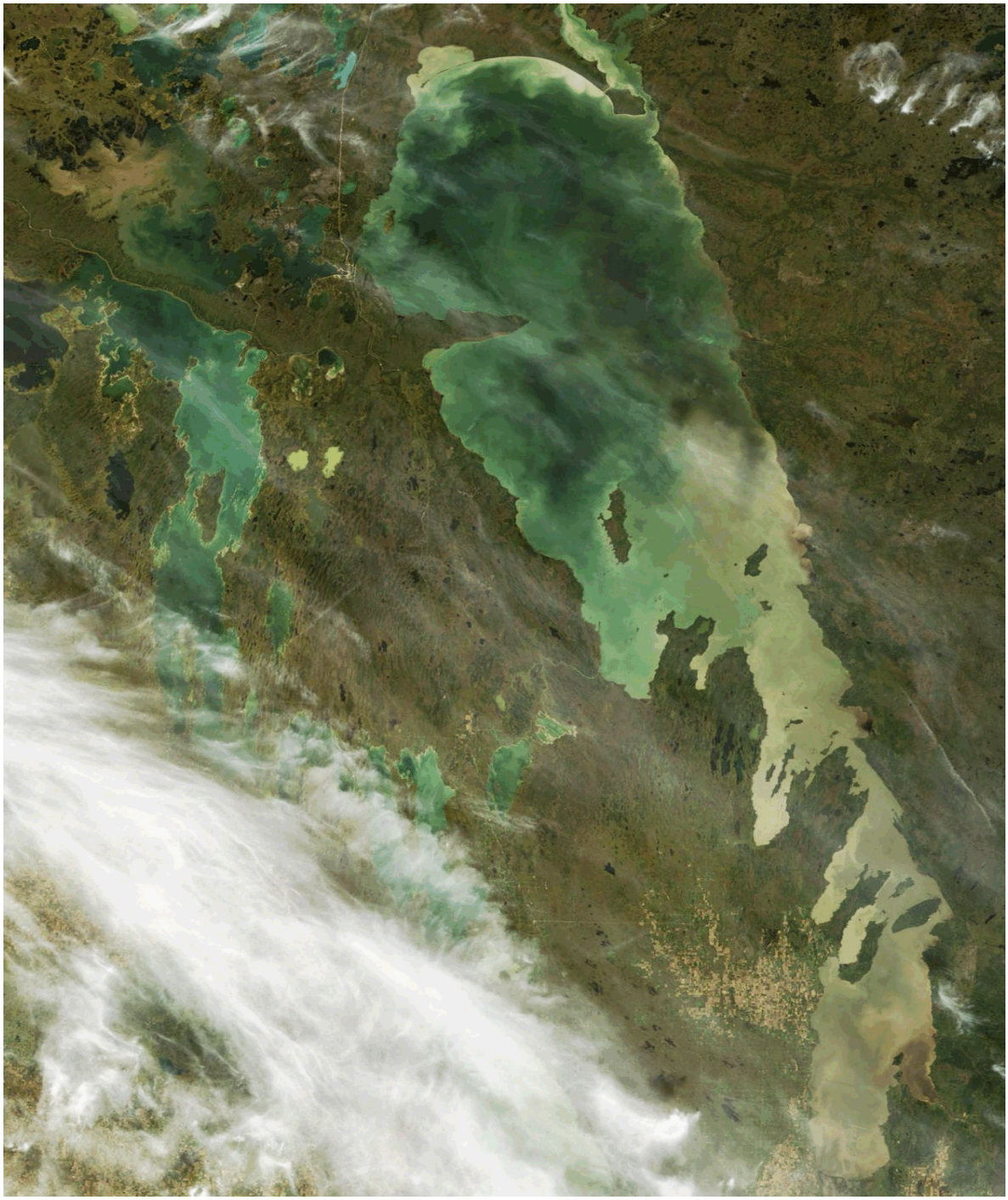


Figure 4. MODIS Image of Lake Winnipeg - September 25, 2004

8.03 Fisheries of the Red River in Manitoba

A number of sampling programs and project specific biological collection activities are currently being conducted along the Manitoba portion of the Red River.

As a requirement of environmental licencing for construction projects modifying shorelines and riparian areas within the limits of the City of Winnipeg, monitoring programs detecting and quantifying status of and changes to the benthic invertebrate communities and qualitative assessments of fish spawning activities have been initiated. There are a number of endangered or rare fish species in the Red River that require close monitoring. The Committee on the Status of Endangered Species in Canada (COSEWIC) has listed bigmouth buffalo (*Ictiobus cyprinellus)*, bigmouth shiner (*Notropis dorsalis*), chestnut lamprey (*Ichtyomyzon unicuspis*) and silver chub (*Macrhboposis storeriana*) as "special concern". The General Status of Species in Canada, which is an overview of the condition of wild species by the Canadian Endangered Species Conservation Council classifies shortjaw cisco as "At Risk" and several other species from the Red as "Sensitive": lake sturgeon (*Acipenser fulvescens*), chestnut lamprey (*Ichthtomyzon castaneus*), silver lamprey (*Ichthyomyzon unicuspis*), bigmouth buffalo (*Ictiobus cyprinellus*), silver chub (*Macrthybopsis storeriana*) and bigmouth shiner (*Notropis dorsalis*). Assessments updating the status of these species were initiated in 2002 with the long-term goal to develop recovery strategies with stewardship groups for fish populations at risk.

Investigations were initiated on the host associations of unionid mussels that will focus on catfish species, especially bullheads, freshwater drum and darters but other fish species and all mussel species will be assessed. Mussel species of concern in the Red include Threeridge (*Amblema plicata*) and Wabash Pigtoe (*Fusconaia flava*) considered as uncommon and Mapleleaf (*Qaudrala quadrala*) ranked as rare.

Manitoba Water Stewardship continued to conduct a fish stock monitoring program along the Red River in the reaches located within the City of Winnipeg. The program is designed to generate a long-term data base suitable for assessing trends in fish stock abundance over time.

Red River at Emerson, Manitoba

In 2003, the Department of Fisheries and Oceans collected a large sample of fish from the Emerson reach of the Red River using an electrofishing boat. Sixteen species of fish were caught with emerald shiner and goldeye being the most abundant. Sex distribution was relatively normal for the large species that were sampled for tissues. Size distributions of the various species were distributed normally as would be expected for healthy populations sampled with electrofishing gear. Channel catfish was the largest predatory species in the reach. White suckers were extremely rare compared to quillbacks and shorthead redhorse. Saugers and shorthead redhorse were tied as the third most abundant species in this part of the river. Only two walleye were caught in a total catch of 661 fish. One well established exotic species, carp, was present in the catch. This survey catch suggests that the fish community in the Emerson reach is robust and abundant. These catches varied with season but sampling design and effort were not consistent for the different dates. The catch results are summarized in Table 10.

Red River Tributary Streams

Macroinvertebrate assessments of five tributaries to the Red River during 1995 to 2001 (Hughes 2001 and unpublished) indicated a range from no impairment of biota in the Rat River to severe impairment on the La Salle River during 1998 (Table 11). The CCME Canadian water quality index (CWQI), calculated for five tributaries to the Red River for the same time period (Hughes 2001 and unpublished), indicated a similar range with a "good" ranking on the Boyne, Rat, Roseau, and Seine rivers during some years to a "poor-fair" ranking for the Seine River in 1995 (Table 11). Generally, water quality was good on the Rat River at Otterburne with slight to virtually no environmental impacts on biota. Similarly, water quality was good to fair on the Roseau River near Dominion City with slight to virtually no environmental impacts on biota in most years. Only in 2000, was moderate impairment of biota observed, and by 2001, no impairment was detected. In the Boyne River at Carman, water quality was also good to fair but slight to moderate impairment of biota was observed in all seven study years. Moderate to slight impairment of biota was also observed on the Seine River and water quality varied more than in any of the other tributaries ranging from poor-fair in 1995 to good in 2000. Water quality

was fair in the La Salle River during all seven years assessed with slight to severe environmental impacts on biota.

Each of the seven pesticides that were detected in the Red River were also detected in at least one of the five tributary streams monitored during Oct 2002 to September 2003.

Table 10. 2003 Fish Catches from the Red River near Emerson, Manitoba

		May	July	October		
Fish Species		**3km**	**2km**	**2km**	**Totals**	**Percent**
Emerald Shiner	*Notropis atherinoides*	0	0	292	292	44.2
River Shiner	*Notropis blennius*	0	0	1	1	0.2
Goldeye	*Hiodon alosoides*	84	14	28	126	19.1
Mooneye	*Hiodon tergisus*	1	0	1	2	0.3
Carp	*Cyprinus carpio*	2	3	16	21	3.2
Silver Chub	*Hybopsis storeriana*	1	1	0	2	0.3
Quillback	*Carpiodes cyprinus*	0	0	21	21	3.2
White Sucker	*Catostomus commersonii*	0	1	2	3	0.5
Golden Redhorse	*Moxostoma erythrurum*	0	0	1	1	0.2
Shorthead Redhorse	*Moxostoma macrolepidotum*	2	9	61	72	10.9
Silver Redhorse	*Moxostoma anisurum*	0	0	2	2	0.3
Channel Catfish	*Ictalurus punctatus*	3	0	22	25	3.8
Northern Pike	*Esox Lucius*	4	0	1	5	0.8
Sauger	*Stizostedion canadense*	50	6	16	72	10.9
Walleye	*Stizostedion stizostedion*	1	0	0	1	0.2
Freshwater Drum	*Aplodinotus grunniens*	4	1	10	15	2.3
TOTAL		152	35	474	661	100

Table 11. Macroinvertebrate assessment and CCME Water Quality Index of Red River Basin Tributary Streams during 1995 to 2001.

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Stream	Year	Biological Condition Category (Relative Impairment)	CCME Water Quality Index Rank
Boyne River at Carman	1995	Moderate impairment	fair - good
Boyne River at Carman	1996	Slight impairment	good
Boyne River at Carman	1997	Slight impairment	fair - good
Boyne River at Carman	1998	Slight impairment	fair
Boyne River at Carman	1999	Slight - moderate impairment	fair
Boyne River at Carman	2000	Slight - moderate impairment	good
Boyne River at Carman	2001	Slight impairment	fair
La Salle River	1995	Moderate impairment	fair
La Salle River	1996	Slight - moderate impairment	fair
La Salle River	1997	Slight - moderate impairment	fair near marginal
La Salle River	1998	Severe impairment	fair
La Salle River	1999	Slight - moderate impairment	fair
La Salle River	2000	Slight - moderate impairment	fair
La Salle River	2001	Moderate impairment	fair
Rat River at Otterburne	1995	No impairment	good
Rat River at Otterburne	1996	Slight impairment	good
Rat River at Otterburne	1997	Slight - no impairment	fair
Rat River at Otterburne	1998	Slight impairment	good
Rat River at Otterburne	1999	Slight impairment	good

Rat River at Otterburne	2000	Slight impairment	good
Rat River at Otterburne	2001	No impairment	good
Roseau River near Dominion City	1995	Slight impairment	good
Roseau River near Dominion City	1996	No impairment	fair - good
Roseau River near Dominion City	1997	No impairment	fair - good
Roseau River near Dominion City	1998	No impairment	fair - good
Roseau River near Dominion City	1999	No impairment	good
Roseau River near Dominion City	2000	Moderate impairment	good
Roseau River near Dominion City	2001	Slight - no impairment	good
Seine River south of Winnipeg	1995	Slight - moderate impairment	poor - fair
Seine River south of Winnipeg	1996	Moderate impairment	fair
Seine River south of Winnipeg	1997	Moderate impairment	fair - good
Seine River south of Winnipeg	1998	Moderate impairment	fair - good
Seine River south of Winnipeg	1999	Moderate impairment	fair - good
Seine River south of Winnipeg	2000	Moderate impairment	good
Seine River south of Winnipeg	2001	Slight - moderate impairment	fair - good

8.04 North Dakota Macroinvertebrate Index of Biotic Integrity

In response to the growing need for better water quality assessment information, the ND Department of Health initiated a biological monitoring program in 1993 and 1994. This program, which was a cooperative effort with the Minnesota Pollution Control Agency and the USGS's Red River National Water Quality Assessment Program, involved approximately 100 sites in the Red River basin. The result of this initial program was the development of the Index of Biotic Integrity (IBI) for fish in the Red River basin. The Department continued this program in the North Dakota portion of the Red River basin in 1995 and 1996. The Upper Red River basin, including the Sheyenne River and its tributaries, was sampled in 1995, while the Lower Red River basin was sampled in 1996. Following these initial monitoring efforts in the Red River basin, biological monitoring was expanded statewide with sampling in the Souris River basin in 1997, the James River basin in 1998, the Lake Sakakawea sub-basin of the Missouri River basin in 1999 and the Lake Oahe sub-basin of the Missouri River basin in 2000. In addition to fish sampling, biological monitoring was expanded to include macroinvertebrate sampling in 1995.

Based on these results, the Department has developed macroinvertebrate Indices of Biotic Integrity (IBI) for two ecoregions in North Dakota that are part of the Red River basin. The Lake Agassiz Plain ecoregion is located wholly within the Red River basin and represents the Red River Valley and the Northern Glaciated Plains ecoregion that lies to the west of the Lake Agassiz Plain ecoregion (Figure 5).

The Lake Agassiz Plain macroinvertebrate IBI is based on 10 macroinvertebrate community attributes or metrics (Table 12) which, through statistical analysis, were shown to respond to human disturbance. Each metric is scored on a scale from 0-100 and each of the 10 metric scores are averaged for the final IBI for each site. While the Lake Agassiz Plain IBI was only developed for glide/pool streams, two IBI were developed for the Northern Glaciated Plains ecoregion - one for glide/pool streams and one for riffle run streams. Seven metrics were shown to respond statistically to human disturbance for the glide/pool streams in the Northern Glaciated Plains (Table 13), while eight metrics were used in the riffle/run IBI (Table 14). Reports describing the IBI for each ecoregion are available from the North Dakota Department of Health.

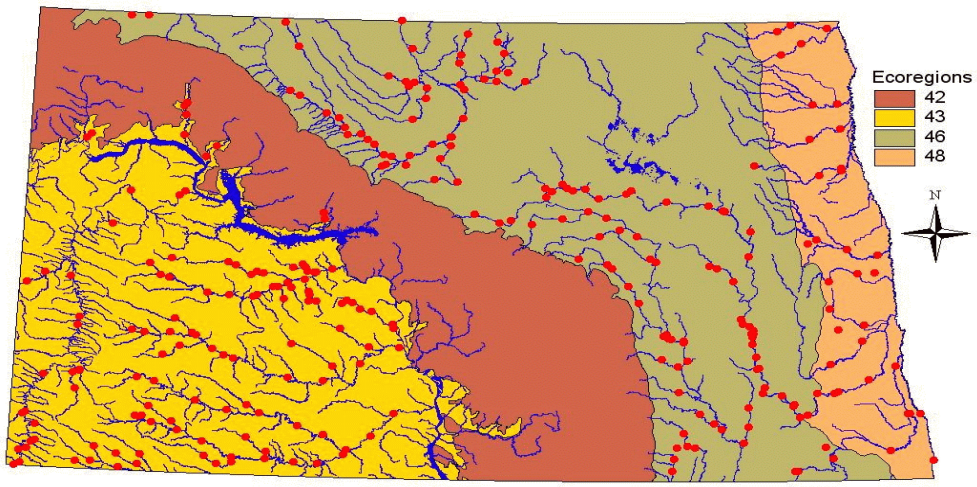

Figure 2. Macroinvertebrate Sampling Sites in North Dakota (1995-2000)
(Color-shaded areas are the Level III ecoregions in the state.)

Table 12. Metrics Used to Develop the Macroinvertebrate IBI for Glide/Pool Streams in the Lake Agassiz Plain Ecoregion.

Metrics	Reaction to Disturbance
Percent Ephemeroptera + Plecoptera + Trichoptera	Decrease
Percent Gastropods	Decrease
Percent Clingers	Decrease
Percent Sprawlers	Decrease
Percent Swimmers	Increase
Percent Predators	Increase
Percent Scrapers	Decrease
Clinger Taxa	Decrease
Scraper Taxa	Decrease
Total Taxa	Decrease

Table 13. Metrics Used to Develop the Macroinvertebrate IBI for Glide/Pool Streams in the Northern Glaciated Plains Ecoregion.

Metrics	Reaction to Disturbance
Percent Gastropods	Decrease
Percent Noninsect	Decrease
Percent Predators	Increase
Percent Clingers	Decrease
Climber Taxa	Decrease
Shredder Taxa	Decrease
Coleoptera Taxa	Decrease

Table 14. Metrics Used to Develop the Macroinvertebrate IBI for Riffle/Run Streams in the Northern Glaciated Plains Ecoregion.

Metrics	Reaction to Disturbance
Percent Ephemeroptera + Plecoptera + Trichoptera	Decrease
Percent Gastropods	Increase
Percent Clingers	Increase
Percent Filterers	Decrease
Percent Shredders	Decrease
Percent Hydraenidae/Tricoptera	Decrease
Ephemeroptera + Plecoptera + Trichoptera Taxa	Decrease
Filterer Taxa	Decrease

9.0 ADDITIONAL ACTIVITIES IN THE RED RIVER BASIN

As described in Appendix A, the duties of the IRRB include maintaining an awareness of the activities of other agencies in the basin, and of developments and conditions that may effect water levels and flows, water quality and ecosystem health of the Red River and its transboundary tributaries. Chapter 9 provides an overview of a number of relevant activities and developments in the basin.

9.01 Garrison Diversion Project

Dakota Water Resources Act

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

Red River Valley Water Supply Project

Authorized in the DWRA, the purpose of the Red River Valley Water Supply Project is to identify the comprehensive water quantity and quality needs of the Red River Valley in North Dakota and options for meeting those needs.

As required in DWRA, the Bureau of Reclamation is preparing a feasibility level engineering report, the *Report on Red River Valley Water Needs and Options* (Needs and Options Report), to address the following categories of need: municipal, rural and industrial water supply; water quality; recreation; aquatic environment; and water conservation measures. Progress to date on the Needs and Options Report includes completion of all final needs assessment reports with the exception of the final industrial reports, which are in progress. Reclamation is working with the North Dakota State Water Commission, U.S. Geological Survey, and the Minnesota Department of Natural Resources to determine if groundwater can meet a portion of the water needs. The draft Needs and Options report is scheduled for release for a 120 day review in May 2005. A final report will be completed by Reclamation in November 2005.

The DWRA also requires completion of an Environmental Impact Statement (EIS) that evaluates environmental impacts of the alternative ways to meet the water needs of the Red River Valley. As directed by the DWRA, Reclamation and the State of North Dakota are jointly preparing the EIS. The Governor of North Dakota has designated the Garrison Diversion Conservancy District as the state entity responsible for serving as co-lead with Reclamation in the preparation of the EIS.

Three groups of alternatives are being studied for inclusion in the EIS: a No Action Alternative, required by the National Environmental Policy Act; in-basin alternatives that propose use of water sources within the Red River Basin including Lake of the Woods; and import alternatives that propose moving water from the Missouri River to the Red River Valley. The State of North Dakota plans to identify a state-preferred alternative in the draft EIS; however, final selection of the preferred alternative will be made by the Secretary of the Interior in consultation with the State of North Dakota in coordination with local affected communities, as required by the DWRA. A draft EIS is scheduled for release for public review in December 2005.

Progress reports on Reclamation=s Needs and Options Report are available via the Needs and Options Newsletter, and progress on the jointly prepared EIS appears on the EIS website (www.rrvwsp.com) and in the EIS newsletter.

Northwest Area Water Supply Project

The Municipal, Rural and Industrial (MR&I) component of the Garrison Diversion Project also includes the Northwest Area Water Supply Project (NAWS). The NAWS Project, now under construction, will carry pre-treated water from Lake Sakakawea to the City of Minot where it will be fully treated to drinking water standards and distributed to surrounding communities and rural areas in the Souris River basin. Potential international

issues related to NAWS are the responsibility of the International Souris River Board. However, the IRRB will continue to be interested in activities associated with the NAWS project because the project is an interbasin water transfer from the Missouri River basin to the Hudson Bay basin.

9.02 Devils Lake Sub-Basin

The level of Devils Lake reached a recorded high of 1449.1 msl on June 17, 2004. The elevation on October 13, 2004 was approximately 1448.2 msl. At this elevation the lake surface area is approximately 133,000 acres with a volume of about 2.59 million acre-feet.

The slow decline (after June 17, 2004) in the elevation of Devils Lake continued due to evaporation and flows to Stump Lake, but was countered in part by some wet weather in September.

Stump Lake has risen about 8.0 feet since the spring of 2004. Flows from Devils Lake are slowing with current flows around 87 cfs versus the maximum of 252 cfs this summer. An estimated 49,000 ac-ft of water flowed into Stump Lake since the end of March 2004. Stump Lake was at about 1423.1 msl on October 13 representing a surface area of about 9,100 acres and a volume of 219,000 acre-feet.

Federal Outlet Project

The Energy and Water Development Appropriations Act, 2003, Division D of Public Law 108-7, provided $5 million in funding for construction of an emergency outlet from Devils Lake to the Sheyenne River but imposed several conditions before construction could proceed. These include that the project be cost shared, that it be technically sound and environmental acceptability, that there be a determination of emergency need and assurances by the Secretary of State that the Boundary Waters Treaty of 1909 will not be violated. The law also prohibits any consideration of an inlet from the Missouri River. This legislation differs from language in similar Public Laws of 1998 through 2001 by deleting direction for consultation with the International Joint Commission in regard to the Boundary Waters Treaty and by deleting the requirement for the outlet be economically justified. The Public Law requires instead that the justification for the outlet be fully described, including the analysis of the benefits and costs.

The US Army Corps of Engineers completed a final Integrated and Planning Report and EIS in April 2003 and signed a Record of Decision recommending an outlet in October 2003. This report identified the Pelican Lake 300 cfs. outlet with sand filter protection as the preferred alternative. In January 2004 the Secretary of State signed a letter that assured that the recommended design would comply with the Boundary Waters Treaty of 1909.

At this time the North Dakota State Water Commission is continuing to construct a state-sponsored Devils Lake outlet. The State of North Dakota has rejected the federal project because of the high cost and length of time required for approval and construction.

State Outlet Project

Park Construction continues work on the canal. The canal is nearly complete down to the drop structures. A clay liner and bentomat geofabric are being placed in the area adjacent to the old Dokken (blue) house. The canal is set to be finished to grade down to siphon two this fall, with the area between siphons two and three close to grade. The area downstream of siphon three is stripped of topsoil but will not be completed this year. The first three road crossings downstream from the second transition structure (between the drop structures, on county road leading to Maddock, and by the Dokken house) are nearly complete, awaiting finishing touches such as guardrails, riprap, etc. Installation of all road crossings is planned for this year.

Industrial Builders Inc. has only to install finishing touches (handrails, fencing, etc) at Transition structure #2, while the two drop structures are complete. The inlets and outlets need to be built at Siphon #1 and Siphon #3, while installation of the pipe continues at Siphon #2. No trash racks or fencing has been installed at any of the siphons. The outlet of the terminal structure is nearly complete, needing only fencing, etc. They will be moving to work on the inlet of the terminal structure, having completed the excavation. The vertical walls and wing walls

have been poured at the first transition structure; railings, fences, etc. have yet to be installed.
SJ Louis has the entire first pipeline in the ground, needing only to pressure test and connect it to the first transition structure. The second pipeline is currently being installed. Advance Tank has the second standpipe to its complete height with the inner plumbing currently under construction. The first standpipe is four rings (approx. 40 ft) high.

Excel construction has the base and walls of the Josephine intake structure poured. The pump cans are in the process of being set. The pump cans are already set at the Round Lake pump station along with the manifold. The pumps themselves are not on site. Pipe will be laid to the Josephine stand pipe in the coming weeks.

If the construction continues according to schedule, the project is anticipated to be operable after the spring 2005 runoff.

In August 2003, the North Dakota Department of Health first issued a US Clean Water Act (Section 402) Water Quality Certification for the State outlet project. The State of Minnesota, the Government of Canada, Manitoba and citizens of North Dakota thereafter petitioned the Department to reconsider its decision. In February 2004, the Department issued its final notice regarding the permit and a 30-day appeal period. In March 2004, the Government of Manitoba and People to Save the Sheyenne launched a legal challenge of the 402 permit. In August 2004, North Dakota's Southeast District Court ruled against the action. Concerns relate to potential water quality, biological and ultimately economic consequences that could be caused by discharging Devils Lake water into the Sheyenne and Red Rivers. The State project does not attempt to address water quality issues or the possible transfer of alien invasive species into the Sheyenne and Red Rivers.

In June 2004, the governments of Manitoba and Minnesota and a number of US NGO's requested the US Army Corps review whether the State outlet project can proceed in the absence of a Clean Water Act Section 404 permit concerning wetlands. The US Army Corps is presently undertaking an administrative review of the issue.

There remains significant opposition to the State project from Canadian and US entities. To date, Canada has been unable to obtain US support for a joint IJC reference to undertake an impartial review of the project.

9.03 US Corps of Engineers Flood Control Activities

Flood Control Projects for the cities of Grand Forks, North Dakota and East Grand Forks, Minnesota, located at the confluence of the Red River of the North and the Red Lake River, consists of levees and floodwall set back from the river, forming "rings" around three discrete portions of the two communities. In addition, stabilization of an existing dam, removal of a former railroad bridge, interior flood control features, numerous road and railroad closures, extension and expansion of an existing diversion channel, and construction of a new diversion channel with associated structural features are part of the proposed project. The design level of protection is equivalent to the peak discharge experienced during the 1997 flood. Construction is complete on the first two construction projects: the removal of the pedestrian bridge and bank stabilization of the Riverside Dam. Construction is complete or underway on all but the last two stages of levees and tie backs. The date that construction will start on the last two levee reaches is subject to availability of funds. Construction began during summer 2000, and completion is estimated in 2005-2006. The final project cost is estimated to be $400 million.

Flood protection project for Crookston, Minnesota, located on the Red Lake River, 52 miles upstream from its confluence with the Red River of the North, consists of two downstream high-flow cutoff channels and levees built to the 100-year level of protection for the Thorndale, Woods and downtown/Riverside neighborhoods. The project is substantially complete. The City requested the Corps to initiate a Section 205 study for the Sampson's and Chase/Loring neighborhoods, which are not currently part of the authorized project. The initial work on the Section 205 study indicated that a project is likely to be economically feasible.

Flood protection projects for Wahpeton, North Dakota and Breckenridge, Minnesota, located at the confluence of the Bois de Sioux and Ottertail Rivers and the beginning of the Red River of the North, are treated as two separate, but dependent projects. The Breckenridge Project consists of a high-flow diversion channel located to the north of the Ottertail River and entering into the Red River and two separable permanent levee reaches that would protect all of Breckenridge. Congress authorized the project consistent with the plans identified in the

Feasibility Report and appropriated construction funding in 2001. Construction of the diversion was completed in the fall of 2004. Construction of the levees is subject to availability of funds. The Wahpeton Project, authorized under Section 205 of the Continuing Authorities Program, consists of a permanent levee system and flood easements. Construction of the Wahpeton project began in 2003 and is scheduled for completion in 2006.

Flood protection project for Ada, Minnesota, located in the Marsh River watershed, which is tributary of the Red River of the North. Ada is subject to flooding from the Wild Rice River, which can break out of its banks and flow into the Marsh River. Although initially found not justified under study through the Section 205 Continuing Authority, two record-breaking flood events occurred in June 2002, which drove the benefit-cost ratio over 2.0. The project will be continued under the Section 205 authority subject to availability of funds.

Flood protection project for Grafton, North Dakota, located on the Park River, a tributary of the Red River of the North, consists of a bypass channel, levees, flow control structures, three railroad bridges, and a highway bridge. The Project is approved and can move to construction once a Project Cooperation Agreement is signed. The community is concerned with the cost of the project and has not determined whether to proceed.

Flood protection project, Baldhill Dam, North Dakota, located on the Sheyenne River a tributary of the Red River of the North, consists of replacing the existing spillway gates, allowing the dam to store up to 5 feet more (30,000 acre-feet of additional storage) during major floods, acquiring 1,500 acres of flowage easement around Lake Ashtabula and 300 acres for a mitigation area, raising land and buildings at a church camp, and constructing several small levees and placing fill near structures around the reservoir. No permanent increase in storage will result. All construction is complete on this project and real estate acquisition should be completed by the end of 2004.

Feasibility study, prepared under the Section 205 Continuing Authority, for a flood protection project for Ridgewood Addition, Fargo, North Dakota, has been completed and is under review by higher headquarters. The project will provide protection to the portion of Fargo between 15th Avenue North and 22nd Avenue North and the Veterans Administration hospital.

Flood protection project for Minnewaukan, North Dakota, located on the western shore of Devils Lake. The City is not able to cost share a study at this time. They may require emergency flood control assistance if the lake continues to rise.

Hay Creek Project, located in the Roseau River watershed, 5 miles northeast of Roseau, Minnesota is a multipurpose project that will improve the wildlife habitat and reduce flood damages by restoring more natural hydrologic and hydraulic behavior. Features include replacement of a six-mile ditch with a 500-foot stream corridor border by setback levees and 1000 acres of permanent wetland and adjacent buffer zone. Total project cost is approximately $8 million. Construction will begin in 2005-6.

A feasibility study has been started for Roseau, Minnesota, located on the Roseau River, a tributary to the Red River of the North. The study is scheduled for completion in June 2005.

A feasibility study of the Wild Rice River watershed is underway that is based largely on the Wild Rice River Watershed District's watershed management plan update. Types of measures that will be investigated under this study are gated diversion, setback levees along the Wild Rice River, restoration of the Wild Rice River, and off-channel storage. Phase 1 of the $2.2 million study is scheduled for completion in 2004. Phase 1 is a preliminary assessment of measures to determine their potential for Federal partnership. Phase 2 will be a more rigorous analysis of measures that survive Phase 1.

A multi-purpose, cost-shared feasibility study of the Red River of the North watershed above Fargo-Moorhead was initiated with the signing of a Feasibility Cost Sharing Agreement in August 2004. Phase 1 of the study will include screening of flood control measures and a Phase 2 will include more detailed investigations.

A Section 905b Analysis (for purposes of determining the potential for Federal interest) has been completed for the Pembina River watershed. The Corps proposes to initiate a 2- to 3-year, 50/50 cost-shared sub-basin feasibility study for the Pembina River as Federal and non-Federal funding resources allow. The parent Red River

Reconnaissance Study (RRRS) will continue to be the vehicle for developing a feasibility cost sharing agreement.

Devils Lake reached its highest recorded level (1449.1 feet) in June 2004. The existing levee system protecting the City of Devils Lake is about 7.2 miles in length with a top elevation of 1457 feet above mean sea level to provide protection from a lake elevation of 1451. The project includes five pumping stations for interior drainage. Because of recent increases in lake levels and the probability that the lake will remain above elevation 1448 at freeze-up, the Corps awarded a construction contract to raise the top of levee to elevation 1460 in August 2004. Construction is expected to be completed by the fall of 2005 and will raise the existing level of protection 3 feet to elevation 1454. The design includes new levee sections in low-lying areas and the extension of the existing levees to high ground. The initial levees were constructed in the 1980's to an elevation of 1445. Approximately $43 million has been spent on the levee system to date. Costs of the 3-foot levee raise are estimated at $8 million, bringing the total project costs to approximately $50.5 million.

More detailed information may be obtained from the Corps of Engineers website:
http://www.mvp.usace.army.mil/

9.04 Energy and Environmental Research Center

The Energy and Environmental Research Center (EERC) is a research, development, demonstration, and commercialization facility at the University of North Dakota, recognized internationally for its expertise. The EERC is dedicated to moving promising technologies out of the laboratory and into the marketplace.

The EERC's business partners range in size from large multinational corporations to regional and small local businesses. The EERC's government partners include federal, state and local government entities.

Waffle Project

A strategy being investigated by the EERC is the feasibility of temporary storage to augment existing flood control structures and help mitigate springtime flooding throughout the Red River basin. This project, commonly referred to as the Waffle Project, is evaluating the technical and economic feasibility of utilizing existing "depressions", such as low-relief fields bounded by raised roads, for temporary water storage during the spring. These preexisting storage areas, supplemented by roads and drainage structures, could act as a network of channels and control structures to slowly release stored water into the Red River and its tributaries after the flood crest passes. The waffle concept applies a spatial approach that may provide benefits with respect to major floods as well as the less severe but more frequent events.

The Waffle project first received funding by the USDA National Resources Conservation Service (NRCS) in April of 2002 and is anticipated to conclude in the spring of 2006. Progress to date includes the development of hydrologic models for 27 of 28 watersheds in the U.S. portion of the basin. These models will be tied to a mainstem model (in development by the EERC and the US Army Corps of Engineers) to create the first hydraulic/hydrologic model for this portion of the Red River basin. Additional progress includes the completion of the first phase of a Waffle field trial to assess the impacts of temporary water storage on downstream flood reduction and on the land. Results from this preliminary trial indicate no significant effects on water quality and on soil nutrients, and minimal delays in planting. Flood mitigation effects, crop yield assessments and road stability tests are also being conducted. Field trial studies will continue throughout 2005 on multiple parcels of land located throughout the Red River basin.

Additional information and updates on the progress of the Waffle Project are available at
http://www.eerc.und.nodak.edu/waffle/aboutus.asp

9.05 Red River Basin Institute

The Red River Basin Institute (Institute) was formed in 2000 following a series of recommendations from the International Flood Mitigation Initiative (IFMI). The Institute is charged with conducting applied research through partnerships with existing research assets in the Red River Basin (RRB), assisting and monitoring implementation of state-of-the-art flood mitigation projects, and building on the data gathering, mapping, and decision support tools that were developed through the International Joint Commission's Red River Basin Task

Force (IJC 2004). Guided by a public, private and non-profit Advisory Board, the Institute serves as a collaborative mechanism for Canadian and U.S. governments, the private sector, NGOs and academic and research institutions in the RRB to deliver watershed education programs and identify and conduct applied natural resources and flood damage reduction research (RRBI 2004A).

The Institute has initiated and leads a number of basin-wide efforts that are related to the International Joint Commission's International Red River Board and its mission, including:

- RRBDIN –The Institute has agreed to host the Red River Basin Decision Information Network (www.rrbdin.org) and has established the site at North Dakota State University's Agricultural Communications Department. The Institute is responsible for operation, maintenance, and the news release/dissemination feature. Funding to continue these activities is being pursued.

- Digital Elevation Model (DEM) – The Institute hosted a series of meetings to discuss the development of a DEM. Recently, a private company has come forward and is considering making a capital investment to develop the DEM in the Red River valley (13 counties adjacent to the Red River mainstem). The Institute is hosting a meeting on October 6th in Fargo to discuss the emerging public and potential private alternatives for a basin-wide LIDAR collect DEM development.

- Reference Condition/Aquatic Ecosystem Assessment – the Institute worked with the International Red River Board and its Aquatic Ecosystem health Committee to convene a Red River Basin Biological Assessment workshop. The workshop summary and recommendations was presented at the annual 2004 International Red River Board meeting in Devils Lake, ND.

- Watershed Education - The Institute received a $725,000 National Science Foundation grant to implement a comprehensive training program and professional support system for high school students at five schools in the Red River of the North Basin. The three-year "Understanding the Science Connected to Technology (USCT)" project will build leadership skills through a student and citizen-based volunteer water quality monitoring program called River Watch.

- Basin Research Agenda – The Institute convened a workshop to develop a prioritized basin research agenda for the Red River Basin. The Institute will distribute a summary report documenting the meeting outcomes to a number of resources management organizations including the International Red River Board and ask for the membership to further refine the identified needs.

- Second International Water Conference – The second International Water Conference, "Research and Education in an International Watershed: implications for decision-making" will be held in Winnipeg April 6-7.

Additional information and progress updates are available at:
http://www.tri-college.org/watershed/about_us.htm

9.06 USGS Water Resource Investigations and Activities

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

This USGS study evaluated contaminant contributions in the upper Red River basin. The objectives of the study were 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 was 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. The final report "Constituent loads and flow-weighted average

concentrations for major subbasins of the Upper Red River of the North Basin, 1997-99" (US Geological Survey Scientific Investigations Report 2004-5200) was published.

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

The USGS studied the relations that wetlands and land use have with hydrology of the Red River basin. The objectives were 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 was established near Detroit Lakes, Minnesota, and another was established near Harvey, North Dakota. Data collection ended in 2003. The final report, "Simulation of runoff and wetland storage in the Hamden and Lonetree watershed sites within the Red River of the North Basin, North Dakota and Minnesota" (US Geological Survey Scientific Investigations Report 2004-5268) was published.

Supporting Project for the Bureau of Reclamation's Red River Valley Water Supply Project

The passage of the Dakota Water Resources Act by Congress in 2000 authorized the Bureau of Reclamation, to conduct a comprehensive study of the future water-quantity and quality needs of the Red River of the North Basin in North Dakota and Minnesota. In support of the Bureau's Red River Valley Water Supply Project, the USGS is conducting several projects to provide information that the Bureau of Reclamation needs to evaluate water delivery options. Reservoir evaporation estimates were modified based on methods used to estimate evaporation at Williams Lake, Minnesota and Cottonwood Lake, North Dakota. Also, water-use data have been collected from various agencies and reviewed and used to provide better estimates of withdrawals and return flows. Reservoir evaporation estimates and withdrawals and return flows have been used to improve and update an unregulated flow data base for selected locations in the Red River of the North Basin. Ground-water data are being compiled on selected surficial aquifers in or near the Red River of the North Basin in Minnesota. The potential effects of ground-water development on lakes, streams, and wetlands that are hydraulically connected to the aquifers will also be evaluated. The quality of water during various flow regimes and seasons, particularly during low flows are being determined. The existing water-quality limits or affect on specific uses of surface water will be described. Reports that have been published are: "Regression equations for estimating concentrations of selected water-quality constituents for selected gaging stations in the Red River of the North Basin, North Dakota, Minnesota, and South Dakota" (US Geological Survey Scientific Investigations Report 03-4291), "Estimation of monthly evaporation form Lake Ashtabula in North Dakota, Orwell Lake in Minnesota, and Lake Traverse in Minnesota and South Dakota, 1931-2001 " (US Geological Survey Water-Resources Investigations Report 03-4282), "River gain and loss studies for the Red River of the North Basin, North Dakota and Minnesota" (US Geological Survey Open-File Report 2004-1076), and "Water-use data for the Red River of the North Basin, North Dakota, Minnesota, and South Dakota, 1979-2001" (US Geological Survey Open-File Report 2004-1308).

Hydrologic Changes from Wetland and Prairie Restoration at Glacial Ridge, Polk and Red Lake Counties, Minnesota

This USGS study is investigating the surficial hydrology of an area of drained wetlands and linear prairies on the eastern edge of Glacial Lake Agassiz. The study will produce a set of background data of surface- and ground-water flow and quality in an area about to undergo major wetland and prairie restorations. This data set can be used in the future to attribute hydrologic changes to this land-use change. The study is also beginning to quantify the short-term hydrologic variability of the area to help separate land use hydrologic changes from other sources of hydrologic change.

9.07 Rivers West – Red River Corridor Association Inc.

Rivers West is a non-profit organization established to further the untapped opportunities that exist along the Red River. Its mission is to develop the Red River corridor from Emerson to Lake Winnipeg as a destination. The role of Rivers West involves developing recreational, economic and tourism opportunities while staying focussed on conservation and the preservation of historic and cultural resources. Rivers West has taken a unique and integrated approach. Conservation of the natural, cultural and heritage resources, including greenway development, is melded with infrastructure construction such as docks and pathways and is enhanced through

destination promotion and tourism. This macro approach crosses many boundaries – governmental, geographic, organizational and departmental.

Its initial focus was on product development and marketing and short-term actions, including brochures and self directed tours, to introduce visitors to the area along relevant themes such as fur trade, settlers, nature, First Nations, and art and literature. Rivers West also completed an infrastructure and access study focussing on existing facilities and community needs for docks, marinas, boat launches and related infrastructure. This was followed by a plan to address the study findings.

Rivers West sponsored *Operation Clean-Up*, a restoration and conservation program designed to clean-up a 50 km stretch of land along both sides of the Red River, and is working with municipalities to extend this program throughout the Red River valley. With the assistance of Manitoba Conservation, Rivers West has undertaken a mapping project of the river corridor to identify publicly and privately owned land and its conservation and development potential. As a result of this initiative, an agreement is now in place under the provincial Ecological Reserves program to protect a parcel of rare river bottom forest.

Further, in keeping with Manitoba Premier Doer's commitment to an international greenway along the Red – from Lake Traverse to Lake Winnipeg, Rivers West has developed a greenway strategy. Created in cooperation with provincial and federal government partners, the strategy sets out a process to define and implement a greenway over time.

Rivers West is developing an education program focussing on flooding and flood management in the Red River valley. This project focuses on what can be done to mitigate the impacts of flooding – man-made and natural solutions are being explored. The program will be pilot tested in two Manitoba Grade 8 classrooms (one rural and one urban) in early 2005.

In recognition of its historical and cultural significance, Rivers West is working to have the Red River designated as a Canadian heritage river as part of the Canadian Heritage Rivers System. The nomination document will be completed by June 2005 with potential designation by June 2007.

Additional information is available at: http://www.riverswest.ca/

9.08 EPA-Funded Activities

The US EPA provides grant funding support to a number of activities that are consistent with the objectives and ideals of the IRRB. The project periods for a number of these activities have either recently closed, or are soon coming to a close. Projects include the following:

Watershed Information Network (WIN)

EPA recently closed a grant to the Red River Basin Commission for promoting international, interregional, interstate, and locally-based efforts in dealing with basin-wide ecosystem issues. The grant resulted in funding a watershed coordinator, who undertook coordination efforts between North Dakota and Minnesota on joint Total Maximum Dail Loads (TMDL), provided community assistance in protection of sources of drinking water, enhanced coordination with locally-based organizations, enhanced US/Canada communication, initiated a basin newsletter, released a State of the Basin Monitoring Framework Report, and undertook other ecosystem basin efforts. Many of these efforts are continuing with the Red River Basin Commission and the Red River Basin Institute.

FM River

FM River was a project undertaken by a consortium of organizations including the Energy and Environmental Research Center, River Keepers, and Prairie Public Broadcasting. Other cooperating partners included: City of Fargo, City of Moorhead, Moorhead Public Service, Minnesota Pollution Control Agency, North Dakota Health Department, and EPA Region 8. The project used volunteer water monitoring and city water data to assess the aquatic health of the Red River in the Fargo/Moorhead area, and raise river public awareness and involvement. A half hour special and 18 educational water spots were televised, and a series of annual water festivals were hosted

with over 1400 students in attendance. A website with educational material and water quality monitoring results is located at: http://www.fmriver.org. Water quality monitoring from the original project has been completed and the data posted. Monitoring and educational efforts will continue with an additional EPA grant to River Keepers. The monitoring data from the project have been expanded and are being used in development of a TMDL in the Fargo/Moorhead area.

Greenway on the Red

Greenway on the Red is a multi-state and international effort to establish a 600 mile Greenway (150 miles completed so far) along the Red River in both the US and Canada, and works in conjunction with Rivers West in Canada. Activities include mapping to support Greenway siting, Greenway riparian restoration planning in conjunction with the Red River Basin Research Institute and other project partners, development of program elements for Gateway to the Greenway Audubon Nature Center, dissemination of successful urban Greenway protocols and initiatives among other municipalities, continued compilation of landowner handbook and web-based outputs, hydrologic modeling partnership and coordination with Canadian efforts, continued development of basin wide hydrologic monitoring data for Greenway sites and associated wetlands restoration and protection, and outreach and education.

Red River Basin Biological Monitoring Workgroup

The Red River Biological Monitoring Workgroup is undertaking an effort to improve and expand biological monitoring efforts in the basin and develop benthic macroinvertebrate sampling protocols for slow moving muddy bottomed rivers. These efforts are being coordinated with the, North Dakota Health Department, FM River project and the International Red River Board's Aquatic Ecosystem Health Committee. A sampling protocol and final report are expected sometime during the spring of 2005.

Glacial Ridge Restoration

The Nature Conservancy and its partners are undertaking the largest tallgrass prairie and wetland restoration project in U.S. history. Very little of this glacial Lake Agassiz shoreline restoration area near Crookston, MN are native prairie; the rest has been used for gravel extraction, crop production and cattle and sheep grazing. Primary threats to the area include wetlands drainage, erosion, habitat fragmentation, and invasion of exotic species. When restored, the grassland and wetland areas will connect with other wildlife and recreation areas, and provide 32,000 contiguous acres of excellent habitat for prairie nesting birds, threatened prairie plants and animals. EPA funded the master plan for the project.

Discover a Watershed

The Montana Watercourse group is finalizing the development of a 'Discover a Watershed: Red River KIDS Activity Booklet'. This is one of a series of children's watershed education tools that are being distributed in several basins across The US, Canada, and internationally through the International Project WET (Watershed Education for Teachers). The Red River project has experienced delays, but will be available for a grade school age water festival during 2005.

Brownfields

The EPA Brownfields program is driven by the concept that real or perceived environmental contamination keeps developers and lenders from redeveloping old industrial sites. The new US federal brownfields legislation provides authority to award cleanup grants to non-profit organizations. The creation, preservation, or addition to a park, a greenway, undeveloped property, recreational property, or other property used for nonprofit purposes are considerations for selecting projects - brownfields are not just urban industrial areas. EPA is working with the Red River Regional Counsel on submitting a Brownfields assessment grant proposal for the second time. A Brownfields grant was awarded to the City of Moorhead from EPA Region 5 for assessment of river front property.

Red River Water Festival

EPA again funded River Keepers to undertake an expanded Red River Water Festival at the Hjemkomst Center in Moorhead, MN. River Keepers has been undertaking these volunteer-presented youth educational watershed festivals since 1999. The three day festival held in September 2004 was expanded to full day sessions including both indoor and outdoor river front activities, and enabled students to learn how to gather information needed to make informed decisions about water use and protection. Each year, participation has increased, and in 2004, about 1,800 students in 68 3rd and 4th grade classes in Fargo, Moorhead, and vicinity communities participated. The festival has become a continuing part of the curriculum for the involved schools, and the teachers provide instruction prior to and after the festival. River Keepers will provide a report and workbook for use by others interested in undertaking a student water festival.

Reference Condition Workshops

Phil Larson from EPAs Office of Research and Development and Michael Barbour of Tetra Tech (an EPA contractor) have provided significant assistance in the development of reference conditions in conjunction with the Aquatic Ecosystem Health Committee and the Red River Basin Institute.

EPA Award

On September 1, Max Dodson and Stacey Eriksen of EPA presented an award to Chuck Fritz of the Red River Basin Institute, Genevieve Thompson of Greenway on the Red, and Bob Bachman and Christine Holland of River Keepers. The award was for their efforts in support of natural resource protection, holistic watershed management, and multi-jurisdictional problem-solving in the Red River basin.

Enforcement Action Supplemental Environmental Project

In settlement of an EPA enforcement action for an Oil Pollution Act violation, Mid-America Steel provided $8008 to the Red River Regional Council and River Keepers for the Red River Living Laboratory project. This project is for riparian forest restoration and enhancement and public educational outreach. Mid-America Steel initiated the efforts to make the penalty dollars benefit the community.

APPENDIX A

INTERNATIONAL RED RIVER BOARD DIRECTIVE

DIRECTIVE TO THE INTERNATIONAL RED RIVER BOARD

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

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

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

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

5. The Board's duties shall be to:

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

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

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

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

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

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

   G. Monitor and report on flood preparedness and mitigation activities in the Red River basin and their potential effects on the transboundary aquatic ecosystem, and encourage and facilitate the development and. maintenance of flood-related data and information systems

and flood forecasting and hydrodynamic models. In carrying out this responsibility, the Board shall:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX B

B.1WATER QUALITY OBJECTIVES

B.2WATER QUALITY ALERT LEVELS

B.1 WATER QUALITY OBJECTIVES

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

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

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

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

B.2 WATER QUALITY ALERT LEVELS

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

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

WATER QUALITY ALERT LEVELS FOR THE RED RIVER OF THE NORTH

August 20, 1990

Parameter	Minnesota Standards	North Dakota Standards	Manitoba Objectives	Red River Pollution Board Objectives	Origin/ Rational
Fecal Coliform	200/100 ml geometric mean 10% of samples not to exceed 2,000 based on a minimum of 5 samples in a 30 day period from Mar. 1 – Oct. 31. HH*	200 fecal coliforms per 100 ml. This standard shall apply only during the recreation season, May 1 to September 30. HH	100/100 ml. At least 90% of samples in any consecutive 30 day period should have a fecal coliform density of less than 100 per 100 ml. HH	200/100 ml geometric mean with 10% of samples not to exceed 400 based on min. 5 samples – 30 day period – May 1 – Oct. 31 and for the balance of year not to exceed 1000/100 ml. Current IJC objective.	Minnesota and North Dakota based on primary body contact recreation.
Chloride	100 mg/l (total) ID	100 mg/l (total) ID	100 mg/l (soluble) ID	100 mg/l (dissolved) Current IJC Objective	All agencies based on industrial consumption.
Sulfate	250 mg/l (total) DW	250 mg/l (total) DW	250 mg/l (dissolved) DW	250 mg/l (total) Current IJC Objective	All agencies based on domestic consumption.
TDS	500 mg/l DW	None	500 mg/l DW	500 mg/l Current IJC Objective	All agencies, excluding North Dakota based on domestic consumption.
Dissolved Oxygen	5 mg/l (minimum)	5 mg/l (minimum)	47% saturation or more.	5 mg/l (minimum) Current IJC Objective	All agencies for the protection of aquatic life.

* DW – Drinking Water
HH – Human Health
AL – Aquatic Life
ID – Industrial Consumption
IR - Irrigation

WATER QUALITY ALERT LEVELS FOR THE RED RIVER OF THE NORTH

Parameter	Minnesota Standards	North Dakota Standards	Manitoba Objectives	Red River Pollution Board Alert Levels	Origin/ Rational
			Chemical Characteristics		
pH	6.5 - 9.0 AL	7.0 - 9.0 AL	6.5 – 9.0 AL	6.5 - 9.0	All agencies based on protection of aquatic life.
Temperature	5^{o} F above natural in streams and 3^{o} F above natural in lakes, based on monthly average of the maximum daily temperature, except in no case shall it exceed the daily average temperature of 86^{o} F. AL	85^{o} F. The maximum increase shall not be greater than 5^{o} F above natural background conditions. AL	Site-specific objectives can be developed using procedures set out in the Manitoba Surface Water Quality Objectives. AL	None	All agencies based on protection of aquatic life.
			Dissolved Gas		
Ammonia-N	.04 mg/l as N unionized (warm water) Al	Unionized as N (dissolved). Calculation from standards. See page 8-10. AL	Variable, ranging from 0.0184 to 0.050 mg/l ammonia as NH_3.*		Minnesota and North Dakota for the protection of aquatic life.
			Metals (Total)		
Aluminum	Total 125 μg/l AL	None	None	None	Minnesota for the protection of aquatic life.

WATER QUALITY ALERT LEVELS FOR THE RED RIVER OF THE NORTH

Parameter	Minnesota Standards	North Dakota Standards	Manitoba Objectives	Red River Pollution Board Alert Levels	Origin/ Rational
Cadmium	Total The chronic standard shall not exceed: $_{e}$ [0.7852 {ln (total hardness mg/l)} – 3.49]. For hardness values greater than 400 mg/l, 400 mg/l shall be used in the calculation of the standard. Cadmium standards in µg/l at various hardness values: 50 mg/l hardness = 0.66 µg/l, 100 mg/l hardness = 1.1 µg/l, 200 mg/l hardness = 2.0 µg/l AL	Total The one-hour average, concentration in µg/l cannot exceed the numerical value given by $_{e}$ [1.128{ln(hardness as mg/l)} –3.828] more than once every 3 years on the average. AL The four day average concentration in µg/l cannot exceed the numerical value given by $_{e}$ [.7852{ln(hardness as mg/l)} –3.490] more than once every 3 years on the average.	$_{e}$ [0.7852 {ln(hardness as mg/l)} –3.49], where hardness is expressed in mg/l $CaCO_3$ and the resultant objective is expressed in µg/l. (e.g.) 50 mg/l $CaCO_3$ = 0.66 µg/l, 100 mg/l $CaCO_3$ = 1.1µg/l, 200 mg/l $CaCO_3$ = 2.0 µg/l. AL	Less than detection.	Minnesota and Manitoba for the protection of aquatic life and wildlife.
Chromium	None	Total 50 µg/l DW	$_{e}$ [0.8190 {ln (hardness)} +1.561], where hardness is expressed in mg/l $CaCO_3$ and the resultant objectives is expressed in µg/l. (e.g.) 50 mg/l $CaCO_3$ = 120 µg/l, 100 mg/l $CaCO_3$ = 210 µg/l, 200 mg/l $CaCO_3$ = 370 µg/l.	50 µg/l	North Dakota based on domestic consumption.

WATER QUALITY ALERT LEVELS FOR THE RED RIVER OF THE NORTH

Parameter	Minnesota Standards	North Dakota Standards	Manitoba Objectives	Red River Pollution Board Alert Levels	Origin/ Rational
Chromium, Trivalent	Total The chronic standard shall not exceed: exp. [0.819{ln (total hardness mg/l}+ 1.561]. For hardness values greater than 400 mg/l, 400 mg/l shall be used in the calculation of the standard. Chromium +3 standards in µg/l at various hardness values: 50 mg/l hardness = 117 µg/l, 100 mg/l hardness = 207 µg/l, 200 mg/l hardness = 365 µg/l. AL	None	$_{e}$ [0.8190 {ln (hardness)} +1.561], where hardness is expressed in mg/l $CaCO_3$ and the resultant objectives is expressed in µg/l. (e.g.) 50 mg/l $CaCO_3$ = 120 µg/l, 100 mg/l $CaCO_3$ = 210 µg/l, 200 mg/l $CaCO_3$ = 370 µg/l.. AL	None	Manitoba and Minnesota for the protection of aquatic life.
Chromium, Hexavalent	Total The chronic standard is 11 µg/l AL	None	11 µg/l AL	None	Manitoba and Minnesota for the protection of aquatic life.

WATER QUALITY ALERT LEVELS FOR THE RED RIVER OF THE NORTH

Parameter	Minnesota Standards	North Dakota Standards	Manitoba Objectives	Red River Pollution Board Alert Levels	Origin/ Rational
Copper	Total The chronic standard shall not exceed: exp. [0.62 {ln (total hardness mg/l}) -0.57]. For hardness values greater than 400 mg/l, 400 mg/l shall be used in the calculation of the standard. Copper standards in µg/l at various harness values: 50 mg/l hardness = 6.4 µg/l, 100 mg/l hardness = 9.8 µg/l, 200 mg/l hardness = 15 µg/l . AL	Total The one-hour average concentration in µg/l cannot exceed the numerical value given by $_e$[.9422{1n (hardness as mg/l})-1.464] more than once every 3 years on the average. The four-day average concentration in µg/l cannot exceed the numerical value given by $_e$ [8545{ln (hardness as mg/l)} –1.465] more than once every 3 years on the average. AL	$_e$[0.8545{ln(hardness)}-1.465], where hardness is expressed in mg/l $CaCO_3$ and the resultant objective is expressed in µg/l. (e.g.) 50 mg/l $CaCO_3$ = 6.5 µg/l., 100 mg/l $CaCO_3$ = 12 µg/l, 200 mg/l $CaCO_3$ = 21 µg/l.		Minnesota and Manitoba for the protection of aquatic life.
Iron	300 µg/l DW	None	300 µg/l DW	300 µg/l	Minnesota, Manitoba based on domestic consumption.
Lead	Total The chronic standard shall not exceed: exp. [1.273{ln (total hardness mg/l)}-4.705]. For hardness values greater than 400 mg/l, 400 mg/l shall be used in the calculation of the standard. Lead standards in µg/l at various hardness values: 50 mg/l hardness = 1.3 µg/l 100 mg/l hardness = 3.2 µg/l 200 mg/l hardness = 7.7 µg/l AL	Total The one-hour average concentration in µg/l cannot exceed the numerical value given by $_e$ [1.266{In (hardness as mg/l) - 1.416] more than once every 3 years on the average. The four-day average concentration in µg/l cannot exceed the numerical value given by $_e$ (1.266{ln (hardness as mg/l) - 4.661) more than once every 3 years on the average. AL	$_e$ [1.273{ln (hardness)} - 4.705], where hardness is expressed in µg/l $CaCO_3$ and the resultant objective is expressed in µg/l. (e.g.) 50 mg/l $CaCO_3$ = 1.3 µg/l, 100 mg/l $CaCO_3$ = 3.2 µg/l, 200 mg/l $CaCO_3$ = 7.7 µg/l,		Manitoba, Minnesota and North Dakota for the protection of aquatic life and wildlife.

WATER QUALITY ALERT LEVELS FOR THE RED RIVER OF THE NORTH

Parameter	Minnesota Standards	North Dakota Standards	Manitoba Objectives	Red River Pollution Board Alert Levels	Origin/ Rational
Manganese	50 µg/l DW	None	50 µg/l DW	50 µg/l	Minnesota and Manitoba based on domestic consumption.
Mercury	Total 0.0069 µg/l AL	Total Acute 2.4 µg/l Chronic 0.012 µg/l AL	Acid soluble mercury 0.006 µg/l	Less than detection in water. 0.5 micrograms per gram in fish fillets.	Minnesota, North Dakota and Manitoba for protection of aquatic life, animal life and humans as a result of bioconcentrations in tissue in the food chain.
Nickel	Total The chronic standard (CS) shall not exceed the human health-based criterion of 88 µg/l. For waters with total hardness values less than 50 mg/l, the CS shall not exceed: exp. [0.846{ln(total hardness mg/l)} + 1.1645]. AL and HH	None	$_{e}$ [0.76{ln(hardness)} None +1.06], where hardness is expressed in mg/l) $CaCO_3$ and the resultant objective is expressed in µg/l (e.g.) 50 mg/l $CaCO_3$ = 56 µg/l, 100 mg/l $CaCO_3$ = 96 µg/l, 200 mg/l $CaCO_3$ = 160 µg/l, AL	None	Minnesota for the protection of aquatic life and human health. Manitoba for the protection of aquatic life.
Selenium	Total 5 µg/l AL	10 µg/l DW	10 µg/l DW	10 µg/l	Manitoba and North Dakota based on domestic consumption. Minnesota for the protection of aquatic life.

WATER QUALITY ALERT LEVELS FOR THE RED RIVER OF THE NORTH

Parameter	Minnesota Standards	North Dakota Standards	Manitoba Objectives	Red River Pollution Board Alert Levels	Origin/ Rational
Silver	Total The chronic standard shall not exceed 1.0 µg/l. AL	The one-hour average concentration in µg/l cannot exceed the numerical value given by $e^{}$ [1.72{ln(hardness)} as mg/l)}-6.52] more than once every three years on the average. AL	0.1 µg/l AL	None	Manitoba, Minnesota and North Dakota for protection of aquatic life.
Zinc	Total The chronic standard shall not exceed: exp. [0.8473{ln(total hardness mg/l)} + 0.7615], For hardness values greater than 400 mg/l, 400 mg/l shall be used in the calculation of the standard. Zinc standards in µg/l at various hardness values: 50 mg/l hardness = 59 µg/l 100 mg/l hardness = 106 µg/l 200 mg/l hardness = 191 µg/l AL	Total The one-hour average concentration in µg/l cannot exceed the numerical value given by $e^{}$ [.8473{ln(hardness as mg/l)} +.8604] more than one every 3 years on the average. The four-day average concentration in µg/l cannot exceed the numerical value given by $e^{}$ [.8473 {ln(hardness as mg/l})+.7614] more than once every 3 years on the average. AL	47 µg/l AL	47 µg/l	Minnesota, North Dakota and Manitoba for the protection of aquatic life.

WATER QUALITY ALERT LEVELS FOR THE RED RIVER OF THE NORTH

Parameter	Minnesota Standards	North Dakota Standards	Manitoba Objectives	Red River Pollution Board Alert Levels	Origin/ Rational
			Nutrients		
Nitrates (N)	Total 10 mg/l DW	Dissolved 1.0 mg/l DW	Total 10 mg/l DW	Total 10 mg/l	Minnesota and Manitoba based on domestic consumption.
			Toxic Substances		
Arsenic	Total 50 µg/l DW and AL	Total 50 µg/l DW	Acid soluble arsenic 50 µg/l DW	Total 10 µg/l (under review)	Minnesota based on domestic consumption and for protection of aquatic life.
Boron	500 µg/l IR	750 µg/l IR	500 µg/l IR	Total 500 µg/l	Minnesota, Manitoba based on irrigation water.
Chlorine	Total residual 6 µg/l	None	None	None	Minnesota for protection of aquatic life.
Cyanide	Free cyanide 5.2 µg/l AL	Total 5 µg/l AL	Free cyanide 5.2 µg/l cyanide AL	Total 5 µg/l	Minnesota and North Dakota for protection of aquatic life.
Dioxin	None	None	None	Not detectable in any media analyzing to parts per trillion.	Task Force
PCBs	Total 0.000029 µg/l AL and HH	Total Acute 2.0 µg/l Chronic 0.014 µg/l AL	.014 µg/l AL	Not detectable in water, in fish total PCBs not exceeding 2 micrograms per gram in fillets.	Body burden: Manitoba, North Dakota and Minnesota for protection of aquatic life, animal life and human life.

WATER QUALITY ALERT LEVELS FOR THE RED RIVER OF THE NORTH

Parameter	Minnesota Standards	North Dakota Standards	Manitoba Objectives	Red River Pollution Board Alert Levels	Origin/ Rational
Phenolics	None	None	1 µg/l DW	10 µg/l	North Dakota to protect against taste and odor in water and fish.
Phenol	123 µg/l AL	Total 10 µg/l DW	1.0 µg/l 2.0 AL	None	North Dakota to protect against taste and odor in water and fish.
Pentachlorophenol	The chronic standard shall not exceed: exp.[1.005{pH} – 5 .290]. Pentachlorophenol standards in µg/l at, various pH values: pH 7.0 = 5.7 µg/l, pH 7.5 = 9.5 µg/l, pH 8.0 = 16 µg/l. AL	Acute 20.0 µg/l Chronic 13.0 µg/l AL	0.06 mg/l DW	None	Minnesota and North Dakota for the protection of aquatic life. Manitoba based on domestic consumption.
Pesticides and Volatile Hydrocarbons	Acenapthene 12 µg/l Acrylonitrile 0.38 µg/l Anthracene 0.029 µg/l Benzene 6.9 µg/l Bromoform 128 µg/l Carbon Tetrachloride 1.9 µg/l Chlordane 0.00029 µg/l Chlorobenzene 10 µg/l Chloroform 55 µg/l Chlorpyrifos 0.041 µg/l	Aldrin (total) Acute 3.0 µg/l Chlordane (total) Acute 2.4 µg/l Chronic 0.0043 µg/l Dieldrin (total) Acute 2.5 µg/l Chronic .002 µg/l Endosulfan (total) Acute .22 µg/l Chronic .06 µg/l	Aldicarb 0.009 mg/l Aldrin + Dieldrin 0.0007 mg/l Atrazine 0.06 mg/l Azinphos-methyl 0.02 mg/l Bendiocarb 0.04 mg/l	Not detectable in water**	All agencies for the protection of aquatic life, animal life domestic consumption and human health.

(continued)

** Limits in fish tissue are being researched by the Task Force.
Tissue samples have been collected by North Dakota and Manitoba.

WATER QUALITY ALERT LEVELS FOR THE RED RIVER OF THE NORTH

Parameter	Minnesota Standards	North Dakota Standards	Manitoba Objectives	Red River Pollution Board Alert Levels	Origin/ Rational
	DDT 0.0017 µg/l 1,2-Dichloroethane 3.8 µg/l Dieldrin 0.000026 µg/l Di-2-Ethylhexyl phthalate 1.9 µg/l Di-n-Octyl phthalate 30 µg/l Endosulfan 0.15 µg/l Endrin 0.016 µg/l Ethylbenzene 68 µg/l Fluoranthene 4.1 µg/l Heptachlor 0.00039 µg/l Heptachlor epoxide 0.00048 µg/l Hexachlorobenzene 0.00022 µg/l Lindane 0.032 µg/l Methylene chloride 46 µg/l Parathion 0.013 µg/l Phenanthrene 2.1 µg/l 1,1,2,2-Tetrachloroethane 1.54 µg/l Tetrachloroethylene 3.8 µg/l 1,1,1-Trichloroethane 263µg/l 1,1,2-Trichloroethylene25µg/l 2,4,6-Trichlorophenol 2.0µg/l Toluene 253 µg/l Toxaphene 0.0013 µg/l Vinyl Chloride 0.15 µg/l Xylene(total m, p and o) 166 µg/l	Endrin (total) Acute .18 µg/l Chronic .0023 µg/l Heptachlor (total) Acute .52 µg/l Chronic .004 µg/l Lindane (Hexachlorocyclohexane) Acute 2.0 µg/l Chronic .06 µg/l Toxaphene (total) Acute .73 µg/l Chronic .0002 µg/l AL	Benzene 0.005 mg/l Benzo (a) pyrene 0.00001 mg/l Bromoxynil 0.005 mg/l Carbaryl 0.09 mg/l Carbofuran 0.09 mg/l Carbon tetrachloride 0.005 mg/l Chlordane 0.0043 µg/l Chlorpyrifos 0.09 mg/l Cyanazine 0.01 mg/l Diazinon 0.02 mg/l Dicamba 0.12 mg/l 1,2-Dichlorobenzene 0.2 mg/l 1,4-Dichlorobenzene 0.005 mg/l DDT and metabolites 0.001 µg/l 1,2-Dichloroethane 0.005 mg/l Dichloromethane 0.05 mg/l 2,4-Dichlorophenol 0.9 mg/l 2,4-D – 0.9 mg/l (continued)		

WATER QUALITY ALERT LEVELS FOR THE RED RIVER OF THE NORTH

Parameter	Minnesota Standards	North Dakota Standards	Manitoba Objectives	Red River Pollution Board Alert Levels	Origin/ Rational
			Diclofop-methyl 0.009 mg/l Dieldrin – 0.0019 µg/l Dimethoate – 0.02 mg/l Diquat – 0.07 mg/l Diuron – 0.15 mg/l Endosulfan – 0.056 µg/l Endrin – 0.0023 µg/l Glyphosate – 0.18 mg/l Heptachlor and heptachlor epoxides – 0.0038 µg/l Hexachlorobutadiene 0.1 µg/l Lindane – 0.080 µg/l Malathion – 0.19 mg/l Methoxychlor – 0.9 mg/l Metribuzin – 0.08 mg/l Monochlorobenzene 0.08 mg/l Nitrilotriacetic acid 0.05 mg/l Paraquat – 0.01 mg/l Parathion – 0.05 mg/l Phthalic acid esters: Dibutylphthalate–4.0 µg/l Dii-(2-ethylhexyl) phthalate 0.6 µg/l other phthalates –0.2 µg/l Phorate – 0.002 mg/l Picloram – 0.19 mg/l Polychlorinated biphenyls 0.014 µg/l Simazine – 0.01 mg/l Temephos – 0.28 mg/l Terbufos – 0.001 mg/l		

(continued)

WATER QUALITY ALERT LEVELS FOR THE RED RIVER OF THE NORTH

Parameter	Minnesota Standards	North Dakota Standards	Manitoba Objectives	Red River Pollution Board Alert Levels	Origin/ Rational
			2,3,4,6- Tetrachlorophenol 0.1mg/l Toxaphene – 0.013 µg/l Triallate – 0.23 mg/l Trichloroethylene 0.05 mg/l 2,4,6-Trichlorophenol 0.005 mg/l 2,4,5-T – 0.28 mg/l Trifluralin – 0.045 mg/l Trihalomethanes 0.35 mg/l DW and AL		
Oil and Grease	500 µg/l HH	No visible film or sheen upon the waters.	Free from oil and grease residues which cause a visible film or sheen upon the waters or any discolouration of the surface of adjoining shorelines, or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.	No visible sheen on the surface.	All agencies based on aesthetics, taste and odor in water and fish, and bathing.

APPENDIX C

WATER POLLUTION CONTROL CONTINGENCY PLAN

LIST OF CONTACTS

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

United States:

Minnesota Pollution Control Agency – Detroit Lakes, MN

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

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

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

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

North Dakota Health Department – Bismark, ND

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

Environmental Protection Agency – Denver, CO

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

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

Canada:

Manitoba Conservation – Winnipeg, MB

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

Environment Canada- Regina, SK

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

Environment Canada – Winnipeg, MB

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

APPENDIX D

HISTORICAL STREAMFLOW AND WATER QUALITY CHARACTERISTICS

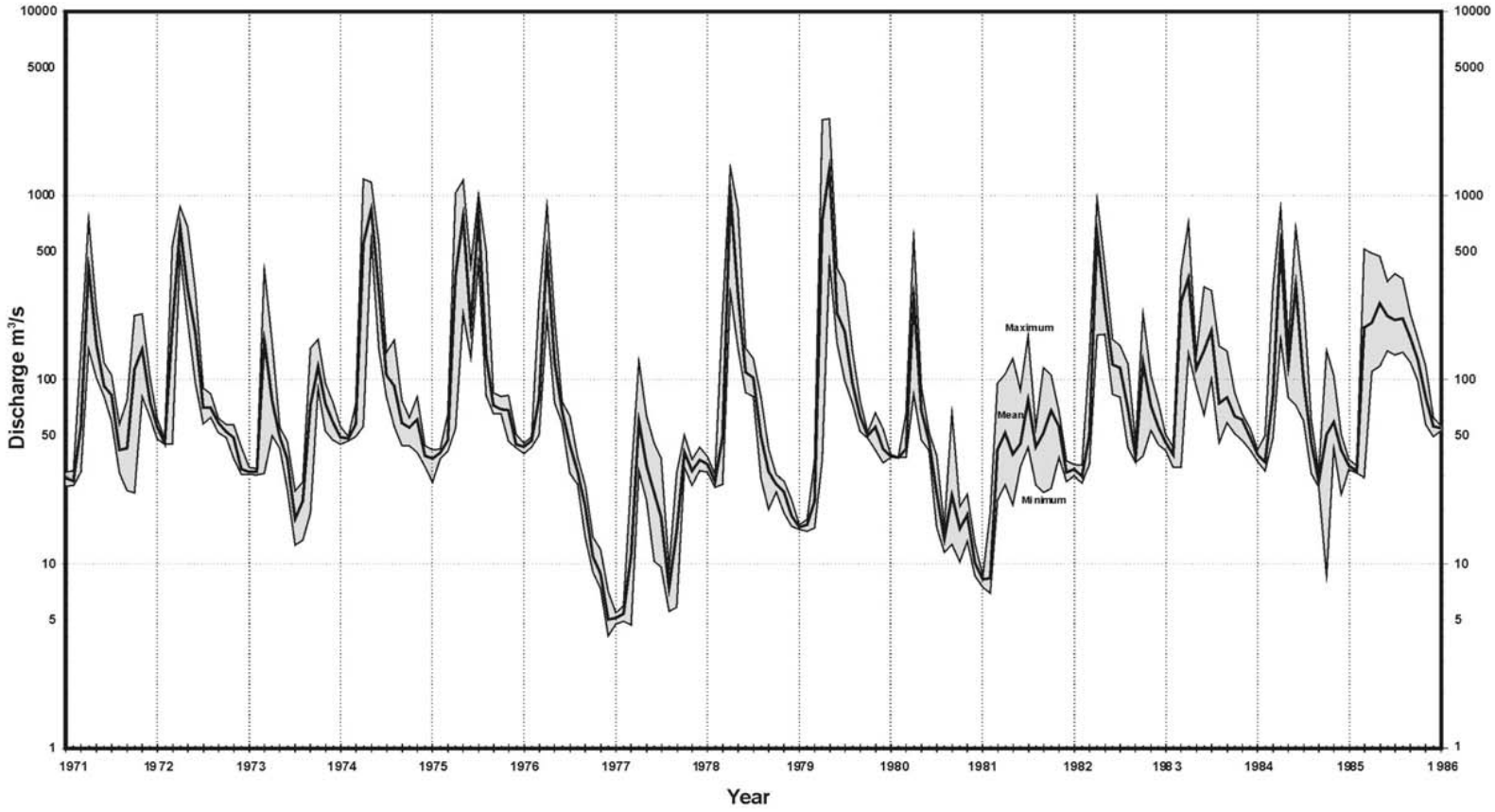

Figure 2a
Variability in mean monthly Discharge (m^3/s), 1971-1986
Red River near the International Boundary

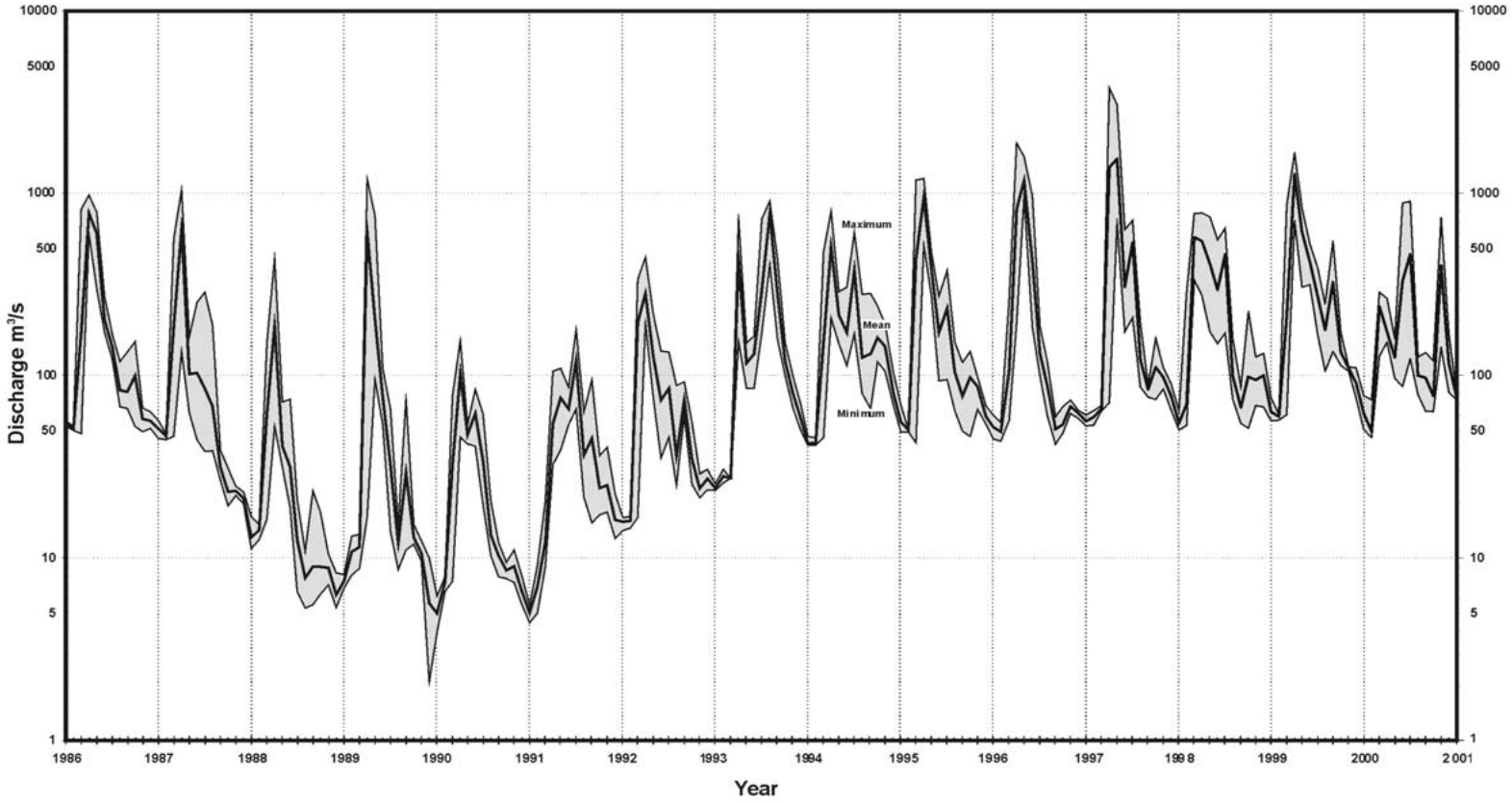

Figure 2b
Variability in mean monthly Discharge (m^3/s), 1986-2001
Red River near the International Boundary

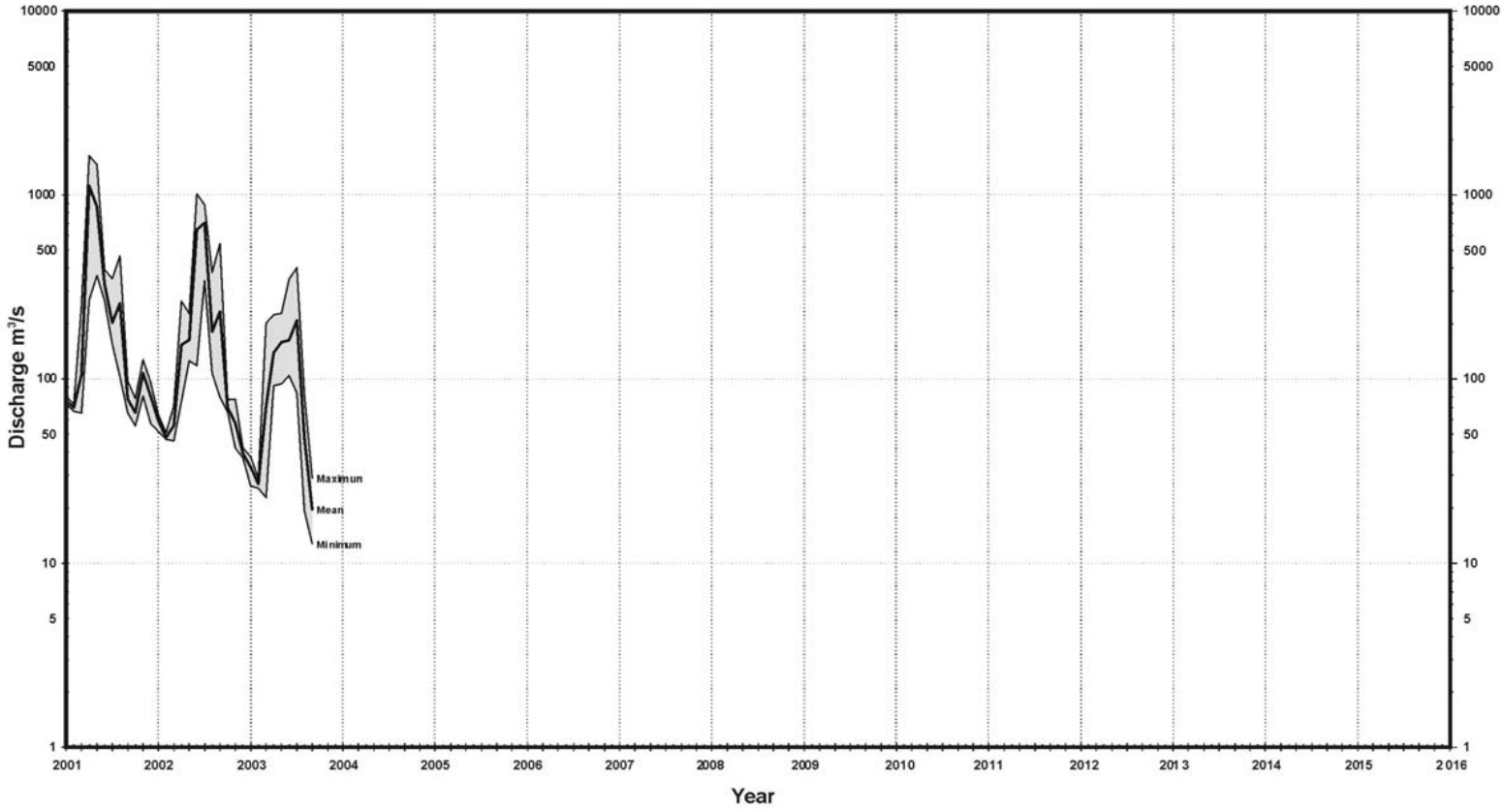

Figure 2c
Variability in mean monthly Discharge (m^3/s), 2001-2016
Red River near the International Boundary

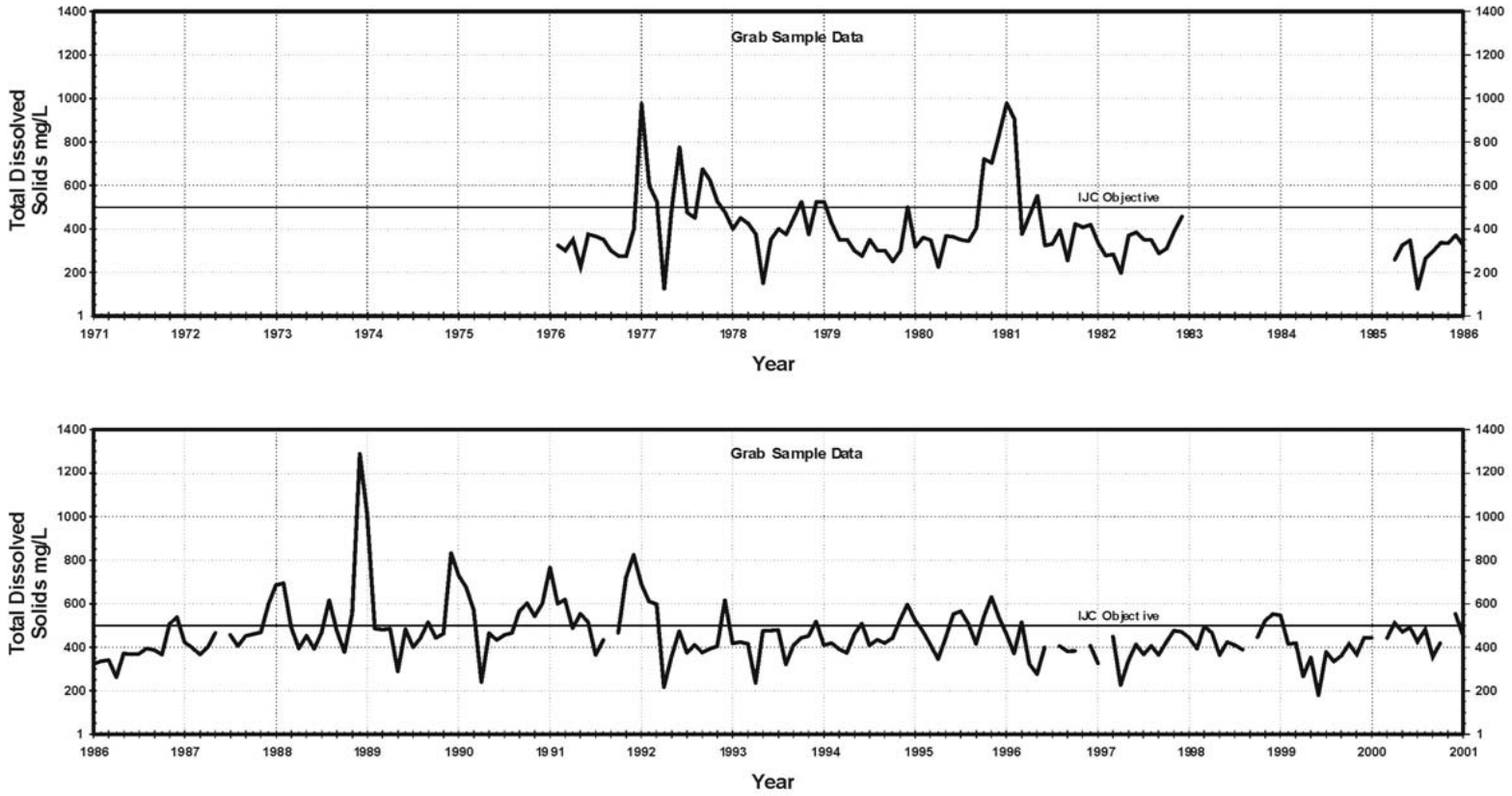

Figure 3a
Mean monthly Total Dissolved Solid (mg/L), 1971-2001
Red River near the International Boundary

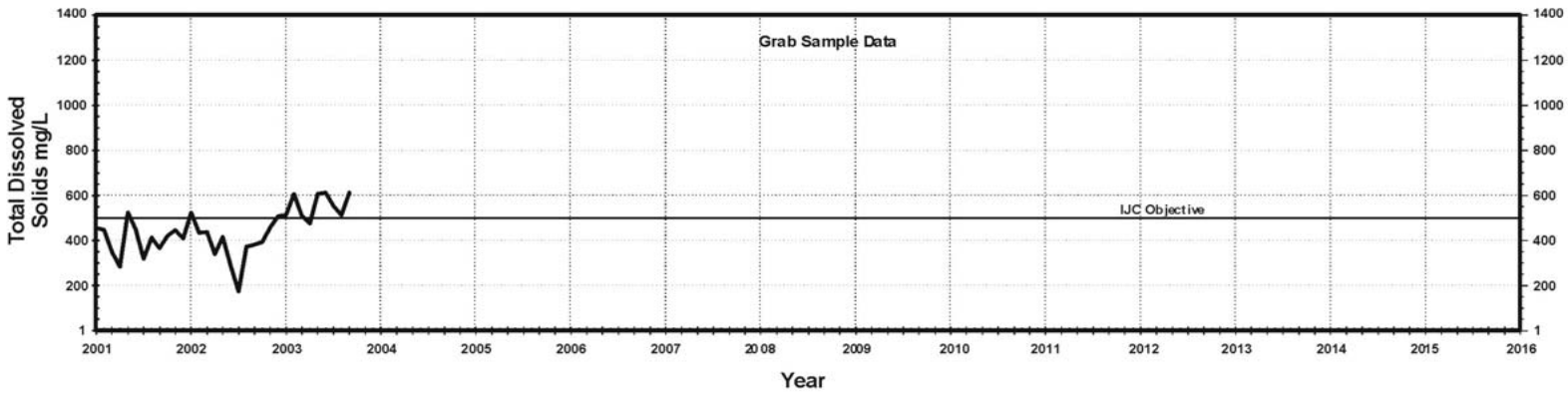

Figure 3b
Mean monthly Total Dissolved Solid (mg/L), 2001-2016
Red River near the International Boundary

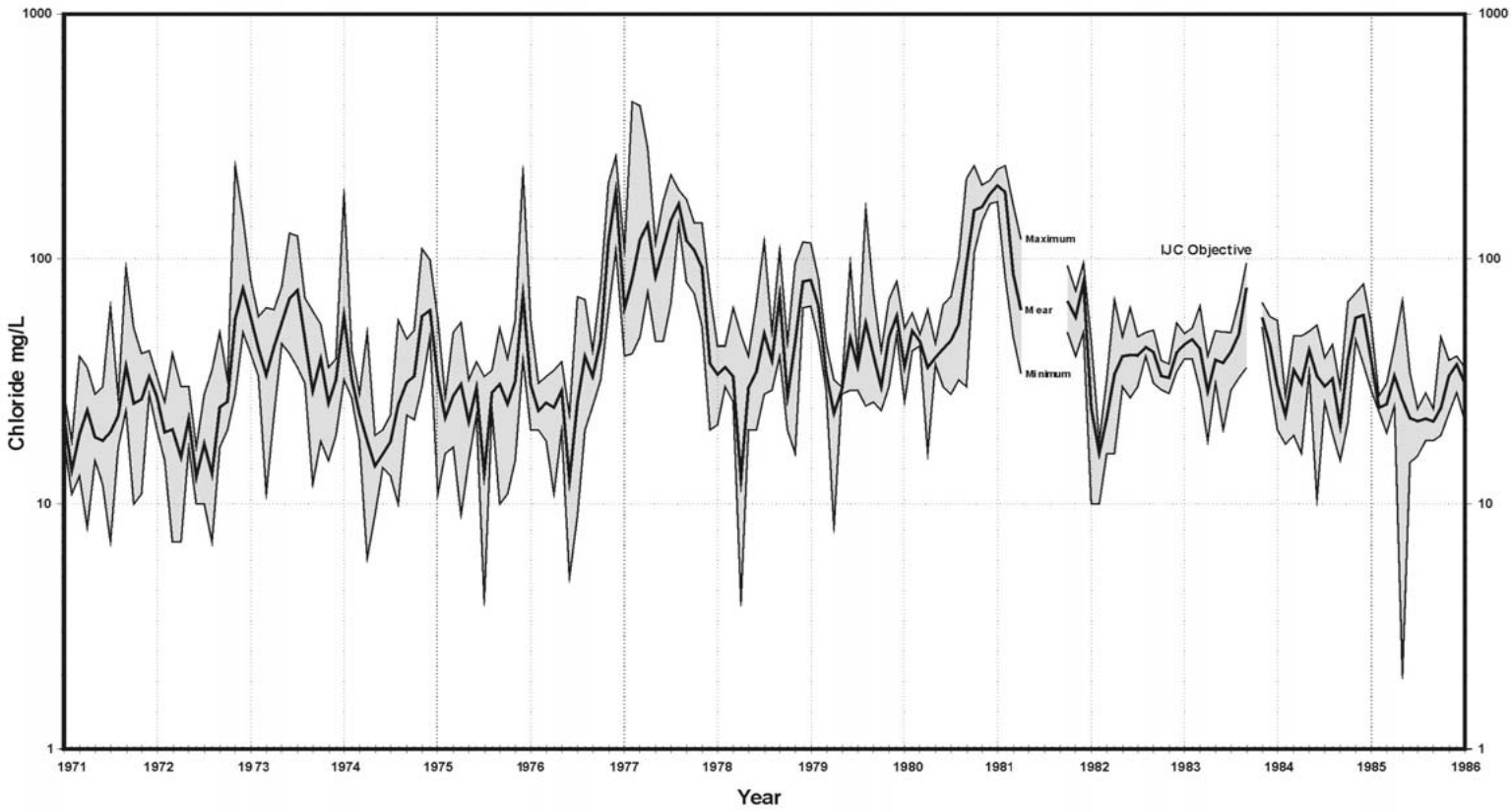

Figure 4a
Variability in monthly Chloride Levels (mg/L), 1971-1986
Red River near the International Boundary

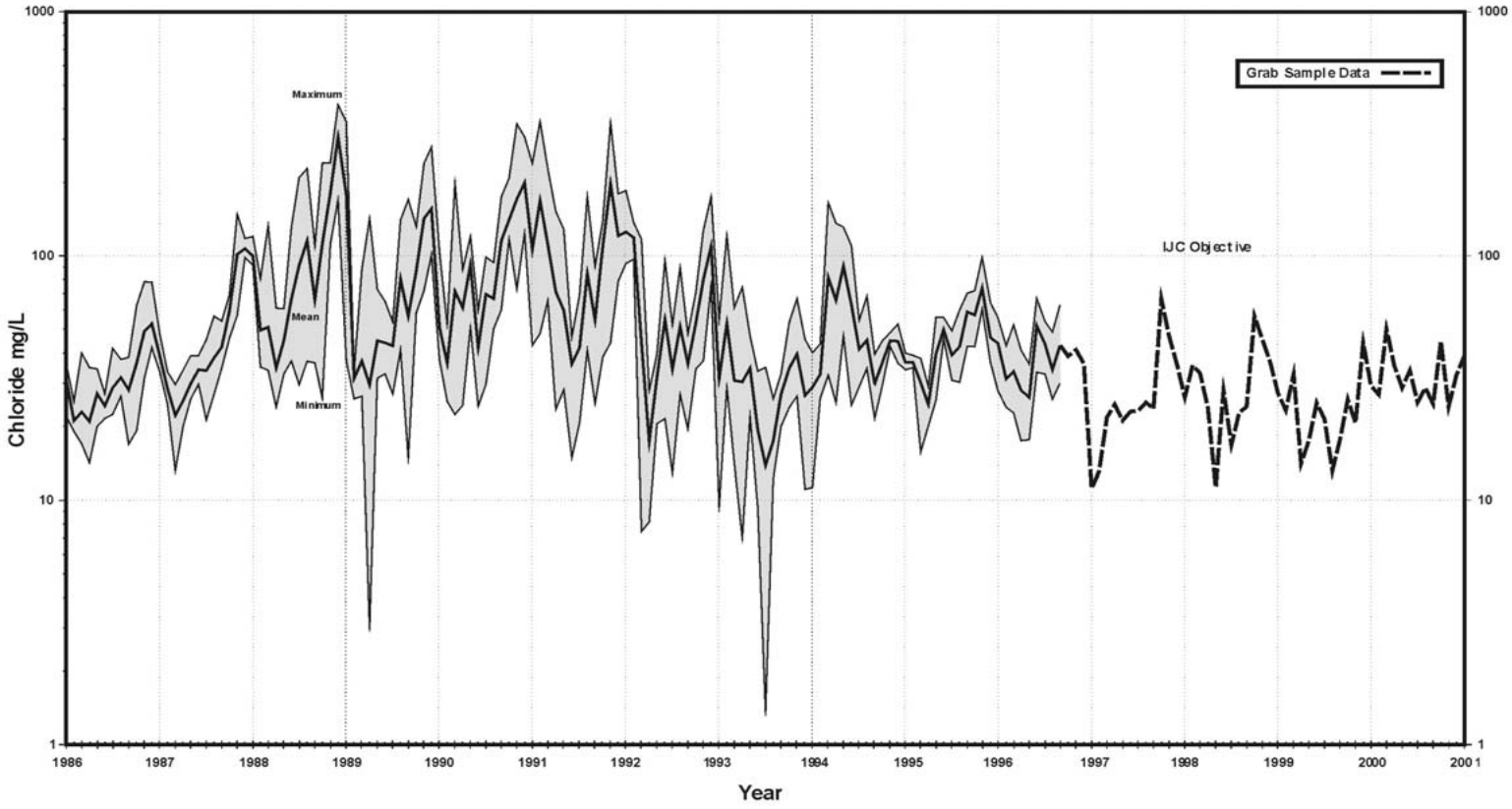

Figure 4b
Variability in monthly Chloride Levels (mg/L), 1986-2001
Red River near the International Boundary

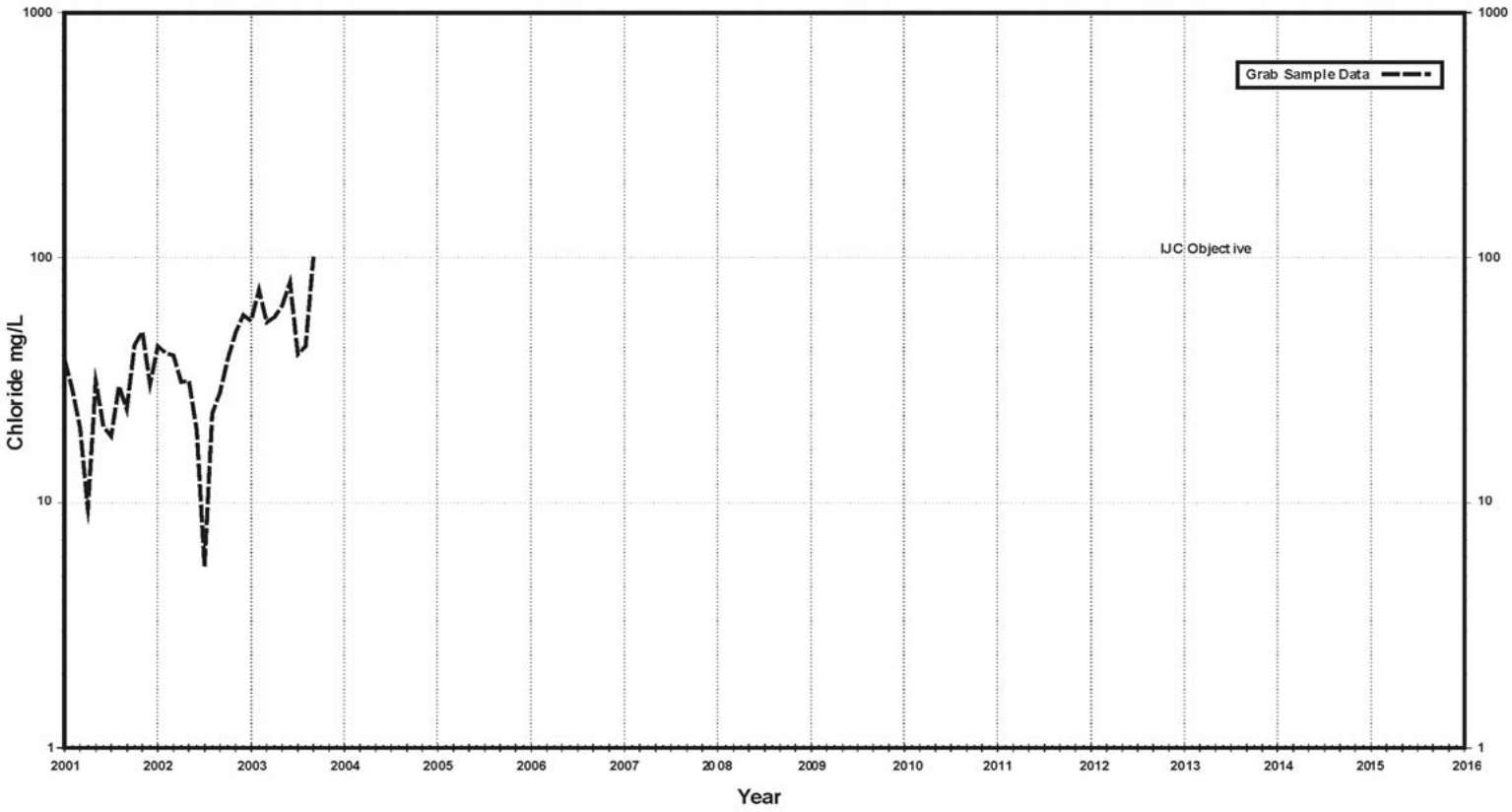

Figure 4c
Variability in monthly Chloride Levels (mg/L), 2001-2016
Red River near the International Boundary

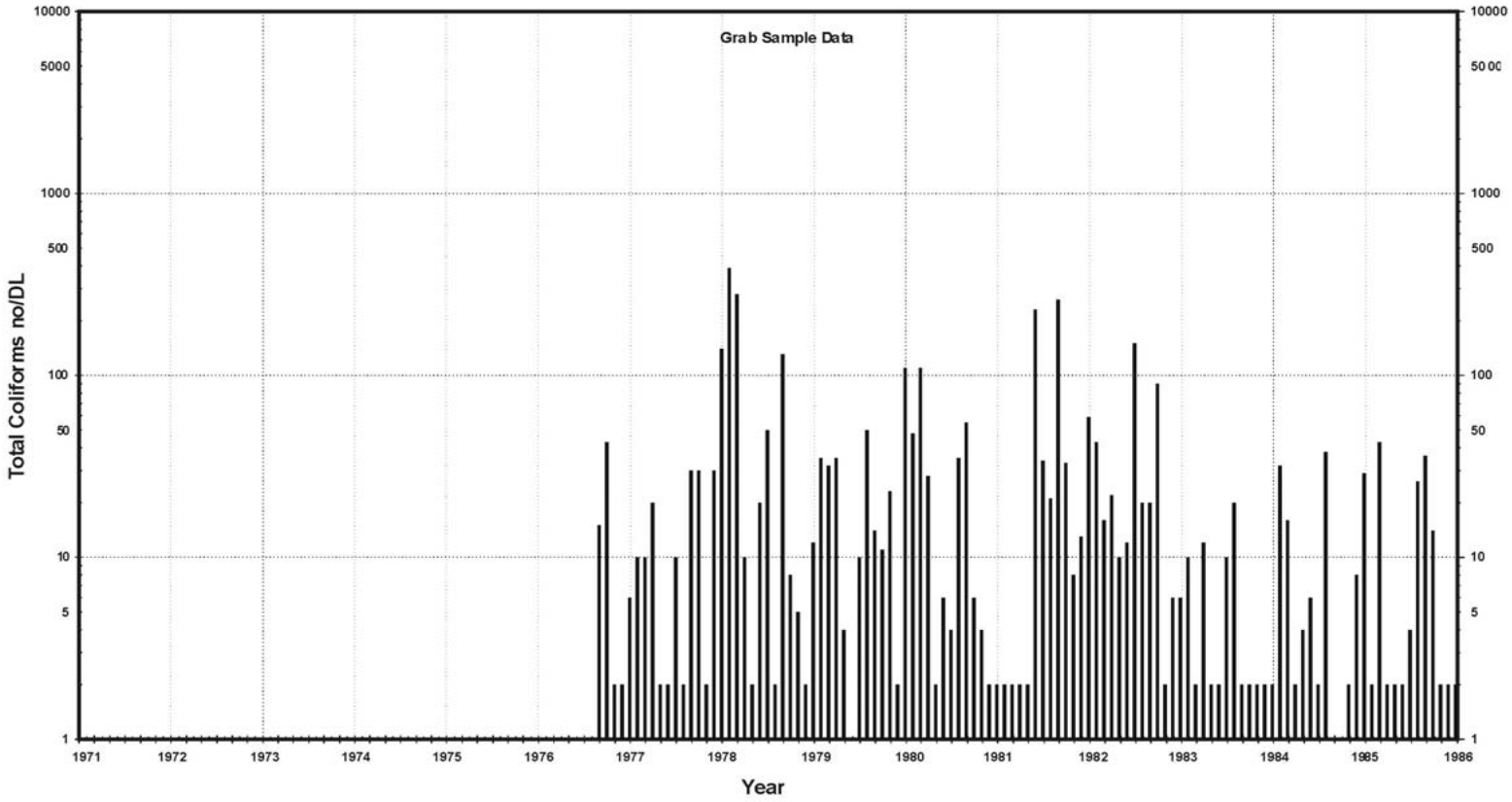

Figure 5a
Variability in Fecal Coliforms (no/DL), 1971-1986
Red River near the International Boundary

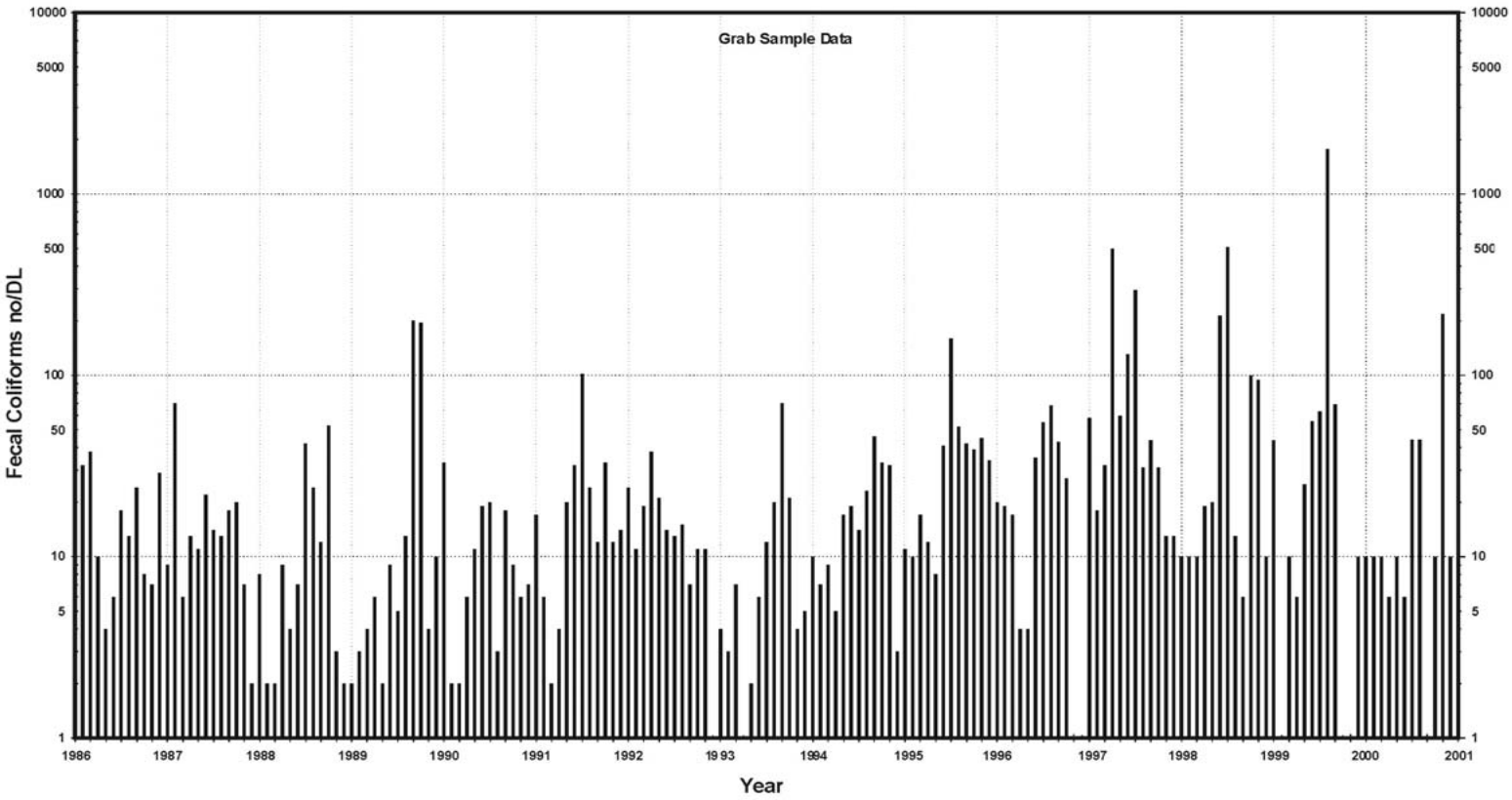

Figure 5b
Variability in Fecal Coliforms (no/DL), 1986-2001
Red River near the International Boundary

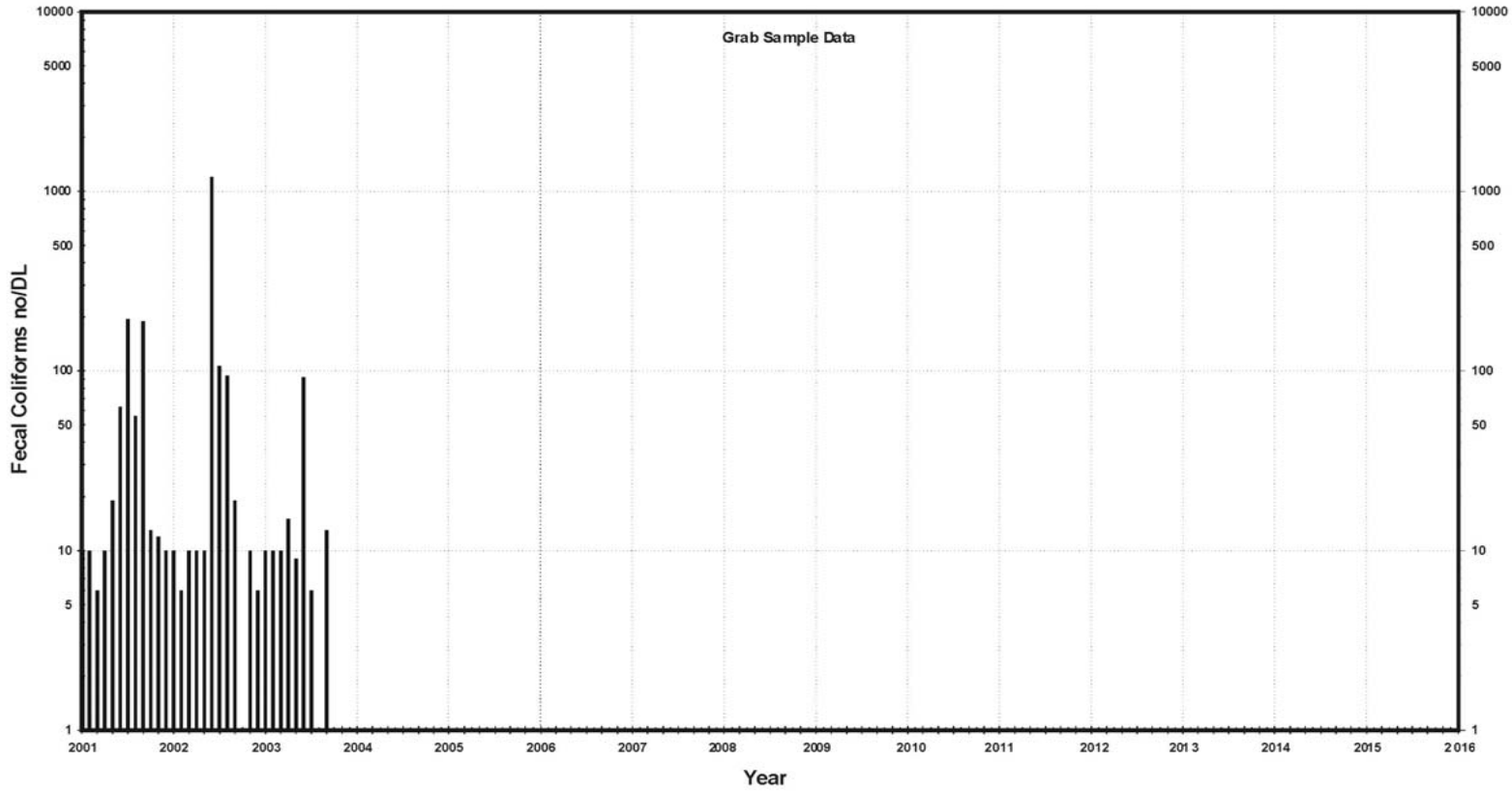

Figure 5c
Variability in Fecal Coliforms (no/DL), 2001-2016
Red River near the International Boundary

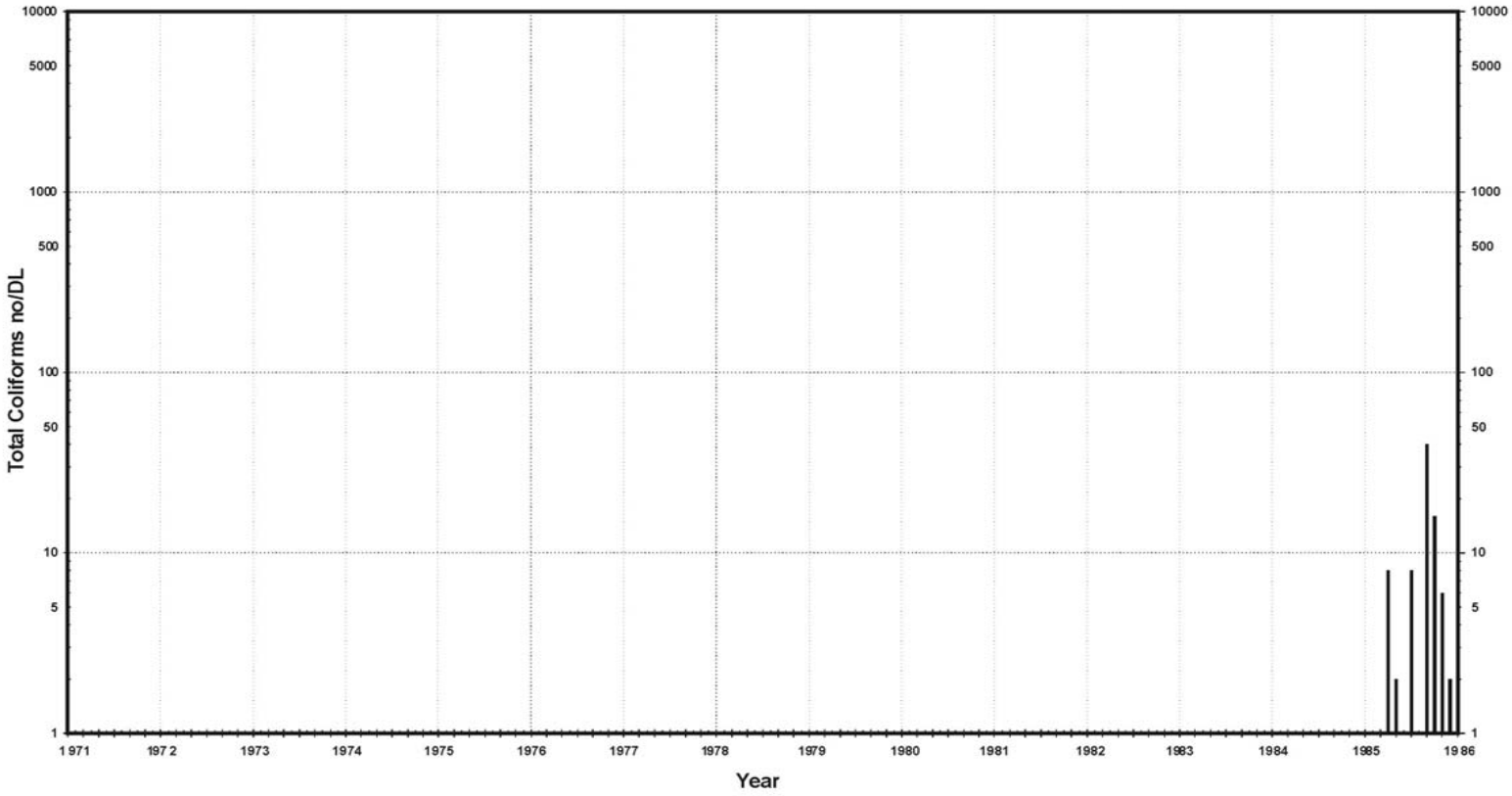

Figure 6a
Variability in Total Coliforms (no/DL), 1971-1986
Red River near the International Boundary

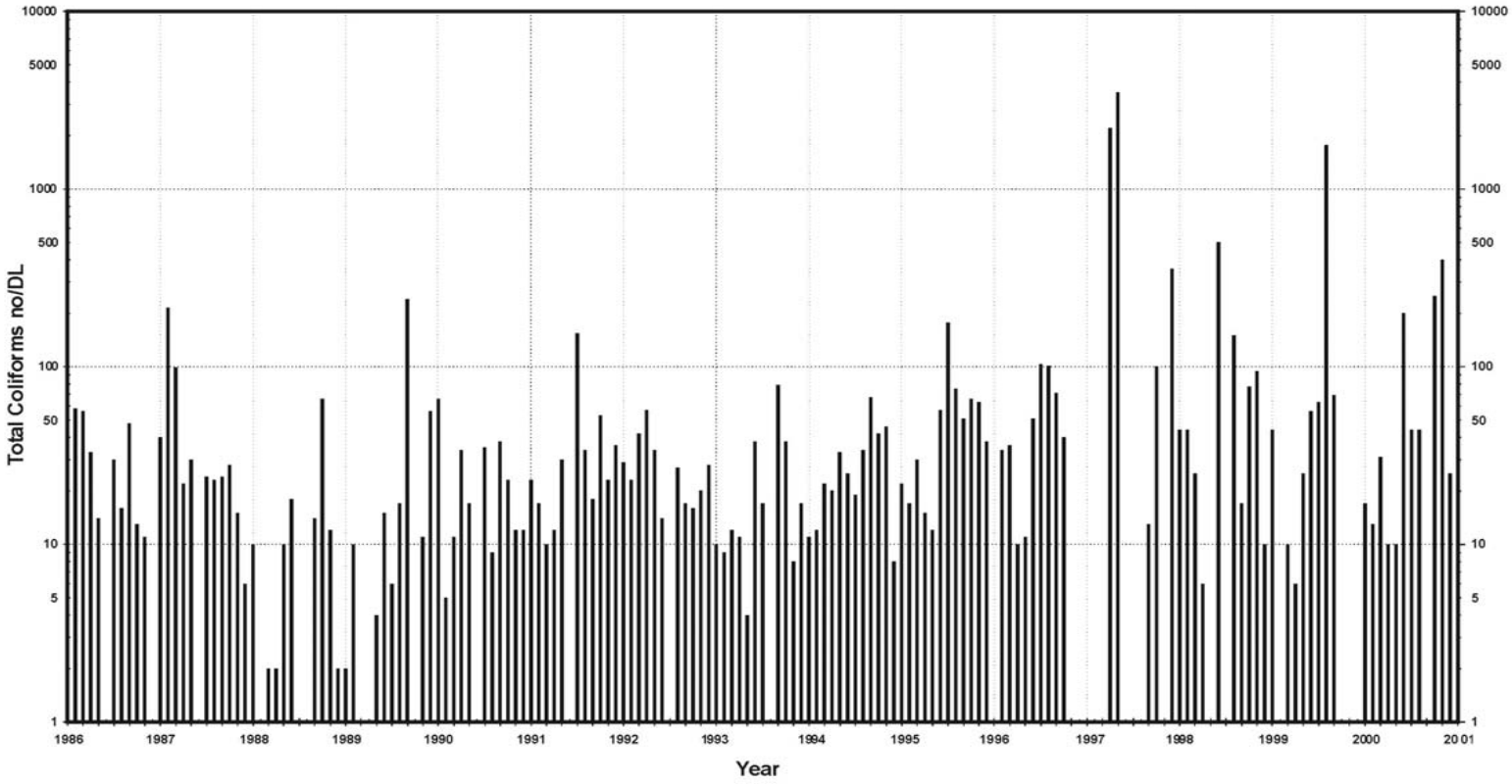

Figure 6b
Variability in Total Coliforms (no/DL), 1986-2001
Red River near the International Boundary

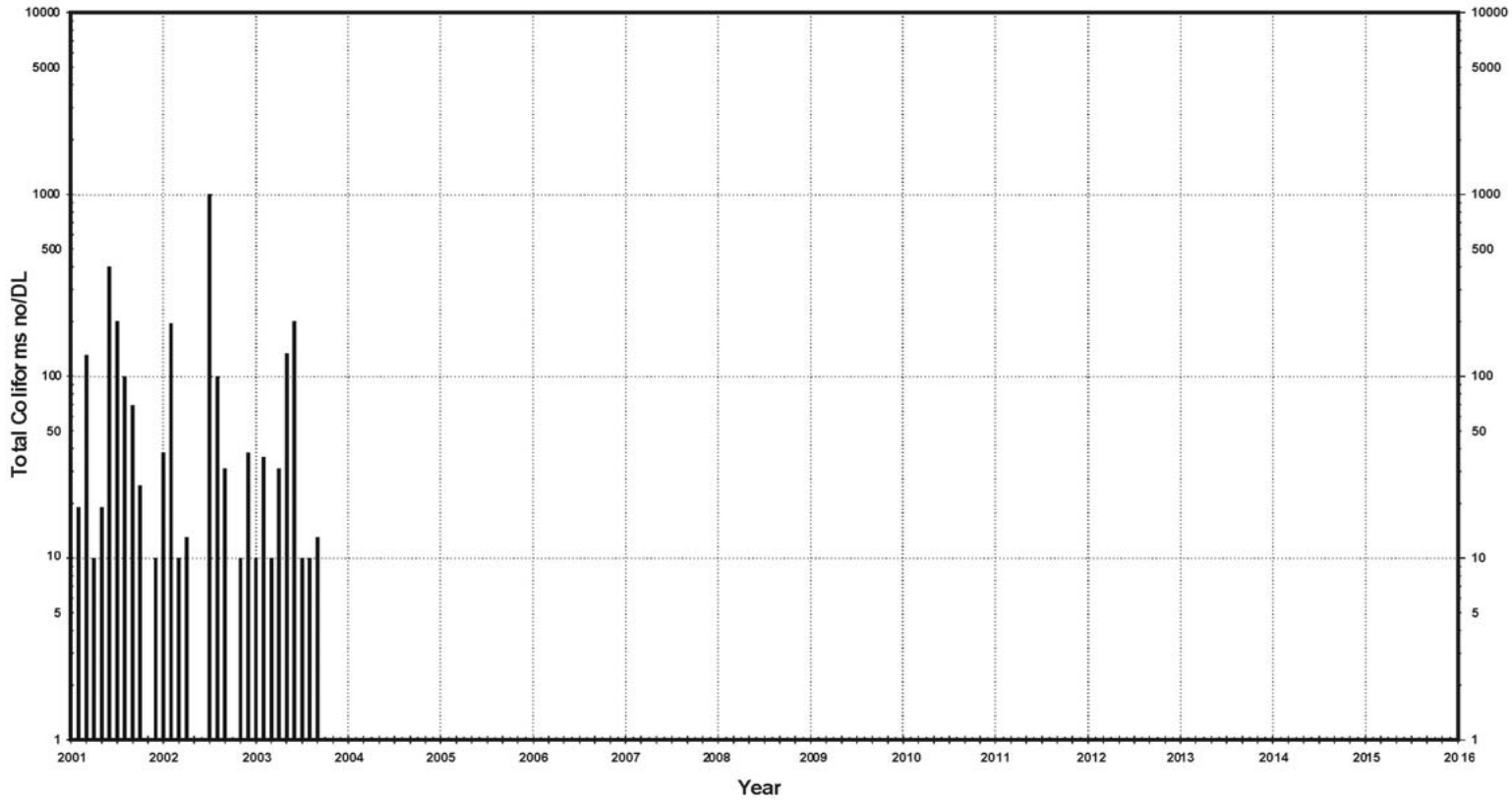

Figure 6c
Variability in Total Coliforms (no/DL), 2001-2016
Red River near the International Boundary

APPENDIX E

HYDROLOGY COMMITTEE AND AQUATIC ECOSYSTEM HEALTH COMMITTEE MEMBERSHIP LIST

International Red River Board
Hydrology Committee

Membership

Name	Organization	Phone	E-mail
Rick Bowering (Chair) Steve Topping (Alt.)	Manitoba Conservation, Winnipeg	(204) 945-6397 (204) 945-6398	Rbowering@gov.mb.ca stopping@gov.mb.ca
Steve Robinson (Chair) Gregg Wiche (Alt.)	USGS, Grand Forks USGS, Bismark	(701) 775-7221 (701) 250-7400	Smrobins@usgs.gov gjwiche@usgs.gov
Michael Kowalchuk (Secretary)	Environment Canada, Secretary IRRB, Winnipeg	(204) 983-5500	Michael.Kowalchuk@EC.GC.CA
Alain Vermette	PFRA, Winnipeg	(204) 984-3694	Vermettea@em.agr.ca
Scott Jutila Greg Eggers (Alt.)	Corps of Engineers, St. Paul	(651) 290-5631 (651) 290-5607	Scott.A.Jutila@usace.army.mil Gregory.W.Eggers@usace.army.mil
Maurice Sydor	Environment Canada, Ottawa	(819) 953-1528	maurice.sydor@ec.gc.ca
Randy Gjestvang	N.D. State Water Commission, West Fargo	(701) 282-2318	rgjest@water.swc.state.nd.us
Chuck Fritz	Red R. Basin Commission, Moorhead	(218) 291-0422	Chuckr2b2@corpcomm.net
Harold Taylor	Red R. Basin Commission, Winnipeg	(204) 982-7254	ticwpg@ilos.net
Ron Harnack Al Kean (Alt.)	Minnesota Board of Water and Soil Resources,	(651) 296-0878 (651) 297-2907	Ron.harnack@bwsr.state.mn.us Al.kean@bwsr.state.mn.us
Kip Gjerde Amy Lieb (Alt.)	U.S. Bureau of Reclamation, Billings/Bismark	(406) 247-7813 (701) 250-4242 ext. 3615	jgjerde@gp.usbr.gov alieb@gp.usbr.gov

International Red River Board
Aquatic Ecosystem Health Committee

Membership

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