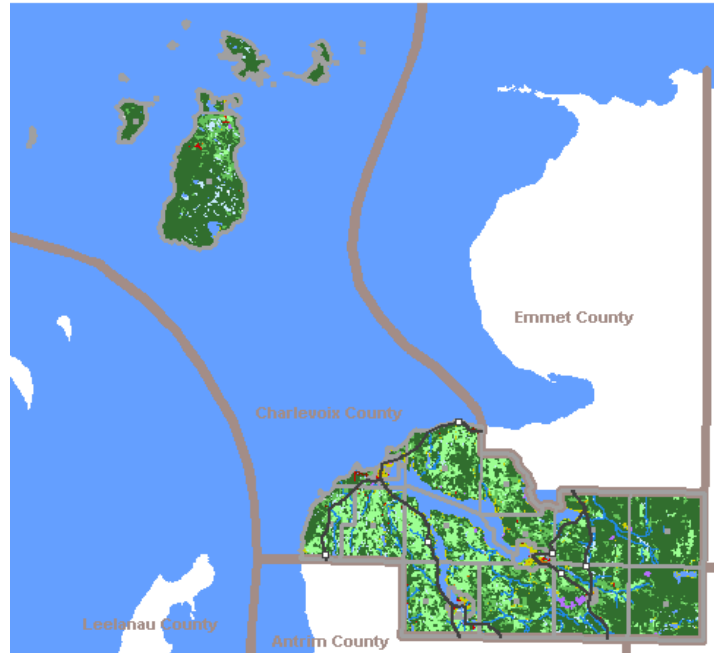


# Natural Hazards Mitigation Plan



## Charlevoix County, Michigan 2004

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## **I. ACKNOWLEDGEMENTS**

This plan is the culmination of our interdisciplinary and interagency planning effort that required the assistance and expertise of numerous agencies, organizations, and individuals. Without the technical assistance and contributions of time and ideas of these agencies, organizations, and individuals, this plan could not have been completed.

Following is a list of the key contributors to the Plan, who participated in the Charlevoix County Hazard Mitigation Planning Task Force:

### **Charlevoix County Board of Commissioners**

Randy Frykberg

### **Charlevoix County Department of Building Safety**

Ken Doty

### **Charlevoix County Emergency Management Coordinator**

Jack Messer

### **Charlevoix County Geographic Information Systems (GIS) Department**

Chris Blough

### **Charlevoix County Planning Department**

Larry Sullivan

Kiersten Nobach

### **Charlevoix County Road Commission**

James Vanek

### **Charlevoix County Sheriff Office**

Don Schneider

### **City of East Jordan**

Bill Breakey

### **Grand Traverse Band of Ottawa and Chippewa Indians**

Randy Stites

### **Organizations**

Charlevoix Area Hospital

Charlevoix County Farm Bureau/Marion Township

Charlevoix Housing Commission

East Jordan Family Health Center

Northwest Michigan Community Health Agency

## II. Letter of Transmittal



A MICHIGAN HISTORICAL SITE

### COUNTY OF CHARLEVOIX BOARD OF COMMISSIONERS

203 ANTRIM ST.  
CHARLEVOIX, MICHIGAN 49720

Telephone (231) 547-7200  
FAX (231) 547-7217

Date October 27, 2004

Mike Sobocinski  
Michigan State Police Emergency Management Division  
4000 Collins Road  
PO Box 30636  
Lansing MI 49809-8136

Dear Mr. Sobocinski:

Enclosed, please find the Charlevoix County Natural Hazards Mitigation Plan. This Plan has been developed in conjunction with the County Emergency Management Coordinator, County Planners, Task Force Members, the public, and the State of Michigan. The Plan lays out the process of evaluating the potential natural hazards, land use and development in Charlevoix County, and the mitigation strategies to protect lives and property in the County.

This transmittal letter serves notice that all future development decisions in Charlevoix County will consider hazard vulnerability reduction as a standard practice. The intent of the Natural Hazards Mitigation Plan is not to limit development, but to ensure that all development occurs in a manner that minimizes the possibility of damage from potential natural hazards to the greatest extent possible.

Thank you for your time and consideration. If you have any questions, please feel free to contact the Charlevoix County Emergency Management Coordinator, Jack Messer at 231.439.3333.

Sincerely,

Victor Patrick  
Charlevoix County Board of Commissioners Chairman

### III. PREFACE

Hazard mitigation is any action taken before, during, or after a disaster to permanently eliminate or reduce the long-term risk to human life and property from natural and technological hazards. This procedure is an essential element of emergency management, along with preparedness, response, and recovery. Emergency management includes four phases: community planning for a disaster; responding when it occurs; recovery process from the disaster with mitigation measures are evaluated and adopted. The evaluation improves the preparedness posture of the County for the next incident, and so on. When successful, mitigation will lessen the impacts of natural hazards to such a degree that succeeding incidents will remain incidents and not become disasters.

Communities may mitigate to reduce the impact of hazards on people and property through the coordination of resources, programs, and authorities. Through a combination of regulatory, administrative, and engineering approaches, losses can be limited by reducing susceptibility to damage. Mitigation allows repairs and reconstruction to be completed after an incident occurs in such a way that does not just restore the damaged property as quickly as possible to pre-disaster conditions. This process is needed to ensure that such cycles are broken, that post-disaster repairs and reconstruction take place after damages are analyzed, and that sounder, less vulnerable conditions are produced.

Recognizing the importance of reducing community vulnerability to natural hazards, Charlevoix County is actively addressing the issue through the development and implementation of this plan. The many benefits to be realized from this effort are:

1. Protection of the public health and safety;
2. Preservation of essential services;
3. Prevention of property damage; and
4. Preservation of the local economic base.

This process will help ensure that Charlevoix County remains a vibrant, safe, enjoyable place in which to live, raise a family, preserve the local industrial and economic base, and maintain a tourist base.

#### IV. EXECUTIVE SUMMARY

In 2000, the Disaster Mitigation Act shifted the Federal Emergency Management Agency's (FEMA) scope of work to promoting and supporting prevention, or what is called hazard mitigation planning. FEMA now requires government entities to have natural hazards mitigation plans in place as a condition for receiving grant money, such as hazard mitigation grant program funds, in the future.

To meet this requirement, the Michigan State Police provided funding to regional planning agencies throughout the State of Michigan to work with individual counties in developing their Hazard Mitigation Plans. For northwest, lower Michigan the **Northwest Michigan Hazard Mitigation Planning Project** was coordinated by the Northwest Michigan Council of Governments (NWMCOG) and included the ten county area of Emmet, Charlevoix, Antrim, Kalkaska, Missaukee, Wexford, Grand Traverse, Leelanau, Benzie, and Manistee. NWMCOG worked with the Task Forces and developed plans for the counties. These plans included a general community profile, a comprehensive inventory of existing hazards, a hazard analysis, goals and objectives, and feasible mitigation strategies to address the prioritized hazards.

The Charlevoix County Natural Hazards Mitigation Plan focuses on the following natural hazards - drought, wildfires, flooding, shoreline erosion, ground subsidence/landslides, thunderstorms and high winds, and severe winter weather, and was created to protect the health, safety, and economic interests of the residents and businesses by reducing the impacts of natural hazards through planning, awareness, and implementation. Through this Plan, a broad perspective was taken in examining multiple natural hazards mitigation activities and opportunities in Charlevoix County. Each natural hazard was analyzed from a historical perspective, evaluated for potential risk, and considered for possible mitigative action.

The Plan serves as the foundation for natural hazard mitigation activities and actions within Charlevoix County, and will be a resource for building coordination and cooperation within the community for local control of future mitigation and community preparedness around the following:

##### **Natural Hazards Mitigation Planning Goals for Charlevoix County:**

*Goal 1: Increase local participation in natural hazards mitigation*

*Goal 2: Integrate natural hazards mitigation considerations into the County's comprehensive planning process*

*Goal 3: Utilize available resources and apply for others for natural hazards mitigation projects*

*Goal 4: Develop and complete natural hazards mitigation projects in a timely manner*

##### **The Charlevoix County Task Force participants designated the following top Natural Hazards Mitigation Priority Areas:**

1. *Severe Winter Storms throughout the County – heavy snow/deep snow, extreme low temperatures, ice storms, downed power lines, overloaded electrical circuits, and frozen water lines*
2. *Severe Thunderstorms and High Winds, and Severe Winter Weather: U.S. Highway 31 bridge concerns*

3. *Flooding: Potential flooding from the breakdown of two dams on the Boyne River and the East Jordan Area*
4. *Wildfire and the possibility of Tornadoes: Utility area*
5. *Severe thunderstorms, High Winds, and Tornadoes: Festival events at seasonal population centers throughout the County*

**Additional Areas of Concern:**

Technical:

- Propane storage tank (90,000 gallons) on M-75 South near Dam Road – the damage could spread about two miles and is near a school
- Spent fuel rods at the decommissioned Big Rock Nuclear Power Plant north of the City of Charlevoix on Lake Michigan

**And, recommended the following mitigation strategies:**

**1. Severe winter storms: Potential throughout the County**

*Snow and Ice Mitigation Strategies:*

- a. Public education, awareness, and preparedness
- b. A National Oceanic and Atmospheric Administration weather station for the area
- c. Improve shelter capacity
- d. Promote the use of battery back-up and/or stand-by generators to maintain essential services
- e. Public education for decision makers
- f. Inventory of public four wheel drive and special use vehicles
- g. Emergency Operations Center planning to include winter storms in future exercises
- h. Identify and maintain critical fueling facilities
- i. Locate utility lines (electrical) underground
- j. Promote the burying of utility lines for new construction
- k. Promote only the planting of trees near power lines that will not grow in a manner to disrupt the power lines

*Wind Mitigation Strategies:*

- a. Ask cities and others to implement sound tree planting strategies around power lines
- b. Encourage tree management by power companies along power line easements
- c. Business and homeowner education
- d. Locate utility lines underground
- e. Improve shelter capacity
- f. Promote the burying of utility lines for new construction
- g. Promote only the planting of trees near power lines that will not grow in a manner to disrupt the power lines

**2. City of Charlevoix: Potential of severe thunderstorms and high winds and severe winter storms around the U.S. Highway 31 bridge**

*Thunderstorm and High Wind Mitigation Strategies:*

- a. Promote the practice of placing utilities underground
- b. Continue support of the Road Commission in their clearance of blocked roads
- c. Coordinate the use of sirens that are in place and public education
- d. Promote a National Oceanic and Atmospheric Administration weather station for the area

- e. Tree management coordination throughout the county to make sure trees do not interfere with power lines
- f. Pre-plan and label alternate transportation routes
- g. Develop inventory of homes located on seasonal roads
- h. Improve shelter capacity
- i. Promote the burying of utility lines for new construction
- j. Promote only the planting of trees near power lines that will not grow in a manner to disrupt the power lines

*Snow and Ice Mitigation Strategies:*

- a. Public education, awareness, and preparedness
- b. A National Oceanic and Atmospheric Administration weather station for the area
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- i. Develop inventory of homes located on seasonal roads
- j. Promote the burying of utility lines for new construction
- k. Promote only the planting of trees near power lines that will not grow in a manner to disrupt the power lines

**3. Boyne River and East Jordan Area: Potential flooding**

There was discussion by the Task Force participants about whether or not this is a priority issue. It is potentially a lower risk.

*Flood Mitigation Strategies:*

- a. Need a better flood warning system
- b. Re-engineering of culverts for flood mitigation
- c. Assessment of flood threat and results of dam inspections
- d. Public education

**4. Eastern Portion of the County: Potential wildfires and the possibility of tornadoes in the utility area**

*Wildfire Mitigation Strategies:*

- a. Inventory dry hydrants and water sources and ensure sources are accessible
- b. Put water source location maps in all emergency vehicles
- c. Study roads in the area for emergency vehicle accessibility
- d. Enforce minimum standards for private roads to ensure emergency vehicle access
- e. Revise ordinances to include standards that ensure access, stipulate maximum grade, minimum driveway width, and turnaround areas
- f. Public awareness and education

*Tornado Mitigation Strategies*

- a. Consistent weather event warnings
- b. Public awareness and education
- c. Improve shelter capacity
- d. Promote the burying of utility lines for new construction

- e. Promote only the planting of trees near power lines that will not grow in a manner to disrupt the power lines

**5. Festival events at seasonal population centers throughout the County: Potential of severe thunderstorms, high winds, and tornadoes**

*Thunderstorm, High Winds, and Tornado Mitigation Strategies:*

- a. Charlevoix County Board to recommend that all groups sponsoring festivals to plan mitigation strategies for their respective festivals
- b. Require all mass gathering events to have a permit review process to include natural hazards mitigation
- c. Develop and implement mutual support and aid practices with surrounding communities
- d. Public education for awareness and self protection
- e. Improve shelter capacity
- f. Promote the burying of utility lines for new construction
- g. Promote only the planting of trees near power lines that will not grow in a manner to disrupt the power lines

**Additional Mitigation Strategies:**

*A. Public Education*

- Programs, brochures, insurance companies
- Let people know what to do to be self reliant for 72 hours during an outage
- Create Emergency Action Guidelines
- Public notice of road closures and alternate routes
- Need consistent language for severe weather warnings between NOAA and the media outlets

*B. Work on a multi-hazard warning plan and strategies for festivals*

- The units of government should approach festival hosts and sponsors to encourage development of plans
- Build awareness for proactive planning and creative thinking to reduce damages
- All Festival Permits should include a natural hazards plan and exit strategy
- Offer annual training by advancing the Sheriff Department's efforts and use the Mackinac Bridge Walk police task force as a model

*C. Develop mutual support and aid from surrounding communities*

- Work with cities and villages and adjacent counties to develop mutual aid pacts or agreements

*D. Work with other governmental entities, organizations, businesses, and the public on natural hazards issues*

*E. Inventory potential natural hazard areas and mitigation activities*

- Study natural areas and undeveloped lands for natural hazards, and look at zoning to guide growth and development away from natural hazard areas
- Identify community shelters, especially ones that can sustain themselves through longer power outages
- Identify shelter needs, power issues, and capacity

- Inventory stream/river culvert tubes and re-engineer and replace with bridges for flood mitigation
- Create laminated maps for emergency vehicles that index water sources (pertaining to wildfires)
- Place signs along the road right-of-way to show emergency responders where water sources are located
- GPS units with laptops in public vehicles for rural areas

F. *Charlevoix County can also utilize watershed management plans that have been developed by the Charlevoix County Conservation District and the Tip of the Mitt Watershed Council. Proposed mitigation strategies described in the Lake Charlevoix Watershed Management Plan are as follows:*

1. Reduce soil erosion and stormwater runoff
2. Increase public awareness through education
3. Promote land stewardship and land protection
4. Improve land use planning and management to reduce impacts from future development and land use decisions
5. Encourage forestry management to prevent soil erosion and stormwater runoff

G. *Incorporate the Plan's natural hazards mitigation concepts, strategies, and policies into existing elements of Charlevoix County's Comprehensive Plan – 2005-2006*

The most effective method for fostering and promoting the implementation of the natural hazards mitigation concepts, strategies, and policies within the County is to integrate them into existing elements of the Master or Comprehensive Plan. Mitigation concepts, strategies, and policies would appear in appropriate places throughout the plan.

The County should consider the following key land use issues and the relationship to natural hazards mitigation:

- Safe, beneficial uses for natural hazards prone areas
- Concentration of population issues
- Proximity to natural hazards priority areas
- Location of public facilities and infrastructure
- Development standards for public facilities and infrastructure
- Effect of accumulated development on community systems and facilities

The Charlevoix County Natural Hazards Mitigation Plan was recommended by the Charlevoix County Planning Commission on October 7, 2004 to the Charlevoix County Board of Commissioners for adoption. The County Board of Commissions adopted the Plan on October 27, 2004.

## V. PURPOSE OF THE PLAN

The Disaster Mitigation Act of 2000 shifted the Federal Emergency Management Agency's (FEMA) scope of work to promoting and supporting prevention, or what is called Hazard Mitigation Planning. FEMA has now required government entities to create mitigation plans as a condition of receiving grant money, such as hazard mitigation grant program funds. To meet this requirement, the Michigan State Police funded regional planning agencies to work with individual counties to develop the Natural Hazards Mitigation Plans. The Northwest Michigan Council of Governments was the agency to develop this Plan.

The **purpose of the Charlevoix County Natural Hazards Mitigation Plan** is to find solutions to existing problems; anticipate future problems; prevent wasteful public and private expenditures; protect property values; and allocate land resources. The implementation of the Plan is to prevent injury, loss of life, property damage, breakdown in vital services like transportation and infrastructure, economic slumps, diminished tourist activity, liability issues, and damage to a community's reputation. For Charlevoix County, the **planning process** utilized the following steps in the development of the Plan. Emphasis was placed on natural hazards that have had significant impact on the community in the past.

1. Identification of natural hazards and risks
2. Preparation of draft plan
3. Identification of natural hazards mitigation goals and objectives for emergency management programs
4. Selection of evaluation criteria
5. Selection of mitigation strategies using locally chosen criteria
6. Public Comment
7. Completion of the final plan

The Plan also lays out the implementation of the plan, and the monitoring and periodic revision of the plan.

### ***What is a Hazard?***

A **hazard** is an event or physical condition that has 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. This plan focuses on natural hazards such as drought, earthquakes, extreme temperatures, wildfires, urban and riverine flooding, high or wind driven waters that cause shoreline flooding and erosion, ground subsidence/landslides, thunderstorms and high winds, tornadoes, and winter weather hazards. This Plan is intended to be a resource for building coordination and cooperation within a community for local control of future mitigation and community preparedness.

In the State of Michigan, the **principle natural hazards** are:

- Tornadoes
- Flooding
- Lightning
- Severe winds
- Severe winter weather (snow, ice, sleet)

These principle natural hazards events have caused the top impacts to be erosion/debris flow, frozen pipes, and floods.

Governor Declarations for major disasters in the State of Michigan that occurred from 1977 to 2001 include:

- Thirteen (13) severe storms
- Eleven (11) floods
- Eight (8) winter storms
- Six (6) tornadoes
- Five (5) technical disasters
- Three (3) fires

***What is Mitigation?***

Mitigation is the sustained action taken to lessen the impact from natural hazards and to work to reduce the long-term risk to human life and property, and their effects. This long-term planning distinguishes mitigation from actions geared primarily to emergency preparedness and short-term recovery. This Plan can be used to lessen the impact; to support and be compatible with community goals; to lay out considerations in choosing and evaluating methods; and to look at the feasibility of mitigation strategies.

## VI. COMMUNITY PROFILE

Charlevoix County offers its residents and visitors access to magnificent natural features including Lake Michigan shoreline and inland lakes such as Lake Charlevoix and Walloon Lake.

The following community data is provided to describe Antrim County for planning and implementing the mitigation strategies.

### Major Geographic Features of Charlevoix County

Area in Water	23,552 acres
Miles of Great Lakes shoreline	102 miles
Forest Lands	172,200 acres 64.5% of total land area
Wetlands	67,349 acres 25.2% of total land area
Operating Farms (2002)	299
Farmland (2002)	38,799 acres

The total County population in the 2000 census was **26,090**. The projected growth for 2010 is 29,501 and for 2020 it is 32,468. The population numbers from the 2000 Census for the **15 Townships and 4 major Cities/Villages:**

Township	Population
Bay	1,068
Boyne City	3,503
Boyne Valley -- Boyne Falls	1,215 370
Chandler	230
Charlevoix City	2,994
Charlevoix	1,697
East Jordan City	2,507
Evangeline	773
Eveline	1,560
Hayes	1,893
Hudson	639
Marion	1,492
Melrose	1,388
Norwood	714
Peaine	244
St. James	307
South Arm	1,844
Wilson	2,022

On peak days, the seasonal population can be three (3) times the normal population, especially with festivals that include:

- Beaver Island – Homecoming
- Boyne City – Mushroom Festival; 4<sup>th</sup> of July Fireworks
- Boyne Falls – Boyne USA events, Polish Festival
- Charlevoix – Venetian Festival, Art Fair
- East Jordan – Freedom Festival
- Melrose – Northern Michigan Antique Flywheelers

**County Resident Profile**

1. There are 16,335 *Housing Units* in Charlevoix County with an average household size of 2.48 people per household. 37.7% of households have 2 persons.
2. The number of residents 65 years and over is 3,894, or 14.9% of the population.
3. The number of residents 19 years and under is 7,318, or 28% of the population.
4. The number of residents over 65 with a disability is 1,497, or 6% of the population.
5. The total Number of residents with disability is 4,544, or 17% of the population.
6. The number of residents that have a language barrier or are linguistically isolated is 112, or less than 1% of the population.
7. Percent below poverty level:  
 February 2004 Poverty level: \$15,670 Family of 3 and \$9,310 Family of 1
  - Families in poverty with children: 305
  - Income less than \$15,000: 13.6%
  - Individuals in poverty: 2,064

**1997 Economic Census**

Industry Description	Number of Establishments	Number of Employees
Manufacturing	69	3,624
Wholesale trade	14	113
Retail trade	172	1,288
Real estate, rental, leasing	29	96
Professional, scientific, technical services	57	191
Administrative, support, waste management, remediation services	42	200
Educational services	1	0-19
Health care, social assistance	48	216
Arts, entertainment, recreation	23	114
Accommodation and food services	84	1,384

Other services (except public administration)	59	208
<b>Merchant Wholesalers</b>		
Wholesale trade	11	84

\*Information provided above was retrieved from the Northwest Michigan Council of Governments' *Benchmarks 2004*, *Northwest Lower Michigan County Profiles 2000*, and reports on the Northwest Michigan Council of Governments' website.

## VII. THE DEVELOPMENT OF THE PLAN

### A. Data Methodology and Map Development

Charlevoix County staff identified the critical facilities and infrastructure on the base map and then the Charlevoix County GIS, Building Safety, and Planning Departments digitized the facilities as point files. The County staff transferred the data to the NWMCOG as a point file. Natural hazards points, polygons, and population centers data was then added to the base maps utilizing the following data:

#### Critical Infrastructure

6	Airports <ul style="list-style-type: none"> <li>Charlevoix Airport – 25,000 passengers in 2002</li> </ul>
15	Banks
16	Bridges
16	Campgrounds
42	Churches
7	Commercial Transit Terminals/Ferry Docks
7	Communications Towers
10	Community Shelters
1	Correctional Facility
5	Dams <ul style="list-style-type: none"> <li>Boyne Falls, Deer Lake, Kircher, Patricia Lake, Walloon Lake</li> </ul>
8	Emergency Management Services Facilities
12	Fire Stations
43	Government Buildings
6	Hazardous Materials Sites or Facilities
6	Hospital and Medical Facilities
11	Industrial Facilities
1	Nuclear Facility
3	Nursing Homes and/or Assisted Living Facilities
6	Police Stations
15	Recreational Facilities
19	Schools/College-University Facilities
1	U.S. Coast Guard Station
17	Utility Facilities
11	Water and Sewage Treatment Facilities <ul style="list-style-type: none"> <li>Water: 36.0% public system or private company; 56.0% individual wells;</li> <li>Sewer: 36.0% public sewer; 62.6% individual septic/cesspool; 1.4% other</li> </ul>

#### Floods Data

Flood hazard information can usually be derived from the Flood Rate Insurance Maps (FIRM) available for jurisdictions. So, in order to delineate potential flood plain areas (seasonal floodplains) for each county, NWMCOG overlaid wetland, soils, and elevation data to determine the most likely flood prone areas. Once overlaid, isolated polygons (areas) were removed in order to show a more accurate representation of potential flood prone areas along

lakes, rivers, and streams. Sources: Temporary/Seasonally Flooded Areas data are from the National Wetland Inventory of the US Fish and Wildlife Service; Hydric soils data are from the county digital soil surveys (where available); and Digital Elevation Model data are from the Center for Geographic Information, Michigan Department of Information Technology.

### ***Fire Data***

Modern forest fire data were obtained from the USDA forest service and the Departments of Natural Resources in Minnesota, Wisconsin, and Michigan. Fire regimes data (fire prone areas) were provided by the USDA Forest Service, North Central Research Station located in Wisconsin. Land type associations, and historical and modern fire rotations were used to identify the fire prone areas.

***Tornadoes*** - National Weather Service

***Damaging Winds*** - National Weather Service

***Large Hail*** - National Weather Service

***Winter Weather*** - National Weather Service

### ***Landslide/Erosion***

Shoreline erosion and landslide incident zones delineated by the US Geological Service. Digital Elevation Model data from the Center for Geographic Information, Michigan Department of Information Technology. High Lake Michigan water levels causing erosion along the coast and Lake Charlevoix.

***Other hazards*** may exist, but are not considered to be substantial risks.

The detailed Charlevoix County Map is presented in Appendix B. #1.

## **B. Natural Hazards Information**

### ***1. Natural Hazards and Climate Change***

Scientists are now convinced that human activity, primarily the burning of fossil fuels to produce electricity and drive cars, is changing the climate. These activities emit gases, primarily carbon dioxide, that blanket the planet and trap heat. Some of the signs of climate changes we are seeing already throughout the Great Lakes region include increasing average annual temperatures; more frequent severe rainstorms; shorter winters; and duration of lake ice cover. In general, Michigan's climate will grow considerably warmer and probably drier during this century, especially in the summer.

### ***Potential Impacts from Climate Change***

Northwest, lower Michigan depends heavily on groundwater, freshwater from Lake Michigan, and rainfall for agriculture, drinking, and industrial uses. As the population in this region continues to grow, the demand for water for all the needs increases. The projected changes in rainfall, evaporation, and groundwater recharge rates from climate change events may affect ecosystems and freshwater users.

- Lower summer water levels are likely to diminish the recharge of groundwater, cause small streams to dry up, and reduce the area of wetlands, resulting in poorer water quality and less habitat for wildlife.
- Lake levels are expected to decline in both inland lakes and the Great Lakes, as more moisture evaporates due to warmer temperatures and less ice cover.
- Pressure to increase water extraction from the Great Lakes will grow, exacerbating an already contentious debate in the region.
- Development and climate change will degrade the flood-absorbing capacities of wetlands and floodplains, resulting in increased erosion, flooding, and runoff polluted with nutrients, pesticides, and other toxins.

## 2. *Natural Hazards Recorded Events*

Data for weather events was compiled from the National Oceanic and Atmospheric Administration's (NOAA) website utilizing the following sections:

- Weather/Climate Events, Information, Assessments
- Climatology and Extreme Events
- U.S. Storm Events Data Base: 1950 to present, local storm reports, damage reports, etc. from various sources – events checked for Charlevoix County included drought, flooding, funnel clouds, hail, lightning, snow and ice, thunderstorms and high winds, tornadoes, wild/forest fires.

The most severe events recorded for Charlevoix County are listed below, including the number of events, dates, and descriptions of the most severe.

1. Flood – 3 events  
1993: (regional)
2. Hail – 13 events
  - July 1996: 0.75 inches (East Jordan) - 2 inch accumulation
  - September 1996: 1.0 inch (Boyne City) - 6 inch accumulation
  - July 2003: .88 inches (East Jordan) - nickel sized
3. Snow and Ice – 66 events (12 inches or more of snow)
  - March 1993: (statewide) \$500,000 property damage; heavy snow
  - April 1993: (region) \$50,000 property damage; heavy snow
  - January 1994: (region) \$5.0 million property damage; heavy snow/freezing rain
  - November 1996: (county) 9 to 17 inches of snow
  - December 2001: (county) 99 inches of snow 25<sup>th</sup>-28<sup>th</sup>; records were broken, and a State of Emergency was declared by Governor John Engler. The county requested \$15,906.85 in disaster assistance.
  - November 2003: (region) \$40,000 property damage; winter storm
4. Thunderstorm and High Wind – 27 events
  - October 1993: (county); high winds with many trees, power poles and power lines blown down; power outages; 59 mph gusts

- September 1998: (St. James, Beaver Island; East Jordan; Boyne Falls); thunderstorm/wind with numerous trees uprooted on the southern portion of the Island; numerous trees snapped off.
- November 1998: (county); high winds with trees and homes damaged
- June 1999: (Boyne Falls); thunderstorm with trees and power lines down
- July 1999: (Charlevoix); thunderstorm/wind with trees and power lines down
- August 2000: (county); high winds with tree limbs down
- June 2001: (Boyne City); thunderstorm/wind with 3 inch tree limbs down
- July 2001: (Charlevoix); thunderstorm/wind with trees and power lines down
- October 2001: (county); high wind with trees and power lines down, power outages
- April 2002: \$15,000 property damage; thunderstorm/wind with a barn roof blown off
- July 2002: (Charlevoix); thunderstorm/wind with 12-15 inch diameter trees down and power lines down
- August 2002: (Boyne City); thunderstorm/wind 12 inch diameter trees down; (Advance) numerous trees down
- Spring 2003: (Charlevoix) Irish Marina #2 destroyed by wind and ice damage
- August 2003: (county) \$45,000 property damage; thunderstorm/wind with numerous trees down; docks, boats, and hoists were damaged; a vehicle was damaged from a fallen tree limb; a sea plane was blown onto shore and tipped over
- November 2003: (county) \$155,000 property damage; high wind

5. Tornadoes – 4 events

- June 1955: (county) \$3,000 property damage; F1, 2 miles long, 50 yards wide
- July 1977: (county); F2, 4 miles long, 33 yards wide
- August 1989: (county); F0, 1 mile long, 50 yards wide
- August 2002: (Boyne City); F1, 1 mile long, 110 yards wide

3. *Probability of Natural Hazards:*

The probability that a natural hazard such as hail, thunderstorms and high winds, tornadoes, and snow and ice will affect this area of Michigan is an annual possibility. The magnitude and severity depends on the season, which determines temperature, moisture in the air, ice cover on the lakes, etc. Also, the severity of an event is connected with tourist activity during the year, the pace of developing second homes, and an increasing base population in northwest, lower Michigan which in turn leads to more development. The events recorded by NOAA show that natural hazard events may be happening more frequently, but the geographic impact of the natural hazards' impact has remained the same in Charlevoix County.

The areas where natural hazards overlap in Charlevoix County can include heavy snow that causes trees and power lines down, and then melting, rain and flooding.

Please see Appendix C: Risk Assessment Summary Table.

**C. Charlevoix County Natural Hazards Task Force and Public Input**

To create the Charlevoix County Natural Hazards Task Force, invitations for the meetings were sent to the following entities requesting their participation:

County Administrator/Coordinators  
County Board of Commissioners  
County Sheriff/Emergency Services (911 Services Coordinators, Public Safety)  
County Emergency Manager/Coordinators  
County Public Works Directors  
County Health Department Director  
County Planning or Community Development Directors  
County Drain Commissioner/Soil Erosion Officers  
County Road Commission Directors  
County Conservation District Director/Soil Erosion Officers  
Township elected and appointed officials  
Township Supervisors  
Township Clerks  
Michigan State Police  
Michigan Department of Environmental Quality  
Michigan Department of Natural Resources  
Michigan Department of Transportation  
U.S. Coast Guard  
Hospitals  
City/Village Maintenance/Utilities  
Tribal Governments  
Environmental/Conservation Groups/Organizations  
American Red Cross  
Groundwater Protection Organizations  
Housing Associations  
Chambers of Commerce  
National Weather Service (Gaylord)  
Michigan Family Independence Agencies

The first Task Force meeting was held on **May 11<sup>th</sup>, 2004** to identify the natural hazards priority areas and the second Task Force meeting was held on **July 23<sup>th</sup>, 2004** to develop the mitigation strategies for the priority issues. Participants in the meetings included representatives from:

Charlevoix Area Hospital  
Charlevoix County Board of Commissioners  
Charlevoix County Building and Safety Department  
Charlevoix County GIS Department  
Charlevoix County Planning Department (2)  
Charlevoix County Road Commission  
Charlevoix County Sheriff Department  
Charlevoix Housing Commission  
City of East Jordan  
East Jordan Family Health  
Emergency Management Coordinator  
Grand Traverse Band of Ottawa and Chippewa Indians  
Marion Township/Charlevoix County Farm Bureau  
Northwest Michigan Community Health Agency

At the first Task Force meeting, the NWMCOG staff presented the background of the required project; the principle natural hazards in Michigan; what is mitigation planning; the purpose of the plan; suggested goals; and the political process. A full county natural hazards map was available for review with four separate quadrant maps. These sectional maps were for the participants to review the areas of the county they were most familiar with. The Emergency Management Coordinator and Planners reviewed all the maps to give input on the entire county.

The group analyzed the map areas for the top natural hazard priority areas by documenting the most threatening. They did a qualitative assessment of points and concerns where they saw potential conflicts with and the relationship to critical facilities and population centers. The general list created included:

1. Wildfire, high winds/tornadoes in Chandler Township where a natural gas transmission facility is located
2. Highway U.S. 31 as a main traffic corridor
3. The dam and water system at Village of Walloon Lake
4. Boyne River dams – flooding and sewage and water treatment plants in Boyne City
5. Big Rock decommissioned nuclear power plant on the shores of Lake Michigan
6. 4<sup>th</sup> of July festival (tornado summer of 2001) in Boyne City
7. Morel Mushroom festival in the spring in Boyne City
8. Wilson Township and East Jordan area: East Jordan Iron Works; flooding; East Jordan plastics plant; telephone and communications centers in East Jordan; East Jordan possible flooding area
9. Hudson Township: Hoffman Lake area is growing in population, and has an EMS/Access center
10. Wildfire areas near Thumb Lake (Lake Louise Christian Community) with pines
11. Major gas pumping station on Thumb Lake Road
12. Winter festival at Boyne Mountain
13. Dam at Boyne Falls to the dam at the Kircher property to Boyne City (culverts)
14. Charlevoix: US Highway 31 Bridge
15. Wildfire areas on Beaver Island
16. Transportation to and from Beaver Island with severe weather issues
17. Large festivals – Beaver Island Homecoming event, Mushroom Festival Boyne City, Boyne USA events and Polish Festival in Boyne Falls, Venetian Festival and Art Fair in Charlevoix, Freedom Festival in East Jordan
18. The seasonal population fluctuation in the summer can be up to three times the off-season population
19. Road closure problem area on US 131 north of the Village of Walloon/Shorts Hill

The participants then took the complete list above and developed their Top Five Natural Hazards Priority Areas. Due to the rural nature of the county, there has not been a lot of property damage, injuries, or deaths due to natural hazards. Please refer to Figure 1.

## **Top Five Natural Hazards Priority Areas**

### **1. Severe winter storms: Potential throughout the County and concerns about utilities**

Charlevoix County is in a snowbelt area. Snowstorms can be very dangerous for a community for short periods of time. Heavy snows can shut down towns and businesses for a period of a few days if the snow is falling faster than it can be cleared in a timely fashion. Blowing and drifting with blizzard conditions cause driving hazards.

### **2. City of Charlevoix: Potential of severe thunderstorms and high winds and severe winter storms around the U.S. 31 bridge**

There is a historical record of high wind events around the Lake Michigan shoreline area and a few tornadoes in the county. Severe winds, or straight line winds that sometimes occur during severe thunderstorms can be very damaging to a community. Severe winds have the potential to cause loss of life from property damage and flying debris. Damage from straight line winds is more widespread than tornadoes and usually affects multiple counties. There is also risk of infrastructure damage due to downed power lines caused by falling trees and limbs.

There is a history of severe thunderstorm events in the county with some concerns regarding the influx of tourists. Thunderstorms are hazards that bring a variety of problems during the spring, summer, and fall seasons. They can cause lightning, flash flooding, hail, strong winds, and even tornadoes.

Given its proximity to Lake Michigan, Charlevoix County is subject to lake-induced precipitation and is recognized by the National Weather Service as a snowbelt area. Snowstorms can be very dangerous for a community for short periods of time. Heavy snows can shut down towns and businesses for a period of a few days if the snow is falling faster than it can be cleared in a timely fashion. Blowing and drifting with blizzard conditions cause driving hazards.

### **3. Boyne River and East Jordan Area: Potential flooding**

The risk of the dams failing could cause a chain reaction of failure down river. Damages will be greater from a cascading failure of events than they will from gradual floodplain inundation (rainfall or snowmelt event).

In addition to “regular” flooding in a riverine floodplain, other flooding may involve low-lying areas that collect runoff waters; flaws or shortcomings in existing sewer infrastructure; undersized or poorly designed stormwater control practices; collective effects of land use and development trends; illegal diversion of water, or actions that interfere with system function.

### **4. Eastern Portion of the County: Potential wildfire and the possibility of tornadoes in a utility area**

The forest types (jack pine, red pine, white pine) that are most fire prone are not located in this area, but the rural, forested topography of this portion of the county make it susceptible to wildfire. Additional factors that increase fire risk include lightning and human factors, such as are the number of persons residing in, camping in, or traveling through an area.

Tornadoes are high-profile hazards that can cause catastrophic damage to a limited or extensive area. There are no recorded tornado touchdowns in this area by the National Weather Service, but there is concern of the potential threat affecting utility facilities.

**5. Festival events at seasonal population centers throughout the County: Potential of severe thunderstorms, high winds, and tornadoes**

There is a historical record of severe thunderstorms and high wind events in these sections of the county with concerns regarding the influx of tourists. Thunderstorms are hazards that bring a variety of problems during the spring, summer, and fall seasons. They can bring potential lightning, flash flooding, hail, strong winds, and even tornadoes.

Severe winds, or straight line winds that sometimes occur during severe thunderstorms can be very damaging to a community. Severe winds have the potential to cause loss of life from property damage and flying debris. Damage from straight line winds is more widespread than tornadoes and usually affects multiple counties. There is also risk of infrastructure damage due to downed power lines from falling trees and limbs.

Tornadoes are high-profile hazards that can cause catastrophic damage to a limited or extensive area. There are no recorded tornado touchdowns in this area by the National Weather Service, but there is concern for the potential threat of a tornado touch down. There is a recorded tornado touchdown confirmed in Eveline Township and Boyne City.

**D. Emergency Warning System Coverage**

Most areas of the county are not covered by warning sirens due to Charlevoix County not being linked with a county-wide siren system. It was stated by the Task Force that some sirens in the County do work, but they did not know which ones. The Big Rock Nuclear Power Plan system has been removed. The City of Charlevoix’s warning system is not working at this time. There is a fire whistle in the City of East Jordan. The county is outside the coverage area of the NOAA Weather Alert System. The group stated that a National Weather Radio Broadcast station is greatly needed in the northern tier of the lower peninsula with more coordination between the National Weather Service and local media on warnings. The warnings that are issues generally tend to be ignored by the citizens.

**E. Economic Impact Analysis**

The total Damaging Events’ Costs recorded since 1950 by the National Oceanic and Atmospheric Administration for Charlevoix County:

1.	Snow and Ice	\$5,605,907
2.	Thunderstorms and High Winds	\$215,000
3.	Tornadoes	\$3,000

NWMCOG staff worked with the Charlevoix County parcel maps to calculate each Priority Area's economic value through the State Equalized Values (SEV) for real and personal property (residential and commercial). The following includes the 2000 Census data for the priority area and the SEV dollar amount times two (estimated fair market values) for each priority area.

1. *Charlevoix County*

Population: 26,090  
Total: \$3,797,379,842

2. *City of Charlevoix/Charlevoix Township - severe thunderstorms and high winds and severe winter storms*

Population: 4,691 plus seasonal influx in summer  
Total: \$599,602,400

3. *Boyne River and East Jordan Area - flooding*

Boyne River Area:

Population: 4,110 plus seasonal influx in summer/winter  
Total: \$171,114,000

East Jordan Area:

Population: 2,507  
Total: \$133,714,400

4. *Eastern portion of the County - wildfire and the possibility of tornadoes*

Population: 869  
Total: \$27,888,200

5. *Festival events at seasonal population centers throughout the County: Severe Thunderstorms, High Winds, and Tornadoes*

Population: 26,090 plus seasonal influx in summer/winter  
Total: \$3,797,379,842

## VIII. NATURAL HAZARDS MITIGATION GOALS AND OBJECTIVES

The mission of the Charlevoix County Natural Hazards Mitigation Plan is to protect the health and safety of the public and property in the County which includes prevention of injury, loss of life, property damage, breakdown in vital services like transportation and infrastructure, economic slumps, maintain tourist base, and liability issues. This is done by taking action to permanently eliminate or reduce the long-term risks from natural hazards.

Specific goals and objectives have been established based upon the community's natural hazards analysis, as well as input from the Task Force participants and the public through meetings, posting of the draft plan with a request for comments in the local newspaper and on the NWMCOG website, and the presentation of the plan to the Charlevoix County Planning Commission.

### **Goal 1: Increase local awareness and participation in natural hazards mitigation strategies**

#### *Objectives:*

- A. Encourage cooperation and communication between planning and emergency management officials
- B. Encourage additional local governmental agencies to participate in the natural hazards mitigation process
- C. Encourage public and private organizations to participate

### **Goal 2: Integrate natural hazards mitigation considerations into the community's comprehensive planning process**

#### *Objectives:*

- A. Enforce and/or incorporate natural hazards mitigation provisions in building code standards, ordinances, and procedures, and into the county's master plan
- B. Incorporate natural hazards mitigation into basic land use regulation mechanisms
- C. Update of zoning ordinances, shoreline protection rules, etc.
- D. Incorporate natural hazards area classifications into standard zoning classifications
- E. Develop community education programs and public warning systems
- F. Strengthen the role of the Local Emergency Planning Committee in the land development process
- G. Integrate natural hazards mitigation into the capital improvement planning process so that public infrastructure does not lead to development in natural hazards areas
- H. Encourage county agencies to assess local roads, bridges, dams, and related transportation infrastructure for natural hazards vulnerability

### **Goal 3: Utilize available resources and apply for additional funding for natural hazards Mitigation projects**

#### *Objectives:*

- A. Prepare a list of desired community mitigation projects to submit to the State for mitigation grant funding
- B. Encourage the application for project funding from other entities

### **Goal 4: Develop and complete natural hazards mitigation projects in a timely manner**

#### *Objectives*

- A. Encourage public and business involvement in natural hazards mitigation projects

## **IX. IDENTIFICATION AND SELECTION OF MITIGATION STRATEGIES**

### **A. Climate Change Solutions**

Regional residents, business leaders, and policymakers can help reduce the potential impacts from climate change by pursuing three necessary and complementary strategies:

- Reduce heat-trapping gas emissions, which will help curb the threat from a changing climate. This can be achieved by increasing energy efficiency, switching to renewable energy sources such as wind and biomass, increasing the fuel economy of vehicles, and investing in clean transportation choices.
- Minimize pressures on the environment by improving air quality, protecting the quality and supply of water resources, protecting habitat, and limiting sprawl.
- Prepare for impacts from global warming that cannot be avoided through better planning and emergency preparedness, adaptations in agriculture, strengthening public health response and warning systems, and adjusting flood control infrastructure based on projected precipitation trends.

### **B. Selection of Feasible Mitigation Strategies**

A set of evaluation criteria was developed to determine which mitigation strategies were best suited to address the identified problems in Charlevoix County.

1. The measure must be technically feasible.
2. The measure must be financially feasible.
3. The measure must be environmentally sound and not cause any permanent, significant environmental concerns.
4. The measure must be acceptable to those participating in the strategy and/or primarily affected by the strategy.

By anticipating future problems, the County can reduce potential injury, structure losses, power disruption, and prevent unnecessary public and private expenditures.

At the second Task Force meeting in **July 2004** the participants reviewed the suggested list of natural hazards mitigation strategies, matched them with each of the top natural hazards (numbered below) priority areas, and also suggested others to create a list of the most desired strategies for each. Please refer to Appendix B. #2.

#### **1. Severe winter storms: Potential throughout the County**

*Snow and Ice Mitigation Strategies:*

- a. Public education, awareness, and preparedness
- b. A National Oceanic and Atmospheric Administration weather station for the area
- c. Improve shelter capacity
- d. Promote the use of battery back-up and/or stand-by generators to maintain essential services
- e. Public education for decision makers
- f. Inventory of public four wheel drive and special use vehicles
- g. Emergency Operations Center planning to include winter storms in future exercises
- h. Identify and maintain critical fueling facilities

- i. Locate utility lines (electrical) underground

*Wind Mitigation Strategies:*

- a. Ask cities and others to implement sound tree planting strategies around power lines
- b. Encourage tree management by power companies along power line easements
- c. Business and homeowner education
- d. Locate utility lines underground

**2. City of Charlevoix: Potential of severe thunderstorms and high winds and severe winter storms around the U.S. Highway 31 bridge**

*Thunderstorm and High Wind Mitigation Strategies:*

- a. Promote the practice of placing utilities underground
- b. Continue support of the Road Commission in their clearance of blocked roads
- c. Coordinate the use of sirens that are in place and public education
- d. Promote a National Oceanic and Atmospheric Administration weather station for the area
- e. Tree management coordination throughout the county to make sure trees do not interfere with power lines
- f. Pre-plan and label alternate transportation routes
- g. Develop inventory of homes located on seasonal roads

*Snow and Ice Mitigation Strategies:*

- a. Public education, awareness, and preparedness
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- c. Improve shelter capacity
- d. Promote the use of battery back-up and/or stand-by generators to maintain essential services
- e. Public education for decision makers
- f. Inventory of public four wheel drive and special use vehicles
- g. Emergency Operations Center planning to include winter storms in future exercises
- h. Identify and maintain critical fueling facilities
- i. Develop inventory of homes located on seasonal roads

**3. Boyne River and East Jordan Area: Potential flooding**

There was discussion by the Task Force participants about whether or not this is a priority issue. It is potentially a lower risk.

*Flood Mitigation Strategies:*

- a. Need a better flood warning system
- b. Re-engineering of culverts for flood mitigation
- c. Assessment of flood threat and results of dam inspections
- d. Public education

**4. Eastern Portion of the County: Potential wildfires and the possibility of tornadoes in the utility area**

*Wildfire Mitigation Strategies:*

- a. Inventory dry hydrants and water sources and ensure sources are accessible
- b. Put water source location maps in all emergency vehicles
- c. Study roads in the area for emergency vehicle accessibility
- d. Enforce minimum standards for private roads to ensure emergency vehicle access

- e. Revise ordinances to include standards that ensure access, stipulate maximum grade, minimum driveway width, and turnaround areas
- f. Public awareness and education

*Tornado Mitigation Strategies*

- a. Consistent weather event warnings
- b. Public awareness and education

**5. Festival events at seasonal population centers throughout the County: Potential of severe thunderstorms, high winds, and tornadoes**

*Thunderstorm, High Winds, and Tornado Mitigation Strategies:*

- a. Charlevoix County Board to recommend that all groups sponsoring festivals to plan mitigation strategies for their respective festivals
- b. Require all mass gathering events to have a permit review process to include natural hazards mitigation
- c. Develop and implement mutual support and aid practices with surrounding communities
- d. Public education for awareness and self protection

**Additional Areas of Concern:**

Technical:

- Propane storage tank (90,000 gallons) on M-75 South near Dam Road – the damage could spread about two miles and is near a school
- Spent fuel rods at the decommissioned Big Rock Nuclear Power Plant north of the City of Charlevoix on Lake Michigan

## **X. IMPLEMENTATION OF THE CHARLEVOIX COUNTY NATURAL HAZARDS MITIGATION PLAN**

### **1. *Natural Hazards Mitigation Plan Managers and Technical Assistance***

The leader for implementing the Natural Hazards Mitigation Plan is the Charlevoix County Board of Commissioners, with the staff leaders being the Emergency Management Coordinator and the Planning Department. Working partnerships can be established with the following to provide technical assistance to accomplish the goals and objectives of the Plan.

Charlevoix County Government  
Townships, cities, and villages  
Charlevoix County Conservation District  
Charlevoix County Drain Commissioner  
Charlevoix County Road Commission  
Grand Traverse Band of Ottawa and Chippewa Indians  
Little Traverse Bay Bands of Odawa Indians  
Little Traverse Conservancy  
Tip of the Mitt Watershed Council  
Michigan State University Extension  
Michigan Department of Environmental Quality  
Michigan Department of Natural Resources  
U.S. Environmental Protection Agency  
U.S. Army Corps of Engineers  
U.S. Department of Agriculture Natural Resources Conservation Service  
Insurance Companies  
Real Estate Companies

All natural hazards mitigation planning could be pursued with the new tool available to local governments which is Michigan Public Act 226 of 2003, the Joint Municipal Planning Act. This Act provides for joint land use planning by cities, villages, and townships and allows two or more municipalities' legislative bodies to create a single joint planning commission to address planning issues. This tool helps with planning for the "big picture" issues such as natural hazards that cross jurisdictional boundaries.

The intent of this legislation is for local governments to consider the following:

- ☞ Individual units of government modifying their ordinances simultaneously to include language that would incorporate aspects of natural hazards mitigation strategies
- ☞ Developing an overlay zoning district that would cross jurisdictional boundaries that would be incorporated into existing local units of government's zoning ordinances
- ☞ Forming a new joint (multi-jurisdictional) planning commission or zoning board
- ☞ Share zoning administration
- ☞ Share enforcement activities

### **2. *Funding the Implementation of the Plan***

To assist with the funding of the proposed natural hazards mitigation strategies, here is a list of potential financial assistance entities to help fund the implementation projects of the Plan.

Federal Emergency Management Administration – Hazard Mitigation Grant Program  
 U.S. Environmental Protection Agency  
 U.S. Department of Agriculture Natural Resources Conservation Service  
 U.S. Department of Agriculture Rural Development: Rural broadband opportunity – high speed telecommunication funding from the Public Telecommunications Facilities Planning and Construction grants  
 U.S. Department of Housing and Urban Development  
 Michigan Department of Environmental Quality  
 Michigan Department of Natural Resources  
 National Oceanic and Atmospheric Administration  
 Community, Regional Foundations  
 Businesses: Home Depot (local store and Foundation) assists with educational initiatives that provide developers and the general public with the information they need to make homes more disaster resistant.

### **3. Action Agenda**

Following are the **recommended natural hazards mitigation actions** for Charlevoix County:

#### **1. Severe winter storms: Potential throughout the County**

##### *Snow and Ice Mitigation Strategies:*

- a. Public education, awareness, and preparedness
- b. A National Oceanic and Atmospheric Administration weather station for the area
- c. Improve shelter capacity
- d. Promote the use of battery back-up and/or stand-by generators to maintain essential services
- e. Public education for decision makers
- f. Inventory of public four wheel drive and special use vehicles
- g. Emergency Operations Center planning to include winter storms in future exercises
- h. Identify and maintain critical fueling facilities
- i. Locate utility lines (electrical) underground
- j. Promote the burying of utility lines for new construction
- k. Promote only the planting of trees near power lines that will not grow in a manner to disrupt the power lines

##### *Wind Mitigation Strategies:*

- a. Ask cities and others to implement sound tree planting strategies around power lines
- b. Encourage tree management by power companies along power line easements
- c. Business and homeowner education
- d. Locate utility lines underground
- e. Improve shelter capacity
- f. Promote the burying of utility lines for new construction
- g. Promote only the planting of trees near power lines that will not grow in a manner to disrupt the power lines

**2. City of Charlevoix: Potential of severe thunderstorms and high winds and severe winter storms around the U.S. Highway 31 bridge**

*Thunderstorm and High Wind Mitigation Strategies:*

- a. Promote the practice of placing utilities underground
- b. Continue support of the Road Commission in their clearance of blocked roads
- c. Coordinate the use of sirens that are in place and public education
- d. Promote a National Oceanic and Atmospheric Administration weather station for the area
- e. Tree management coordination throughout the county to make sure trees do not interfere with power lines
- f. Pre-plan and label alternate transportation routes
- g. Develop inventory of homes located on seasonal roads
- h. Improve shelter capacity
- i. Promote the burying of utility lines for new construction
- j. Promote only the planting of trees near power lines that will not grow in a manner to disrupt the power lines

*Snow and Ice Mitigation Strategies:*

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**3. Boyne River and East Jordan Area: Potential flooding**

There was discussion by the Task Force participants about whether or not this is a priority issue. It is potentially a lower risk.

*Flood Mitigation Strategies:*

- a. Need a better flood warning system
- b. Re-engineering of culverts for flood mitigation
- c. Assessment of flood threat and results of dam inspections
- d. Public education

**4. Eastern Portion of the County: Potential wildfires and the possibility of tornadoes in the utility area**

*Wildfire Mitigation Strategies:*

- a. Inventory dry hydrants and water sources and ensure sources are accessible
- b. Put water source location maps in all emergency vehicles
- c. Study roads in the area for emergency vehicle accessibility
- d. Enforce minimum standards for private roads to ensure emergency vehicle access

- e. Revise ordinances to include standards that ensure access, stipulate maximum grade, minimum driveway width, and turnaround areas
- f. Public awareness and education

*Tornado Mitigation Strategies*

- a. Consistent weather event warnings
- b. Public awareness and education
- c. Improve shelter capacity
- d. Promote the burying of utility lines for new construction
- e. Promote only the planting of trees near power lines that will not grow in a manner to disrupt the power lines

**5. Festival events at seasonal population centers throughout the County: Potential of severe thunderstorms, high winds, and tornadoes**

*Thunderstorm, High Winds, and Tornado Mitigation Strategies:*

- a. Charlevoix County Board to recommend that all groups sponsoring festivals to plan mitigation strategies for their respective festivals
- b. Require all mass gathering events to have a permit review process to include natural hazards mitigation
- c. Develop and implement mutual support and aid practices with surrounding communities
- d. Public education for awareness and self protection
- e. Improve shelter capacity
- f. Promote the burying of utility lines for new construction
- g. Promote only the planting of trees near power lines that will not grow in a manner to disrupt the power lines

**Additional Mitigation Strategies:**

*A. Public Education*

- Programs, brochures, insurance companies
- Let people know what to do to be self reliant for 72 hours during an outage
- Create Emergency Action Guidelines
- Public notice of road closures and alternate routes
- Need consistent language for severe weather warnings between NOAA and the media outlets

*B. Work on a multi-hazard warning plan and strategies for festivals*

- The units of government should approach festival hosts and sponsors to encourage development of plans
- Build awareness for proactive planning and creative thinking to reduce damages
- All Festival Permits should include a natural hazards plan and exit strategy
- Offer annual training by advancing the Sheriff Department's efforts and use the Mackinac Bridge Walk police task force as a model

*C. Develop mutual support and aid from surrounding communities*

- Work with cities and villages and adjacent counties to develop mutual aid pacts or agreements

- D. *Work with other governmental entities, organizations, businesses, and the public on natural hazards issues*
- E. *Inventory potential natural hazard areas and mitigation activities*
- Study natural areas and undeveloped lands for natural hazards, and look at zoning to guide growth and development away from natural hazard areas
  - Identify community shelters, especially ones that can sustain themselves through longer power outages
  - Identify shelter needs, power issues, and capacity
  - Inventory stream/river culvert tubes and re-engineer and replace with bridges for flood mitigation
  - Create laminated maps for emergency vehicles that index water sources (pertaining to wildfires)
  - Place signs along the road right-of-way to show emergency responders where water sources are located
  - GPS units with laptops in public vehicles for rural areas
- F. *Charlevoix County can also utilize watershed management plans that have been developed by the Charlevoix County Conservation District and the Tip of the Mitt Watershed Council. Proposed mitigation strategies described in the Lake Charlevoix Watershed Management Plan are as follows:*
6. Reduce soil erosion and stormwater runoff
  7. Increase public awareness through education
  8. Promote land stewardship and land protection
  9. Improve land use planning and management to reduce impacts from future development and land use decisions
  10. Encourage forestry management to prevent soil erosion and stormwater runoff
- G. *Incorporate the Plan's natural hazards mitigation concepts, strategies, and policies into existing elements of Charlevoix County's Comprehensive Plan – 2005-2006*
- The most effective method for fostering and promoting the implementation of the natural hazards mitigation concepts, strategies, and policies within the County is to integrate them into existing elements of the Master or Comprehensive Plan. Mitigation concepts, strategies, and policies would appear in appropriate places throughout the plan.

The County should consider the following key land use issues and the relationship to natural hazards mitigation:

- Safe, beneficial uses for natural hazards prone areas
- Concentration of population issues
- Proximity to natural hazards priority areas
- Location of public facilities and infrastructure
- Development standards for public facilities and infrastructure
- Effect of accumulated development on community systems and facilities

#### **4. Monitoring and Evaluation**

The Charlevoix County Natural Hazards Mitigation Plan will be monitored on a regular basis by the Emergency Management Coordinator and the Planning Department. Because Charlevoix County is a dynamic, changing county with population growth, it is expected that the plan should be reviewed on an annual basis.

To assess the effectiveness of the Plan, some questions to ask in the review include: 1) How many and which mitigation strategies were developed? Implemented? 2) Did any new natural hazards events take place the past year to report? This review will be administered by the Emergency Management Coordinator with the Local Emergency Planning Committee, the County Planning Commission and Department, and the public. If changes are needed, the plan will be presented to the Task Force participants for revisions.

Although review of the plan will occur annually, and a formal revision may not be needed each year, a new edition of the plan will be expected within every five-year period. New additions of the plan will be based on annual reviews, monitoring, evaluation, and an accumulation of official feedback and public input. When it is appropriate to publish a revised version of the plan, the Task Force participants shall again be involved in the revision process. Each new edition of the plan will again be officially adopted by the Charlevoix County Board of Commissioners.

## **XI. Review of the Charlevoix County Natural Hazards Mitigation Plan**

The opportunities for review by other governmental entities and the public included the following:

- A. Quarterly reports were given to the Northwest Michigan Council of Governments' Board of Directors for neighboring counties' review.
- B. Public Notices were published in the Charlevoix Courier – no comments were received.

### **Public Notice**

The Northwest Michigan Council of Governments is requesting public comment on the Natural Hazards Mitigation Plan draft for Charlevoix County. The Plan is available for review at the Charlevoix County Planning Department, County Building, Charlevoix or at [nwm.org](http://nwm.org), Community Resources, Community and Economic Development, Hazard Mitigation Planning Program, Charlevoix County Plan. Please send comments by September 17, 2004 to: Hazard Mitigation Plans, NWMCOG, PO Box 506, Traverse City MI 49685-0506.

- C. Postcards that gave notice of the draft plan to review were sent to all the Township Supervisors - no comments were received.
- D. The Natural Hazards Mitigation Plan was presented to the Charlevoix County Planning Commission where the meetings are posted in the newspaper and are open to the public. Commission members gave their input and there were no comments from the public.
- E. The Natural Hazards Mitigation Plan was presented to the Charlevoix County Board of Commissioners where the meetings are posted in the newspaper and are open to the public. Commissioners gave their input and there were no comments from the public.

## XII. NATURAL HAZARDS MITIGATION PLAN ADOPTION RESOLUTION

### NATURAL HAZARDS MITIGATION PLAN ADOPTION RESOLUTION

WHEREAS, Charlevoix County, Michigan has experienced natural disasters that have damaged commercial, residential, and public properties, displaced citizens and businesses, closed streets and bridges, and presented general public health and safety concerns; and

WHEREAS, Charlevoix County has prepared a *Natural Hazards Mitigation Plan* that outlines the County's options to reduce overall damage and impact from natural hazards; and

WHEREAS, the *Natural Hazards Mitigation Plan* has been reviewed by County residents, business owners, and federal, state, and local agencies, and has been revised to reflect their concerns;

NOW, THEREFORE, BE IT RESOLVED THAT

1. The *Charlevoix County Natural Hazards Mitigation Plan* is hereby adopted as an official plan of Charlevoix County, Michigan.
2. The Emergency Management Coordinator, the Planning Department staff, and Planning Commission are charged with supervising the implementation of the Plan's recommendations within the funding limitations as provided by the Charlevoix County Board of Commissioners or other sources.
3. Priority attention shall be given to the following action items recommended by the *Natural Hazards Mitigation Plan*:
  - a. Public education and awareness of potential natural hazards, X. 3. a., Page 27
  - b. Require a multi-hazard warning plan and strategies for festivals, X. 3. b., Page 27
  - c. Develop mutual support and aid from surrounding communities, X. 3. c., Pages 27 and 28
  - d. Work with other governmental entities, organizations, businesses, and the public, X. 3. d., Page 28
  - e. Education and enforcement of building and zoning codes – new construction, X. 3. e., Page 28
4. The Emergency Management Coordinator shall review the *Natural Hazards Mitigation Plan* once per year. The staff shall monitor implementation of the plan and shall submit a written progress report to the County Board of Commissioners in accordance with the following format:
  - a. A review of the original plan.
  - b. A review of any disasters or emergencies that occurred during the previous calendar year.
  - c. A review of the actions taken, including what was accomplished during the previous year.
  - d. A discussion of any implementation problems.
  - e. Recommendations for new projects or revised action items. Such recommendations shall be subject to approval by the County Board of Commissioners.

Passed this 27<sup>th</sup> day of October 2004.

Signed by: \_\_\_\_\_

CERTIFIED	
Jane E. Brannon, County Clerk	
Cheryl D. Brown	11/1/04
DEPUTY	DATE

### **XIII. APPENDICES**

#### **Appendix A**

##### **Glossary of Mitigation Planning Terms**

**Alluvial fan:** A gently sloping fan-shaped landform created over time by the deposition of eroded sediment and debris.

**Base Flood:** A flood having a one percent chance of being equaled or exceeded in any given year.

**Coastal high hazard area:** An area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms.

**Disaster:** A major detrimental impact of a hazard upon the population and economic, social, and built environment of an affected area.

**Exposure:** The number, types, qualities, and monetary values of various types of property or infrastructure and life that may be subject to an undesirable or injurious hazard event.

**Flood Insurance Rate Map:** As defined under the National Flood Insurance Program, an official map of the community on which the administrator of the Flood Insurance Administration has delineated both the special flood hazard areas and the risk premium zones applicable to the community.

**Floodplain or flood prone area:** Any land area susceptible to being inundated by water from any source.

**Floodplain management:** The operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to emergency preparedness plans, flood control works, and floodplain management regulations.

**Fuel:** Combustible plant material, both living and dead, that is capable of burning in a wildland situation; any other flammable material in the built environment that feeds a wildfire.

**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.

**Hazard identification:** The process of defining and describing a hazard, including its physical characteristics, magnitude and severity, probability and frequency, causative factors, and locations or areas affected.

**Lifeline systems:** Public works and utilities such as electrical power, gas and liquid fuels, telecommunications, transportation, and water and sewer systems.

**Major disaster:** As defined in the Stafford Act, “any natural catastrophe or, regardless of cause, any fire, flood, or explosion in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance under this Act to supplement the efforts and available resources of states, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby.”

**Mitigation:** Sustained action taken to reduce or eliminate the long-term risk to human life and property from natural hazards and their effects. Note that this emphasis on long-term risk distinguishes mitigation from actions geared primarily to emergency preparedness and short-term recovery.

**Multiple-objective management:** A holistic approach to floodplain management (or the management of other hazards) that emphasizes the involvement of multiple distinct interest in solving land use problems related to the hazardous area.

**Natural hazard:** Hurricanes, tornadoes, storms, floods, tidal wave, tsunamis, high or wind-driven waters, volcanic eruptions, earthquakes, snowstorms, wildfires, droughts, landslides, and mudslides.

**One hundred year flood:** The flooding event that has a one percent chance of occurring in a particular location in any given year. While this is the most common reference point statistically because it is used for regulatory purposes in the National Flood Insurance Program, the same language applies in referring to other actual or hypothetical events in terms of their statistical probabilities.

**Risk:** The potential losses associated with a hazard, defined in terms of expected probability and frequency, exposure, and consequences.

**Risk assessment:** A process or method for evaluating risk associated with a specific hazard and defined in terms of probability and frequency of occurrence, magnitude and severity, exposure, and consequences.

**Special flood hazard area:** Land in the floodplain within a community subject to one percent or greater chance of flooding in any given year.

**Stafford Act:** The Robert T. Stafford Disaster Relief and Emergency Assistance Act (P.L. 93-288, as amended by P.L. 100-707), which provides the greatest single source of federal disaster assistance.

**Structure:** A walled and roofed building, including a storage tank for gas or liquid, that is principally above ground, as well as a manufactured home.

## Tornado Classifications:

F-Scale Number	Intensity Phrase	Wind Speed	Type of Damage Done
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not

			<p><b>be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies</b></p>
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**Urban Wildfire:** A fire moving from a wildland environment, consuming vegetation as fuel, to an environment where the fuel consists primarily of buildings and other structures.

**Urban/wildland interface:** A developed area, also known as the “I-zone,” occupying the boundary between an urban or settled area and a wildland characterized by vegetation that can serve as fuel for a forest fire.

**Vulnerability:** The level of exposure of human life and property to damage from natural hazards.

**Watershed management:** The implementation of a plan or plans for managing the quality of flow of water within a watershed, the naturally defined area within which water flows into a particular lake or river or its tributary. The aims of watershed management are holistic and concern the maintenance of water quality, the minimization of stormwater runoff, the preservation of natural flood controls such as wetlands and pervious surface, and the preservation of natural drainage patterns. Watershed management is, in many ways, an enlargement of most of the concerns that underlie floodplain management.

**Wildland:** An area in which development has not occurred with the exception of some minimal transportation infrastructure such as highways and railroads, and any structures that are widely spaced and serve largely recreational purposes.

## **Appendix B**

### **Detailed Maps**

1. **11 x 17 Full Map**
2. **11 x 17 Zoom in of Priority Areas**

## **Appendix C**

### **Population Density Map**

Appendix D

Risk Assessment Summary Table: CHARLEVOIX COUNTY

HAZARD	How Frequently has the Hazard Occurred in the Past?	How Likely is the Hazard to Occur in the Future	Potential Geographic Size of the Affected Area	Potential Population Impacted	Priority of Mitigation Activities	Detailed Damaged and Estimated Costs (Population, Economic, Environment)
<b>Dams/ Flooding Hazards</b>	3 events	6% chance	<b>Boyne River Dams</b>  Regional	6,319	<b>3</b>	Population, economics, environment
<b>Fire Hazards</b>			<b>Chandler Twp Thumb Lake Beaver Island</b>	230 639 + seasonal 551 + seasonal	<b>4</b>	Economic, environment Population, economics, environment
<b>Hail</b>	13 events	24% chance	<b>Boyne City</b> East Jordan Boyne City Charlevoix Ironton			Economics, environmental
<b>Snow and Ice</b>	66 events	122% chance	<b>County Charlevoix Bridge Area</b>  County/Region	26,090 2,994	<b>1</b> <b>2</b>	Utilities  \$5,605,907
<b>Thunderstorm and High Wind</b>	27 events	50% chance	<b>S Charlevoix Twp Round Lake Boyne City &amp; Boyne Falls Evangeline Twp South of Advance Hayes Township</b>  County Beaver Island East Jordan Boyne Falls Boyne City Charlevoix			Population, economics, environment  \$215,000
<b>Tornadoes</b>	4 events	7% chance	<b>Boyne City EJ &amp; Boyne C. Chandler Twp – Gas trans area Boyne Valley NE</b>  County Boyne City	3,503 + seasonal  Some pop 230	<b>5</b> <b>4</b>	Population, economics, environment

## Appendix E

### Examples of Past Mitigation Projects

Flood Projects	Tornado/Wind Projects	Extreme Cold/Winter/Infrastructure Failure Projects
Replace culvert with bridge	Modify roof ballast system on airport	Insulate municipal water tower
Install stormwater relief drain	Construct storm shelters in public buildings	Insulate city infrastructure
Upgrade road culvert	Construct storm shelters for homes, facilities	Insulate sanitary/storm sewer mains
Elevate floors of homes	Wind bracing for microwave/radio towers	Insulate water mains
Acquire of floodway properties	Construct mobile home park storm shelter	Bury utility lines
Create retention basin	Wind retrofitting for municipal buildings	Relocate sewer mains
Construct new dike	Wind bracing for school facilities	Reroute power lines under a river
Upgrade bridge over a creek (for greater stream flow)	Upgrade warning sirens**	Install plumbing devices to prevent sewer backup
Install sea wall	Install warning sirens**	Elevate and build casing for generator for EOC
Install rip rap to protect roadway	Purchase/Distribute NOAA radios**	Living snow fences for highways and roadways
Re-route various county drains	Severe weather monitoring systems**	
Purchase back-flow prevention valves	Implement long-term community outreach**	
Construct new drains for flood relief		
Flood study for home acquisition		
Flood study of community's flood risk	<b>T-storm/Lightning Projects</b>	<b>Wildfire Projects</b>
Flood study for stream, roadways		
Elevate electrical equipment in basements	Lightning protection (grounding/phasing)	Vegetation management for roadways
Floodproof wastewater treatment plant	Purchase/Distribute NOAA radios**	Vegetation mgmt. for urban interface areas of city
Warning sensor for creek/river	Install weather alert monitors**	Vegetation mgmt. for homes in fire prone areas
Warning sensor for dam		Urban Interface Education Program**
Raise manholes above 100-Yr floodplain		
Expand storm sewer network for subdivision		
Excavate floodway channel bypass		
Establish permanent flood elevation benchmarks**		
Increase pump capacity for pump stations		
Remove abandoned dam		
Construct emergency floodway		
Install plumbing devices to prevent sewer backup		

\*\*Denotes Hazard Mitigation Grant Program State Discretionary projects (only 5-10% set aside of HMGP funding)

## Appendix F

### Resources

*Benchmarks 2004*, Northwest Michigan Council of Governments

*Confronting Climate Change in the Great Lakes Region, Michigan* fact sheet, Union of Concerned Scientists and the Ecological Society of America, April 2003.

*Elk River Chain of Lakes Watershed Management Plan*, Tip of the Mitt Watershed Council, July 2001, [www.watershedcouncil.org](http://www.watershedcouncil.org).

*Grand Traverse Bay Watershed Protection Plan*, Watershed Center Grand Traverse Bay, December 2003, [www.gtbbay.org](http://www.gtbbay.org).

*Integrating Human-Caused Hazards Into Mitigation Planning, State and Local Mitigation Planning how-to guide*: Federal Emergency Management Agency, September 2002, FEMA 386-7 CD.

*Lake Charlevoix Watershed Management Plan*, Charlevoix Conservation District and the Tip of the Mitt Watershed Council, 2003.

*Local Hazard Mitigation Planning Workbook*: EMD-PUB 207, February 2003, Emergency Management Division, Michigan Department of State Police.

*Michigan Hazard Analysis*: EMD PUB-103, December 2001, Emergency Management Division, Michigan Department of State Police.

*National Oceanic and Atmospheric Administration: Weather/Climate Events, Information, Assessments; Climatology and Extreme Events; U.S. Storm Events Data Base; 1950-present, local storm reports, damage reports, etc. from various sources.* [www.ncdc.noaa.gov](http://www.ncdc.noaa.gov)

*Northwest Michigan County Profiles 2000*, Northwest Michigan Council of Governments, November 2002.

Northwest Michigan Council of Governments Website Data, [nwm.org](http://nwm.org).

*Planning for a Disaster-Resistant Community: A One-Day Workshop for City and County Planners, Planning Officials, and Consultants*: American Planning Association Research Department, American Planning Association, 2002 in cooperation with the Federal Emergency Management Agency, Planning and Mitigation Branch (materials only).

*State and Local Mitigation Planning how to guide: Understanding Your Risks, identifying hazards and estimating losses*: Federal Emergency Management Agency, August 2001, FEMA 386-2.