Enhancing Local Level Emergency Management: The Influence of Disaster Experience and the Role of Households and Neighbourhoods

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Abstract:

This report summarizes the research findings of a two-year project funded by the Institute for Catastrophic Loss Reduction (ICLR). In July 2000 the Pine Lake, Alberta area was severely affected by an F3 tornado – 12 people were killed and over 140 seriously injured. Following an extensive review of the available literature, the study compares emergency preparedness levels and perceptions between two communities: Pine Lake and North Dumfries, Ontario, of which only the former has experienced a serious natural disaster. It also assesses the role that gender plays in risk perception and preparedness. Emergency preparedness and attitudes were measured using a variety of indicators including household safety activities, economic and insurance factors, views and knowledge of the tornado warning system, levels of community social capital, community knowledge of local vulnerability and perceptions of government emergency management activity. The study also summarizes information about tornadoes, forecasting and early warning systems and assesses the impact of the tornado on the residents of Pine Lake. Methodologically, the two communities were matched across several characteristics to isolate the effect of the disaster experience. Both qualitative interview and document information as well as quantitative survey data was collected and assessed.

Devastation at Green Acres, Pine Lake, Alberta

Source: http://www.redcross.ca/

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1 INTRODUCTION

This report summarizes the research findings of a two-year project funded by the Institute for Catastrophic Loss Reduction (ICLR). The study focuses on providing insights into individual and community mitigation strategies, by examining their motivation for implementing emergency preparedness activities, assessing the public's current understanding of natural hazards as well as their perception towards individual and government responsibilities. The research directly addresses the Institute's fourth research priority – 'Improving community actions for disaster mitigation'. It also contributes to a deeper understanding of ICLR's fifth organisational principle which states that local and individual actions are the most effective means of reducing loss of life and property.

This study compares emergency preparedness in two municipalities - the Township of North Dumfries, Ontario and Red Deer County, Alberta, which includes the area of Pine Lake (See Figures 1.1 and 1.2). Both are located in the parts of Canada that are the most prone to tornadoes, respectively, southern Ontario and the central portion of Alberta. The first community, North Dumfries, has not experienced a severe weather event such as a tornado or any other type of major risk event for several decades. Conversely, part of the second, the Pine Lake area of Red Deer County, experienced an F3 tornado in July 2000. This devastating event claimed more lives than any other North American tornado experienced in that year as well as ranking as Canada's fifth-deadliest tornado in history (Environment Canada 2000a). The tornado resulted in 12 fatalities and 140 physical injuries (ICLR 2001). The financial costs amounted to just over $10 million dollars of insured loss (IBC 2001a)[1] with an overall economic loss of $30.5 million (PSEPC 2004). As with most disaster damage information, statistics on psychological trauma, extended physical health impacts or residual financial need have not been captured. Therefore, the full social and economic impacts of this disaster are unknown.

This study is distinct in that there is little research that specifically compares the views of communities with different disaster backgrounds. There is also a dearth of disaster studies that are conducted within a Canadian context. Further, due to the multi-disciplinary nature of the project team, the issue of local emergency management is examined from several perspectives[2]. Finally, many of the available studies about emergency preparedness focus on a 'developing' world environment whereas we provide new data about the perspective of the 'developed' world.

1.1 Purpose and Objectives

The overall purpose of the study is to evaluate the extent to which household and neighbourhood level emergency management interacts with, and enhances, the municipal management of risks and hazards. The research team specifically targeted the impact of the disaster experience as an important aspect of local level management. The objectives of the research project are (1) to assess the effect of disaster experience on risk perception as well as emergency preparedness levels and (2) to assess the capacity of the community to deal with risk events. The study also

[1] In the Pine Lake tornado disaster, 532 property and 468 automobile claims were filed (IBC 2001)

[2] The team is composed of two geographers, a sociologist, a meteorologist and an economist

reviews and synthesizes information about tornados and warning systems in Canada and evaluates the impact of the tornado on the community of Pine Lake. The three key arguments in this report are:

1) Experiencing a disaster influences perceptions of natural disasters in that subsequent attitudes towards household, neighbourhood and government-level emergency preparedness are affected by this experience.

2) Municipal-level capacity to adequately prepare for, and recover from, disasters consists of more than 'top-down' government-mandated emergency management. It is also influenced by, among other things, the disaster experience, gender, the network of relationships that exist within households and neighbourhoods and the financial and knowledge resources that are available among individuals, neighbourhoods and communities.

3) Current meteorological tornado and storm prediction capacities and warning systems for alerting households, neighbourhoods and municipalities about imminent risk events are in need of further funding and support to more effectively protect all Canadians.

The report begins by providing a literature review of the pertinent academic literature, including tornadoes and warnings, emergency preparedness, risk perception and vulnerability/capacity. The review summarizes key findings, across several disciplines. The insights gained facilitated the development of the research instruments, particularly influencing the way in which the two communities were compared in the quantitative survey. Where applicable, this section also incorporates some of the background information gathered about the Pine Lake tornado. Subsequent sections outline the methodology utilized by the project as well as the study's empirical results. The report concludes by providing recommendations regarding the management of natural hazards, particularly at the municipal level.

Figure 1.1: Red Deer County

Source: http://www.reddeercounty.ab.ca/visitor/index.php?main_id=226

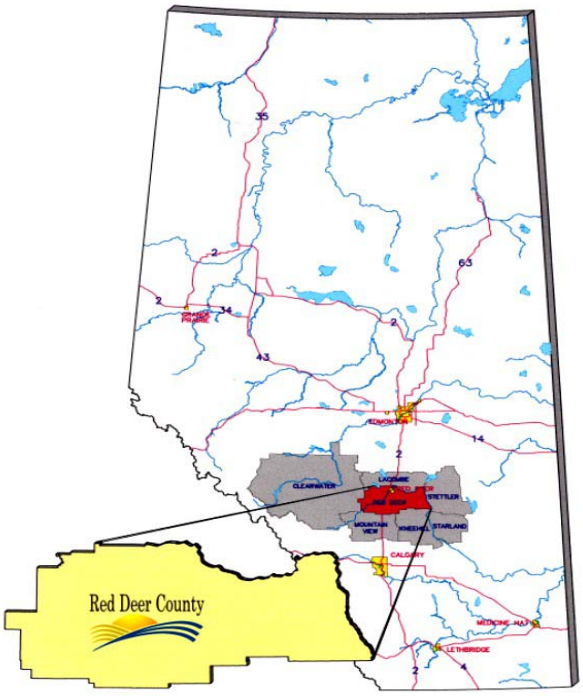
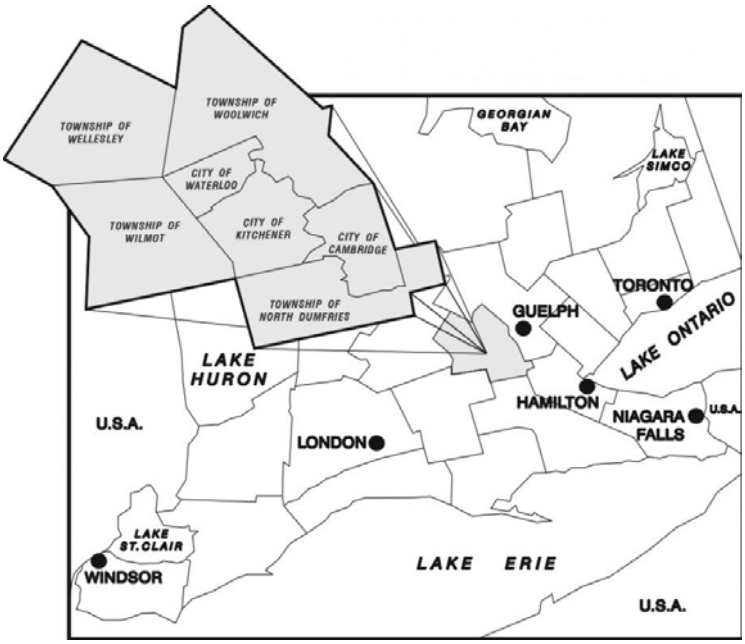


Figure 1.2: Township of North Dumfries

Source: http://www.region.waterloo.on.ca/web/region.nsf/8ef02c0fded0c82a85256e590071a3ce/DAE687E12CE8BE9385256B1A00626A73/$file/masterplan.pdf?openelement



2 EXTREME WEATHER AND TORNADOES

2.1 Natural Disasters

The human and material losses from disasters increased alarmingly during the twentieth century (Varley 1994). These losses are expected to continue to rise (IBHS 2002). During the 1990s natural disasters killed more than 650,000 people, displaced 2 billion others and contributed to more than C$1 trillion in economic losses (IFRC 2000).

Globally, the property and casualty insurance industry has been confronted with a drastic increase in the frequency and cost of natural disasters. Insurance payments resulting from natural disasters have increased exponentially worldwide since the 1950s. The largest insured losses have been in the more developed nations because, in financial terms, the majority of the world's buildings and other infrastructure are located in these countries (Kovacs and Kunreuther 2001).

The disaster literature identifies three major factors for this increase – population and economic growth, ageing infrastructure, and climate change. First, the trend is primarily attributed to the continuing steady growth of the world population and the increasing concentration of people and economic values into areas that are particularly exposed to natural hazards, such as coastal regions and urban areas (ICLR and EPC 1998).

Second, aging infrastructure is another cause of increased damage (ICLR and EPC 1998, Kovacs 2002). Many critical systems, like storm sewers and other buried underground infrastructure, were put in place many decades ago and are now coming to the end of their useful life. Funds for infrastructure maintenance and upkeep have been declining for decades.

Third, the frequency and severity of extreme weather events is rising with changes in the world's climate (McBean 2003, IPCC 2001). Data from the insurance industry shows that severe weather claims have been rapidly increasing at a rate that cannot be explained solely as a result of increased vulnerability (Dotto 1999). This analysis partly attributes the increased losses to more frequent and more severe natural hazards (Etkin et al. 1998). In a warming world, it is predicted that there will be an increase in the frequency and severity of extreme weather incidents. Although it is impossible to directly attribute a particular disaster to climate change, events such as the 1998 Ice Storm or the Red River Flood (1997), are indicative of the kind of extreme events associated with climate change. Under these conditions there is an ever increasing need to prepare for, and mitigate against, potential threats (Bruce et al. nd).

Of most concern to this study is the potential increased severity and frequency of climate-linked natural disasters, including but not limited to, tornadoes. With greater periods of heat and atmospheric instability, Canadians can likely expect more tornado activity as well as severe thunderstorms and hail. While these will be most evident in the historically active tornado areas – Alberta, across the Prairies and throughout southwestern Ontario – with the increased heat we can probably expect tornadoes to occur in hitherto relatively tornado-free territory (Ross 2000, McBean 2004).

2.2 Warnings

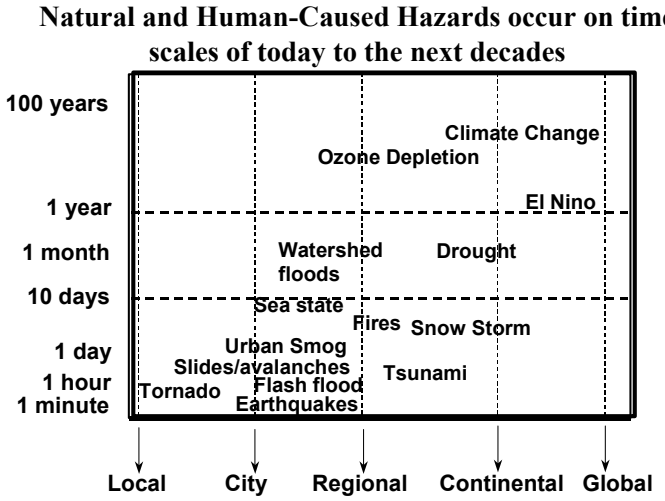
Early warning systems are a key component of disaster preparedness (Trujillo 2002). The goal of early public warning systems is to maximize the probability that people at risk take appropriate action prior to the impact of a sudden-onset disaster (Mileti 2003).

Early warnings are defined as *the provision of information at a time and with a confidence level that actions can and will be made to protect people and property*, including public infrastructure. As defined within the United Nations International Strategy for Disaster Reduction (see www.unisdr.org), early warning systems and preparedness play a critical role in preventing hazardous events from turning into disasters. Clear warnings, if received in time and coupled with the knowledge of how to react, can mean the difference between life and death, or between economic survival and ruin, for individuals and communities. Early warning is more than just a prediction; a complete early warning system comprises a chain of four elements:

- Prior knowledge of the risks faced by communities,
- A technical monitoring and warning service for these risks,
- The dissemination of understandable warnings to those at risk, and
- Knowledge by people of how to react and capacity to do so.

Early warning systems can be applied to a wide range of natural and non-natural hazards, to reduce losses when these events occur. It is important to recognize that for many hazards there is a wide range of time and space associated with natural and human-caused hazards, as shown schematically in Figure 2.1.

Figure 2.1



There are several elements to the management of hazards and their impacts, usually referred to as: Response; Recovery; Preparedness; and Mitigation. Although governments generally continue to devote most of their resources towards response and recovery, studies show that investments in preparedness for and mitigation of natural hazards are a more effective investment and Early Warning systems are one critical part of that investment. Understanding vulnerability and building resilience are a major part of reducing disaster impacts. Early Warnings provide the information on which vulnerability analyses and resilience investment decisions are made, and the warnings on which people act in order to reduce loss, on time scales of minutes to decades.

From a sociological perspective, one aspect of early warning research that has been extensively studied relates to the behavioural response to repetitive warnings. Extensive behavioural research has shown that one commonly held misconception about human responses to warnings is that the greater the frequency of hearing a severe weather warning, the less likely the person is to respond to this critical message (Fischer 1998). As repeatedly demonstrated in sociological research, the cry wolf syndrome only occurs when warnings are issued that do not produce the anticipated results AND the public is not informed as to why the anticipated results (ie. High-impact weather) were not experienced (Mileti 2004). Recognizing this, meteorologists can dramatically reduce the number of people discouraged by false alarm warnings by continuing to track the system which promoted the issuing of a warning and, if this system does not produce the forecasted outcome, communicating this to the public. Studies have shown that the public appreciates the degree of uncertainty inherent in weather prediction, yet requires the communication of warning messages to be regularly updated and revoked if the weather system no longer merits a warning designation (Twigg 2003).

2.3 Tornadoes

Among the range of time and spatial scales of atmospheric and other hazards, tornadoes are among the shortest: they start, mature and die in a few hours or less and their spatial dimensions range up to a few kilometres in width of path and a few tens of kilometres in length, as the move across the landscape (Ahrens 1998). A typical tornado moves southwest to northeast and remains in contact with the ground for a distance of three to four kilometres. Their forward motion averages 65 km/hr, although some have been known to travel up to 100 km/hr.

Since tornadoes are such complex and small-scale events they are hard to detect and forecast. The physics of tornadoes is reasonably understood but because the trigger mechanisms are small scale it is not possible to be sure whether or not they will form. Current technology and scientific understanding does not permit meteorologists to determine the exact location and time of when a tornado will occur (McCarthy 2002). However, weather radar, satellite images, and mathematical algorithms to analyse the information do allow the detection of areas of probable tornado activity within a region (Moran and Morgan 1997).

Weather radar is used to detect precipitation, by transmitting pulses of microwave energy (Moran and Morgan 1997). Because of the wavelength of the microwave energy, radars can detect water droplets of rain size but not smaller cloud droplets. When the precipitation is heavy, the radar can detect signatures of severe thunderstorms. A more advanced form of weather radar is Doppler radar. This radar has the capacity to measure wind speed (Moran and Morgan 1997). Although the winds of tornadoes are high in velocity, they are small scale and not directly detected by Doppler radars that average the winds over a volume of air that may be a few kilometres in each direction. Further, since the Doppler radar can only measure the wind component along the line from the radar to the measurement area, signal processing and algorithms must be used to detect rotation, which can be used to infer tornado activity and its approximate location (Rauber et al. 2002).

Tornadoes are defined as violently rotating columns of air rising from the ground into an updraft of a convective cloud. This vortex or funnel cloud becomes visible if it is filled with cloud, water, dirt or debris (Glickman 2000); if these conditions are not present then it remains invisible. Processes that lead to the formation of tornadoes are not well understood; however it is known that most tornadoes form during an intense weather system called a supercell. Supercells are the most powerful thunderstorms in the Earth's atmosphere, with strong rotating cells capable of producing violent weather (Rauber et al. 2002).

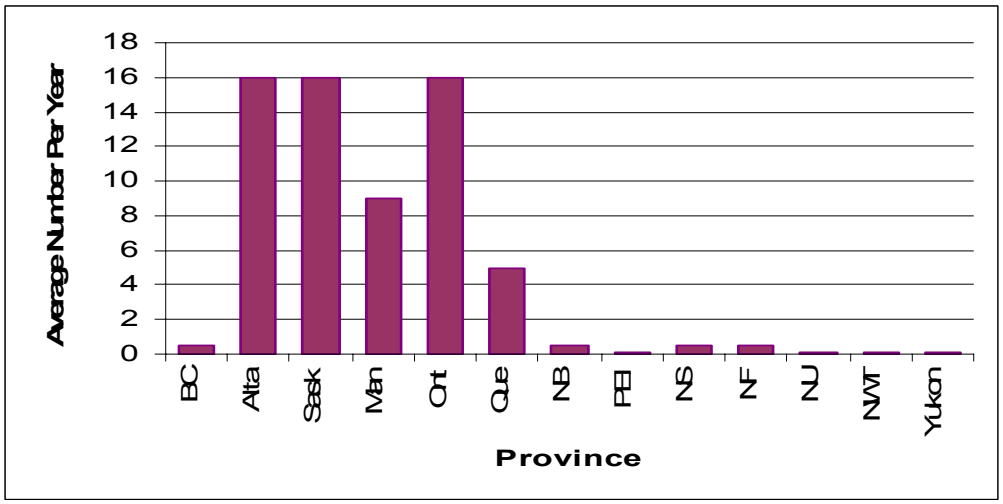
In Canada, the conditions favourable for the formation of supercells occur when moist air from the Gulf of Mexico flows north and collides with cool, dry polar air from the northwest (McCarthy 2002). In a supercell thunderstorm air is drawn into the storm's updraft causing the axis of the rotation (usually parallel to the ground) to become tilted to the vertical (Golden 2000). The narrowing column of rotating air stretches downwards causing part of the cloud to extend towards the ground leading to a funnel emerging from its base. The funnel cloud contains a spiralling vortex of air that is not in contact with the ground. Only when contact is made between the vortex and the earth's surface is the storm classified as a tornado (Golden 2000). The tornado life cycle concludes when cold, dense air encircles the tornado, eventually weakening and eliminating the tornado's updraft (Grazulis 2001). Roughly fifty percent of all supercell

thunderstorms will spawn tornadoes; but the rationale of why some produce tornadoes while others do not, remains a scientific mystery.

While the United States leads the world in tornado occurrences, Canada typically reports 60-80 tornadoes a year, although scientists believe the actual number may be two to three times higher (ICLR 2001). The vast majority of the reported tornadoes occur across the southern half of the Prairie Provinces, southern Ontario and southern Quebec. Alberta, Saskatchewan and Ontario each average approximately 16 tornadoes a season, as outlined in Figure 2.2. Due to southern Ontario's latitude and proximity to the Great Lakes, this region has Canada's highest tornado density and is among one of the more active areas in North America (Eisen 2000).

Figure 2.2 – Average Annual Tornado Occurrence

Source: ICLR 2001



Since radar can only detect tornadoes that fall within its range, detection of tornadoes also relies on storm spotters who work with their local weather office providing information on approaching severe weather or funnel clouds and reporting these observations to weather stations (Moran and Morgan 1997). It was volunteers who first spotted both the Edmonton (1987) and Pine Lake (2000) tornado, alerting forecasters to the actual event.

2.4 Observing Systems for Detection of Tornadoes

In 1997, the Meteorological Service of Environment Canada (MSC) announced a plan to establish a national weather radar network to improve the detection of severe weather events. They presented a seven-year plan for the positioning of 11 new Doppler weather radars and the retrofitting of 19 existing radars with Doppler capacity (Lapczak 2002). The radars' locations were selected to provide coverage of the areas of most intense weather activity across southern Canada. With a typical coverage area of about 200km in radius around the station, most of the populated areas of southern Canada are now covered.

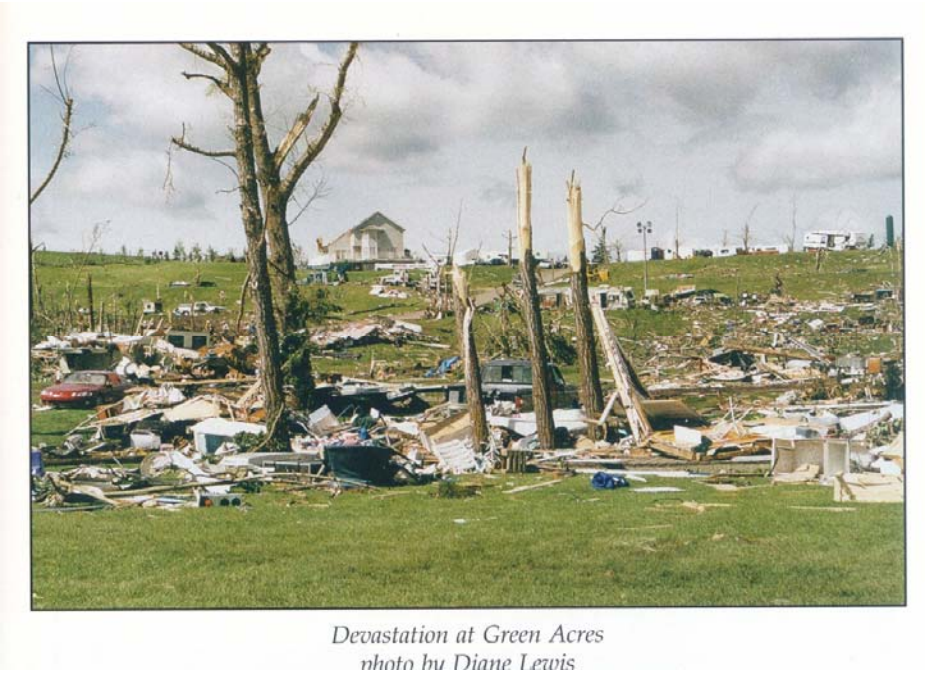
Although the Government reduced the MSC's budget by 1/3 in 1995, the MSC went ahead in 1997 with the implementation of the upgraded radar program. Over the next four years, a third of

the staff positions were eliminated, all local weather offices, 52 of them, were closed, observing stations were shut down and research was cut back. Since then there have been fewer eyes on the weather and their ability to examine and forecast dangerous events has been reduced.

Last spring eleven of the senior scientists of the Meteorological Service and ten leading professors of atmospheric science signed a public report entitled "Beyond the Breaking Point?" They wrote: "The research arm of the Meteorological Service of Canada is one of this country's most valuable scientific assets. It should not be allowed to decline gradually into insignificance as a result of continued underfunding."

Figure 2.3: Pine Lake Tornado – Green Acres Camp Ground

Source: Elnora-Pine Lake History Book Association



Devastation at Green Acres
photo by Diane Lewis

2.4.1 Warning Communication and the Media

One of the most devastating tornados in Alberta's history struck the large metropolitan City of Edmonton in 1987. This F4 tornado claimed 27 lives and injured more than 300 (McCarthy 2002). The powerful storm destroyed 500 buildings leaving a quarter of the population homeless, particularly 133 homes located in Evergreen Mobile Home Park (located just north of Edmonton, Alberta). The experiences of this event led the Alberta government to implement several legislative and cultural changes aimed at mitigating the impact of future extreme events. The most prominent was the establishment and operation of a provincial Emergency Public Warning System (EPWS) designed to interrupt television and radio broadcasts alerting the public when a significant emergency is underway (McCarthy 2002). Although the Prairie Regional Storm Prediction Center is one of the authorized users of this system, they chose not to activate this system prior to the touch down of the Pine Lake tornado as the supercell that spawned this tornado was not initially considered dangerous (McCarthy 2002).

Although advances in weather radar technology and scientific understanding of tornadoes are needed, the improved information and forecasts will only protect the public if the resulting information is effectively communicated to the public. Recognizing that the primary mode of communication with the public is through media outlets, a partnership between the national weather service and the media is crucial to the success of any warning system. Unfortunately in Canada, this partnership is almost exclusively voluntary. Environment Canada, our national weather service does not have the authority to interrupt television or radio broadcasts to announce a warning of impending extreme weather, except in the province of Alberta (EPWS). All weather warnings transmitted by Environment Canada are directed to Weather radios and relayed to radio and television stations through "news circuits" typically news wire services (Eisen 2000). Once the local station has received the bulletin, discretion on whether to broadcast the information lies solely with the station (McCarthy 2002). This is particularly problematic for radio stations where flexibility of the staff to respond quickly to warning scenarios is limited.

Prior to the Pine Lake tornado, attempts to heighten the warning communication model were undertaken, with Environment Canada submitting an application to the Canadian Radio-Television and Telecommunications Commission (CRTC) in 1999 to establish a national "All Channel Alert System" which would provide in text form, local warnings of imminent threats to life or property caused by extreme weather events (Environment Canada 2003). Despite support from numerous local government officials and community organizations the proposal was denied. The reasons cited for this decision were CRTC's concern about the cost to the consumer, difficulties in technical coordination and liability issues from their visually impaired clients (Environment Canada 2003).

In the case of Pine Lake, Environment Canada issued its first notice at 5:37 pm as a severe thunderstorm watch. When the supercell began to display possible rotation activity the notice was upgraded to a severe thunderstorm warning at 6:18 pm with the news release clearly stating that a storm with large hail, lightening and heavy rain had developed (Environment Canada 2000). It was not until 7:05 pm when Environment Canada received official notice that a tornado had touched down in Pine Lake that the thunderstorm warning was upgraded to a tornado warning (Environment Canada 2000)[3]. More than 40 watches and warnings were issued for Alberta and Saskatchewan during the remainder of the evening.

Following the event, survivors and local emergency response agencies claimed that no warning of the tornado was heard or issued[4]. This prompted Environment Canada to release the above sequence of notices that were issued along with a detailed description of how the warning communication process was performed. This news shocked many and prompted an informal investigation into why the warnings were not broadcasted. Findings from this research showed that although the Prairie Regional Storm Prediction Office had issued notices for the affected region, some media outlets did not receive this information or any other warnings that had been issued for Central Alberta since May 2000 (Lapczak 2002). Apparently in May 2000 the headers of Environment Canada's news releases had undergone minor changes causing some news

[3] A tornado watch is issued if the conditions in the area indicate that a tornado could develop, while a warning means that a tornado has actually been sited in the area.
[4] Our data confirmed that few people heard any watch/warning messages. See Section 7.4

agencies to not receive them. When this finding was presented to Environment Canada immediate alterations were made to ensure that all news agencies receive any weather bulletins (Environment Canada 2003).

Although Environment Canada continues to explore new warning dissemination options, media and telecommunications continue to provide the most timely and accessible opportunities to communicate with the public. However, until an effective early warning communication model is implemented, Canadian citizens will be subject to higher levels of risk.

Beyond funding issues and technical capacities, several other factors, related to the social characteristics of the affected population, also influence the salience and effectiveness of storm watches and warnings. Among other things, to be effective warnings of extreme events must be multi-lingual and should be distributed through a wide range of media outlets in order to reach vulnerable groups including visually and hearing impaired persons (Fothergill et al. 1999). Attention should also be given to make the message understandable for individuals with low levels of education and to provide clear, unambiguous instructions. Some research also indicates that gender is a factor in receiving and understanding warnings. In a study about earthquake aftershock warnings, O'Brien and Atchison's (1998) research indicated that 1) women were more likely to get information from informal sources (e.g. word of mouth from friends and relatives) and to pay less attention to official sources, but they were also more likely to heed the warnings and take defensive action and 2) in response to the warnings, men were more likely to get involved in emergency activities outside of the home including such actions as traffic direction and search and rescue, whereas women undertook action to secure their households. Beyond the background information provided here, in this report we also empirically investigate some of these sociological aspects of warnings associated with the Pine Lake tornado (see Section 7.4).

2.5 Pine Lake Tornado

The tornado that struck the small rural community of Pine Lake formed in a severe thunderstorm that moved eastward across Alberta into an unstable air mass, located in one of Canada's tornado alleys (Environment Canada 2000). Moist air coming in from the east, combined with evapotranspiration from crops, formed a narrow band of low-level moisture. When the thunderstorm encountered this moisture a high precipitation supercell was created (Environment Canada 2000).

On July 14, 2000 at 4:29 pm an off-duty meteorologist noticed a developing thunderstorm and contacted the Prairie Regional Storm Prediction Center of Environment Canada to inform them of this suspicious cloud (McCarthy 2002). The storm was being tracked using a Radar Decision Support System (RDSS). It indicated that the storm was weak, with no suggestion of severe weather. However, the visual information provided by the off-duty meteorologist indicated that this storm contained violent weather, causing Environment Canada to closely monitor the storm's development (Environment Canada 2003). At 5:37 pm forecasters observed that the storm was moving into unstable air and therefore issued a severe thunderstorm warning for all of Red Deer County (including Pine Lake).

As the vortex strengthened and widened, rain began to wrap around the vortex, partially obscuring much of the developing funnel. Radar detected an increase in lightening activity and the production of large hail stones (Environment Canada 2000). At 6:45 in the evening a powerful tornado touched down 8 km west of Green Acres, a campground located in the Pine Lake area and traveled eastward to the town of Lousana (McCarthy 2002). The tornado was on the ground for approximately thirty minutes, covering a distance of almost 25 kilometres and varied in width from 800 to 1500 meters along its path (Environment Canada 2000). Lightening activity increased rapidly and the storm continued to intensify as it progressed eastwards, splitting into two funnels at approximately 7:30 pm east of Lousana. These storms, particularly the larger of the two, produced baseball-sized hail stones and wind damage at many locations over the next three hours. Eventually the supercell crossed into Saskatchewan before dissipating after midnight (McCarthy 2002).

This particular tornado did not have the classic 'cone' or funnel shape appearance but was a fast moving, high precipitation storm. These features made the tornado difficult to identify and forecast; unfortunately tornadoes of this shape are often mistaken for large swirling masses of cloud (McCarthy 2002). Eyewitness accounts suggest that their only sense of the impending tragedy was the darkening clouds and sudden rain and hail moments before the fast-moving tornado struck. At 7:05 pm the Prairie Regional Storm Prediction Center received reports that a tornado had touched down in Pine Lake. The severe thunderstorm warning was upgraded to a tornado warning at that time (Environment Canada 2000).

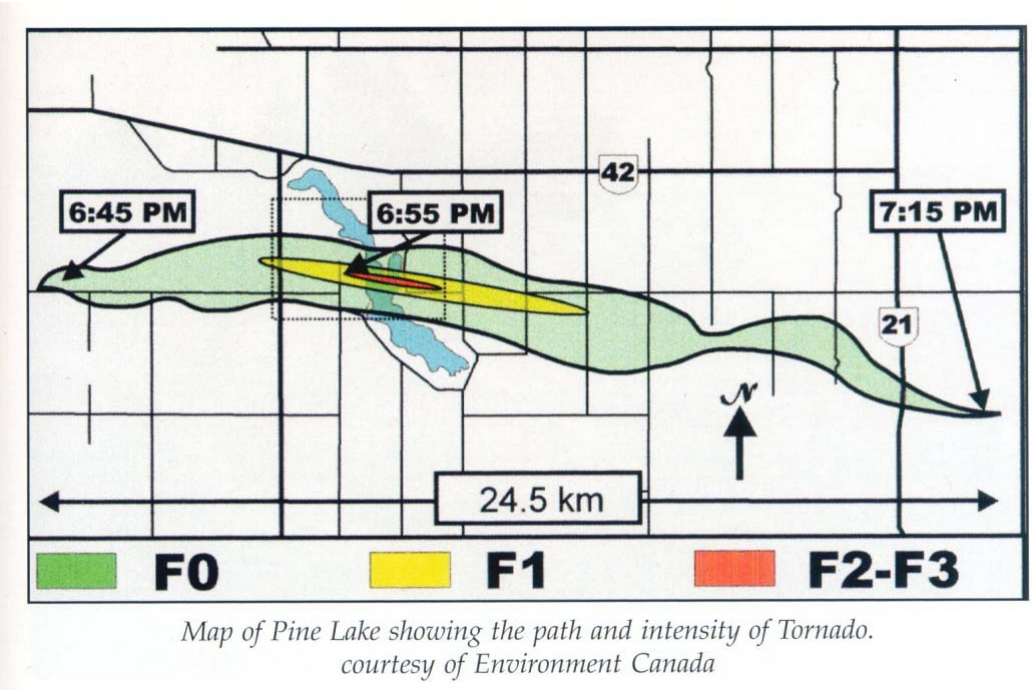
In the days following the tornado, Environment Canada conducted the damage assessment and determined the path of the tornado using the Fujita Scale (Figure 2.4). The process of rating a tornado with the F-Scale begins by observing the damage a tornado has caused, since measurements of winds during the event are rarely available (McDonald 2002). Using the F-Scale, a subjective estimate of wind speed range can be made for the tornado, based upon post-storm surveys of damage. The scale assigns an F-value from F0 (weak) to F6 (strongest), however an F-6 tornado has never been observed. This is a theoretical value, which lists the strongest possible storm. In Canada only 9 tornadoes have been classified as an F4, with more severe tornadoes never recorded in the country. Most tornadoes are classified as weak (F0 and F1), with most deaths attributable to strong or violent tornadoes (F2 and above). The most common injuries associated with tornadoes are soft-tissue lacerations, fractures, blunt trauma, head injuries and minor strains. As experienced in Pine Lake and Edmonton, a large percentage of fatalities occur in mobile home parks, due to the minimal protection these units offer their occupants.

Environment Canada's damage assessment concluded that when the tornado first touched down, it exhibited F0 characteristics. However, it grew quickly in size as it tracked eastwards, reaching F1 status approximately three km from the campground. The tornado had grown to maximum intensity, F3, when it struck the trailer park at approximately 6:55 pm. Its path cut directly through the centre of the campground with a swath of 250 metres, completely destroying the southern half of the park. Damage patterns suggested that wind speeds were approaching 300 km/hr. Cars and trucks were thrown up to 50 metres, dozens of trailers and recreational vehicles were left unrecognizable on the southern side of the lake with the northern half sustaining peripheral damage. Leaving a damage path of 1.5 km in width, the tornado crossed the peninsula, flattening most trees and maintained at least moderate intensity for another 5 km beyond the lake

(McCarthy 2002). In addition to the trailer park, the tornado also did extensive damage to farms, rural residential homes and cottage properties. In this area farm buildings and grain storage bins were destroyed and many homes were severely damaged, some beyond repair (See Figure 7.13).

Figure 2.4: Path of Pine Lake Tornado

Source: Elnora-Pine Lake History Book Association



Map of Pine Lake showing the path and intensity of Tornado.
courtesy of Environment Canada

3 EMERGENCY PREPAREDNESS

3.1 Hazard Response Cycle

Within emergency management, the Hazard Response Cycle was developed to conceptualize how society manages hazards and disasters over time. The cycle consists of a proactive and a reactive phase. The proactive phase consists of hazard mitigation and emergency preparedness, while the reactive involves response and recovery.

Mitigation involves efforts to reduce to the extent possible, the physical effects of any potential hazards and involves activities such as changes in land use, dams and enforcement of building codes. Emergency preparedness is the process of planning and implementing protective actions as well as warning people about hazards (see Section 3.3)

The insurance industry has become active in promoting hazard mitigation measures because of the severe losses that they have incurred. One element involving the lack of enforcement of building codes was particularly evident in the United States following Hurricane Andrew (Kunreuther 1996, Lecomte 1994, Peacock et al. 1997). Worldwide, the property and casualty insurance community has been interested in mitigation, particularly through the Re Insurance

sector. The Canadian property and casualty insurance industry has been involved in disaster mitigation since the early 1990s; this interest in mitigation was formalized with the opening of the Institute of Catastrophic Loss Reduction (ICLR) in 1997. The insurance sector can play a major role in the enforcement of safety standards by imposing higher costs for insurance, the more unsafe the structure or facility. The Institute for Business and Home Safety, the American Insurance Service Office (ISO) and insurance industry have been advocating for the development of effective building codes and the enforcement of these codes (ISO 1994) as a house built to code will stand up to the majority of tornadoes (Devlin 1997). For individual homeowners, fewer initiatives have been undertaken by the insurance industry to encourage emergency preparedness. Insurers have generally felt that incentives, such as voluntary premium reductions for preparedness measures undertaken, would not be voluntarily adopted. It is felt that the upfront cost of adopting these measures are generally too steep for the modest premium reduction that can be offered (Kunreuther 1996).

Although the public is exposed regularly to what governments are doing to protect against hazards, household and neighbourhood-level emergency preparedness is also considered vitally important. During a large scale disaster, households and neighbourhoods should be prepared to provide for their own needs for up to seventy-two hours, since it may take that long for official first responders (e.g. fire, police and ambulance) to reach all affected residents. This is especially the case if transportation and/or communication infrastructure have been destroyed during the risk event (Scanlon 1997).

Of late, the activities that occur in the proactive phase are becoming an ever more important part of emergency management. Among practitioners and academics alike, it is recognized that adequate planning greatly reduces the impact of any subsequent disaster (Mileti 1999). The World Disaster Report warns that spending huge sums on disaster relief operations makes little sense when a much smaller amount of money applied before the disaster occurs could prevent widespread death, human suffering and economic fallout (IFRC 2002). Hazard mitigation will save money and strengthen the Canadian economy by reducing future expenditures on disaster recovery and reducing community recovery time (IBC 2001b).

Since the direct benefit of a proactive orientation is not realized until a disaster occurs, it is very easy to ignore or under fund this aspect of management (Smith 1992). Moreover, proactive measures are considered 'more affordable' when societal resources are high (Tierney 1993) and are easily cut during government downsizing. Given the importance of, and lack of attention to, this phase of management, the focal point for this study is the proactive phase of management.

In contrast, until recently the reactive management phase has received far more attention, since it is impossible to ignore the risk once disaster strikes. Typical emergency response activities include government and private responses to emergency medical needs, evacuation, and the establishment of shelters and feeding stations. Secondary activities include restoring essential services, such as electricity, telecommunications links, and water services, as well as private efforts such as sending adjusters to address insurance claims (Brun et al. 1997).

The fourth stage of the cycle, recovery, occurs after people's immediate needs have been addressed. Activities include private and public sector payouts from insurance schemes and financing arrangements. They also encompass public and private rebuilding. Ideally, rebuilding should occur with mitigation in mind so that over time the impact of disasters will be reduced

(Brun et al. 1997). The management system should be seen as cyclical, since ideally, mitigation and preparation will address flaws uncovered during earlier response and recovery endeavours. Thus, since it is important to learn from previous events, this study also devoted some effort to understanding the Pine Lake tornado and how it affected residents.

3.2 Emergency Preparedness and Insurance

Society shares the risk of disasters through the use of insurance programs or through government disaster relief programmes. These two financial arrangements were the largest compensators following the Pine Lake tornado, with the federal government providing $3.5 million in aid and insurance covering $10 million in losses (IBC 2002). Volunteer agencies and NGOs also play important roles, largely through the donation and distribution of money, goods and services. These actions do not reduce the overall impact of the disaster, but they make the individual impacts manageable and create a more stable and resilient society.

Insurance is an important loss-sharing mechanism. It is a redistributive method for disaster losses whereby property owners join forces with a financial organization to spread the risk in a collective manner (Smith 1992). For those who purchase it, insurance provides financial protection from disasters by spreading their economic impact among a large group of policyholders. Insurance is based upon three principles: a large population must be exposed to the risk, a small proportion of the exposed population is likely to incur a loss at any particular time, and losses occur randomly (Etkin et al. 1998).

In Canada most severe weather damage is covered as part of a standard insurance policy. This includes coverage for wind damage. Smith (1992) states that more property is probably insured against storms and weather-related damage than any other form of environmental hazard. An individual's perception of risk has an important bearing on their decision to purchase insurance. Those who choose not to be covered generally perceive the risk to be sufficiently low such that they are not worried about the consequences (Kunreuther 1996; Kunreuther and Ryland 2001; Weinstein 1987). Other research suggests that the dominant reason for not having insurance is a perceived lack of need -- that a disaster would not occur in their area. Further reasons include a sense of safety in one's own home and financial constraints due to the high costs of insurance (McIntyre and Mustel Research Ltd. 2000, Rolf 2002). More generally, those least likely to have adequate insurance are lower social status households (Drabek 1986), as well as tenants, and pensioners. These households are also least likely to recover financially after a disaster (Peacock et al. 1997, Smith 1992).

3.3 Household-Level Preparedness

Preparations at the household level can include drafting family emergency plans, assembling home survival kits, doing home repairs to reduce hazards, storing a supply of food, purchasing disaster insurance, and obtaining first aid training (American Red Cross 2002, Brun et al. 1997).

An economic approach to encouraging emergency preparedness involves the use of incentives. An economic incentive is defined as a payment or concession encouraging a homeowner to invest in disaster mitigation. The term is used to include all types of support that would lead homeowners to make their home safer. An economic disincentive is the absence of adequate

payment or concession, or its withdrawal, thus discouraging action or effort in disaster prevention. Tobin (2002) defined several categories of incentives (see Table 3.1).

Table 3.1 Categories of Incentives (Tobin 2002)	
Financial	Grants, credits, rebates, assessment limits, loan discounts, and favourable insurance deductibles and prices
Lower the Cost of Retrofitting	Waived or subsidized fees, reduced cost of materials and tools, discounts and rebated evaluation and design fees
Public Information	Literature with personalized information for owners, financial professionals, contractors, and parties that benefit from improved performance
Facilitate Evaluations and Retrofitting	Lists of qualified professionals and contractors, how-to-do-it literature, and expedited permits and inspection
Technical Assistance	Standard details, technical advice, and hands-on-assistance with evaluation, contracting and financing
Planning and Zoning	Exemptions from plan and code requirements and restrictions such as setback, parking and zoning requirements, and density bonuses
Training	Training for owners, inspectors, engineers, architects, building contractors, and real estate, insurance and lending agents
Penalties	Increased fees, restrictions in density and use, withdrawal of use certificates on non compliant buildings, and fines for failure to take mandated actions

More specifically, Tobin's (2002) overview of Californian examples of incentives to encourage earthquake resistant communities suggested that 1) retrofits should not increase property taxes, 2) affordable loans and reduced/waived permit fees should be available for work related to emergency preparedness measures, 3) tool lending libraries are useful, and 4) free repairs should be available for low income elderly and disabled people. He also states that when incentives are offered in conjunction with a 'triggering condition', such as a property transaction, an order to retrofit or a concern for the liability derived from doing nothing, they are more likely to be influential.

Similarly, a recent survey (2001) by the California Earthquake Authority (CEA) asked participants in its SAFER program to evaluate what would be the best way to offer incentives for retrofitting homes. A $1,000 voucher and a tax credit were the most popular. Slightly less popular was reducing costs for earthquake insurance, and considerably less popular was offering a low-interest loan. It is also worth noting that among those with earthquake insurance, the incentives that would reduce premium or deductible costs were equally as popular as the tax credit and $1,000 voucher (Tobin 2002).

In another study that also examined retrofitting, Larsson and Enander (1997) found that the preparations that people are most willing to make are generally those that require little time and money, do not require major commitment and are seen as having high personal relevance. The less popular preparations are those that are more expensive and require a major long-term commitment.

Beyond economic incentives, at the individual and household level, there are various socioeconomic indicators that appear to be related to preparedness levels. Overall, most households do relatively little to prepare and there is scant data related to why people made those choices (Mileti 1999, Murphy 2004). Generally, household preparation activities are more likely to be undertaken by households with higher income, school age children, long-term residents, higher social connectivity, disaster education, and non-minority residents (Mileti 1999). Studies have shown that married men, particularly those exhibiting higher socioeconomic characteristics through income, occupation and place of residence, will make more preparations when warned of disaster that those who are single and/or of lower socioeconomic status (Drabek 1986). Turner et al. (1986) in a California study found that white people tend to be better prepared than either Blacks or Latinos. They found that preparedness increases decisively with age until the over-fifty category is reached, when the drop is striking. Owner-occupied households are noticeably better prepared than renter-occupied households and having children (especially school-aged) in the household encourages preparedness (Turner et al. 1986). Although these authors offer no discussion of the reasons for these various discrepancies, it could be hypothesized that this is linked to issues of vulnerability such as the lack of power, knowledge and resources to take the appropriate action.

In a Swedish context, Larsson and Enander (1997) outline that the most common preparation people make include getting a first aid kit and learning how to give first aid. The least common involved stocking up on canned food or joining an organisation. The most prevalent reason for not taking action was related to not knowing what to prepare for. Although emergency preparedness varied by subgroups such as age and gender, they are careful to point out that the noted differences may be related to the cumulative situation of individuals and groups. For instance, older people often have less education and the combination of factors such as marriage, children, home ownership and rural location may increase emergency preparedness.

According to Toscani (1998), Enarson and Morrow (1998) and others, household level emergency management activities are differentiated by gender roles. As outlined by Enarson and Morrow (1998) the specific focus on gender is warranted for a number of key reasons. First, while men's disaster work in the public sphere, either prior to, or after a disaster, (e.g. dam building, search and rescue) is often visible and recognized as vital to the community, women's private, background work, such as emotional support, family maintenance and caring for the young and elderly, is often taken-for-granted and may even be undermined during times of crisis (see also Domeisen 1997; Neal and Phillips 1990; Scanlon 1997). Second, research suggests that men and women acquire, assess and communicate risk information in different ways. They also often contribute differently during various emergency management activities. Third, women's traditional networks of relationships within their extended families and neighbourhoods is a vital resource in both preparing for and responding to disasters. We would also assert that men's relationships in more formal organisations such as service groups are of key importance. Within emergency preparedness, women are more likely to undertake family-oriented activities such as

assembling emergency provisions and establishing emergency plans, whereas men are more likely to be involved with such things as repairing or improving the home's physical structure (Enarson and Morrow 1998; Mulilis 1999; Toscani 1998).

3.4 Neighbourhood-Level Preparedness

At the neighbourhood-level, there is very little research available about emergency preparedness. In his discussion about preparedness planning, Quarantelli (1988) points out that behaviour in disasters exhibits similar patterns to non-crisis situations and that the activities and relationships inherent within neighbourhoods tend to continue throughout the emergency period. For example, to the extent possible, family chores and occupational obligations will continue and organisations will maintain their daily routines. Thus, behaviour or relationships that contribute to the community's capacities or vulnerabilities prior to a disaster will continue, to the extent possible, when a disaster occurs, By extension, we therefore argue that any efforts undertaken to increase disaster resiliency prior to a disaster will likely benefit communities during a crisis.

In one example of emergency preparedness in the San Francisco Bay area it is argued that community groups can be ideal initial responders in the gap between the risk event and the arrival of the official emergency organisations (Simpson 1992). These groups might be stand alone volunteer disaster response organisations initiated by residents, or tied to an existing group such as crime watch, a school or a neighbourhood association (see also Kartez and Lindell 1987). Simpson argues that local organisations will be able to provide culturally appropriate support, will be aware of the location and needs of vulnerable populations and local resources, and that, with basic training, local residents can provide valuable assistance during the response efforts. He suggests that training should include such things as first aid and light search and rescue and that all training and organisation must be in place prior to a risk event – 'on-the-job' training is very difficult during the confusing first few hours after a disaster occurs. Also, these neighbourhood-level organisations need to be integrated into the city-wide response plans, with contact points appointed for each neighbourhood block. Simpson notes, however, that the groups that he researched were established in response to two major disasters in the Bay area. It is not at all clear if support or interest for these types of volunteer groups would be forthcoming in areas that have not experienced a disaster. Haque (2000), for instance, notes that local-level adaptation to risk events is strongly associated with prior experience. Further, as Kartez and Lindell (1987) point out, in jurisdictions with high prior experience with disasters, managers were far more likely to develop plans that integrate the 'community at large'; these managers recognized that in major disasters they could not meet all of the community's needs.

In terms of gender, Fothergill (1998) maintains that in some research studies, women were somewhat more likely to volunteer to manage emergency programs in their areas. Women became involved because risks pose a threat to their homes and communities. This volunteer work seems to be an extension of their traditional domestic, nurturing and caretaking roles.

However, as Momsen (2000) points out in the context of environmental management, emphasizing the role of women within households might simply add an additional burden onto women for yet another dimension of their caregiving responsibilities. This approach also reinforces traditional gender stereotypes. Instead, she suggests that what is needed is an approach that recognizes the different gendered interests involved in order to develop

sustainable, equitable roles and responsibilities for all societal members. Further, Fothergill (1998), Momsen (2000), Enarson (2001) and others clearly point out that this division between gender roles is neither natural nor immutable. Instead it arises from socialisation and is specific to cultures and time periods. For individuals, these preset roles may also evolve as people deal with life events such as disaster crises. For instance, during the Red River flood, the active role many women took to facilitate the recovery of their community led to their increased sense of empowerment (Enarson 2001). More generally, Domeisen (1997) suggests that the problems and stereotypes inherent within and between societies continue to be important when a community attempts to prepare for, or respond to, a risk event.

3.5 Municipal-Level Emergency Preparedness

The literature on municipal level emergency management is vast and well beyond the scope of this paper. The research team elected to focus on issues that are pertinent within the context of this paper.

First, despite the reported overall increase in natural disasters, for a particular municipality the probability of a major catastrophic event is typically very low. There is, therefore, usually little political or community interest in emergency preparedness, property owners are often unwilling to bear the cost of any preparedness/mitigation measures, and community members assume that should a disaster occur, the government will look after them (Simpson 1992). This set of circumstances tends to inhibit proactive emergency management.

Second, local municipalities are well positioned to determine both the vulnerabilities and capacities within their jurisdictions and to undertake appropriate emergency preparedness and mitigation endeavours. However, proactive emergency management will often require the financial assistance, and we would argue the technical support, from higher levels of government (ICLR and EPC 1998). Sustained proactive disaster management is unlikely, even following a serious risk event, without the advocacy work of professional and scientific groups, public officials and citizen organisations (Tierney 1993).

Third, public involvement in disaster planning and response is beneficial (Anderson and Woodrow 1989; Blaikie et al. 1994; Bolin and Bolton 1986; Enarson 2002; Haque 2000; Hutton 2001; Morrow 1999). Although time consuming and costly, there are many benefits of involving the public in the disaster planning process. “Planners and managers who make full use of citizen expertise and energy will more effectively improve the safety and survival chances of their communities" (Morrow 1999:11). Citizens are more likely to comply with emergency measures they have had a hand in devising and citizen involvement allows for immediate feedback on citizen perceptions of the acceptability or the workability of different strategies (Perry and Mushkatel 1986). Since women’s voices, as well as others, have largely been absent or ignored in decisions about disaster management (Enarson and Morrow 1997), public involvement can also be structured to include these marginalised perspectives.

Fourth, preparedness planning requires an integrated community approach involving local emergency management organisations, medical and social services, private and institutional groups (Quarantelli 1988), and we would add, grass-roots neighbourhood organisations. Research suggests that currently, organisations that possess ‘disaster relevant resources’ but

whose focus is not emergency management, are often excluded from the planning process (Lindell et al. 1996). Kartez and Lindell (1987) suggest that establishing a 'disaster assistance council' comprised of all potentially useful community organisations may provide one opportunity to integrate management and establish relationships among the various groups. In another case study, Garaventa et al. (1984) outline that in West Marin, California, following a large flood, the volunteer bureau was incorporated into the community emergency management plans to coordinate such community resources as housing, childcare and the distribution of messages and bulletins. In this isolated, rural area neighbourhood plans were also developed to increase self-sufficiency.

Fifth, emergency management is usually predicated on a 'command and control' approach in which authoritarian structures are put into place during a crisis under the assumption that residents are helpless victims and that response is best handled through centralized command (Tierney 1993). This approach is not realistic in that it assumes that ingrained, everyday patterns can somehow be instantly replaced during a crisis (Quarantelli 1988). This top down mentality should be replaced with the development of an 'emergent resource coordination model' which recognizes and integrates all of the pre-existing players, behaviours, authority patterns and resources (Quarantelli 1988). This alternative is also based on the notion that communities are resourceful and resilient, even under the most dire of circumstances (Tierney 1993). During emergency preparedness planning this approach emphasizes working with existing institutions and groups to identify their strengths and enhance their capacity to effectively respond to a disaster.

Sixth, disaster preparedness should be considered a process, rather than a tangible product. As such, municipalities should concentrate on developing relationships with stakeholders, providing training and opportunities for information sharing, holding simulations and drills, and continually updating plans and strategies (Quarantelli 1988).

Seventh, it is important to base municipal plans on facts not myths. Two common myths in emergency management are that people will panic during a disaster and that social disorganisation (e.g. looting) will be rampant (Haque 2000; Scanlon 1998). In fact, research indicates that altruistic behaviour is more likely during a disaster (Mileti 1999; Perry et al. 1983), with people willingly helping in any way they can. The Edmonton tornado is a case in point. Here impassable roads and damaged telecommunications led to chaos during the first few hours after the tornado struck, leaving most initial search and rescue operations to be conducted by survivors (Scanlon 1997). Thus, rather than immobility and panic, the real problem during disasters is convergence, where individuals and groups, sometimes in numbers that far exceed the need, turn up at the disaster site wanting to help out (Kartez and Lindell 1987). Yet, disaster planning rarely plans for convergence or plans to make use of the innate abilities and resources of these initial responders (Quarantelli 1988).

Another common myth is that major disasters are simply large emergencies. Quarantelli (1988) and Tierney (1993) maintain that disasters are qualitatively different from regular emergencies; community systems experience extreme stress, demand on responders are often different and more challenging and organisations that usually do not interact are often required to cooperate during the response. These circumstances suggest that a concerted effort should be made during

non-crisis periods to develop relationships with a wide range of actors who may be potential responders.

Finally, disaster experience tends to result in community commitment to emergency preparedness, since the risk event personalizes the threat (Tierney 1993). However, repeated exposure to a single threat could also result in apathy, in which communities simply accept the risk as an everyday occurrence. Alternatively, communities may prepare exceptionally well for one type of hazard, but may be completely unprepared for a different threat. Either of these latter situations may mean that communities are not adequately prepared for the range of disasters that could affect their community (Tierney 1993).

4 RISK PERCEPTION

Hazard perception is a process that links individual judgements of the degree of danger (risk) with action (preparedness) (Cutter 1993). Risk is the likelihood of the event occurring and includes three sub-elements: the potential source of the risk, the impact of the risk itself (high or low consequence), and the estimated frequency of occurrence (Cutter et al. 2000).

As a general trend, most research indicates that women are less willing to accept risk from all sources and are more concerned about health and safety issues (Flynn et al. 1994, Momsen 2000, Szalay et al. 1986). Similarly, racial minorities and those of lower income are also less accepting of risks. In contrast, white males tend to see the world as a much less risky place. A socio-political explanation of this pattern may be related to power in society, in that

> …white males see less risk in the world because they create, manage, control, and benefit from so much of it. Perhaps women and non-white men see the world as more dangerous because in many ways they are more vulnerable, because they benefit less from many of its technologies and institutions, and because they have less power and control (Flynn et al. 1994, 1107).

More specifically, in a study of factors that affected the perception of the tornado hazard in Alabama communities that had experienced a devastating tornado, de Man and Simpson Housley (1987) focused on respondent ratings of probable tornado recurrence, estimations of expected damage severity and level of anxiety, should another tornado be predicted for their area. Their results indicated that gender was the best predictor of respondent perceptions of probable tornado recurrence and level of anxiety, while education accounted for the most variability in perception of damage severity ratings. Men rated the chances of recurrence and their stress level as less than women. While most participants rated the expected damage from tornadoes as relatively high, less educated participants gave higher damage estimates.

Another trend captured by the social amplification of risk model, suggests that risks interact with psychological, social, cultural and institutional processes in ways that amplify or attenuate public response (Cutter 1993). Information about risks and disasters are most often obtained through the mass media including in those communities that have experienced disaster (Drabek 1986). Risks, in turn, can be amplified by the media who 1) bombard the public with large volumes of information presented via a large number of media, 2) foster uncertainty by broadcasting disputes over factual information as experts challenge one another, 3) dramatise and

sensationalise the issue, and 4) utilise value-laden visuals and terminology (Cutter 1993). As a result of all of these issues, it can be difficult for households to obtain accurate disaster information.

4.1 Risk Perception and Economics

Kruse and Ozdemir (2002) researched the impact of risk perception on the actions a homeowner would take to protect their property. The authors found that the people were more willing to pay for preventative measures if they perceived the hazard to be a real threat. Kruse and Ozdemir (2002) also examined the motivation of households to invest in a storm shelter or tornado safe room. One of the most important variables that explained a homeowner's maximum willingness to pay for making his/her home safer was the presence of dependent children. On average, people with dependent children stated a maximum willingness to pay nearly $1,000 more for the safe room than respondents without dependent children.

A study by Simmons et al. (2002) found that buyers who purchase new homes will pay more for residences with visible investments in hazard mitigation. Furthermore, the increase in the value of the home was fully reflective of the cost of the investment in disaster safety. This study opens up the possibility that homebuyers, if aware of the safety features contained in a home, are willing to pay more for such a home.

Other studies suggest that the expected savings from reduced damage in future disasters would be more than sufficient to offset the higher construction costs (Ryland 2002). However, contractors indicate that they are not motivated to build structures that exceed existing codes because of the challenge of competing with rivals who did not include these features. This leads to a situation where the public sector has to bear a larger portion of the disaster losses than if these measures had been adopted (Kovacs and Kunreuther 2001).

4.2 Risk Perception, Preparedness and Education

Cutter (1993) suggests there is a wealth of evidence that prior experience with a natural hazard affects people's perception and alters responses to an event. These responses, however, are not consistent (Drabek 1986, Kovacs and Kunreuther 2001). While Kovacs and Kunreuther (2001) outline that in one study disaster victims were not willing to financially invest in mitigation measures despite the large amount of damage that they and/or their friends and neighbours suffered from recent disasters, other research asserts that personal experience with risk is one of the best motivators for encouraging emergency preparedness and the purchase of insurance (Kunreuther 1996; Mileti 1999, Turner et al. 1986). Further, others claim that even witnessing a disaster in another community or country may motivate concern for risk reduction (Gordon 2001; Turner et al. 1986). Despite these contrary findings, most researchers agree that personal contact with disaster makes the hazard threat more salient as future warnings will bring to mind a real experience, not a hypothetical problem (Tierney 1993; Weinstein 1987).

There are several reasons why people may be unwilling to prepare for disasters. One postulated reason is that an individual's expectation of a damaging disaster does not necessarily lead to preparedness. Turner et al. (1986) suggest that the sense of being at risk does not, of itself, move people to action. "The practical implication of these findings is that heightening awareness and

stimulating fear of the hazard can make only limited contributions in any program to motivate people to take a few simple precautionary steps to ward off some of the possible side effects of a severe (hazard)" (Turner et al. 1986:189).

At the household level, good educational programmes are often seen as a key element in ensuring that widespread public support is available for hazard mitigation and emergency preparedness. Education and public information is also important to ensure that the user communities become better skilled at defining their own needs (Smith 1992). Further, education programmes to increase public awareness about hazards and disasters are often looked to as catalysts for preparedness.

Fitzpatrick and Mileti (1994) examined a variety of hazards communication studies and found that the contradictory research findings on the impact of public hazard education programs are at best unclear (see also Paton and Johnston 2001). Waterstone (1978) and Bauman (1983) both concluded that public flood education increased hazard knowledge and awareness, and encouraged the creation of household emergency plans. In contrast, Ruch and Christensen (1980) determined that the public hurricane awareness program actually decreased the perceived risk. In another study after Hurricane Hugo, Faupel and Styles (1993) determined that citizens who had participated in the local disaster education program generally reported higher levels of stress than did those who did not participate. Engaging in household preparedness activities also resulted in higher levels of stress (Faupel and Styles 1993). It was hypothesized that these findings may have been related to the psychological predisposition of the individuals who chose to attend the program or that education raised participant expectations regarding what they should be able to accomplish. These various inharmonious results suggest that risk education may enhance risk perception and emergency preparedness in some limited ways, may decrease perception and preparedness, or may have no effect (Fitzpatrick and Mileti 1994).

Despite these contradictory findings, the literature generally suggests that there are methods available to improve the positive impact of disaster education. As is the case for warning communication, public disaster education must be multi-lingual and must use various media in order to target vulnerable groups, including visually and hearing impaired persons (Fothergill et al. 1999; Gordon 2001) and people with lower levels of education (Faupel and Styles 1993; Hewitt 2000). Rather than attempting to reach all members of a general audience, messages will be most effective if targeted to meet the requirements of specific groups (Larsson and Enander 1997; Paton and Johnston 2001). Paton and Johnston (2001) also suggest that focusing communication on tangible activities, such as safeguarding livestock or household preparedness activities, rather than on uncontrollable threats such as tornadoes, is more likely to facilitate action. On a related topic, Szalay et al. (1986) assert that communication aimed to increase volunteerism for disaster related activities will be more effective if targeted to appeal to the attitudes and motivations of various groups.

5 VULNERABILITY AND CAPACITY

5.1 Vulnerability

Vulnerability of human communities can be understood to consist of two intersecting factors - social and spatial vulnerability (Cutter 1996). Spatial vulnerability focuses on the distribution of

hazardous conditions, the human occupancy of this hazardous zone and the degree of loss associated with the event (Blaikie et al. 1994). Actions to reduce spatial vulnerability include relocation projects, berm and levee construction, zoning and building codes, retrofitting or elevating buildings, plantings and marsh management, and the development of community-level early warning systems (IBC 2001; OCIPEP 2002).

The second factor, social vulnerability focuses on the societal capacity to resist (mitigate and prepare) and cope with (respond and recover) hazards. This perspective highlights vulnerability as a social construction rooted in historical, cultural, social and economic processes (Blaikie et al. 1994; Cutter 1996; Hewitt 1983). The degree to which populations are vulnerable is not solely dependent on proximity to the potential source of the threat (Cutter et al. 2000). "Far from unmediated 'natural' events arising from human settlements in an inherently uncertain environment, natural disasters are social processes precipitated by environmental events but grounded in social relations and historical development patterns" (Enarson 2002:6).

Key vulnerability characteristics include class, ethnicity, gender, ability, age, and family structure (Blaikie et al. 1994; Fothergill et al. 1999; Hewitt 1983; Hewitt 2000; Morrow 1999; Oliver-Smith 1996; Rasid et al. 2000; Wisner and Luce 1993). When these physical and social attributes are associated with limited access to resources and power, individuals and groups become more vulnerable to potential hazards.

A holistic perspective of disaster, one that can incorporate both social and spatial vulnerability is required to fully comprehend what makes people vulnerable. The approach must take into account multiple causal sources, catalytic processes and the compound interaction of physical, built, technological, and social systems (Burton et al. 1993; Mileti 1999; McEntire 2001). For instance, some parts of southern Ontario are vulnerable to tornadoes (spatial vulnerability) and those living in mobile homes (social vulnerability) would be yet more vulnerable. Further, an elderly person living in that mobile home would be more at risk than a younger person. Cutter (1996), among others, offers such an integrative perspective, when she locates the ‘vulnerability of place’ at the intersection of spatial and social vulnerability. This focus on place permits researchers and practitioners to conceptualise both the range of vulnerabilities that may affect particular areas as well as their interactive impacts. The idea of place vulnerability emphasizes the range of factors and players that are involved in emergency management. For this particular study, we suggest that our multi-disciplinary approach has provided the opportunity to incorporate more breadth in understanding the issues that influence emergency management in order to better address issues embedded in the vulnerability of place.

When dealing with vulnerable populations, effective disaster management requires that policy and practice take into account the groups’ needs and priorities, and when possible, mitigation should be implemented in a manner that fosters positive change in everyday life (Hutton 2001). Disaster preparedness measures should aim at reducing levels of vulnerability and strengthening coping capacity, thereby helping to address some of the root causes of emergencies (Trujillo 2002).

Emergency planners also need up-to-date information regarding the diversity and vulnerability within their community. Planners must have knowledge on the numbers and whereabouts of minority populations, children, households of various composition, disabled persons, elderly

persons and group living facilities (Morrow 1999). They must also account for a community's culture, history, and prior experience, since overlooking these factors may lead to more problems in recovery.

5.2 Capacity and Social Capital

Canada's emergency response system is based on the approach that individuals and households are primarily responsible for their own safety after a disaster. When a household is overwhelmed they often look to their community for support. People can and do act to protect their property and loved ones and certainly contribute to the response and recovery of their households and communities. Within communities, one salient resource that people tend to access to cope during all phases of the hazard cycle, is their network of trusting relationships. The social interactions and networks that accumulate and develop over a person's and society's history constitute a valuable resource that can be appropriated to assist in increasing well-being (Wall et al. 1998). These social networks can provide disaster information and can be a source of both physical and emotional support during a crisis.

These networks and sense of trust are sometimes termed social capital. Putnam (1993) defines social capital as "features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions" (Putnam 1993:167). Social capital is thought to have beneficial effects on both individuals (promoting better health and social interactions; increasing successful job searches; providing a climate for entrepreneurship) and communities (stimulating economic development and cooperation) (Mohan and Mohan 2002). These social relationships are one of the ways in which we cope with uncertainty, extend our resources and achieve outcomes we could not attain on our own (Torjam and Leviten 2001)). The presence of social capital in a community is an important factor in how well a community is equipped to cope with and recover from disaster as it can be the basis of material and emotional support in times of need (EMA 2002).

> One's family, friends and associates constitute an important asset, one that can be called upon in crisis…those communities endowed with a rich stock of social networks and civic associations will be in a stronger position to confront poverty and vulnerability, resolve disputes and/or take advantage of new opportunities. Conversely, the absence of social ties can have an equally important impact (Woolcock 2001:12 (as cited in Torjam and Leviten 2001)).

Social capital can also have negative effects. It can be used by certain groups to exclude or dominate other groups in society (Kawachi 2001). It may act as a barrier to social inclusion and social mobility through nepotism or the formation of 'old boys club' networks (Strategic Thinkers Seminar 2002). It may divide rather than unite communities as many groups achieve internal cohesion at the expense of outsiders, who can be treated with suspicion, hostility, or even outright hatred (Fukuyama 2001).

The utilisation of the social capital concept within emergency management studies is quite recent, with only a few instances noted in the literature (e.g. Buckland and Rahman 1999; Pelling 1998). Buckland and Rahman (1999), for instance, use the concept to help them understand the relationship between the nature of community development and the ability of communities to

adequately prepare for and respond to a disaster. That said, although the terminology is different, there is a long history of research related to community relationships, volunteerism and the like within the disaster literature. For example, Turner et al. (1986) assert that bondedness in the community increases active preparedness and fosters action more than fear or concern of potential disaster. In even older studies, Perry et al. (1983) assessed the extent to which a therapeutic community, based on altruism, emerges when the entire population of a given area is affected by a disaster. They conclude that people provided more assistance than they received, but that most of that assistance was directed towards friends who lived nearby, since extended family members often could not reach those most affected. Less help was also provided to strangers. They also point out that this pattern of helping those with whom there is more familiarity could mean that physically or socially isolated individuals may not receive the support they need during a disaster event. Similarly, Clason (1983) focused on the family as 'life-saver' during a disaster and concludes that "it is not living in a family as such that gives an individual a better chance of survival in disaster, but participating in a caring relationship with (an)other person(s)" (Clason 1983:55). Turner et al. (1986) found that the discussion of earthquake topics, community bondedness and attending meetings were all significant influences on household emergency preparedness. As they explain in their analysis, all of these factors indicate the "presence of social ties and exposure to interaction in the neighbourhood and the community" (Turner et al. 1986:185). They maintain that passivity often results from simply obtaining disaster preparedness information from a media outlet, while active involvement is encouraged by both discussion and meeting attendance. Further, social bondedness also appears to play a role in reducing passivity by overcoming the detachment often associated with being a spectator rather than an engaged participant.

Nehnevajsa (1989), in his study of volunteerism and emergency preparedness, found that about one third of American respondents had been involved in some voluntary activity in the past 12 months, with about 2 hours per week spent on these activities. About three quarters of respondents also claimed that they would be willing to offer voluntary service for emergency preparedness or would be willing to undertake emergency management training. He notes that the willingness to participate will not necessarily translate into actual volunteerism without some impetus from government or other organisations and unless the activities are targeted to meet the needs of specific groups.

In more recent work, Sweet's (1998) longitudinal study of the effects of disaster on social cohesion found that cohesion increases in the immediate aftermath of the disaster. However, one month after the disaster, perceptions of the community returned to pre-disaster levels. Sweet's study indicates that there are few lasting effects on social cohesion resulting from a natural disaster. In their review of resiliency, Paton and Johnston (2001) suggest that having a sense of community, including feelings of belonging and attachment towards people and places, encourages involvement in community response following a disaster (see also Larsson and Enander 1997). Individuals who perceive themselves as having no investment in their community may develop a level of detachment which, following a natural disaster, may trigger feelings of isolation, encourage learned helplessness and heighten vulnerability. This suggests that having access to social networks increases one's ability to cope with (and presumably prepare for) disaster.

While many other examples could be cited, we argue that disaster research has been investigating elements of 'social capital' for some time. However, what is interesting about specifically adopting the social capital framework, is that the vast literature on this specific topic provides a sound and relatively coherent theoretical base from which to predict and asses the social network patterns that may contribute to household and community capacity to effectively deal with proactive and reactive disaster management.

This section has outlined the key findings in several areas of the disaster literature including early warning systems, the hazard cycle, insurance/economics, risk perception, vulnerability and social capital. It also provided some background information about hazards, tornadoes and the Pine Lake tornado. Insights gained formed the basis of the empirical phase, and were used to develop the research instruments as well as to analyze the results. The following section outlines the study's methodology. This is followed by the research results.

6 METHODOLOGY

6.1 Research Proposal

The primary focus of this project was to determine if the experience of a severe disaster affects individuals/households perceptions of risk and thus their attitudes towards emergency preparedness. Other important foci were the assessment of other factors that influence emergency preparedness attitudes and the impact of the tornado on Pine Lake residents. To assess these primary areas of interest, two main data sources were used: (1) interview feedback from households, first responder agencies and government personnel regarding the emergency preparedness activities currently operating in their community as well as their views on government spending, risk and community response capabilities; and (2) a quantitative survey based on a comparison of two communities, only one of which had experienced a disaster. The target populations for this research were households from the Pine Lake, Alberta community located within Red Deer County and households within the Township of North Dumfries, Ontario; the direct first responder agencies for the 2000 Pine Lake tornado; and community leaders and the government personnel in both areas. For purpose of this study, "household" is defined as a person or group of people who occupy the same dwelling as their primary residence.

Canadians are urged by governments, non-governmental organizations, and the private sector to undertake personal and household preparations for an emergency or disaster situation. Despite the vast knowledge and programs nested within the purview of emergency preparedness, differing opinions exist about what constitutes the nature of this issue. For purposes of this study, the research team has chosen to employ the definition used by both the Office of Critical Infrastructure and Emergency Preparedness (OCIPEP) and the Canadian Red Cross: Emergency preparedness involves those activities that prepare an individual or household to provide for their basic needs of security (health and safety), shelter, food, water and clothing for up to 72 hours following an emergency affecting their community (OCIPEP).

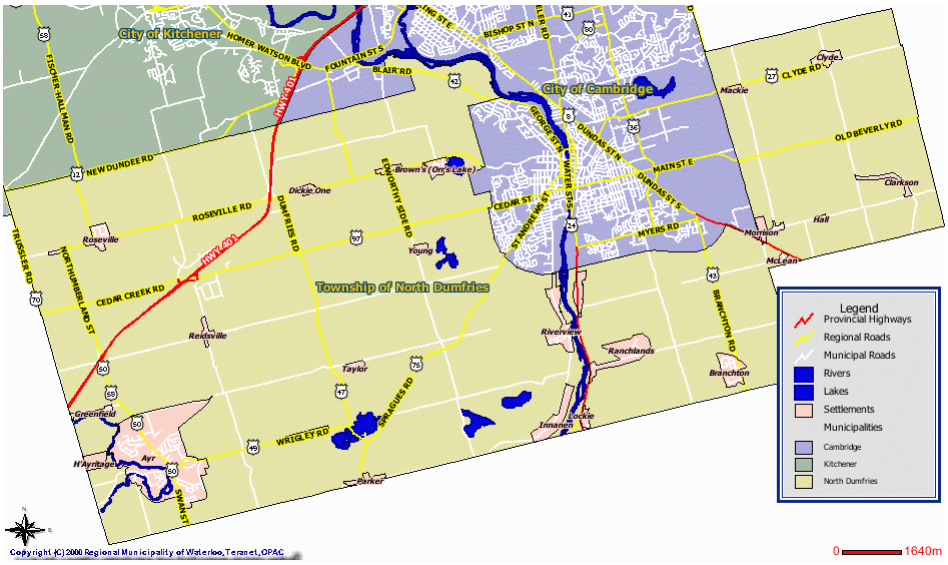
In developing the survey, indicators of how to assess attitudes and behavioural change in relation to emergency preparedness were selected. No universal definition of the actions a household should have in place to protect them from the impacts of an emergency or disaster situation exist in the disaster management community. For the purposes of this study, five items were selected

that transcend the composition of disaster safety kits as advocated by the Institute for Catastrophic Loss Reduction, the Office of Critical Infrastructure Protection and Emergency Preparedness and the Canadian Red Cross. The items are: 3-day supply of canned food and water for each member of the household, a family evacuation plan, a portable battery-operated radio, a flashlight with functioning batteries and home or apartment insurance.

The methodological approach adopted in this study involves a case study comparison of two communities, only one of which has recently been affected by a tornado. Case studies provide an important opportunity to collect in-depth and detailed information at a scale limited by either time or space. However, their limited scope may mean that the results obtained are not generalisable to the broader scale (Tesch 1990). This limitation must be kept in mind when assessing the data and making recommendations that would be appropriate across broader scales.

Figure 6.1: North Dumfries Ontario

Source: http://www.township.northdumfries.on.ca/images/north_dumfries_area.gif



6.2 Community Selection

In order to isolate the effect of the disaster experience, the research team twinned the Pine Lake community with a similar one, North Dumfries (see Figures 1.1-1.2, 2.4, 6.1). Recognizing that identical communities are impossible to find, the research team believes that these two communities are quite similar, except with respect to the experience of a recent severe disaster. Although it is impossible to control for every variable, we are reasonably confident that confounding variables have not unduly influenced the results. The following factors were considered in the twinning process:

1. Both communities are located in tornado-prone areas.

2. Both sections of the municipalities chosen for the study involve rural spaces that are used for a range of activities including farming, rural residential, recreational activities (including cottages and mobile homes) and extraction of natural resources (Pine Lake – oil, North Dumfries – aggregate).

3. Both municipalities are located near and influenced by adjacent urban areas. Red Deer County is located equidistant between Edmonton and Calgary, while North Dumfries is located within the Regional Municipality of Waterloo which includes the cities of Cambridge, Kitchener and Waterloo.

4. There is a large trailer park in North Dumfries, similar to the one affected by the tornado in Pine Lake.

5. Neither designated sections of the municipalities has a central core where residents can access retail, social, education or other services.

6. Both areas may experience delays in emergency response due to remoteness, transportation route design and topography.

7. Both areas consist of rolling topography with natural spaces integrated into a predominantly farm-oriented landscape.

8. The municipalities have similar demographic characteristics (see Table 6.1), although the income and education in North Dumfries are somewhat higher. However, it is impossible to determine if the population in the portion of the regions from which we drew our sample had a similar structure since statistics for these areas are not available.

Table 6.1: Community Characteristics

(Statistics Canada 2001 Census)

	Red Deer County (includes Pine Lake)	**North Dumfries Township**
AGE		
0-19	30%	31%
20-44	34%	36%
45-64	26%	24%
65+	10%	9%
Total	100%	100%
GENDER		
Male	53%	51%
Female	47%	49%
Total	100%	100%
INCOME		
Median Total Income	$21,390	$29,996
EDUCATION		
Age 20-34, less than high school	22%	14%

Age 20-34, at least high school	78%	86%
Age 35-44, less than high school	22%	16%
Age 35-44, at least high school	78%	84%
Age 44-64, less than high school	29%	26%
Age 44-64, at least high school	71%	74%

6.3 Sample Size

The initial research design determined that a sample of 100 households from each community would be more than sufficient to achieve acceptable ranges of error and ensure reliability for the testing of statistical relationships. Since the research team was from Ontario, to facilitate the collection of data in the Pine Lake area, a research assistant from the nearby city of Red Deer was utilized. The assistant was responsible for arranging the survey interviews and assisting the team in understanding the local context. Despite hiring a local contact person, several intervening factors led to a revision in the scope of the Pine Lake sample drawn for this study.

Accessing the Pine Lake community proved to be difficult for a variety of reasons. First, the residents in this area were guarded about discussing the tornado or issues related to disasters, as they simply wanted to "move on with their lives". Compounding this was that the swath of the tornado had gone through a seasonal trailer park and contacting these individuals three years after the event proved to be challenging. For the residents we were able to contact and interview, a perception that the Ontario research team were "outsiders" existed among some the respondents. Hence, the final samples consisted of 76 participants from Pine Lake and 128 from North Dumfries. Despite the challenges encountered, the survey results for both communities are statistically significant at the 95 % level (+/- 5%). Since the number of respondents from each community is not large, and not always normally distributed, the data analysis has been limited to a descriptive comparison with non-parametric, chi square analysis.

A non-random method was used to select the participants that would be surveyed. This was done to ensure that sufficient representation of all resident types (permanent both farm and rural, cottagers, and seasonal trailer park) from each community was present. To determine the households that the sample would be drawn from, geographical boundaries were used. For the Pine Lake area, meteorological information on the swath of the tornado created the zone from which to draw potential subjects. This was extended out to the nearest major roads to create a block from which potential households were selected. In North Dumfries survey respondents were selected from households south of the 401, a major highway, extending to residents who bordered the small village of Ayr, located on the west side of North Dumfries Township. The nucleated settlement was avoided, since a similar pattern does not exist in Pine Lake.

From the designated areas outlined above, in the Pine Lake community residents were contacted by phone to arrange an appointment. Phone numbers were primarily obtained through a locally produced Pine Lake directory, with contact information for the trailer park residents obtained through personal referrals. In North Dumfries, within the more scattered farming and rural residential areas, residents were contacted by phone and asked if they would like to participate.

Phone numbers were obtained by collating address information from the North Dumfries tax role with numbers from a regional phone book. In addition, in North Dumfries, in clusters of up to 40 houses, residents were selected randomly and asked to participate through a door-to-door process. To better mirror the Pine Lake participants, the investigators obtained permission to complete surveys with both seasonal and permanent residents in a North Dumfries trailer park.

6.4 Research Instrument Design

A structured, primarily interviewer-delivered survey was developed. A structured format was chosen for a number of reasons. First, because the fieldwork section of the study was completed in less than one academic year, an expedient and efficient method was required. Additionally, structured surveys maximize the financial and human resources needed to tackle the geographical distribution of the reference population. Also, since three members of the research team and three student field assistants collected the survey data, the structured format, facilitated inter-interviewer consistency. Consistency was further complemented by providing all interviewers with clear instructions and by the participation of the principal investigator throughout the data collection process.

The survey contained primarily close-ended questions to ensure consistency in data collection and to facilitate useful comparisons among responses. Questions were designed to measure a number of variables including: emergency preparedness, risk perceptions, community social cohesion, experience and attitudes towards disaster situations, and individual/household demographics. The survey sought to gauge both community household perception of risk and natural hazards in Canada as well as their previous disaster experience. Additionally it explored their views about weather warnings and storm prediction, financial and insurance aspects of emergency preparedness, measures of household preparedness activities and resiliency and experience with natural disasters. Some of the survey questions are based on work completed by Turner et al. (1986) in which the researchers evaluated the public perceptions, preparedness levels and media coverage of earthquake predictions in California. Since so few people in North Dumfries had any experience with natural disasters, where the survey assesses the effects of a recent disaster and subsequent recovery, only the Pine Lake data are analysed and discussed. In the survey many questions used a 5 point scale while others provided an extensive range of options (including the 'other' category) from which to choose. The identical survey was used in both communities.

Prior to taking the survey into the field, it was vetted by a number of sources. An informal pre-test of the survey was carried out with a small number of subjects. The feedback received suggested various changes to the format, which were subsequently incorporated into the survey. When the survey design work was nearing completion, the Ethics Review Committee from the University of Guelph, was given an opportunity to provide feedback of the survey prior to its finalization. In addition, the Institute for Catastrophic Loss Reduction's Research Committee offered helpful comments to improve the survey's effectiveness.

To check for biases in the survey and to provide greater context to its results, the research team complemented the surveys with key informant interviews and the collection and review of available documents and reports. This triangulation of data collection allowed the researchers to verify their findings through a range of sources. In both communities, the team asked questions

about emergency management, recent disaster experiences, governmental roles, community dynamics, etc.

6.5 Data Collection and Processing

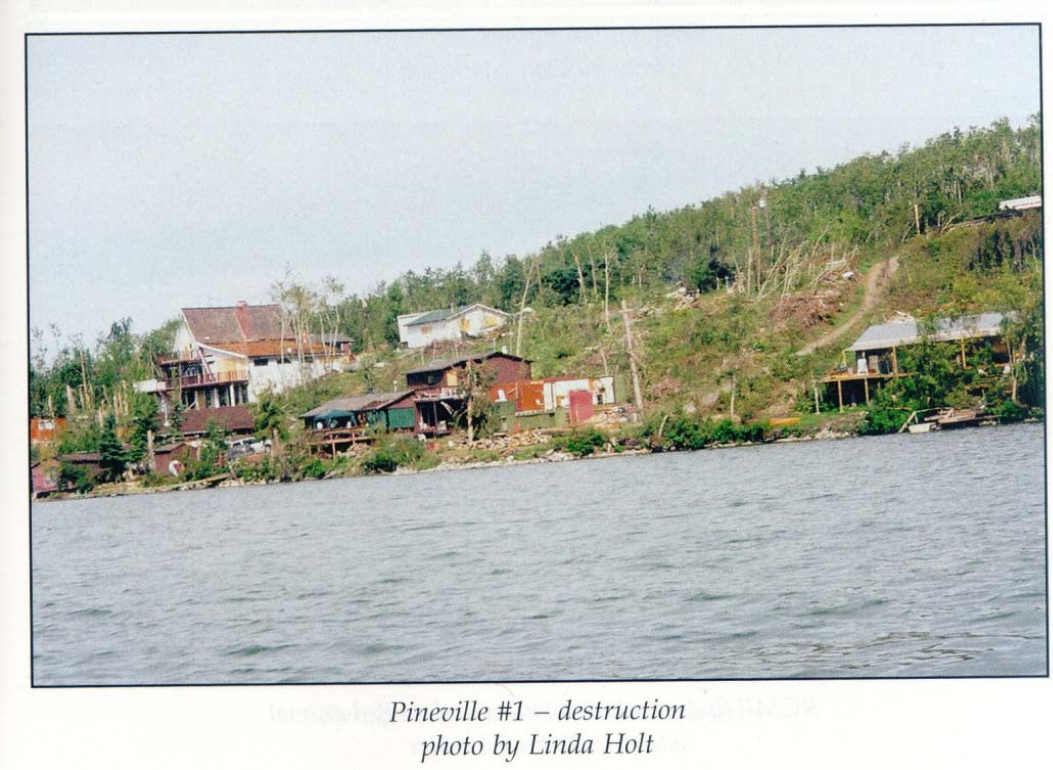
The surveys were conducted in both communities over a seven month period from April to October 2003. Due to the vast geographical area and time constraints to conduct fieldwork, slightly differing data collection methods were used in the two communities. Throughout Pine Lake, the survey was administered during a 45-minute face-to-face interview following the structured survey format. The face-to-face format was critical to providing respondents support as they discussed the impact of the 2000 tornado, which for many remained a very sensitive topic. In North Dumfries a mixed approach was used, with about half of the surveys completed during face-to-face interviews. The remainder were hand-delivered to residents who completed them on their own. This was done to accommodate the preferences of North Dumfries residents. In both communities, to increase the response rate for those surveys that were arranged by phone, three attempts were made to contact potential participants. In both communities, the direct contact with participants provided additional qualitative information that was useful in understanding their responses.

All the survey data from both communities were entered into the statistical analysis program, SPSS. Two identical files were created to guarantee separation of the data for each community. Once all cases were entered, these files were then merged to allow comparison. To avoid inter-operator biases, one research assistant entered all data. After the first few cases were entered, a thorough review of the entry process was undertaken to check for accuracy and consistency. Changes and corrections were made at this time. The data entry process was further verified through a review of a random selection of subsequent cases. No problems were discovered in the entry process.

Complementing the survey, key informant interviews were undertaken in both communities with a range of representatives. These included: local community leaders, local emergency managers, Canadian Red Cross staff and volunteers, fire personnel, Township and County staff and the respective provincial government authorities. To ensure that all the relevant data was captured from these interviews, the interviews were recorded. Summary notes were typed up from the recordings. The tapes provided essential contextual details as well as additional depth and breadth to the survey data. Several of the key informant interviewee's provided access to local emergency plans, minutes of staff meetings discussing preparedness or response planning and briefs on the 2000 Pine Lake disaster operation. The research team also reviewed these documents for additional information.

Figure 6.2: Tornado Destruction on the West side of Pine Lake

Source: Elnora-Pine Lake History Book Association



Pineville #1 – destruction
photo by Linda Holt

7 EMPIRICAL RESULTS

The empirical results are divided into six areas: socio-demographic statistics, perception of risk, household-level emergency preparedness, perception of warnings and government-level preparedness, neighbourhood-level emergency preparedness, and the impact of the tornado on Pine Lake residents. Each section begins by reporting the quantitative survey results. Where appropriate, this is augmented by information gathered during our qualitative interviews and document search. Most sections include a discussion of the specific results within the context of the published literature.

Given that our key goal is to compare the views of participants in the two communities, the data are primarily sorted by community. We also undertake gender analysis on a number of key variables to assess the importance of this factor.

7.1 Socio-Demographic Statistics

As demonstrated by Table 7.1 there are some differences between the two samples (Pine Lake versus North Dumfries); however, none of these were statistically significant. This suggests that differences noted between the communities will not likely be related to underlying differences in the data sets. As is the case for the entire municipalities, the participants in the North Dumfries sample are somewhat wealthier and better educated than those from the Pine Lake area. In comparison to the municipality data, we surveyed slightly more women in North Dumfries and

slightly more men in Pine Lake. Based on the overall similarity between the community and sample data, the survey sample appears to be relatively representative of the population.

Table 7.1: Survey Sample Demographic Characteristics		
	Pine Lake Area	**North Dumfries Township, Sub Area**
AGE		
26-45	20%	38%
46-65	60%	45%
65+	20%	17%
Total	100%	100%
GENDER		
Male	46%	54%
Female	54%	46%
Total	100%	100%
INCOME		
Under $20,000	3%	3%
$20,000-80,000	66%	59%
$80,000+	31%	38%
Total	100%	100%
EDUCATION		
High school	42%	30%
Post Secondary	58%	70%
Total	100%	100%

7.2 Perception of Risk

We began the survey by asking participants four questions:

- Do you think natural disasters happen in Canada?
- How likely is it that a natural disaster could strike your community in the future?
- How likely is it that a tornado could strike your community in the future?
- If a tornado was to strike your community, how likely is it that severe damage would result to your personal property?

These questions were designed to assess participants' perceptions of risk, both to natural disasters and tornadoes. The questions also asked about both the probability and consequence of such events. Participants answered the question using a 5 point Likert scale ranging from Not at all (1) to Very strong likelihood (5). The answers to these questions were then added together and categorized to form an index of participant perceptions (Table 7.2). The results indicate that disasters, both their causes and consequences were more important to Pine Lake participants.

Table 7.2: Index, Perception of Natural Disasters and Associated Damage

(p=.018)

	Pine Lake	North Dumfries
Not/Somewhat Likely	6%	1%
Moderately Likely	35%	51%
Quite Likely	59%	48%
Total	100%	100%

We then asked participants if they had experienced a disaster, what that disaster was and the seriousness of that event (Figure 7.1, Table 7.3). Eighty-seven percent of Pine Lake participants, but only 32% from North Dumfries indicated that they had experienced a disaster. Of those who had experience, 91% of Pine Lake and 36% of North Dumfries indicated that a tornado was the most recent disaster in which they were involved. Pine Lake residents also indicated that the disaster they experienced was far more serious. These results support the contention that the Pine Lake tornado disaster experience is a key differentiating characteristic between the two communities.

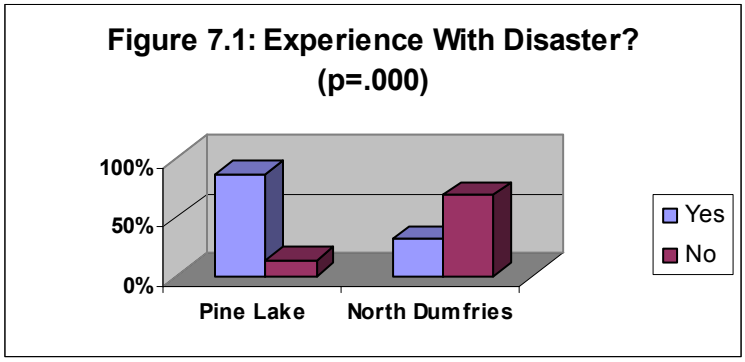


Table 7.3: Seriousness of Most Recent Disaster (p = .031)		
	Pine Lake	North Dumfries
Extremely serious	41.5%	14.3%
Relatively serious	10.8%	16.7%
Somewhat serious	10.8%	23.8%
Relatively minor	16.9%	21.4%
Extremely minor	20%	23.8%
Total	100%	100%

Then, in order to assess the extent to which their perception of disasters was related to disaster experience, rather than some other difference between the two communities, we cross-tabbed the perception index against the experience of disaster (Table 7.4a). Note that the values in the 'Yes' and 'No' columns closely align with the Pine Lake/North Dumfries distinction made in Table 7.2. Using Chi Square, we also cross-tabbed perception against experience, controlling for age, gender, education, income, length of residence, presence of children and living alone. None of these variables proved to be significant. The same analysis was undertaken using Pine Lake and North Dumfries as the dependent variable. Only age in Pine Lake was statistically related to perception. Based on this analysis, as suggested by Cutter (1993) and others, we argue that the differences we note between the two communities are strongly related to the disaster experience. Chi-square analysis results (Table 7.4a) support the hypothesis that disaster experience significantly affects perceptions of risk.

Based on the above findings, in the subsequent analysis the data is divided according to community. This division is used to evaluate the various aspects of disasters outlined in the literature above.

In a further analysis we cross-tabbed perception directly against the above independent variables. The only significant relationship concerned gender, in which women's perception of disaster was stronger than men's (Table 7.4b). However, when gender is cross-tabbed against experience there is no significant relationship. These results support the literature that asserts that gender also plays an important role in determining perceptions (de Man and Simpson Housley 1987; Flynn et al. 1994; Momsen 2000): these perceptions are determined by more than the disaster experience.

Table 7.4a: Perception of Disaster versus Experience (p=.047)		
	Yes	No
Not to Somewhat Important	0%	3%
Moderately Important	35%	49%
Quite Important	65%	48%
Total	100%	100%

Table 7.4b: Perception of Disaster versus Gender (p=.012)		
	Females	Males
Not to Somewhat Important	3%	2%
Moderately Important	36%	57%
Quite Important	61%	41%
Total	100%	100%

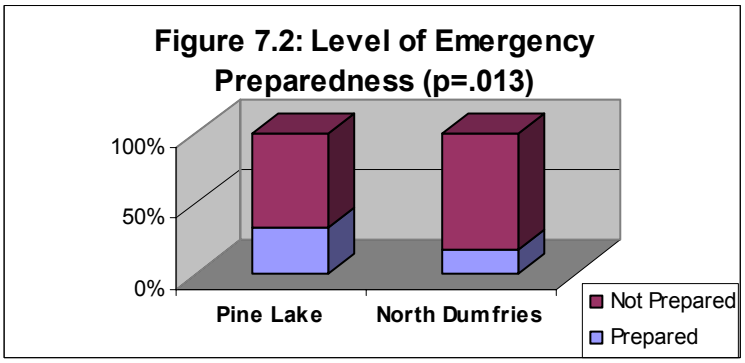
7.3 Household-Level Emergency Preparedness

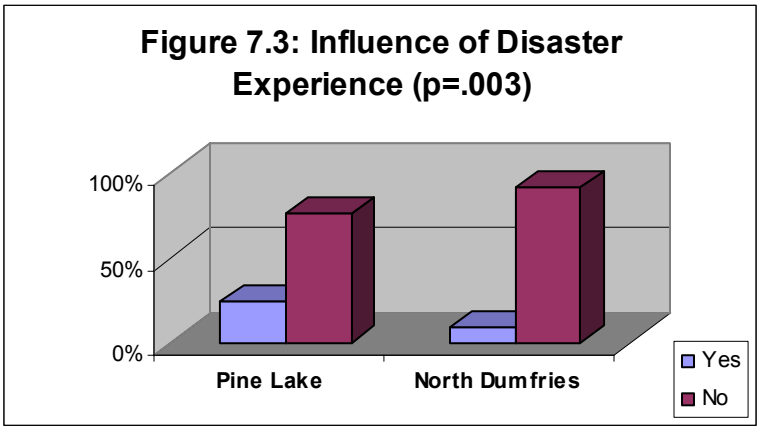
7.3.1 General Preparedness

We began by posing four questions related to respondent's emergency preparedness levels. Participants were asked if they had the following measures in place: a family evacuation plan, a three day supply of food and water, a portable, battery operated radio/flashlight and home insurance. This list was not exhaustive but was used to indicate general preparation. This was compiled into an index of emergency preparedness. While initially measured on a 4 point scale this was reduced to two categories. 'Prepared' means that participants had the measure in place, 'Not Prepared' means that they did not plan to put the measure in place or had thought about it, but had not implemented the measure. The 'don't know' category was dropped since it was rarely chosen. Generally speaking, neither community displayed high levels of preparation. These results mirror those of Turner et al. (1986) and Murphy (2004). In the latter study, while many households had some of the recommended items on hand, only 13% had gathered these together to create an emergency kit. Socio-economically, the results did not reveal any clear pattern regarding who was more or less prepared. This was not unexpected, given the small data sets.

Although neither community was particularly well prepared, as Figure 7.2 illustrates, Pine Lake residents were more likely to adopt emergency preparedness measures, when compared to North

Dumfries. Figure 7.3 illustrates that Pine Lake participants were more likely to state that the emergency measures adopted were related to the influence of their disaster experience. Further, 11% of Pine Lake and 18% of North Dumfries participants claimed that their emergency preparedness measures had been influenced by a disaster event they saw reported in the media. Thus, as predicted by the literature, both direct experience with disaster and media reports had an influence on risk perception and emergency preparedness activities. Our results did not detect any differences in preparation levels between men and women.

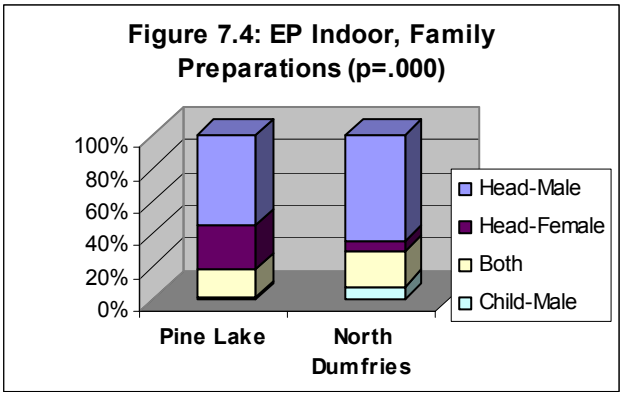


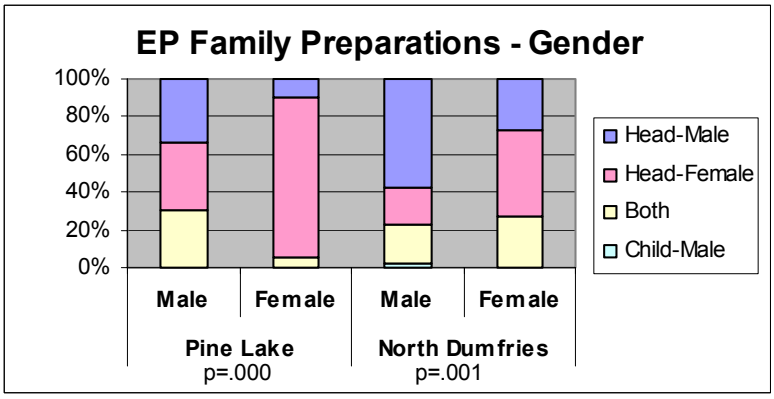


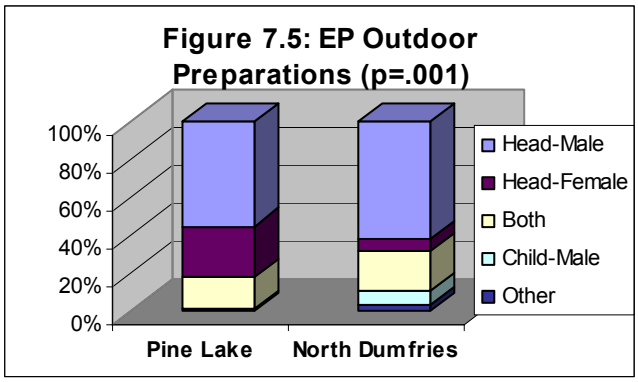
At the household level, the survey further inquired about the participants' views towards emergency preparedness responsibility. The first question asked participants who should be most responsible for preparing households against a disaster. While the majority of participants in both communities chose themselves, North Dumfries residents were more inclined to rely on local government (Table 7.5). We asked if there were any barriers that would prevent participants from participating in tornado preparedness activities. Sixty-eight percent of Pine Lake residents, but only 48% from North Dumfries claimed that there were no barriers. The most important barrier for people from North Dumfries was that they did not know what to do (28% as compared to 8% from Pine Lake).

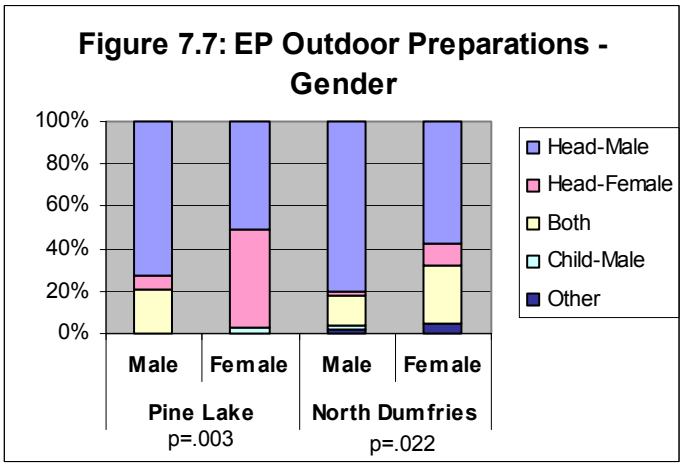
Table 7.5: Nexus of Household-Level Responsibility (p=.015)		
	Pine Lake	North Dumfries
Federal Government	1%	1%
Provincial Government	14%	9%
Municipal Government	16%	30%
Canadian Red Cross or Other Agency	1%	4%
Yourself	67%	54%
Other	1%	2%
Total	100%	100%

More specific questions followed about the roles that men and women report playing within households to prepare against disasters. As can be observed in Figures 7.4-7.5 when viewed from the municipality perspective, men appear to dominate both the indoor and outdoor preparations, and in a large number of cases, participants indicated that both men and women participated in the preparations. In contrast, when emergency preparedness roles are broken down within each municipality by gender of participants, a stronger gender bias appears in both communities (Figures 7.6-7.7). Men more often stated that they undertook outdoor related activities, while women were more likely to assert that they were responsible for indoor preparations. When these same variables were tested using the combined Pine Lake-North Dumfries data, the relationship between preparedness responsibility and gender was significant at the 99% confidence level (p=.000), with a traditional gender split noted. These results confirm the findings of other studies including Larsson and Enander (1997), Enarson and Morrow (1998) and Toscani (1998). However, the pattern toward cooperation between men and women is still visible in these results. As noted by Fothergill (1998) and others this suggests fluidity in the gender roles; these roles are not immutable. The cooperation also suggests that both men and women are taking on the challenge of emergency preparedness, neither gender appears to be bearing the brunt of the workload.









7.3.2 Economic Aspects of Preparedness

The next set of questions about household-level emergency preparedness was related to financial and insurance considerations. There is no clear trend in the literature regarding the relationship between those who have experienced a disaster and the likelihood of undertaking financial investment to improve disaster resilience (e.g. Kovacs and Kunreuther 2001; Miletti 1999), but some studies do suggest that experience increases investment. Since it was established in Section 7.2 that the perception of risk was stronger in Pine Lake and that this had influenced some emergency preparation activity, we had anticipated that these participants would be more likely to invest. In contrast, when asked if they would be willing to financially invest in their home to improve disaster resilience, North Dumfries participants, not those from Pine Lake, were more likely to agree. To further investigate this idea we cross-tabbed the perception index against the willingness to invest, using the combined Pine Lake-North Dumfries data. As suspected from the previous results, this also did not result in a statistically significant relationship. Despite the findings from Section 7.2, there was no difference in the willingness to invest among those with different levels of risk perception. The same results were obtained when willingness to invest was cross-tabbed against age, education, income and length of residency. When the data were disaggregated by community, it seems to be the case that the unwillingness of Pine Lake participants to invest is related to women's opinions about investment (Figure 7.8a and 7.8b). But when the data are combined, gender did not have an overall significant influence. Based on the risk perception literature (e.g. Turner et al. 1987) and comments made by Pine Lake participants, we speculate that the unwillingness to invest in home improvements may be related to the level of devastation that they had witnessed. Participants unwilling to invest often asserted that, given the strength of the winds, no amount of investment would have prevented or reduced the damage.

Interestingly, of those who would be willing to invest, participants in Pine Lake were more willing to invest significantly more funds (Figure 7.9). Among those willing to invest, comments made by Pine Lake residents indicated that, in the wake of their experience with the tornado, they felt that only higher levels of investment would positively contribute to improved home resilience. The main reason that participants were willing to invest was that it would protect family members (Table 7.6). The main reasons they would not be willing to invest were

that it would not improve resiliency, it was too expensive and participants did not know what to do (Table 7.7). Notice that Pine Lake residents were less positive that the investment would protect family members and were more likely to state that the investment would be too expensive. This seems to support our contention that given the enormity of the disaster in Pine Lake, residents were hesitant about the effectiveness of financial investments and that only substantial investments would be able to provide the protection needed.

When asked about the willingness to pay more for a new home that had additional weather-related safety features, approximately 20% of both Pine Lake and North Dumfries respondents stated that they would not be willing to make the additional investment and another 30% stated that they did not know if they would be willing to invest. The remaining 50% said they would be willing to invest up to $5000. Again, the disaster experience did not increase the willingness to invest. Nevertheless, it seems to be quite a positive outcome that half of all participants would consider paying extra for safety-related features on new homes. This echoes results by Simmons et al. (2002) and suggests that, despite contractor trepidation, the marketing of new homes could benefit by incorporating upgraded safety features. As a positive benefit, Kovacs and Kunreuther (2001) explain that when a disaster event occurs, this may not only reduce the homeowner's repair costs, it would also reduce the public sector expense associated with aid provision.

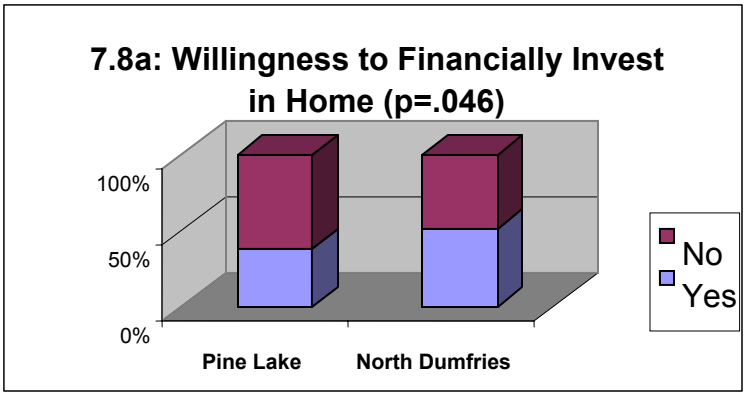
Although the literature suggests that experiencing a disaster tends to encourage household-level mitigation and preparation, including making improvements to their homes, our results were mixed. Participants' first two stated reasons regarding why they would not be willing to invest suggests that having witnessed the tornado's devastation, participants from Pine Lake felt that there was nothing they could reasonably do to protect against this level of destruction. It is not clear why women were less willing to invest than men.

It is also important to note that over one third of participants in both communities indicated that they would be willing to invest in improvements to increase disaster resilience and about half of participants in both communities indicated that they would pay more for a new home with added safety features. Many also stated that the reason that they would not be willing to invest was related to lack of knowledge. Moreover, the survey did not ask any of these questions with the added perk of the incentives outlined by Tobin (2002). These results, therefore, point to the willingness of many households to financially invest in their home and to the need for more research regarding the economic aspects of emergency preparedness.

The index created in section 7.3.1 included a question about household insurance. Over 95% of participants in both communities stated that they had insurance. Since high winds are covered under basic policies, virtually everyone affected by the tornado was entitled to some level of coverage. The sample was not large enough to ascertain whether or not more vulnerable sectors of the population (e.g. the poor, elderly, etc.) had sufficient coverage. Had the area been hit by a flood, landslide or an earthquake - perils not necessarily covered by insurance - more extensive government aid may have been required by area residents.

In terms of insurance, about 63% of Pine Lake and 72% of North Dumfries participants indicated that they would be willing to invest in weather-related disaster proofing for their homes, if they were offered a premium discount. This supports the findings reported by Tobin (2002). About 74% of participants from the two communities stated that they would be willing to wait between

3 and 10 years to recover their investment through lower insurance premiums. Thus, despite the wariness of the insurance industry about offering discounts, this may be an avenue that should be further explored. It may be the case that insurance incentives could contribute to more prepared, more resilient households.



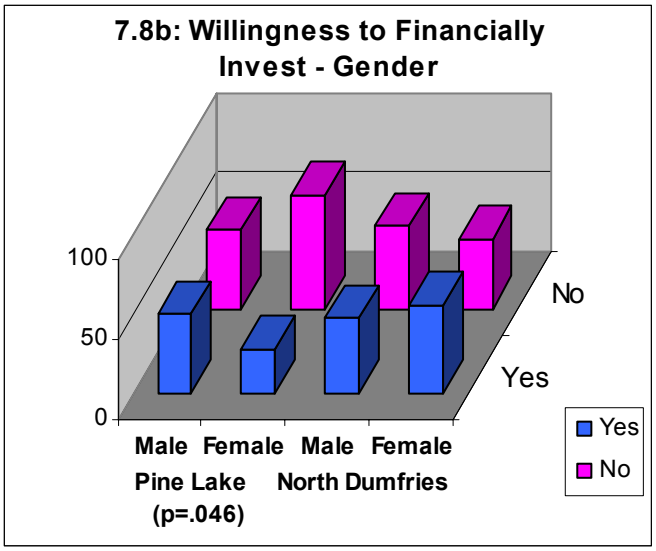
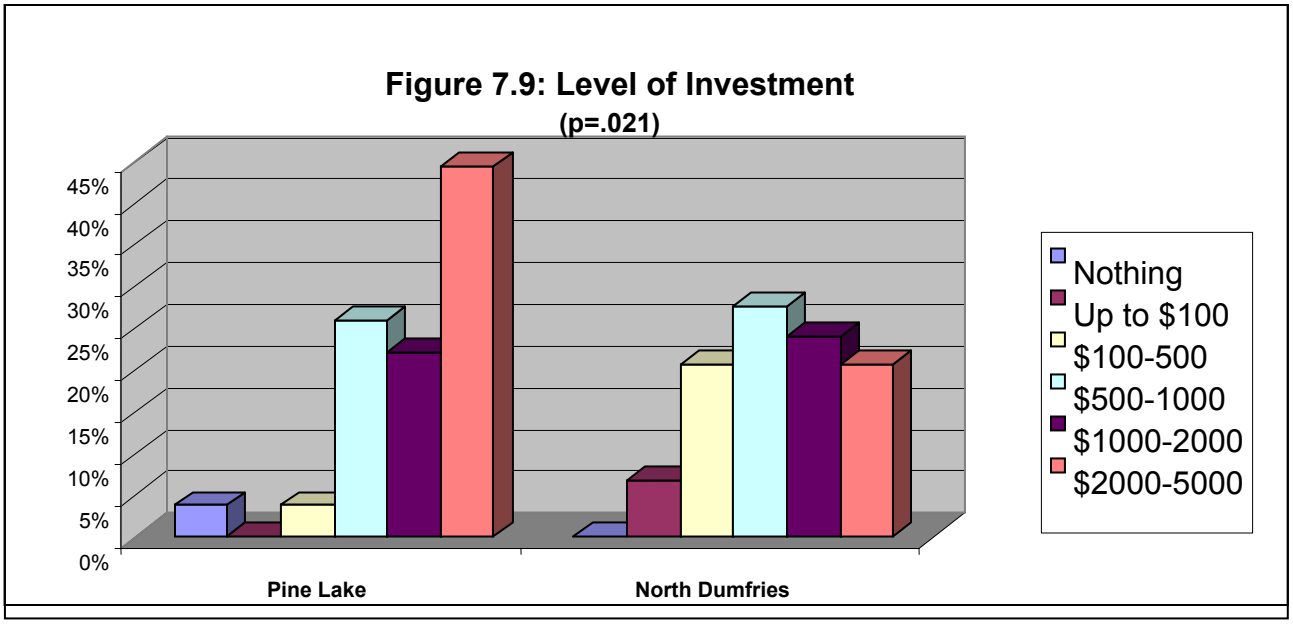


Table 7.6: Why would you be willing to invest in home improvements?		
	Pine Lake	North Dumfries
Protect Family Members (p=.011)	70%	91%
Peace of Mind	63%	42%
Protect Property	41%	34%

Table 7.7: Why wouldn't you be willing to invest?		
	Pine Lake	North Dumfries
Would not improve resilience	52%	47%
Too expensive (p=.049)	23%	9%
Don't know what to do	23%	27%
Area not prone to tornadoes	17%	30%



7.3.3 Information and Emergency Preparedness

In both communities, about 90% of participants stated that they would be interested in obtaining more information about emergency preparedness. In contrast, Murphy (2004) found that only 38% of respondents indicated that they would be interested in such information. It is unclear why we obtained such an overwhelmingly positive response from participants. Since so few people chose the negative response, it was not possible to assess the underlying factors that the literature proposes may influence the willingness to seek out new information.

Of people looking for information about emergency preparedness, Pine Lake participants were more likely to consult a wider range of sources (Table 7.8a) and women in North Dumfries were more likely to rely on their partners for information (Table 7.8b). Notice that the pattern between men and women holds for the first five sources of disaster information, with men more likely to seek information from the radio or official organisations, while women were more likely to watch television or go to the library. Internet use was also slightly more important for men, particularly in North Dumfries. In both communities, internet use also varied significantly with age ($p=.019$); younger people were far more likely to make use of this information source.

Both participants from Pine Lake and North Dumfries indicated that the best place to hold a workshop about emergency preparedness was at a location close to their home such as at a neighbourhood association, or through a community group. About 20% of North Dumfries residents (as compared to only 5% from Pine Lake) stated that they would prefer a workshop through their place of employment.

In comparison to information seeking behaviour about emergency preparedness, when asked about their source of information during the response/recovery period, Pine Lake participants ranked friends/neighbours (23%) as their number one source. This was followed by the radio (20%), television (18%), government officials (13%), family (12%), police/fire department (7%) and the newspaper (4%).

Table 7.8a: Sources of Emergency Preparedness Information

	Pine Lake	North Dumfries
Radio	33%	41%
Official Organisations*	33%	11%
Television	31%	58%
Internet	30%	13%
Library	19%	9%
Newspaper	19%	19%
Spouse	10%	20%
*Official organisations include municipal authorities, fire, police, Red Cross, etc.		

Table 7.8b: Sources of Emergency Preparedness Information – Gender *statistically significant relationship				
	Pine Lake		North Dumfries	
	Male	*Female*	*Male*	*Female*
Radio	41%	29%	49%	34%
Official Organisations	37%	32%	17%	7%
Television	22%	37%	57%	60%
Internet	30%	29%	15%	10%
Newspaper	15%	18%	23%	16%
Spouse	11%	11%	9%*	27%
Library	4%	14%	0%	3%

Particularly for Pine Lake residents, the preference for having an emergency preparedness workshop at their community centre is related to the role that the Pine Lake "Hub" has in the lives of residents. Built by residents to replace a closed and badly deteriorated local school, the 'Hub' now serves as the focal point for the area. Its members hold regular meetings and social events as well as hosting local functions such as weddings. As Table 7.14 (see below) indicates, this facility plays an important role in terms of providing an opportunity to remain connected with their community. Further, in the aftermath of the tornado disaster, this centre was a used to shelter and feed victims and responders alike. Later on it was used to support and coordinate the volunteer effort during the recovery efforts.

More generally, the importance of nearby venues for the dissemination of disaster information, points to the way that people are still very much embedded in their local communities. Despite globalisation, mass media and modern telecommunications and transportation, people are still grounded in their local areas – they still live *somewhere*. Preferring this type of local, convenient, familiar venue may mean that more centralized locations that do not have that 'community' feel, may not attract as many people (see Kroll-Smith and Gunter 1998:173-175 for a similar discussion). This suggests that the delivery of disaster information may attract the most participation if provided through locally-embedded institutions.

When inquiring about the sources of information people consulted regarding the earthquake threat in California, Turner et al. (1986) determined that television, newspapers and radio rated as the top three sources. Notice that this is the same pattern observed in North Dumfries. In North Dumfries, as in this particular situation in California, a disaster situation was only a hypothetical possibility. Interestingly, the Pine Lake participants, in sharp contrast to Turner et al., stated that official organisations were important sources of information. This may be related to their increased knowledge of these organisations and their functions due to the tornado experience. Turner et al. (1986) also found that awareness of the earthquake threat was partly explained by previous experiences with earthquakes. Of course, the other major difference in information resources is the ever growing presence of the internet, especially among younger

people, as a critical source of public information. Murphy (2004) found that 53% of Ontario residents stated that they would consult the internet for emergency preparedness information.

The gender difference is also important to note; men and women did not necessarily consult the same sources and as outlined in some studies, some women were more likely to rely on informal sources such as their partners for information. Taken together, these results suggest that to adequately provide information on emergency preparedness to a wide range of people, public education campaigns must involve a wide range of public media and must be aware that their audience is a heterogeneous population, with different needs and an array of information seeking behaviours.

7.3.4 Emergency Preparedness and Level of Tornado Knowledge

We asked participants the following four questions to test participant knowledge of tornado-related information:

- Which statement most closely reflects your view of what a tornado warning means when it is issued by a meteorologist?
- How long do you have to find shelter after a tornado warning is issued?
- In your opinion, during a serious tornado where would you be the least safe?
- Does your insurance cover damage from tornadoes?

Due to their recent experience, we had expected Pine Lake participants to be more knowledgeable, and thus, more prepared to deal with the possibility of future tornadoes. In their California study, Turner et al. (1986) found that most of their respondents had some knowledge of what to do if an earthquake occurred. However, the results were mixed with a significant relationship only noted for the second and fourth questions. 60% of Pine Lake residents knew that on average, there is only 10 minutes to find shelter after a tornado warning is issued (as compared to 25% from North Dumfries). Conversely, Pine Lake residents were *less* likely to state that insurance covers tornado damage. Both Pine Lake and North Dumfries participants knew that they would be the least safe in a car or mobile home during a tornado. Surprisingly, 81% of Pine Lake and 91% of North Dumfries participants did NOT know that a tornado warning means that a tornado has actually been sighted. These results suggest that beyond basic emergency preparedness information, public education campaigns should also provide information about what to do during the specific types of disaster events that are most common for that area.

In terms of the question regarding insurance and tornadoes, the uncertainty noted by Pine Lake residents appears to be related to the difficulties that many families had in recouping their losses from the disaster. While damage to homes was generally fully covered, this was not always the case for outbuildings, landscape features (e.g. large trees) and barns. In these situations, participants asserted that the item was sometimes only insured for its depreciated, rather than its replacement value, was underinsured, or was simply not covered by standard policies. Beyond

additional funds provided by government aid, this has meant that residents, particularly farmers have had to either rebuild partly at their cost or manage without the destroyed structure.

In this case, the general confusion regarding public understanding regarding what is or is not covered by standard insurance policies and what level of coverage is provided, was a serious problem. This is a problem that could be addressed by the insurance industry through better education, particularly when households first obtain a new policy.

7.4 Perception of Disaster Science and Warnings

To explore participant views of warnings and predictions, we first posed the question: When a weather warning is issued, do you consider it a serious enough threat to alter your plans? In both Pine Lake and North Dumfries about 75% of participants stated that they would alter their plans. Thus, previous disaster exposure was not a factor in this attitude. Of those who would not alter their plans, the primary reason given was that they had heard numerous warnings before (38% in Pine Lake and 69% in North Dumfries) where no significant event materialized. These results seem to support the 'cry wolf' mythology associated with the issuing of warnings. However, since no further questions were asked about the participants' awareness of the withdrawal or termination of weather warnings they may have heard, it is not possible to state conclusively if these data support or contradict the predominant sociological literature on this subject.

In answer to the question -- How accurate do you think the science of tornado warning and prediction is today? -- most participants were quite confident in the science and thought it was somewhat to quite accurate (Table 7.9). However, when we asked Pine Lake residents if they had heard a warning prior to the tornado, 95% stated that they had not heard any warning. As outlined earlier, since it is difficult to predict these types of storms, it is not unusual for very little warning to be provided prior to the storm hitting an area. Although a severe thunderstorm warning had been issued and the tornado actually first touched down at 6:45 p.m., the tornado warning was not issued until twenty minutes later at 7:05 p.m., once the storm had already hit the trailer park. Radar images of this particular storm had not suggested that a tornado was imminent and the provincial Emergency Public Warning System, unfortunately, was not activated. Further, since the tornado did not take on the classic funnel cloud shape, the majority of survey participants who were not in the storm's path stated that they had no idea that a tornado had passed through the area until they began to receive reports from the affected area. For those who were hit directly, the approaching black clouds looked like a severe thunderstorm – not a tornado.

Turner et al. (1986) asked a similar question about the accuracy of earthquake predictions. Their results indicated that the majority of respondents also believed in the scientific accuracy of predictions. These results are interesting considering that the trust and faith in science within modern society is said to be on the decline (Beck 1992). Despite this general societal malaise, people continue to have faith in modern hazard prediction capabilities, even within communities that experienced an event for which no warning was received.

Even if it had been provided, it is not clear to what extent a five or ten minute warning would have been helpful to those in the trailer park, where the majority of serious injuries and all deaths occurred. Within the trailer park, other than the owner's home and a small restaurant, there was

virtually no other place for people to seek shelter. Even if it had been possible to round up everyone on short notice, it seems unlikely that everyone in the park could have squeezed into the available facilities. Surprisingly, no changes were made in the park after the event to provide additional shelter, should another tornado or serious storm occur. This is not a unique situation – campers in all tornado-prone areas often face similar situations during severe storm events. As outlined by the hazard response cycle, since improvements to emergency management rests on learning from our past experiences, it seems short-sighted that the camping industry has not adopted any measures in light of this tragedy.

Further, given that this was a beautiful Friday evening on a campground, when most people were enjoying leisure activities, it seems unlikely that many people would have heard a warning, even if it had been issued. One way to deal with this problem might be to have a weather radio in the camper registration office. Should the radio sound a warning for an immediate serious threat, employees could then pass along the information to the campers via a loudspeaker system, by sounding an alarm, or by informing the campers directly.

Table 7.9: How accurate do think the science of tornado warning and prediction is today?

	Pine Lake	North Dumfries
Very inaccurate	3%	2%
Quite inaccurate	15%	6%
Somewhat accurate	41%	44%
Quite accurate	41%	44%
Extremely accurate	0%	4%
Total	100%	100%

7.5 Perceptions of Government-Level Emergency Management

When asked if government should be involved in protecting households and neighbourhoods against weather-related disasters, over 90% of participants in both communities felt that there was a need for government involvement. Table 7.10 outlines the kinds of activities that participants felt to be the most important. Note that storm prediction and the warning system were quite important for Pine Lake, whereas for North Dumfries, public education was most salient. To put participant preferences within the context of more general government priorities, we then asked: Suppose government officials had additional funds to spend, in what two areas would you prefer the additional money spent? As Table 7.11 indicates, storm prediction and warning systems remain in the top three for Pine Lake, but dropped to seventh place for North Dumfries, where a more important priority was environmental protection.

This latter question in particular, mirrors closely a question asked by Turner et al. (1986). These researchers also found that although support for government action related to mitigation and

emergency preparedness was quite substantial, when rated against other societal priorities, this ranking tended to be reduced. Simpson (1992) also asserts that it is generally difficult to motivate tax payers to support mitigation-related activities. What is particularly important in the current study is the extent to which government emergency management activities remained a priority among those who had experienced the Pine Lake tornado. Again, Turner et al. (1986) had similar findings in that those with the most experience with earthquakes contributed the most support for government action. This suggests that it may be somewhat easier to implement proactive emergency management strategies in communities with prior disaster experience.

Table 7.10: Activities Governments Should Undertake to Protect Communities

	Pine Lake	North Dumfries
Better Storm Prediction and Warning System (p=.000)	51%	25%
Public Education	38%	43%
Provide Community Support for Self-directed EP* (p=.041)	35%	22%
Enforce Building Codes (p=.03)	28%	41%
Better Emergency Plans (e.g. shelter system)	15%	14%
Tax Deductions for EP* Measures	11%	18%
More EP* Research	8%	7%
Financial Incentives (p=.043)	7%	16%
*EP – Emergency Preparedness		

Table 7.11: Government Spending Priorities

	Pine Lake	North Dumfries
Health Care	57%	69%
Education	50%	46%
Storm Prediction and Warning Systems (p=.002)	26%	9%
Police Protection and Crime Prevention	21%	21%
Military	20%	13%
Emergency Preparedness	15%	11%
Environmental Protection (p=.006)	8%	22%

As with the household level, for the municipal level, we asked the same question regarding who should have most responsibility for preparation against a disaster (see Table 7.5). Thirty-five percent of Pine Lake and 29% of North Dumfries participants continued to indicate that individuals had the most responsibility. However, 52% from North Dumfries and 31% from Pine Lake stated that the municipal government played a key role at this level. Interestingly,

26% from Pine Lake (only 7% from North Dumfries) asserted that the provincial government was most responsible. These results indicate that participants both understood that they had an important role to play in emergency management, but that the government should also be involved. They also confirm that there is a lack of public knowledge regarding what various levels of government should do to improve disaster resiliency (see Table 7.10).

Given the basic awareness of household responsibility, but the minimal level of emergency preparedness and the lack of knowledge regarding disasters as well as what activities the government was undertaking, there appear to be plenty of salient topics that could be included in an education campaign. Moreover, there is a large minority of individuals, particularly among those who have experienced a disaster, who may be interested in the contents of such a campaign.

We asked one final question about the role of government:

- Do you think your local government has been actively working to make your community disaster resistant to weather-related events?

The results indicate that neither community perceived their government as active. Further, 34% of North Dumfries residents did not know what their government was doing (if anything), (Figure 7.10).

To contextualize the answers for this last question, it is important to note that the situation within each municipality is quite different. As a result of the Edmonton tornado and several other serious local emergencies, Red Deer County has been actively involved in all phases of emergency management. This pro-active attitude towards emergency management among municipalities that have experience with disasters, is well supported by the literature (e.g. Haque 2000; Karetz and Lindell 1987). The county has a department dedicated to emergency management with its own manager and undertakes extensive training and relationship building activities. Their emergency plan is extensive and upgraded regularly. However, the Pine Lake area is located about 30-45 minutes from the county's center of operations which is based within the City of Red Deer. Also, official first response (from emergency medical services, fire and police) is located at some distance from the Pine Lake area. Although the county was well aware of these problems, limited resources prevented the amelioration of the situation. This has meant that Pine Lake residents often feel isolated when an emergency does occur and Pine Lake residents maintained that they felt somewhat remote and disconnected from the core area of the county's emergency management operations.

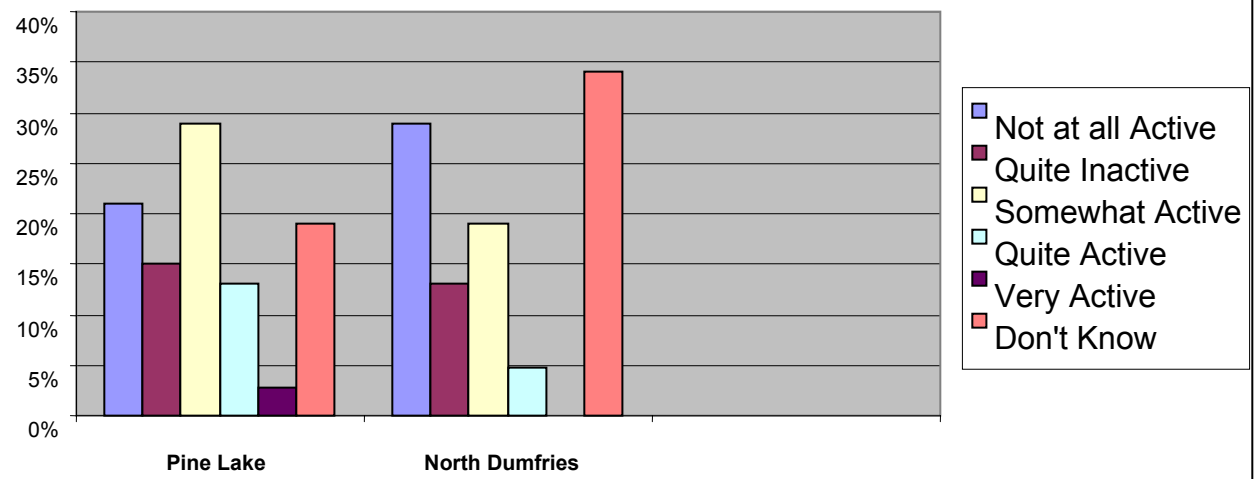
North Dumfries, by comparison, manages the township with a vastly smaller staff in which multi-tasking is necessary. Officials take on emergency management in addition to their other duties. To compensate for this situation, when ever possible, officials take advantage of the excellent emergency management advice and support offered by the Regional Municipality of Waterloo, within which the township is embedded. In Ontario, new legislation now requires all municipalities to upgrade their emergency planning, readiness and response capabilities. North Dumfries is struggling to find the financial and human resources to meet these requirements. Further, as is the case with Pine Lake, official first responders are located some distance from the more remote parts of the township. To compensate for the distance, arrangements have been

made allowing first response in some areas to be handled by the neighbouring City of Cambridge. One advantage of the North Dumfries government is that their offices are located within the rural township itself, giving them a stronger connection to local residents. Unfortunately, the smaller administrative capacity combined with the lack of any experience with a major risk event, except for a chemical fire on a train several years ago, has resulted in North Dumfries being less proactive with their emergency management planning.

In both cases, albeit for different reasons, participant views regarding the emergency management activities of their local government seem partly connected to the rural nature of both areas. Yet, the long history of diverse disaster experiences in Red Deer County, has meant that overall, this area is more prepared for a range of risk events. Beyond these concerns, based on the literature suggesting that active public participation enhances emergency preparedness, we also investigated whether or not local officials in either municipality had made any concerted attempts to engage the local community in the disaster planning process. Beyond some public outreach in the wake of the tornado, this was still a very underdeveloped part of the emergency management process within both communities. Thus, neither municipal government was reaping the benefits of a more engaged, committed citizenry, something considered important by a plethora of researchers (e.g. Perry and Mushkatel 1986, Hutton 2001).

But the efforts of both municipalities must also be placed within the broader context of provincial politics and funding allocation. In both Red Deer County and North Dumfries, local officials would have gladly upgraded services to their citizens, but could not do so because of limited financial and human resources. As outlined by Krajnac (2000) and Prudham (2004) changes in political ideologies and associated funding patterns can have profound effects on municipal-level capacities to deal effectively with a host of problems, including disasters. Although both localities were aware of their vulnerabilities, as ICLR and EPC (1998) point out, proactive emergency management requires the support of higher levels of government – in this case the provincial government.

Figure 7.10: Perception of Government EP Activities



7.6 Perceptions of Vulnerability

The survey assessed the extent to which participants were willing to help vulnerable populations in their neighbourhood become more prepared. We argue that being aware of vulnerable people and willing to help may be indicators of the available social capital within that community. Pine Lake residents were much more likely to indicate that they would be willing to help (Figure 7.11). 87% of men, but only 70% of women said they would help. This mirrors the literature in which it is claimed that women are less likely to help those outside of their family, probably due to their heavy home-based responsibilities. Further, North Dumfries residents were most likely to indicate that they would not know what kind of help might be needed.

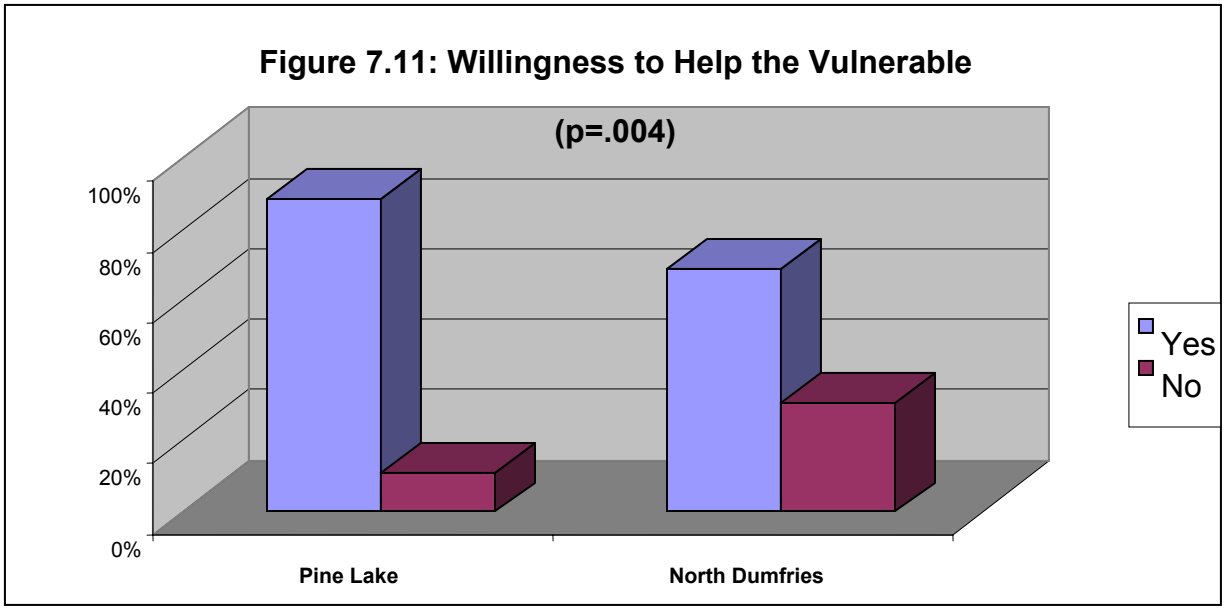
We also asked who residents thought were the most vulnerable (Table 7.13). Racial and ethnic categories were not provided since both communities are predominantly white. Interestingly, Pine Lake participants pointed out that campers (e.g. those in the trailer park) were among the most vulnerable. This is an important contextual factor that increases the vulnerability of all social groups, regardless of their other social characteristics. It is quite notable that participants in both communities were able to identify at least some of the more visible vulnerable groups such as the elderly, sick and handicapped and that residents indicated they would be willing to help those more vulnerable. It is not clear if less tangible issues related to class or family structure, were actually less prevalent in the area or simply not noted by participants. While some research indicates that women, due to their own place in society, may have more awareness of vulnerability, this was not observed in this survey.

At the personal level, it was quite obvious from conversations with residents in both communities that many were well aware of certain friends, neighbours or family members that would require assistance in an emergency. They spoke of particular individuals, such as the mother with young children or the elderly/sick neighbour, who they would immediately check on should a disaster occur. Both these qualitative comments and the quantitative survey results point to the existence of a valuable resource within neighbourhoods and communities. On-the-ground, localized, in-depth knowledge is vital to targeting emergency response towards those most in need. To be of greatest benefit, this information should be incorporated into neighbourhood plans and should be conveyed to planners and first responders at the municipal level (Morrow 1999). One excellent opportunity to access this knowledge would be during public participation processes designed to enhance disaster planning exercises.

When asked what activities they would be willing to undertake to help the vulnerable in their neighbourhood become more prepared, the category ‘act as an emergency contact’ was most often chosen in both communities (Table 7.14). Other endeavours included attending a workshop and physically undertaking capacity enhancing activities in the neighbourhood. Even though actual activity levels never match stated willingness to participate, the overall willingness to help and the range of activities that residents would be willing to undertake, seems to indicate that neighbourhood-based preparedness programs could prove to be successful, even among those who have not experienced a disaster. However, as Tierney (1993) and others outline, the impetuous for, and organisation of, such programs are unlikely to evolve without direction and support from various levels of government and other emergency management advocates. Indeed, of those who would not help those most vulnerable, lack of knowledge and time were the predominant reasons given (Figure 7.12).

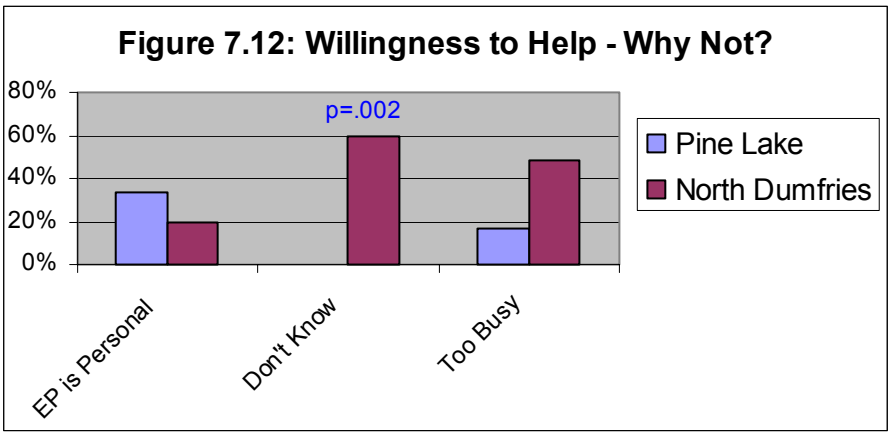
Table 7.13: Who are the most vulnerable residents?		
	Pine Lake	North Dumfries
Older People	58%	47%
Sick/Frail People	38%	58%
Campers	20%	3%
Handicapped People	18%	36%
Families with Young Children	8%	5%
Single Parent Families	6%	3%
Single People	6%	3%
Working Class Families	3%	3%

Table 7.14: Activities Participants Would be Willing to Undertake		
	Pine Lake	North Dumfries
Act as Emergency Contact	55%	45%
Attend Workshop	45%	37%
Be Part of Work Group in Neighbourhood	40%	23%
Deliver Emergency Preparedness Flyers	29%	39%
Organise Workshop	26%	21%
Help With Fundraiser	20%	13%
Help Authorities Identify Those Least Protected	9%	15%



Note that in terms of helping the vulnerable, North Dumfries residents again stated that they would not know what to do (they gave similar answers for household investment in emergency preparedness, see Table 7.7 and under constraints to emergency preparedness in Section 7.3.1). The repeated response from North Dumfries residents that they did not know what to do may be related to their lack of experience with disaster. As Larsson and Enander (1997) noted in their Swedish study, lack of knowledge appears to be strongly related to lack of emergency preparation activity. Pine Lake residents may have become more aware of the needs of the most vulnerable as a result of the tornado and their heightened awareness of their own vulnerability to natural disasters also appeared to encourage them to seek out information from a wider range of sources. These results suggest that while there is an obvious need for public education to reduce household vulnerability, it may be more difficult to design programs that capture people's attention if they have never experienced a disaster.

How then to motivate people to undertake precautionary activities? Beyond the disaster experience, as many researchers point out, targeted information, sensitive to factors such as gender, location, age, stage in the life cycle and so on, may be more successful at reaching the intended audience and encouraging behavioural change. Other contextual factors that must also be accounted for in the information dissemination process include language and ability barriers as well as the variation across societal groups regarding resources such as knowledge and financial assets.



7.7 Community Networks and Relationships

To further ascertain participants' views regarding their neighbourhoods and local disaster resilience, we posed the following four questions, which were all answered on a 5 point Likert scale:

- How would you rate the friendliness of your neighbourhood?
- Would you say this is a safe community in which to bring up children?
- Do you think your neighbourhood is well prepared for a disaster?
- In a disaster situation, would your neighbours help?

The answers were summed to create an index and the index was simplified to three categories – positive views, balanced views and negative views about the neighbourhood and resilience. As Table 7.12 outlines, Pine Lake residents have a more positive perception of their neighbourhood. This is likely tied to the strong role of the community centre within the area and to the long-lasting feelings of community that further developed following the disaster (see Section 7.3.3 and Table 7.16). However, both these small rural communities had quite positive views towards their neighbourhoods. Murphy (2004) also found that rural residents had the most positive perception towards their neighbours. Although some research suggests that the heightened 'sense of community' that develops during the response phase tends to dissipate over time, anecdotal evidence from Pine Lake seems to indicate that in this instance, this was not the case. Residents remarked about the new people they had met during the crisis and the continued sense of gratitude and good-will that they felt towards those that had offered assistance. As outlined by the social capital literature, these positive attitudes towards the local community are an important resource that can be utilized during a risk event.

Table 7.12: Perception of Neighbourhood and Disasters (p=.000)		
	Pine Lake	North Dumfries
Negative Perceptions	0%	7%
Balanced Perceptions	47%	63%
Positive Perceptions	53%	30%
Total	100%	100%

To further understand participants' relationships within their communities and to get another measure of the social capital that may be present, we asked if residents participated in any community activities. Eighty-one percent of Pine Lake residents and 64% of North Dumfries stated that they participated in various sorts of activities ranging from neighbourhood groups to volunteer emergency organisations (Table 7.15). Of those who participated in groups, about 70% indicated that they spent up to 5 hours per week doing these activities. Murphy and Dolan (in review) also noted that about 72% or respondents were involved in volunteer activities in the small town of Walkerton, Ontario. In comparison to other research on volunteer activity, these rural areas may have higher levels of interaction and connection. For instance, as outlined earlier, in his broader study of the United States, not differentiated by type of area, Nehnevajsa (1989) found that about one third of respondents participated in volunteer activities.

We also asked the following three questions about participant ties with family, friends and neighbours.

- How often do you visit with close relatives who are not part of your immediate family?
- How often do you talk to your neighbours?
- How often do you do activities with your friends?

The answers to these questions ranged across five categories, from two or more times per week through to less than once per month. These were summed to form an index of participant connectedness. The scale was simplified to three categories (little, some and good connection). Using this scale, in contrast to the participation in organisations, North Dumfries residents appear to have closer ties to their communities (Table 7.16). Despite these differences, when taken as a whole the robust levels of involvement and connection appear to indicate that social capital is present in both of these communities and that these relationships would be a valuable resource during an emergency (e.g. EMA 2002; Torjam and Leviten 2001).

Table 7.15: Participation in Community Activities		
	Pine Lake	North Dumfries
Neighbourhood Group (p=.047)	74%	28%
Church Activities (p=.05)	53%	36%
Athletic League	30%	36%
Clubs/Hobby	30%	30%
Service Groups	28%	20%
Environmental Group	20%	6%
Local Government (p=.047)	15%	5%
Volunteer Emergency Organisation	7%	5%

Table 7.16: Participant Community Connectedness (p=.015)		
	Pine Lake	North Dumfries
Little Connection	32%	16%
Some Connection	50%	69%
Good Connection	18%	15%
Total	100%	100%

7.8 Impact of the Tornado on Pine Lake Residents

7.8.1 Impact

To assess the impact of the tornado on Pine Lake residents we posed a number of questions. First, 86% of participants said they had been affected by the tornado in both positive and negative ways (Table 7.17). Notice that the most often chosen response (tied with anxiety) was 'increased sense of community'. This seems to tie into the ongoing positive outcomes associated with the tornado.

When asked if they had recovered from the tornado (the survey was administered 3 years after the tornado) 71% stated that they had recovered, however that left 29% of participants dealing with residual effects. Of those who continued to suffer effects, residents noted anxiety (11%) and financial costs (6%) as the main long-term impacts. This is a common pattern noted across many studies including Peacock et al. (1997) and Murphy and Dolan (in review). Further, when asked specifically about their financial recovery, 20% indicated that they had made no recovery,

while the remainder had made at least some recovery. Using socio-demographic indicators of vulnerability such as gender and age, no clear pattern emerged regarding who was more or less able to recover. The main sources of financial assistance were government aid (15%), insurance (15%), personal funds (11%), and funds donated to the community (5%). This result corresponds with the primary sources of financial recovery outlined in the literature (e.g. Smith 1992).

In terms of the process associated with recovering their financial losses, the majority of Pine Lake participants felt that the process proceeded quickly, that it was not overly time consuming and that it was a fairly easy process to understand. However, when asked if the process led to equitable and fair settlements, a different picture emerged (Table 7.18). In this case a substantial number of participants were unhappy with the outcomes of the process.

The dissatisfaction with the settlement outcomes, not necessarily with the process itself, was very evident in our conversations with local residents. Although the path of the tornado takes on a bordered, black and white appearance when viewed on a map (See Figure 2.4), in reality when individual properties were assessed the situation was vastly different. For instance, residents complained that the provincial government committed support to those who had been affected by the tornado, but avoided paying compensation to some individuals by excluding those who had only been affected by 'high winds'. They maintained that this resulted in strange situations where very close neighbours, with seemingly comparable damage and located within the tornado path, did or did not qualify for assistance, depending on the evaluation of their particular property by government officials. Other properties, located just outside the 'border' of the tornado's path were also denied aid, despite substantial damage. In terms of insurance, these distinctions were not important, since all 'high winds' including tornadoes, were covered. Concerns about insurance revolved around different issues (see Section 7.3.4).

In the wake of a disaster, concerns about the compensation process and outcomes are not unusual. For instance, Murphy and Dolan (In review) note that after the water-borne disease tragedy in 2000, many Walkerton residents are still dealing with the financial, psychological and health impacts of the disaster. Further, the second phase of their compensation package has been mired in controversy and delays.

On a more positive note, those who did qualify for aid, particularly affected farmers, were quite pleased with the compensation they received and the way in which their concerns were handled by the provincial government. Similarly, most seemed pleased with their treatment by insurance adjusters.

Table 7.17: Impact of Tornado on Pine Lake Residents	
	Percent Affected
Increased Sense of Community	37%
Stress/Anxiety	37%
Damage to Home/Possessions	31%
Financial Costs	24%
Sense of Accomplishment	18%
Time off Work	11%
Time Crunch	7%
Fatality of Someone They Knew	6%
Injury/Sickness – Friend/Family	4%
Injury/Sickness - Self	3%

Table 7.18: The Process was Equitable and Fair	
	Percent of Pine Lake Participants
Strongly Disagree	11%
Disagree	45%
Neither Agree or Disagree	22%
Agree	22%
Strongly Agree	0%
Total	100%

7.8.2 Local Capacity

To return to the topic of social capital, the survey asked Pine Lake participants about four situations. First, whether or not organisations with which they had prior involvement helped them during the tornado disaster. Thirty-five percent indicated that this was the case. We then asked if their prior involvement with organisations had provided them with an opportunity to help others. In this case, 49% of participants stated that some of the help they provided was facilitated through their association with community organisations. In a third scenario, we asked participants if they had received help from organisations with which they had no prior involvement. Forty-eight percent of participants agreed. Fourth, we asked if participants had

provided any other volunteer work, beyond that orchestrated by formal organisations. Sixty-three percent indicated that they had.

We also inquired about the type of assistance that was provided. As indicated in Table 7.19, an impressive level and range of support was both given and received. Finally, we asked residents about their level of reliance on family, friends and neighbours during the crisis (Table 7.20). Note that in all cases there was substantial reliance on participant relationships and networks to help them get through the crisis. These results suggest that social capital was indeed present (and probably built up) in the community and was utilized to help residents cope with the crisis.

Table 7.19: Type of Assistance Given and Received

	Organisation Help-Self	Organisation Help-Other	Organisation Help-New	Other Volunteering
Someone to Talk to	11%	12%	13%	15%
Repair Work	6%	7%	5%	12%
Helped with Injured	1%	5%	2%	4%
Financial Support	2%	4%	4%	5%
Search/Rescue or Debris Clearing	8%	11%	13%	20%
Checking in, Cooking, Babysitting	5%	11%	9%	14%
Provide Advice	5%	7%	8%	8%

Table 7.20: Reliance on Relationships During Crisis

	Family	Friends	Neighbours
None at All	15%	13%	20%
Slight Reliance	16%	21%	14%
Some Reliance	13%	15%	14%
High Reliance	28%	33%	38%
Extreme Reliance	28%	18%	14%
Total	100%	100%	100%

Due to the relative isolation of the Pine Lake area from official disaster organisation response estimates from different sources indicated that it was about 30-45 minutes before fire, paramedic and police services arrived. This is the lag-time until 'official' response that Simpson (1992)

pointed out in his study. As he and others (e.g. Kartez and Lindell 1987) suggest, by this time the community had already sprung into action. The community response to this disaster is yet one more example that debunks the myths related to victim panic and social disorganisation and supports the contention that communities are resourceful and resilient, even under duress (Quarantelli 1988). At Green Acres, less injured victims searched through wreckage for anyone who was trapped, turned off propane tanks and carried the more injured up the hill to a central area. Neighbours with fire and medical knowledge quickly set up a triage area and began to deal with the most critically injured. Others, with access to tractors, boats and chainsaws began combing the area for survivors and removed debris that was hindering transportation efforts. Many of the injured were taken to area hospitals by local residents or by other victims (For more specific accounts see Elnora-Pine Lake History Book Association).

Within a short time of the tornado touching down, local resources were called into play. The 'Hub' became the Red Cross victim registration centre and the nearby Mennonite community came bearing huge quantities of food for both victims and responders. Since in the initial hours after the tornado struck, most official response was focused on the trailer park, in the farming and cottage areas, most first response was undertaken by neighbours and friends. Residents spoke of friends frantically attempting to clear very long laneways of fallen trees in order to reach victims' homes.

In the next few weeks volunteer convergence continued in the area, both by immediate neighbours and by people and organisations from across Canada. For instance, businesses donated significant quantities of supplies, the local oil refinery sent their emergency response team and the nearby prison offered a team of prisoners to help with debris clearance. Individuals from the community and beyond also came forward to help with such activities as tree/debris removal and fence mending. In cooperation with the county, the coordination and feeding of volunteers was facilitated by Pine Lake residents. This was a massive undertaking involving matching the needs of many businesses, farms and homeowners with the capacities of those who were volunteering and then making sure that the volunteers were transported to the appropriate locations and looked after while they were there.

One of the most long-term, visible effects of the tornado was the devastation of Pine Lake's wooded areas, hedge rows and treed landscapes. To address this situation, a local resident spearheaded the development of a volunteer organisation called "Trees Please" that solicited the donation of trees, equipment and labour. They successfully replaced hundreds of trees in the affected area as well as further fostering positive social cohesion within the community (see Figure 7.14). The development of this type of voluntary organisation is a good example of the type of recovery activity that contributes towards the long-term resilience within the affected community.

It is important to note that none of these voluntary response activities arose through an organisational structure pre-designed to deal with emergency situations. In other words, there were no grass-roots emergency plans or groups in place in the Pine Lake area. Yet, the literature suggests that having basic neighbourhood plans in place can substantially increase risk resiliency. Indeed, people involved with the "Hub" mentioned that they would like to have some basic equipment and training to be better able to respond to risk events. Especially in rural areas, where there may be a substantial time-lag before the official response even for minor events, it

would seem to be a prudent approach to have voluntary responders better prepared to meet these challenges. The literature also maintains that response tends to involve organisations, such as neighbourhood associations and service groups, not normally thought of as emergency response groups. This was certainly observed in Pine Lake and supports the idea that disaster response will tend to require the interaction of organisations that do not normally have regular contact. As outlined in the literature review, these results suggest that resiliency to disasters can be improved by involving all organisations that may have 'disaster relevant resources' in the emergency planning process (Kartez and Lindell 1987; Garaventa et al. 1984).

These types of responses to a disaster situation are the norm, rather than the exception. Dynes (1998) has developed a typology of organisations that respond in a disaster situation. Beyond pre-established groups, he notes the strong tendency towards voluntary, emergent organisational patterns. He states this is common across a wide range of disasters, in both developed and developing countries. Within Canada, both Scanlon (1997) and Murphy and Dolan (in review), among others, have also noted this trend. Despite this recurring pattern, it is often the case that emergency management plans, either within municipalities or within first response organisations, do not incorporate any preparation to deal with, and effectively utilize these available resources. As Stalling (1998) states, stemming from a strong background in military security approaches, emergency management groups seem to feel that it is a point of organisational pride that they can handle everything themselves; that they have everything under control. This perception seems to persist even though it is illusory and the reality points to a more fluid, dynamic, emergent response to disasters.

Although positive, altruistic behaviours and attitudes dominated during the tornado response, some tensions were evident within Pine Lake, particularly among affected property owners (farmer, rural residential and seasonal residents) and between property owners and the campers from Green Acres. In the night time hours after the tornado hit, it was not immediately apparent that an extensive rural area, beyond the trailer park had also been affected. Some comments were made by participants that the rural area should have received more help in those initial first few hours and that the media virtually ignored the destruction beyond Green Acres. While it is true that all deaths occurred in the park, and all participants grieved for this loss of life, in terms of the long-term effects on the environment and their livelihoods, permanent residents sometimes felt that their perspectives and concerns were ignored. Among the property owners themselves, there was also tension created by the compensation process since some felt that, in comparison to other residents, they had received less support, or had been denied help due to the government designation of their property as a 'high wind' area. In other instances, participants made comments suggesting that they felt that the financial resources, educational levels or political connections of some residents resulted in better settlements. These findings indicate that in both these situations, both among the property owners and between the owners and campers, evidence of insider/outsider tensions were visible. Thus, although the more positive aspects of social capital certainly predominated, negative aspects were also present.

On a more positive note, as suggested by the social capital literature and other disaster studies about relationships and volunteerism, formal ties with community groups and informal ties with family, friends and neighbours were important resources utilized by the community during the crisis. Murphy (2004) and Murphy and Dolan (2003) found a similar pattern for the electrical power blackout of August 2003 and Walkerton water contamination disaster in 2000. The

networks of relationships provided substantive support including emotional and financial assistance, as well as aided with the physical tasks involved of recovering from a risk event.

Figure 7.13: Tornado Destruction in Rural Areas

Source: Elnora-Pine Lake History Book Association

Ruined grain bin on Feil's farm
photo by Lloyd Feil

Figure 7.14: Recovery - Replanting Trees

Source: Elnora-Pine Lake History Book Association

Spruce trees delivered to A. Page farm
photo by Betty Page

8 DISCUSSION/RECOMMENDATIONS

This report began by summarising a range of literature related to natural disasters, particularly tornadoes as well as the perception and management of disasters at the local level. This was followed by an analysis of data collected during the empirical phase, in which the disaster experience, perceptions and emergency management of two rural municipalities, Red Deer County, Alberta and North Dumfries, Ontario were compared using both quantitative and qualitative research methods. Throughout the evaluation section, the specific empirical results were interpreted in light of the pertinent literature. Based on these findings, this final part of the report provides general recommendations, applicable beyond the immediate focused case study results. These recommendations are able to extrapolate beyond the local context by combining the empirical results from this study with the insights obtained from the literature review. As with all recommendations, their suitability for particular contexts must always be carefully evaluated in terms of the local situation. Nevertheless, we hope that communities, as they continue to strive for improved disaster mitigation and preparedness, will find these ideas helpful.

1. The disaster experience has a profound influence on the management of hazards and disasters at the local level – both in terms of the municipality approach as well as the perceptions and activities of community residents. Generally, those households and localities with more experience will tend to be more aware of potential dangers and better prepared for any disaster events. This implies that for *both municipalities and households* that have not recently experienced a disaster, a proactive approach towards mitigation and emergency preparedness will be more difficult to stimulate and maintain. One caveat is that there is some ambiguity related to the positive preparedness attitude generated by the disaster experience. Viewing extreme devastation may lead to a sense of fatalism, in that people feel powerless to prepare against such massive destructive forces.

2. Beyond the disaster experience, there are also other factors that influence local emergency management. For instance, in this study it was shown that gender also had a strong influence on risk perceptions as well as on the views towards the management of hazards and disasters. Since gender differences exist in virtually every culture on earth, we argue that gender should always be considered a fundamental factor in planning for and recovering from disaster events. That said, depending on the particular local contexts, the influence of gender, or a host of other factors such as race, ethnicity, age, economic status, etc. on emergency management processes and outcomes will vary substantially. It will largely be dependent on the extent to which the presence of such factors leads to either the vulnerability or enhanced capacity of the affected populations.

3. At the municipal level, public outreach programs, designed to raise awareness and encourage preparedness activities must be targeted to address the particular needs and concerns of the various populations and communities within its borders. In order to accomplish this goal, municipalities should: 1) fully evaluate the local context to categorize the households and their needs, 2) design complementary, but differentiated, outreach programs that can address the identified needs, 3) deliver the programs using a variety of media, taking care to include those with disability, language or other barriers,

4) deliver the programs in a dispersed manner involving already established neighbourhood/group community venues, 5) time the delivery of programs to coincide with moments in the public domain when the public is more likely to 'hear' the message (e.g. after a minor local crisis or a major event dominating the media) 6) provide practical advice that outlines easily accomplished activities, 7) provide support to households and neighbourhoods as they attempt to undertake the suggested activities (e.g. tool lending, tax breaks, advice), and 8) provide additional support to those who are not be able to improve their disaster resilience without outside assistance.

4. Disaster resiliency within communities requires more than emergency management at the governmental level. Communities that acknowledge, and provide for, the needs of all their members and that have the basic health and safety services in place are better positioned to prepare for and respond to any crisis or disaster. In today's interconnected society, communities cannot achieve these goals without the consistent support of higher levels of government.

5. Within municipalities, smaller communities, such as neighbourhoods or rural areas encompass a wealth of resources that are often not recognized as important in increasing disaster resilience. Residents often have extensive knowledge of both the vulnerabilities and resources that exist with their area and many appear willing to become active in emergency management activities – if support and direction is provided.

6. An integral component of all households, communities, neighbourhoods and groups is the web of relationships that provide the bonds and trust among their members. These relationships, called social capital, tend to foster positive development and are an important resource that is called upon during a disaster event. Social capital is one of the locally-embedded resources that flourishes with government support. Sponsorship of neighbourhood groups, local art events, homeless and crisis shelters, literacy programs, sports events, etc. lead to benefits beyond the immediate provision of activities and services – they also encourage interaction among residents and the development of social capital. However, it is also important to note that there is a need to foster interaction among various groups and communities in order to avoid the problems of inter-group alienation.

7. Warnings about impending disasters form a key part of emergency management. An effective communication system involves predetermined protocols between provincial warning systems and local television and radio stations, as well as a way to ensure that there is efficient warning for vulnerable groups, including hospitals, group homes, retirement institutions, schools, trailer parks, day care, and churches.

8. As demonstrated by the trailer park at Green Acres, warning systems and provisions for shelter should be incorporated into the design and management of all camping facilities to reduce the vulnerability of all recreational users.

9. Local residents, especially those that have experienced disaster, are strongly in favour of maintaining and enhancing Early Warning systems. In Canada, current government cutbacks are undermining existing systems and preventing their further improvement.

10. The role of public participation is especially important. Emergency planners need to engage local people to develop an emergency plan so that locally-relevant and socially acceptable activities and initiatives are devised. The process involving citizens in a 'meaningful' way – that is, they should play an active role in the development and implementation of an emergency plan – will itself build capacity in the community to better prepare for and response to hazard/disaster events.

11. The role of residents as initial, informal 'first responders' is also fundamental. Contrary to traditional views that people in crises will act irrationally and hysterically, the Pine Lake example illustrates that victims themselves are often the first to help those in need. Formal first responders should acknowledge these roles and devise, in advance, protocols to manage such situations. In some cases, victims and local people who want to continue to help are left feeling helpless and powerless by formal emergency responders who arrive on the scene to take control. While it is imperative that trained authorities manage the health and safety of such situations, some forethought as to how to handle informal first responders would help relieve some of the anxiety they feel when formal authorities take control of disaster situations.

12. Although orthodox thinking within the insurance and economic sectors often discounts the value of encouraging households to engage in home improvements or other activities that increase disaster resiliency, the results from this study suggest that this approach deserves further analysis. It appears to be the case that under the right circumstances (e.g. when purchasing a new house) people may be willing to invest in making their homes more disaster resilient.

Figure 8.1: Recovery – Memorial at Green Acres

Source: Elnora-Pine Lake History Book Association

Memorial Park – Green Acres, July, 2001
photo by Tim Forsberg

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