

Presented to the Flood Strategies Subgroup of
Red River Basin Task Force of
The International Joint Commission

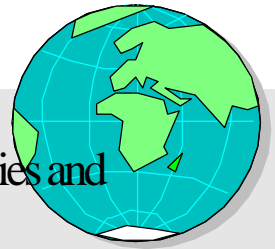
Review of Red River Basin Floodplain Management Policies and Programs



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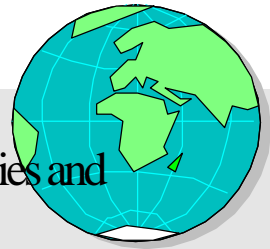
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List of Acronyms

DEM	Division of Emergency Management
DENR	Department of Environment and Natural Resources (South Dakota)
DFAA	Disaster Financial Assistance Arrangements
DNR	Department of Natural Resources (Minnesota)
ARDA	Agriculture and Rural Development Agreement
DNR-DOW	Department of Natural Resources-Division of Waters (North Dakota)
DSWMA	Deerwood Soil and Water Management Association
EERC	Energy and Environmental Research Center
ENGO	Environmental Non-Government Organization
EPC	Emergency Preparedness Canada
FDR	Flood Damage Reduction (program) - Minnesota
FDRP	Flood Damage Reduction Program - Canada - Manitoba
FEMA	Federal Emergency Management Agency
FEPPC	Federal Emergency Preparedness Coordinating Committee
FMAP	Flood Mitigation Assistance Program
GIS	Geographic Information Systems
IEPC	Interagency Emergency Preparedness Committee (Manitoba)
IISD	International Institute for Sustainable Development
IJC	International Joint Commission
MBDOE	Manitoba Department of the Environment
MBNR	Manitoba Department of Natural Resources
MBRD	Manitoba Department of Rural Development
MEMO	Manitoba Emergency Measures Organization
NDCCC	North Dakota Century Code Chapter
NDCC	North Dakota Consensus Council
NFIP	National Flood Insurance Program
NGO	Non-Government Organization
NRCS	Natural Resources Conservation Service, USDA
PREMAC	Prairie Region Emergency Management Advisory Committee
RFPE	Regulatory Flood Protection Elevation
RM	Rural Municipality
RRBB	Red River Basin Board
RRBTF	Red River Basin Task Force
RRDFA	Red River Designated Flood Area
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture



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Executive Summary

The Red River has its headwaters in the southern parts of North Dakota and Minnesota and the northeast of South Dakota. It flows north into Canada and drains into Lake Winnipeg. The larger part of the watershed is contained within the United States. The main stem of the Red River flows through remarkably flat terrain – lake sediments left by post-glacial Lake Agassiz. Consequently, the floodplain is very large with major floods sometimes creating a “Red Sea” of up to 40 km (25 mi) in width and more than twice that in length.

The characteristics of the basin and its flood events present unique challenges in floodplain management. These challenges exist in land management practices, zoning, structural measures, public awareness of risks and in the development and maintenance of a flood preparedness culture.

Each of the United States and Canada has its unique division of powers among federal, provincial/state and county/municipal governments. Each jurisdiction has developed its own portion of the complex web of regulatory policy and program tools needed to manage the Red River floodplain.

A flood such as occurred on the Red River in the spring of 1997, due to its extreme size, is bound to test the effectiveness of floodplain management policies in use prior to the event. This has resulted in a number of regulatory, policy and program initiatives in all jurisdictions aimed at addressing gaps revealed during the 1997 experience and improving floodplain management in the basin.

There is no comprehensive, basin-wide effort underway to ensure compatibility among the floodplain management regimes being used in the Red River watershed.

There are a number of policy filters that can be applied to the regulatory and program instruments presently in use. These include:

- Is there a sound scientific basis?
- Is it durable?
- Is it applied consistently?
- Is it enforced effectively?
- Are there incentives for compliance?
- Are sufficient resources allocated?
- Is it clear and comprehensive?

Many of the instruments in use, while having a number of strengths, could be improved in one or more of the above categories. There are many inter-jurisdictional inconsistencies. Many of the inconsistencies are of no significant consequence. A few are more consequential. Lack of consistent enforcement appears to be a common problem throughout the basin.

It is important that a flood preparedness culture be encouraged in the Red River Basin. An improved awareness of the characteristics of the basin, and of the diverse needs of residents in all parts of the basin, will create a setting that will be more receptive to basin-wide initiatives. Citizens would benefit from better opportunities to participate in consultation and decision-making.

A basin-wide approach to collaborative decision-making including better communication among competing interests is recommended. The rise in the number of special interest groups in the basin is indicative of a level of frustration linked to an inability to advance effectively one's interests. A basin-wide collaborative effort holds the only real hope of developing compatible floodplain management policies and practices. Such an initiative, to be effective, must capture the imagination, enthusiasm, and energy of existing organized interests.



CHAPTER 1 INTRODUCTION, APPROACH AND METHODOLOGY

OVERVIEW

The 1997 flood in the Red River Valley was the most destructive on record. Major property damage was done in both the US, and in Canada. The settlement of property damage claims, the completion of repairs and the resettlement of many of the affected parties is still on-going on both sides of the border - well over a year after the flood has subsided. As well, the flood has heightened public awareness of the hazards posed by flooding, and triggered some new efforts to increase flood protection works such as higher dikes for existing development and increased minimum elevations for new building construction.

It should be broadly understood that a flood like 1997 could be repeated or even exceeded in any given year. However, each year there are more residential, agricultural and industrial developments within the floodplain. Each new flood creates the potential for even greater loss than in 1997. Vigorous action on floodplain management is needed in order to anticipate and prevent the damage that a large flood can cause.

In the aftermath of the 1997 flood, the Red River Basin Task Force (RRBTF) was formed by the International Joint Commission (IJC) and tasked with identifying ways that will minimize the damage caused by future flooding. This review of floodplain management policies, programs and legislation on both sides of the border is part of their work. This project responds to a need identified by the Task Force to thoroughly review and compile in one study, the kinds of floodplain management policies and practices which are in place, analyzing them with a view to finding ways to make improvements in floodplain management in the Red River Basin.

This study is being conducted under the Flood Strategies Subgroup of the RRBTF concurrently with a similar undertaking on recovery assistance. Two other Subgroups are addressing the availability and use of data and the effective use of decision support models in assessing flooding potential, severity and responses.

APPROACH AND METHODS

This study began with a review of legislation, policies and programs that exist at the federal, state, provincial and local level which have a bearing on floodplain management. Interviews have been conducted with, and reports collected from, a wide variety of practitioners and other interested parties related to floodplain management issues both in the Red River Basin and beyond. An in-depth summary of floodplain-related legislation, policies and programs, detailed by jurisdiction, is found in the Appendices at the back of this report.

The main intent of this report is to focus on elements that add to, or have the potential to add to, the resilience of individuals and communities living in the floodplain. The presence or absence

of such elements within the current legislative and policy regime are noted, and possible adjustments to current floodplain management policies and programs are suggested, with an emphasis on enhancing co-operation and co-ordination mechanisms at all levels.

The study concludes with a proposal for a decision making model for floodplain management intended to provide the structure necessary to address inconsistencies and issues identified earlier in the study. It is acknowledged that differences in approach and operations exist between Canadian and the US floodplain management initiatives, specifically in terms of preparedness for future flooding. In a transboundary, multi-jurisdictional watershed like the Red, it is clear that specific laws, programs and policies will vary. However, it is felt that co-ordination, sharing of information and resources, and collaborative decision-making in the whole drainage basin is the overall key to enhancing flood protection. Therefore, the intent of our approach is to highlight the policies, programs and decision-making regimes which can benefit most from co-operation, not to simply criticize past management practices.

LIMITATIONS

This study has primarily focused upon floodplain management measures aimed at generalized snowmelt runoff flooding. Certain aspects, such as tributary water retention, may be relevant as well to generally isolated rainfall runoff flooding in certain areas, but this was not the intention of the analysis. In determining the true value of such approaches, these ancillary benefits should be included to a greater degree than was possible in this discussion.

Decades worth of programs and policies covering hundreds of organizations, thousands of square miles and the efforts of thousands of individuals cannot be summarized comprehensively in a document of this scale. The study team is confident of the accuracy of the information presented herein. Despite this, potential for minor errors of omission do exist. Such omissions do not detract from our primary conclusions, particularly that added mechanisms to coordinate and simplify the processes in place are essential.

STUDY ORGANIZATION

The text has been organized in the following manner:

Chapter 1 – Introduction, Approach and Methods

- Introduces the context of the study and outlines the approach and methodology applied.

Chapter 2 - Overview of the Red River and Floodplain Management

- Provides a general overview of the hydrologic and hydraulic characteristics of the Red River, and a generic discussion of floodplain management including definitions of terms and an analysis of flood prevention and protection measures.

Chapter 3 - Overview of Legislation, Policies and Programs

- Outlines the legislative climate, statutory instruments, programming and deliverance agencies at the federal, provincial, state, and local levels.

Chapter 4 – Key Policy and Process Analysis and Issues

- Outlines a set of policy evaluation filters, and uses them as the basis for analysing policies and programs. Observations on additional issues are presented. Reviews legislative, policy and practice issues as well as program instruments. Highlights certain policy characteristics not captured by the evaluation filters.

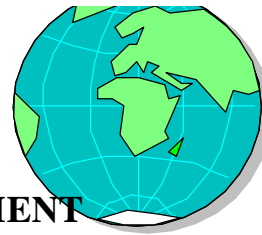
Chapter 5 – Conclusions and Recommendations

- Outlines the key recommendations for ways to enhance floodplain management that emerge from the policy analysis, and which have a focus on increasing protection from future flooding. The goals and characteristics of a good decision-making process are reviewed, leading into a discussion of possible improvements to the current decision making process within the basin.

Appendices

- Appendices have been included to provide the detailed descriptive summaries of current legislation, policies and programs. Generally, these provide the background for summaries in the third chapter and the basis for analysis in the fourth.

Most information is presented in text, with figures and tables included where useful to clarify the concepts. Text boxes have been used either to present relevant thoughts from original or literature in the field, or to explore further an idea that is ancillary to the flow of the chapter.



CHAPTER 2 OVERVIEW OF FLOODPLAIN MANAGEMENT

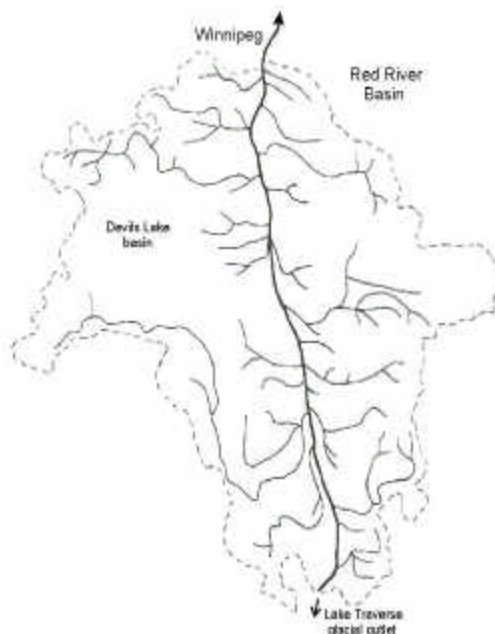
FLOODPLAIN, FLOODWAY AND FLOODPLAIN MANAGEMENT DEFINITIONS

Floodplain management is relatively well-developed in research and application (for example, see Philippi, 1996, Nassir, 1982, Penning-Rowsell *et al*, 1974). Unfortunately, much of this knowledge does not readily apply to the unique characteristics of snowmelt runoff flooding in the prairie environment. For example:

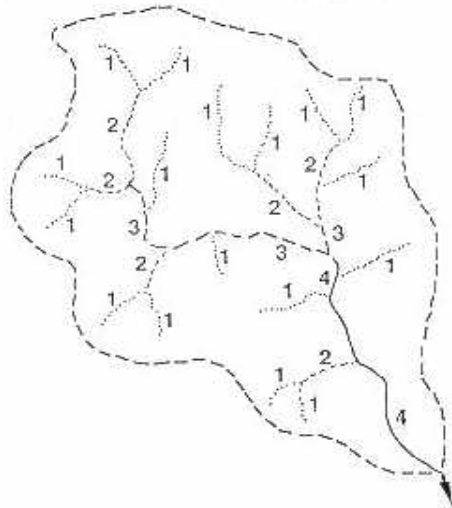
- In relative terms, prairie flooding is subject to excellent event forecasting well in advance of flood events,
- flooding can be heavily influenced by weather conditions occurring as much as eight to ten months in advance of the flood event,
- the low topography of prairie regions is difficult to model hydrologically and hydraulically, Red River floods take time; they rise and fall slowly, meaning that defences must be robust, and evacuation periods are long,
- large variances in the areal extent of flooding occur as a consequence of relatively small variations in flood elevation,
- floodplains are massive in geographical extent, and,
- relatively routine infrastructure developments (roads, culverts, bridges) can have large impacts on local flood hydraulics.

It is essential to address the critical definitions regarding this subject, particularly as disparity in definition of certain concepts can result in drastically different management outcomes. A contentious definition is that of the term *floodplain*. In general, the use of this term varies by jurisdiction (and even between agencies within the same jurisdiction) based on risk profile, available data, differences in application of scientific principles, attitudes toward compensation and political considerations. Let us examine this definition from the point of view of how a river, in this case the Red, is formed and how it behaves.

The Red River channel is incised into the bed of glacial Lake Agassiz formed at the end of the last ice age. At that time the Red River valley waters drained southwards into the Minnesota River through the low valley of Lake Traverse. When the glaciers retreated 8,000 years ago the flow reversed northwards, carving the meandering channel of the Red River into the flat lake sediments. Like other rivers in temperate climatic zones, the configuration of the channel is defined by the river itself, and has developed to contain approximately the mean annual flood peak within its banks. What



this means is that while in half the years the flood is contained within the banks, in the other half of the years, flood waters escape from the channel and flow over the adjacent landscape. The extent of the overland flooding is dependent on the amount of flow, the local topography and the existence and type of any obstructions to the flow that may have been constructed. These may take the form of buildings, roads, bridges, and so on. The spring flood flow is, in turn, dependent on the moisture content of the soil at the time of freeze-up, the amount of frost in the soil, the amount of moisture in the snow pack, the timing and rate of snowmelt, available local storage in natural depressions, and the occurrence of any significant precipitation events during the spring run-off.



The development of the channel network on the low gradient glacial lake basin landscape has also caused unique flood conditions in the valley. In most rivers, small tributaries are gathered in branching networks that lead to the main stem of the river through a series of larger and larger tributaries. The branches are often described with order numbers that show their position in the network, as illustrated in the example to the left; for a given map scale, an order 1 branch has no tributaries, and order 2 branch begins where two order 1 branches unite etc. The larger branches provide in-channel flood storage and often opportunities for flood control reservoirs. This is not the case for the Red River branches. There are few

larger tributaries, and those that exist are mainly short. The predominant pattern is that of a series of small tributaries that lead directly in to the main stem of the river. For example, on the order 4 main stem of the Red River shown on the previous page there are only 4 order 3 tributaries but there are 21 order 1 and 2 channels that lead directly in to the main channel. With this configuration there is limited storage to buffer rapid releases from headwater basins and, depending on timing, their effects may rapidly accumulate along the main stem. The implication for flood reduction management is that retention of headwaters will necessarily require many small works distributed throughout the watershed.

When we talk about floods, we have found it useful to refer to these floods as having return periods of, say, a 100-year flood, a 25-year flood or a 500-year flood. Unfortunately, this has led many people to think of a 100-year flood as occurring only once in a century - a presumption not supported by experience in the last two decades on the Red River. It is better to think of these floods as having a certain probability of occurrence. In the case of a 25-year flood, there is a 4% chance of it occurring in any one year. For a 100-year flood, a 1% probability of occurrence in any one year. For a 500-year flood, a 0.2% probability in any one year. And so on. As the return period increases, the extent of flooding increases and the probability decreases. Further, it is important in cases in which a 1:100 year floodline has been established for residents to remember that the 1% probability applies only adjacent to that line. Behind the line (away from the river), the probability of flooding may be only slightly lower. Immediately in front of the line (towards the river), the probability may be substantially higher. This depends on the slope of the landscape.

This definition based on probability is not without difficulty either. For example, a home inside the 1% floodline might be subject to flooding only 0.5% of the time due to dikes or levees. This home is now vulnerable to the 200-year flood, but at a level of damage that may be far above that for a home located at the unprotected 200-year floodline.

Floodway is another term used regularly in respect of river basins. It is sometimes described as a subset of the floodplain. However, an important distinction between *floodplain* and *floodway* is that a floodplain is determined by the river itself and its flow characteristics. A floodway, on the other hand, is culturally determined. A floodway is an area on each side of the river within which particular zoning or building practices or requirements apply. A floodway may be defined in a specific area as a strategic way to deal with flooding. It may or may not be directly linked to a flood of a particular probability. It may simply be defined as the most hazardous part of the floodplain where the water tends to be deeper, swifter and pose a greater threat to life. Because of the nature of the Red River floodline, a floodway has not been defined for much of the valley. Finally, Figure 1 identifies the flood fringe as that portion of the floodplain that is outside the floodway.

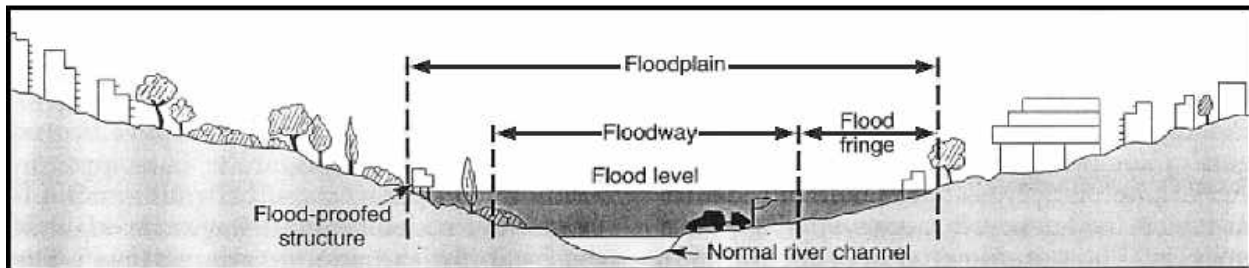


Figure 1: Floodplain and Floodway depiction from Environment Canada

Now, to return to the definition of *floodplain*. While some may choose to define a floodplain in simple terms as being, for example, the land covered by a 100-year flood, we would suggest that it is instead:

- The amount of land covered by water in any flood, irrespective of its probability of occurrence.
- An area of land on each side of the Red River channel, which usually widens as the flood event increases in size and that flood's probability of occurrence decreases.
- An area of land which could be plotted on a map according to its probability of occurrence - in other words, there are bands of probability of flooding on both sides of the river as one ascends the landscape.

This probability-related definition of floodplain becomes important to assessing economic

"Floodplain management incorporates an integrated approach to protecting the floodplain from further damages. It entails dealing with existing flooding problems and eliminating increases in the level of potential damage from further development.

Since flooding and erosion are natural processes that are extremely difficult and costly to combat directly, the management and planning of floodplains is a reasonable alternative to ensure public safety and reduce the cost of damages."

Canada Water Book on Flooding
Environment Canada, 1993

alternatives when we turn our minds to developing legislation and policies for floodplain management.

Floodplain management, then, can be briefly defined as actions or activities that are undertaken on a floodplain which serve to diminish the severity of, or damages from, floods. For example, mapping and zoning of high risk areas may be categorized as floodplain management activities, while emergency response to a flood or compensation for losses resulting from a flood would not. In addition, large water control structures that serve to retain or divert water on main river channels are typically outside the definition of floodplain management.

A comprehensive discussion of land management practices, which have effects on the extent and damages from flooding, is not limited to activities that fit the definition of *floodplain management* above. In many cases, it is the activities which are not specifically oriented towards flood protection or prevention which have the greatest and often most uncertain potential to change the level and destructive force of a flood. For example, one of the most contentious issues regarding land and water management on the prairies is that of land drainage (primarily) for agricultural purposes. The specific contribution of the massive network of drainage projects in the Red River basin to flood levels is difficult to quantify. While it is clear that such projects result in accelerated runoff velocity and earlier drainage of lands, it is not necessarily true that this impacts negatively on flood levels (for example, earlier runoff in the lower reaches of the river may prevent such runoff coinciding with the flood peak).

This overview of floodplain management techniques is largely limited to those that fit the definition of floodplain management as noted above. As such, the immense range of activities undertaken regarding land and water management in the Red River basin will not be specifically presented in this section. (Certain land management techniques, which have potential benefits during flood events, are presented in the section on Prevention below). Further analysis of land and water management practices, which are derived from government policy and legislation, will be conducted in Chapter 4 to the extent that linkages exist with regards to current floodplain management policy. Regrettably, such linkages tend to be minimal.

APPROACHES TO FLOODPLAIN MANAGEMENT

Overview

As noted above, floodplain management activities can generally be divided into two distinct categories: those intended to reduce the damages from flooding (protection) and those intended to reduce the severity of flooding (prevention). In general, the former has received far more attention from North American researchers and policymakers to date.

Limitations on the Analysis of Floodplain Management Approaches

Identifying the appropriate extent of floodplain management activities is a result of interdisciplinary study involving hydrologists, engineers, land-use planners, and economists. The basic principles of economic cost/benefit analysis are often relied on to identify the relative advantage versus expense of different options. The most common approach in contemporary analysis is from an incremental perspective; that is, an examination of the benefits and costs

associated with a single potential undertaking. Under this approach activities providing protection from floods, particularly structural flood-damage reduction measures, are typically favoured – the benefits from these projects are generally immediate, projects can be undertaken independently, data for analysis are generally available (subject to the limitations outlined below) and they offer a favourable benefit to cost ratio.

In contrast to the incremental approach, comprehensive floodplain management planning requires a more co-ordinated process of planning to identify best practices throughout the basin. This type of analysis is less common and distinctly more onerous, but the more recent literature suggests that it would favour the prevention approaches (general land and water management activities which prevent extreme flood levels) as described later in this chapter over protection approaches.

The Flood Preparedness Culture

The settlement of the Red River valley occurred as a result of characteristics such as low relief and good agricultural potential. These characteristics are largely the product of glacial Lake Agassiz with some alteration due to periodic and severe flooding. Although individuals living on this floodplain are occasionally provided a strong reminder of the damage that is possible, the tendency is to ignore this reality through much of their daily lives. A good example of this principle is demonstrated by research in the U.K. where, shortly after one particularly devastating flood, only 44.7% of floodplain residents agreed that they had a flooding problem where they lived, and only 26.7% recognized that there would be another such flood at some time in the future (Penning-Rowsell *et al*, 1974:541). Similarly, the distinct reduction in real estate values following a large flood event, and the subsequent gradual return to pre-flood values as memory of the flood event fades, also illustrates the point.

The most essential component of any floodplain management plan must revolve around creating a permanent awareness of the risks associated with the landscape. On a floodplain, the return of extreme flood events is a certainty, and there is a statistically small, but not insignificant risk that an extreme event will happen in any given year. In this context, residents of a floodplain should not be seen as (or see themselves as) victims of a chance event; they should possess full knowledge and awareness that at some (unknown) point in the future their lands will be under water. This principle is true for residents of communities with permanent structural protection measures (such as Winnipeg) just as it is for isolated dwellings elsewhere in the floodplain. The level of risk associated with each spring run-off may be different, but it is reasonable to assume that there will be a flood at some point which is larger than the protection measures in place are able to hold back.

“Traditionally, people have depended to a large degree on emergency efforts in their struggle against floods. That is understandable because in most countries the history of dyke elevations has followed the history of the flood levels they had to cope with. The dykes were raised when overtopped but the protection provided was invariably insufficient for the next higher flood...

Emergency measures are more expensive and far less reliable than what can be accomplished with proper planning. They should be kept for the truly unforeseen factors that always seem to arise, like the Brunkild gap, which fortunately could be closed in the nick of time, or the initial underestimation of the flood levels for Grand Forks, which unfortunately did not leave sufficient time for the emergency raising of the dykes”

The Risk of Going Under
Booy, C., 1998

All floodplain management activities inherently assume the presence of an awareness of risks, provide support for reducing those risks, and concern for a sufficiently long time horizon (to achieve returns on protection or prevention investments). In the absence of this cultural awareness, the efficient investments associated with floodplain management activities are replaced with *ad hoc* and frenzied emergency response initiatives, which are more costly, less effective, and more disrupting to local residents.

REDUCING THE DAMAGES RESULTING FROM FLOOD EVENTS (PROTECTION)

Flood protection measures are common in flood-prone areas throughout the world. These vary from simple, accepted building practices to complex dikes and zoning regulations. In most cases, flood protection measures are initiated as a result of, and subsequent to, large flood events.

The variety of approaches to flood protection generally fit within a small number of categories:

- Floodplain Mapping and Modeling,
- Land Use Regulation,
- Structural Flood Damage Reduction and Floodproofing, and
- Education about Risks

Floodplain Mapping and Modeling

In order to determine the flood risk for any region, relatively well-developed floodplain mapping and geomorphologic data are required. These data can contribute to land planning processes, which can be scientifically based on the probability of loss for any particular area or type of development. In general, data can be collected from historical studies, GIS and survey mapping or computer modeling of hydrological scenarios. Human modifications of the landscape, particularly roads, dikes, and other linear disturbances, need to be included in such modeling. All further floodplain management activities require, to some degree, the type of data collected and disseminated through this process.

Land Use Regulation

The most prominent actions in floodplain management in the Red River watershed relate to land use zoning and activity restrictions in high flood-risk areas. The process of zoning lands in floodplains generally relates to preventing or controlling uses that would increase the risks or costs associated with flood events.

The rigour of land use regulations may vary considerably as a function of the risk aversion of the jurisdiction and the attitudes towards compensation. Regions that are dominated by a culture of individual rights and risk evaluation, and that are not subject to high levels of public compensation following floods, may choose to apply less rigour in land use regulation than areas where the role of government is oriented towards protecting citizens and where compensation from public sources is more generous.

Land use regulation within the chosen floodway will be the most onerous, reflecting standards ranging from a complete ban on developments to permitting only the most floodproofed or least susceptible structures or developments. Flood fringe zoning will generally be less onerous, but still provide controls on developments that risk the life, investment, or livelihood of those wishing to develop or others. Zoning can also result in restrictions on dangerous developments in high-risk areas (such as hazardous waste facilities, nuclear plants, etc.).

In the case of the Red River, the flooded area can have a width of 40 km (25mi) with a length considerably greater still. Some of the land use regulation actions that would be prescribed in other river basins may simply not be suitable. It would not be practical to consider a “no residency” zone up to the 1:100 year flood. It would be unreasonable to restrict all residential uses of the land, especially given the access issue that would then arise for farmers of that land.

Structural Flood Damage Reduction and Floodproofing

This is an area in which there appear to be different definitions in use in Canada and the United States and even within the United States. For simplicity, this report uses a definition that includes both structural and non-structural approaches in the definition of floodproofing (see Flood Proofing Techniques, Programs and References, USACE).

Once zoning regulations have been formulated limiting various development activities, the standards for floodproofing permitted developments can be determined. Generally, floodproofing in the context of floodplain management involves setting structural standards to reduce the amount or frequency of damage that may occur. For example, standards for permanent dikes are based on probabilistic flood heights and relative risk aversion. The standards can vary depending upon the type of development (hospitals and seniors facilities may have higher standards) and are typically enforced through the building permitting and building codes approval processes.

Floodproofing can also be undertaken to reduce damages to environmental quality. For example, developments such as sewage lagoons, manure retention ponds, hydrocarbon storage or containment of other contaminants may be subject to specific standards which exceed the rigour applied to residential dwellings (due to the greater risks posed by such contaminants). In some jurisdictions, regulations have been put in place to address the risk of storing contaminants on the floodplain. In many cases, however, risks from contaminants are judged to be small due to the massive volumes of water involved in prairie floods and the high levels of dilution; these determinations need to be made on a development by development basis.

Public Awareness of Risks

Beyond regulatory approaches to floodplain management, resident education can be an important means for affecting development patterns and encouraging a flood preparedness culture as noted

above. Public risk awareness initiatives commonly involve three components: education about the level of risk for each resident, education regarding the probable damages in the case of a flood event, and education about flood relief programs and the expected level of assistance each resident will receive. Taken together, these awareness programs can result in residents opting for a lower risk tolerance than the legislated level.

The Importance of Risk Awareness

Potentially the most significant incentives for encouraging or discouraging personal responsibility regarding risks are achieved through regulation of public and private insurance availability. Despite this, simple risk education can play an effective role in encouraging such personal responsibility. Even with generous public insurance packages, residents of a floodplain can be severely inconvenienced and face expensive replacement costs for uninsured belongings. By investing responsibly in floodplain developments over and above the regulatory requirements, such inconveniences can be reduced.

REDUCING THE SEVERITY OF FLOODING (PREVENTION)

Actions designed to reduce the severity of flooding are generally not well coordinated on the prairies and do not receive the degree of attention that is paid to the protection activities described above. At present, few widespread management activities in the Red River basin could qualify as preventative, although consideration of such approaches is being encouraged by such organizations as the International Institute for Sustainable Development (IISD), the Energy and Environmental Research Center (EERC), and the Sierra Club. In addition, the Manitoba Water Commission recommends initiating “watershed planning and management on a watershed basis with a view toward reducing peak flows on streams feeding into the Red River” and conducting “an analysis of watershed land use” (1998; xvi).

“The new philosophy in U.S. floodplain management recommends that nonstructural measures be incorporated into flood management policies. Examples of such measures are to vegetate exposed ground, promote crop residue practices, restore, enhance and construct wetlands, and provide cash incentives for not farming moist or highly erodable soil regimes.”

Benefits to Downstream Flood Attenuation and Water Quality as a Result of Constructed Wetlands in Agricultural Landscapes
DeLaney, T.A., 1993.

One of the possible reasons for the low emphasis on prevention is the perception that low topography, as found in the prairies, does not allow for effective retention measures to be taken. Hydrological research is required on proposed water retention ideas in order to quantify the volumes and water that may be affected, and the period for which water may effectively be retained. The general need for further research is true of all approaches outlined in this section.

In general, prevention of flood events (or reduction of their severity) is achieved through activities that retain water for some period of time in the upper regions of a watershed for release at times other than the flood crest. This can be accomplished through two approaches:

- Structural Measures (such as retention dams), and
- Land Management Practices.

Structural Measures

The Red River basin is not without topographic variation, but relief is generally small. The potential for storage of large volumes of water (other than a small number of sites near the headwaters) is generally non-existent or where it does exist, the potential has already been exploited. Retention through structural measures is therefore limited to small volume reservoirs that can be placed on tributaries or on open land to reduce peak flow runoff. Although largely untested, it has been argued that small reservoirs may need only retain water for a matter of days to have a potentially significant aggregate effect on the height of flood peaks (EERC, 1998).

Theoretically, the retention of relatively large volumes of water can be accomplished through a network of small reservoirs throughout the Basin which retain snowmelt on open lands and allow for gradual release into the tributaries of the Red. Described as the *waffle approach* (or microstorage approach) by those who endorse the idea, this may be possible through the use of existing infrastructure (particularly roads and rail lines) as retention structures. In addition to the lack of hydrological data described above, the ability of land managers to co-ordinate such a system of retention and release and the potential costs to landowners who retain the water (and approaches to compensating for these costs) would need to be assessed. In contrast, another school of thought in the basin recommends increased channelization of tributaries and relatively large control structures to allow for an engineered approach to flood control.

Retention is also possible in some cases on small and even seasonal tributaries of the Red River (as distinct from open land retention as described above). An additional rationale for exploration of this approach is the ancillary benefits of agricultural water supply and infrastructure savings from such retention reservoirs, as noted in the experimental programs undertaken to date (see Deerwood sidebar). If these structures include control of the outflows, pressures are likely to arise for the structure to be operated for purposes other than flood control. This can complicate operating plans and procedures. Additionally, any substantial upstream storage projects do need to be assessed for their overall effect on the basin in times of drought as well as flood.

Deerwood Soil and Water Management Association

The retention of water on the small tributaries of the Red River has been undertaken in one portion of Manitoba by a number of organizations associated with the Deerwood Soil and Water Management Association (DSWMA). The intention of this undertaking was to prevent soil erosion and to provide water storage capabilities for farming needs, but the hydrological effects on flooding caused by these retention structures has also been a component of ongoing research (DSWMA, 1998). To date, data have not been processed to the extent that an understanding of the effects on the Red River system can be determined. In addition, the small scale of this one project (approximately 37 m³/sec at peak runoff during the 100 year flood) does not readily contribute to assessment of potential benefits over many tributaries. Despite this, promising hydrological results (reduction of peak flow by up to 19%), significant ancillary benefits (municipalities report savings of \$25,000 on infrastructure spending due to reduced floodwater damages) and opportunities for application over a larger area suggest the possibility of benefits from further research

(DSWMA, 1998; Government of Manitoba, 1997).

Land Management Practices

Differences in the amount of water retained in the soils of the watershed, the velocity of spring runoff, and the agrometeorological characteristics of the region can be attained through changes

in (largely agricultural) land management practices. Although not specifically applied through regulation, such land management practices are currently encouraged by a number of government organizations and NGOs for a wide range of agroecosystem benefits. As noted above, the potential benefits have not yet been quantified, but the detrimental effects of current practices have been suggested in statistical analyses. Booy (1998), for example, has determined that the period since 1940 has been subject to more severe flooding on the Red River than the first decades of the 20th century. Acknowledging major floods in the 1800s and although hesitant to imply causation, the author has noted that this corresponds with ongoing changes in land management practices throughout the basin.

An exhaustive list of land management activities which have the potential to affect basin hydrology would be extensive and of little value in comprehending the material that follows. The most prominent examples are highlighted below.

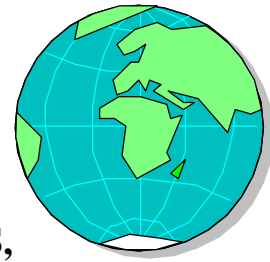
The maintenance of permanent cover or stubble (zero tillage) on agricultural fields may contribute to increased infiltration through increased heat transfer and subsequent thawing of soils in the pre-flood spring melt, and through a seeping process of moving moisture into the soils. In addition, a physical barrier that slows runoff velocity and increases time for infiltration is provided. To date, this benefit is only alluded to in the literature as ancillary to other agricultural benefits of these practices (MNDZTFA, nd).

Wetlands have been highlighted as natural sponges, which can moderate the severity of flooding and provide gradual release through the season. Notably, the US federal government has recently increased restrictions on developments that involve the draining of wetlands, in order to maintain these (and other environmental) benefits (Floodplain Management Association, 1997).

Permanent agricultural drainage projects, channelization of streams, and changes in cropping incentives also provide uncertain potential opportunities for altering the flood hydrology of the Red River basin. In addition, the amount of treed cover can play a role in lengthening the spring runoff season through lengthening snowmelt periods and increasing retention. The availability of lands for establishing treed cover in the Red River basin (due to intensive agricultural operations) is however, liable to be small.

Land management practices can have a favourable effect on flood peaks (probably more so for smaller floods than for larger ones). However, the degree of this effect is difficult to estimate. Indeed, there could well be circumstances in which upper basin water retention could have an adverse effect on flood peaks depending on the timing of releases.

With this overview in mind, the key legislation, policies and programs on floodplain management are presented in the next chapter.



CHAPTER 3 OVERVIEW OF LEGISLATION, POLICIES, AND PROGRAMS

U. S. ARRANGEMENTS FOR SHARING RESPONSIBILITIES



In general terms, U.S. constitutional arrangements in respect of floodplain management, are based on strong federal powers. The federal government, in some instances, will set basic or minimum standards and then often delegate to the states the responsibilities for implementing and administering those requirements. More specifically:

- All orders of government may undertake buy-outs of flood prone land. However, FEMA has some funding for this while the states and counties, generally, have fewer resources for this purpose.
- Wetlands are, in large measure, a federal responsibility. However, the states are involved and, through agreement, can assume many of the activities and responsibilities for wetland conservation.
- The federal government is responsible for endangered species.
- Responsibility for the management of fish and wildlife resources is shared by both orders of government. Migratory species fall under federal responsibility.
- In respect of water quality and other environmental issues, the federal government sets basic standards. States may then, by agreement, exercise regulatory control as long as the federal standards are enforced. State activities are effectively backstopped by the federal government. If the federal government has not spoken, the state has plenary responsibility.
- The federal government has not set standards for floodplain building requirements but exercises control through the requirements of the National Flood Insurance Program.
- Tribal governments, in most cases, have obtained the responsibility to exercise regulatory control over environmental matters on their own lands.

U.S. FEDERAL LEGISLATION AND IMPLEMENTING AGENCIES

Numerous pieces of federal legislation directly or indirectly relate to flooding or have an impact on floodplain management in the United States. Although a brief synopsis is listed below, a more lengthy overview can be found in Appendix B.

The Stafford Act

- Responsibility and authorization for floodplain management is designated within the *Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) P.L. 93-288*, as amended by *P.L. 100-707 (U.S.C.5170)*. The Act authorizes programs for predisaster mitigation, streamlines administration of disaster relief, and controls the Federal costs of disaster assistance. This statute gives the Federal Emergency Management Agency (FEMA) the jurisdictional responsibility for floodplain management at the federal level. A recent requirement under the Act is that for every dollar spent by FEMA on flood recovery, \$0.15 must be spent on mitigation - the federal government must provide this money.

Federal Emergency Management Agency (FEMA)

- FEMA has leadership responsibilities for national emergency management. The mission of FEMA is to reduce loss of life and property and to protect institutions from all hazards through risk-based emergency management comprised of mitigation, preparedness, response, and recovery programs. Red River basin floodplain management regulation, to the extent it is a FEMA responsibility, is handled by two regional offices of FEMA – the Denver office deals with North Dakota, while the Chicago office deals with Minnesota.

FEMA exercises its floodplain management activities indirectly through the National Flood Insurance Program (NFIP). Communities join the NFIP at their own choice. FEMA's jurisdiction over floodplain activities is exercised through flood plain management ordinances adopted by the individual communities. Communities which are performing well in terms of regulating floodplain activity, buying out flood prone properties, promotion of awareness, etc. may apply to be included in the Community Rating System. This system provides an incentive, through reduced flood insurance premiums, for good floodplain management. A graduated rating approach permits a community to have its continual improvement reflected through stepped reduction of NFIP premiums.

Different types of programs relating to floodplain management and disaster assistance are delivered by FEMA. Mitigation efforts are centred on an acquisition program (see the Flooded Property Purchase Program), along with an insurance program, the NFIP. In addition, FEMA provides and co-ordinates grant and loan assistance after disasters. Individuals, non-profit agencies, and state and local governments are also eligible to apply for assistance from FEMA. FEMA has recently created Project Impact (building disaster resistant communities). This is a pre-disaster mitigation initiative for improving disaster resistance. It is based on public and private partnerships that focus on consolidating financial resources from all sources.

U.S. Army Corps of Engineers (USACE)

- In addition to FEMA, the U.S. Army Corps of Engineers (USACE) operates under federal jurisdiction (as delegated by *The Flood Control Act of 1936*) but have no mandate or authority in the floodplain. Although they have no policies that directly control development within floodplains, the Corps are called in to plan and design flood protection works as well as identify technical needs around flood-related issues. Working from designated floodway/floodplain maps generated by FEMA, the Corps may use the 100-year flood as the design level. However, design levels are determined using a set of criteria and may vary from the 100 year flood, depending upon the application. Data from the 1997 flood are currently being used to update the elevations of both 100 year and 500 year flood events.

U. S. Bureau of Reclamation

- The Bureau of Reclamation manages or enters into partnerships to deliver water conservation and water management programs. The Bureau also operates a HYDROMET data system.

The Bureau is active in the western U. S. and thus has activities only in the western part of the Red River Basin

USDA, Natural Resources Conservation Service

- The Natural Resources Conservation Service (NRCS) operates a number of programs directed toward watershed management, flood prevention, fish and wildlife habitat enhancement, and wetlands creation or restoration. These programs include the Small Watershed Program and Flood Prevention Program, the Wetlands Reserve Program and the Emergency Watershed Protection Program. Participation by NRCS in these programs is usually in the form of technical or financial assistance. Some of the key programs are authorized by the *Watershed and Flood Prevention Act, P.L. 83-566*.

STATE LEGISLATION

Each State has responsibility for preparing a State disaster plan. Under section 102 of *The Stafford Act*, States are required, as a condition for receiving federal financial assistance for disaster preparedness, to put in place a disaster mitigation program. Section 103 of this statute authorizes grants for updating and improving State disaster plans. A process for offering States the option of administering the Hazard Mitigation Grant Program is established in section 104 of the Act. Emergency flood response is assigned to the State under the rules of FEMA.

Like the federal statutory climate, numerous pieces of State legislation directly or indirectly relate to floodplain management. An overview of the state legislation below focuses on particular recent statutory and program changes designed to improve floodplain management. A more complete listing of State regulations related to this subject is found in Appendix B.

MINNESOTA LEGISLATION



Flood Plain Management Act (M.S. Chapter 103F)

- Enacted in 1969 the Act emphasizes the use of nonstructural measures, such as floodplain zoning regulations, flood insurance, floodproofing, and flood warning and response planning as integral elements in a comprehensive approach to solving flooding problems. Flood prone communities within identified floodplain areas are required to adopt floodplain management regulations and enroll in NFIP. In 1987 *The Flood Plain Management Act* was amended to establish a cost-sharing grant program to help local governments plan for and implement flood hazard mitigation measures. In 1997, there were a series of Special Session Amendments related to various policy items, freeboard requirements, and flood damage reduction.

Minnesota Statutes Chapter 1335 – State Building Code

- The State Building Code adopts the U.S. Army Corps of Engineers’ “Floodproofing Regulations” and requires all new structures and their mechanical systems in the area subject to the code to meet minimum building standards.

Minnesota Statutes Chapter 394.22 Subd.7 – County Planning, Development, Zoning

- Allows “conditional use” zoning upon finding that (1) certain conditions as detailed in the zoning ordinance exist, and (2) the use or development conforms to the comprehensive land use plan of the county and (3) is compatible with the existing neighbourhood.

Minnesota Statutes Chapter 462 – Municipal Planning Act

- Allows the governing body discretionary authority to designate certain types of development conditional uses by ordinance. The State floodplain management program requires that certain categories of activities in floodplains be allowed only after the granting of a conditional use permit.

The following activities require a conditional use permit:

- a) Flood Fringe District – floodproofing a structure in lieu of elevating a building on fill to the RFPE; and
 - b) Floodway District - fill, storage of materials and equipment and structures accessory to certain specific open space uses;
 - c) General Floodplain District – any activity which requires fill, obstructions, structures or storage of materials and equipment.
- As a prerequisite to adoption of land use controls, a board of adjustment must be established to resolve land use control appeals and variances.
 - Until the township ordinance is approved by the Department of Natural Resources and FEMA, the county continues to be responsible for administration and enforcement for shoreland, floodplain and wild and scenic river zoning activities in its unincorporated areas.

Minnesota Statutes 103D. Watershed Law.

- Enables the designation of Watershed Districts, which have local taxing, permitting and enforcement authority.
- Anyone within a District wanting to drain an area larger than 5 acres needs a permit from the District.
- Forming a Watershed District is voluntary, and there are nine in the state, ranging in area from 500 to 6000 square miles. Not all of the tributaries of the Red in Minnesota are covered by a District.

Regulations and Programs

Statewide Standards and Criteria for Management of Flood Plain Areas of Minnesota

- The Department of Natural Resources has established a set of standards and criteria which outlines minimum standards for floodplain management. Under these standards, all local

floodplain management regulations adopted after June 30,1970 must comply. In addition, all state agencies and local units of government must comply with these regulations in the construction of structures, roads, bridges, or other facilities located within floodplain areas delineated by local ordinances. Both federal and state standards identify the 100-year floodplain as the minimum area necessary for regulation at the local level.

Flood Damage Reduction

- The Department of Natural Resources also administers the Flood Damage Reduction Grant Program (FDR). The FDR Program was established by the 1987 Legislature to provide technical and financial assistance to local government units for reducing the extent of flood damages. Under this program, the state makes cost-share grants for up to 50% of the total local cost of flood mitigation projects. Since the inception of the program, almost \$61 Million in state grant monies have been distributed to local units of government across Minnesota for flood damage reduction projects. Flood damage mitigation projects in Minnesota have averted over one-half billion dollars in damages. Some examples of eligible projects are: structural acquisition in the 100-year flood plain, levees, flood warning systems, public education workshops, flood insurance studies, flood plain ordinance changes, flood plain mapping, flood storage easements, flood plain/river restorations and cost-share on federal projects. Participation in the FDR program appears to have enabled communities to break the expensive damage – repair cycle.

Building Codes

- Minnesota bases its building code on the Uniform Building Code
- The State adds floodproofing standards from USACE for all homes in a defined floodplain
- Building codes are enforced only in counties or cities which formally adopt/alter the State Code (small number)
- The State Code applies but is not enforced in cities and counties which do not formally adopt/alter the State Code (large number)

The Minnesota Hazard Mitigation Plan (draft)

- Outlines a number of issues related to floodplain management in the state. These issues are summarized:
 - Concern that the most current federal and state floodplain regulations are not being adopted and enforced by communities.
 - Acknowledgement that public awareness about NFIP is limited.
 - Inadequacy of familiarity with NFIP by insurance, real estate, and lending professionals.
 - Enforcement of floodplain regulations by local governments can be improved.
 - NFIP data needs to be supplemented and/or updated.
 - Concern about structures experiencing repetitive flooding.



NORTH DAKOTA LEGISLATION

North Dakota utilizes a number of regulatory instruments that affect floodplain management in the Red River Basin. Three statutes in particular deserve special attention.

North Dakota Century Code Chapter 54-21.3-03

- The State Building Code embodied in North Dakota Century Code Chapter 54-21.3-03 outlines the parameters for construction of structures within the state. Of special note is the third point of this section which reads:

The governing body of a city, township, or county that elects to administer and enforce a building code shall adopt and enforce the state building code.

North Dakota Century Code Chapter 11-33-02

- This chapter relates to county zoning, and specifically to the power of county commissioners to designate districts. The Board of county commissioners may resolve to divide all or any parts of the county and may “enact suitable regulations to carry out the purposes of this chapter”. Two lines of this section are of particular note:

These regulations shall be uniform in each district, but the regulations in one district may differ from those in other districts. No regulation or restriction, however, shall prohibit or prevent the use of land or buildings for farming or any of the normal incidents of farming

North Dakota Century Code Chapter 58-03-11

- The powers invested in the township are discussed in this part of the statute. Specifically, this chapter establishes the scope of zoning regulations and restrictions. The board of township supervisors is given the authority to:

... establish one or more zoning districts, and may regulate, and restrict the erection, construction, reconstruction, alteration, repair, or use of buildings and structures... the density of population, the location and use of buildings, structures, and land for trade, industry, residence, or other purposes.

- Like the section on county zoning, this segment includes direction that the regulations need to be uniform in each district, but they may differ between districts. Similarly, the regulations may not prohibit or prevent the use of land or buildings for farming or any of the normal incidents of farming.

Floodplain Management Act of 1999

- This Act proposes a number of important legislative changes that will directly affect floodplain management practices in the state. They are:
 - An increase of one foot in the elevation to which structures must be built on the flood fringe.
 - Plans for development in subdivisions in counties are to show portions of land located on the 100-year floodplain.
 - The State Engineer would have added authority to review proposed floodway development, and
 - The State Engineer would be able to establish a base flood elevation for lakes.

Regulations and Programs

The 1999 State Water Management Plan

- *The 1999 State Water Management Plan* grew out of a need expressed by the state legislature for a “comprehensive, coordinated, and well-balanced short- and long-term plans and programs...[with responsibility for the] optimal protection, management, and wise utilization of all the water resources in the state.” (page 1, An Inventory of State Water Commission Policies). A coordinated public involvement process brought recommendations from the public into the state planning process. Goals of the plan include:
 - Encourage and promote integrated, coordinated, and adaptable water resource management, and prudent stewardship of water resources.
 - Ensure that the needs and wishes of the public are appropriately considered in decisions involving the use and/or management of water resources in the state and consistent with NDCCC 61-04-06.
 - Encourage optimum development of water resources that promote stability and growth of the state’s economy.
 - Maintain, and where possible, enhance water quality and water-related habitats.
 - Encourage and promote programs that will assure life and health within the state are not threatened by the management or use of water resources.

An Inventory of State Water Commission Policies (Unpublished – 10/1/98)

- This document contains policies directly related to flooding which clearly promote better floodplain management. The proposals include:
 - The State Water Commission will provide cost-sharing for up to 50 percent of the eligible items of any cost-sharing application for flood control projects.
 - The State Water Commission will provide cost-sharing for up to 25 percent of the eligible items on natural streams of any cost-sharing application for snagging and clearing.
 - A comment under the Floodplain Management Policy item of the inventory recommends that the NFIP be adopted statewide.

Floodplain Management Policy

- This policy is marked for future update. Currently, the goal of the policy is stated as:

It is the policy of North Dakota to encourage the protection of flood plains and reliance on a balance of management and structural alternatives in reducing or preventing flood damages.

The Flood Control Levee Regulation

- The maintenance of flood control levees is to be regulated by the State but are in fact generally maintained by local entities. There are no maintenance regulations. The degree of maintenance of these structures varies with the capability and diligence of the organization charged with its maintenance.

Building Codes

- North Dakota bases its building code on the Uniform Building Code.
- There are no floodproofing or floodplain provisions in the State Code.
- Cities and counties may adopt the State Code and enforce it.
- For cities and counties that choose not to adopt the State Code, it applies by default but there is no enforcement.



SOUTH DAKOTA

A different approach was taken by the study team with South Dakota, because only a tiny fragment of the basin is contained in the state, and none of the Red River proper. The following is a general description of the situation.

The principal agency of concern here is the South Dakota Department of Environment and Natural Resources (DENR).

The key issue of concern to South Dakota that leads to their involvement in Red River Basin management is flooding at Lake Traverse. This results in property damage, erosion of the lakeshore and public safety concerns.

Lake Traverse lies between South Dakota and Minnesota at the very headwaters of a tributary to the Red River. The lake is known to make a hydraulic connection to the Mississippi at certain stages. This is referenced in the IJC interim report. Under normal flow circumstances, the lake drains north into the Red. There are two flood control dams on the Red River side of the lake. The dams protect downstream landowners but increase the incidence of flooding in the lake, aggravated in part by the diversion of the Mustinka River from Minnesota into the lake.

South Dakota's main interest is in managing flows in the Mustinka in an attempt to minimize the flood impact on the lake. Therefore flood prevention prescriptions aimed at doing this elsewhere in the basin would be of interest to them. As well, The DENR has an interest in maintaining the view that the Lake, and its major tributaries are an integral part of the drainage, and need to be included if a whole basin approach is being taken.

Based on the nature of the interest South Dakota has on flooding issues in the Red River, the study team decided not to look in depth at the State's floodplain management laws and regulations.

CANADIAN ARRANGEMENTS FOR SHARING RESPONSIBILITIES



In Canada, jurisdiction in resource and environment matters is derived from federal and provincial heads of power. Federal heads of power include:

- Exclusive jurisdiction on federal lands and Indian Reserves.
- Authority to tax and spend including in areas which would otherwise be outside their jurisdiction.
- Jurisdiction over inter-provincial and international trade and commerce.
- Authority to collect and disseminate environmental and resource information through census and statistics powers.
- Navigation and shipping.
- Seacoast and inland fisheries.
- Agriculture (shared with the provinces).
- Criminal law (legislation protecting human health, life and safety).
- Regulation of facilities that are inter- or extra-provincial such as pipelines.
- Treaty powers - responsibility for foreign affairs.
- General powers concerning laws for the Peace, Order and Good Government of Canada (emergency, doctrine of national concern).

Provincial heads of power include:

- The exploration for and development, conservation and management of non-renewable resources and the development, conservation and management of sites and facilities in the province for the generation and production of electrical energy.
- Water management within provincial borders, including irrigation, drainage, domestic and consumptive uses.
- Property and civil rights.
- Local works and undertakings.
- All matters of a local or private nature.
- Agriculture (shared with the federal government).

CANADIAN FEDERAL LEGISLATION AND IMPLEMENTING AGENCIES

The statutory and policy climate in Canada is largely reactive. Emphasis is on ensuring communities are adequately prepared to react to emergencies and specific events once they occur. This contrasts starkly with the more proactive mitigation-based strategies prevalent in the United States. In addition, provincial and local emergency preparedness legislation and structures are relied on as a driving force for action around flood events rather than reliance on federal direction. The federal role therefore is more consultative and supportive than directive in respect of emergency (flood-related) events. Two pieces of legislation at the federal level relate directly to flooding, and thus floodplain management. A more comprehensive review of Canadian legislation, policies and practice related to floodplain management is found in Appendix A.

The Federal Emergencies Act

- *The Federal Emergencies Act* codifies and defines the term emergency, and grants the federal government, in consultation with the province(s) involved, the authority to declare a national emergency in response to a particular event. Broad, temporary powers within an emergency event are granted to the federal government under this statute.

Emergency Preparedness Act

- *The Emergency Preparedness Act*, provides for the development and implementation of provincial and local emergency plans, and designates statutory responsibility for emergency response to the Canadian Armed Forces. Another component of the act allows for the development of agreements between the federal and provincial governments pertaining to civil emergency plans. The Act also establishes Emergency Preparedness Canada as a coordinating, planning and response vehicle at the provincial level nation-wide.

The Canada Water Act

- *The Canada Water Act* permits the federal government to enter into agreements to inventory waters of national interest, to measure the quality, quantity and distribution of those waters, to conduct research and formulate water resource management plans and design projects for efficient conservation, development and utilization of those waters. This *Act* enables the creation and maintenance of Canada's hydrometric network and gave rise to the Federal – Provincial Flood Damage Reduction Program.

Emergency Preparedness Canada (EPC)

- EPC's principal role is to coordinate the federal response and resources during an emergency, and assist in cooperation with provincial emergency services organizations. EPC also administers the Disaster Financial Assistance Arrangements (DFAA) which specify cost-sharing arrangements between federal and provincial governments related to disaster assistance.

Environment Canada

- Environment Canada's role in flood plain management remains in the operation of the national hydrometric network. Until the early 90s, Environment Canada also participated heavily in Flood Damage Reduction Programs across the country. This was largely a mapping and planning program.

Programs

Towards a National Mitigation Policy

- In the fall and early winter of 1998, Emergency Preparedness Canada with the Institute for Catastrophic Loss Reduction undertook a nation-wide consultation on disaster preparedness. This consultation has produced a number of observations and recommendations that would aid in putting in place a mitigation policy for Canada.

MANITOBA LEGISLATION



Water Rights Act

- *The Water Rights Act* requires approval for any diversion works. After poor experience with the legal interpretation of “drainage”, the province covers the requirement for licensing drainage as a diversion of water. All such diversions require approval from the designated official.

Water Resources Administration Act

- The Act empowers the Water Resources Branch of the provincial Department of Natural Resources, which plays a key role in monitoring water levels, doing flood level prediction, operating the floodway south of Winnipeg, and setting the designated flood elevation for building within the floodplain. The department also issues permits for constructing permanent structures within a designated flood area, and enforces the terms of the permits through regular inspections. The *Act* also clarifies responsibilities for the maintenance of improved waterways in the province.

Conservation Districts Act

- *The Conservation Districts Act* enables the formation of conservation districts in the province. It identifies how such bodies may be formed, what their work may be and how they will be supported by the province. Conservation districts are a local management mechanism that deals with water and drainage issues.

Environment Act

- This act empowers the Manitoba Environment Department to issue permits and licenses for the purpose of discharging wastes to the environment within limits specified by the license. A license can contain terms and conditions, which must be complied with or the license holder is in violation and commits an offense. For the purpose of this review, the important feature is that a license can specify that certain works be built to protect facilities such as sewage and livestock manure storage lagoons or waste disposal grounds if there is a risk that these could be flooded.

The Planning Act , C.C.S.M. c.P80

- This act empowers government to control planning and development in Manitoba, by controlling the subdivision of land and providing planning guidance to local government. Subdivision approvals can have terms and conditions attached, but these would not include provisions that are within the mandate of another department, such as specifying building elevations.

Manitoba Emergency Services Act c.C.C.S.M. c.E80, 1987

- This is the principal legislation that guides emergency preparedness and response in the province. It concerns itself with all emergencies, not just floods. It establishes the Manitoba Emergency Management Organization (MEMO), gives powers to the province to make emergency preparedness and disaster assistance plans, and cause local governments to have

their own plans in place. It gives the minister the authority to declare an emergency in all or part of the province, and sets out the government's powers during a declared emergency.

- The Act calls for MEMO to consult with federal other provincial and local governments in the development of provincial emergency preparedness plans and policies, and to work with local governments in the development of community emergency response plans to ensure that these are compatible with provincial plans.
- The Act also is concerned with the compensation of persons who suffer loss during an emergency, provides for the administration of disaster assistance and compensation, and sets up a disaster assistance appeal board to hear claims from those who are dissatisfied with the level of assistance they received.

Manitoba Dangerous Goods Handling and Transportation Act, CCSM cD12, 1987

- This legislation lays down the requirements for the storage and transportation of dangerous goods such as pesticides and PCB contaminated liquids or soils. It prohibits activities unless a license is issued and signed by a Director in Manitoba Environment. The relevance to floodplains is that the license can specify appropriate terms and conditions for safe storage above flood elevations. Failure to comply may result in an order to comply, or for the work to be done at the owner's expense, or for fines imposed by the courts.

Regulation and Programs under *Environment Act*

Livestock Waste Regulation. reg. 42/98

- Section 5-1 requires that no person can build livestock manure storage facilities within the 100 year flood elevation unless adequate flood protection exists to the satisfaction of the regional director.

Regulation and Programs under *Planning Act*

Provincial Land Use Policies Regulation reg. 184/94

- This is a set of policies intended to apply to the entire province, and act as guidance to local governments in the preparation of local land use plans. Where a local government has an approved land use plan, its policies supersede the provincial policies, and can vary from them. The provincial policies are therefore guidance only, but are used as the standard against which local plans are compared prior to approval.
- Policy 7 of the regulation deals with flooding and erosion. The objectives of the policy guidance is to encourage wise use in flood-prone areas to minimize property damage, public expenditure and personal hardship, and to maintain the natural capability of waterways to convey flood flows. Another policy objective is to restrict development or land uses that could reduce the benefits of flood control works.
- The policies stipulate that lands that are subject to significant flooding or erosion should remain in their natural state or developed for low intensity uses such as grazing or recreation. Land subject to flooding is defined as land that would be inundated by a 100 year flood, or

some variation of that specified by the province in areas protected by flood control works. Approved local land use plans within flood-prone areas should contain policies that are consistent with the provincial policy.

Regulation and Programs under *Manitoba Emergency Services Act*

- MEMO runs the program that distributes money to flood victims to replace their damaged goods and property through a cost shared program in cooperation with the federal DFAA. MEMO uses the DFAA rules and guidelines of its own in adjudicating applications for assistance. MEMO also undertakes training of emergency personnel throughout the province on emergency response and preparedness.

The City of Winnipeg

City of Winnipeg Act and Amendments (Province of Manitoba)

- This Act is the legislation that enables the City of Winnipeg to undertake normal planning and land development approval processes. It allows the City to declare regulated areas such as the floodway and the floodway fringe and to enforce development practices on these lands.
- A 1991 amendment provides for bylaws that declare regulated areas, and gives the Council powers to regulate uses within those areas. The City must hold public hearings in setting uses within the regulated area, or in varying requirements where these are major variances. It establishes that there will be a designated floodway area and fringe areas, and that a permit system will be used to regulate land uses therein. The City may issue orders to remedy unauthorized acts. Floodproofing requirements are referred to but are contained in a separate regulation. The Act amendment clearly spells out that the City may refrain from paying flood damage assistance where the floodproofing criteria are not complied with.

Dyking Authority Act (Province of Manitoba)

- This legislation applies only to the City of Winnipeg. It establishes the role of the Dyking Commissioner, a provincial appointee. A designation of a primary line of defence is enabled. The intent of this Act is to ensure that the primary line of defence (the City's primary dikes) is maintained intact. Annual reports are required on the part of the Dyking Commissioner.

Designated Floodway Fringe Area Regulation SM.1989-90 c.10

- This regulation establishes a designated floodway area and floodway fringe areas within the city, referencing maps filed with the Water Resources Branch in 1980. The regulation calls for the minister to designate a flood protection level, and it specifies floodproofing criteria, which are similar to Sections 9 -11 in the provincial DFA regulation.
- The regulation specifies that structures protected by the primary dike system are deemed to be floodproofed. It also states that primary dikes are to be approved by the city administrator and the Dyking Commissioner, and that "in no case shall the elevation be less than the flood protection level".

Building Codes

- Building codes are adopted provincially from the National Building Code
- There is no provision for floodproofing or floodplain standards in the Building Code.



CHAPTER 4 KEY POLICY AND PROCESS ISSUES AND ANALYSIS

INTRODUCTION

The legislation, policies and practices outlined in the previous chapter have been reviewed using a set of parameters identified by the study team. These "policy filters" are outlined below. In general, the filters were used to assess the relative strengths, application and appropriateness of the legislation and policies identified. Not all filters are relevant to all policies and, for the sake of brevity, the result of the analysis does not repeat the names of the filters.

In considering the functioning of any given policy, it is essential to evaluate the policy in both intent and application. In addition, in many cases policies that are effective and efficient when applied in isolation may be at cross purposes with other initiatives in the same or other jurisdictions. As a result, the set of filters encompasses two components; those that highlight the functioning and operation of the policy, and those that focus on the interactions between policies.

The ability of an independent study team to do a comprehensive evaluation and recommendations for an interjurisdictional floodplain management program is limited. Based on the policy filters that follow, it is possible to identify problems with the current processes, but it cannot be suggested that the set of problems identified is a comprehensive set of the problems that exist, or that simple adjustments to alleviate these problems will necessarily result in the most efficient floodplain management system possible.

TABLE 1 - POLICY FILTERS	
POLICY OPERATION FILTERS	
Sound Scientific Basis	Is the policy based on scientifically determined risks (both the likelihood of an event and severity of potential loss resulting from that event)?
Durability	Has the policy been through significant changes in its lifetime, or has it been resilient to multiple events?
	Are the principles applicable to the floodplain in general or only to specific types of flood events?
	Does the policy require adjustment after each flood event.
Application	Consistency: Is the policy applied consistently across the basin?
	Enforcement: Is there monitoring of compliance with the policy. Is there a means for enforcement of the policy (authority and support)?
	Grandfathering/Non-Conforming: Does the policy apply generally to the entire floodplain or only to new activities?
	Incentives and Disincentives: Does it provide incentives to compliance?
	Resources Allocated: Are sufficient resources allocated to applying and enforcing the policy? Is there clear responsibility for applying the policy?
Clarity and Specificity	Is the policy clear, understandable and unambiguous?
POLICY INTERACTION FILTERS (WITHIN/BETWEEN JURISDICTIONS)	
Consistency and Complementarity	Are the different policies consistent in their requirements?
	Do the various policies complement each other?
Completeness/Comprehensiveness	Is the set of policies covering any specific area comprehensive or are there clear gaps?
Clear Hierarchy and Precedence	Is there a clear hierarchy amongst the various policies (as to which take precedence when inconsistencies arise)?

The results of the policy analysis using the filters outlined above are presented below. Information from all jurisdictions has been synthesized within each filter category. This analysis is as comprehensive as possible given the time and resource constraints the team was under. Some readers will no doubt remark upon omissions. In providing a synthesis, we had to be selective to some degree in looking at areas where a policy filter had application to more than one jurisdiction, and preferably, across the basin.

Policy Operation Filters:

Sound Scientific Basis

- Good efforts are being made to apply sound science in flood forecasting and flood prediction. This is essential for proper public preparedness. New flow and flood crest data from 1997 is being used on both sides of the border to update forecasting models and prediction tools. The IJC itself is working on new data and tools techniques to contribute to these improvements.
- The designation in Manitoba of a new flood protection level at the 1997+ 2 feet, as contemplated in the new DFA regulation, may offer different levels of protection in different parts of the Basin. It is slightly higher than a 100-year flood elevation. Its validity will have to be confirmed using the tools that are currently being developed by the IJC.
- The USACE, along with other agencies such as the U. S. Geological Survey, is updating flood maps on the US side based on the new flood crest and elevation data obtained during the 1997 flood. For example, data show the pre-1997 100-year event at Grand Forks, North Dakota was 89,000 cfs. With the 1997 actual flood data, the level is being updated to 110,000 cfs.

Durability

- Based on this review, policies do tend to change after a large flood. For example, the Manitoba DFA design flood elevation is changing from that implemented following the 1979 flood. This is reasonable given how large the 1997 flood was. But it means that facilities built in the floodplain before 1997 are below the new design flood elevation, giving rise to the need for "grandfathering" provisions and variances within the area of flood risk. As experience increases, "safe" building elevations rise. None has been durable.
- The US approach of putting more emphasis on mitigation is more durable than the Canadian approach. Evidence of this is that mitigation efforts in the US are intensifying, whereas a shift in focus toward mitigation is just beginning in Canada. The present emphasis on flood-fighting preparedness and response in Canada is not durable. Efforts to introduce mitigation into the DFAA or other federal and provincial programs are being made and a joint initiative of Emergency Preparedness Canada and the Institute for Catastrophic Loss Reduction is providing a needed boost to a mitigation approach in Canada.

- The institutions responsible for flood preparedness and response have not changed in the recent past. FEMA is the clear lead agency in the US as MEMO is in Canada. What seems less durable are the relations of these lead agencies with their partner organizations. For the U.S., this means relations among FEMA, the Corps of Engineers and the National Weather Service, as well as state agencies and stakeholders. In Canada, this means MEMO's relations with EPC, other provincial agencies and the municipalities. The importance of such relationships cannot be over-emphasized. There are signs that improvements are necessary.
- There are significant durability questions regarding programs that require public funding in an era of reduced public expenditure, such as dike building, public education or flood preparedness. Important projects might be initiated, but are unsustainable because of lack of on-going funding. In times of downsizing of government expenditure on all government levels, and on both sides of the border, it is important that programs can rely on ongoing funding and political support.
- Is the NFIP durable? We received no information to suggest it wasn't. However, one must be cognizant of the need of an insurance program to have a broad base of subscription supported also by policies, programs and enforcement that lead to risk reduction.

Application of Policy

A selection of policies are examined below on the basis of how they are being applied, using several subheadings, as follows.

Consistency

- Clearly there will be differences in the way policies are implemented at the local level, especially where rural municipal or county governments have the authority to re-zone and sub-divide land, or approve development. Local political and economic pressures increase the probability that rules will be bent. The International Joint Commission reported that since 1979, only 63% of new homes within the DFA have complied with the regulation, yet people are living in those homes that are out of compliance.
- The newly proposed DFA level of 1997 +2 feet is inconsistent with standard practice in other agencies in Manitoba, such as the 100-year flood level used by both Rural Development and Environment. This inconsistency in the basin may lead to confusion, at a minimum.
- It is not clear how Manitoba Environment or other agencies will respond to the new designated flood elevation of 1997 plus two feet, proposed in the new regulation from Manitoba Natural Resources. Potentially, the environment department will continue to issue licences in the Red River floodplain that specify the 100-year flood, even though the minimum flood protection is thought to be 1997 plus two feet, which is higher than the 100 year flood level. Consistent application of a 100-year design elevation, and the required freeboard above it seems to be a matter of practice in Manitoba, subject to interpretation on a site by site basis. Adoption of a new elevation based on the 1997

flood creates the potential for inconsistent application, and possibly inconsistency between regions and between government departments.

- In the US, the federal and state levels have each approved floodplain management laws and formalized approaches. FEMA prescribes the use of the 1:100-year flood for design and building purposes for qualification for flood insurance. Minnesota adds one foot to this. North Dakota has not yet done so.
- Floodplain regulations in Minnesota need only be applied where adequate technical data to identify the 100-year flood elevation are available. The extent of this in the Red River basin is not known, but the potential exists for the inconsistent application of the regulations. The inadequacy of data has been noted as an area of concern within the Red River basin, therefore dependence on data as a requirement for compliance creates the potential for inconsistent application of the regulations.
- There is a federal requirement in the U.S. that houses in flood prone lands should not be built with basements. Communities can obtain exemptions to allow the construction of flood proofed basements. Fifteen of 278 communities in North Dakota and seven out of 504 in Minnesota have obtained a residential basement exemption.

Enforcement

- Enforcement activity is a clear reflection of public understanding and commitment and related political will. On the Canadian side, enforcement of the DFA regulation could be better, as indicated by the statistic above. The key enforcement agency is the Manitoba Natural Resources, which has been reduced in size and capacity. The likelihood of effective enforcement of the new DFA regulation is slim, unless a special effort is made in this regard.
- When an environment license is issued from Manitoba Environment that specifies a building elevation, there is rarely an inspection to confirm the elevation has been achieved. Instead, reliance is placed on the signed "as-built" drawings submitted by the licensee. This is a human resource issue; the department has too few inspectors to be able to check this kind of detail.
- Policies such as those that exist in North Dakota for inspecting dikes require vigilant enforcement action in order to be effective. Within North Dakota, there are suggestions that local responsibilities for maintenance are taken with variable degrees of seriousness.
- In Minnesota, local agencies such as the watershed districts have enforcement capabilities, and there is ready access to the courts. The tendency is to work with landowners who are out of compliance in order to bring them into compliance, but for clear violations of local ordinances, enforcement action can be initiated at the community level.

- Enforcement of the NFIP has been seriously hampered by staff cutbacks. For example, the Chicago office of FEMA has just 17 staff in a division charged with enforcement of compliance in six states. Clearly this points out a serious gap in support for enforcement of the program.
- The designated flood protection level in the City of Winnipeg is 27.8 James Ave., but much of the primary dike system is still well below that, despite the regulation stating "in no case shall the elevation (of dikes) be less than the flood protection level."

Grandfathering

- Regulations on both sides of the border have provisions that allow prior land uses, or prior building elevations, despite evidence that the new levels may be more protective. Examples include:
 - State-wide standards and criteria for management of floodplains have been adopted by Minnesota, and only local floodplain regulations after June, 1970 need to comply.
 - Amendments to the Manitoba DFA will grandfather existing structures that do not comply with the new flood protection elevation.
- New data on flood characteristics put governments in a policy bind because they have allowed floodplain development to proceed according to old assumptions and information. Grandfathering is a way out of this dilemma. Grandfathering can be applied in one of two ways. It can be applied to an existing structure, allowing an otherwise out of compliance structure to remain with its present vulnerability. Alternatively, grandfathering can be applied to an activity such as the building of a particular type of structure, and allowing that activity to continue while new restrictions apply only to the creation of other types of structures. Grandfathering is not an inherently faulty policy alternative, but it does immerse governments, especially those without a flood insurance program, deeper into a potential liability situation. The liability is in lending legitimacy to out-of-compliance structures or in granting consent to do certain things in the floodplain, and then having related investments wiped out by a flood. On the other hand, what is to be done with non-compliant structures? Grandfathering exists because governments do not have the appetite to remove people from their homes or sever them from or compensate them for their investments. The FEMA Acquisition Program in the United States has met with some success, but acquisitions still account for only a small portion of high risk properties.

Incentives for Compliance

- Using a flood return period of 100 years or more may be a disincentive to take precautions. The 100-year return period approach is used in all jurisdictions except in the DFA in Manitoba. Concern is centered on public understanding of the probability of another event occurring before 100 years. A common mindset looks at the 1997 flood as the "flood of the century", and assumes there won't be another flood of similar magnitude for another century, thus eliminating the need to worry now. From a policy perspective,

the use of this return period may make sense, but from a flood preparedness perspective, it requires substantial public education and awareness.

- Flood insurance, available through the NFIP in the US, appears not to be a strong incentive for compliance with floodplain management policy. In a very large flood, such as in 1997, the President is likely to declare an emergency, thus making some compensation available to the insured and many of the uninsured alike. There is low incentive to participate in NFIP if, during an emergency, compensation occurs irrespective of the existence of insurance. Insurance may, however, be an incentive for compliance in the case of minor floods, which do not trigger the declaration of an emergency.

However, it should be pointed out, that within the NFIP, additional incentive for good floodplain management is provided through the Community Rating System. The better a community performs in terms of floodplain management, the better deal its residents will get on NFIP insurance premiums. In addition, FEMA is currently working to close some of the gaps between their disaster assistance and flood insurance programs.

- In Manitoba, the rules that guide disaster assistance could be more strongly linked to preparedness, and compliance through flood proofing criteria such as those in the Water Resources regulation. Making flood assistance too easy to obtain, or setting the level of assistance too high, may serve as a disincentive to a more proactive, protectionist approach, and does not contribute to a flood preparedness culture in the Basin.
- The lack of enforcement throughout the Basin, as mentioned above, acts as a disincentive to policy compliance.
- Some incentives do however exist. Development or land use plans that comply with floodplain regulations will be approved more expediently. The two-part system for permitting new construction in the Manitoba DFA is an incentive for rural residents to comply.
- For the DFA regulation in Manitoba, there seems to be no direct penalty if a structure is built out of compliance. An inspector issues a written notice if a structure does not comply with the regulation and a caveat is placed on the property stating that future flood damage payments will not be made.

Resources Allocated

- Throughout the Basin, agencies responsible for floodplain management are experiencing the effects of government downsizing or budget restrictions. The lack of resources can be directly linked to a reduced hydrometric network, resultant lack of hydrologic information, lower levels of enforcement, a too-early demise of the Federal – Provincial Flood Damage Reduction Program in Canada, and, probably, less education and collaboration.

Clarity and Specificity

- In Manitoba, more clarity is required pertaining to action regarding existing structures in the DFA that are below the flood protection level. The regulation seems to apply to all structures (section 9) but there is also a grandfather clause contemplated for section 6, and there is provision in the Act for variances ordered by the Municipal Board.
- The language in the provincial policies is not very specific. For instance, what is the meaning of "significant" as it applies to flooding? Perhaps more to the point, what is *insignificant* flooding? The meaning of "restrict development" is unclear; does it mean no development, less development, or certain kinds? Vague language such as this, opens the policy to broad interpretation. To some extent, this may be intentional, as no single land use policy will apply everywhere in the province, and some flexibility is warranted. However, in order to reduce the risk of future flood damage, more clarity in the language of the policy would be helpful.
- As noted in several reports stemming from the 1997 flood, municipal emergency preparedness plans require operational guidelines specific to flood preparedness. The Manitoba Water Commission suggested that criteria are needed to evaluate the ability of a municipality to respond to a flood emergency. This would be MEMO's responsibility. The municipalities are not clear about what costs will be recoverable, and are therefore hesitant to take preemptive action in case they get stuck with the bill. Early clarity on what costs are covered, and what are not is required to enable municipalities to take early protective measures.

Policy Interaction Filters:

Consistency and Complimentarity among jurisdictions

- Generally, the variety of approaches within each jurisdiction lead to inconsistencies across the basin. The minimum guidelines set by FEMA suggest that the U.S. NFIP should be operationalized in a reasonably consistent manner, however, practice is divergent. Minnesota has its own floodplain management legislation, which seeks to achieve within-state consistency, while still meeting the FEMA rules regarding flood insurance. The jurisdictional split on the U.S. side of the Red River Basin into two FEMA regions creates potential coordination and consistency issues. The Chicago Region deals with Minnesota and the St. Paul office of USACE. The Denver Region deals with North Dakota and the same office of the USACE. The mis-matched regional boundaries of federal administrations in the basin means special efforts need to be taken with regard to overall communication and coordination. At least the FEMA rules coming from the two regional offices provide some consistency.
- In respect of Minnesota floodplain zoning, state and federal floodplain standards require that communities regulate floodplain non-conformities. However, the zoning enabling legislation for municipalities does not contain specific language pertaining to the treatment of non-

conformities. Municipalities may regulate non-conformities if they so choose. Regulation is therefore not consistent between jurisdictions, thereby weakening the overall effectiveness of higher-level floodplain standards.

- There are existing coordination mechanisms in place on the Canadian side, such as PREMAC (international), FEPCC, IEPC, but their effectiveness is in doubt. During the 1997 flood, for example, The City of Winnipeg, MEMO and EPC held separate press briefings. Confusion also existed between the city and the province in respect of the declaration of a state of emergency. The relationship among these parties may need to be strengthened.
- In addition, there are apparent inconsistencies in flood design elevations along the Red River. In Minnesota it is the 1:100 year flood plus one foot. In North Dakota, it is the 1:100-year flood. In Manitoba, it is 1997 plus two feet. The differences may be there for economic, social or other reasons, but their existence may create administrative difficulties. For example, the difference between North Dakota and Minnesota may be a source of difficulty when federal compensation money needs to be shared after the next major flood event. There is a proposal in North Dakota to bring their base elevation to the same as that used by Minnesota.
- At present, the City of Winnipeg does not have the authority to regulate secondary dikes. This has meant that property owners have been free to alter them and, in many cases, reduce their usefulness. This authority needs to be provided to the city by the province.

Completeness/Comprehensiveness

- The weight of evidence shows that floodplain policy is in transition, spurred on both side of the border by the 1997 event. There is movement toward greater completeness and comprehensiveness. The new DFA regulation in Manitoba is aimed at improving on the old one with more complete provisions. The movement toward mitigation in Canada also reflects this direction. In the US, the USACE is using the new flood elevations for the 1997 flood to re-do the flood insurance studies and maps from the Canadian border south. This is in aid of both completeness and comprehensiveness.

Clear Hierarchy and Precedence

- A distinct hierarchy of floodplain management policies exists on both sides of the border. However, what may seem simple on the surface may not be in practice. North Dakota has declared its "sovereignty" over water management issues. Awareness of federal requirements seems incomplete. Much is delegated from senior governments to more local governments but quality control is imperfect. There are clear and different flood response hierarchies on each side of the border. These differences would not seem to be problematic.

OTHER CONSIDERATIONS

U.S. FEDERAL

Disaster Mitigation Act of 1998

While this Act establishes some important milestones in mitigation and disaster assistance at the federal level, the Act is ultimately an illustration of the kinds of problems floodplain management has faced since its inception. Two issues are of primary concern. Firstly, under Section 104, funds for the Pre-disaster Hazard Mitigation Program are limited to \$35 million per year for fiscal years 1998-2002. Similarly, the overall authority for this program terminates on October 1, 2003, a relatively short duration. Lack of commitment to ongoing fiscal and political support is obvious from these examples. Although the Act, by its timing, seems to capitalize on the momentum and interest created by the 1997 flood event, it fosters, by its own design, the common error of ignoring the need for proactive work during low-flow cycles.

Another important aspect of this legislation is the role of the President in creating incentives and disincentives for positive action in floodplain management. The President is given large discretionary powers within the Act. Section 202 details the minimum federal share of costs to repair, restore, reconstruct or replace damaged public or nonprofit facilities at 75 percent of the cost. The President, however, has the authority to reduce that share to 50 percent or, conversely, to raise that share to 90 percent. Bestowing such strong fiscal power upon the President gives him the power to forcefully influence policy within the Basin.

MINNESOTA

The State Floodplain Management Act (M.S. Chapter 103F)

This Act mandates the local adoption of floodplain regulations when adequate technical data are available to identify the 100-year floodplain. An inherent weakness in the statute therefore, is the assumption that adequate technical data are available. In reality, lack of accurate technical data has been identified as a problem within the Red River Basin. Weak wording and a dependence on data which may not be available seems to undermine the intent of this statute. The voluntary nature of the NFIP compounds this weakness.

Furthermore, the state *Floodplain Management: A Handbook for Local Officials* acknowledges that the minimum state and federal floodplain standards only require revised or new local regulatory programs to ensure that:

1. All new floodplain development is properly protected against flood damage,
2. The health and safety of floodplain occupants is insured, and
3. Floodway areas are devoted to essentially open spaces so that floodplain encroachments do not increase flood levels above acceptable limits to the detriment of others.

There is little acknowledgement of the inherent risk of development within the floodplain, and instead an assumption that reliance on the Regulatory Flood Protection Elevation will be sufficient to alleviate flood damage.

NORTH DAKOTA

An Inventory of State Water Commission Policies (Unapproved document - 10/1/98)

In this document, non-eligible items for cost-sharing (page 15) are discussed:

Maintenance and deferred maintenance on any project which has previously received cost-sharing assistance from the State Water Commission shall not be an eligible item for cost-sharing, except for maintenance that maybe required as a result of an unusual climatological event.

Funds would be available to assist in the creation of projects. However, lack of ongoing funding for maintenance may be an issue. At present, most water projects are owned by local entities that sign agreements to operate and maintain the project after completion. As a general rule, the State Water Commission does not cost share on normal maintenance. However, need is considered. The internal policy is flexible.

Comments related to *The Flood Control Levee Regulation* indicate that the degree of maintenance of these structures varies with the capability and diligence of the organization charged with its maintenance. As noted in the Inventory,

This situation creates a potential hazard in that levees may deteriorate to the point of being unsafe.

It is suggested in the Inventory, therefore, that “the State Water Commission should be authorized to develop maintenance criteria for flood control levees and to insure compliance with these criteria through an inspection program”. For such a change to be effective, maintenance criteria would need to be made through statutory amendments. Without detailed enforcement and non-compliance ramifications, maintenance criteria would be unenforceable, and inspections (if carried out), could be a waste of time.

CANADA

Federal Government

The principal agency that coordinates emergency response at the federal level is Emergency Preparedness Canada (EPC). The analysis of policy and program initiatives in EPC raises the following key points.

EPC’s approach is a mixture of preparedness and response, but the emphasis is on response once the event occurs. Recent work by EPC on promoting a national mitigation policy is a step toward a more proactive response, particularly if the DFAA rules are amended to promote mitigation, or if new funds are allocated to do so. This would mean that funds would be available to repair or replace damaged public works to a standard that is higher than pre-flood condition, thereby

“It is rare to find long-term strategic planning designed to mitigate the many facets of the flood hazard, even among the state’s larger communities... the state and federal governments have implemented emergency action plans to facilitate the immediate relief of flood victims, which tends to work against the development of comprehensive disaster planning.”

*From Floodplain Management in North Dakota,
(unpublished)*

protecting against future flood events of higher magnitude. The present situation invites waste and inefficiency, because facilities that are repaired after a flood, like bridges, are still potentially at risk from the next flood.

MANITOBA

Manitoba Natural Resources - Water Resources Branch

The key legislation empowering this Branch, the *Water Resources Administration Act*, and its supporting regulations, raise policy issues that are important to this discussion.

The Water Resources Branch seems to be the acknowledged experts on water resources in the province, and it is unclear if this can be sustained. Most other agencies in Manitoba defer to this department on matters of flood forecasting and water management. The Branch may not be able to sustain this role in the wake of staff and budget cuts. Indeed, according to the IJC interim report, flood forecasting is done by only one person in the Branch.

The designation of the flood protection level by the Minister is a critical decision. Since 70% of Manitobans live in the Red River Basin, getting the correct design flood elevation is important. Or, put another way, the appropriate level of flood protection is important. The flood protection level, and the degree of enforcement of the level, are both directly related to decreasing future flood damage. Clearly if the level is too low, or not enforced, people and property will be put in harm's way.

Within the DFA, the new regulation proposes 1997 +2 feet (the 2 feet being the freeboard) as the new flood protection elevation. The proposed elevation is not directly linked to probability, and therefore cannot be used in risk or economic assessment of circumstances under which new construction within the floodplain can or should take place. The implication is that everything outside the DFA line on the map is safe. There is a concern that this sends the wrong message to communities about preparedness and the risks associated with being in the floodplain. New buildings and perimeter diking will be built in the basin in Manitoba to this elevation with a public expectation that it provides adequate protection.

Few specific references are found to the 100-year flood level in regulations. However, its use as a basis for design seems to be common practice. Further, in those applications, the amount of freeboard above the 100-year flood seems to be a local decision, made on a case-by-case basis. Other than the permit system applied by the Water Resources Branch, there appears to be no enforcement of the 100-year flood elevation. The potential for this to be inconsistently applied across the provincial government is great. This may place new development in flood jeopardy. In order to protect against future flooding, all agencies that approve land or resource uses should agree to a single, protective design flood level within the basin, and be prepared to support it through their licences and permits.

More clarity about what to do with existing structures in the DFA that are below the flood level is required. The new proposed regulation seems to apply to all structures (section 9), but there also seems to be a grandfather clause contemplated for section 6. There is provision in the Act

for variances ordered by the Municipal Board. Presumably all properties damaged in a general emergency will be compensated, even if they are in non-compliance. This situation provides little incentive for people building on the flood plain to develop a flood preparedness culture, or to fully take proactive steps to respond to the threat they ultimately must face.

MANITOBA EMERGENCY MANAGEMENT ORGANIZATION

Several policy issues emerged in the review of the Act and regulations pertaining to this organization.

The Act does not charge MEMO with responsibility for mitigation, or for preventing future damage from flooding. Some emergencies are a total surprise, but flooding in the Red River is a certainty. In anticipation of the event therefore, it makes sense for MEMO to be more proactive to prevent damage and reduce the seriousness of future events. “Preparedness” in practice seems to mean being prepared to fight a situation while it is happening, rather than to avoid the situation (see the definition of EP in the Act). There is evidence that MEMO is interested in mitigation, and supports the EPC’s attempts to promote more mitigation measures within Canada. The Act that guides MEMO, however, does not reflect this direction.

The Act infrequently compels the minister. More often, the Act says the minister *may* do something, such as in Section 6 where the minister *may* make orders and regulations, or section 9 where the minister *may* implement plans. It is understood that compelling a minister in an Act is not common practice. However, in the case of emergency response and preparedness, in which many lives and valuable property are potentially endangered, more compulsion and control may be warranted. What is not known is the extent to which ministerial discretion adds to the damage or increases the threat to people or the environment.

The rules that guide disaster assistance could be more strongly linked to preparedness, and compliance with flood proofing regulations, like those from the Water Resources regulation. Making flood assistance too easy to get, or setting the level of assistance too high, may serve as a disincentive to take a more proactive, protectionist approach, thereby lessening the contribution to a flood preparedness culture in the Basin.

RURAL DEVELOPMENT

The pattern of land use within the floodplain is a key element in protecting against future flood damage. Both farm consolidation and an increase of rural non-farming residents in the Basin has led to development of expensive housing, often close to the river. A general attitude of non-enforcement and some tendency for municipalities to compete with each other both for residential and industrial development has led to unnecessary increases in potential damages in the floodplain. Combined with a general lack of awareness of the risk of flooding this situation encourages risk in high risk areas. Improving the information base for land use planning would increase understanding regarding which areas present greater risk for building, thereby adding to flood protection in the long term. Unfortunately, updating and expanding the information base requires government commitment and resources.

CITY OF WINNIPEG

The primary dike elevations in the city are below the flood protection level and significant costs would be incurred to raise them to this level. It is the view of city officials that the primary dikes could not be raised in time to respond to a specific flood. This would affect the ability of Water Resources to operate the floodway according to Rule 2. However, if the Red River experiences an 1826-level flood, it is almost certain that the floodway will not be able to convey all the surplus flow, and some portions of the city would flood. Some parts of the city are not protected even at the 1997 flood level. Several neighbourhoods needed to be sandbagged and/or evacuated in 1997.

RESPONSES OF THE GOVERNMENTS TO THE IJC INTERIM REPORT RECOMMENDATIONS

The International Red River Basin Task Force delivered an Interim Report in December 1997. This report contained 40 recommendations for action by the governments with jurisdiction in the Basin. In July 1998, a brief report on the progress of the governments in implementing the Interim Report recommendations was issued. The authors of the present work did not specifically attempt to update the report on progress on these recommendations. It is noted however, that predictably, implementation is proceeding with differing levels of enthusiasm and degrees of success. Some tasks are proceeding apace. Some would appear to not have left the starting block. In reviewing floodplain management policies in the Basin, we came to many of the same conclusions as are found in the Interim Report. We would simply note that there is some urgency in moving forward on the recommendations. Both people and institutions can have short memories of events such as the 1997 flood. Motivation for change decreases rapidly with time. A cautious approach is often advisable, but tardiness can seriously harm an initiative. The momentum of concern stemming from a large flood event is a powerful uniting force. It would be a shame to miss the opportunity to capitalize on the momentum remaining from 1997.



CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS

Chapter 4 reveals the need for a reconsideration of many policies and practices throughout the basin. Two areas of policy and practice that we believe should be pursued with some vigour are those directed at the encouragement of a culture of preparedness and those that assist in the creation and maintenance of public and political will for enforcement. A third area that deserves attention is that of collaborative decision-making.

A CULTURE OF PREPAREDNESS

Discussion

People in the Red River Valley are well aware of the tendency of their river to overflow its banks. Nonetheless, memories can be surprisingly short. Our inclination to address difficult problems begins to diminish when the hardships recede from our memories. Many of those we interviewed remarked on how we have a small window of opportunity and receptivity among the public and the decision-makers for changes to how we conduct ourselves on the floodplain. People will forget and the present sense of urgency will be replaced with ambivalence and, later, disinterest. This is inconsistent with a good understanding of the ongoing risks associated with living in a basin like that of the Red River.

We are in a world in which we want to believe that we can control natural events to a major degree. However, events such as the 1997 flood remind us that we usually have only minor influence. It is difficult to accept our limitations in a Basin-wide sense, when locally there are obvious examples of successful manipulation of the natural system. Locally, our efforts to modify the land and water system, can result in effect removal of water from the land, or effective storage of run-off. Even in major flood events, our sense of being able to control our own destiny (if not that of the river) is heightened when we observe some of our neighbours to be successful in fighting the flood. Yet, in terms of the amount of water and the shape of the flood hydrograph, our ability to influence that, in the short term, is relatively small. In the foreseeable future, we can only hope to play at the edges. At one level, we can do so much. At another, we can do so little.

All parts of the Basin are inter-linked. A narrowly conceived, locally made decision can often cause problems elsewhere in the Basin. The most common manifestation of this is in the downstream effects of upstream drainage (more easily observed during smaller floods than during larger floods).

One cannot discuss upstream retention and downstream flood reduction without acknowledging the tension that exists between these often-competing interests. On the one hand, downstream or mainstem interests anticipate significant flood level reduction through wetlands conservation or restoration, through the construction of storage impoundments, or through on-land retention of floodwaters. On the other hand, upstream interests are more supportive of downstream

protection measures such as dikes and diversions. They also fear that they will have to bear the consequences of upstream measures while the benefits accrue to others only. Understanding the characteristics of the basin, it is unlikely that the answers lie only upstream or only downstream, but through a combination of approaches.

It has been noted in Chapter 2 that knowledge of the river basin and its characteristics should be a major determinant of directions for policy and practice. The Red River and its tributaries have been shown to be unique, or at least, significantly different from the norm. This knowledge should lead to conclusions about the fitness of certain basin and floodplain management approaches. What parts of the Basin are suitable for prevention measures? What parts of the Basin call for protection measures?

Conclusions and Recommendations

Education and shared experiences can lead people to a better understanding of the Red River Basin and its flow characteristics and of their neighbours and their needs. It can also help us to understand the limits on our ability to affect floods and flooding impacts. Education materials specific to the Red River Basin should be prepared, distributed and discussed. These materials should convey the sense of the Red River Basin being a system.

Citizens of the basin should be encouraged and given the opportunity to participate in consultation and decision-making processes that will broaden their perspectives as well as those of the decision-makers.

Much of the legislation, policies and practices may not be attuned to a good understanding of the Red River Basin. With improved understanding of the Red River Basin will come a public who will support and even demand policies and practices that fit an accurate understanding of the river as a system. Elected officials and their staff need to lead by linking policies more closely to an overall understanding of the Basin..

Although there is evidence that local flood prevention measures along the Red are justified, we believe that there is limited value in contemplating these measures in any part of the Basin other than the upper tributaries because of the characteristics of the Basin noted in Chapter 2.. Here, the slopes of the river and the surrounding topography are greater. Impoundments and on-land retention are possible. What difference could initiatives such as this make to a major flood peak? Although there is much speculation and even debate about the potential for reducing floods, we do not know. Experimentation, related to this debate has been conducted at Tobacco Creek on the Manitoba escarpment. Its results are extremely small scale but the information available suggests that there would be value in developing a pilot scale model of this approach on a larger portion of the basin. The pilot scale experiment would provide data on the effect of on-land retention and the costs of such an approach. These results could then be extrapolated to other upper reaches of the watershed and the activities expanded, if shown to be warranted.

THE CREATION AND MAINTENANCE OF PUBLIC AND POLITICAL WILL FOR ENFORCEMENT

Discussion

We were regularly reminded of the need for better enforcement of floodplain management policies. Enforcement can be an issue at a number of levels. Building may take place below safe elevations. This can occur either because appropriate permits are not sought, because of laxness in checking the plans against the criteria, or because available enforcement resources are inadequate or are weakly mandated. Dikes or levees may be lowered or otherwise weakened during low-flow cycles to “improve” the view or the land use. This has occurred due to inadequate regulatory authority or to an incomplete understanding of the need for the dike on the part of the landowner.

It may be further noted that the discretion allowed within a policy can lead to a gradual weakening of requirements. In the words of one interviewee, “The 1:100 design flood was conceived as the floor. It has become the ceiling.”

Good risk awareness is required to set the stage for enforcement. Otherwise, we cannot expect the political will to be there when it is required. Thus, the culture of preparedness and the ability to enforce are intertwined. Enforcement is quite reliant on the culture of preparedness and the resulting understanding of the river and the diverse needs of residents in the Basin.

Conclusions and Recommendations

Enforcement is an issue on both sides of the border. This has its roots in an absence of consequences of non-compliance which, in turn, arises from two issues - a lack of human and financial resources and the need for strong public and political support. The public and political support will develop from the culture described and recommended above. However, governments need to provide the financial and human resources for enforcement activity.

Governments should also give consideration to lessening discretion that can be exercised under floodplain management policies.

COLLABORATIVE DECISION-MAKING

Discussion

We commonly heard of the need for basin-wide approaches to floodplain management. Basin-wide approaches will take more time to develop since they require that more interests be considered and be a serious part of the decision process. Basin-wide approaches cannot be developed in narrow forums.

The Pembina River, one of the major tributaries of the Red presents its own challenges. The upstream - downstream conflict exists, as elsewhere in the basin, with downstream problems

being attributed to upstream drainage. Dikes along lower reaches of the river have controversial effects on flood levels. The situation is further complicated by the fact that it straddles the international boundary and crosses and re-crosses the boundary on its way to empty into the Red. We understand that there have been a significant number of studies done on the Pembina River problems. Some of the studies, however, pre-dated today's greater environmental awareness. The studies contemplated storage reservoirs being built in the U.S. and/or Canada. Whether these proposals would still be seen as environmentally acceptable is an open question. It is important to note that a broad range of interests would need to be engaged in any decisions.

There is always an issue of appropriate timing when proposing significant changes to management practices for any entity, let alone something as large and diverse as an international watershed. When is a good time to make major changes to structures, policies, practices or the behaviours of residents, government bureaucracies and decision-makers? As noted above, striking while the iron is hot, while the memories of the flood of 1997 are fresh is clearly important. Putting off decisions has a number of consequences that we should bear in mind. Tough decisions today may take a substantial amount of political courage to make, especially if the payoffs only occur in the long term. Yet, to delay is often to allow the impediments to grow and to make that decision ever more difficult in the future. For example, a decision today to avoid relocating a particularly at-risk population, may only get harder and more costly as that community or settlement grows over the next several years.

The Red River Basin is well-endowed with interest groups and organizations aimed at influencing decision-makers. None of these groups, however, appears to be fully inclusive in their membership. These organizations, their memberships and energies can be seen as a huge resource to decision-makers in the Basin.

Conclusions and Recommendations

Careful decision-making requires an ongoing and long-term commitment on the part of all participants. This will be difficult to maintain in the absence of awareness of risk and a culture of preparedness.

Better information, better communication between the apparently competing interests and basin-wide collaborative decision-making are required to deal with upstream – downstream conflicts throughout the Basin.

It would appear to be wise to undertake a comprehensive review of the work that has been done in the Pembina Sub-basin, update it in terms of trends in public interest (primarily environmental) that have emerged in the last two decades and altered social and economic circumstance. Specific proposals for addressing the issues in the Pembina Sub-basin should then be developed. This should be done with the engagement of all legitimate interests in the Sub-basin.

Lack of progress towards decisions allows existing conflicts to grow. Positions become more entrenched and collaboration becomes more and more difficult to achieve. Participants in such

debates, throughout the Basin, should be brought into collaborative processes as soon as possible.

It will be important to capture the enthusiasm and energy of organized interests in any new collaborative process.

Summary

This review has revealed important similarities and differences in the policy approaches to floodplain management being taken by the jurisdictions through which the Red River flows. This was expected. In order to enhance protection from future flooding, in either the US or Canada, we suggest a “whole watershed” approach that recognizes the river as an hydrological system, not just a river to be managed in segments. This recognition should include accepting that the risk of being flooded varies throughout the floodplain, and that more effort needs to be placed on ensuring public understanding and appreciation of these risks. In addition, we support the focus on mitigation that is evident in the US, and is emerging in Canadian policies.

It is reasonable for jurisdictions to have different approaches. Some differences are without great consequence. Other differences introduce incompatibilities among jurisdictions. An objective of policy and practice uniformity throughout the basin is not realistic. However, an objective of policy and practice compatibility is. We suggest that a new collaborative decision-making process that includes all legitimate interests and all relevant decision-makers is critical, and is consistent with the need for a whole watershed approach. The design of this new process should be completed by the participants of the process. The initiation of this process should not wait; the need for collaboration is acute, and the risks resulting from waiting are high.



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APPENDIX A – CANADA

1. FEDERAL

a) Legislation

Emergency Preparedness Act, RSC, 1985, c. 6

- Provides for the development and implementation of civil emergency plans in Canada. Outlines use of the Canadian Armed Forces in dealing with emergencies.
- Establishes the agency Emergency Preparedness Canada to coordinate federal planning and response in the event of a provincial emergency.
- Allows for the development of agreements between the federal and provincial governments with respect to civil emergency plans.

Federal Emergencies Act, RSC, 1985, c.22

- Empowers the federal government, after consultation with the province involved, to declare a national emergency, and to take temporary measures to ensure safety and security during such an emergency.
- Definitions of emergencies are codified: Public Welfare Emergencies, such as large floods or ice storms, Public Order Emergencies, in which the security of the country is threatened, International Emergencies, or War Emergencies. Grants the federal authorities broad but temporary powers during a declared national emergency. Such powers include direction of police, issuance of special orders or regulations, evacuation of people, distribution of emergency supplies as well as many others.
- Requires an inquiry within 60 days following the end of an emergency, and a report to Parliament within 360 days.

b) Regulations and Programs

Emergency Preparedness Canada (EPC)

- Emergency Preparedness Canada runs several national programs including the provision of cost shared emergency preparedness with provinces, the Disaster Financial Assistance Arrangements (DFAA), and a Business Resumption Planning program (BRP).
- EPC's principal role is to coordinate the federal response and resources during an emergency. Central to this role is cooperation with the provincial emergency agency in delivering federal assistance, including financial assistance once the emergency is over.
- The approach has historically been focused on response, but EPC has recently been advocating more focus on mitigation and prevention of future loss.

Disaster Financial Assistance Arrangements (DFAA)

- The DFAA specifies cost-sharing arrangements between the federal and provincial governments related to disaster assistance. Funds are provided according to a formula based

on the per capita cost of necessary expenditures caused by the disaster. Funding to individuals, farms, and businesses is focused on replacement of items of an essential nature, based on depreciated value. Funding is made available to municipalities for repairs to essential services.

- A key stipulation of the DFAA rules is that it provides funds for repair or replacement of private or public property up to pre-flood condition only. The federal government will not share in the cost of upgrading public works to standards higher than those which existed before the disaster. As well, in the case of private property in disaster-prone areas assistance can only be given once, unless taking effective action to avoid a recurrence was not practical.

Prairie Regional Emergency Management Advisory Committee (PREMAC)

- There is a Canada/US consultative group for international cooperation, as well as a Prairie Regional Emergency Management Advisory Committee, which includes federal US and Canadian agencies

Flood Damage Reduction Program (FDRP)

- Under the Federal Flood Damage Reduction Program areas of high flood risk are mapped and delineated. No new construction damaged by a flood within these designated areas is eligible for assistance under the DFAA.

Manitoba Agreement on Red River Flood Disaster Assistance

- Developed in May, 1997, this program clarifies a number of important elements of cost sharing and eligibility under the DFAA, including enhanced diking and flood proofing and improved regional water management planning. A high level federal-provincial officials' coordinating group is charged with implementation of the agreement.

Prairie Farm Rehabilitation Administration (PFRA)

- Following the 1997 Red River flood, federal funds being spent on improving dikes and flood control works have been administered by the Prairie Farm Rehabilitation Administration (PFRA) for the federal Department of Western Economic Diversification (WED). Funds are paid to the province; decisions regarding interpretation of compensation guidelines under the program, are made by the province.

c) Practices

- The EPC operates a Federal Emergency Preparedness Coordinating Committee (FEPCC) in Manitoba, made up entirely of federal officials from about 20 departments and agencies, including the RCMP and Atomic Energy of Canada. The FEPCC promotes emergency preparedness and planning within federal agencies, and it can quickly marshal and commit federal resources to an emergency.
- The EPC cooperates with the Manitoba Emergency Management Organization (MEMO), sits on the Interagency Emergency Preparedness Committee (IEPC), chaired by MEMO, and uses MEMO as the focal point for response coordination in the province.
- During an emergency event, FEPCC meets every other day and maintains close liaison with MEMO and the IEPC. Maintenance of good relations and communications is a priority.

2. PROVINCIAL

a) Legislation

Water Resources Administration Act C.C.S.M. c. W70

- This is the key act empowering the province, through the Water Resources Branch of the Natural Resources Department, to set the ground rules on flood plain management in Manitoba. Its provisions establish the authority to set out the requirements for, and license water control works; it relieves municipalities from the responsibility of managing waterways, and sets out prohibitions of use within designated flood areas. It also authorizes the Minister to issue an evacuation orders if a diked area is flooded.
- Within designated flood areas, it makes the requirement for a permit to be issued that authorizes the occupation and construction of buildings, and states that the permit can contain terms and conditions that are consistent with regulations (see below). The act also provides for an appeal process to the Municipal Board, of the terms and conditions if a permittee disagrees with them, or if a permit is refused.
- In practice, Water Resources advises using the 100 year flood as a design elevation throughout the province, but specifies a different elevation in the Red River Valley through the DFA regulation. The DFA regulation refers to a "freeboard allowance" in schedule B, but the height of this allowance is not specified. As a matter of practice, the freeboard allowance is 2 feet, but it may be higher if, judged on a case by case basis, Water Resources Branch requires it.
- Other agencies, such as Rural Development and Environment, defer to advice from the Water Resources Branch, which is acknowledged as the lead agency in water resources information and management in the province.

b) Regulations and Programs

Establishment of Designated Dyking System Regulation. reg. 24/88

- This regulation sets out as designated dyking systems the dikes and water works around the communities of Morris, Brunkild, Emerson, Letellier, Rosenort, St Jean Baptiste, and St Adolphe. This regulation is contemplated in Section 26(1)j of the foregoing Act, and appears to make the dikes the responsibility of the province.

Designated Flood Area Regulation (draft, Sept. 1998)

- The draft regulation, written after the 1997 flood, is reviewed here, even though it has not yet been passed. It is the one being contemplated, and will be relevant in terms of preventing future flood damage.
- This designates a flood area (DFA) in the Red River Valley, which is drawn on a map, and requires the minister to specify the flood protection level within the designated area, as provided for in Section 26(1) of the Water Resources Administration Act. The new flood protection level being proposed is two feet (0.60 m) over the 1997 flood level. This is an amendment of the existing level, which is 3 feet over 1979 flood level.
- The regulation establishes a new two stage permit system for new buildings within the DFA. Stage one provides for foundation construction to a reference mark that is established by the Water Resources Branch. Stage two provides for completion and occupation once it is shown that the constructed elevation complies with the reference mark. Established

buildings that do not meet this elevation are grandfathered in. The regulation contains a series of schedules that specify difference elevations for residential, outbuildings and other structures.

- Sections 9, 10 and 11 of the regulation specify criteria for flood-proofing buildings that are within a designated flood area. In general, it requires buildings to be built on fill or on piles, or to be protected by a dike that is built to the flood protection level.
- The regulation calls for the designation of inspectors, and requires the inspectors to issue a written notice to permit holders and the municipality after an inspection to indicate if the structure inspected complies with the regulation.

New Flood Proofing Program

- This is a federal-provincial cost shared (50/50) program to assist residents with flood proofing projects. The program provided up to 75% of the costs of raising or moving a home or building protective dikes, up to a maximum of \$30K. A total of \$64 Million has been allocated to this program. As of August, 1998, it was estimated that individual homeowners were investing \$10 Million as their contribution to floodproofing.

a) Legislation

Environment Act

- This act empowers the Manitoba Environment Department to issue permits and licenses for the purpose of discharging wastes to the environment within limits specified by the license. A license can contain terms and conditions, which must be complied with or the license holder is in violation and commits an offense. For the purpose of this review, the important feature is that a license can specify that certain works be built to protect facilities such as sewage and livestock manure storage lagoons or waste disposal grounds if there is a risk that these could be flooded.

b) Regulation and Programs

Livestock Waste Regulation. reg. 42/98

- Section 5-1 requires that no person can build livestock manure storage facilities within the 100 year flood elevation unless adequate flood protection exists to the satisfaction of the regional director.

c) Practices

- Where there is no regulation specifying an elevation for flood protection, the 100 year flood elevation is used as a minimum. This applies to both waste treatment facilities and to drinking water treatment systems under the public health legislation, administered by Manitoba Environment. The height required above the 100 year elevation is a judgment call made at the regional level, and not specified by regulation or policy. As a general practice, Manitoba Environment wants berms to be 1 meter higher than the 100 year flood elevation.
- Once specified in a license, and shown in engineering drawings, the department simply does not have the resources to double check berm elevations. However, they do inspect licensed berms after a flood to check the integrity of the structure.

a) Legislation

The Planning Act , C.C.S.M. c.P80

- This act empowers government to control planning and development in Manitoba, by controlling the subdivision of land and providing planning guidance to local government. Subdivision approvals can have terms and conditions attached, but these would not include provisions that are within the mandate of another department, such as specifying building elevations.

b) Policies and Programs

Provincial Land Use Policies Regulation reg. 184/94

- This is a set of policies intended to apply to the entire province, and act as guidance to local governments in the preparation of local land use plans. Where a local government has an approved land use plan, its policies supersede the provincial policies, and can vary from them. The provincial policies are therefore guidance only, but are used as the standard against which local plans are compared prior to approval.
- Policy 7 of the regulation deals with flooding and erosion. The objectives of the policy guidance is to encourage wise use in flood-prone areas to minimize property damage , public expenditure and personal hardship, and to maintain the natural capability of waterways to convey flood flows. Another policy objective is to restrict development or land uses that could reduce the benefits of flood control works.
- The policies stipulate that lands that are subject to significant flooding or erosion should remain in their natural state or developed for low intensity uses such as grazing or recreation. Land subject to flooding is defined as land that would be inundated by a 100 year flood, or some variation of that specified by the province in areas protected by flood control works. Approved local land use plans within flood-prone areas should contain policies that are consistent with the provincial policy.

c) Practices

- The Department of Rural Development, which administers the Planning Act, is responsible for subdivision approvals, and review of local land use plans. When a subdivision is approved, Rural Development has the authority to attach conditions, but in practice these do not include provisions for flood protection, since these are regulated by another agency.
- Local governments issue building permits or development permits for new construction within their boundaries. These will contain conditions that are consistent with the provisions of their plan or by-law, or are requirements imposed by Water Resources Branch within the Red River Designated Flood Area.
- Where a rural development is proposed for land that does not require a subdivision approval, Rural development is not heavily involved in the decision-making or permitting, and defers to the local government.

a) Legislation

Manitoba Emergency Services Act c.C.C.S.M. c.E80, 1987

- This is the principal legislation that guides emergency preparedness and response in the province. It concerns itself with all emergencies, not just floods. It establishes the Manitoba

Emergency Management Organization (MEMO), gives powers to the province to make emergency preparedness and disaster assistance plans, and cause local governments to have their own plans in place. It gives the minister the authority to declare an emergency in all or part of the province, and sets out the government's powers during a declared emergency.

- The Act calls for MEMO to consult with federal other provincial and local governments in the development of provincial emergency preparedness plans and policies, and to work with local governments in the development of community emergency response plans. It is to ensure that these are compatible with provincial plans.
- The Act also is concerned with the compensation of persons who suffer loss during an emergency, provides for the administration of disaster assistance and compensation, and sets up a disaster assistance appeal board to hear claims from those who are dissatisfied with the level of assistance they received.

b) Policies and Programs

- MEMO runs the program that distributes money to flood victims to replace their damaged goods and property, through a cost shared program in cooperation with the federal DFAA. MEMO uses the DFAA rules and guidelines of its own in adjudicating applications for assistance.

c) Practices

- Most of the practice issues we encountered concern themselves with the manner in which MEMO distributed assistance after the flood. There was much dissatisfaction with this, but it lies out side our immediate charge. The Ernst Young report contains an assessment of these issues.
- In practice, the emergency preparedness plans developed by local governments and approved and filed with MEMO are ineffective. The existence of an emergency prompts the local government to act more on an ad hoc basis.
- MEMO operates an Interagency Emergency Preparedness Committee that has federal and local participation. When there is an emergency, the committee meets daily, and briefs the media on an on-going basis.

a) Legislation

City of Winnipeg Act

- A 1991 amendment provides for bylaws that declare regulated areas, and gives the Council powers to regulate uses within those areas. The City must hold public hearings in setting uses within the regulated area, or varying requirements where these are major variances. It establishes that there will be a designated floodway area and fringe areas, and that a permit system will be used to regulate land uses therein. Floodproofing requirements are referred to but are contained in a separate regulation. The Act amendment clearly spells out that the city shall not pay flood damage assistance where the floodproofing criteria are not complied with.

b) Policies and Programs

Designated Floodway Fringe Area Regulation SM.1989-90 c.10

- This regulation establishes a designated floodway area and floodway fringe areas within the city, referencing maps filed with the Water resources Branch in 1980. The regulation calls for the minister to designate a flood protection level, and it specifies flood proofing criteria, which are similar to Section 9 -11 in the provincial DFA regulation.
- The regulation specifies that structures protected by the primary dike system are deemed to be floodproofed. It also states that primary dikes are to be approved by the city administrator and the diking commissioner, and that "in no case shall the elevation be less than the flood protection level".

c) Practices

- Because of the elevation of certain water discharges and drains in the city, in practice, the gates at the floodway facility south of the city must be operated to keep the water level through the city at 24.5 feet James Ave. Any higher than this and flood water will reverse through some openings along the river and flow into the city.
- Interim flood risk maps were produced for the city in 1980, which identified a designated floodway area and a floodway fringe area. In 1981, the designated flood protection level adopted was the 160 year flood elevation plus 2 feet of freeboard, or 27.8 James Ave. Note that the designated flood level is 3.3 feet higher than the elevation of water that can actually be allowed through Winnipeg for reasons stated above. Certainly, 27.8 is higher than the primary diking system in the city.



APPENDIX B – UNITED STATES



1. FEDERAL

a) Legislation

Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), P.L. 93-288, as amended by P.L. 100-707 (U.S.C. 5170)

- Authorizes programs for predisaster mitigation, streamlines administration of disaster relief, and controls the Federal costs of disaster assistance.
- Formally authorizes the FEMA to encourage and promote predisaster mitigation.

The National Flood Insurance Reform Act of 1994

- Purpose is to improve the financial condition of the National Flood Insurance Program (NFIP) and reduce the Federal expenditures for Federal disaster assistance to flood damaged properties.
- Provisions for increased lender compliance are aimed at increasing the number of flood insurance policies that are placed and maintained, therefore reducing the need for Federal Disaster Assistance.
- Mitigation assistance grants will provide assistance for states and communities to protect homes and businesses before a flood event.
- Mitigation Insurance will provide additional financial resources to allow rebuilding of repetitively flooded or damaged homes and businesses in compliance with local floodplain management ordinances.

Flood Control Act of 1936, ch.688, 49 Stat. 1570, as amended (33 U.S.C. 701a)

- Gave general jurisdiction over flood control projects to the Army Corps of Engineers. Although the Corps has general authority to plan and construct dams for flood control, major construction projects must be authorized by Congress. The technical services of the Army Corps of Engineers have been provided as a non-construction alternative for flood damage reduction since 1960. Authorization for emergency flood response from the Corps comes from the *Emergency Flood Control Work, amendments of June 28, 1955, ch. 194, 69 Stat. 186 (U.S.C 701n)*.
- Amendments in 1986 established a local cost share, and 1996 amendments increased the local cost share to 35% for federally planned projects.

Reclamation Act of 1902, as amended, ch. 1093, 32 Stat. 388 (43 U.S.C. 371 et seq.)

- Empowers the Secretary of the Interior to construct, operate, and maintain dams and diversion projects principally for irrigation, although flood control is often an associated purpose.

Reclamation Project Act of 1939 (Section 9(b)), as amended, ch. 418, 53 Stat. 1187 (43 U.S.C. 485h(b))

- Authorizes the Secretary of the Interior to allocate multipurpose project costs related to flood control as non-reimbursable costs, and to operate the project for such purposes.

Flood Control Act of 1944, ch. 665, 58 Stat. 887, 907 (33 U.S.C. 701b-1)

- Authorized the Secretary of Agriculture to undertake flood prevention and other related purposes in 11 specified projects covering 35 million acres.

Emergency Flood Response Act of June 26, 1948, ch. 676, 62 Stat. 1052 (43 U.S.C 502)

- Authorizes money from the emergency fund to finance costs associated with emergencies, including flooding.

Water Resources Development Act of 1974 (U.S.C. 701b-11)

- Requires federal agency planning or designing of a flood control project to consider possible non-structural alternatives to prevent or reduce flood damages.

Water Resources Planning Act of 1965, P.L. 89-80 (42 U.S.C. 1962 et seq.)

- Authorized the creation of river basin commissions, however though some were created, they were later revoked by a series of executive orders.

Watershed Planning Act of September 5, 1962, P.L. 87-639 (16 U.S.C. 1009)

- Authorizes the Secretary of the Army and the Secretary of Agriculture to conduct joint investigations and surveys of watershed areas for flood prevention and control purposes under the direction of the House Transportation and Infrastructure Committee and the Senate Public Works Committee.

Watershed Protection and Flood Prevention Act of 1954, ch. 656, 68 Stat. 666, as amended (16 U.S.C. 1001-1006)

- Provides financial and technical assistance to local organizations to plan and implement measures pertaining to prevention of erosion, sedimentation, and flood damage. Structural measures may include dams, and levees.

b) Policies and Programs

Predisaster Hazard Mitigation Program

- Requires, as a condition for receiving Federal financial assistance for disaster preparedness, that States submit to the President a comprehensive program for mitigating major disasters and emergencies that includes a provisions for prioritizing mitigation activities.
- Authorizes grants for improving and updating State disaster assistance plans (Fed share not to exceed 50% of cost of update). Grants may be used for testing and application technologies for disasters other than flooding. With regard to flooding in particular, FEMA is encouraged to investigate and verify available flood hazard information.
- Authorizes the President to establish a program for States, local governments, and other entities for carrying out predisaster mitigation activities that exhibit long-term, cost-effective benefits and substantially reduce the risk of future damage from major disasters.

In selecting a site, the President must consider:

- likelihood of damage resulting from a natural disaster
- identification of cost effective mitigation activities with meaningful outcomes
- the consistency with State mitigation programs
- the opportunity to maximise net benefits to society

- the ability of State or local government or entity to fund mitigation activities
 - private sector interest
- Federal share for mitigation activities is set at 75% (or 90% for impoverished communities with a population of 10,000 or less). Each State is to receive a minimum of the lesser of \$500,000 or 1% of total appropriated funds with no State receiving more than 15% of the funds. Funds for this program are \$35 million per year for 1998-2002. Post-disaster mitigation funds are to be used if not obligated within 30 months of the disaster declaration.
 - Funds may be used to disseminate information about cost-effective mitigation technologies.
 - Requires a report to Congress on the effectiveness of this program, reviewing its goals and objectives and providing recommendations within 3 years of funding.
 - An Interagency Task Force, chaired by the Director of FEMA will coordinate the implementation of the programs.
 - Changes the maximum hazard mitigation contributions from 15% to 20% of aggregate amount of grants.

Streamlining and Cost Reduction Program

- Directs the President to establish management cost reimbursement rates, subject to periodic review.
- Designates a minimum Federal share of 75% of the cost of repair, restoration or replacement of public facilities or nonprofit facilities. The President has the authority to reduce the share to 50%, or raise to 90%.
- New rules for cost estimates allow reconsideration of the cost of repairs where actual cost is above 120% or below 80% of estimated cost. The President will establish an expert panel for development of procedures for cost estimation.
- Caps total assistance per individual or household at \$25,000 per major disaster. The President is authorized to assist individuals by replacing their homes under certain conditions or allowing them to rent alternative housing and by providing financial assist for medical, dental, funeral, personal property, and transportation expenses. The President will issue regulations for eligibility criteria.
- The President is directed to establish a process for offering States the option of administering the program - sets criteria for and audits program.
- Requires the President to establish at least 2 State pilot programs for the purpose of streamlining the Public Assistance program and report to Congress within 2 years on program's results.

National Flood Insurance Program (NFIP)

- Purchase of flood insurance is a condition of receiving any form of Federal or federally-related financial assistance for acquisition or construction purposes with respect to insurable buildings and mobile homes within an identified special flood, or flood-related erosion hazard area that is located within an community participating in the Program.
- Flood insurance shall not be sold or renewed under the program unless the community has adopted adequate flood plain management regulations consistent with Federal criteria.
- NFIP does not allow a community to permit the construction of residential floodproofed basements below the 100-year flood level. The NFIP has established a “basement exception” process where, if a community is successful in getting a basement exception, floodproofed

basements are permissible and floodproofing is credited for flood insurance premium rating purposes.

The Flooded Property Purchase Program

- Under NFIP, seeks to remove repetitively and/or substantially damaged structures from flood risk areas. Property located in a flood risk area and covered by flood insurance under NFIP may be purchased by a State or local community and dedicated in perpetuity for open space purposes.

Flood Damage Reduction Program

- A federal/state collaborative program which provides 50/50 grants to assist local governments undertaking structural and nonstructural projects. This program supplements federal programs. Nonstructural projects include feasibility studies, acquisition and relocation of structures and flood warning systems. Structural projects include flood levees, flood bypass channels, flood impoundments, and cost-sharing on federal projects.

Flood Risk Reduction Program

- Under this program, landowners can opt to receive a lump sum payment instead of annual payments if they farm land with high potential to flood and agree to waive specified farm and disaster payments.

Hazard Mitigation Grant Program (HMGP)

- FEMA program to reduce future flood damage potential.

Emergency Conservation Program

- As part of the emergency flood response, this program restores damaged farmland by reshaping it and removing debris.

Emergency Watershed Protection Program

- Mandated under Title IV of the *Farm Credit Act of 1978*, the aim of this program is to reduce hazards in watersheds damaged by natural disasters.

Watershed Surveys and Planning Program

- Authorized under the *Watershed and Flood Prevention Act of 1954*, ch. 656, 68 Stat. 666 (U.S.C. 1001-1008), the purpose of this program is to assist federal, state and local agencies to protect watersheds from damage caused by natural elements such as flood water. Upstream flood damage concerns are addressed within this program.

Project Impact (building disaster-resistant communities)

- This is a pre-disaster initiative for improving disaster resistance in communities throughout the United States. There can be community-level and regional-level projects based on public and private partnerships that maximize the financial resources that can be drawn upon and that can be sustained into the future.

2. STATE - NORTH DAKOTA

a) Legislation

North Dakota Century Code Chapter 61-16.2

- Stems from the National Flood Insurance program goal of reduction in “flood damages through sound floodplain management stressing nonstructural measures such as floodplain zoning and floodproofing, acquisition and relocation, and flood warning practices.”
- The State provides “coordination and assistance to communities in floodplain management activities” and “encourages communities to adopt, administer, and enforce sound floodplain management ordinances”.
- Regulates structures built in the floodfringe to be constructed to base flood levels.
- Regulation of building within the floodfringe as well as general goals of reduction of flood damages through floodplain management measures.

North Dakota Century Code Chapters 57-51.1-07, 61-02-14

- Provides limited cost-sharing projects for flood control and protection. Eligible items include channels, ring dikes, dikes, and levees.

North Dakota Century Code Chapters 57-51.1-07, 61-02-14

- Designates the NDSWC responsibility for dam safety. Dam maintenance may be cost-shared up to 50% as a flood control project.

North Dakota Century Code Chapter 61-02-01.1

- Authorizes the NDSWC to update the State Water Management Plan.

North Dakota Century Code Chapter 61-15-03

- Vests the State Engineer with authority, control and supervision of all water and wildlife projects and wildlife reservations.

North Dakota Century Code Chapter 54-21.3-03

- Outlines the amendments to the State Building Code and sets parameters for construction of structures within the state.

North Dakota Century Code Chapter 11-33-02

- Outlines county zoning and empowers county commissioners to designate districts.
- The Board of county commissioners may divide all or any parts of the county and may “enact suitable regulations to carry out the purposes of this chapter”.

North Dakota Century Code Chapter 58-03-11

- Outlines the role of townships, establishing the scope of zoning regulations and restrictions.
- The responsibility of the board of township supervisors is designated under this act.

1998 Proposed Revisions to State Statutes (from the office of the State Engineer)

North Dakota Century Code Chapter 61-16 (2 & 2.08)

- Require the State Engineer to review the determination of impact of proposed development activities within the mapped, regulatory floodway.
- Increase by one foot, unless the State Engineer determines it is not necessary or practicable that another elevation is acceptable, the elevation at which structures must be built in the flood fringe.

North Dakota Century Code Chapter 40-50.1-01

- Require plans for development of subdivisions in cities to show any portions of land located within the 100-year floodplain.

North Dakota Century Code Chapter 11-33.2

- Require plans for development of subdivisions in counties to show any portions of land located within the 100-year floodplain.

North Dakota Century Code Chapter 11-33-03, 40-47-03, 58-03-12

- Specifying that the comprehensive plan adopted by zoning authorities may be designed to provide for “emergency management”. The plan would provide for the development and maintenance of an effective capability to mitigate, prepare for, respond to, and recover from, known hazards or situations, caused by an act of nature or man, which may threaten, injure, damage, or destroy lives, property, or our environment.

North Dakota Century Code Chapter 61-16.2-04

- Allowing the State Engineer to establish a base flood elevation for lakes.

b) Policies and Programs

North Dakota Water Resources Program (North Dakota State Water Commission – NDSWC)

- Provides limited cost sharing for flood-control projects with a 50 to 65 percent local cost share. Eligible projects include rural flood control and flood protection (ring dikes, dikes and levees).
- Emergency flood response is coordinated by DEM in cooperation with other state agencies.
- NDSWC is responsible for cost sharing maintenance of dams.

1998 Proposed Policy and Program Revisions (from the office of the State Engineer)

The state should:

- Provide additional training and require certificates for new floodplain managers.
- Consider a cost-share for riparian buffer zones in the identified floodplain.
- Consider a pilot project in cooperation with FEMA to develop new maps and revise older floodplain maps.

3. STATE – MINNESOTA

a) Legislation

Minnesota State Floodplain Management Act (M.S. Chapter 103)

- Chapter 103F.121, Subd. 2) outlines the DNR Adoption Procedure. It mandates the local adoption of floodplain regulations when adequate technical data are available to identify the 100-year floodplain. Within six months after notification of delineation of floodplains and/or floodways by the DNR, local governmental units shall prepare or amend their floodplain management ordinances in conformance with the provisions of Sections 103F.101 to 103F.155 and submit ordinance to the Commissioner for review and approval.
- Coupled with the Floodplain Management Rules found in Minnesota Rules, parts 6120.500 to 6120.6200, Chapter 103F.121 of the Act identifies specific allowable land uses and development standards applicable to floodplain areas.
- Chapter 103F.135 establishes Commissioner’s Assistance and Inspections – “ the commissioner shall conduct, whenever possible, periodic inspections to determine the effectiveness of local floodplain management programs, including an evaluation of the enforcement of and compliance with local floodplain management ordinances”.
- Chapter 103F.161 institutes Flood Damage Reduction Program Grants to supplement the federal program.

b) Policies and Programs

Flood Damage Reduction Program

- Provides a grant program 50/50 (state/local) to assist local governments undertaking structural and nonstructural projects. Minnesota general fund has a \$75,000 limit on individual projects.
- New initiatives include offsetting the local share of U.S. Corps of Engineers’ flood control project technical investigations, developing a state floodplain mapping capability (in lieu of relying solely on the NFIP, and providing increased baseline (general fund) funding for FDR projects.
- \$1.3M invested prior to 1996 were estimated to have saved upwards of \$15M in 1996 and 1997 in flood damages.

Minnesota Rules parts 6120.5000 – 6120.6200– Statewide Standards and Criteria for Management of Flood Plain Areas of Minnesota

- All local floodplain management regulations adopted after June 30,1970 must be compliant with these standards.
- All state agencies and local units of government must comply with Minnesota Regulations in the construction of structures, roads, bridges or other facilities located within floodplain areas delineated by local ordinance.
- Both federal and state standards identify the 100-year floodplain as the minimum area necessary for regulation at the local level.

Division of Emergency Management (DEM) – Minnesota Hazard Mitigation (MHM) Plan

- Describes the state’s long-term strategy for reducing and/or eliminating repeated future losses to life and property from natural hazards.

- An essential component of the plan is an analysis of natural hazards affecting the state (The Minnesota Natural Hazard Analysis). The Analysis includes information on a given hazard's frequency of occurrence, its historical impacts, and its ranking as a natural hazard affecting the state.

APPENDIX C

Table of Legislation