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~Amy~
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1.1. Introduction and Purpose of Thesis

Indiana is vulnerable to many natural hazards including flooding, severe thunderstorms, and tornadoes. On October 18th, 2007, an EF-3 tornado struck the small Amish town of Nappanee, Indiana, damaging more than 450 buildings. The tornado struck at 10:05pm, when most people were settling down for bed. The National Weather Service had been monitoring the weather situation closely for several days and had made numerous public notices regarding the potential for severe weather, including the possibility of tornadoes. However, the Amish of northern Indiana, trusting that all events are part of God’s plan for them, had no real concern for hazardous weather and reject modern means of communication, making it difficult for emergency management and National Weather Service personnel to get the severe weather message to their community.

1.2. Problem Statement

The purpose of this study is two-fold. The primary problem to be addressed by this thesis is to understand how a tornado hazard analysis can aid
local emergency managers in the development of a comprehensive hazard mitigation plan. To this end a tornado climatology for Indiana was created for use by emergency managers as part of a comprehensive, local hazard analysis. The secondary objective of this thesis was to examine the unique needs of the Amish community in terms of the emergency management phases and formulate suggestions for tailoring mitigation activities of local emergency management programs to this diverse community. An overview of the 18 October 2007 Nappanee tornado in Elkhart County is presented as a basis for discussion into the mitigation, preparedness, prevention, response, and recovery needed by a socially vulnerable community from a tornado.

1.3. *Significance of Study and Objectives*

This thesis examined tornado hazards in Indiana in order to create a statewide, comprehensive tornado hazard analysis which may then be used as part of local emergency management mitigation plans. Critical to the discussion of an effective mitigation program is a discussion of the local community. This thesis examined a unique community within northern Indiana and reviewed the actions of that community to a real-life natural disaster in order to provide suggestions for tailoring a mitigation program to that community. It was the intent of this thesis to develop suggestions for local emergency managers with a similar community to use as part of their mitigation planning. The real-life event concentrated on issues related to mitigation and recovery of the Old Order Amish community through a case study of a tornado in Elkhart County, Indiana, on 18 October 2007. A discussion of the disaster recovery process of Amish and non-
Amish households and businesses in northern Indiana enabled local emergency managers to gain a better understanding of disaster recovery needs for specialized populations. A statewide tornado hazard analysis identifying the frequency, severity, and geographic dispersion of tornadic events over the period from 1950-2006 provided a closer look at Indiana’s seasonal distribution of tornadoes, allowing emergency management personnel to mitigate against and prepare for a tornadic event and to tailor these efforts to a non-traditional community.

The significance of this research was the creation of a tornado climatology not only for Indiana, but allowing that climatology to assist in hazard planning for an area with a unique community population. The overall goal of this study was to provide emergency managers with a quick glance of Indiana’s tornado climatology to enable them to prepare for the hazard. A secondary goal of this research was to examine the recovery from a tornado in Indiana Homeland Security District 2 looking at both the Amish and non-Amish communities.

With limited staff and time and numerous anti-terrorism projects that fund not only the emergency management agency but other public safety agencies in the county, a hazard analysis, though vital to the community and success of an emergency management program, may not be given its due process. This thesis aimed to provide a detailed tornado hazard analysis for Indiana communities, particularly Elkhart County. With this information, Indiana’s Emergency Managers
can better plan for tornadic events through all phases of emergency management- mitigation, preparedness, response, and recovery.

1.4. Study Region

The primary study region for this project was Indiana Department of Homeland Security District 2 (Figure 1.1) in north central Indiana along the Michigan border, particularly the town of Nappanee (Figure 1.2), located in southwest Elkhart County. Elkhart County was chosen as the study area due to its relatively high population of Amish residents and the rarity of a tornado occurrence in a primarily Amish community.
Figure 1.1. Indiana Department of Homeland Security Districts (Indiana Department of Homeland Security, www.in.gov/dhs).
Figure 1.2. Elkhart County and the Town of Nappanee, Indiana.

Through the creation of unique tornado days within Indiana and interviews with Amish and non-Amish who were affected by the Nappanee tornado, it is the intent of this thesis to aid local emergency managers in beginning a dialog with their Amish communities and aiding them in all phases of emergency and disaster management.
There are many ways to develop a tornado climatology. The climatology developed for this thesis is unique because it focuses on the creation of a catalogue of unique tornado days, rather than reports of individual tornadoes, tornadoes by strength, killer tornadoes, or long track tornadoes which have all been created by other researchers. This climatology will enable emergency managers to implement a tornado component to their county hazard analysis. Emergency managers may use the climatology to illustrate the risk to their local communities, including Amish populations, who have unique concerns when it comes to disaster preparedness and response.

2.1. Tornado Climatology

2.1.1. What is a tornado climatology?

A climatology involves collecting data over a given period to analyze trends or patterns. Schaefer et al. (1993) examined various decadal periods of tornadic events and found that a more accurate picture of a tornado climatology should
include a minimum of thirty-five years of data. When comparing events across a
five or ten-year period, United States tornado frequencies show large
discrepancies in tornado maximas and minimas. A more accurate picture can be
gauged with a longer climatology. Prior to cross-referencing by Kelly et al (1978),
tornado data from 1950-1976 was considered heavily biased. Kelly et al
examined more than 17,000 tornado reports from 1950-1976 to obtain a
consistent and clean tornado climatology. Therefore, tornado data can be
considered relatively accurate from 1950 to the present. For the purpose of this
project, a fifty-seven year climatology was used (1950-2006).

Although a graphical climatology of U.S. tornadoes (including data prior to the
early 1950s) would show a dramatic increase in tornadic activity around 1952, it
is not the frequency of tornadoes that has increased, but the frequency in the
*reporting* of tornadoes that has increased. This reporting increase comes from
greater public awareness of severe thunderstorms and tornadoes due to National
Severe Storms Forecast Center (NSSFC) public severe weather statements
beginning in 1952.

2.1.2. *Limitations of a tornado climatology*

Numerous limitations in the various tornado databases have been
highlighted in meteorological publications. One of the primary limitations with
tornado climatologies exists in F-scale classifications. Prior to 1972, no scale
existed to classify tornadoes. In 1971, Dr. Tetsuya “Ted” Fujita of the University
of Chicago developed the Fujita Scale to provide a method to rate the intensity of
tornadoes (by estimated wind speeds) based on damage caused to various structures. There was a need to be able to rate tornadoes in the historical database as well as future tornadoes as they occur. Doswell (2007) includes small sample size in his list of data quality issues. Kelly et al (1978) showed the inconsistencies of the tornado database from 1950-1976. Doswell and Burgess (1988) discussed F-scale rating and very long path tornadoes in their article *On Some Issues of United States Tornado Climatology*.

The National Weather Service (NWS) applies the Fujita Scale in rating tornadoes. Although the Fujita Scale has been in use for several decades, there are several limitations, primarily a lack of damage indicators, no account of construction quality and variability and no definitive correlation between damage and wind speed. These limitations have led to inconsistent rating of tornadoes.

Fujita scale ratings are subject not only to structural integrity, but to the experience of the damage assessor as well. Damage ratings may be subject to the assessor’s knowledge, experience, and personal biases. Lack of adequate training for damage assessors may lead to default Fujita scale ratings, such as the National Weather Service’s guideline of assigning F2 ratings in borderline F1/F2 damage. Wind speeds estimated by spotters or chasers may also be used in assigning F-scale ratings when structural damage is lacking (the tornado hits in an open field or hits a decrepit barn). Lack of qualified NWS damage assessors may negate the need for damage assessment to be done by unqualified local officials.
Key to the use of the original Fujita scale is the understanding that it is a damage scale, not a tornado intensity scale. Damage inflicted by a tornado is subject to the structural integrity of the object being hit. For example, a wood frame building will be demolished under weaker winds than a concrete building. Verbout et. al. (2006) discussed problems with the Fujita Scale rating of tornado damage. These limitations have led to inconsistent ratings of tornadoes including occasional overestimation of tornado wind speeds. At the urging of meteorologists, engineers, and researchers, a consistent damage classification standard was developed based on the original Fujita scale. This new scale, termed the Enhanced Fujita (EF) Scale, incorporated DIs (Table 2.1) and DODs (Table 2.2). For each DI, several DODs are identified, ranging from minimal damage to complete destruction. Each DOD requires a higher expected wind speed than the previous DOD. The estimated wind speeds are then correlated to an EF rating, from EF0 – EF5. In February 2007 the EF Scale was put into use for all subsequent tornadoes. The correlation between the Fujita Scale and the Enhanced Fujita Scale can be seen in Table 2.3.
<table>
<thead>
<tr>
<th>Number</th>
<th>Damage Indicator</th>
<th>Damage Description</th>
<th>Exp**</th>
<th>LB</th>
<th>UB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Small barns, farm outbuildings</td>
<td>Threshold of visible damage</td>
<td>65</td>
<td>53</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>One- or two-family residences</td>
<td>Loss of roof covering material (&lt;20%), gutters and/or awning; loss of vinyl or metal siding</td>
<td>79</td>
<td>63</td>
<td>97</td>
</tr>
<tr>
<td>3</td>
<td>Single-wide mobile home</td>
<td>Broken glass in doors and windows</td>
<td>96</td>
<td>79</td>
<td>114</td>
</tr>
<tr>
<td>4</td>
<td>Double-wide mobile home</td>
<td>Uplift of roof deck and loss of significant roof covering material (&gt;20%); collapse of chimney; garage doors collapse inward or outward; failure of porch or carport</td>
<td>97</td>
<td>81</td>
<td>116</td>
</tr>
<tr>
<td>5</td>
<td>Apartment, condo, townhouse (3 stories or less)</td>
<td>Entire house shifts off foundation</td>
<td>121</td>
<td>103</td>
<td>141</td>
</tr>
<tr>
<td>6</td>
<td>Small retail building (i.e. fast food)</td>
<td>Large sections of roof structure removed; most walls remain standing</td>
<td>122</td>
<td>104</td>
<td>142</td>
</tr>
<tr>
<td>7</td>
<td>Masonry apartment or motel</td>
<td>Exterior walls collapsed</td>
<td>132</td>
<td>113</td>
<td>153</td>
</tr>
<tr>
<td>8</td>
<td>Large sections of roof structure removed; most walls remain standing</td>
<td>Most walls collapsed in bottom floor, except small interior rooms</td>
<td>152</td>
<td>127</td>
<td>178</td>
</tr>
<tr>
<td>9</td>
<td>Motel</td>
<td>All walls collapsed</td>
<td>170</td>
<td>142</td>
<td>198</td>
</tr>
<tr>
<td>10</td>
<td>Institutional building (i.e. hospital, government, university)</td>
<td>Destruction of engineered and/or well constructed residence: slab swept clean</td>
<td>200</td>
<td>165</td>
<td>220</td>
</tr>
<tr>
<td>11</td>
<td>Large shopping mall</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Large, isolated retail building</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Automobile showroom</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Automotive service building</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*DOD is degree of damage  ** wind speed values are in mph

Table 2.2  Enhanced Fujita Scale Degrees of Damage (Texas Tech Wind Science and Engineering Center, 2006)
In the mid-1980s, Tom Grazulis undertook a 9-year, cross-country project to verify tornado reports kept by the National Severe Storms Forecast Center. The initial data set, commissioned by the Nuclear Regulatory Commission (NRC), contained approximately 15,000 tornadoes, many prior to the 1972 inception of Fujita scale damage ratings. Grazulis’ tornado project took him to small towns and large cities in search of archived tornado events wherein he sought to classify or reclassify each event with an F-scale rating. He found nearly 4 percent of the National Severe Storms Forecast Center’s tornado data set had a change in damage classification (Grazulis, 1993a). His work, *Significant Tornadoes: 1680-1991*, is perhaps the most comprehensive collection of tornado events available.

<table>
<thead>
<tr>
<th>F Number</th>
<th>Fastest 1/4-mile (mph)</th>
<th>3 Second Gust (mph)</th>
<th>EF Number</th>
<th>3 Second Gust (mph)</th>
<th>EF Number</th>
<th>3 Second Gust (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>40-72</td>
<td>45-78</td>
<td>0</td>
<td>65-85</td>
<td>0</td>
<td>65-85</td>
</tr>
<tr>
<td>1</td>
<td>73-112</td>
<td>79-117</td>
<td>1</td>
<td>86-109</td>
<td>1</td>
<td>86-110</td>
</tr>
<tr>
<td>2</td>
<td>113-157</td>
<td>118-161</td>
<td>2</td>
<td>110-137</td>
<td>2</td>
<td>111-135</td>
</tr>
<tr>
<td>3</td>
<td>158-207</td>
<td>162-209</td>
<td>3</td>
<td>138-167</td>
<td>3</td>
<td>136-165</td>
</tr>
<tr>
<td>4</td>
<td>208-260</td>
<td>210-261</td>
<td>4</td>
<td>168-199</td>
<td>4</td>
<td>166-200</td>
</tr>
<tr>
<td>5</td>
<td>261-318</td>
<td>262-317</td>
<td>5</td>
<td>200-234</td>
<td>5</td>
<td>Over 200</td>
</tr>
</tbody>
</table>

*Table 2.3. Fujita Scale and Enhanced Fujita Scale Comparison (Texas Tech Wind Science and Engineering Center, 2006)*
2.1.3. Benefits of a tornado climatology

As the number of years in a tornado data set increase, tornado-maxima and minima areas may become more defined. Such maximas may aid in alerting the public to the increased risk associated with the high frequency of events in their area. A hazard analysis may allow insurers to use this climatology to set rates based on increased risk or to offer reduced rates based on the mitigative efforts of a community or homeowner. Researchers use such a climatology to do in-depth studies as to why various areas have such maximas and minimas (land-cover boundaries, greater concentration of a certain storm type, etc.). Similarly, emergency management benefits from a hazard analysis of their area and could better mitigate against (and otherwise plan for) the consequences of tornadoes. The National Weather Service, Storm Prediction Center, universities, emergency managers, and other researchers can use tornado climatologies to study radar signatures, upper-air features, or local topographic features associated with tornado days, locations, season, times, intensities, or parent thunderstorm type. A tornado climatology using individual days tornadoes are likely to occur allows users a quick glance at the probability of a tornado occurrence affecting their community, but may not account for extreme events such as an tornado outbreak, which are only counted as a single tornado day (or perhaps an event spreading across two days).

2.2. Emergency Management
2.2.1. History of Emergency Management in the United States and Indiana

Emergency management is the managerial function charged with creating the framework within which communities reduce vulnerability to hazards and cope with disasters (see Appendix A for definitions). Its vision is to promote safer, less vulnerable communities with the capacity to cope with hazards and disasters. Emergency managers are asked to meet this vision by protecting communities through coordination and integration of all activities necessary to build, sustain, and improve the capability to mitigate against, prepare for, protect against, respond to, and recover from threatened or actual natural disasters, acts of terrorism, or other man-made disasters.

Emergency preparedness had its beginnings early in the turn of the last century with the advent of World War I. In 1916, the United States established the Council of National Defense, having the direct responsibility of “coordinating resources and industries for national defense” and “stimulating civilian morale” (United States Department of Homeland Security, 2006). In turn, the federal government asked that state and local governments also establish their own councils, but much of what was completed related very closely to supporting the war effort, and not for the general protection of the civilian population.

By 1941 the United States, as well as much of the rest of the Northern Hemisphere, was involved in another far-reaching conflict. In response to requests made by states and local governments for the protection of their citizens, President Roosevelt created the Office of Civilian Defense (OCD). The
OCD was charged with “civilian protection to include morale maintenance, promotion of volunteer involvement, and nutrition and physical education” (United States Department of Homeland Security, 2006). Much like the Council of National Defense that came before the OCD, state and local governments were again asked to organize their own councils. After World War II however, emergency protection and preparedness efforts lost their appeal at the federal level.

With the rise of the Soviet Union and their first successful test of a nuclear weapon in 1949, the federal government moved toward a new effort in protecting the civilian population as well as sustaining government functions. Spear-headed by President Truman, Congress enacted the Federal Civil Defense Act of 1950, which placed most of the civil defense burden on the States and created the Federal Civil Defense Administration (FCDA). In 1951, Indiana passed the Civil Defense Act, which created the Indiana Department of Civil Defense.

Although the perceived threat of a nuclear attack weighed heavily on the minds of many leaders during the 1950s, it was not widely discussed until the Kennedy administration. On July 20, 1961, President Kennedy issued Executive Order 10952, that effectively created the Office of Emergency Planning (OEP) and the Office of Civil Defense (OCD). The responsibilities of these offices were quite different from what their names suggested; OEP was an executive level organization reporting directly to the President, charged with non-military emergency preparedness programs, whereas the OCD considered the defense of the “homeland” and reported to the Secretary of Defense.
During the first few years of this decade, Americans were witness to a building and funding boom for fall-out shelters all across the country. The stockpiling of equipment, supplies, and food was also encouraged, which held to President Kennedy’s belief that these civil defense measures acted as “insurance we trust will never be needed – but insurance which we could never forgive ourselves for foregoing in the event of catastrophe” (United States Department of Homeland Security, 2006).

Under the leadership of President Johnson, however, civil defense efforts that were specific to nuclear attack began to subside. One of the primary reasons was the significant and catastrophic events that took place later in the 1960s. These incidents included hurricanes Hilda and Betsy which devastated the southeast, and an Alaskan earthquake that caused a damaging tidal wave in California. There was also a lethal tornado outbreak that swept through the Midwest, including Indiana, on Palm Sunday 1965. This one incident still remains the most devastating tornado outbreak in Indiana history, taking the lives of 137 people.

As a consequence of these events, Indiana’s own Senator Birch Bayh (father of former Governor Evan Bayh), sponsored a piece of legislation which would grant emergency federal loan assistance to disaster victims. This bill passed in 1966, allowing for additional funding for those citizens impacted by disaster events. Over the next decade, nuclear attack shared the spotlight with, and in some instances took a backseat to, the need to prepare for natural disasters.
Interestingly, only under President Richard Nixon did the U.S. see the true merging of the national priorities of nuclear attack and natural disasters, replacing the OCD with the Defense Civil Preparedness Agency (DCPA). It was the first time since civil defense was established that federal funds previously allocated for the preparation of military attacks would be shared with state and local governments for natural disaster preparedness.

Later in the Nixon Administration, the Disaster Relief Act of 1974 (known today as the Stafford Act) was passed and with it came a stronger emphasis on involving state and local governments in preparing communities for natural disasters. It was with the passing of this law that the federal government provided funds to state and local governments for emergency preparedness activities. To this end, Indiana passed the Civil Defense and Disaster Law of 1975, [IC 10-4-1-2], promoting the concepts that would later be called emergency management.

At the end of the decade in 1979, President Carter issued Executive Order 12148, establishing the Federal Emergency Management Agency (FEMA) as the lead agency for coordinating federal disaster relief efforts. At that time, the creation of FEMA represented the single largest consolidation of civil defense efforts in U.S. history, bringing together a large number of federal agencies, departments, and organizations.

Consequently, Indiana also made changes to the Civil Defense Disaster Law, eliminating the Indiana Department of Civil Defense and replacing it with the Indiana State Emergency Management Agency (SEMA). Like FEMA at the federal level, SEMA was comprised of multiple organizations, which included the

Over the next two decades, from the administrations of Reagan to Clinton, the nation bore the brunt of a significant number of natural disasters, to include devastating hurricanes, tornadoes, flooding, and wildfires. Additionally, technological events like those of the Three Mile Island nuclear power plant incident continued to shape how emergency preparedness activities were addressed.

A new threat however, came to the forefront toward the end of the 1990s. This threat was the recurring incidents of both domestic and international terrorism. It was during this period the phrase “weapons of mass destruction” or more commonly, WMDs, came to the forefront of emergency preparedness. Events such as the 1993 bombing of the World Trade Center, the 1994 bombing of the Alfred P. Murrah Federal Building in Oklahoma City, and the bombing of the Khobar Tower in Saudi Arabia, an American military facility, all played a significant role in the next concept of emergency preparedness- homeland security. This new focus on terrorism would be the beginning of what many still see as negligence toward natural hazards and disasters.

The greatest catalyst for the expansion of homeland security came on the morning of September 11, 2001 when nineteen Islamic terrorists hijacked commercial airliners and flew them into the World Trade Center Tower and the Pentagon. A total of 2,974 people died in the carefully planned attacks. The majority of the fatalities were civilians, representing over 90 countries. As a
result, the United States, under the administration of President George W. Bush, launched the War on Terrorism, invading the country of Afghanistan to depose the Taliban, who harbored al-Qaeda, the masterminds of the 9/11 attacks.

The terrorist attacks on the United States in 2001 brought about yet another shift in the focus of government response to disasters. In January 2003, the U.S. Department of Homeland Security was created and was the largest reorganization of a government agency since WWII, incorporating 26 federal agencies and over 200,000 employees. Its primary purpose is to prevent and protect the United States against acts of terrorism, absorbing such agencies as the United State Immigration and Custom Enforcement, the United State Coast Guard, United States Secret Service, and FEMA. Massive amounts of federal funding were passed down to the states and counties to work on anti-terrorism projects, including planning, training, and exercising. Local emergency management agencies were overwhelmed with hundreds of thousands of dollars in grants for each county and no additional staff to help manage these funds (same at the state level, but with millions in funding). Prior to 2001, SEMA doled out about $2M a year in funding to the counties. By the end of 2002, SEMA had $60M in homeland security / anti-terrorism money to dole out, shifting its focus from natural disasters to terrorism.

The 2001 terrorist attacks not only brought about changes at the federal level, but the states were affected as well. Indiana, following the lead of the federal government, established the Indiana Department of Homeland Security in
April 2005. This new department took over the responsibilities and functions of SEMA, absorbing such groups as the Counter-Terrorism and Security Council (C-TASC), the Office of the State Fire Marshal, the State Building Commission, State EMS Commission, and creating the Indiana Intelligence Fusion Center (IIFC). The new Indiana Emergency Management and Disaster Law, IC 10-14-3, provided language that supported both responsibilities and obligations to homeland security and emergency management. As a result, many county and municipal emergency management agencies, took on the additional title of “homeland security”.

As homeland security and emergency management lines begin to cross and areas of public safety responsibilities are shared, the real challenge will be to continue to prepare for, respond to, and recovery from emergencies and disasters in a timely and effective manner.

2.2.3. Phases of Emergency Management- Mitigation, Preparedness, Response, and Recovery

According to McLoughlin (1985), an effective emergency management program “must identify its potential hazards and determine the probable impact that each can have on people and property” (p. 168). The importance of a hazard analysis is underscored by Blanchard et al (2007) in *Principles of Emergency Management*. Throughout this document the vitality of a hazard analysis is discussed- “Emergency management is the managerial function charged with creating the framework within which communities reduce vulnerability to hazards
and cope with disasters” (p. 4), and promotes safer communities that can cope with hazards and disasters. The basis of the emergency management position is to account for all possible hazards and determine risks and vulnerabilities, thus building safer, more resilient communities. This includes mitigative efforts aimed at reducing the potential for future disasters, preparing for those disasters which cannot be mitigated against, responding to disaster situations in a timely and cost-effective manner, and providing recovery coordination after a disaster. Finally “emergency managers value a science and knowledge-based approach…” (p. 4).

The phases of emergency management, though distinct in their purpose, should be thought of as cyclic rather than linear. As a community is recovering from a disaster, planning should be taking place on how to mitigate against that hazard in the future. While working on a mitigating plan, the community should be preparing for the hazard by training to that plan and exercising it to ensure validity. This involves all members of the community, including citizens, community planners, first responders, local government, and subject matter experts.
This thesis focuses on the mitigation needed to prepare a specific community (Old Order Amish) to a specific hazard (tornadoes). Therefore, though all four phases will be briefly discussed, it is not the intention of this thesis to develop a comprehensive emergency management program for a local community, only to enable Indiana emergency managers to develop one piece of a hazard mitigation plan and to give some considerations on a unique, non-traditional community. The tornado climatology addressed by this thesis may be used by emergency managers during the mitigation and preparedness phases, while the case study of the Nappanee tornado addresses the preparedness and response phases of emergency management. Finally, the Amish interviews will help emergency managers with disaster mitigation and planning, therefore addressing the recovery, mitigation, and preparedness phases for a unique community.
2.2.2a. Mitigation

An effective mitigation program involves preparing a community for hazardous events. In order to do this, a hazard analysis must be conducted. This involves identifying potential threats to a community, whether natural or human-caused. Through identification of potential events that could affect a community, efforts can be directed towards mitigation activities and developing effective incident response plans.

According to the Environmental Protection Agency (EPA), a hazards analysis is a three step process: hazard identification, vulnerability analysis, and risk analysis (Blanchard, p. 534). These steps involve conducting an extensive review of the hazardous events that have historically and could potentially affect a community, analyzing the vulnerability of the community to those hazardous based on a variety of factors from land use to population statistics to infrastructure, and determining the risk of that community to the given hazards. This thesis undertook the first two steps in the hazard analysis for Indiana. Local communities will need to pursue a risk analysis, using the tornado hazard analysis, to complete a comprehensive mitigation plan for tornadoes.

In terms of a hazard analysis, determinations of hazard probability, intensity, and location can be made on the basis of historical data collection, scientific research, or community perception of the risk of an event. FEMA (Blanchard, 2008, p. 535) concludes,

When the data for each hazard are combined, a community can determine its relative vulnerability to each hazard. This will allow assignment of priorities for emergency management needs.
Conducting a hazard analysis should be part of an on-going hazard mitigation plan (HMP) that focuses on taking proactive steps in advance of a hazardous event to decrease or eliminate its impact on the community. The HMP involves the coordination of activities aimed at reducing the injuries, deaths, property damage and loss, environmental hardships, and economic losses due to natural or human-caused events and should focus on the long-term benefits to the community of reducing such hazards (Blanchard, 2008).

2.2.2b. Preparedness

Because not all hazards can be mitigated against/ prevented, emergency managers must conduct preparedness activities to get their communities ready for such events. This involves planning for the event, training to the plan, and exercising the plan to ensure it works as anticipated. Preparedness can be thought of as a state of readiness for hazardous events. Barring any chance of mitigation, the best way to protect against the effects of hazards is to be prepared for them. Preparedness and mitigation are key to reducing the impacts of disasters (Blanchard, 2008).

2.2.2c. Response

Perhaps the most visible and well-known phase of emergency management, the response phase is where the mitigation and preparedness phases are tested in a real-life event. This phase involves the use of resources,
both personnel and equipment, to save lives, protect property and the environment, and meet the basic survival needs of a community. The response phase may include the use of emergency declarations, ordinances, or other authorities at a local, state, and/or federal level to enable a community to support short- and long-term actions. Such actions may include enacting a curfew, providing for emergency equipment procurement, providing emergency food, water, shelter, and medical attention, performing search and rescue/recovery operations, and/or declaring a local disaster.

The declaration of a local disaster is critical to having any hope of receiving state or federal aid, including resources or monetary assistance for recovery. Without a local disaster declaration, outside assistance may not be provided. In Indiana, declaring a disaster effectively enacts the local disaster plan as a form of law which must be followed not only by the citizens it aims to protect, but by the supporting agencies included in the disaster response plan.

2.2.2d. **Recovery**

After initial actions are taken to assist the community with life-, property-, and environment-saving, a community begins to transition to a state of recovery. This is the phase where the community begins to return to a pre-disaster state, including restoration of utilities, rebuilding critical infrastructure such as roadways, bridges, schools, and government facilities, and individual recovery. During the recover phase disaster expenses may be recouped and emergency personnel transition from short-term (hours and days) response/operations to
long-term (weeks, months, and perhaps even years) recovery. It is also within this phase that emergency management (in the community-wide sense) must look at ways to prevent a future occurrence of the hazard through mitigative efforts.

2.3. Social Vulnerability and Special Needs Populations

2.3.1. Definition of Socially Vulnerable and Special Needs Populations

One of the most widely accepted versions of social vulnerability defines it as traits of a person or group and their lifestyle or living situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (Wisner et al, 2003). Cutter (2007) also includes in this definition qualifications such as special needs populations (children, elderly, poor health, mental/physical handicaps, transients), gender (women), race and ethnicity (non-white, non-Anglo), socioeconomic status (poor), head of household type (single parents, female head of household), family and social networks, and immigration status which can determine how much of an effect a disaster has on a person. In addition to the immediate impact a disaster may have on an individual or household, vulnerability can also apply to a person’s ability to recover from a disaster or from future disasters. According to Wisner et al (2003),

*Vulnerable groups are also those that also find it hardest to reconstruct their livelihoods following disaster, and this in turn makes them more vulnerable to the effects of subsequent hazard events.*
This includes infants/children; frail/elderly; economically disadvantaged; intellectually, psychologically, and physically disabled; single-parent families; new immigrant and visitors; socially/physically isolated; seriously ill; poorly sheltered social groups (p. 337). A comparison of Indiana counties (Figure 2.2) shows Elkhart County to be in the middle group of vulnerability. In a comparison with the nation (Figure 2.3), Elkhart County rates in the middle – low classification.

Special needs populations are described by the United States Department of Homeland Security’s National Response Framework (NRF) as populations whose members may have additional needs before, during, and after an incident in functional areas, including but not limited to maintaining independence, communication, transportation, supervision, and medical care (p. 4).

In Elkhart County, these definitions would include the Amish who may have difficulty with communication, transportation, and medical care. In some areas they may also be physically or socially isolated, have large numbers of children, or could be vulnerable to illness or injury with no rapid access to medical care. When emergency management considers special needs or socially vulnerable populations in disaster planning, the community is able to recover from disasters more effectively.
Figure 2.2. Social Vulnerability Index, County Comparison within Indiana
(From Cutter, 2007)
Figure 2.3. Social Vulnerability Index, County Comparison within the Nation (From Cutter, 2007)
2.4. Amish History and Statistics

2.4.1. Amish Religious Beliefs

In the Amish community, church is a crucial part of everyday life. The Ordnung, a prescribed set of guidelines for living, dictates everything from dress code to use of technology and requires letting go of one’s own identity to create a stronger community identity. This includes a submission to the authority of the church and its bishops. The Amish are perplexed when outsiders inquire whether one can be a non-church going Amish, as their religion dictates their everyday life. Church and the Amish way of life cannot be separated.

Membership in the Amish church requires submission to an authority beyond oneself. Their belief in gelassenheit, submission to God, to others, and to the church, allows the Amish to lose themselves and find a stronger identity in their collective community of faith (Meyers and Nolt, 2005). Gelassenheit involves giving up one’s own identity to strengthen that of the group. The Amish believe the identity of the community is greater than the identity of the individual. To stand out in the Amish community is frowned upon. Gelassenheit calls for a humble demeanor, in dress, speech, and all acts of daily life. Amish are soft-spoken, defer to the opinions of others, and are hesitant to identify themselves publicly, including through signatures and photographs. Even church bishops beg forgiveness for incorrectness in sermons and ask others to correct what he has said.
Devoting their lives to *nachfolge* “to follow some creed or person” means imitating Christ’s life of service to fellow humans, including taking care of chores when a church member falls ill or building barns for or assisting “neighbors who have suffered disasters, even when those neighbors are not Amish” (Shachtman, 2007, p. 122).

2.4.2. *In This World But Not Of It*

The Amish, pious in their faith and their belief in conforming “not to the standards of this world, but to a higher calling of God”, reject things that represent worldliness, “everyone and everything that stands apart from their understanding of the gospel” (Meyers and Nolt, 2005, p. 11-12). By separating themselves from worldly influences, the Amish believe they are able to remain pure in their faith and their belief that to be a true Christian one should live a life in imitation of Christ; that is, to prepare for the eternal life after death. This separation includes hesitation in accepting assistance from outsiders, a sort of self-insurance program. Meyers and Nolt (2005) point out “the Amish avoid involvement in anything that places them in direct contact with government. Most do not accept…forms of government subsidy”, as government is seen as being part of the outside world (p. 12).

*The Riddle of Amish Culture* by Donald B. Kraybill (2001) discusses eleven kinds of social networks the Amish have established to deal with helping each other through tough times (p. 101-106). The Amish Aid Society, the first of these networks, was established in 1875 to assist community members with fires
and storm damage. Disaster Aid, founded in 1969 in response to Hurricane Camille, has since become a subcommittee of the Mennonite Disaster Service. Mennonite Disaster Service, an Anabaptist organization focused on helping victims of tornadoes, hurricanes, fires, and other disasters through mutual aid, was formed in 1950 in response to the desire of Amish, Mennonites, and Brethrens, all Anabaptist groups, to help their communities in everyday service.

The Amish differ from non-Amish (what they call “English”) in their attentiveness to their religion. The degree to which they practice their religion sets the Amish apart from mainstream Christians. They believe Christians should conform to biblical teachings and God’s higher calling, rebuffing the standards of the world. They follow the Bible through their every move, denying worldly pleasures to live simply so that they may revere God through their lifestyle. To the Amish, “‘worldliness’ is a sign that the boundary is breaking down; giving in to the habits of the world is, in a real sense, giving in to evil. Many elements of Amish culture…help make the boundaries between the Amish and non-Amish worlds unmistakably clear” (Meyers and Nolt, 2005, p. 10). Take, for example, David Wagler’s thoughts on television. Wagler, a columnist for the Amish weekly The Budget, says,

‘When the world is invited into our homes, it accepts the invitation and proceeds to take over… This monster will demand complete submission to its own set of values… We admit it would be convenient to have television sets in our homes to get the news, the markets, and the weather report. But we don’t think we can afford it. The price is too high…We don’t think it is fair to ourselves or to our children to be constantly exposed to the example and teachings of those who do not have the knowledge of the
true God. We will not invite the false gods that personify the goals of this world to enter our homes’ (Shachtman, 2007, p. 80).

In An Amish Patchwork, Meyers and Nolt (2005) describe the idea of mutual aid in the Amish community (p. 14):

The other side of church discipline is accountability and commitment. Members know and support one another and live by an ethic of mutual aid. The church is not an abstraction but a living, breathing social body. It is a group of people that an Old Order individual knows he or she can depend on in a time of need and to which each person expects to contribute some form of assistance. If a fire destroys a house or barn, the grieving family can count on an outpouring of financial and emotional support from the community while recovering from the loss and rebuilding the structure. The vast majority of the Amish do not purchase commercial health insurance because they believe that the sick should depend on the church rather than on a worldly institution in times of need.

2.4.3. Amish in Indiana

In their book An Amish Patchwork (2005) noted scholars Meyers and Nolt conducted extensive research on Indiana’s Amish communities. Movement is a way of life for Amish and Indiana’s 19 settlements come from a variety of backgrounds. Several distinct waves of Amish came to Indiana between 1730 and the mid nineteenth century. The first group arrived from Germany between 1730 and 1770, calling Pennsylvania home until 1840 when a small group ventured west into Indiana, eventually settling along the St. Joseph River in northern Indiana. This group is now known as the Elkhart-LaGrange settlement and is the largest Amish settlement in Indiana. The second wave of Amish from Europe headed straight for the Midwest in the period from 1815 to 1860. This group settled in Allen, Adams, and Howard Counties (Figure 2.4). Many of the immigrants from this era were of Swiss heritage and though they shared the
same faith as their brothers and sisters in the Elkhart-LaGrange settlement, they bore closer ties to their European heritage than did the settlement that had been living on North American soil for more than a century. Lancaster, PA has lent to the patchwork of Amish communities in the southern and eastern parts of Indiana. Settlements in Daviess and Wayne Counties descended from there in the early 1990s.

Since the Amish are divided into church districts rather than towns dictated by political boundaries, the Nappanee Old Order Amish community is spread across Marshall, Kosciusko, St. Joseph, and Elkhart Counties, including the town of Nappanee in southwest Elkhart County (Table 2.4). The community is made up of 33 church districts and dates back to 1842. Of the six oldest Amish settlements in Indiana, the average church district holds 40 households, however, the Nappanee district has 27 households in its district. Once a church district gets too large, a new church district is formed (Meyers and Nolt, 2005).
Figure 2.4. Old Order Amish Settlements by Linda Eberly. (Meyers and Nolt, *An Amish Patchwork: Indiana’s Old Orders in the Modern World*, 2005)
<table>
<thead>
<tr>
<th>Settlement</th>
<th>Origin</th>
<th># church districts in 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Berne (Adams, Jay, Wells Cos.)</td>
<td>1840</td>
<td>32</td>
</tr>
<tr>
<td>2. Elkhart-LaGrange (Elkhart, LaGrange, Noble Cos.)</td>
<td>1841</td>
<td>114</td>
</tr>
<tr>
<td>3. Nappanee (Marshall, Kosciusko, St. Joseph, Elkhart Cos.)</td>
<td>1842</td>
<td>33</td>
</tr>
<tr>
<td>4. Allen Co.</td>
<td>1844</td>
<td>14</td>
</tr>
<tr>
<td>5. Kokomo (Howard, Miami Cos.)</td>
<td>1848</td>
<td>2</td>
</tr>
<tr>
<td>6. Daviess-Martin Cos.</td>
<td>1868</td>
<td>19</td>
</tr>
<tr>
<td>7. Paoli (Orange Co.)</td>
<td>1957</td>
<td>2</td>
</tr>
<tr>
<td>8. Steuben Co., IN and Williams Co., OH</td>
<td>1964</td>
<td>2</td>
</tr>
<tr>
<td>9. Milroy (Rush and Decatur Cos.)</td>
<td>1970</td>
<td>4</td>
</tr>
<tr>
<td>10. South Whitley (Whitley Co.)</td>
<td>1971</td>
<td>1</td>
</tr>
<tr>
<td>11. Salem (Washington Co.)</td>
<td>1972</td>
<td>1</td>
</tr>
<tr>
<td>12. Salem (Washington Co.)</td>
<td>1981</td>
<td>2</td>
</tr>
<tr>
<td>13. Vevay (Switzerland, Jefferson Cos.)</td>
<td>1986</td>
<td>2</td>
</tr>
<tr>
<td>14. Parke Co.</td>
<td>1991</td>
<td>4</td>
</tr>
<tr>
<td>15. Worthington (Owen, Greene Cos.)</td>
<td>1992</td>
<td>1</td>
</tr>
<tr>
<td>16. Wayne, Randolph, Henry Cos.</td>
<td>1994</td>
<td>3</td>
</tr>
<tr>
<td>17. Paoli (Orange, Lawrence Cos.)</td>
<td>1994</td>
<td>1</td>
</tr>
<tr>
<td>18. Rochester (Fulton and Miami Cos.)</td>
<td>1996</td>
<td>1</td>
</tr>
<tr>
<td>19. Vallonia (Washington and Jackson Cos.)</td>
<td>1996</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 2.4.** Old Order Amish Settlements in Indiana (Meyers and Nolt, *An Amish Patchwork: Indiana’s Old Orders in the Modern World*, 2005)
Indiana has two distinct ethnic groups of Amish, Pennsylvania Dutch and Swiss Amish (Meyers and Nolt, 2005). A large group of Amish arrived in the United States in the 1700s and became known as the Pennsylvania German (known today as the Pennsylvania Dutch). These immigrants later made their way to Indiana after 1840 and settled first in the northern parts of the state, including Nappanee. Those Amish who arrived in Indiana at the end of the 20th century also share Pennsylvania roots with the early arrivals. The Swiss Amish descend from Switzerland and made their way into the United States from the 1830s-1850s. They later settled in Allen and Adams Counties, Indiana.

Some Amish districts are more strict than others, preferring the tradition of the old ways to untested modern ways. “Convention is valued more than innovation because it has endured through time and is not as susceptible to the whims of popular culture” (Meyers and Nolt, 2005, p. 15). Change is possible within the Amish community, but is a slow process and must be shown to be of value to the community before it will be instituted.

While the Amish may differ from non-Amish in numerous ways, emergency management must work with a variety of diverse populations. Working with the Amish involves working directly with the bishops. The bishops, believed to be chosen by God, are the voice of the church and the community and guide their congregation in decision making (Meyers and Nolt, 2005). Instituting change in the Amish community means working directly with local bishops.
An examination of tornado climatologies created by previous researchers led to the creation of an Indiana-specific tornado climatology based on unique tornado days. This climatology can then be used by local emergency managers to help prepare their communities for a tornado event. In preparing their communities, planning must be done to incorporate all sectors, including special needs or socially vulnerable populations. This particular thesis focuses on the Amish as a special needs population and will suggest ways to incorporate this community into all phases of emergencies and disasters.
3.1. Study Region Rationale

The unique population of Amish in Elkhart County, coupled with the tornado event which struck their community, provided a rare opportunity to examine the effects of a tornado on this unique community and learn how emergency management can work with the Amish in disaster mitigation, preparedness, response, and recovery.

Indiana Homeland Security District 2 encompasses St. Joseph, Elkhart, Starke, Marshall, Kosciusko, Pulaski, and Fulton counties. While the latter five counties are mostly rural with relatively small populations and large agricultural bases, St. Joseph and Elkhart counties include the cities of South Bend, home to the University of Notre Dame and a large student population, and Elkhart, a diverse community with a relatively large Amish population, respectively.

Elkhart County is Indiana’s 6th most populous county with nearly 200,000 people estimated in 2007 US Census Bureau reports. Of Indiana’s nearly 40,000 Amish, about 60 percent live in the northern counties. It is estimated up to 8
percent of the population of Elkhart County is Amish (Figure 3.1). This percentage is among the highest percentage in the country. The Nappanee Amish number approximately 4,750 and are spread across Kosciusko, Marshall, Elkhart, and St. Joseph Counties (Nolt, pers. comm.). Since Amish live in church districts with no political boundary such as county lines, church districts whose members live in two or more counties are assigned to a county where the majority of their members live. Very few of the Nappanee Amish live in the politically defined town boundaries.
Figure 3.1. Old Order Amish as a Percentage of all Residents, 2000 (Association of Statisticians of American Religious Bodies)
3.2 Summary of Tornado Event

On 18 October 2007, a 20 mile long, ¼ mile wide, tornado struck the small Amish community of Nappanee, Indiana, damaging more than 450 buildings. The tornado struck at 10:05pm, when most people were settling down for bed. Although the tornado path covered 20 miles and was, at its widest, ½ mile (Figure 3.2 and 3.3), no deaths or serious injuries occurred (National Weather Service, http://www.crh.noaa.gov/iwx/?n=18oct07_tornado), A study of US tornadoes 1950-1994 shows 74 percent of all U.S. tornadoes are “weak” with winds less than 110mph (Grazulis, 2008a) and life spans of less than 10 minutes (Storm Prediction Center, http://www.spc.noaa.gov/faq/tornado/), the Nappanee tornado was among the 25 percent of all U.S. tornadoes considered “strong”, with winds estimated 110-205 mph (Grazulis, 2008a). The Nappanee tornado, rated an EF-3 on the Enhanced Fujita (EF) Scale, had winds estimated at 138-165 mph.

The National Weather Service had been monitoring the weather situation closely for several days and had made numerous public notices regarding the potential for severe weather, including the possibility of tornadoes. However, the Amish of northern Indiana reject traditional means communication, making it difficult for Emergency Management and National Weather Service personnel to get the severe weather message to their community.
Figure 3.2. Google Earth Tornado Path Through Nappanee with EF Scale Rating (Northern Indiana National Weather Service Office, http://www.crh.noaa.gov/iwx/?n=18oct07_tornado)
Figure 3.3. Tornado track overlaid on Nappanee map. (Northern Indiana National Weather Service Office, http://www.crh.noaa.gov/iwx/?n=18oct07_tornado)
3.3. **Methodology**

Elkhart County has a history of tornadoes, including several experienced during the Palm Sunday outbreak of 1965 (National Weather Service). Creation of a graphic was essential to providing emergency managers a quick glance at a county’s tornado history. This thesis created a tornado vulnerability map for Indiana using unique tornado days as the indicator of vulnerability. Research has indicated a strong bias when taking into account individual tornado reports. According to McCarthy and Schaefer, “Dr. Stanley Changnon has long advocated the use of “event days” because of its mitigation of the impact of reporting biases (Changnon and Schnickedanz, 1969). When tornado days are plotted against year, the rapid inflation that is apparent in the numbers of reported tornadoes is no longer present” (McCarthy and Schaefer, 2004).

For the purpose of this thesis, unique tornado days were characterized as having one or more tornado events within Indiana in a twenty-four hour period. For example, tornadoes occurring in Noble, LaGrange, and Kosciusko counties at 1200, 1245, and 1726 on May 23\textsuperscript{rd}, 1978 were classified as 1 unique tornado day (5/23/78). A tornado occurring at 1200 on June 12, 1954 in St. Joseph County and a tornado occurring in Marion and Jasper Counties on June 14, 1954 at 1700 would be considered a two unique tornado days. Because tornadoes often contain multiple segments or cross county/state lines and be counted separately, individual tornadoes were not used in this project. Instead, a dataset of tornado days was created. Each twenty-four hour period was considered a unique tornado day. The tornado datasets were broken down by date (d/m/y),
time (CST), county, and Fujita Scale (original version) ranking. If a tornado affected multiple counties during the 24-hour period, each county received credit for 1 tornado day. In the 1950-2006 study period researched for this thesis, Elkhart County experienced 19 unique tornado days (Table 3.1).

### Number of Unique Tornado Days in Indiana Counties 1950-2006

<table>
<thead>
<tr>
<th>County</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adams</td>
<td>18</td>
</tr>
<tr>
<td>Allen</td>
<td>20</td>
</tr>
<tr>
<td>Bartholomew</td>
<td>17</td>
</tr>
<tr>
<td>Benton</td>
<td>13</td>
</tr>
<tr>
<td>Blackford</td>
<td>4</td>
</tr>
<tr>
<td>Boone</td>
<td>22</td>
</tr>
<tr>
<td>Brown</td>
<td>4</td>
</tr>
<tr>
<td>Carroll</td>
<td>11</td>
</tr>
<tr>
<td>Cass</td>
<td>18</td>
</tr>
<tr>
<td>Clark</td>
<td>11</td>
</tr>
<tr>
<td>Clay</td>
<td>7</td>
</tr>
<tr>
<td>Clinton</td>
<td>13</td>
</tr>
<tr>
<td>Crawford</td>
<td>5</td>
</tr>
<tr>
<td>Daviess</td>
<td>18</td>
</tr>
<tr>
<td>Dearborn</td>
<td>9</td>
</tr>
<tr>
<td>Decatur</td>
<td>17</td>
</tr>
<tr>
<td>De Kalb</td>
<td>9</td>
</tr>
<tr>
<td>Delaware</td>
<td>18</td>
</tr>
<tr>
<td>Dubois</td>
<td>11</td>
</tr>
<tr>
<td>Elkhart</td>
<td>19</td>
</tr>
<tr>
<td>Fayette</td>
<td>8</td>
</tr>
<tr>
<td>Floyd</td>
<td>5</td>
</tr>
<tr>
<td>Fountain</td>
<td>7</td>
</tr>
<tr>
<td>Franklin</td>
<td>7</td>
</tr>
<tr>
<td>Fulton</td>
<td>13</td>
</tr>
<tr>
<td>Gibson</td>
<td>11</td>
</tr>
<tr>
<td>Grant</td>
<td>17</td>
</tr>
<tr>
<td>Greene</td>
<td>8</td>
</tr>
<tr>
<td>Hamilton</td>
<td>23</td>
</tr>
<tr>
<td>Hancock</td>
<td>16</td>
</tr>
<tr>
<td>Harrison</td>
<td>13</td>
</tr>
<tr>
<td>Hendricks</td>
<td>20</td>
</tr>
<tr>
<td>Henry</td>
<td>18</td>
</tr>
<tr>
<td>Howard</td>
<td>13</td>
</tr>
<tr>
<td>Huntington</td>
<td>14</td>
</tr>
<tr>
<td>Jackson</td>
<td>14</td>
</tr>
<tr>
<td>Jasper</td>
<td>17</td>
</tr>
<tr>
<td>Jay</td>
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</tr>
<tr>
<td>Jefferson</td>
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<td>Jennings</td>
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<tr>
<td>Johnson</td>
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</tr>
<tr>
<td>Knox</td>
<td>17</td>
</tr>
<tr>
<td>Kosciusko</td>
<td>23</td>
</tr>
<tr>
<td>Lagrange</td>
<td>8</td>
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<tr>
<td>Lake</td>
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</tr>
<tr>
<td>La Porte</td>
<td>17</td>
</tr>
<tr>
<td>Lawrence</td>
<td>11</td>
</tr>
<tr>
<td>Madison</td>
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<tr>
<td>Marion</td>
<td>35</td>
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<tr>
<td>Marshall</td>
<td>23</td>
</tr>
<tr>
<td>Martin</td>
<td>7</td>
</tr>
<tr>
<td>Miami</td>
<td>12</td>
</tr>
<tr>
<td>Monroe</td>
<td>12</td>
</tr>
<tr>
<td>Montgomery</td>
<td>17</td>
</tr>
<tr>
<td>Morgan</td>
<td>15</td>
</tr>
<tr>
<td>Newton</td>
<td>10</td>
</tr>
<tr>
<td>Noble</td>
<td>9</td>
</tr>
<tr>
<td>Ohio</td>
<td>1</td>
</tr>
<tr>
<td>Orange</td>
<td>6</td>
</tr>
<tr>
<td>Owen</td>
<td>11</td>
</tr>
<tr>
<td>Parke</td>
<td>5</td>
</tr>
<tr>
<td>Perry</td>
<td>7</td>
</tr>
</tbody>
</table>

**Table 3.1** Number of Unique Tornado Days in Indiana Counties, 1950-2006.

A retrospective analysis was conducted using both the *Significant Tornadoes* book by Tom Grazulis for data 1950-1995 and the National Climatic
Data Center (NCDC)’s Storm Data database of tornadoes from 1996-2006 for Indiana to determine monthly, diurnal, and day of year distribution of tornadoes. The start of this dataset was chosen as 1950 because consistent tornado reports have been available only since the early 1950s (Verbout et al, 2006). The end of the dataset was chosen as 2006 because it was the last full year the original Fujita scale was in use, thus allowing for consistency in tornado ratings. An analysis was also conducted to determine Fujita Scale strength for Indiana tornadoes compared to national averages. Tornado reports from NCDC were placed into a spreadsheet and sorted the same way as the Grazulis data. With NCDC data, reports are generally given by nearest town or city, rather than by county. Each of the 300 tornado reports for the 1996-2006 period had to be sorted by county and time (UTC) to be consistent with Grazulis data.

Indiana’s tornado history includes tornadoes during all seasons, months, and times of day. From January 1, 1950 to December 31, 2006, there were approximately 482 unique tornado days in Indiana. Using the Grazulis and NCDC records, nearly 1400 tornado reports were recorded in Indiana in the period 1950-2006. This data was further broken down into the number of tornado days occurring in each Indiana county during the study period.

There are several problems with the Grazulis and NCDC data sets:

1) Numerous reports are given for events that may be either a single tornado or multiple tornadoes, making it difficult to determine and
strenuous to the researcher to differentiate between unique tornadoes and multiple reports of the same tornado,

2) A tornado that hit multiple counties was reported multiple times so that a single tornado that hit five counties would be reported at least five times,

3) In some cases data is skewed toward counties that have higher population densities, ie. more people to observe and report tornadoes, and more structures for the tornado to affect, increasing the probability the tornado will cause damage and that damage will a) be observed b) be rated by National Weather Service personnel and c) damage intensity may increase due to compactness of urban areas and tendency for swirling debris to cause subsequent damage to nearby structures.

4) Counties with geographic features that might obstruct the reporting of a tornado (ie. hills, open fields where damage cannot be observed, etc.) tended to have fewer reports of tornadoes.

For the purpose of this thesis, only the first two problems were resolved.

The primary problem with this data is that it contains numerous reports of a single event. For example, if a tornado occurred in Jackson County on March 3, 1995, it might be reported as several events due to reports of the event coming from numerous sources (local law enforcement, local citizens, National Weather Service personnel, etc.) so that it would appear as if several tornadoes actually occurred in Jackson County. This challenge was overcome by creating a
database of unique tornado days rather than events. For the purpose of this thesis, a unique tornado day is characterized as having one or more tornado events within Indiana in a 24 hour period from the time of the first reported tornado. For example, multiple tornadoes occurring in Noble, LaGrange, and Kosciusko counties at 1200, 1245, and 1726 on May 23rd, 1978 are classified as 1 unique tornado day (5/23/78). A tornado occurring at 1200 on June 12, 1954 in St. Joseph County and a tornado occurring in Marion and Jasper Counties on June 14, 1954 at 1700 were considered two unique tornado days. Tornadoes occurring more than 24 hours apart were assigned separate days.

After figuring out unique days for each year, data was cleaned further into unique days across all years, regardless of year of tornado occurrence. This allowed for a look at the seasonality over the 57-year collection period.
<table>
<thead>
<tr>
<th>Month</th>
<th>Day</th>
<th>Year</th>
<th>Hour</th>
<th>Dead</th>
<th>Inj.</th>
<th>F scale</th>
<th>County</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAY</td>
<td>31</td>
<td>1958</td>
<td>2020</td>
<td>0</td>
<td>0</td>
<td>F2</td>
<td>La Porte</td>
</tr>
<tr>
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<td>2</td>
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<td>La Porte</td>
</tr>
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<td>0</td>
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<td>1958</td>
<td>1730</td>
<td>0</td>
<td>0</td>
<td>F1</td>
<td>Jasper</td>
</tr>
<tr>
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<td>8</td>
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<td>2100</td>
<td>0</td>
<td>0</td>
<td>F2</td>
<td>Jasper</td>
</tr>
<tr>
<td>JUN</td>
<td>8</td>
<td>1958</td>
<td>0530</td>
<td>0</td>
<td>0</td>
<td>F1</td>
<td>Porter</td>
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<tr>
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<td>8</td>
<td>1958</td>
<td>2324</td>
<td>0</td>
<td>1</td>
<td>F2</td>
<td>Tipton</td>
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<tr>
<td>JUN</td>
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<td>2125</td>
<td>0</td>
<td>0</td>
<td>F1</td>
<td>Madison</td>
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<tr>
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<td>1958</td>
<td>0040</td>
<td>0</td>
<td>0</td>
<td>F2</td>
<td>Cass</td>
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<td>F2</td>
<td>Cass</td>
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<td>0230</td>
<td>0</td>
<td>1</td>
<td>F2</td>
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<tr>
<td>JUN</td>
<td>13</td>
<td>1958</td>
<td>1600</td>
<td>0</td>
<td>0</td>
<td>F1</td>
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<td>13</td>
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<td>1630</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<td>24</td>
<td>1958</td>
<td>1726</td>
<td>0</td>
<td>0</td>
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<tr>
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<td>1958</td>
<td>1726</td>
<td>0</td>
<td>0</td>
<td>F2</td>
<td>St Joseph</td>
</tr>
</tbody>
</table>

Table 3.2. Raw tornado data collected from Grazulis dataset, 1950-2006.

There were many problems with the raw data. Table 3.2 illustrates a few of the problems with the raw dataset. Events in red were reported multiple times for same county. If these events were within twenty-four hours of each other, they were merged into one unique tornado day. If events were more than twenty-four hours apart, they were counted as two unique days. Events in black were reported only once for a county. Some problems (see June 8-9 event above). If initial report was within twenty-four hours of final report, then event was counted as one unique day. If initial and final reports more than twenty-four hours apart, events were counted as multiple days. Table 3.2 translated to one unique day each for May 31, June 8, June 9, June 13, and June 24. Over a 57-year period, there were five events that occurred on June 8th (1958, 1978, 1981, 1990, and
Therefore, in a 57-year period, June 8th would have a total of five unique tornado days. Table 3.3 illustrates the actual tornado days after cleaning the dataset based on the aforementioned parameters.

<table>
<thead>
<tr>
<th>Unique Days</th>
<th>County (ies) Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAY 31 1958</td>
<td>La Porte</td>
</tr>
<tr>
<td>JUN 8 1958</td>
<td>Henry, Jasper, Porter, Tipton</td>
</tr>
<tr>
<td>JUN 9 1958</td>
<td>Madison</td>
</tr>
<tr>
<td>JUN 13 1958</td>
<td>Cass, Madison, Monroe, Montgomery, White</td>
</tr>
<tr>
<td>JUN 24 1958</td>
<td>Elkhart, St. Joseph</td>
</tr>
</tbody>
</table>

**Table 3.3.** Clean data from Grazulis dataset 1950-2006.

A similar problem arose with multiple day events. For example, a tornado event that started on 27 May 1973 at 1450 UTC and ended on 29 May 1973 at 1420 UTC with events that also occurred on 28 May would be counted as multiple days. This particular example would be counted as 2 days, but which days to assign the unique tornado day value? This was resolved by giving unique tornado day status to the first two days, provided the final report on the third day was within twenty-four hours of the last report on the second day. In this case, 27 May and 28 May would each receive one unique tornado day point, while 29 May would receive no points. However, if the final report on 29 May was more than twenty-four hours after the initial report on 28 May, 29 May would receive its own point while 28 May would receive no points.
After all tornadoes from 1950-2006 were entered into a database and sorted by county, date (d/m/yy), time (CST), and Fujita Scale ranking, each day of the year was assigned a value based on the number of tornadoes it had experienced during that 57-year period. For example, April 14th had 4 unique tornado days in the years 1950-2006. Therefore, April 14th was assigned the value of 4. This value was then calculated into a percentage to analyze the probability of tornado occurrence on April 14th (\# years of tornado occurrence on April 14th / years in study period= % probability). On any given April 14th between 1950 and 2006, there was a 0.07 percent probability of a tornado occurring somewhere in Indiana. Each day of the year was assigned a percentage of probability, which led to a probability of tornado occurrence (%) by day of the year. Further, this value led to a tornado seasonality for Indiana, allowing for a quick glance at the probability of tornado occurrence both by day of the year and by month. A comparison of Indiana’s trend and the national trend shows similarities in tornado increases around days 140 through 195 with late fall mini peaks in the national trend and early fall mini peaks in the Indiana trend. These results will be discussed further in Chapter 5- Results and Discussion.

3.3.1a. Tornado Alley Defined

Tornadoes, no matter their size or duration, can wreak havoc on any community. Basic life support systems such as power and communications can be severed, leaving a community susceptible to disarray and chaos. Resources
may be severely limited or unavailable, potentially leading to loss of life. The economic impact from a tornado event can range from minor- businesses being closed for a few hours or days to clean up- to devastating- entire towns wiped out including businesses, homes, and schools.

A nickname with no official boundary, “Tornado Alley” is often thought of as Oklahoma, Kansas, and Texas. A tornado climatology and subsequent Tornado Alley can be constructed using a variety of methods, mostly based on what the individual researcher wants to define as his/her focal point. Based on a history of significant (rated F2 or stronger) tornadoes (Concannon et al, 2000), Broyles and Crosbie (2004) defined small scale Tornado Alleys across the U.S. as having received long-track (25+ miles) F3-F5 tornadoes during a period from 1880-2003 (including 6 areas in Indiana). Tornado Alleys can also be created using outbreaks as the foundation, as in Schneider, et al’s work *Tornado Outbreak Days: An Updated and Expanded Climatology 1875-2003*. A map of tornado events created using SeverePlot software, a geographical database of severe thunderstorm and tornado occurrences showing all tornado reports across the U.S. from 1950-2006, illustrates the dispersion of tornado events and further highlights the inconsistency in defining a true Tornado Alley.

Further, a map of U.S. tornado activity per 1,000 square miles created by the NOAA Storm Prediction Center (Figure 3.4) shows not only a primary tornado focal point in the Great Plains, but highlights the frequency of tornadic events in Indiana, incorporating an area from Lake County east through Elkhart County,
due south to Monroe County, west to Owen County, and due north to Lake County. For the purpose of this thesis, a tornado climatology for Indiana was created using the both the Grazulis tornado database for events 1950-1995 (1993a) and National Climactic Data Center’s *Storm Data* database for events 1996-2006. Using this data, a map of unique tornado days was created for Indiana counties to enable a quick glance of a tornado climatology. Schaefer et al (1993) suggest tornado days be used as a more accurate picture of tornado activity rather than actual tornadoes due to the apparent inflation of reported tornadoes (p. 460).

![Tornado Activity in the United States](image)

**Figure 3.4.** Tornado Activity in the United States per 1,000 sq. mi. (Storm Prediction Center, [www.spc.noaa.gov](http://www.spc.noaa.gov))
Then there are Tornado Alleys created using the average number of tornadoes per year per 10,000 square miles (Figure 3.5), significant, long-track tornadoes as in Broyles and Crosbie (Figure 3.6), and Tornado Alleys created using Fujita Scale strengths (Figure 3.7a-c) by Kelly et al (1978).

**Figure 3.5.** Average Number of Tornadoes per Year per 10,000 sq. mi (Oklahoma Climatological Survey, [http://earthstorm.mesonet.org/materials/graphics_severe.php](http://earthstorm.mesonet.org/materials/graphics_severe.php))
Figure 3.6. Frequency of F3 to F5 tornadoes with at least 25 mile tracks from 1880 to 2003 normalized to 1,000 square miles. (Broyles and Crosbie, 2004)
Figure 3.7a. Frequency of Weak (F0-F1) Tornadoes 1950-1976 Normalized to 10,000 mi² per year. (Broyles and Crosbie, 2004)

Figure 3.7b. Frequency of Strong (F2-F3) Tornadoes 1950-1976 Normalized to 10,000 mi² per year. (Broyles and Crosbie, 2004)
Figure 3.7c. Frequency of weak, strong, and violent tornadoes 1950-1976 normalized to 10,000 mi² area per year. (Broyles and Crosbie, 2004)
CHAPTER 4
DATA AND METHODOLOGY
EMERGENCY MANAGEMENT AND AMISH COMMUNITIES

This thesis sought to aid local emergency managers in the partial creation of a hazard analysis. In particular, this thesis sought to discover Indiana’s tornado climatology in order to aid local emergency managers in creating a comprehensive emergency management program. To answer this question, a comprehensive, statewide tornado climatology was created. This climatology identified peak seasons by Julian day, frequency of tornadoes by strength, and created a quick-glance map of tornadoes per county that can be used by local emergency managers to develop part of a hazard analysis.

Secondary to this was to examine the Amish community in northern Indiana and formulate suggestions for tailoring a local emergency management program to this diverse group. A case study of the 18 October 2007 Nappanee tornado that affected a primarily Amish community was used to discover ways to work with the Amish community during all phases of emergency management.
4.1. Using Indiana’s Tornado Climatology as a Method for Emergency Management to Work with the Amish

4.1.2 Lessons Learned from the 18 October 2007 Nappanee Tornado

4.1.2a. Mitigation and Preparedness

To develop a better understanding of the Amish perspectives of disasters and preparedness, interviews were conducted with three members of the Amish community; Howard Chupp, a bishop in the Nappanee area and a type of superintendent of Amish parochial schools for the northern Indiana area; Nick Raber, a medical responder in Daviess County who grew up in the Amish faith but has since left the church; and a church member and farmer who requested his identity remain anonymous. For the purpose of this project, he will be known as Samuel. Interviews were also conducted with members of the English community with extensive experience in working with the Amish. It is apparent many Amish communities are willing to focus on natural disasters such as floods, fires, winter storms, and tornadoes, but may be unwilling to concern themselves with human-caused events such as shootings and acts of domestic terrorism. The Amish trust their faith in God, that He will do what is right for them and teach them through emergency events. They want to be aware of potentially dangerous situations, but trust God to take care of them.

Prevention of disasters may be a foreign concept to a group who believes that hazardous events are part of God’s will and it is not up to them to circumvent His will. Therefore they see no need to be warned of an event that is in God’s plan for them. According to Steve Eddy (pers. comm.), a National Weather
Service Meteorologist who worked extensively within Amish communities during his years at the northern Indiana NWS office,

The problems range from no electricity, multimedia devices or phones in their houses, they are rural and live far apart, and they have a very old and traditional culture that is slow to change to our fast changing world. They honestly don’t really see a big need to be warned of any hazardous event. Their folklore, wives tales, and word of mouth take care of that from their viewpoint.

You are dealing with a culture (Amish) that thinks electronics are only a luxury and an opposing culture that believes electronics are almost a God (you and me). You have a training/awareness problem and the church that operates in small communities that are not really governed by a higher body (other than tradition and God). So there is no "head council" to go and sell the emergency preparedness message to...therefore you have to go to each of the bishops (1 every 2 square miles or so, thus probably 75 in Elkhart County alone). And if you could get to all the churches, you have to correctly enter their culture. For example, they have council church once every 6 months or so. Council church is when they decide what "new" technology they allow into the community and under what conditions. Thus someone would have to get with each Bishop, then show up at each of the churches’ council session to demonstrate the warning alert method you wish to present. The problem is most of the churches have council church around the same time of year, so now you need about 75 well trained advocates to be available on any given Sunday (maybe anytime in the day when they get to your topic), etc. etc.

Of the 60 municipalities in Lancaster County Pennsylvania, home to an estimated 18,000 Amish in 964 square miles, no tornado warning sirens exist (Randy Gockley, pers. comm.). The only sirens that do exist for mass notification of hazards are the sirens on the nuclear power plants which are within 10 miles of 20 percent of the county. Those sirens may be used for all-hazards warning
notification, but when the siren is sounded the Amish must find out what the siren is warning, a task made difficult by their complacency when it comes to hazardous events. Gockley, Emergency Management Coordinator for Lancaster County, manages to get warnings to the Amish through a sort of Pony Express method. When he spoke with the church bishops about the need for warnings for hazards, including rapid onset events such as tornadoes, the bishops indicated communication should come from the local emergency manager through the volunteer fire departments in Amish areas, and to the bishops who would then disseminate the warning to the community. It is clear that this method of communication is not only time-consuming, but may risk lives by the stagnant pace at which the message must travel.

Jennifer Tobey, Emergency Management Director for Elkhart County, Indiana, works through the bishops to promote weather safety, but it has taken her years to make progress and to be accepted into the Amish community (pers. comm.). As a single female, Tobey feels it has been difficult to get male bishops to accept her as a person of authority and with great responsibility within the English community. Her offers of free, battery-powered weather radios for the Amish communities have been repeatedly turned down. Tobey believes it is in part because the technology represents “worldly” technology in a community where separation from the outside world is crucial (Jennifer Tobey, pers. comm.).

A glimmer of hope for emergency managers working to dispense emergency warnings within Amish communities may have been inadvertently
caused by the tragic school shooting in Nickel Mines, Pennsylvania in 2006. Gockley notes,

*In the aftermath of the Nickel Mines School shooting, the Amish seem to be willing to take a more proactive attitude with public safety. For example, there are over 200+ Amish Schools in the County. Many, as did the Nickel Mines School, not have a street address. Since the shooting, many church elders have come forward and request actual street addresses for the schools in case of emergency.*

Working with Amish communities before an event teaches them to recognize warning signs. Tobey has a list of addresses for most Amish in her community which she uses to send flyers and informational brochures about various community hazards. Tobey also uses the local Amish newspaper to spread information on various hazards and how to plan and prepared for them. Tobey believes using communication and technology that are within their beliefs aids in the willingness of the Amish to work with outsiders.

Some preparedness efforts may be accepted by the Amish provided it stays within the confines of their faith and lifestyle. In 2008, Tobey began working with the Amish in her community to create an Amish version of the Community Emergency Response Team (CERT) program which aims to teach citizens how to help themselves and their neighbors in the event of a disaster. The first Amish CERT in Indiana, perhaps the country, Tobey is working with the local bishops to bring together local first responders (Amish and English alike) and the Amish community to enhance preparedness efforts one step at a time.
How can an emergency manager engage the Amish in emergency management and disaster preparedness without challenging their belief system? The first place to start in working with the Amish is to learn about the Amish community and work through local connections. Rather than pushing hazard and disaster information on them, ask them if you can talk to them rather than forcing them to accept your presence. New emergency management directors should contact experienced emergency management directors who also have an Amish population, as neighboring Amish communities can point to other community leaders. To get issues into Amish community, public safety must show the Amish there is a need for addressing that issue and how the issue affects them personally. According to Nick Raber (per. comm.) who grew up Amish and currently works in the medical community, if the outside world can make an issue relevant to the Amish way of life or livelihood, they will prepare for it. They do not prepare for what could happen, but what has happened and may happen again. Many in the Amish community believe preparedness is showing you have no faith in God and you are showing Him you do not believe in His will if you prepare for things He has planned for you. According to Howard Chupp, getting the Amish engaged in disaster preparedness or concern over events outside their control is not an easy task. The Amish do not feel the need to concern themselves with events outside their control and realize they cannot prepare for all potentially dangerous events. They prefer to keep their faith in God, trusting that He will use a disaster event to teach them to become better people through aid for others and becoming more sensitive to the needs of others. Even with
human-caused events, the Amish believe God has allowed that event to occur in order to teach them something, be it compassion, forgiveness, empathy, learning not to place blame, or another trait.

The Amish are not a community who prepares for the sake of staving off potential trouble. Rather, they are willing to prevent future occurrences of an event based on past occurrences. For example, an infectious disease struck the equine population in Daviess County, Indiana in 2005. Prior to then, preventing this type of problem was not an issue to the Amish community. When the Amish lost many of their horses, a staple in their way of life, prevention of future outbreaks was discussed and plans were implemented with the assistance of the local veterinarians. The Nickel Mines, Pennsylvania shooting of 10 girls at an Amish schoolhouse in 2006 also prompted the Amish to take a look at the safety of their schools. Many Amish communities in Ohio and Indiana have developed safety manuals for their schools. Some schools have gone as far as installing doors that lock from the inside so intruders cannot enter. However, the decision to include such precautions rests with the three man school board and the teacher. A change which has come about since the shootings is the inclusion of all Amish school addresses in local public safety directories. Many schools in the north central Indiana area have a phone booth outside the school in case of an emergency and the older school children are taught how to call 911. A third example is the current tornado drills conducted in Nappanee and Daviess County
schools. Both areas have experienced tornadoes in recent years and have incorporated tornado safety in school drills and safety manuals.

The subject of safety for their community is coming to the attention of many, says Samuel. Recent events such as the tornado, animal illness in southern Indiana, and the Nickel Mines shootings have caused some Amish elders to reconsider disaster preparedness. While the Amish would be open to safety information developed by public officials, preferably with the input of the Amish community so as to adhere to their beliefs, they would be more concerned with natural events than human-caused events. In northern Indiana, Bishop Chupp worked with members of the various school boards and the Northern Indiana Safety Association to develop a school safety manual for Amish parochial schools (Appendix C). The manual focuses on first aid, fire drills and prevention, road safety for pedestrians and buggies, tornadoes, and playground safety.

Disaster education can be taught to adults as well as children, but it should only be taught in a schoolhouse, not at a church session. Church sessions are reserved for spiritual devotion and topics of an unrelated nature should not be entered into discussion. With the exception of the American Red Cross first aid course, formal disaster preparedness training is traditionally not available to teachers unless the English community conducts it. Amish are willing to accept presentations for schoolchildren by members of the public safety community or the National Weather Service, but these are not typically part of the
curriculum. Knowledge of weather and emergency events is passed down among the generations.

Although the Amish do not have an organized warning system for emergencies or rapid-onset events such as tornadoes, they use word of mouth to spread warnings about potentially severe weather events. Prior to the Nappanee tornado, word of mouth had spread notification of pending severe weather throughout the community. They are also keenly aware of weather patterns, having learned it from their parents and grandparents. While the Amish may occasionally have access to technology in the outside world (outside their homes and businesses) such as a television, battery-powered radios are not permitted in the Nappanee Amish community, as they do not want to be exposed to such technology if at all possible. Bishop Chupp feels television and phones are only a generation away from being accepted by the Amish community and he believes it is preferable to keep the younger generation exposed to technology as little as possible. According to Nick Raber, word of mouth is an unbelievably rapid method of communication for the Amish community. At a farm accident in Daviess County, Indiana, Raber estimates 500-700 Amish arrived on scene within 15 minutes. However, with no formal medical training, most of them were unable to help the victim. Raber has since been pushing for first aid training in the schools and in Spring 2009 held his first course with 26 of 42 Daviess County Amish school teachers in attendance.
4.1.2b.  *Response and Recovery*

Who would think being able to clean up quickly after a disaster would be a problem? In true Amish style, most homes affected by the tornado were repaired or replaced within a week of the event. According to Tobey, by the time FEMA damage assessors had a chance to survey the 20 percent of Nappanee that incurred damage, new homes had been built directly in the center of the tornado path. Assessors would read on their maps that a home had received major damaged, only to find a brand new one in its place 5 days after the event. Non-Amish homes, on the other hand, were still in various states of disrepair because owners were waiting on insurance companies to conduct evaluations of repair costs or were awaiting FEMA assessments for insurance purposes. While the Amish got on with life, the non-Amish were not able to move as quickly. It certainly did not help matters when FEMA denied Indiana’s two requests (Appendix F) for disaster assistance which would have helped cover losses of property for the disaster (Indiana Department of Homeland Security Press Release, 11/21/07). FEMA stated there was not enough loss from the private sector to warrant a federal disaster declaration. Considering many homes were repaired within a week of the tornado event, it is clear this had an effect on the lack of private damage losses and thus a federal disaster declaration. Eventually the U.S. Small Business Administration was able to provide assistance to those residents affected by the tornado (Indiana Department of Homeland Security Press Release, 1/18/08).
As local Emergency Management Director, Tobey worked directly with the Amish in the weeks following tornado. Even though funds were offered to them on several occasions from a variety of non-Amish sources, some as far away as Asia, the Amish community fund, supported by contributions of church members and used for emergency purposes, was used by the Amish to purchase supplies to rebuild their homes and businesses. The Amish politely refused outside assistance, wanting to maintain their independence and separation from worldly entities. After several weeks of negotiation and repeated offers of assistance, the Amish bishops were reluctantly willing to accept outside monetary assistance because their fund was depleted. The bishops would not set a dollar amount they were willing to accept. Instead, the Northern Indiana Tornado Recovery Operation (NITRO) offered them various amounts until NITRO felt they had made a fair offer that the Amish would accept. In the end, $50,000 worth of support was provided to the Amish to replace funds depleted from their internal emergency fund, an estimated $1.2 million worth of damage. Although Nappanee did not qualify for public assistance funding through FEMA, Governor Mitch Daniels gave Nappanee nearly $200,000 from the state disaster relief fund to assist with losses (Rosemary Petersen, IDHS Public Assistance, per. comm.). Zhe Chi, a Buddhist organization from Taiwan, donated gift cards in the amount of $300-500 to homes and businesses that had major damage or were destroyed to help meet immediate needs of residents.
The data gathered from the Nappanee tornado suggests the Amish will ultimately take care of their own in a disaster response, but may be open to outside assistance if the assistance is offered through their bishops. One of the biggest lessons learned by Tobey after working with the Amish during disaster recovery was they did not expect any help and were quite content working within their churches to recover. Tobey states, “People think of them as outsiders, but Amish are willing to work with outsiders like family members. They should not be treated any differently. You don’t have to do anything extra for Amish in disaster. Don’t forget about them, but they will take care of themselves.” According to Tobey, the Amish did not ask for help, it was offered. They did not see themselves as victims of a disaster; rather, they saw the event as a chance to help others.

The best way to prepare a community for a hazard is to help that community understand its risk to the hazard. Indiana’s peak tornado season begins in April and last through early July, indicating that, while Indiana is vulnerable to tornadoes during all months, tornado preparedness efforts should peak before severe storm season (spring) and continue into the off season (late fall) in an effort to maximize citizen readiness. In Indiana a typical tornadoic event has a major impact on most communities. Residents typically need short- and long-term assistance in terms of recovery (housing, utilities, goods and services). Preplanning for these needs is crucial to helping a community recover from a devastating event. In the Amish community, religious beliefs will dictate what they
will and will not allow in terms of mitigation, preparedness, response, and recovery. While some communities may only allow emergency contact through bishops or local fire departments with Amish members, others may use a phone tree, if phones are permissible or if a business phone can be used for emergency purposes. Most Amish communities in Indiana, including the Nappanee community, allow outside phones for any church member who desires one.

An analysis of the Nappanee tornado event can aid emergency managers with high Amish populations anticipate the needs of this unique community. When it comes to developing comprehensive emergency management plans, emergency managers must get to know the local community and the needs within. Emergency management should work with local Amish leaders (bishops) to institute change, including preparedness training and warning communication, but must be prepared to explain why change is needed and also face rejection. Persistence may pay off, but progress is slow in this community.

In order to promote effective mitigation of hazards within a community, emergency managers must understand the culture that envelopes the community. This is exceedingly difficult within the Amish community, whose lives are lived according to the principles of finding individual meaning only through a community of believers; a clear and visible distinction between the Amish church community and the rest of the world; relying primarily on one another and not outside agencies or government for support in difficult times; and the wisdom of tradition is usually a better guide for living life than are the uncertainties found
with innovation and progress. If Emergency Managers can understand and appreciate the Amish way of life, they can begin to work with them to implement preparedness measures that would be acceptable to the Amish. Emergency managers should strive to work within the systems the Amish trust (bishops and church) and be patient, as progress is sometimes a four-letter word to the Amish. The Amish may change, but it will be slow and carefully debated to ensure progress adheres to their beliefs.

Getting to know the local community is key to gaining their support for public safety programs. Each Amish community is different in what it will and will not accept when it comes to support and technology. Nappanee Amish refuse to use battery-powered or hand-crank weather radios on the principle that technology is part of the outside world and does not belong in the Amish community. Elkhart County Emergency Manager Jennifer Tobey (per. comm.) recommends working through the bishops first and selling the product or concept to the decision makers. Once the bishops buy in to a concept or product they have the power to influence the entire community. To get greater buy in to an emergency preparedness program one might work through the local Amish newsletter, the national newsletter *The Budget*, visiting them on their turf, and establishing a relationship with the bishops. In the Nappanee community, Amish are willing to accept weather training, handouts, use of a phone tree to contact bishops, and hands-on Community Emergency Response Team (CERT) and first aid training. Tobey has found if the reasons behind a product or concept are
explained, the Amish are generally willing to accept some form of change. A bishop Tobey worked with during the 18 October 2007 tornado called from his outdoor phone two days before the one-year anniversary of the tornado. He was having some concerns another tornado might occur. After acknowledging his concern and issuing comfort, the bishop told Tobey he was grateful for her help during the tornado and said he knew she would be around to help if anything happened in the future.

One of the key areas emergency managers will have to deal with after a disaster is the recovery process. While many in the English world employee homeowner, rental, or auto insurance, Amish employ an emergency fund called the Amish Aid Plan. The money is not kept in an account, does not accrue interest, nor is anyone paid to care for the fund. The Amish believe if the funds were to be kept in advance of a disaster it would be a type of insurance program and would be placing doubt in God and His will for them. Once an emergency or disaster occurs, monetary aid is gathered from all church members and sent to victims. Each church member contributes a base amount to the fund and those who can contribute more. The amount each member contributes is based on several factors including property or businesses owned, income, and recent hardships. For example, if a disaster were to hit a nearby community, each member would make a contribution to the church district designee who would then distribute this aid to affected families. Assistance following a disaster is a quick process. As with physical aid, there is relatively no waiting for families to
receive money once a disaster hits, unlike with traditional insurance for the English community, which may take months or even years to recover disaster costs.

One of the questions posed to the Amish interviewees was how public safety could help them following a disaster. Aid such as debris removal, site security, or transportation to the hospital were acceptable methods of assistance, however, monetary aid, particularly from government or non-local charities, would typically not be accepted. Because the Amish want separation from “the world” and government is considered the world, they do not wish to accept aid. It is looked at as a sort of welfare. The Amish perspective is that disasters are a way to help others and if they were to accept monetary aid to pay for recovery costs they would undermine God’s purpose for them. When Daviess County, Indiana received federal disaster assistance from FEMA following a tornado in November 2005 that affected many Amish families, the Amish were offered money to help them rebuild. The Amish asked that the money instead be used to repair local roads, therefore benefiting the entire county.

By getting to know a local Amish community in advance of a disaster, emergency managers will be more sensitive to the uniqueness and needs of this diverse group. Emergency officials must be prepared for the Amish to take care of themselves, but they should not be forgotten. Post-disaster assistance should be offered, but not forced upon them. Preferred assistance may include debris
removal, transportation, or medical care, but will likely not include physical labor or monetary support.
CHAPTER 5
RESULTS AND DISCUSSION

5.1. Creation of a Tornado Climatology for Indiana

5.1.1. Tornadoes by Fujita Scale Strength

This thesis used the traditional Fujita scale, rather than the Enhanced Fujita scale, to define tornadoes because all tornadoes in the study, with the exception of the 2007 Nappanee tornado, were classified during the era of the Fujita scale. Tornado classification using the Enhanced Fujita scale did not begin until February 2007. The Nappanee tornado rated an EF-3, with 3-second wind gusts estimated at 138-167 mph. This is comparable to a strong F2 or weak F3 (Table 5.1).
Table 5.1. EF-Scale Wind Speed Ranges Derived from Fujita-Scale Wind Speed Ranges (Texas Tech University Wind Science and Engineering Center, 2006)

<table>
<thead>
<tr>
<th>Fujita Scale</th>
<th>Fastest 1/4-mile Wind Speeds</th>
<th>3-Second Gust Speed, mph</th>
<th>EF Scale</th>
<th>3-Second Gust Speed, mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>F0</td>
<td>40-72</td>
<td>45-78</td>
<td>EF0</td>
<td>65-85</td>
</tr>
<tr>
<td>F1</td>
<td>73-112</td>
<td>79-117</td>
<td>EF1</td>
<td>86-109</td>
</tr>
<tr>
<td>F2</td>
<td>113-157</td>
<td>118-161</td>
<td>EF2</td>
<td>110-137</td>
</tr>
<tr>
<td>F3</td>
<td>158-207</td>
<td>162-209</td>
<td>EF3</td>
<td>138-167</td>
</tr>
<tr>
<td>F4</td>
<td>208-260</td>
<td>210-261</td>
<td>EF4</td>
<td>168-199</td>
</tr>
<tr>
<td>F5</td>
<td>261-318</td>
<td>262-317</td>
<td>EF5</td>
<td>200-234</td>
</tr>
</tbody>
</table>

In the United States, 99 percent of tornadoes are classified as being weak (F0-F1) or strong (F2-F3). Only 1 percent of tornadoes are classified as being violent (F4-F5). Historically, most U.S. tornado deaths (67 percent) occur during violent tornadoes, while 29 percent of deaths occur with the strong tornadoes, and only 4 percent occur with weak tornadoes (Grazulis, 2008b).

Of the nearly 1400 recorded tornadoes in Indiana’s 57 year history, more than 60 percent were considered “weak” having F scale ratings of F0 or F1 and estimated wind speeds of 40-112 mph. Approximately 32 percent of Indiana tornadoes during that time frame fell into the “strong” category, with estimated wind speeds at 113-207 mph and the remaining nearly 7 percent were considered “violent” tornadoes, with wind speeds estimated at 208-318 mph. National statistics for the period 1950-1994 are 74 percent, 25 percent, and 1
percent, respectfully (Figure 5.1). Figure 5.2 illustrates the frequency of tornado occurrence in Indiana by Fujita Scale class 1950-2006 while figure 5.3 breaks those classes down further into Fujita scale strength.

**Figure 5.1.** Percent of All U.S. Tornadoes 1950-1994 by Fujita Scale Class (strength). (Grazulis, 2008a)

**Figure 5.2.** Frequency of Tornado Occurrence in Indiana 1950-2006 by Fujita Scale Class (strength).
Figure 5.3. Frequency of Tornado Occurrence in Indiana 1950-2006 by individual Fujita Scale Strength.

The differences in percentages can be attributed to multiple factors, not the least of which is population density. Since the Fujita Scale estimates a tornado’s wind speed (and thus the strength of the tornado) by the damage it does, a tornado in an open space will not be able to create as much damage to structures as would a tornado in an urban or suburban area. When there is little to no damage, there is little evidence on which to rate the tornado and estimate its wind speeds. Other factors include mesoscale thermodynamics / kinematics. Those factors may best be left to future research. Mesoscale thermodynamic and kinematic issues have been covered in numerous studies, including Edwards and

5.1.2. Seasonality of Tornadoes

5.1.2a. Month

An analysis of the 1950-2006 dataset confirmed Indiana’s primary tornado season, in terms of unique tornado days, is April-July (Figures 5.4 and 5.5) with an average of nearly 69 percent of all unique tornado days occurring during these four month. Smith et al (2007) documented severe weather in the Ohio Valley’s cool season as being relatively rare, but add that forecasters (and emergency manager’s by extension) need to be conditionally aware of outbreaks of severe weather during the cool season. Using this information as part of a hazards analysis enables emergency managers to be situationally aware during potential severe weather in the non-traditional severe weather season.
Figure 5.4. Monthly dispersion of tornado days in Indiana 1950-2006.

Figure 5.5. Number of Unique Tornado Days in Indiana by Month, 1950-2006.
5.1.2b. Day of Year

In a 1980-1999 study Brooks et al found most United States tornadoes occur between days 120-189 (early May through early July) (Figure 5.6). The 1950-2006 Indiana dataset concluded most unique tornado days occur on days 90-190 (early April through early July) (Figure 5.7). This difference in timeframes is accounted for in examining the seasonal distribution of tornadoes in the U.S. (Figure 3.15). As different areas of the country experience a peak in tornado occurrences, this factors in to the average peak created by Brooks, whereas Indiana’s data is solely representative of Indiana. The differences in primary peak percentages between the Indiana and national peaks (nearly 12 percent and 1.1 percent, respectively) can be accounted for in the accumulation of data. While national data incorporates all 50 states- many of which experience tornadoes infrequently and only a few of which experience tornadoes frequently- over a 20 year study period, Indiana’s data is solely representative of 1 state over a 57 year period.
Figure 5.7. Indiana Tornado Annual Cycle by Day of Year 1950-2006.
5.1.2c. Time of day

Schaefer and Edwards found most tornadoes in the Northern and Southern Plains and Southeast U.S. occur between 3-8pm local time. Kelly et al’s (1978) diurnal distribution of tornadoes in the Midwest (Figure 5.9) shows the peak of tornado activity occurring between late afternoon to just before sunset which would hold true with the national statistics. Occurring at night in the fall, the Nappanee tornado went against convention in both time of day and season.
5.1.2d. Average path length

Tornado path length may be a function of several kinematic and thermodynamic factors (Garner, 2007). In a small sample of tornado events, Garner found “kinematic fields, such as the mid-level ground-relative flow, 0–8-km bulk shear, storm motion, and Bulk Richardson Number (BRN) shear showed the best skill in forecasting tornado path length. On the other hand, thermodynamic parameters showed little ability in discriminating between long- and short-path tornadoes” (http://www.nwas.org/ej/2007-EJ5/). Nappanee’s path length was approximately 20 miles, making it a relatively long-track tornado. Most tornadoes last less than 10 minutes (www.spc.noaa.gov), but the Nappanee
tornado lasted about twice this long
(http://www.crh.noaa.gov/iwx/?n=18oct07_tornado).

5.1.2e Top Tens

Indiana consistently ranks in the top 10 for tornadoes. Indiana ranks number 3 for deaths per 10,000 square miles and annual tornadoes per 10,000 square miles, and number 8 for both the number of killer tornadoes and total tornado path length per 10,000 square miles (www.tornadoproject.com). A study conducted by Broyles and Crosbie (2004) on long track tornadoes in the United States from 1880-2003 shows Indiana ranked number 6 on the list of states having eight or more long-track F3-F5 tornadoes per 1,000 square miles 1880-2003 (Table 5.2) and Indiana has 2 major cities in the top 5 (Table 5.3).

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>Square Mileage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mississippi</td>
<td>7789</td>
</tr>
<tr>
<td>2.</td>
<td>Oklahoma</td>
<td>4540</td>
</tr>
<tr>
<td>3.</td>
<td>Alabama</td>
<td>4376</td>
</tr>
<tr>
<td>4.</td>
<td>Arkansas</td>
<td>3629</td>
</tr>
<tr>
<td>5.</td>
<td>Nebraska</td>
<td>3343</td>
</tr>
<tr>
<td>6.</td>
<td>Indiana</td>
<td>2891</td>
</tr>
<tr>
<td>7.</td>
<td>Louisiana</td>
<td>2737</td>
</tr>
<tr>
<td>8.</td>
<td>Iowa</td>
<td>2571</td>
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</tbody>
</table>

<table>
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<th>Rank</th>
<th>State</th>
<th>Square Mileage</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
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<td>2019</td>
</tr>
<tr>
<td>10.</td>
<td>Kansas</td>
<td>1627</td>
</tr>
<tr>
<td>11.</td>
<td>Georgia</td>
<td>1471</td>
</tr>
<tr>
<td>12.</td>
<td>Missouri</td>
<td>983</td>
</tr>
<tr>
<td>13.</td>
<td>Illinois</td>
<td>979</td>
</tr>
<tr>
<td>14.</td>
<td>N. Carolina</td>
<td>690</td>
</tr>
<tr>
<td>15.</td>
<td>Minnesota</td>
<td>430</td>
</tr>
<tr>
<td>16.</td>
<td>Ohio</td>
<td>410</td>
</tr>
</tbody>
</table>

Table 5.2. States with Counties Having 8 or Greater Long Path F3-F5 Tornadoes per 1,000 sq. mi 1880-2003. (Broyles and Crosbie, 2004)
Table 5.3. Top 20 Cities for Long Track F3-F5 Tornadoes in U.S. 1880-2003. Frequency per 1,000 mi² is next to rank. (Broyles and Crosbie, 2004)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Value</th>
<th>City, State</th>
<th>Rank</th>
<th>Value</th>
<th>City, State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>10.2</td>
<td>Tulsa, OK</td>
<td>11.</td>
<td>5.8</td>
<td>Kansas City, KS</td>
</tr>
<tr>
<td>2.</td>
<td>9.3</td>
<td>Shreveport, LA</td>
<td>12.</td>
<td>5.7</td>
<td>Oklahoma City, OK</td>
</tr>
<tr>
<td>3.</td>
<td>8.8</td>
<td>South Bend, IN</td>
<td>13.</td>
<td>5.2</td>
<td>Omaha, NE</td>
</tr>
<tr>
<td>4.</td>
<td>7.6</td>
<td>Indianapolis, IN</td>
<td>14.</td>
<td>5.2</td>
<td>Little Rock, AR</td>
</tr>
<tr>
<td>5.</td>
<td>7.5</td>
<td>Huntsville, AL</td>
<td>15.</td>
<td>5.0</td>
<td>Wichita, KS</td>
</tr>
<tr>
<td>6.</td>
<td>7.3</td>
<td>Topeka, KS</td>
<td>16.</td>
<td>4.7</td>
<td>St. Louis, MO</td>
</tr>
<tr>
<td>7.</td>
<td>6.9</td>
<td>Springfield, IL</td>
<td>17.</td>
<td>4.5</td>
<td>Minneapolis/St. Paul, MN</td>
</tr>
<tr>
<td>8.</td>
<td>6.2</td>
<td>Jackson, MS</td>
<td>18.</td>
<td>4.4</td>
<td>Cleveland, OH</td>
</tr>
<tr>
<td>9.</td>
<td>6.0</td>
<td>Nashville, TN</td>
<td>19.</td>
<td>4.2</td>
<td>Cedar Rapids, IA</td>
</tr>
<tr>
<td>10.</td>
<td>5.9</td>
<td>Springfield, MO</td>
<td>20.</td>
<td>4.0</td>
<td>Memphis, TN</td>
</tr>
</tbody>
</table>

5.1.2f  By County

Using the unique tornado day method, each county’s unique tornado days were mapped to provide a quick glance at their tornado vulnerability (Figure 5.10). Although tornadoes know no political boundaries, this graphic was created using geopolitical county boundaries to enable those who are confined to work within these boundaries a quick glance at the tornado risk to their jurisdiction. The breakdown of tornado days by counties creates the appearance that some counties have had more tornado days than others. This can be attributed to several factors including population density (more sparsely populated counties have fewer properties to sustain damage and fewer people to report a tornado), agricultural features (crops will show damage, but only when they are in bloom), and terrain (if a thunderstorm passes over hilly terrain, the horizontal vortex [or vortices] may not be able to interact with the rear-flank downdraft or updraft base to create a tornado until the storm passes over the downslope or flatland).
The hope is this graphic will allow emergency managers to plan for tornadoes accordingly. Even those counties with few unique tornado days (Ohio, Brown, Blackford) can see that, although they may not have experienced many tornadoes in the past, if past trends are any indication, there is always a risk of experiencing tornadoes in the future. This graphic also allows districts to assess their tornado vulnerability and plan for resources accordingly. Perhaps the biggest benefit to a graphic such as this is it allows emergency managers in highly vulnerable areas to have another tool at their disposal to bring other public
safety personnel into the community disaster planning fold by visually illustrating the tornado risk to their county.

Using two sets of tornado databases, a comprehensive tornado catalog was established for Indiana. From this, a retrospective analysis was conducted and graphics were created by the author illustrating tornado seasonality in Indiana by month, day of year, and county. These graphics allow a quick glance at Indiana’s historical tornado occurrences and may be used as part of a comprehensive hazard analysis for local emergency managers.
CHAPTER 6
CONCLUSION

This thesis aimed to understand how a tornado hazard analysis can aid local emergency managers in the development of a comprehensive hazard mitigation plan. A tornado climatology for Indiana was created for use by emergency managers as part of a comprehensive, local hazard analysis. The unique needs of the Amish community in terms of the emergency management phases and formulate suggestions for tailoring mitigation activities of local emergency management programs to this diverse community were explored through an overview of the 18 October 2007 Nappanee tornado in Elkhart County and interviews with members of the Amish church.

Indiana’s tornado climatology illustrates the importance of tornado preparedness in Indiana. A statewide tornado climatology can be used by emergency management to develop part of an effective hazard mitigation program. It allows a quick glance at the tornadic events affecting not only their community, but the larger community within the state. Information from the hazard analysis allows emergency management to review critical infrastructures
such as businesses and public utilities. An effective hazard analysis also allows the emergency manager to develop a vulnerability assessment for his/her community and provides for situational awareness of the hazard threats.

Delimitations of this thesis included...

1. Limiting the tornado hazard analysis to Indiana and

2. Focus on a particular tornado event occurring in Elkhart County in north central Indiana.

3. Study focused on how emergency managers could help the Amish community throughout the four phases of emergency management.

   Natural hazards have happened throughout Indiana, but by focusing on the aforementioned delimitations, the thesis focuses on a specific natural hazard (tornado) in a unique community (Amish) and allows public safety officials, particularly emergency management, to structure preparedness programs to this unique audience.

Limitations included...

1. The National Climatic Data Center (NCDC)’s tornado dataset is known to have errors in tornado intensities,

2. Interviews with a select group of Amish and non-Amish participants affected by the October 18, 2007 Nappanee, Indiana tornado, thus getting both an inside perspective of how the tornado affected the Amish community and the English perspective of the tornado and it’s after effects,
3. The study area was primarily limited to Indiana Homeland Security District 2, particularly Elkhart County, and the Town of Nappanee.

4. The Elkhart County Emergency Manager was on the job for less than 1 year, limiting her ability to effectively cater to a unique community such as the Amish. Although many lessons were learned about working with the Amish during and after the disaster, Jennifer Tobey’s short time on the job gave her little time to work with the Amish to preplan for disasters. An emergency management director with more experience may have had a response and recovery plan prepared to assist the Amish. An experienced emergency management director also would likely have high-level contacts within the Amish community who could have let the director know what the needs of the Amish community were instead of having assistance forced on them as was the case in the Nappanee event.

Assumption

1. All tornado events for Indiana listed in the Grazulis and National Climatic Data Center (NCDC)’s Storm Data during the study period were real, accurate, and complete.

Final Thoughts on Working with the Amish

A final thought on working with Amish would be inclusion of a section on special needs populations or non-traditional communities in the comprehensive emergency management plan for the jurisdiction. The Amish may not ask for specific help, but they may be willing to accept it if offered and, because Amish
are part of their local community, emergency managers need to be able to provide assistance.

1. Get to know the local Amish community before a disaster strikes. Know their strengths and what assistance they are willing to accept.
2. Be persistent but respectful. Change is a slow process for a community steeped in tradition. Work with the local bishops to institute change, but be prepared for it to take months or even years.
3. Ask what the Amish need following a disaster rather than forcing assistance on them. Physical labor is generally not needed, but assistance with debris removal may be.
4. Make preparedness relate to them and show how disasters can affect their community. Use examples they can relate to such as natural disasters or animal health issues that have occurred in recent memory.

*Future Research*

Other research may fuse lessons learned from the Amish with needs of rural communities. A full hazard analysis for an Amish or other vulnerable community could benefit local emergency management if it were to provide suggestions on incorporating that community into all phases of emergency management.
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APPENDIX A

DEFINITIONS AND TERMS
Definitions and Terms

1. **Affiliation:** Amish church districts that recognize one another’s discipline. Also known as being “in fellowship” with another church district (Meyers, T.J., and S.M. Nolt, 2005: *An Amish Patchwork: Indiana’s Old Orders in the Modern World*, p.19).

2. **Disaster:** An event that requires resources beyond the capability of a community and requires and multiple agency response (*Blanchard, Wayne, 2008. Guide to emergency management and related terms, definitions, concepts, acronyms, organizations, programs, guidance, executive orders, & legislation: A tutorial on emergency management, broadly defined, past and present*, p. 274).

3. **District:** Local Amish churches, also known as church districts (Meyers, T.J., and S.M. Nolt, 2005: *An Amish Patchwork: Indiana’s Old Orders in the Modern World*, p.17)

4. **Emergency management phases:** Mitigation, preparedness, protection, response, and recovery. The phases are cyclic with no clear ending or beginning. Mitigation can be ongoing while recovery from an event is happening. *Federal Emergency Management Agency Strategic Plan for Fiscal Years 2008-2013. FEMA P-422, January 2008. 64 pp.*

- **Mitigation:** Provides a critical foundation in the effort to reduce the loss of life and property from natural and/or man-made disasters by avoiding or lessening the impact of a disaster and providing value to the public by
creating safer communities. Mitigation seeks to fix the cycle of disaster damage, reconstruction, and repeated damage. These activities or actions, in most cases, will have a long-term sustained effect (p. 50).

- Preparedness: Continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and improving in an effort to ensure effective coordination during incident response (p. 51).

- Prevention: Actions to avoid an incident or to intervene to stop an incident from occurring. Prevention involves actions taken to protect lives and property (p. 51).

- Response: Activities that address the short-term, direct effects of an incident. Response includes immediate actions to save lives, protect property, and meet basic human needs. Response also includes the execution of emergency operations plans and of mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavorable outcomes (p. 52).

- Recovery: The development, coordination, and execution of service and site restoration plans; the reconstitution of government operations and services; individual, private-sector, non-governmental, and public assistance programs to provide housing and promote restoration; long-term care and treatment of affected persons; additional measures for social, political, environmental, and economic restoration (p. 52).

5. Hazard: An event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss. Hazards are both naturally occurring (tornadoes, floods, blizzards, etc.) and human-caused (terrorism, cyber failures, power plant accidents, etc.). (Blanchard, Wayne, 2008. Guide to emergency management and related terms, definitions, concepts, acronyms, organizations, programs,
6. **Hazard analysis**: The basis for development of the emergency management program. It evaluates what could happen, the likelihood of this event occurring and the magnitude of problems created because of a given event. By identifying potential events that could occur, efforts can be directed towards mitigation activities and developing needed response plans. Although this is not a complex task it does require a comprehensive review of the natural and technological (man-made) hazards of the region. Consideration must be given to the possibility of damage or failure of facilities, loss of basic utilities, and multiple casualty events, to name a few. The organization must also consider the effect of a loss of trust from the community as well as legal ramifications, if it fails to respond properly. Consulting with local emergency planners, public health, fire, police, public works, and utility company officials is essential to this process in identifying current hazards and historical events that have occurred in the region. Examples of this would be obtaining information on the region’s 100-year flood plain record, hurricane or severe storm experience, earthquake potential, utility outage records and hazardous materials concerns in the area. (*Blanchard, Wayne, 2008. Guide to emergency management and related terms, definitions, concepts, acronyms, organizations, programs, guidance, executive orders, & legislation: A tutorial on emergency management, broadly defined, past and present, pg. 534*)

8. **Settlement:** A group of Amish church districts in a given geographic area that also share a common history. Eg. Elkhart-Lagrange settlement or Nappanee settlement. Geographically adjacent settlements without a shared history and origin are considered distinct settlements (Meyers, T.J., and S.M. Nolt, 2005: *An Amish Patchwork: Indiana’s Old Orders in the Modern World*, p. 19)

9. **Tornado climatology:** For the purpose of this thesis, a study of the tornado events affecting Indiana over a study period of 57 years.

10. **Unique tornado day:** a day characterized as having one or more tornado events within Indiana in a 24 hour period. For example, tornadoes occurring in Noble, LaGrange, and Kosciusko counties at 1200, 1245, and 1726 on May 23\textsuperscript{rd}, 1978 are classified as 1 unique tornado day (5/23/78). A tornado occurring at 1200 on June 12, 1954 in St. Joseph County and a tornado occurring in Marion and Jasper Counties on June 14, 1954 at 1700 would be considered a two unique tornado days. Because tornadoes often contain multiple segments or cross county/state lines and be counted separately, individual tornadoes were not used in this project. Instead, a dataset of tornado days was created. Each 24-hour period was considered a unique tornado day.
APPENDIX B

ACRONYMS
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>C-TASC</td>
<td>Indiana Counter-Terrorism and Security Council</td>
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<tr>
<td>DCPA</td>
<td>Defense Civil Preparedness Agency</td>
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<tr>
<td>EF</td>
<td>Enhanced Fujita (Scale)</td>
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<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
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<tr>
<td>FCDA</td>
<td>Federal Civil Defense Administration</td>
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<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
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<tr>
<td>HA</td>
<td>Hazard analysis</td>
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<tr>
<td>HMP</td>
<td>Hazard mitigation plan</td>
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<td>IDHS</td>
<td>Indiana Department of Homeland Security</td>
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<td>IIFC</td>
<td>Indiana Intelligence Fusion Center</td>
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<tr>
<td>NRF</td>
<td>National Response Framework</td>
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<td>OCD</td>
<td>Office of Civil Defense</td>
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<td>OEP</td>
<td>Office of Emergency Planning</td>
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<tr>
<td>SEMA</td>
<td>Indiana State Emergency Management Agency</td>
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<tr>
<td>SoVI</td>
<td>Social Vulnerability Index</td>
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<tr>
<td>USDHS</td>
<td>United States Department of Homeland Security</td>
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<tr>
<td>WMD</td>
<td>Weapons of Mass Destruction</td>
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</table>
APPENDIX C

SCHOOL SAFETY PLAN FOR AMISH PAROCHIAL SCHOOLS
**First Aid**

+ School should have a fully stocked basic first aid kit.

+ Have someone from your local fire department do a basic first aid seminar annually.

+ Recommend that at least one of the teachers has training in CPR, in using “direct pressure” on bleeding wounds until emergency help arrives and the Heimlich Maneuver on a choking person.

+ On serious bleeding, keep clean and put clean cloth or sterile gauze pad, if available, directly on spot where bleeding is and press firmly against wound. Add an additional dressing on top, if needed. Do not remove the first dressing. Keep pressure on the spot until help arrives.

+ Make sure everyone knows not to move a seriously injured person until emergency help arrives. Cover victim to keep warm if needed and also try and keep the person quiet.

+ Find out if anyone is allergic to insect stings. Teacher should then be trained to recognize and respond to an allergic reaction. The same with pupils that might be given with seizures at unexpected times.

---

**Fire Prevention**

- Do not store flammable liquids in schoolhouse. Keep flammable liquids in clearly labeled plastic or metal containers but never in glass.

- Shutoff valve for piped-in fuel should be easily accessible in case of emergency.

- An ABC fire extinguisher should be mounted inside and close to each exit door, including the basement.

- Smoke and heat detectors need to be in place.

- All removable floor registers should have guards to prevent someone from falling through onto furnace.

- Does your teacher know the location of the outside fuel shutoff valve?

- Does your teacher know how to operate the building heat source?

  ✓ Inspect gas lights and repair as needed.

  ✓ Furnace and appliances checked for cracks or leaks, cracked or broken grates. (Gas furnace & appliances should be checked by a licensed service person.)

  ✓ Stove pipes checked for damage or obstruction. Replace if worn out.

  ✓ Chimney inspected for cracks, creosote build-up or obstruction. Cleaned out if necessary.

  ✓ Furnace draft controls working properly.

  ✓ Furnace filters replaced.
Give training to teachers and older pupils on how to use fire extinguishers. Remember this word: PASS

Pull the pin.
Aim at base of fire.
Squeeze the trigger
Sweep across the base of fire with spray.

Fire extinguishers and detectors inspected annually by licensed service people. Monthly inspections done by teacher or board members.

**Dates Inspected:**

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A fire drill practiced within a week after school starts and at least two more times during the school term.

**Dates When Practiced:**

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Fire drill procedures on next page

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**Fire Drill Procedures**

MAKE SURE THAT TEACHERS AND STUDENTS UNDERSTAND FIRE DRILL PROCEDURES BEFORE ATTEMPTING ONE.

1

Have a designated area where everyone will gather after leaving schoolhouse. The designated area should be off to the side so as not to interfere with emergency people when they arrive.

2

Everyone needs to leave all books and papers as is, quickly stand up and face door, walk in single file (or double if you have double doors), stay in line. "DO NOT" run or shove but walk briskly to the designated gathering area. The first ones to the door should hold them open for the rest. "TEACHERS" make sure everyone is accounted for.

Proceed with ☑ next when an actual fire occurs. You can do a mock practice on these.

3

Have two of the oldest boys appointed & trained to go for help and/or call 911 if needed. Have school address posted at phone and speak slowly and clearly. The teacher could write the phone number and address on a paper to be taken along to the phone so the boys can just read it.

4

Turn off outside fuel valve if this can be done easily without getting hurt.
What if?

Someone Gets Burned: If someone has open flames on clothes, roll on ground or wrap with a blanket. Immediately cool the burned skin with Water and continue until you get relief. **Do Not** use ice! Stay out of wind or draft. Putting water on quickly and continuously is more important than removing shoes and clothing. Keep clothes cool by adding **More Water**. Keep the affected area as clean as possible. **Do Not** use any salve or grease right away because that will trap the heat inside.

Fire Is Blocking Exit: Do not panic, but simply use the closest exit available. Practice this scenario in various ways. Only as a last resource open a window for an exit. If you can't reach the ground than tie together blankets, coats, shirts or some clothes strong enough to use as a rope to climb down to the ground.

Unusual Smell Of Gas: Evacuate immediately the same way as with fire. Leave school doors **Wide Open** and turn fuel valve off on the outside. Have a school board member or neighbor check it out before going back in.

Other Good Instructions

Teach your upper graders how to use a fire extinguisher correctly.

Ring school bell continuously to summon help from the neighbors.

Teach all pupils the importance of keeping the First Aid Kit and the Fire Extinguishers updated. (An empty kit or extinguisher has little value.)

Road Safety

**Have Horses and ponies that are safe and controllable.**

**Buggies, carts, bikes and anything on wheels visible and properly marked and lighted.**

**Teach proper respect for motorists and other traffic.**

**When walking face traffic, when on wheels go with traffic. Pupils walking and pupils on wheels should not travel together because it narrows the road for passing traffic.**

**Avoid traveling in large groups and don't walk or bike with more than two side by side. Go single file when there is other traffic.**

**Never accept rides or food from strangers. Stranger/Danger.**

**Never send a young child out on the road alone.**

**If a pupil is not present, find out why.**

**Never send pupils home late unless parents are notified. This will avoid worry at the home front.**

Dates When These Rules Are Discussed:

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**Emergency Plan**

These are some basic emergency procedures when you need help from the First Aid, Firemen, Policemen and etc.

If You Need To Evacuate: Have a designated area where everyone will gather after leaving schoolhouse. The designated area should be off to the side so as not to interfere with emergency people when they arrive.

To Evacuate School Grounds: Designate someplace such as a neighbor's house to gather if it's extremely cold or for any other reason that you might need to leave the school grounds completely in an emergency such as a concern of an explosion when there is a gas leak.

Call 911: Have two of the oldest boys appointed & trained to go for help and/or call 911 if needed. Have school address posted at phone and speak slowly and clearly.

Remember, don't panic and create a confusion but trust in the Lord and help each other. Especially the older ones helping the younger ones.

Discuss Emergency Plan & Have A Storm Drill Periodically:

<table>
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<tr>
<th>Dates When Discussed:</th>
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**PLAYGROUND SAFETY**

In our parochial schools most games are played co-ed and/or in mixed age groups. This is great but we need to be well aware of the potential of girls or lower graders getting hurt while playing with upper grade boys. Getting hit in the head with a ball can be devastating. There are some precautions that should help minimize these hurts.

Softball: Softball bats went from wood to aluminum to double wall to triple wall and now to composite. If you cannot find the older aluminum bats then try and at least stay with bats that are rated by ASA.

The best results at this time might be to try and get softballs that are the least active. You will be further ahead by buying new ones that are more flight restricted than getting the potent ones that were used in one game.

Dodge Ball: It can become pretty aggressive when using air filled rubber balls such as kickballs. The official dodge balls are a little smaller and a foam type of material on the inside. This makes it more fun but not quite as aggressive. They are harder to find so we have listed at least a couple companies that have them available.

S&S Discounts - 1-800-243-9232 One style ball is SMGW4791
(There are different grades available)

Millers Country Store - 1-574-642-3661 7" ball is regular size.
(They have factory 2nds, but appear to be okay)

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**NOTE**

Do Not Go Out In A Rainstorm When There Is Lightening
APPENDIX D

18 OCTOBER 2008 NAPPANEE, INDIANA DAMAGE PHOTOS
Howard Chupp’s family barn (A) was rebuilt a week after the tornado struck his family property in Nappanee, Indiana on 18 October 2008. The duck barns (B), part of the family business, were also destroyed in the tornado. Chupp estimates he had over 200 people helping clean up and rebuild his farm.
Howard Chupp’s home the morning after the 18 October 2008 Nappanee tornado (Elkhart, Co., Indiana). House is located along C.R. 1000 West, south of Nappanee. Note the barn in the foreground (A) and duck barns (B) on the top left of the frame. The home (C) remained undamaged, but the Chupp’s lost nearly 200 pine trees on the property. The tornado entered the property from the bottom right corner and traveled past the duck barns on the top left corner (SW to NE).
APPENDIX E

PRESIDENTIAL DISASTER DECLARATION REQUESTS
November 2, 2007

The Honorable George W. Bush
President of the United States
The White House
Washington, D. C. 20202

Through: Edward G. Buikema
Regional Administrator
Federal Emergency Management Agency
Region V
536 South Clark Street, 6th Floor
Chicago, Illinois 60605-1521

Dear Mr. President:

Under the provisions of Section 401 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C.5121-5206 (Stafford Act), and implemented by 44 CFR 206.36, I request that you declare a major disaster for the State of Indiana as a result of severe storms and tornado that occurred on October 18, 2007 affecting Elkhart, Kosciusko and Marshall Counties.

The National Weather Service, Northern Indiana Forecast Office, provides the following meteorological analysis of the storm development: “Convective initiation occurred shortly after 4 pm from central Illinois into northwest Indiana in response to a secondary mid level shortwave trough ejecting out of central Missouri and increasing forced ascent. 18Z special sounding from Lincoln Illinois (KILX) showed dramatic mid level cooling as a result of the ejecting mid level shortwave trough. Rapid scan visible imagery showed aggravated CU/TCU development by late afternoon with continued surface based destabilization and low level moisture advection within mid level dry slot left behind lead shortwave trough which spawned widespread showers and thunderstorms earlier in the day. An unseasonably strong upper level wind maxima associated with this ejecting trough and backing surface flow led to extreme deep layer wind shear. Several broken lines of discrete super cells developed in the evening although the storm responsible for this tornado developed toward the end of the event. Numerous storms exhibited intense low level rotation with several reports of funnel clouds but all but this particular storm failed to produce actual tornadoes.”

The National Weather Service surveyed the damages on October 19, 2007 and filed this report: “Damage assessment teams from the National Weather Service Forecast
Office in Northern Indiana confirmed a single tornado touchdown during the late evening hours of October 18th. Damage associated with this long track tornado began near the intersection of 12B road and Gumwood road...just west of Bourbon around 10:05 pm EDT. Shingle and tree damage was found...consistent with an EF0. As the tornado moved rapidly northeast at over 50 mph, it intensified rapidly, tracking between Bremen and Bourbon. Several structures, trees and power lines suffered varying degrees of damage with the intensity reaching high end EF1 intensity just prior to crossing into Kosciusko County near 1000N along the county line with a path width near 1/2 mile. The tornado continued to intensify over northwest Kosciusko County, reaching EF3 intensity, just south of Nappanee with 17 homes suffering extensive damage. The tornado contracted as it entered into southeast Nappanee, reaching max intensity of a high end EF3 with winds estimated at 165 mph, and caused widespread severe damage to homes and businesses within its quarter mile path width. Over 100 structures suffered significant damage or were destroyed in Nappanee. The tornado continued moving northeast out of town...northeast of Nappanee...but weakened with EF1/EF0 damage observed prior to lifting near the intersection of CR46 and CR17. The tornado path extended for 20 miles with a maximum width of one half mile and a peak intensity of EF3 on the Enhanced Fujita Scale. Despite the time of day, only minor injuries, consisting of mainly bumps, bruises and cuts, were reported.”

The National Weather Service provided information regarding the possibility of tornadoes associated with this event over the previous two days. Conference calls providing briefings on the expected severe weather were conducted by NWS with emergency personnel and broadcasters throughout the state. The proactive role of the NWS and area broadcasters in providing information to the public well in advance, over the two day period leading up to the event, coupled with the warning and response actions of local governments, no doubt, saved lives and reduced injuries.

In response to the situation, I have taken appropriate action under Indiana Code and directed the execution of the State Emergency Plan on October 18, 2007, in accordance with Section 401 of the Stafford Act.


The State of Indiana maintains a current, approved standard hazard mitigation plan. It is anticipated that the plan will be updated no later than April, 2008.

On October 23, 2007, I requested a joint federal state, and local survey of the damaged areas. Preliminary assessments indicate the most severe impacts were to homes and businesses in Elkhart and Kosciusko Counties, particularly in the City of Nappanee. The tornado swept a one half mile swath of destruction over a 20.8 mile path beginning
just west of Bourbon, in Marshall County, traveling through the northwestern corner of Kosciusko County, and ending just northeast of Nappanee, in Elkhart County. This continuous path of damage destroyed 51 homes and caused major damage to an additional 137. An additional 201 residences were determined to have sustained minor damage or were affected. The preponderance of the damage occurred in the small rural Elkhart County community of Nappanee (population 6,710). It is important to note that a small portion of the city’s south side (130 homes) is situated in Kosciusko County. Of the homes damaged, only very few were Amish or Mennonite owned properties. Local building officials, when performing inspections of damaged homes, are finding that homes previously categorized as minor damage have shifted on their foundations.

Based upon the large number of destroyed and major damaged residences, temporary housing will be an issue. Rebuilding and repairing residences will take many months in most cases. The construction season is nearing an end in this region. Many families, who are fortunate enough to have adequate insurance, will be able to begin planning their recovery. Many victims will not have adequate insurance proceeds to repair or rebuild. While there is insurance, there are those homeowners who are grossly under insured. American Red Cross (ARC) estimates indicate that only 25 percent of the homes damaged in Kosciusko and Marshall Counties have any form of insurance. ARC estimated that only half of the homes in Elkhart County have some form of insurance. Of those that are insured, there is very little replacement insurance in place. It has also been determined that renters insurance, at less than 3 percent, virtually does not exist. Rental housing is in very short supply throughout the area. School age children of displaced families will be forced to attend different school systems. Employees of area industries and businesses will be forced to travel longer distances to their local places of employment and to their churches, doctors, etc., enduring increased transportation and fuel costs. According to the US Census Bureau, Nappanee residents have the shortest commuting distances in the state. Most residents both live and work within the community. This forced relocation poses a major disruption of family life and greater hardship for many of the victims.

The Indiana Legislature’s Interim Study Committee on Mortgage Lending Practices and Home Loan Foreclosures met for the first time on August 16, 2007. The following are statements from their first meeting: “Indiana has one of the highest foreclosure rates in the nation. Low wages and joblessness resulting from the loss of manufacturing jobs has created a climate unfavorable to owning and/or buying a home in Indiana, which has resulted in more families losing their homes to foreclosures. Sub-prime lending is also responsible for Indiana’s high foreclosure rate. The low and/or zero down payment offers and accessibility of sub-prime loans easily attract the target consumers. However, sub-prime loans are very risky investments, often leading to rapidly increasing interest rates, which lead to foreclosures.”
Unfortunately, the manufacturing industry serves as the primary sector of the local Nappanee City economy. Families already struggling to maintain their homes are now faced with greater financial need than ever before. This traumatic event, coupled with mounting recovery costs, will increase the need for mental health services.

Unemployment is also a critical issue in this disaster. Two of the City’s major employers, Fairmount Homes, a manufacturer of modular homes (and major supplier of travel trailers during the Hurricane Katrina/Rita housing emergency) and Gulfstream, a travel trailer manufacturer, both had production facilities seriously damaged. Several of its operating units were destroyed. Collectively, these companies employ over 3000 local residents. Franklin Coach, a company with a workforce of 65, is unable to operate. Its manufacturing facilities suffered a direct hit by the tornado at its greatest intensity. At this time, it is doubtful that the company will be able to reopen. Employees are presently laid off with no anticipated return date. Currently, voluntary agencies are providing minimum financial assistance to these employees to meet their immediate living expenses.

Unemployment rates and poverty rates were at 4.8 percent and 10.1 percent respectively in Elkhart County; 4.8 percent and 7.9 percent respectively in Kosciusko County; and 5.3 percent and 8.1 percent respectively in Marshall County. Unemployment rates for the affected areas are well above the state 3.3 percent average. From nearly 8 percent to over 10 percent of the population of the affected counties live in poverty which is also well above the 6.7 percent state average.

A total of 107 businesses have sustained physical damages and many more have been impacted indirectly as a result of this disaster. Even minor damages can have a major impact on business. Consideration must be given to the fact that many businesses depend upon industries that have sustained major damage. Companies that supply the local manufactured housing industry have been impacted. In addition, local businesses will suffer economic injury as a result of the layoffs or decreased incomes of the local workforce. Mortgages will be at risk of default. This disaster has far reaching impacts on the economy of the entire region. Virtually every enterprise in the community has been adversely affected by this disaster, either physically or economically.

The City of Nappanee lost several buildings that housed its Street Department facilities. Water treatment and distribution as well as waste water systems were also harmed. Equipment stored at the Street Department was destroyed. Damages were reported to several city owned pieces of equipment including a fire truck. Physical damages and debris removal costs are still being tabulated by the City. Preliminary estimates, to date, indicate that nearly $900,000 in damage was sustained by the City. This amount is expected to increase as work continues. These costs will be passed on to
city residents who are already experiencing the adverse affects of the disaster. Nappanee city property tax is one of the highest in the state. Currently, the estimated damage sustained by the City equate to over $132 per capita. These costs will, in all probability, place the city in fiscal crisis.

I have determined that this incident is of such severity and magnitude that effective response is beyond the capabilities of the State and affected local governments and that supplementary federal assistance is necessary. I am specifically requesting the implementation of Individual Assistance Programs including Individual and Household program, Disaster Housing, Other Needs Assistance, Crisis Counseling, Disaster Unemployment Assistance, U.S. Small Business Administration Disaster Loans, and Hazard Mitigation state-wide.

I am specifically requesting Individual Assistance programs for Elkhart, Kosciusko and Marshall Counties.

I intend to implement the Other Needs Assistance Program as shown in Table A.

I reserve the right to request the Public Assistance Program once infrastructure damages are fully understood.

Preliminary estimates of the types and amount of assistance needed under the Stafford Act are tabulated in Enclosures A and B. Estimated requirements for assistance from certain Federal agencies under other statutory authorities are tabulated in Enclosure C.

The following information is furnished on the nature and amount of State and local resources that have been used to alleviate the conditions of this disaster:

The Indiana State Police (ISP) provided traffic control, search and rescue and security.

The Indiana Department of Transportation (INDOT) provided traffic control and debris removal assistance.

The Indiana Department of Natural Resources (IDNR) provided traffic control, search and rescue and security.

The Indiana Department of Insurance provided on-site services to assist disaster victims with insurance claims.

Indiana Department of Workforce Development dispatched a WorkOne Rapid Response Team to the area to support the workers whose places of employment have been damaged or destroyed.
The President
November 2, 2007
Page 6

The Indiana Utility Regulatory Commission maintained constant surveillance of power outages keeping the EOC advised of the severity and estimated times of restoration.

The Indiana Department of Homeland Security provided overall direction and control on my behalf, on-site coordination of response operations, continuously monitored the situation, surveyed stricken areas and coordinated with federal agencies including the Federal Emergency Management Agency. The Division of Fire and Building Safety provided technical assistance and inspection services as well as providing damage assessment information on homes, and monitored fire operations throughout the affected area.

Volunteer agencies are providing immediate needs assistance. Presently, the American Red Cross, Elkhart Chapter, is still assisting Nappanee victims with financial support (vouchers), food and clothing needs.

The Salvation Army is feeding disaster workers, volunteers and victims as well as providing other essential immediate services.

The Hope Crisis Network (HCN) is assisting in rebuilding and repairing damaged homes. HCN is currently operating from the Nappanee Missionary Church. HCN is accepting donations at the church as well as well as using it as a distribution point.

The United Methodist Committee on Relief (UMCOR) is assisting in debris removal in Nappanee as well as Kosciusko and Marshall Counties.

Church World Service is assisting in the coordination of volunteers and the local Long Term Recovery Committee. Regular meetings are being conducted to coordinate the volunteer effort.

Volunteer agencies are also assisting families in Marshall County to meet their monthly housing financial obligations. Volunteers are working to clear nearly 400 fallen trees from private property in Marshall County.

To date, over 42,400 volunteer hours have been provided to assist the affected area. Many of the volunteers have been engaged in the debris removal activities. Over 700 trees are being cleaned up by volunteers. Voluntary agency support in this disaster has been outstanding. While the voluntary agencies are doing a magnificent job, the magnitude and scope of this disaster requires resources and capabilities beyond what these essential organizations can provide.
The President  
November 2, 2007  
Page 7  

I certify that for this major disaster, the State and local governments will assume all applicable non-Federal share of costs required by the Stafford Act. Total expenditures are expected to exceed $73,464.00, in accordance with the table in Enclosure D.

In addition, I anticipate the need for debris removal, which poses an immediate threat to lives, public health, and safety. Pursuant to Sections 403 and 407 of the Stafford Act, 42 U.S.C. 5170b & 5173, the State agrees to indemnify and hold harmless the United States of America for any claims arising from the removal of debris or wreckage for this disaster. The State agrees that debris removal from public and private property will not occur until the landowner signs an unconditional authorization for the removal of debris.

I have designated J. Eric Dietz as the State Coordinating Officer for this request. He will work with the Federal Emergency Management Agency in damage assessments and may provide further information or justification on my behalf.

County and city officials responded to this event displaying a high degree of professionalism. Operations were conducted in a rapid and efficient manner. Their proactive role in warning and response were a key element in lessening injuries and preventing fatalities. Nonetheless, this storm system has caused serious damage to both residential and public property. The low insurance levels and high per capita costs greatly impact this rural disaster area. The voluntary agencies are struggling to meet the immediate needs of the storm victims. The resources required to address the recovery needs of these rural counties reside in the FEMA Individual Assistance programs. Temporary housing is needed. Other needs Assistance is required.

I look forward to your earliest reply.

Sincerely,

[Signature]

Attachments: A

Enclosures: A, C, D
ATTACHMENT A

STATE OF INDIANA
EXECUTIVE DEPARTMENT
INDIANAPOLIS

EXECUTIVE ORDER       07-19

FOR: DECLARING A DISASTER EMERGENCY IN ELKHART, KOSCIUSKO
AND MARSHALL COUNTIES DUE TO DEVASTATION CAUSED BY A
TORNADO AND SEVERE STORMS

TO ALL TO WHOM THESE PRESENTS MAY COME, GREETINGS:

WHEREAS, on October 18, 2007, a tornado touched down west of Bourbon, in
Marshall County, Indiana and traveled northeast through Kosciusko
county and Nappanee, in Elkhart County, Indiana leaving behind a twenty-
mile path of destruction;

WHEREAS, the tornado and severe storms damaged nearly 400 homes, with 51 homes
destroyed and 137 homes suffering major damage;

WHEREAS, the tornado and severe storms also destroyed or damaged numerous
business and government buildings, including 3 recreational vehicle
plants, Fairmont Homes, Gulf Stream Coach and Franklin Coach, that are
among the City of Nappanee’s largest employers.

NOW, THEREFORE, I, Mitchell E. Daniels, Jr., by virtue of the authority vested in
me as Governor of the State of Indiana, do hereby:

DECLARE that a state of disaster emergency exists in Elkhart, Kosciusko and
Marshall Counties; and

ORDER the Indiana Department of Homeland Security, having already
implemented the State Emergency Plan, to provide needed emergency
services to the damaged areas of Indiana impacted by the tornado and to
coordinate assistance with appropriate federal, state and local agencies.

This declaration of disaster emergency was in effect beginning on October 18, 2007 and
continues.

IN TESTIMONY WHEREOF, I,
Mitchell E. Daniels, Jr., have hereunto
set my hand and cause to be affixed the
Great Seal of the State of Indiana on this
1st day of November, 2007.

Mitchell E. Daniels, Jr.
Governor of Indiana

ATTEST: Todd Rokita
Secretary of State
Enclosure A
Estimated Requirements for individual Assistance
The Stafford Act

<table>
<thead>
<tr>
<th>Temporary Housing</th>
<th>Repairs</th>
<th>Replacement</th>
<th>Permanent Housing</th>
<th>Other Assistance</th>
<th>Other Programs (Disaster unemployment Assistance, Legal Services and Crisis Counseling)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$60,564</td>
<td>$1,318,280</td>
<td>$468,894</td>
<td>TBD</td>
<td>$226,514</td>
<td>TBD</td>
</tr>
</tbody>
</table>
Enclosure C
Estimated Requirements Other Federal Agencies
The Stafford Act

<table>
<thead>
<tr>
<th>County</th>
<th>SBA Home Loans</th>
<th>SBA Business Loans</th>
<th>FSA Loans</th>
<th>NRCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elkhart</td>
<td>$6,570,000</td>
<td>$18,600,000</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Kosciusko</td>
<td>$1,541,000</td>
<td>$356,000</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Marshall</td>
<td>$ 515,000</td>
<td>$ 0</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>
ENCLOSURE D
Governor’s Certification

I certify that for this current disaster, State and local expenditures and obligations will include the non-federal share of costs required by the Stafford Act. As stated in my basic letter, and based on information available at this time, tabulation of these estimated expenditures and obligations are as follows:

<table>
<thead>
<tr>
<th>CATEGORY OF ASSISTANCE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual Assistance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Other Assistance&quot; under Individuals and Households Program</td>
<td>$ 56,628 0</td>
</tr>
<tr>
<td>Other</td>
<td>0 TBD</td>
</tr>
<tr>
<td>Total</td>
<td>$ 56,628 0</td>
</tr>
<tr>
<td>Public Assistance:</td>
<td></td>
</tr>
<tr>
<td>Category A - Debris Removal</td>
<td>$ 0 0</td>
</tr>
<tr>
<td>Category B - Emergency Protective Measures</td>
<td>0 0</td>
</tr>
<tr>
<td>Category C - Roads and Bridges</td>
<td>0 0</td>
</tr>
<tr>
<td>Category D - Water Control Devices</td>
<td>0 0</td>
</tr>
<tr>
<td>Category E - Buildings and Equipment</td>
<td>0 0</td>
</tr>
<tr>
<td>Category F - Utilities</td>
<td>0 0</td>
</tr>
<tr>
<td>Category G - Other (Parks, Recreational Facilities, etc.)</td>
<td>0 0</td>
</tr>
<tr>
<td>Total:</td>
<td>$ 0 $ 0</td>
</tr>
<tr>
<td>Grand Total:</td>
<td>$ 56,628 $ 0</td>
</tr>
</tbody>
</table>
APPENDIX F

ENHANCED FUJITA SCALE DAMAGE INDICATORS
### Enhanced Fujita Scale Damage Indicators

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>DAMAGE INDICATOR</th>
<th>ABBREVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Small barns, farm outbuildings</td>
<td>SBO</td>
</tr>
<tr>
<td>2</td>
<td>One- or two-family residences</td>
<td>FR12</td>
</tr>
<tr>
<td>3</td>
<td>Single-wide mobile home (MHSW)</td>
<td>MHSW</td>
</tr>
<tr>
<td>4</td>
<td>Double-wide mobile home</td>
<td>MHDW</td>
</tr>
<tr>
<td>5</td>
<td>Apt, condo, townhouse (3 stories or less)</td>
<td>ACT</td>
</tr>
<tr>
<td>6</td>
<td>Motel</td>
<td>M</td>
</tr>
<tr>
<td>7</td>
<td>Masonry apt. or motel</td>
<td>MAM</td>
</tr>
<tr>
<td>8</td>
<td>Small retail bldg. (fast food)</td>
<td>SRB</td>
</tr>
<tr>
<td>9</td>
<td>Small professional (doctor office, branch bank)</td>
<td>SPB</td>
</tr>
<tr>
<td>10</td>
<td>Strip mall</td>
<td>SM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Large shopping mall</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---------------------</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Large, isolated (&quot;big box&quot;) retail bldg.</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>Automobile showroom</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>Automotive service building</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>School - 1-story elementary (interior or exterior halls)</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>School - jr. or sr. high school</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>Low-rise (1-4 story) bldg.</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>Mid-rise (5-20 story) bldg.</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>High-rise (over 20 stories)</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>Institutional bldg. (hospital, govt. or university)</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>Metal building system</td>
</tr>
<tr>
<td>21</td>
<td></td>
<td>Service station canopy</td>
</tr>
<tr>
<td>No.</td>
<td>Description</td>
<td>Code</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>23</td>
<td>Warehouse (tilt-up walls or heavy timber)</td>
<td>WHB</td>
</tr>
<tr>
<td>24</td>
<td>Transmission line tower</td>
<td>TLT</td>
</tr>
<tr>
<td>25</td>
<td>Free-standing tower</td>
<td>FST</td>
</tr>
<tr>
<td>26</td>
<td>Free standing pole (light, flag, luminary)</td>
<td>FSP</td>
</tr>
<tr>
<td>27</td>
<td>Tree - hardwood</td>
<td>TH</td>
</tr>
<tr>
<td>28</td>
<td>Tree - softwood</td>
<td>TS</td>
</tr>
</tbody>
</table>