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CANADA: *FLOOD MANAGEMENT IN THE RED RIVER BASIN, MANITOBA*

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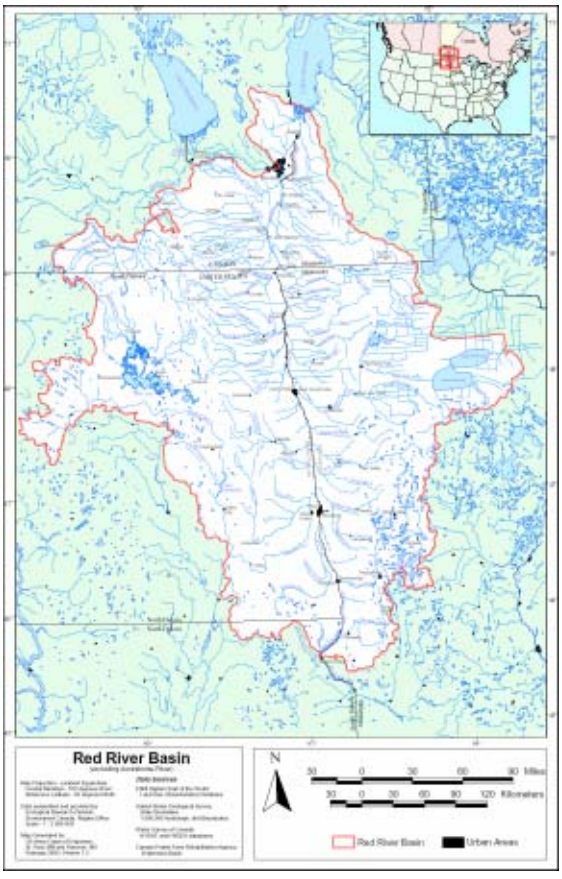
CANADA: *FLOOD MANAGEMENT IN THE RED RIVER BASIN, MANITOBA*

Slobodan P. Simonovic [1]

1. Location

Situated in the geographic centre of North America, the Red River originates in Minnesota and flows north (one of eight rivers in the world that flow north). The Red River basin covers 116,500 km^2 (exclusive of the Assiniboine River and its tributary, the Souris) of which nearly 103,600 km^2 are in the United States. The basin is remarkably flat. The elevation at Wahpeton, North Dakota, is 287 meters above sea level. At Lake Winnipeg, the elevation is 218 meters. The basin is about 100 km across at its widest. The Red River floodplain has natural levees at points both on the main stem and on some tributaries. These levees (some 1.5 m high) have resulted from accumulated sediment deposit during past floods. Because of the flat terrain, when the river overflows these levees, the water can spread out over enormous distances without stopping or pooling, exacerbating flood conditions. During major floods, the entire valley becomes the floodplain. In 1997, the Red River spread to a width of about 40 km in Manitoba. On the eastern side of the Red River drainage basin, landscape is so level that wetlands drain to either side. On the western side, natural drainage systems have been interrupted in places by deposits from glaciers causing surface water to collect there rather than drain, until it evaporates or seeps away. The type of soil in this region also contributes to flooding because, while topsoil is rich, beneath it lies anywhere from 1 to 20 m of largely clay soil, with characteristic low absorptive capacity. Water tends to sit on the surface for extended periods of time.



In general the climate of southeastern Manitoba is classified as *sub humid* to *humid continental* with resultant extreme temperature variations. Annually, most of the precipitation received is in the summer rather than the winter. Approximately ¾ of the 50 cm of annual precipitation occurs from April to September. Consequently, most years spring melt is well managed by the capacities of the Red River and its tributaries. However, periodically weather conditions exist which instead promote widespread flooding through the valley. The most troublesome conditions (especially when most or all exist in the same year) are as follows:

a) heavy precipitation in the fall
b) hard and deep frost prior to snowfall
c) substantial snowfall
d) late and sudden spring thaw
e) wet snow/rain during spring breakup of ice.

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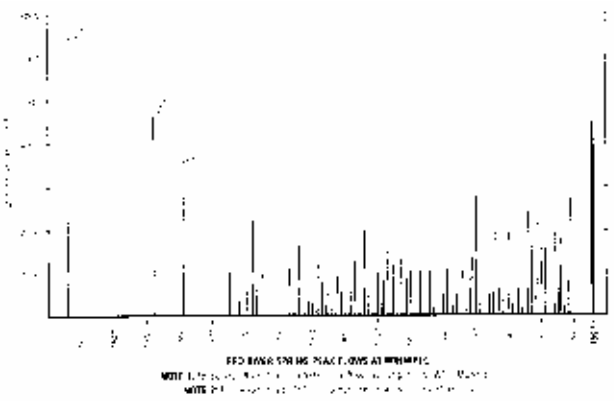
In Manitoba, almost 90 percent of the residents of the Red River/Assiniboine basin live in urban centres. Metropolitan Winnipeg contains 670,000 people, and another 50,000 live along the Red River north and south of the city. The Red River valley is a highly productive agricultural area serving local, regional and international food needs. There has been an extensive and expanding drainage system instituted in the Basin to help agricultural production by increasing arable land. The purpose of agricultural drainage is to remove, during the growing season, water in excess of the needs of crops and to prevent sitting water from reducing yields. However, the contribution of drainage activities, if any, to flooding and damages is both a concern and a source of disagreement. Faster removal of the spring water from the fields is considered to be one of the contributors to the regular spring flooding in the basin. Often problems with maintenance of drainage infrastructure are claimed as a source of infield flooding.

2. Description of floods



The basin floods regularly. Early records show several major floods in the 1800s, the most notable being those of 1826, 1852 and 1861. This century, major floods occurred in 1950, 1966, 1979, 1996 and 1997. The Red River basin has 25 subbasins, which have different topography, soils and drainage that result in different responses during flood conditions. One common characteristic is overland flow during times of heavy runoff. Water overflows small streams and spreads overland, returning to those streams or other watercourses downstream. Existing monitoring and forecasting systems do not track these flows well, leading to unanticipated flooding.

The earliest recorded flood in the basin was in 1826, although anecdotal evidence refers to larger floods in the late 1700s. The flood of 1826 is the largest flood on record; it was significantly larger than the devastating 1997 flood. A sudden thaw in April of 1826, followed by ice jams on the river and simultaneous heavy rainfall, had water on the Red River rise 1.5m downtown in just twenty-four hours. Preservation of life took precedence over preservation of property, thus losses were enormous. Whole houses were carried by the River. The estimated maximum flow was 7,362 m^3/sec. The water apparently took over one month to recede completely.

A pivotal event in Red River flood history was the 1950 flood which was classified a great Canadian natural disaster based on the number of people evacuated and affected by the flood. A very cold winter and heavy snowpack in the United States, combined with heavy rain during runoff, were the primary causes. All towns within the flooded area in the upper valley had to evacuate. Over 10,000 homes were flooded in Winnipeg and 100,000 people evacuated. A plan to evacuate all 350,000 people in Winnipeg was prepared, although luckily it did not have to be used.

The large 1979 flood was primarily the result of a rapid thaw and wet spring. Half of the upper valley evacuated. Homes just south of the flood control system were very hard hit yet again. Winnipeg was largely spared.

The 1997 flood was a true test of the flood control system throughout the valley. Extreme snowpack (98th percentile), extreme cold north and south of the border, high topsoil moisture,

unfavorable time of runoff, and an April blizzard combined to cause the inundation. The peak discharge at Emerson, Manitoba (at the border) was 3,740 m^3/sec; in the 1950 flood it was 2,670 m^3/sec. At the Floodway Inlet (just south of Winnipeg) peak was 4,587 m^3/sec compared to 3,958 m^3/sec in 1950. Floodwaters at the Inlet had actually crested 0.45 to 0.60 m higher than the forecast range pronounced; unexpected overland flooding was a major contributor to the error in forecasting, and ultimately increased damages.

Location	1950		1979		1997	
Red River - Emerson in m^3/sec	May 13	2,670	May 1	2,620	May 2	3,740
Red River -Winnipeg in m^3/sec	May 19	3,058	May 10	3,030*	May 4	4,587*

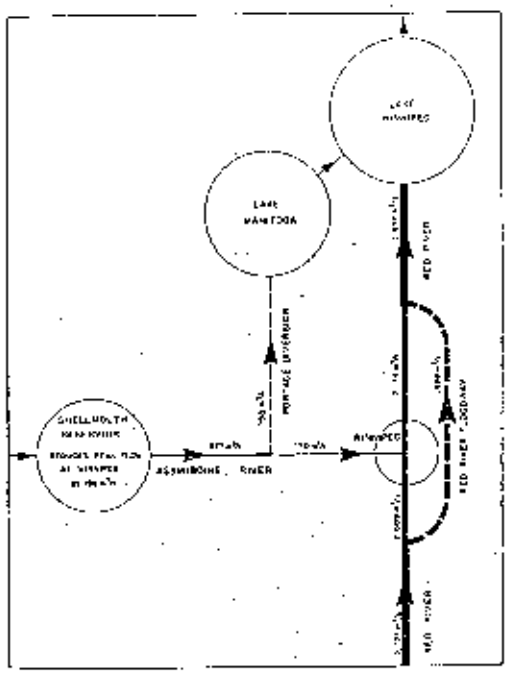
* Computed natural flow as would have occurred without existing flood control works.

The 1997 flood was the highest recorded this century. An estimated 1840 square kilometers of land was flooded as the Red River rose 12 meters above winter levels. Structural measures such as the diking systems and the Red River Floodway are known to have prevented enormous losses, as did emergency diking. Estimates of those prevented damages run as high as $6 billion. Eight valley towns with ring dikes remained dry; however, one town, one urban-fringe community, and numerous farm properties were flooded with subsequent damages.

3. Flood management measures

Without doubt it was the 1950 flood, a huge natural disaster, that clearly revealed the vulnerability of settlements along the flood plain in southeastern Manitoba, and the high costs associated with flood damages. This was enough to prompt all levels of government to search for ways to mitigate the flood hazard.

The first large scale water control structure in Southern Manitoba was intended as a temporary ameliorative measure; it was a boulevard diking system constructed after the 1950 flood in the greater Winnipeg area. Although intended as only *temporary*, it was followed by six flood- free years. This created a false sense of security and no permanent flood protection plans were made until a narrowly averted flood threat in 1956 served as impetus for a more comprehensive structural plan. In response to the 1956 threat, the Provincial Government took the first steps in development of a more far- reaching long- term flood damage reduction plan for Manitoba. They established a Royal Commission to prepare a benefit–cost analysis for a range of flood protection schemes. They considered traditional structural approaches such as channel improvements, increased diking systems, detention reservoirs, and also a more radical response, the diversion of floodwaters to protect vulnerable areas. The comprehensive flood control system which was finally adopted included an extensive plan to divert water around the city of Winnipeg. It was constructed from 1962-72, with federal and provincial governments sharing the costs, -60% - 40% respectively.



The use of a major structural system to reduce flood damage to Winnipeg was essential. When the devastating 1950 flood was quickly followed by successive smaller floods, it was evident that only structural measures could provide a

significant reduction in flood damages. The land was already in use; the benefits of more appropriate land use would be evident only over a period of time.

Following is the description of main structural measures used to reduce flood damage to Winnipeg.

Red River Floodway

Measure	• excavated channel about 48 km long
Implementation	• on advisement of 1958 Royal Commission , based on benefit-cost analysis • completed in 1968, at cost of $62.7 million
Responsibility	• operation and maintenance done by Manitoba Natural Resources- Water Resources Branch
Goal	• to divert flood waters in excess of 850 m3/sec around the city of Winnipeg from south to north
Efficiency	• highly successful at protecting Winnipeg, within technological limitations
Issues	• inappropriate development in highly vulnerable areas due to exaggerated sense of security within the protected area • institutionalization of flood damage reduction (perception that flood damage reduction is a government function and not a public issue) • if flood waters exceed channel capacity, damages could be extremely high • capacity insufficient to handle flood equal to that of greatest flood on record (i.e.1826) • operation is poorly understood by the public, prompting criticism • allegations that operation caused excessive flooding south of structure • after the 1997 the Floodway expansion is considered • provincial government estimates Floodway has saved over $10.5 billion in potential damages to Winnipeg

Portage Diversion

Measure	• consists of a diked earth channel, a diversion dam and spillway dam • channel is 4 km west of city of Portage la Prairie • diverts water from Assiniboine River to Lake Manitoba 29 km to the north
Implementation	• recommended by Royal Commission (1958) • completed in 1970 • cost $20.5 million
Responsibility	• Water Resources Branch
Goals	• To keep water levels in Winnipeg at acceptable level---below 17 ft. or 18 ft. at James Avenue • Protect agricultural land and communities downstream from Portage la Prairie
Efficiency	• highly efficient, subject to • problems with ice jams which can significantly reduce diversion channels capacity • technological limitations

Issues	• Diversion is most essential when the Red River and the Assiniboine both crest at or close to the same time; Winnipeg floodway would otherwise be heavily taxed • Reduces flood damages along lower Assiniboine River, much of which is agricultural land • May have contributed to false sense of security along lower Assiniboine River

The Shellmouth Reservoir

Measure	• consists of earthfill dam, overflow spillway, and reservoir • Located on Assiniboine River near Russell, Manitoba
Implementation	• Recommended by Royal Commission (1958) • Completed in 1972 • Cost $10.8 million
Responsibility	• Water Resources Branch
Goals	• provide water storage and control reservoir outflows to minimize downstream flooding in spring or during summer rainfall flood conditions • ensure adequate water supply in summer

Winnipeg Diking System

Measure	• earth dikes and pumping stations
Implementation	• recommendation of Royal Commission (1958) • initially implemented by the Greater Winnipeg Diking Board 1950-52 with involvement of three levels of government, later enhanced • initial cost (1950-51) $6 million, cost of enhancements in subsequent years undetermined
Responsibility	• Water Resources Branch (per the Diking Authority Act)
Goals	• protection of Winnipeg property from flood waters • pumping stations operate to lift water and sewage waste over boulevard dikes and prevent sewage back-up
Efficiency	• adequate only to a limited water level • easily breached under bad weather conditions or in very long duration floods • must be properly maintained
Issues	• permanent dikes are insufficient for highest water levels on record • some Winnipeg riverbank properties could not be protected by dikes due to proximity to river • some residents have removed the dikes on their property for aesthetic reasons, placing entire community at risk

Ring Dikes

Measure	• ring dikes around select communities (earth)
Implementation	• recommended by Royal Commission(1958) • cost – benefit analysis conducted prior to construction on 8 communities • first ring dikes completed in 1972, cost $2.7 million • from 1982-1991 new ring dikes and old dike enhancements cost $4 million; this figure is $6.9 million if *total* expenditures on the diking systems are included (such as pumping stations, communications equipment…) • new ring dikes completed following the 1997 flood
Responsibility	• Water Resources Branch – regional engineering staff (for maintenance and operation)
Efficiency	• adequate, subject to water level heights, weather conditions and maintenance/monitoring of dike
Issues	• dikes must be maintained, monitored and often enhanced during flood conditions • dike openings such as roads and railways must be closed with earth during floods • adequate pumping facilities must be in place • municipal cooperation required for construction and maintenance of dikes

Without doubt, the floodway has proved its value to the City of Winnipeg; at no time was this better illustrated than in the recent 1997 flood. Structural measures certainly can reduce or eliminate flood damage within the area they are designed to protect. However, the experience of Manitobans has a negative side according to some experts' analysis. Concern has arisen as to the implications of a "two tier system of protection" such as exists in the Red River Valley, i.e. those protected by the floodway versus those not.

Controversies also abound about whether or not the operation of the Floodway (and the artificial diversions of water resulting from structural measures) have increased hardship to some communities by diverting water *towards* them. These accusations stem back to the 1974 flood after which public hearings and consultations *confirmed* improper floodgate control had produced an upstream level 2.1 feet higher than normal.

False sense of security and the resultant complacency of people protected by the major structural flood damage reduction measures in Manitoba is a problem. Complacency has encouraged the "project-induced development" in the floodplain, so that with each successive flood the *potential* damage if structural measures fail is escalating. It is important to also note that the 1826 flood, the most severe on record, inundated all of metropolitan Winnipeg except for the western portion. Thus today much of the city is at risk, a risk heightened by the fact that the existing floodway may not contain waters of the 1826 flood's magnitude. This exemplifies the need for a long-term approach to flood protection, and implementation of other strategies (such as non-structural ones) to complement structural ones if flood damage reduction is a primary goal.

Following is the description of main non-structural measures used to reduce flood damage to Winnipeg.

Flood fighting

Measure	• Flood fighting includes those activities done prior to or during a flood with the intent of reducing damages from the flood
Responsibility	• Water Resources Branch of the Manitoba Conservation • EMO (Manitoba Emergency Measures Organization) • three levels of government • individual property owners
Issues	• need for *ongoing* emergency preparedness and planning, to ensure adequate needs assessment and timely access to human and other resources • proactive and long-term planning required versus reactive • optimal use of forecasts to determine flood fighting strategies, and provide sufficient warning to at-risk areas • improve flood response in some rural municipalities • improve public awareness of provincial government's flood fighting activities, including more specific information on the operation of the Floodway gates • establish nature of government liability, if any, for damages resulting from inaccurate predictions of water levels • improve individual property owners' and communities' emergency response

Flood forecasting and warning

Measure	• River streamflow forecasting involves complex analysis of the many variables which influence river levels, to ultimately best anticipate levels using probability calculations.
Responsibility	• Water Resources Branch – River Forecasting Centre
Issues	• enhanced use of modeling techniques needed • improved communication of risk to the public • improved prediction of overland flows

Post-Flood Recovery

Measure	• Activities, programs and policies which assist victims post-flood and restore property, including financial compensation and rehabilitation/ restoration
Responsibility	• EMO Claims Department • Three levels of government • Charity Organizations
Issues	• Federal and Provincial governments provide post disaster assistance based on the Canadian Federal Disaster Assistance Arrangement. The cost sharing formula which outlines the federal contribution is as follows: 0% of total rehabilitation costs if the disaster costs are less than $1 per capita of provincial population, 50% for the next $2 of eligible provincial expenditures on assistance, 75% for the next $2, and 90% of the remainder. • Primary responsibility for recovery rests with the provincial level of

	government. • The willingness of government to pick up a significant amount of costs associated with recovery in recent decades has caused citizens to now see some types of compensation/assistance as government's *responsibility.* • Private and charitable funds are essential to full restoration to pre-flood state. • There is no source of compensation for some types of damages . • Increasing land development and property values contribute to rising flood assistance payments

Land Use Regulation and Mapping

Measure	• Land use regulation refers to rules of practice and policy governing how land is used within a designated floodplain, as supported by government. Floodplain mapping activity complements land use regulation by delineating the area at risk during floods of specific magnitude; in Manitoba the 100 year flood level is used in regulation.
Responsibility	• Provincial government, with Federal input and legislation • Municipal government
Issues	• The use of land use regulation as a means of flood damage reduction has been slow to be effectively adopted in Manitoba • Inconsistencies abound in use of Designated Flood Area maps • Weak land use regulation has allowed for increasing residential development along the river south of the Floodway which is extremely vulnerable to flooding. • Poor enforcement of regulations has been an ongoing weakness. • New legislation is now before the provincial government which is intended to improve the success of land use regulation by more clearly discouraging the building of structures which are not compliant, and improving the inspection process.

Flood Proofing

Measure	• Flood proofing activities are meant to protect individual structures from flood damage; they include diking, terracing, raising buildings, relocation etc.
Responsibility	• Manitoba Water Resources Branch administers the program with the assistance of the Emergency Management Organization. The latter maintains the database of victims and their circumstances. Water Resources Branch provides both technical and financial assistance to communities, businesses and individuals who need help to flood proof.
Issues	• Since summer 1997 the current flood proofing program has been instituted, using the 1997 flood as the design flood. • Due to the large personal losses of some victims of the 1997 flood it is difficult for some victims to access sufficient funding to flood proof • The flood proofing program will be in operation for five years, with applications required within two years; however, the consequences (if any) of failing to flood proof are unknown if future damages are sustained.

There are limits to the amount of flood protection offered by structural measures. The use of complementary non-structural measures can both maximize the efficiency of existing structural measures and reduce damages in vulnerable areas. For long-range innovative and far-reaching solutions to be not only developed but successfully implemented requires that jurisdictional responsibilities, and particularly financial arrangements between levels of government, be clarified; as well, enforcement of non-structural flood mitigation strategies must be done. Since a prevalent problem in the past has been complacency among the general public concerning flood preparedness, regulatory enforcement is one way to combat this disinterest.

Ultimately a strategy that assists individuals to act in their own self-interest, and problem solve when it comes to flood protection, rather than leaving it exclusively in the hands of government, will benefit Manitoba in the long run. Nonstructural measures such as emergency or flood preparedness, are vitally important at the individual and community level. The unfortunate reality which must be acknowledged is that a flood of such magnitude that current structural measured are breached will occur every several hundred years. Nonstructural measures of all types – those related to emergency preparation, flood recovery, land use regulation, flood proofing etc. all offer additional protection when carefully applied. They must be given more priority than they have to date both by government and the public.

4. Flood and water management policy instruments

To provide a context for understanding the evolution of federal-provincial policy on flood damage reduction, a cursory overview of the three major pieces of federal legislation related to the topic is done. These pieces of legislation were responsible for influencing the nature of federal-provincial agreements and activities for flood damage reduction in Manitoba.

Canada Water Conservation Assistance Act (1953)

As the first actual water resources Act, it was intended to provide (to the provinces) federal financial assistance for the construction of "works" designed to conserve or control water. The Act stated that the federal government would contribute up to 37.5% of the cost of the works, provided the contribution of the federal government was not greater than that of the provinces.

Canada Water Act (1970)

Superceding the previous Act, the Canada Water Act outlined the nature of federal involvement in water resource management and water quality programs. It allowed for federal-provincial agreements to conduct research, formulate comprehensive water management plans, and develop water management projects. It differed from the previous Act because it focused not on "works" alone, allowing for consideration of non-structural water management alternatives. It also allowed for consideration of economic, social and environmental objectives, and solicitation of ideas from people affected by the management plans. There was a broader planning perspective, looking at larger geographical areas and wider impacts.

Concerns which the Act hoped to address through more comprehensive planning included: reducing flood damage costs, and reducing "income transfer" from the general public to floodplain dwellers in the event of floods.

Flood Damage Reduction Program (1975)- umbrella agreement still in effect

The primary objective of the Flood Damage Reduction Program was to reduce escalating flood damage costs; it came about because much of the increasing damage in the 1970's was a direct result of *new* uncontrolled development in floodplains. The *first* goal was to discourage development in high-risk floodplains.

To identify these high-risk areas, the program included a flood mapping agreement, and a public education component; this would allow the " designated flood areas" to be formally determined, mapped, and shared with the public to discourage further inappropriate development. For each designated area, provincial and federal governments agreed to the following provisions 1) they would not build, approve or finance inappropriate development 2) they would not provide flood disaster assistance for such development built after the designation as flood-prone 3) provincial authorities would *encourage* local authorities to zone on the basis of flood risk.

The first provision of the above legislation has been somewhat successful in Manitoba. Projects can be refused funding by various federal and provincial departments governments because they are inappropriate for the level of flood risk in the proposed location. How often refusal has been given is not readily available, but government sources maintain there have been instances. Canada Mortgage and Housing Corporation (CMHC), in some cases, makes mortgage insurance conditional upon specified flood proofing requirements. However, all properties are *not* routinely assessed, usually only those where the banking institution or the homeowner has requested it. Also, municipal governments in the Red River Basin have much autonomy with regard to development in their area; hence, there are significant differences in their flood damage reduction activities and their willingness, (or lack of) to approve development.

The second provision has not been enforced in Manitoba; no individual or business has been refused assistance (e.g. 1997) because their structure was not appropriate or failed to meet certain flood-proofing standards. New legislation before the provincial government is now reiterating the possibility of severe consequences for inappropriate development or failure to flood proof, although generally it is believed that the provincial government would not take such severe action.

The third provision, i.e. to encourage local authorities to zone on the basis of risk, has been only partly successful. It has left the decision on whether or not to include appropriate building elevations in municipal zoning by-laws to the discretion of municipal governments. Some municipalities have used Designated Flood Area maps regularly (and effectively) in approving development, and have included flood proofing criteria in their zoning by-laws. Others have not used the information effectively, and in some instances, suffered the negative consequences of this failure in the 1997 flood. There are nine municipalities in the Designated Flood Area in Manitoba so leaving such issues to the discretion of municipal governments has, not surprisingly, led to much inconsistency in land use regulation.

5. Institutions responsible for flood management

This review will include only the key institutions with regard to their flood mandate.

Manitoba Conservation - Water Resources Branch is primarily responsible for flood planning and management. For floods in the Red River Basin the Department's Central Region carries out the delivery of flood related services. Water Resources Branch administers nine Acts: The Water Resources Administration Act, The Dyking Authority Act, The Water Commission Act, The Water Rights Act, The Ground Water and Water Well Act, The Rivers and Streams Act, The Water Power Act, The Water Supply Commissioners Act, and The Lake of the Woods Control Board Act. They are responsible for flood management activities such as forecasting, operation of flood control works, monitoring of flows/levels, and dissemination of information as necessary. They also interface with the City of Winnipeg, municipal governments and other government departments.

Manitoba Conservation – Regional Operations is responsible for field activities, enforcement of legislation, emergency response to floods, and delivery of services at the community level.

Manitoba Conservation - Regional Engineering Staff maintain and operate flood protection systems in eight rural communities, the Red River Floodway, and the Portage Diversion.

Department of Conservation - Operations Division provides security to diked communities, and search and rescue during large floods.

Manitoba Emergency Measures Organization (EMO) , part of Manitoba Government Services, works with and coordinates federal government's involvement / contribution (including financial) during natural disasters such as floods. As the civil defense agency, they help in coordination of emergency response per The Emergency Preparedness Act.

EMO also coordinates damage claim assessment and communicates with federal government about their share of recovery costs according to the federal Disaster Financial Assistance Arrangements (DFAA) and the Canada –Manitoba Agreement on Red River Flood Disaster Assistance (1997).

After the flood of 1997, the Manitoba legislature established a new standard for floodplain development. Primary responsibility for implementation of the new development standard rests with municipal governments. One of the main deficiencies of current institutions is lack of general public participation in the planning and flood management activities. Public hearings have been used as one of the instruments for public involvement. However, the flood of 1997 pointed out the need for more meaningful involvement of broader public in every stage of flood management in the basin.

6. Lessons learned

Long history of the flood control work in the Red River basin provides a wealth of information and lessons that can be used to further improve the flood management in the basin and/or transfer experience to other basins in Canada and abroad.

Solving the flood damage reduction problems of the Red River basin while concurrently protecting and enhancing the floodplain environment requires full use of all the structural and non-structural methods available. No one approach can solve all the problems by itself. *There are no silver bullets.* Whether the challenge is protection of an individual, a community, or the basin as a whole, all approaches to damage reduction should be considered and integrated into the solutions.

It is evident that without the current flood control system protecting the city of Winnipeg, losses from floods since the late 1960's would be much greater in magnitude. This is quite generally accepted, although there are regions south of the city that maintain that the control system has increased their flooding. The resolution of this issue, which has existed for decades, requires attention. Unfortunately, the issue does foster conflict between some rural and urban residents.

The choice of protection for communities in the upper valley is ring-diking. The long-term consequences of numerous home and community dikes on water movement in the rural landscape are unknown and warrant investigation.

Of the non-structural flood damage reduction measures, land use regulation warrants particular attention. It is evident that poor enforcement by authorities and inconsistent application of land use regulation by municipal governments has greatly reduced the effectiveness of this strategy in the Red River basin.

The flood proofing programs sponsored by the federal and provincial governments in past years have made a positive contribution to flood damage reduction. Both communities and individuals who flood proofed to the 1979 design flood level suffered less damages overall in 1997. However, flood proofing has its limitations, particularly evident when water levels exceed the standard 100-year level or unpredicted overland flows occur.

The question of whether the government will continue to compensate victims who fail to flood proof is frequently posed. Experience in Red River basin has been that government *always* compensate regardless of flood proofing. While relocation is an option in the flood proofing program, it is rarely sought by victims. The emphasis in Manitoba is clearly on reconstruction, even in highly vulnerable areas.

It is clear in the Red River basin that much of the information necessary to implement various strategies is at a municipal level. There are nine municipalities in the Designated Flood Area, each with different approaches to flood risk management. A detailed analysis of the impacts of flood damage reduction strategies requires significant resources and municipal cooperation.

The institutionalization of flood mitigation is a concern in the Canadian portion of the Red River Basin. Flood fighting, management of flood control systems, and responsibility for post flood recovery all rest largely in the hands of government, freeing the individual from a perception of responsibility until a crisis. This reduces the effectiveness of flood damage reduction initiatives.

Because of the recent flood (1997), authorities are putting considerable effort into flood management activities. Cooperation and exchange of information between departments and different levels of government must lead to a rigorous analysis of which strategies warrant the input of financial and human resources in future. This is a long-term goal in the Red River basin.