

**FLOOD RISK PERCEPTION IN THE RED RIVER BASIN, MANITOBA:
IMPLICATIONS FOR HAZARD AND DISASTER MANAGEMENT**

BY

MICHAEL E. OLCZYK

**A Thesis submitted to
The Faculty of Graduate Studies
In Partial Fulfillment of the Requirements for the Degree of**

MASTER OF NATURAL RESOURCES MANAGEMENT

**Natural Resources Institute
University of Manitoba
Winnipeg, Manitoba
R3T 2N2**

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ABSTRACT

A key element in hazard and disaster management is awareness of how stakeholders perceive risk. The primary goal of this study is to examine flood risk perception and its role in decision-making in relation to hazard and disaster management in the Red River Basin, Manitoba, Canada. The specific study objectives are to: 1) assess the nature of perceived risk at both the local and organizational levels; 2) determine if there is any variation between perceived risk among flood area residents and institutional experts; 3) identify various factors that influence perceptions of risk and decision-making processes at the local level; and 4) examine the variations in flood area residents' perceptions of risk and flood-related issues based on their geographical location.

In order to achieve the objectives of the study, the research methods selected were qualitative in nature. A modified Delphi Process was utilized to solicit subjective, informed judgments from residents and decision makers in the basin. The Delphi Process involved two methods: 1) face-to-face interviews, and 2) a two-round mail-out Delphi survey. A sample (non-representative) of 42 respondents was divided into two separate groups, Flood Area Residents and Institutional Representatives. Flood Area Residents were divided into Winnipeg (urban) and South (rural) respondents and Institutional Representatives were divided into Senior, Local, and Non-Government respondents.

The study findings established that while an element of variation in perceived risk between flood area residents and institutional experts does exist, it is not as significant as postulated in the literature. Residents' perceptions were based on subjective factors, but many exhibited a general awareness of objective risk. Perceptions of institutional experts responsible for managing risk involved some degree of value judgments and an element

of subjectivity as well. The gap that did appear to exist between the two groups was associated with a lack of understanding and communication. The study findings also indicated that a number of factors have influenced residents' perceptions of risk. The most notable factors were the geographical location of Winnipeg and South respondents and the influence of large-scale structural mitigation measures. Other influencing factors identified were: past flood experience, uncertainty, and visual presentation of the flood.

The research exemplified that the inclusion of perceptions of risk is pivotal to decision-making processes. For example, a lack of communication to residents regarding policy changes to evacuation procedures since 1997 could have considerable implications for future flood response (i.e. public opposition). Within the City of Winnipeg the reduction in physical risk and sense of security afforded by the Floodway has attenuated the perceptions of risk of some respondents and potentially made them more vulnerable to extreme flood events. The Floodway Expansion project may exacerbate this situation by increasing the level of physical protection. In addition, past flood experience heightened the awareness of some respondents and will serve as the context for future perceptions; uncertainty amplified risk-related anxiety for some respondents and could potentially increase stress in future floods; and visual presentation of the flood heightened perceptions of risk for some respondents and in some cases also influenced behaviour.

With an enhanced understanding of risk perception, institutional experts and decision makers will be better able to establish and implement proactive mitigation and preparedness strategies that are sustainable and improve resiliency. One of the keys to this inclusion is a two-way communication process that involves learning on both sides.

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CHAPTER 1
INTRODUCTION

1.1 – The Problem of Flooding in the Red River Basin

The primary goal of this study is to examine flood risk perception and its role in decision-making in relation to hazard and disaster management in the Red River Basin, Manitoba, Canada. The research will address four specific objectives. The first objective is to assess the nature of perceived risk at both the local and organizational levels. The second objective is to determine if there is any variation between perceived risk among flood area residents and institutional experts. The third objective is to identify various factors that influence perceptions of risk and decision-making processes at the local level. The fourth and final objective is to examine the variations in flood area residents' perceptions of risk and flood-related issues based on their geographical location.

The Red River Basin occupies sizeable parts of North Dakota, northwestern Minnesota, southern Manitoba, and a small part of northeastern South Dakota (see Figure 1). The basin covers approximately 45,000 square miles (116,500 square kilometres) of land, excluding the Assiniboine River Basin, and drains into Lake Winnipeg in Manitoba (IJC, 2000b). The main component of the basin is the Red River Valley, “a 17,000-square mile [44,000 square kilometre] piece of incredibly flat real estate” (Krenz and Leitch, 1993, p.1). The valley is as a remnant of glacial Lake Agassiz and is the flattest part of the basin. At its widest point the valley spans 60 miles (95 kilometres) across and extends for 315 miles (500 kilometres) in length (Krenz and Leitch, 1993). The focal point of the valley is the Red River, which forms in Wahpeton, North Dakota with the convergence of the Bois de Sioux and Ottertail Rivers and flows northwards through a

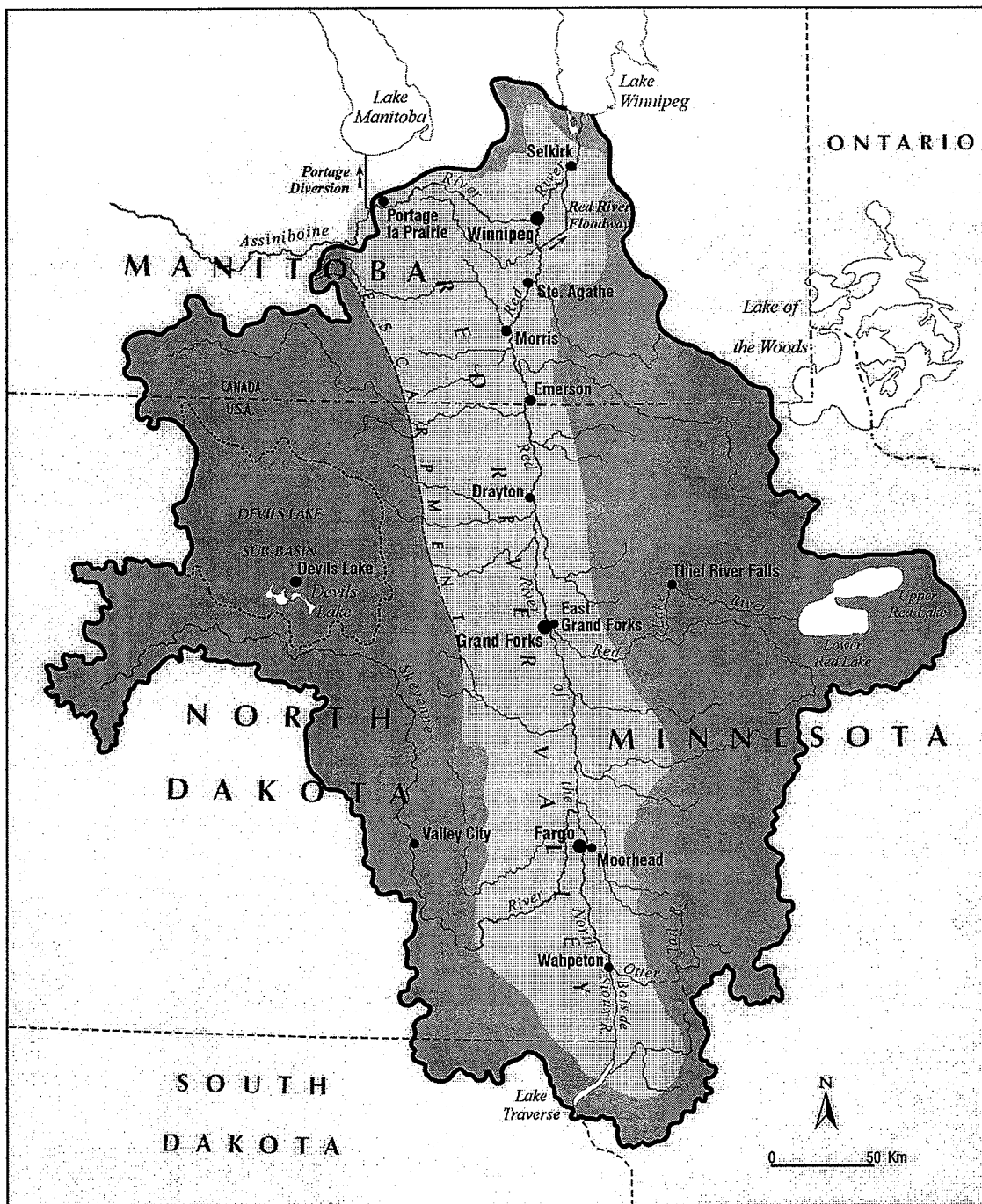


Figure 1: Map of the Red River Basin (Source: Weldon Hiebert, University of Winnipeg, 1993)

pattern of meanders until it empties into Lake Winnipeg. The flatness of the basin is illustrated by the northward slope of the river, which is variable and averages less than one-half foot per mile. Flows in the river are erratic and highly variable, ranging from periods of virtually no flow to extremely high flows that create flood conditions.

Flood conditions are a natural process in the region and have a regular historical occurrence. "The floodplain has clay soils with low absorptive capacity that can contribute to flood problems ... [and] the river's northward flow increases the potential for ice jams and resultant backwater flooding" (IJC, 2000b, p.9). Historical floods deposited fine silts throughout the floodplain and helped make the valley "one of the most productive agricultural areas in the world" (Krenz and Leitch, 1993, p.1). This was one of the primary factors that attracted human settlement to the banks of the river in the early 19th century and led to the development of major urban centres, including Winnipeg (population 670,000), Fargo-Moorhead (population over 100,000), Grand Forks-East Grand Forks (population 60,000), and Selkirk (population 9,800) (IJC, 2000b). Due to the location of settlements and the physical characteristics of the valley, both rural and urban residents are exposed to flood risk whenever river flow exceeds channel capacity.

The seriousness of flood risk in the region became clearly evident in 1950 when settlements throughout the valley, including major portions of Winnipeg, were inundated and experienced considerable devastation from flooding. High water levels forced nearly 80,000 residents to evacuate Winnipeg and resulted in more than 9,000 building damage claims (Bumsted, 1993). "It was estimated that over 2,000 dwelling places in greater Winnipeg had been flooded over the first-floor level" (Bumsted, 1993, p.85). Moreover, 40,000 residents throughout southern Manitoba were evacuated and approximately 2,500 premises experienced flood damage (Bumsted, 1993). The estimated total cost of the flood to the province in 1950 was approximately \$42 million (Bumsted, 1993).

Due to these exorbitant losses, the provincial and federal governments formed the 'Royal Commission on Flood Cost-Benefit' in the aftermath of the flood. The purpose of