International Joint Commission

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Living with the Red

A Report to the Governments of Canada and the United States on Reducing Flood Impacts in the Red River Basin

NOVEMBER 2000

International Joint Commission
Commission mixte internationale

International Joint Commission (www.ijc.org)

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The International Joint Commission is a binational organization established by the Boundary Waters Treaty of 1909. The Commission helps Canada and the United States to manage the waters they share in a variety of ways, including investigating and reporting on issues when asked to do so by the two federal governments.

The full report may be downloaded from www.ijc.org
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The International Joint Commission

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November 28, 2000

Honorable Madeleine Albright
Secretary of State
2201 C St., NW
Washington, D.C. 20520

Honourable John Manley, P.C., M.P.
Minister of Foreign Affairs
125 Sussex Drive
Ottawa, Ontario K1A 0G2

Dear Secretary Albright and Minister Manley:

We have the honor to transmit herewith the Final Report of the International Joint Commission (Commission) addressing issues arising from the 1997 Flood on the Red River. This report was requested by the governments of Canada and the United States in the reference of June 12, 1997, concerning the causes and effects of damaging floods in the Red River basin, and follows up the Commission's Interim Report of December 31, 1997.

The Commission plans to release the Report to the public on December 6, 2000.

Gerald E. Galloway
Secretary
United States Section

Murray Clamen
Secretary
Canadian Section

Executive Summary

The flood of 1997 will long be remembered in the Red River basin of Canada and the United States. Over 100,000 people had their lives disrupted for several months and some still suffer from the physical and emotional trauma of the flood. Economic damages in the two countries approached U.S.$5 billion and flood recovery and mitigation costs continue to grow. Many of those who were not harmed by the flood recognize that their safety was preserved by only a matter of inches or centimeters. With great internal strength, basin residents on both sides of the border met the challenge of the flood but now look to governments to ensure that such destruction never again is visited upon them. At the request of Canadian Prime Minister Jean Chrétien and U.S. President William J. Clinton, the International Joint Commission undertook to analyze the root causes of the flood and to make recommendations as to how damage from major Red River floods could be mitigated in the future.

...what makes a community a place to live in is not the buildings, it's the people—the spirit and faith that are in those people. Water cannot wash that away, and fire cannot burn that away, and a blizzard cannot freeze that away. And if you don't give it away, it will bring you back better than ever.

Grand Forks Mayor Pat Owens, April 22, 1997.

It is hard not to be touched by the sadness and enormous impact that the flood wrought on so many lives. But the flood also demonstrated how crisis brings out the best in people and in communities.

Winnipeg Mayor Susan Thompson, October 23, 1997.

Since the summer of 1997, the Commission and its binational Task Force have been examining the flood and methods to reduce or eliminate the impacts of future major floods. In carrying out its responsibilities, the Task Force initiated the development of products that will be of continuing utility to the basin, including hydraulic models to aid in analysis of flood flows, high-resolution topographic and land use data for flood-prone areas and a virtual network to link those in the basin dealing with flood issues. The Commission has closely examined the work of the task force, conducted meetings and hearings in the basin, met with leaders at all levels in the public and private sector, and extended the analysis of the Task Force in some measure.

The Commission has come to the conclusions set out below:

- Flooding in the Red River basin is a natural hydrometeorological event. Although the 1997 flood was a rare event, floods of the same magnitude as 1997, or even greater, can be expected to occur in the future.
- The people and property of the Red River basin will remain at undue risk until comprehensive, integrated, binational solutions to flood problems are developed and implemented. Solutions for one part of the basin must take into account the impacts on other parts of the basin.

- There is no single solution to the flood damage mitigation challenge. To reduce vulnerability to flooding, all possible approaches, including both structural and non-structural damage reduction measures, must be considered as part of a comprehensive plan. This would include, when environmentally, economically and socially justified, development of additional reservoir storage, restoration of wetlands, micro-storage, construction or improvement of levees and dikes, floodwalls and bypass channels, permanent evacuation of high-risk areas, flood-proofing, and the enhancement of flood forecasting and warning systems.
- The potential flooding of major population centers in the Red River basin needs immediate attention:
  - The risk of a failure of Winnipeg's existing flood protection infrastructure is high under flow conditions similar to or greater than those experienced in 1997. While, for the most part, the city was spared significant damage in 1997, public safety requires that the city and province focus immediate attention on designing and implementing protective measures to further protect Winnipeg. These measures must respect both the needs of Winnipeg and the interests of those outside the city who might be affected by any such measures.
  - Detailed assessment of the significant flooding risks facing Fargo–Moorhead is required. Studies by the U.S. Army Corps of Engineers and the Federal Emergency Management Agency should be expedited so that appropriate mitigation measures can be identified and quickly implemented.
  - The work currently being undertaken in Grand Forks–East Grand Forks will serve to protect residents from future flood damage but needs to be completed in a timely manner and periodically evaluated for its level of protection.
  - Completion of studies, and development and implementation of proposed projects to protect Wahpeton and Breckenridge, should be expedited.
- The floodplain ecosystem of the Red River valley will be threatened unless steps are taken to protect it as part of the process of developing flood damage reduction solutions. In addition, steps must be taken to ensure that banned materials are removed from the basin and that storage of hazardous materials on the floodplain is carefully controlled.
- Governments at all levels need to promote a culture of flood preparedness and flood resiliency in the basin; continue the work begun by the Commission's Task Force; provide opportunities for multi-jurisdictional problem solving and the exchange of best-practices information; and integrate floodplain management activities into the broader field of watershed and basin management.

The Commission, in this report, has provided 28 recommendations for governments at all levels. The recommendations provide a blueprint for action. The challenge will come in the execution of these recommendations.

Federal, state, provincial and local governments have many well-established and active agencies dealing with various aspects of flooding within their jurisdictions. Non-governmental organizations also fill important flood-related roles. There also is a need for basin-wide binational institutional arrangements to deal with the transboundary issues that will arise, and the Commission finds that this need for a binational approach is generally accepted within the basin.

The Commission proposes to assign certain flood-related activities to its International Red River Board after consultations in the basin and with governments. The Commission also strongly recommends that:

- Governments immediately take steps, on a binational basis, to begin development of a comprehensive flood damage reduction plan for the Red River basin.
- Governments work with the International Red River Board and existing and emerging bilateral organizations to ensure that appropriate arrangements are in place for coordinating and implementing measures for flood-preparedness and mitigation activities, and to implement the recommendations of the Commission found in this report to governments.

IJC Conclusions and Recommendations

Throughout this report, the Commission has referred to the work of the International Red River Basin Task Force and to its conclusions and recommendations. As noted earlier in the text, some of the recommendations have been repeated as Commission recommendations while others have simply been referred to in a general way. Appendix 2 summarizes the Commission's position with respect to each of the recommendations of the Task Force. The following lists all of the Commission's conclusions and recommendations, including those from the Task Force's final report that the Commission endorses but did not restate.

IJC Conclusions

Conclusion 1: Although the 1997 flood was a rare event, floods of the same size as the 1997 event, or greater, can be expected to occur in the future in the Red River basin. People and property remain at risk from these floods.

Conclusion 2: It would be difficult if not impossible to develop enough economically and environmentally acceptable large reservoir storage that alone would reduce substantially the flood peaks for major floods. Storage to reduce flood peaks for more frequent local floods may prove worthwhile and deserves further study.

Conclusion 3: Large-scale micro-storage has some potential to reduce flood peaks, perhaps significantly for more frequent local floods, but reliance solely on micro-storage for major flood events would be impracticable and costly. While there are many obstacles to its effective and efficient implementation, the feasibility of micro-storage for flood peak reduction should continue to be analyzed.

Conclusion 4: Wetland storage can provide an economically and environmentally beneficial method of reducing flood flows for frequent, smaller floods, but wetland storage alone is unlikely to significantly reduce the peaks of large floods on the mainstem of the Red River.

Conclusion 5: Under flow conditions similar to those experienced in 1997, the risk of a failure of Winnipeg's flood protection infrastructure is high. Public safety requires that the city, province and Canadian federal government focus immediate attention on designing and implementing measures to further protect Winnipeg.

Conclusion 6: Further improvement and maintenance of the Red River virtual floodplain management database is required. Federal, state and provincial governments and local authorities must maintain a high level of involvement in further database development and in improving data accessibility.

Conclusion 7: Large and small communities throughout the Red River basin will remain at undue risk until a comprehensive binational multi-faceted solution to the full range of flood problems is developed and implemented. Such a solution will require use of all flood mitigation methods, both structural and non-structural, and must take into account potential impacts on the environment.

IJC Recommendations

Recommendation 1: The federal governments should convene a meeting of senior federal, provincial and state officials in 2002 to undertake policy discussions and an examination of the 1997 flood, with emphasis on review of emergency plans, evacuation procedures and mitigation measures underway.

Recommendation 2: The design flood used as the standard for flood protection works for Winnipeg should be the highest that can be economically justified or, at a minimum, the flood of record, the 1826 flood.

Recommendation 3: The city, province and the Canadian federal government should cooperatively develop and finance a long-term flood protection plan for the city that fully considers all social, environmental and human effects of any proposed flood protection measures and respects both the needs of Winnipeg and the interests of those outside the city who might be affected by such a plan.

Recommendation 4: The government of the United States, in cooperation with the cities of Fargo and Moorhead and the states of North Dakota and Minnesota, should expedite the study of flood risk potential and implement plans for flood protection measures for the Fargo–Moorhead area.

Recommendation 5: The government of the United States, in cooperation with the cities of Grand Forks and East Grand Forks and the states of North Dakota and Minnesota, should ensure that the planned flood protection works are promptly and expeditiously completed.

Recommendation 6: The government of the United States, in cooperation with the cities of Wahpeton and Breckenridge and the states of North Dakota and Minnesota, should expedite approval and implementation of flood protection plans to reduce the risk of flooding at Wahpeton–Breckenridge.

Recommendation 7: The province of Manitoba and city of Selkirk should expedite studies of flood-risk potential in the Selkirk area.

Recommendation 8: 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.

Recommendation 9: Governments at all levels should ensure that in the development of flood mitigation strategies for the basin the needs of small communities, individual isolated farmsteads and agriculture are not overlooked.

Recommendation 10: Federal government agencies, in cooperation with the state of North Dakota and the province of Manitoba, should establish a consultative group to work with local interests, including the Pembina River Basin Advisory Board, to resolve the lower Pembina River flooding issue, provide necessary resources for the group, and act to achieve a solution.

Recommendation 11: Governments should develop a binational integrated approach to mitigation initiatives at all political levels, based on a comprehensive mitigation strategy for the entire basin. In the United States, the strategy should be integrated within the overall national framework.

Recommendation 12: The Canadian federal government should establish a national flood mitigation strategy, or a broader disaster mitigation strategy, and support it with comprehensive mitigation programs.

Recommendation 13: Governments should use, at a minimum, the 100-year (1 percent) flood as the basis for floodplain regulations and revise their estimates of the 100-year flood levels based on 1997 and new data that become available.

Recommendation 14: State, provincial and other appropriate authorities should review the effectiveness of and compliance with the floodplain management regulations in the basin and take steps as needed to improve enforcement.

Recommendation 15: Within the current context of Canada–United States cooperation for civil emergency planning and management, governments should develop more detailed bilateral emergency planning and management arrangements with specific adaptations to Red River flooding.

Recommendation 16: Development of the digital elevation model for the Red River basin, with high resolution in appropriate high flood risk areas, should be pursued and completed through collaborative initiatives of federal, state, provincial and local governments.

Recommendation 17: Federal, state and provincial governments should develop and implement a binational agreement to establish an appropriate network of hydrological and meteorological stations and data exchange for floodplain management and flood forecasting in the Red River basin.

Recommendation 18: The governments should authorize the Commission to establish a binational Red River Flood Forecasting Liaison Committee under the International Red River Board to improve interjurisdictional coordination and to help ensure that clear, understandable and compatible forecasts are issued to the public.

Recommendation 19: As a long-term priority, government agencies responsible for flood forecasting and mitigation measures should develop basin-wide models rather than separate but coordinated models for each country.

Recommendation 20: The Canadian government should review its data and information management policies to ensure that topographic, hydrometeorological, and other flood-related data collected under government programs are made available without restrictions or conditions that limit their accessibility.

Recommendation 21: Governments should ensure that progress continues in building a binational, virtual network linking the people, data, and models for the Red River basin.

Recommendation 22: Federal, state, and provincial governments should work with basin organizations to complete in a timely manner the development of a prototype decision-support system and establish a cooperative mechanism for coordination and funding its further development and implementation.

Recommendation 23: Governments should take immediate steps to ensure that all banned materials such as toxaphene are removed from the Red River basin. Governments should also ensure that potentially hazardous materials are not stored in the 500-year floodplain, although reasonable quantities of such substances could be maintained in the floodplain for immediate use.

Recommendation 24: Flood protection projects focus not only on reduction of flood damage but also on protection and enhancement of the floodplain environment.

Recommendation 25: Governments immediately take steps, on a binational basis, to begin development of a comprehensive flood damage reduction plan for the Red River basin.

Recommendation 26: Governments at all levels should undertake the following measures:

a. Develop and implement comprehensive, multi-faceted plans for concurrently reducing flood damage and protecting and enhancing the natural environment;
b. Ensure ongoing institutional support and full multi-jurisdictional participation in further development and maintenance of the Task Force's legacy projects;
c. Implement Commission and Task Force recommendations designed to ensure basin-wide flood preparedness and community resiliency;
d. Promote a culture of flood preparedness and flood resiliency in the basin;
e. Enhance technology and monitoring systems to provide early warnings and early action in the face of impending major floods;
f. Ensure binational coordination of flood forecasting and communications of forecasts to the public;
g. Provide opportunities for multi-jurisdictional problem solving and the exchange of best practices information; and
h. Integrate floodplain management activities into the broader field of watershed and basin management.

Recommendation 27: Governments should assign the following functions to the International Joint Commission for implementation by the International Red River Board:

a. 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;
b. Encourage governments to develop and promote a culture of flood preparedness in the Red River valley;
c. Encourage government efforts to develop and implement a long-term strategy for flood mitigation and emergency preparedness;
d. 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;
e. 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;
f. Promote the application of innovative technologies for supporting flood modeling and mapping;
g. 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;
h. Monitor potential transboundary effects of flood mitigation and other works in the basin, and encourage cooperative studies necessary to examine these effects;
i. Encourage governments to integrate floodplain management activities in watershed and basin management;

j. Interact with all levels of government to help decision makers become aware of transboundary flood-related and associated water management issues; and
k. Assist in facilitating a consultative process for resolution of the lower Pembina River flooding issue.

Recommendation 28: The federal governments, in cooperation with the state and provincial governments, should work with the Commission and its International Red River Board, as well as with existing and emerging bilateral organizations, to ensure that appropriate arrangements are in place to coordinate and implement measures for flood preparedness and mitigation activities and to implement recommendations of the Commission.

Task Force Conclusions Endorsed but not Restated by the IJC

Conclusion 7: There is general recognition in the region that flooding in the lower Pembina River basin has been profoundly affected by the construction of dikes and of roads that act as dikes on both sides of the boundary. Rectifying the transboundary flooding consequences of these structures will require action in both countries and there appears to be a general readiness to take such action.

Conclusion 8: Further improvement and maintenance of the [virtual] Red River floodplain management database [initiated by the Task Force] is required. Federal, state and provincial governments and local authorities must maintain a high level of involvement in further database development and in improving data accessibility.

Task Force Recommendations Endorsed but not Restated by the IJC

Recommendation 2: Future ice jam information from the entire basin should be incorporated into the [U.S. Army Corps of Engineers' Cold Regions Research Engineering Laboratory] CRREL Ice Jam Database so that ice problems in the basin can be analyzed further. Where feasible, historic ice jams from the Canadian portion of the basin should be entered.

Recommendation 3: Communities in the United States portion of the Red River basin should ensure that community-built flood damage reduction projects are certified by FEMA for 100-year or greater protection, or should participate in the Non-Federal Flood Control Works Inspection Program.

Recommendation 5: Based on results from hydraulic model studies, modify the east embankment of the [Winnipeg] Floodway to improve the performance of the Floodway entrance to lower upstream water levels and increase capacity.

Recommendation 6: The west dike [upstream of the Winnipeg Floodway inlet] should be raised to allow a water level elevation of 778 feet (237 m) at the Floodway inlet structure with appropriate freeboard.

Recommendation 7: The primary diking system [for Winnipeg] should be raised where economically feasible to the elevation specified in existing legislation.

Recommendation 10: Modifications to the sewer and land drainage systems [of Winnipeg] should be optimized and undertaken once the overall plan for Winnipeg flood protection is determined.

Recommendation 11: The City of Winnipeg should give immediate high priority to the preparation of a detailed emergency preparedness and response manual.

Recommendation 12: Operating rules for new flood control measures [for Winnipeg] should be designed to accommodate all flow regimes, even those beyond design capacity. The public should be consulted on any proposed new operating rules.

Recommendation 15: The 500-year flood (0.2 percent flood) should be defined throughout the Red River basin and used to inform the public of the potential risks of flooding from rare events, including the need to buy flood insurance in the United States, and as the basis of regulations for siting and flood-proofing critical facilities.

Recommendation 16: Both North Dakota and Minnesota should consider adopting the new International Building Code that includes requirements for design and construction in flood hazard areas.

Recommendation 17: The National Building Code of Canada should specify design and construction standards for buildings in flood hazard areas such as the Red River basin. Floodplain construction requirements should be incorporated into the Manitoba code when available.

Recommendation 18: Federal, state, provincial, and local governments in the Red River basin, in conjunction with the private sector, should continue to develop, refine, and implement effective strategies to improve the disaster resiliency in basin communities. Efforts should be made to increase public awareness of flood risks throughout the basin.

Recommendation 21: The Canadian federal government should include in the Disaster Financial Assistance Arrangements provisions to allow for the permanent removal of structures in areas subject to repeated flooding.

Recommendation 25: Recovery, rebuilding, and mitigation expertise and information should be widely shared across the border in advance of flooding.

Recommendation 26: Measures of flood resilience should be developed, and a system should be established to monitor resilience in the Red River basin.

Recommendation 28: Given the transboundary nature of the [Pembina River] basin and the potential for federal involvement in funding and monitoring any agreement, federal agencies from both countries should be engaged in this process [to determine and implement solutions to flooding problems] as well.

Recommendation 29: Changes in the road network and diking system in the lower Pembina basin should be modeled by the hydrodynamic model prior to implementation of any plan to ensure that there are no unintended consequences.

Recommendation 30: The virtual database and decision-support system prototype that the Task Force has begun to develop for the Pembina basin should be continued by relevant agencies in Canada and the United States.

Recommendation 32: Any modification to existing operating plans or physical structures associated with Lake Traverse that could increase pool elevation must be accompanied by features that eliminate the southward movement of water into the Little Minnesota River.

Recommendation 34: Governments should continue to monitor toxaphene in the Lake Winnipeg ecosystem until concentrations decline to pre-1997 levels.

Recommendation 35: Hydrometric and meteorological data networks necessary for flood forecasting should be improved and maintained in a state of readiness to forecast future floods.

Recommendation 36: New geographically related data collection in the United States should be in accord with the North American Vertical Datum of 1988.

Recommendation 37: For consistency and accuracy, data used in models should take into account the differences in data at the border. Because datum conversions can affect data accuracy, any conversions between standards should be noted and reported along with the data.

Recommendation 38: U.S. National Geodetic Survey and the Geodetic Survey of Canada should convene a forum of datum experts [~~in the year 2000~~] to discuss Red River basin datum issues and develop a long-term transition plan [for resolving datum differences between the two countries].

Recommendation 39: All key data providers in Canada should make available at no cost and with no restriction the data sets necessary for the Red River floodplain management and emergency response, and regional or basin-wide modeling activities.

Recommendation 40: Data providers should remain responsible for maintaining and replicating the data sets [in the developing virtual database].

Recommendation 44: The U.S. National Weather Service should implement its Advanced Hydrologic Prediction System in the Red River basin as an early priority.

Recommendation 46: Confirm the flood peak reduction findings of Chapter 3 [of the Task Force's final report of April 2000] for large floods and examine reductions for smaller floods by implementing distributed models on tributaries such as the Mistinka, Wild Rice and Maple Rivers.

Recommendation 48: Conduct surveys of secondary roads, particularly in the central portion of the basin, with differential global positioning systems, and incorporate the results into the hydraulic models.

Recommendation 50: Measures should be taken to ensure that data supporting the operation of the hydraulic models and model outputs can be made widely available.