# **Chapter 6 - Hazard Identification**

# Overview

Alpena County is vulnerable to a wide range of natural, technological and human-related hazards. Managing these many varied threats, and protecting life and property, are challenges faced by emergency management officials at all levels of government. In order to attain an effective emergency management capability to mitigate, prepare for, respond to, and recover from all types of hazards, an understanding of the multitude of hazards that confront the County must first be obtained. The first step is to identify potential hazards within a community. Next, the hazards are ranked according to the relative risk to the community. The final step in the process will be to assess the level of vulnerability for each identified hazard.

When coupled with relevant community profile information, the hazard identification and vulnerability assessment becomes a powerful planning tool that enables emergency management officials to set priorities and goals for resource allocation and mitigation and preparedness activities. This process should not be considered a reliable predictor of the occurrence of any hazard. Hazards have always had an uncanny way of occurring when least expected. This section can give communities a realistic base by which to plan for mitigation preparedness, response and recovery activities.

# **Hazard Descriptions**

#### **Flooding Hazards**

#### Dam Failures

Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act (451 P.A. 1994), as amended, provides for the inspection of dams. This statute requires the MDEQ to rate each dam as either "high", "significant", or "low" hazard potential, according to the potential downstream impact if the dam were to fail (not according to the physical condition of the dam). The MDEQ has identified and rated over 2,400 dams. This statute regulates dams over 6 feet in height that create an impoundment with a surface area of more than 5 acres. Dam owners are required to maintain an EAP for "high" and "significant" hazard potential dams. Owners are also required to coordinate with local emergency management officials to assure consistency with local emergency operations plans. Dams regulated by FERC, such as hydroelectric power dams, are generally exempt from this statute.

The FERC licenses water power projects (including dams) that are developed by non-federal entities, including individuals, private firms, states and municipalities. Under provisions of the Federal Power Act and federal regulations, the licensee of the project must prepare an EAP. This plan must include a description of actions to be taken by the licensee in case of an emergency. Licensees must conduct a functional exercise at certain projects, in cooperation with local emergency management officials.

Dam failures can result in loss of life and extensive property and/or natural resource damage for miles downstream from the dam. Failure of a dam does not only occur during flood events,

which may cause overtopping of a dam. Failure can also result from mis-operation, lack of maintenance and repair, and vandalism. Such failures can be catastrophic because they occur unexpectedly, with no time for evacuation. Michigan has experienced over 260 dam failures in its history.

Alpena County has three FERC license hydro dams; two of them, the Norway Point Dam and the Four Mile Dam, are high hazard. (**Table 6.1**)

Table 6.1 Design Information for Four Mile, Norway Point and 9 <sup>th</sup> Street Dams				
Name	Dam Height	Dam Pool	Normal/Max Storage	Year Built
Four Mile Dam	27 feet	900 acres	900 acre feet	1902
Norway Point Seven Mile	43 feet	1,700 acres	27,500 acre feet	1924
9 Street Dam	24 feet	704 acres	6000 acre feet	1910

Norway Point Dam is located about 4 miles from the Alpena city limits, and Four Mile Dam is about 3 miles from the City. An additional hazard consideration is that both dams are located within about 3 miles from the Alpena County Regional Airport/Alpena Combat Readiness Training Center, and in the general flight path of that facility. **(Figure 6.1, 6.2)** Neither Norway Point nor Four Mile dam has experienced failure to the extent that the City of Alpena was threatened or affected.



# **Riverine and Urban Flooding**

Riverine flooding is defined as periodic occurrences of overbank flows of rivers and streams resulting in partial or complete inundation of the adjacent floodplain. Riverine floods generally

caused by prolonged, intense rainfall, snowmelt, ice jams, dam failures, or any combination of these factors. Such overbank flows are natural events that may occur on a regular basis.

Riverine floods occur on river systems whose tributaries may drain large geographic areas and encompass many independent river basins. Floods on large river systems may continue for several days. Many areas of Michigan are subject to riverine flooding. Flash flooding differs from riverine flooding in extent and duration. Flash floods are brief, heavy flows on small streams or in normally dry creeks. Flash floods are normally the result of locally intense thunderstorm resulting in significant rainfall. Flash floods are typically characterized by high velocity water, often carrying large amounts of debris.

Urban flooding involves the overflow of storm sewer systems and is usually caused by inadequate drainage



following heavy rainfall or rapid snowmelt. In the City of Alpena and the Township of Alpena, there are areas of poor drainage and the need to separate storm water from sanitary wastewater. The principal flooding concern in the County involves the Washington Bridge on U.S. 23 crossing the Thunder Bay River. The bridge acts as a dam during periods of high water flow causing backup and flooding. The backup is made worse by debris left in the river from the demolition of a previous bridge.

The county is also vulnerable to other flooding situations. During the spring of 1998, the Thunder Bay River Basin experienced a series of weather events that when taken together resulted in exceptional downstream flooding. **(Table 6.2)** The Alpena Intergovernmental Drainage Committee developed the Fletcher Creek Flood Study, which analyzed the flood event, identified problem areas and made recommendations to mitigate drainage issues and future fold event impacts. The normal flow of the Thunder Bay River for generating power with no gates or spillways open is 1,200 CFS. The peak flow on April 2, 1996 at the Ninth Street Dame was 15, 825 CFS. This was the highest flow rate recorded since 1923.

The principal flood hazard areas for Alpena County were mapped by FEMA in 2011. Maps

indicate a 100 year flood potential around Sunset Lake, just Southwest of Alpena City limits. The principal flooding hazard potential is generally restricted to Alpena Township and the City of Alpena along the Lake Huron shoreline, within the sub-watersheds of the lower Thunder Bay River, Devil's River and

Table 6.2 Spring 1998, Weath	er Conditions
Saturday, March 28, 1998	25" snow melt
Sunday, March 29, 1998	1 <sup>1</sup> ⁄ <sub>2</sub> " rainfall
Monday, March 30, 1998	2 <sup>1</sup> ⁄ <sub>2</sub> " rainfall
Tuesday, March 31, 1998	1 ¾" rainfall
Wednesday, April 1, 1998	0.6" rainfall

around Sunset and Devil's Lakes. Drainage and flooding continue to be problems within the Fletcher Creek watershed, and around Trucky, French and Golf Course Roads.

## Shoreline Flooding/Erosion

Flooding and erosion along Michigan's 3,200-mile long Great Lakes shoreline is typically caused by high Great Lakes water levels, storm surges, or high winds. Shoreline flooding and erosion are natural processes that occur at normal and even low Great Lakes water levels. During periods of high water, however, flooding and erosion are more frequent and serious, causing damage to homes, businesses, roads, water distribution and wastewater treatment facilities, and other structures in coastal communities. Windstorms and differences in barometric pressure can temporarily tilt the surface of a lake up at one end as much as 8 feet. This phenomenon is called a storm surge and can drive lake water inland over large areas.

Alpena County has an extensive Lake Huron coastline, Thunder Bay River and its tributaries and many large lakes and ponds scattered through the county. The extent of critical sandy shoreline along these water bodies, and its inherent capacity for erosion, has generated remediation activities for many years to these shorelines. Implementation of land use policies and regulations is an important strategy used by local, state and federal units of government for protecting water quality. In addition to their benefits for aquatic resources, planning and zoning are tools used for ensuring the conservation of wildlife habitat, providing for sustainable development, protecting property values, and maintaining community character.

#### Hazardous Materials Incidents

#### Fixed Site

A hazardous material incident is defined as an uncontrolled release of hazardous materials from a fixed site, capable of posing a risk to health, safety, property and the environment. Hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other community facilities. Hazardous materials are materials or substances, which, because of their chemical, physical, or biological nature, pose a potential threat to life, health, property and the environment if they are released. Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gases. Hazardous materials are highly regulated by the government to reduce risk to the general public, property and the environment. Despite precautions taken to ensure careful handling during the manufacture, transport, storage, use and disposal of these materials, accidental releases are bound to occur. Areas at most risks are within a 1-5 mile radius of identified hazardous material sites. Many communities have detailed plans and procedures in place for responding to incidents at these sites, but releases can still cause severe harm to people, property and the environment if proper mitigation action is not taken in a timely manner.

There are six 302 sites in Alpena County. These are: Frontier Alpena Central Office, 223 Lockwood Street; Alpena Supply Company, 410 11<sup>th</sup> Street; ATI Casting Service, 615 McKinley Avenue; Alpena, 510 11<sup>th</sup> Street; METC Alpena Substation, 3251 Four Mile Road; Alpena Airgas, 510 11<sup>th</sup> Ave., Alpena; American Process energy Recovery Inc., 412 Ford Ave., Alpena and Bresnan Telecommunications Company, LLC, 1390 Bagley Street. To date there have been no 302 emergencies recorded in Alpena County, but some Tier II events have occurred at fixed sites.

## **Transportation**

An uncontrolled release of hazardous materials during transport is capable of posing a risk to health, safety, property or the environment. All modes of transportation - highway, railroad, seaway, airway, and pipeline - are carrying thousands of hazardous material shipments on a daily basis through local communities. A transportation accident involving any one of those hazardous material shipments could cause a local emergency affecting many people. The U.S. Department of Transportation regulates the transportation and shipping of over 18,000 different materials. Areas most at risk are within a 1-5 mile radius of a major transportation route along which hazardous material shipments move. All areas in Michigan are potentially vulnerable to a hazardous material transportation incident, although the heavily urbanized and industrialized areas in southern Michigan are particularly vulnerable due to the highly concentrated population. The large number of transportation routes (highways, railroad and water) associated with Alpena County and the large volume of hazardous material shipments that occur on a daily basis leave the county vulnerable.

# Air, Land and Water Transportation Accidents

Hazards include a crash or accident involving an air, land or water-based commercial passenger carrier that results in death or serious injury. Vulnerable areas would include: 1) communities with, or near, an airport offering commercial passenger service; 2) communities with railroad tracks on which commercial rail passenger service is provided; 3) communities in which commercial intercity passenger bus or local transit bus service is provided; 4) communities with school bus service; and 5) communities in which commercial marine passenger ferry service is provided. A serious accident involving any of the above modes of passenger transportation could result in a mass casualty incident, requiring immediate life-saving community response. In addition, a marine transportation accident would require a water rescue operation, possibly under dangerous conditions on the Great Lakes.

The City of Alpena as a regional center and port serves as a focus of air, land and water transportation. Each mode of transportation brings with it specific hazards and disaster potential. There is a need to provide for projects and activities that will work toward mitigating the potential effects of these identified hazards.

## Fire Hazards

## Scrap Tire Fires

Any instance of uncontrolled burning of scrap tire storage or recycling site. Each year in the U.S., an estimated 250 million vehicle tires have to be disposed of. Michigan alone generates 7.5-9 million scrap tires annually. Many of these scrap tires end up in disposal sites (legal or illegal), some of which may have several hundred thousand tires. Tire disposal sites can be fire hazards due to the large quantity of "fuel" onsite, coupled with the fact that the shape of a tire allows air to flow into the interior of a tire pile rendering standard firefighting practices nearly useless. Flowing burning oil released by the burning tires spreads the fire to adjacent areas. Some scrap tire fires have burned for months, creating acrid smoke and an oily residue that can leach into the soil, creating long-term environmental problems. Scrap tire fires can require significant resources to control and extinguish; 2) the costs of fire management are often far beyond that which local government can absorb; 3) the environmental consequences of a major tire fire can be significant; and 4) the extreme heat from the fire converts a standard passenger

vehicle tire into about two gallons of oily residue, which can then leach into the soil or migrate to streams. There are no known significant tire storage sites in Alpena County.

#### Structural Fires

Any instance of uncontrolled burning which results in structural damage to residential, commercial, industrial, institutional, or other properties in developed areas. In terms of average annual loss of life and property, structural fires - often referred to as the "universal hazard" because they occur in virtually every community - are by far the biggest hazard facing most communities in Michigan and across the country. The State Fire Marshal estimates that a structural fire occurs every 24 minutes in Michigan. In Alpena County, there are about 100 structural fires a year with 25% of the structures completely destroyed.

Alpena County, unlike some of the more rural neighboring counties relays on a combination of paid and non-paid fire departments. **(Table 6.3)** This provides the county with an excellent array of firefighting services available to the respective communities. However, the lack of full-time professional fire fighters in outlying rural townships means less time available to conduct fire inspections and take other preventive measures necessary to lessen structural fire threat. Out of necessity, efforts in these communities are directed at fire suppression.

Table 6.3 Alpena County Fire Staffing					
Department Sq. Miles 2010 Paid Part-paid Non-paid Population					
Alpena DPS	15	10,483	27	0	0
Alpena Township FD	101	9,060	6	32	0
Sanborn Township FD	45	2,110	0	0	12
Wilson Township Fire/Rescue	90	2,500	0	0	18
Long Rapids Township FD	81	1,010	0	0	20
Maple Ridge Township FD	54	1690		0	14
Green Township VFD	125	1,228	0	0	12
Alpena Combat Readiness TC	5	1,200	17	0	0
MDNR, Alpena Field Office	12,747	30,605	7	0	0
Totals			57	22	76

Another major challenge facing Michigan fire service is the lack of a state-mandated fire safety code and code enforcement program for all occupancies. The State enforces fire safety codes in schools, dormitories, health care facilities, and correctional facilities, plus some businesses; the remainder of the job is left to local officials. Since there is no uniform, mandated fire safety code at the state level, a variety of local ordinances have emerged. Some communities may not have fire safety codes. This problem manifests itself more seriously in rural areas and small towns, which typically have few, if any, paid full-time fire fighters. Even if a mandated fire safety code were instituted statewide, it wouldn't totally solve the problem of structural fire prevention because the costs of compliance in existing buildings would often be prohibitive for business owners. Such a measure would, however, help ensure that new construction doesn't compound the problem.

#### **Wildfires**

An uncontrolled fire in grass, brushlands, or forested areas. The most immediate dangers from wildfires are the destruction of homes and timber, wildlife, and injury or loss of life to persons who live in the affected area or who are using recreational facilities in the area. Long-term effects can be numerous and include scorched and barren land, soil erosion, landslides/mudflows, water sedimentation, and loss of recreational opportunities. Forests cover approximately one-half of Michigan's total land base. As a result, much of the state is vulnerable to wildfire. In addition, development in and around forests and grasslands is increasing rapidly, making public safety a primary consideration in wildfire mitigation and suppression efforts. The State forest area in Alpena County makes this the one of highest rated hazards.

Contrary to popular belief, lightning strikes are not the primary cause of wildfires in Michigan. Today, only about 2% of all wildfires in Michigan are caused by lightning strikes; the rest are caused by human activity. Outdoor burning is the leading cause of wildfires in Michigan. Most Michigan wildfires occur close to where people live and recreate, which puts both people and property at risk. The immediate danger from wildfires is the destruction of property, timber, wildlife, and injury or loss of life to persons who live in the affected area or who are using recreational facilities in the area.

Forest types vary depending upon the soils, moisture and past activities such as logging, fires and land clearing. Jack pine, oak and aspen-birch are the most fire susceptible forest types. According to the MIRIS Land Cover/Use Inventory, about 7% of Alpena is covered with these forest types. **See Figure 6.3** These sites are located along the sandy beach ridges in the eastern townships and upon sandy outwash in Green and Ossineke Townships in southern Alpena County. The principal use of this land is as State forest and hunt club, although some residential usage does exist.

Although Michigan's landscape has been shaped by wildfire, the nature and scope of the wildfire threat has changed. Michigan's landscape has changed substantially over the last

several decades as residential development continues to expand into the same historic wildfire prone areas. A 60% increase in the number of rural homes since the 1980's) has increased the potential for loss of life and property from wildfires. There are simply not enough fire suppression forces available in rural areas to protect every structure from wildfire.

Information from the Michigan Department of Natural Resources show there were 135 wildfires in Alpena County from 2001 to 29012. **(Table 6.4)** It should be noted that the figures shown on the

Table 6.4         Number of Wildfires by County in Northeast         Michigan, 2001-May of 2012         (MDNR jurisdiction only)				
County	Number of Wildfires	Acres Burned		
Otsego	231	329		
Alcona	135	376		
Alpena	pena 135 303			
Cheboygan	gan 136 328			
Crawford	224	11,819		
Montmorency	110	416		
Oscoda	61	256		
Presque Isle 74 424				
Source: Michigan Department of Natural Resources,				
Forest Management Division				

maps do not include those wildfires suppressed by local volunteer fire departments or the U.S. Forest Service. If records from those sources were readily available, and broken down by county, the statistics would be significantly affected. The relatively high number of wildfire occurrences in Alpena County during this time may be partially explained by the proximity of population centers close to wildfire prone pine/oak forest of the County. Pine/Oak forest of Alpena County are located predominately in Ossineke Township, with significant occurrence in Wilson and Maple Ridge Townships.



## Severe Winter Weather Hazards

Winter weather hazards consisting of heavy snow, freezing rain and blizzards are prevalent natural hazard that occurs in Alpena County and can be expected to occur several times every year. Since January of 2006, 13 winter storm events have been recorded in Alpena County. Over the past 10 years the county has averaged 3.1 severe winter weather hazards each year. The number and intensity of winter weather hazards can fluctuate dramatically from year to year.

#### Ice and Sleet Storms

A storm that generates sufficient quantities of ice or sleet to result in hazardous conditions and/or property damage. Sleet storms differ from ice storms in that sleet is similar to hail (only smaller) and can be easily identified as frozen rain drops (ice pellets) that bounce when hitting the ground or other objects. Sleet does not stick to trees and wires, but sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires, etc. with ice, sometimes causing extensive damage. When electric lines are downed, inconveniences are felt in households and economic loss and disruption of essential services is often experienced in affected communities. Michigan has had numerous damaging ice storms over the past few decades. There were no freezing rain or ice storm events from 2006 to March of 2012, however, in the 1990's there were two freezing rain events and one ice storm as recorded by the National Climatic Data Center of the National Oceanic and Atmospheric Administration.

#### **Snowstorms**

A period of rapid accumulation of snow often accompanied by high winds, cold temperatures, and low visibility. Blizzards are the most dramatic and perilous of all snowstorms, characterized by low temperatures and strong winds bearing enormous amounts of snow. Most of the snow accompanying a blizzard is in the form of fine, powdery particles of snow, which are wind-blown in such great quantities that, at times, visibility is reduced to only a few feet. Blizzards have the potential to result in property damage and loss of life. Just the cost of clearing the snow can be enormous. As a result of being surrounded by the Great Lakes, Michigan experiences large differences in snowfall in relatively short distances. The annual mean accumulation ranges from 30 to 170 inches of snow. The highest accumulations

Table 6.5: Alpena County Snowfall Extremes 1991-2010			
Month	High (in)	Year*	
January	43.0	1994	
February	35.3	2006	
March	31.6	1998	
April	20.2	2003	
May	0.7	2004	
June	0.0	-	
July	0.0	-	
August	0.0	-	
September	0.4	2003	
October	3.0	1997	
November	34.8	1995	
December	48.1	2008	
Year	146.0	1985	
Recorded at Station: 0164, ALPENA WSO AP Source: Midwest Regional Climate Center			

are in the northern and western parts of the Upper Peninsula. Since winter storms tend to move from west to east, the western parts of the state usually have greater amounts of snow than the eastern parts. The highest seasonal snowfall recorded at Alpena County Airport was 146 inches during the 1985 season. (**Table 6.5**)

#### Severe Summer Weather Hazards

#### Hailstorms

A condition where atmospheric water particles from thunderstorms form into rounded or irregular lumps of ice that fall to the earth. Hail is a product of the strong thunderstorms that frequently move across the state. As one of these thunderstorms passes over, hail usually falls near the center of the storm, along with heaviest rain. Sometimes, however, strong winds occurring at high altitudes in the thunderstorm can blow hailstones away from the storm center, causing an unexpected hazard at places that otherwise might not appear threatened. Hailstones range in size from a pea to a golf ball, but hailstones larger than baseballs have occurred in the

most severe thunderstorms. Large hail is a characteristic of severe thunderstorms, and it often precedes the occurrence of a tornado.

The National Weather Service began recording hail activity in Michigan in 1967. Statistics since that time indicate that approximately 50% of the severe thunderstorms that produce hail have occurred during the months of June and July, and nearly 80% have occurred during the prime growing season of May through August. As a result, the damage to crops from hail is often extensive. The incidence of hail follows the incidence of severe thunderstorms. Therefore, those areas of the state most prone to severe thunderstorms are also most prone to large and damaging hail. Generally, severe thunderstorms that produce hail occur more frequently in the southern half of the Lower Peninsula than any other area of the state. However, damaging hail has occurred in every part of Michigan. The National Weather Service forecasts of severe thunderstorms usually provide sufficient warning time to allow residents to take appropriate action to reduce the effects of hail damage to vehicles and some property. However, little can be done to prevent damage to crops.

According to the Michigan Hazard Analysis Plan: A line of severe thunderstorms that ravaged northern Lower Michigan during the weekend of September 26-27, 1998 produced hail up to 2" in diameter in Manistee County, destroying an estimated 30,000-35,000 bushels of apples at area farms. The same storm system produced tennis ball size hail north of the town of Gladwin, which damaged several homes and vehicles. In Arenac County, near Sterling, 3.5" diameter hail damaged crops and injured some livestock at area farms, and damaged several homes, satellite dishes, and vehicles.

The National Climate Data Center reports 19 hail events in Alpena County since 2006. The largest diameter hailstone recorded in the County was 1.75 inches.

#### **Lightning**

The discharge of electricity from within a thunderstorm. Although lightning is often perceived as a minor hazard, it damages many structures and kills and injures more people in the U.S. per year, on average, than tornadoes or hurricanes. Many lightning deaths and injuries could be avoided if people would have more respect for the threat that lightning presents. Michigan ranks second in the nation in both lightning-related deaths and lightning-related injuries.

The following information is compiled in the Michigan Hazard Analysis Plan: Statistics compiled by the National Oceanic and Atmospheric Administration (NOAA) and the National Lightning Safety Institute (NLSI) for the period 1959-1994 revealed the following about lightning fatalities, injuries and damage in the United States:

#### Location of Lightning Strikes

40% are at unspecified locations
27% occur in open fields and recreation areas (not golf courses)
14% occur to someone under a tree (not on golf course)
8% are water-related (boating, fishing, swimming, etc.)
5% are golf-related (on golf course or under tree on golf course)
3% are related to heavy equipment and machinery
2.4% are telephone-related
0.7% are radio, transmitter and antenna-related

Gender of Victims

84% are male; 16% are female

<u>Months of Most Strikes</u> July (30%); August (22%); June (21%)

<u>Days of Most Strikes</u> #1 – Sunday; #2 – Wednesday; #3 – Saturday

<u>*Time of Most Strikes*</u> • 2:00 PM – 6:00 PM

Number of Victims

• One victim (91%); two or more victims (9%)

The NLSI estimates that 85% of lightning victims are children and young men (ages 10-35) engaged in recreation or work-related activities. Approximately 20% of lightning strike victims die, and 70% of survivors suffer serious long-term after-effects such as memory and attention deficits, sleep disturbance, fatigue, dizziness, and numbness. Unfortunately, lightning has taken a tremendous toll on Michigan's citizens in terms of injury and loss of life. Since 1959 when the National Weather Service began keeping such records, Michigan has incurred 99 lightning deaths, and 693 lightning injuries.

- consistently ranking it near the top of the nation in all three categories. During the period 1959-1994 (the last period for which composite statistics are available), Michigan was ranked 2nd nationally (behind Florida) in lightning injuries, 12th nationally in lightning deaths, and 2nd nationally (again, behind Florida) in lightning casualties. Undoubtedly, the fact that Michigan is an outdoor recreation-oriented state contributes heavily to its high lightning death and injury tolls. As the table below indicates, Michigan's lightning deaths and injuries are fairly consistent with the national trends in terms of location of deadly or injury-causing strikes: **(Table 6.6).** 

Table 6.6 Lightning-Related Deaths in Michigan: 1959-July 2001			
Number of Deaths	Location	Percent of Total	
28	Open fields, ball fields	28%	
26	Under trees (not golf)	27%	
11	Boats/water related	11%	
10	Golf Course	10%	
4	Near tractors/heavy equipment	4%	
2	At telephone	2%	
18	Other locations/unknown	18%	
Source: Storm Data, National Climatic Data Center			

## Severe Winds (Windstorm)

According to the National Weather Service, winds in excess of 58 miles per hour are classified as a windstorm. Windstorms are a fairly common occurrence in many areas in Michigan. Along the Great Lakes shoreline, strong winds occur with regularity, and gusts of over 74 miles per hour (hurricane velocity) do occasionally occur in conjunction with a storm front. Severe windstorms can cause damage to homes and businesses, power lines, trees and agricultural crops, and may require temporary sheltering of individuals without power for extended periods of time. Windstorms occur in all areas of Michigan, although more often along the lakeshore and in central and southern Lower Michigan.

Severe winds spawned by thunderstorms or other storm events have had devastating effects on Michigan in terms of loss of life, injuries and property damage. According to data compiled by the National Weather Service for the period 1970-August 2000, Michigan experienced 9,215 severe wind events (not including tornadoes) that resulted in 115 deaths and millions of dollars in damage. It is important to note that the high number of severe wind events is due in part to the fact that storm data is compiled by county. Thus, multi-county storms are counted more than once. Severe wind events are characterized by wind velocities of 58 miles per hour or greater, with gusts sometimes exceeding 74 miles per hour (hurricane velocity).

Figures from the National Weather Service indicate that severe winds occur more frequently in the southern-half of the Lower Peninsula than any other area of the state. On average, severe wind events can be expected 2-3 times per year in the Upper Peninsula, 3-4 times per year in the northern Lower Peninsula, and 5-7 times per year in the southern Lower Peninsula. It must be emphasized that this refers to winds from thunderstorms and other forms of severe weather, but not tornadoes. In terms of response to a severe wind event, providing for the mass care and sheltering of residents left without heat or electricity, and mobilizing sufficient resources to clear and dispose of downed tree limbs and other debris from roadways, are the primary challenges facing Michigan communities. Therefore, every community should adequately plan and prepare for this type of emergency. A summary of impact of some of these severe windstorms is reported in **(Table 6.7).** 

Strong winds and thunderstorm winds are the most prevalent severe weather that affects Alpena County. Annually, thunderstorms will occur on an average of 30 days per year with an average of one per year that has severe winds. From 1955 to 2002, there have been 64 severe wind events recorded in Alpena County causing over \$100,000 in damage. Records from October of 2006 through May of 2012 show there were nine strong wind events with six of those associated with thunderstorm activity. Total estimated damage was \$71,000. Strong winds are most likely in the summer months of June July and August, but can and have occurred at any time of year. One of the most powerful windstorms recorded in the Great Lakes region occurred on June 19, 1955 and November 10, 1998. Wind speeds from these powerful storm reached 88 and 82 knots respectively.

## <u>Tornadoes</u>

A violently whirling column of air extending downward to the ground from a cumulonimbus cloud. The funnel cloud associated with a tornado may have winds up to 300 miles per hour and an interior air pressure that is 10-20 percent below that of the surrounding atmosphere. The typical length of a tornado path is approximately 16 miles, but tracks much longer than that some even up to 200 miles - have been reported. Tornado path widths are generally less than one-quarter mile wide. Historically, tornadoes have resulted in the greatest loss of life of any natural hazard, with the mean national annual death toll being 111 persons. Property damage from tornadoes is in the hundreds of millions of dollars every year. Tornadoes in Michigan are most frequent in the spring and early summer when warm, moist air from the Gulf of Mexico collides with cold air from the polar regions to generate severe thunderstorms. These thunderstorms often produce the violently rotating columns of wind that are called tornadoes. Michigan lies at the northeastern edge of the nation's primary tornado belt, which extends from Texas and Oklahoma through Missouri, Illinois, Indiana, and Ohio. Michigan averages approximately 16 tornadoes per year, most occurring in the southern Lower Peninsula.

National Weather Service data indicates that Michigan has experienced 893 tornadoes and 239 related deaths during the period from 1950-1999, an average of 18 tornadoes and 5 tornadorelated deaths per year. The greatest number of tornadoes per year during that period occurred in 1974 with 39 tornadoes. The least number occurred in 1959 with only 2 tornadoes. From 1950-1999, Michigan experienced 473 "tornado days" (defined as days in which tornadoes are observed), an average of nearly 9.5 days per year. Approximately 63% of all Michigan tornadoes have been weak tornadoes (F0 or F1 intensity), while 33% have been strong tornadoes (F2 or F3 intensity) and 4% have been classified as violent tornadoes (F4 or F5 intensity). However, those few violent tornadoes have been responsible for 78% of Michigan's tornado-related deaths. Strong tornadoes (F2 or F1 intensity) have accounted for approximately 21% of the deaths, while weak tornadoes (F0 or F1 intensity) have caused only 1% of all tornado-related deaths.

Although relatively rare, tornadoes have occurred in Alpena County. Between 1955 and 2002 there were 10 tornadoes occurred within Alpena County causing a \$100,000 in property

damage. IN 2007 there were two fall tornadoes that caused nearly \$500,000 in property damage. The majority of tornadoes have occurred in the

months of May-August, although tornadoes have occurred as early as April 19 and as late as October 18. When a tornado travels over water it is called a waterspout. In Alpena County, one waterspout has been recorded since 1961, and it occurred on June 25. 1998. The most recent tornado to affect Alpena County occurred on June 13. 2004. (Figure 6.4) This tornado covered distance of about seven miles on a southwest to northeast course along the Montmorency County line, and caused \$150,000 damage to property. The tornado was reported in the Alpena News as follows:

**Figure 6.4:** Alpena County Tornado Picture courtesy of Hilary Edison



Table 6.7 \$	Severe Windstorms in Northern Michigan
Location	Summary of Impacts
Statewide	Nov. 10-11, 1998:One of the strongest storms ever recorded in the Great Lakes moved across Michigan on the 10th and 11th of November, 1998, producing strong, persistent winds that damaged buildings, downed trees and power lines, killed one person, and left over 500,000 electrical customers in the Lower Peninsula without power. Wind gusts of 50-80 miles per hour were common, and a peak gust of 95 miles per hour was reported on Mackinac Island. Damage was widespread but relatively minor for a storm of that intensity. However, there were several pockets of significant damage across the state. The U.S. Forest Service reported that at least \$10 million worth of timber was lost in the Ottawa and Hiawatha National Forests
Northern	Sept 26-27 1008: During the weekend of September 26-27 1008 severe thunderstorms rayaged
Lower Michigan	northern Lower Michigan, producing strong winds that damaged or destroyed homes, businesses and public facilities, and downed trees and power lines. Otsego County, and specifically the city of Gaylord, was hardest hit, although damage was also reported in Crawford and Charlevoix counties as well. The storm front, which ran along and north of the M-32 corridor from East Jordan to Alpena, was approximately 12 miles wide and 15 miles long. When the front slammed into Gaylord, wind speeds had reached hurricane force of 80-100 miles per hour. The wind was accompanied by brief heavy rainfall and golf ball size hail. The storm lasted only a few minutes in Gaylord, but the damage was tremendous. Thousands of trees were snapped off at waist level, homes and businesses were torn apart, power lines were downed, and several public facilities were substantially damaged – including the Otsego County Courthouse, which lost half of its roof. Approximately 818 homes were damaged throughout Otsego County, including 47 that were destroyed and 92 that incurred major damage. In addition, the storm injured 11 persons – none seriously. Region-wide, about 12,000 electrical customers lost power. A Governor's Disaster
VA/a at	Declaration was granted to the county to provide state assistance in the debris cleanup effort
West- Central and Central Michigan	On May 31, 1998, a line of severe thunderstorms passed through west-central and central Michigan, producing in some areas hurricane and tornado-force winds that damaged or destroyed 1,500 homes and 200 businesses, severely damaged numerous public facilities, and downed thousands of trees and power lines throughout the 15 county affected area. The downed power lines left nearly 900,000 electrical customers without power, some for up to one week. The storms directly and indirectly caused four fatalities and injured over 140 more. The severe winds were measured at speeds of up to 130 miles per hour in some areas – equivalent to an F2 tornado or strong hurricane. Damage to homes and businesses was estimated at \$16 million, while public damage totaled another \$36 million. A Presidential Major Disaster Declaration was granted for 13 of the 15 counties, making available both public and hazard mitigation assistance to affected local jurisdictions. In addition, Small Business Administration disaster loans were made available to 11 of the 15counties to help rebuild homes and businesses damaged in the storms.
Michigan	brought gale force winds to much of Lower Michigan. Wind gusts of 50-70 miles per hour created 10-15 foot waves on the Lake Michigan shoreline, causing widespread wind damage and lakeshore beach erosion. Private damage was estimated at \$5 million, most of that occurring in a handful of West Michigan counties. The winds downed numerous trees and power lines across the region, causing roof damage to many structures and power outages for nearly 200,000 Consumers Energy electrical customers. No deaths or injuries were reported in this severe wind event.
Lower Michigan	On April 30, 1984 a windstorm struck the entire Lower Peninsula, resulting in widely scattered damage, 1 death, and several injuries. Wind gusts measured up to 91 miles per hour in some areas. Damage was widely scattered, but extensive, with 6,500 buildings, 300 mobile homes, and 5,000 vehicles being damaged. Over 500,000 electrical customers lost power. In addition, 10-16 foot waves on Lake Michigan caused severe shore erosion, collapsing some cottages and driving many boats aground.

# Extreme Temperatures

Prolonged periods of very high or very low temperatures, often accompanied by other extreme meteorological conditions such as high humidity, lack of rain (drought), high winds, blizzard conditions etc. Extreme temperatures - whether extreme heat or extreme cold - share a commonality in that they both primarily affect the most vulnerable segments of society such as the elderly, children, impoverished individuals, and people in poor health. The major threats of extreme heat are heatstroke (a major medical emergency), and heat exhaustion. Extreme heat is a more serious problem in urban areas, where the combined effects of high temperature and high humidity are more intense. Extreme summer heat is also hazardous to livestock and agricultural crops, and can cause water shortages, exacerbate fire hazards, and prompt excessive demands for energy. High air pollution and resultant respiratory problems coincide with extreme high temperatures. Roads, bridges, railroad tracks and other infrastructure are susceptible to damage from extreme heat.

Like heat waves, periods of prolonged, unusually cold weather can result in a significant number of temperature-related deaths. Each year in the United States, approximately 700 people die as a result of severe cold temperature-related causes. The major direct threats of extreme cold are hypothermia (also a major medical emergency) and frostbite. However, a significant number of cold-related deaths are the result of illnesses and diseases that are negatively impacted by severe cold weather, such as stroke, heart disease and pneumonia. Extreme cold temperatures coupled with transportation difficulties and power outages present challenges of providing heat, especially to isolated and vulnerable populations.

Alpena County is subject to both temperature extreme conditions.

# Drought

According to the Michigan Hazard Analysis: Drought is a normal part of the climate of Michigan and of virtually all other climates around the world – including areas with high and low average rainfall. Drought differs from normal arid conditions found in low rainfall areas in that aridity is a permanent characteristic of that type of climate. Drought is the consequence of a natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length. The severity of a drought depends not only on its location, duration, and geographical extent, but also on the water supply demands made by human activities and vegetation. This multi-faceted nature of the hazard makes it difficult to define a drought and assess when and where one is likely to occur.

Droughts can cause many severe impacts on communities and regions, including: 1) water shortages for human consumption, industrial, business and agricultural uses, power generation, recreation and navigation; 2) a drop in the quantity and quality of agricultural crops; 3) decline of water quality in lakes, streams and other natural bodies of water; 4) malnourishment of wildlife and livestock; 5) increase in wildfires and wildfire-related losses to timber, homes and other property; 6) declines in tourism in areas dependent on water-related activities; 7) declines in land values due to physical damage from the drought conditions and/or decreased economic or functional use of the property; 8) reduced tax revenue due to income losses in agriculture, retail, tourism and other economic sectors; 9) increases in insect infestations, plant disease, and wind erosion; and 10) possible loss of human life due to food shortages, extreme heat, fire, and other health-related problems such as diminished sewage flows and increased pollutant

concentrations in surface water. Some other drought related economic impacts are reflected in **(Table 6.8).** 

The 1976-77 drought in the Great Plains, Upper Midwest, and West also severely impacted Michigan. Extreme drought conditions contributed to wildfire, crop damage and low Great Lakes levels. The 1988 drought / heat wave in the Central and Eastern U.S. (an event that greatly impacted Michigan) caused an estimated \$40 billion in damages from agricultural losses. disruption of river transportation, water supply shortages, wildfires, and related economic impacts. In response to the 1988 drought, Michigan communities instituted temporary water use restrictions. To stem the potential for wildfire in Michigan, the Governor issued (in June, 1988) a statewide outdoor burning ban. The summer of 1998 drought / heat wave from Texas to the Carolinas caused an estimated \$6-9 billion in damage. The summer of 1999 drought / heat wave caused over \$1 billion in damage - mainly to agricultural crops in the Eastern U.S. The summer of 2000 drought / heat wave in the South-Central and Southeastern U.S. resulted in over \$4 billion in damages and costs. The drought / heat wave that struck Michigan during the summer of 2001 damaged or destroyed approximately one-third of the state's fruit, vegetable and field crops, resulting in a U.S. Department of Agriculture Disaster Declaration for 82 of the state's counties. In addition, the drought / heat wave caused water shortages in many areas in Southeast Michigan, forcing local officials to issue periodic water usage restrictions. In Alpena County, impacts from extended drought are reduction in crop and livestock production, increased potential for wildfires, reduction in farm products, reduction in timber production, and loss of tourism and decreased watercraft access to Lake Huron and large inland lakes. Social and environmental factors are also significantly stressed.

## Other Natural Hazards

## Subsidence

Depressions, cracks, and sinkholes in the ground surface, which can threaten people and property. Subsidence depressions, which normally occur over many days to a few years, may damage structures with low strain tolerances, such as dams, nuclear reactors, and utility infrastructure. The sudden collapse of the ground surface to form sinkholes poses an immediate threat to life and property. Such ground movements may continue for several days, weeks, months or even years, until the walls stabilize.

The population most at risk would be in areas where industrial or residential development has occurred above active or abandoned mines where underground cavities are present near the surface, as well as areas where an extensive amount of groundwater has been withdrawn. The most prevalent subsidence features in Alpena County are Karst sinkholes in the northern portion of the county Geologist believe that a hinge-line fault, serving as a pathway for subterranean drainage, interconnects several sinkholes and sinkhole controlled lakes before emptying into Lake Huron at El Cajon Bay. The collapse of a sink is a localized natural hazard and there has not been an occurrence recorded in recent history in the County. Karst subsidence also offers the threat of exposing groundwater to rapid contamination in certain circumstances.

Table 6.8 Economi	c Impact of Drought
Costs and losses to	Annual and perennial crop losses
agricultural	Damage to crop quality
producers	Income loss for farmers due to reduced crop yields
	Reduced productivity of cropland (wind erosion, long-term loss of organic matter, etc.)
	Insect infestation
	Plant disease
	Wildlife damage to crops
	Increased irrigation costs
	Cost of new or supplemental water resource development (wells, dams, pipelines)
Costs and losses to	Reduced productivity of rangeland
livestock producers	Reduced milk production
	Forced reduction of foundation stock
	Closure/limitation of public lands to grazing
	High cost/unavailability of water for livestock
	Cost of new or supplemental water resource development (wells, dams, pipelines)
	High cost/unavailability of feed for livestock
	Increased feed transportation costs
	High livestock mortality rates
	Disruption of reproduction cycles (delayed breeding, more miscarriages)
	Decreased stock weights
	Increased predation
	Range fires
Loss from timber	Wildland fires
production	Tree disease
•	Insect infestation
	Impaired productivity of forest land
	Direct loss of trees, especially young ones
Loss from fishery	Damage to fish habitat
production	Loss of fish and other aquatic organisms due to decreased flows
General economic	Decreased land prices
effects	Loss to industries directly dependent on agricultural production (e.g., machinery and
	fertilizer manufacturers, food processors, dairies, etc.)
	Unemployment from drought-related declines in production
	Strain on financial institutions (foreclosures, more credit risk, capital shortfalls)
	Revenue losses to federal, state, and local governments (from reduced tax base)
	Reduction of economic development
	Fewer agricultural producers (due to bankruptcies, new occupations)
	Rural population loss
Loss to recreation	Loss to manufacturers and sellers of recreational equipment
and tourism	Losses related to curtailed activities: hunting and fishing, bird watching, boating, etc.
Energy-related	Increased energy demand and reduced supply because of drought-related power
effects	curtailments
	Costs to energy industry and consumers associated with substituting more expensive
	fuels(oil) for hydroelectric power
Transportation	Loss from impaired navigability of streams, rivers, and canals
Food Production	Increase in food prices
decline	Increased importation of food (higher costs)
	Source: National Drought Mitigation Center, University of Nebraska, Lincoln

## Earthquakes

A sudden motion or trembling in the earth caused by an abrupt release of slowly accumulating strain, which results in ground shaking, surface faulting, or ground failures. Most areas of the United States are subject to earthquakes including parts of Michigan, and they occur literally thousands of times per year. Northeastern Michigan to date has been out of known earthquakes impact areas. Most earthquake occurrences result in little or no damage. However, when moderate or severe earthquakes occur, the results can be devastating in terms of loss of life, property and essential services. One of the most dangerous characteristics of earthquakes is their ability to cause severe and sudden loss. Within 1 to 2 minutes, an earthquake can devastate an area through ground shaking, surface fault ruptures, and ground failures. Most deaths and injuries are not directly caused by the earthquake itself, but rather indirectly through the collapse of structures.

According to the U.S. Geological Survey, although Michigan is in an area in which there is a low probability of earthquake occurrences, distant earthquakes that occur in the New Madrid Seismic Zone and upstate New York may affect the area. The New Madrid Seismic Zone poses the most significant threat. Based on recent scientific studies, portions of southern Michigan could be expected to receive minor damage were such an earthquake to occur. The greatest impact on the state would probably come from damage to natural gas and petroleum pipelines, which is a major consideration in Northeast Lower Michigan including Alpena County. If the earthquake occurs in the winter, many areas of the state could be severely impacted by fuel shortages. Damage would probably be negligible in well designed and constructed buildings. However, poorly designed and constructed buildings could suffer considerable damage under the right circumstances. There have been no recorded incidences of significant earthquake activity in Alpena County.

## **Technological Hazards**

## Oil and Gas Pipeline Accidents

An uncontrolled release of oil or gas or the poisonous by-product hydrogen sulfide, from a pipeline. As a major oil and gas consumer in the United States, vast quantities of oil and natural gas are transported through and stored in Michigan. Though often overlooked as a threat because much of the oil and gas infrastructure in the state is located underground, oil and gas pipelines can leak, erupt or explode causing property damage, environmental contamination, injuries and loss of life. In addition to these hazards, there is also a danger of hydrogen sulfide release. Hydrogen sulfide is an extremely poisonous gas that is also explosive when mixed with air temperatures of 500 degrees or above. In addition to pipelines, these dangers can be found around oil and gas wells, pipeline terminals, storage facilities, and transportation facilities where the gas or oil has a high sulfur content.

## Oil and Gas Well Accidents

There exists a potential for an uncontrolled release of gas from wells and pipelines from the more than 935 wells that are located in Alpena County. See Oil and Gas Pipeline Accidents above for hazard description. Oil and gas are produced from fields in over 60 counties in the Lower Peninsula. Over 40,000 wells have been drilled in these counties. Of that total, approximately one-half (20,000) have produced oil or gas. Over 1.1 billion barrels of crude oil and 3.6 trillion cubic feet of gas have been withdrawn from these wells. Figure 6.6 shows the location of gas and other wells in Alpena County. There are 894 producing gas wells, 39 brine disposal wells, 101 plugged wells and 419 wells classified as terminated permit.



#### Infrastructure Failures

A failure of critical public or private utility infrastructure resulting in a temporary loss of essential functions and/or services. Such interruptions could last for periods of a few minutes to several days or more. The August 2003 electrical power blackout that covered much of Northeast United States is an excellent example of the potential and problems associated with disruptions of this nature. Public and private utility infrastructure provides essential life supporting services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. When one or more of these independent, yet inter-related systems fails due to disaster or other cause - even for a short period of time - it can have devastating consequences. For example, when power is lost during periods of extreme heat or cold, people can literally die in their homes.

When water or wastewater treatment systems in a community are inoperable, serious public health problems arise that must be addressed immediately to prevent outbreaks of disease. When storm drainage systems fail due to damage or an overload of capacity, serious flooding can occur. All of these situations can lead to disastrous public health and safety consequences if immediate mitigation steps are not taken. Typically, it is the most vulnerable segments of society - the elderly, children, ill or frail individuals, etc., that are most heavily impacted by an

infrastructure failure. If failure involves more than one system, or is large enough in scope and magnitude, whole communities and even regions can be negatively impacted.

An interesting situation in Northeast Michigan is an extensive area that remains unserved by any form of telecommunication. Although this area is comprised largely of large holdings, predominately hunt clubs, it nevertheless presents a significant communication handicap to residents in these area, especially in times of emergency.

#### Nuclear Attack

Any hostile attack against the United States, using nuclear weapons, which results in destruction of military and/or civilian targets. All areas of the United States are conceivably subject to the threat of nuclear attack. However, the strategic importance of military bases, population centers and certain types of industries place these areas at greater risk than others. The nature of the nuclear attack threat against the U.S. has changed dramatically with the end of the "Cold War" and the conversion of previous adversaries to more democratic forms of government. Even so, the threat still exists for a nuclear attack against this country. Despite the dismantling of thousands of nuclear warheads aimed at U.S. targets, there still exists in the world a large number of nuclear weapons capable of destroying multiple locations simultaneously. In addition, controls on nuclear weapons and weapons components are sporadic at best in the former Soviet Union, and the number of countries capable of developing nuclear weapons continues to grow despite the ratification of an international nuclear non-proliferation treaty. It seems highly plausible that the threat of nuclear attack will continue to be a hazard in this country for some time in the future.

At this point, attack-planning guidance prepared by the Federal government in the late 1980s still provides the best basis for a population protection strategy for Michigan. The guidance identified potential target areas that would impact Michigan communities, which include the following categories: 1) commercial power plants; 2) chemical facilities; 3) counterforce military installations; 4) other military bases; 5) military support industries; 6) refineries; and 7) political targets. For each of these target areas, detailed plans have been developed for evacuating and sheltering the impacted population, protecting critical resources, and resuming vital governmental functions in the post-attack environment. The CRTC at the Alpena County Regional Airport would be a number (4) in the above categories.

#### Nuclear Power Plant Accidents

An actual or potential release of radioactive material at a commercial nuclear power plant or other nuclear facility in sufficient quantity to constitute a threat to the health and safety of the offsite population. Such an occurrence, though not probable, could affect the short and long-term health and safety of the public living near the nuclear power plant and cause long-term environmental contamination around the plant. As a result, the construction and operation of nuclear power plants are closely monitored and regulated by the Federal government. Communities with a nuclear power plant must develop detailed plans for responding to and recovering from such an incident, focusing on the 10 mile Emergency Planning Zone (EPZ) around the plant, and a 50 mile Secondary EPZ that exists to prevent the introduction of radioactive contamination into the food chain. Michigan has 3 active and 1 inactive commercial nuclear power plants in addition to 4 small nuclear testing/research facilities located at 3 state universities and within the City of Midland. Alpena County does not have a Nuclear power plant.

# Societal Hazards

#### Public Health Emergencies

A widespread and/or severe epidemic, incident of contamination, or other situation that presents a danger to or otherwise negatively impacts the general health and well-being of the public. Public health emergencies can take many forms: 1) disease epidemics; 2) large-scale incidents of food or water contamination; 3) extended periods without adequate water and sewer services; 4) harmful exposure to chemical, radiological or biological agents; or 5) large-scale infestations of disease-carrying insects or rodents. Public health emergencies can occur as primary events by themselves, or they may be secondary events of another disaster or emergency, such as a flood, tornado, or hazardous material incident. The common characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, a large number of people. Public health emergencies can be statewide, regional, or localized in scope and magnitude.

Perhaps the greatest emerging public health threat would be the intentional release of a radiological, chemical or biological agent with the potential to adversely impact a large number of people. Such a release would most likely be an act of sabotage aimed at the government or a specific organization or segment of the population. Fortunately, to date Michigan has not experienced such a release aimed at mass destruction. However, Michigan has experienced hoaxes and it is probably only a matter of time before an actual incident of that nature and magnitude does occur. If and when it does, the public health implications – under the right set of circumstances – could be staggering. Response preparation and training and public education must be maintained and updated to meet this potential threat.

## Civil Disturbances

A public demonstration or gathering (such as a sports event), or a prison uprising, that results in a disruption of essential functions, rioting, looting, arson or other unlawful behavior. Large-scale civil disturbances rarely occur, but when they do they are usually an offshoot or result of one or more of the following events: 1) labor disputes where there is a high degree of animosity between the two dissenting parties; 2) high profile/controversial judicial proceedings; 3) the implementation of controversial laws or other governmental actions; 4) resource shortages caused by a catastrophic event; 5) disagreements between special interest groups over a particular issue or cause; or 6) a perceived unjust death or injury to a person held in high esteem or regard by a particular segment of society.

Areas subject to civil disturbances may encompass large portions of a community. Types of facilities that may be subject to or adversely impacted by civil disturbances may include government buildings, military bases, community colleges, businesses, and critical service facilities such as hospital, police and fire facilities. Civil disturbances (including jail uprisings) often require the involvement of multiple community agencies in responding to and recovering from the incident.

## Sabotage/Terrorism

An intentional, unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, social, or religious objectives. Sabotage/terrorism can take many forms or have many vehicles for delivery, including: 1) bombings; 2) assassinations; 3) organized extortion; 4) use of nuclear, chemical and biological weapons; 5) information warfare; 6) ethnic/religious/gender intimidation (hate crimes); 7) state and local militia groups that advocate overthrow of the U.S. Government;

8) eco-fanatacism, designed to destroy or disrupt specific research or resource-related activities; and 9) widespread and organized narcotics smuggling and distribution organizations. Because sabotage/terrorism objectives are so widely varied, so to are the potential targets of such actions. Virtually any public facility or infrastructure, or place of public assembly, can be considered a potential target. In addition, certain types of businesses engaged in controversial activities are also potential targets, as are large computer systems operated by government agencies, banks, financial institutions, large businesses, health care facilities, and colleges/universities. MSP 74 Post in Alpena was subject to dynamite blast many years back, so Police facilities are potential targets.

# Local Jurisdictions

# **Mitigation Planning Sectors**

The hazard mitigation planning approach being used in this plan is to divide Alpena County into geographic sub-parts (sectors) for the purpose of developing a more detailed, targeted hazard analysis and set of mitigation, preparedness, and response and recovery strategies. Sectoring is being accomplished by using existing municipal boundaries. Each planning sector has a map of the area showing community facilities and infrastructure and some general information on population, housing and land use. Information received from the communities was used to help define the potential hazards the community may encounter.

## City of Alpena

Natural

Technological

The predominant land cover in the City of Alpena is urban development. The Thunder Bay River and its impoundments bisect the city. The major eastwest artery is M-32 that has an annual average 24-

failure.

**City of Alpena, Potential Hazards** 

	City of Alpena Data		
	2010 Population	10,483	
d cover in the City of Alpena is	% Change from 2000	-7.3%	
The Thunder Bay River and	Total Housing Units	5,278	
ect the city. The major east-	Occupied Housing Units	4,734	
at has an annual average 24-	Vacant Housing Units	544	
at has an annual average 24	Seasonal Homes	70	
ential Hazards	Housing Units 40+ years old	76.6%	
Riverine flooding, shoreline erosion were suffer sugarther,			
Transportation accident (water, land, rail), structural fire, hazardous material spill, industrial accident, infrastructure failure, flooding from dam			

Societal Civil disturbance, public health hour traffic count of 9.600 vehicles per day. U.S.23 is the major north-south artery and carries 12, 300 vehicles per day.

## Alpena Township

Alpena Township is located on Michigan's northeastern Lake Huron coastline and includes the city of Alpena. It is bordered on the south by Devils Lake and on the north by the small coastal communities of Lakewood and Rockport, situated next to beautiful Long Lake, a large inland lake just one mile from Lake Huron. It's scenic coastline includes the peninsula jutting out into Lake Huron that forms Thunder Bay, which is at the mouth of the Thunder Bay River, one of Michigan's premiere fishing spots. It also includes several islands off the coastline that are popular boating spots, including Thunder Bay Island, where a Coast Guard Station is located.

The predominant land cover in Alpena Township is lowland forest type. Lowland forest areas are dominated by species that grow in very wet soils. Lowland hardwoods include ash, elm, red maple and cottonwood. Lowland conifers include cedar, tamarack, balsam fir, black and white spruce. Lowland forest is the largest land use in the Alpena County with approximately 132,906 acres or 33.4 percent of the land area.

The Township is bisected by Thunder Bay River, and is down-river of 7 mile and 4 mile dams. M-32 is the major east-west artery through Alpena township and records an annual average 24-hour traffic of 9,600 vehicles per day; The major northsouth artery is U.S. 23 recording - 6,400 to 15,200 vehicles per day.

The majority of development, as indicated in the Alpena County Master Plan, will take place on the

Alpena Township Data	
2010 Population	9,060
% Change from 2000	-7.4%
Total Housing Units	4907
Occupied Housing Units	3,976
Vacant Housing Units	931
Seasonal Homes	558
Housing Units 40+ years old	46.8%
Source U.S. Census	

periphery of the City, with strips of commercial development along US-23 and M-32 corridors. Concentrations of residential development are located in areas that would be served by Golf Course, French, Bagley, Grant, Genshaw, Hobbs and Werth Roads. Development in the Township is not limited by available land; however the urban service limit line that is the boundary for extension of water and sewer services limits growth.

Alpena Township, Potential Hazards		
Natural	Riverine flooding, shoreline erosion, wildfire, severe winter weather,	
Technological	Transportation accident (water, land, rail), hazardous material spill, dam failure, structural fire. industrial accident,	
Societal	Bovine TB	

# Green Township

Green Township is located in the western margin of the County. The predominant land cover type in Green Township is upland forest and agriculture. The upland forest category includes upland hardwoods like maple and beech, other upland species like aspen and birch, upland conifers such as red, white or jack pine, white spruce, blue spruce, eastern hemlock, and balsam fir. Upland forest in the county is approximately 85,120 or 21.4 percent of the land area.

Green Township Data	
2010 Population	1,228
% Change from 2000	1.9%
Total Housing Units	922
Occupied Housing Units	508
Vacant Housing Units	414
Seasonal Homes	318
Housing Units 40+ years old	40.1%
Source U.S. Census	

The South Branch Thunder Bay River bisects Green Township. Fletcher Pond reservoir and associated dam provide a significant landscape feature. Green Township is bisected by South Branch Thunder Bay River. Annual daily traffic volume in Green township is for M-32 3,600, vehicles per day; and on the north-south running M-65. – 2,200 vehicles per day.

Green Township, Potential Hazards		
Natural	Riverine flooding, shoreline flooding/erosion, wildfire	
Technological	Transportation accident (air, land), hazardous material spill, dam failure, structural fire	

## Maple Ridge Township

Maple Ridge Township is located in north central Alpena County. The Township's predominant land cover is field agricultural and lowland forest. Lowland forest areas are dominated by species that grow in very wet soils. Lowland hardwoods include ash, elm, red maple and cottonwood. Lowland conifers include cedar, tamarack, balsam fir, black and white spruce. Lowland forest is the largest land use in the county with approximately 132,906 acres or 33.4 percent of the land area.

Lake Winyah, a reservoir of 7 Mile Dam on the North Branch of the Thunder Bay River, bisect the Township north and south. Long Rapids, Bolton and Cathro Roads represent the main transportation routes in Maple Ridge Township. The Combat Readiness Training Center (CRTC) located at the Alpena Regional Airport is situated astride the Wilson Township's northern boundary. Although the training center is well equipped to respond to potential emergencies, response coordination and training is a continuous requisite.

Maple Ridge Township Data		
2010 Population	1,690	
% Change from 2000	-1.5%	
Total Housing Units	904	
Occupied Housing Units	665	
Vacant Housing Units	239	
Seasonal Homes	184	
Housing Units 40+ years old	42.6%	
Source U.S. Census		

Maple Ridge Township, Potential Hazards		
Natural	Riverine flooding, shoreline flooding/erosion, wildfire	
Technological	Transportation accident (air, land), military accident, structural fire, dam failure	
Societal	Bovine TB	

#### Long Rapids Township

Long Rapids Township's predominant land cover is agricultural. The main and North Branch of the Thunder Bay River bisects the township north and south. Long Rapids Rd and M-32 on its southern boundary provide primary east-west access. The major North-south artery through Long Rapids Township is M-65 with an Annual average 24-hour traffic count of 2,300.

Long Rapids Township Data		
2010 Population	1,010	
% Change from 2000	9%	
Total Housing Units	574	
Occupied Housing Units	418	
Vacant Housing Units	156	
Seasonal Homes	107	
Housing Units 40+ years old	45.4%	
Source U.S. Census		

Long Rapids Township, Potential Hazards		
Natural	Riverine flooding, wildfire, drought	
Technological	Transportation accident (air, land), structural fire	
Societal	Bovine TB	

# Ossineke Township

Ossineke Township is located at the southwestern corner of Alpena County. It traverses most of the Alcona/Alpena County border, with its area covering 18 x 6 square miles - three times the normal size of a township. Approximately seven square miles in the township are part of the Alpena State Forest. Its largest community is the town of Hubbard Lake, which is one mile north of the actual lake itself: just over the border into Alcona County The predominant land cover types in Ossineke

Ossineke Township Data		
2010 Population	1,675	
% Change from 2000	-4.9%	
Total Housing Units	1,102	
Occupied Housing Units	706	
Vacant Housing Units	396	
Seasonal Homes	322	
Housing Units 40+ years old	39.9%	
Source U.S. Census		

Township are agricultural, upland forest and lowland forest. The township has remained primarily rural, with Wolf Creek and the Lower South Branch of the Thunder Bay River flowing through it. The major north-south artery passing through Ossineke Township is M-65, with an annual average 24-hour traffic count of 1,500, vehicles per day. There are no east-west roads that cross the this Township.

Ossineke Township Potential Hazards		
Natural	Riverine-flooding, wildfire, drought	
Technological	Transportation accident (air, land), structural fire	
Societal	Bovine TB	

# Sanborn Township

Sanborn Township is located in the southeastern corner of Alpena County along the shores of

Lake Huron. Its main community is Ossineke, located at the corner of Nicholson Hill Road and U.S. 23, about a mile inland. This corner serves as economic and social focus of the township as the majority of all commercial, government and institutional land uses are located there. This rapidly growing area has seen significant real estate development in the last five years. A shopping plaza along US-23 also continues to be on the grow. This area functions primarily as an adjunct community to Alpena, 10 miles to the north.

Sanborn Township Data		
2010 Population	2,116	
% Change from 2000	-1.5%	
Total Housing Units	1,083	
Occupied Housing Units	845	
Vacant Housing Units	238	
Seasonal Homes	146	
Housing Units 40+ years old	49.8%	
Source U.S. Census	-	

Sanborn Township is located in the southeastern corner of Alpena County along the shores of Lake Huron. Its main community is Ossineke, located at the corner of Nicholson Hill Road and U.S. 23, about a mile inland. This corner serves as economic and social focus of the township as the majority of all commercial, government and institutional land uses are located there. This rapidly growing area has seen significant real estate development in the last five years. A shopping plaza along US-23 also continues to expand. This area functions primarily as an adjunct community to Alpena, 10 miles to the north. The predominant land cover types in Sanborn Township are agricultural and lowland forest. The Township is bisected north and south by Lake State railroad and Devils River. The primary north-south artery is U.S. 23.

annual average 24-hour traffic count for U.S.23 is 6,400 vehicles per day. The Community of Ossineke is situated down river from Devils Lake dam.

Sanborn Township, Potential Hazards		
Natural	Riverine-flooding, shoreline flooding, wildfire,	
Technological	Transportation accident (air, land), dam failure, structural fire	
Societal	Bovine TB	

## Wellington Township

Located in the Northwest corner of Alpena County, Wellington Township's predominant land cover type is lowland forest. The North Branch of the Thunder Bay River and Truax Creek bisects the Township. The dominant feature of this landscape is an extensive lowland area known locally as 'Long Swamp". There has been no master plan or zoning ordinance adopted for Wellington Township.

Wellington Township Data		
2010 Population	307	
% Change from 2000	3.7%	
Total Housing Units	247	
Occupied Housing Units	127	
Vacant Housing Units	120	
Seasonal Homes	98	
Housing Units 40+ years old	52.1%	

Wellington Township, Potential Hazards		
Natural	Riverine-flooding,	
Technological	Transportation accident (air, land), structural fire	
Societal	Bovine TB	

## Wilson Township

Wilson Township's predominant land cover type is agricultural. Agricultural land uses include: cropland, orchards, confined feeding operations for

livestock of any kind, permanent pasture lands, farmsteads, greenhouse operations, and horse training areas. The total agricultural land use in Alpena County is approximately 78,037 acres or 19.6 percent. The South Branch of Thunder Bay River and Wolf Creek bisect the Township. The principal east-west artery in M-32 which carries

an annual average 24 hour traffic of 4,900 vehicles per day. The Combat Readiness Training Center (CRTC) located at the Alpena Regional Airport is

Wilson Township Data		
2010 Population	2029	
% Change from 2000	-2.2%	
Total Housing Units	1,036	
Occupied Housing Units	812	
Vacant Housing Units	224	
Seasonal Homes	158	
Housing Units 40+ years old	47.7%	
Source U.S. Census		

situated astride the Wilson Township's northern boundary. Although the training center is well equipped to respond to potential emergencies, response coordination and training is a continuous requisite.

Wilson Township, Potential Hazards	
Natural	Riverine-flooding, wildfire
Technological	Transportation accident (air, land), military accident, structural fire, hazardous material spill.
Societal	Bovine TB















