Natural Hazards Mitigation Plan
2007
Benzie County, Michigan

Produced by:
Northwest Michigan Council of Governments
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# TABLE OF CONTENTS

I. Acknowledgements .................................................. Page 3

II. Letter of Transmittal ................................................ Page 4

III. Preface .................................................................. Page 5

IV. Executive Summary ............................................... Page 6

V. Purpose of the Plan ................................................ Page 10

VI. Community Profile ............................................... Page 12

VII. The Development of the Plan .................................. Page 14
      A. Data Methodology ....................................
      B. Natural Hazards Information ....................
         a. Natural Hazards and Climate Change ........
         b. Natural Hazards Recorded Events ...........
         c. Probability of Natural Hazards .........
      C. Benzie County Natural Hazards Task Force and Public Input ...
      D. Emergency Warning System Coverage ......
      E. Economic Impact Analysis ......................

VIII. Natural Hazards Mitigation Goals and Objectives .......... Page 25

IX. Identification and Selection of Mitigation Strategies ......... Page 26
      A. Climate Change Solutions ....................
      B. Selection of Feasible Mitigation Strategies ....

X. Participation in the Development of the Benzie County Natural Hazards Mitigation Plan .......... Page 29

XI. Implementation of the Benzie County Natural Hazards Mitigation Plan ........................................... Page 32
      1. Natural Hazards Mitigation Plan Managers and Technical Assistance ...
      2. Funding the Implementation of the Plan .........
      3. Action Agenda ....................................
      4. Monitoring and Evaluation ......................

XII. Natural Hazards Mitigation Plan Adoption Resolution .......... Page 36

XIII. Appendices ................................................................ Page 37
      A. Glossary ..............................................
      B. Detailed Maps ........................................
         1. Full County ......................................
         2. Priority Areas ....................................
      C. Population Density Map .........................
      D. Risk Assessment Work Sheet ..................
      E. Examples of Past Mitigation Projects ..........
      F. Task Force Meetings ..............................
      G. Resources ..........................................
I. ACKNOWLEDGEMENTS

The Plan is the culmination of the 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 development of the Benzie County Natural Hazards Mitigation Plan:

**Benzie County Board of Commissioners**
Don Howard
Don Tanner

**Benzie County Emergency Management Coordinator**
Rory Heckman

**Benzie County Planning Department**
Dave Neiger

**Benzie County Equalization Director**
Vickie Esch

**Benzie County Planning Commission**

**Fire Department**
John Hanmer

**Grand Traverse Band of Ottawa and Chippewa Indians**
Warren Bailey

**Platte Township Representative**
Clarence Davis

**United States Coast Guard**
Douglas Leavell

**Organizations**
Paul Oliver Memorial Hospital
April 21, 2005

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 Benzie 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 mitigation strategies to protect lives and property in the County.

This transmittal letter serves notice that all future development decisions in Benzie County will consider natural hazards 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 Benzie County Emergency Management Coordinator, Rory Heckman at 231.882.4484.

Sincerely,

Donald R. Howard, Chairman
Benzie County Board of Commissioners
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: a community prepares for a disaster; responds when it occurs; and then there is a transition into the recovery process, during which 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.

Reducing the impact of natural hazards on people and property through the coordination of resources, programs, and authorities prevents communities from contributing to the increasing severity of the problems. 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. Through a combination of regulatory, administrative, and engineering approaches, losses can be limited by reducing susceptibility to damage.

Recognizing the importance of reducing community vulnerability to natural hazards, Benzie 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 Benzie County remains a vibrant, safe, enjoyable place in which to live, raise a family, maintain a tourist base, and continue to conduct business.
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.

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 Natural Hazards 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 natural hazards, a hazards analysis, goals and objectives, and feasible mitigation strategies to address the prioritized hazards.

The Benzie County Natural Hazards Mitigation Plan focuses on natural hazards such as drought, wildfires, flooding, shoreline erosion, thunderstorms and high winds, tornadoes, 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 Benzie 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 Benzie 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 Benzie 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 Benzie County Task Force participants designated the following top Natural Hazards Mitigation Priority Areas:

1. Potential Wildfire Areas:
   • Lake Ann Area (Village of Lake Ann, Almira Township) – increased development in and around the pine plantations that have a high fire load, possible lightning strikes as starters
   • Sleeping Bear Dunes National Lakeshore Area (National Park Service) – wildfire/development interface
2. Severe Winter Weather throughout the county – heavy snow, extreme temperatures, ice damage occurrences on Crystal Lake (Lake, Benzonia, Crystal Lake Townships, Village of Beulah)

3. High Wind Areas throughout the county - downed trees and power lines, downed trees over roads, usually during the month of November

4. Flooding Areas:
   - Honor/Platte River (flash flooding) (Village of Honor, Homestead Township)
   - Platte River Bridge (Homestead Township)
   - South Street Bridge US Highway 31 Honor area (Homestead Township)
   - Betsie Lake M-22 (Village of Elberta, Crystal Lake Township)
   - East side of Upper Herring Lake (Mick and Garvan Roads) (Blaine Township)

5. Lake Michigan Coastal Erosion Areas: Crystal Downs area, Michabou Shores, and around the village of Elberta. (Lake, Crystal Lake, Gilmore, Blaine Townships, Village of Elberta) Other Erosion Area: Honor (Village of Honor, Homestead Township)

And, recommended the following mitigation strategies:

Priority 1. Potential Wildfire Areas:
   - Lake Ann Area (Village of Lake Ann, Almira Township) where increased development in and around the red pine plantations have a high fire potential or “fuel load”. There are concerns about possible lightning strikes starting wildfires
   - Sleeping Bear Dunes National Lakeshore (National Park Service) where there is the wildfire and development interface

Wildfire Mitigation Strategies:
   a. Develop new building and zoning codes such as a 25 foot cleared space between houses/structures; defensible space
   b. Adjustments in the planning, design, and development process for area structures
   c. Public education, awareness, and alertness – become a FIREWISE community; fuel management, diversity of and native vegetation; homeowner property maintenance
   d. Visit campgrounds to advise campers of critical fire levels
   e. Building code enforcement (only on new construction)

Priority 2. Severe Winter Weather potential each year throughout the County – heavy snow, extreme temperatures, ice damage occurrences on Crystal Lake (Lake, Benzonia, Crystal Lake Townships, Village of Beulah)

Snow Load and Ice Build Up Mitigation Strategies:
   a. Adoption of stricter snow load building codes – for this area the load is 60 lbs. per sq. ft. and probably should be 100 lbs. per sq. ft.
   b. Public education
   c. Building code enforcement (only for new construction)

Priority 3. High Wind potential throughout the County which cause downed trees over roads and downed power lines. These events usually occur during the month of November.
High Winds Mitigation Strategies:
a. Shelters for Campground areas – Betsie River Campground, Lake Michigan Campground on the Platte River in Sleeping Bear Dunes National Lakeshore; Lake Ann Baptist Camp
b. Public Education for structural elements and tree management and promoting anchoring and tie downs for structures that need it
c. Building code enforcement (only for new construction) – 80 lbs. per sq. ft.
d. Building code enforcement for pavilions
e. Tree management by power companies on power line easements

Priority 4. Potential Flooding in these areas: (Village of Honor, Homestead, Crystal Lake, Blaine Township, Gilmore Townships, Village of Elberta)
   • Honor/Platte River flash flooding area on and around U.S. Highway 31
   • Platte River Bridge
   • South Street Bridge on U.S. Highway 31
   • Betsie Lake M-22
   • East side of Upper Herring Lake (Mick and Garvan Roads)

Flood Mitigation Strategies:
a. Mapping of flood prone areas (Blueberry Creek/Trout Pond area off of US 31 west of Honor
b. Wetland protection
c. Enforcement of stormwater/drainage control statutes/ordinances and other state and county ordinances – The County is working on creating a new 50 foot and 100 foot building/septic development setback for residential and commercial entities on all water bodies in The Sanitary Code and proposed as 50 to 75 feet for Crystal Lake and the Betsie River; presently only a 25 foot set back
d. Enforcement of building codes
e. Public education

Priority 5. Lake Michigan Coastal Erosion Area located in the Crystal Downs development, Michabou Shores, and Village of Elberta (Lake, Crystal Lake, Gilmore, Blaine Townships, Village of Elberta); Other Erosion Areas include the Village of Honor area (Village of Honor, Homestead Township)

Shoreline Erosion Mitigation Strategies:
a. Promote the relocation of structures – property owner’s expense or demolition
b. Drainage control and placement of vegetation, utilizing native vegetation
c. Enforcement of soil erosion statutes/permits – water levels rising at new construction sites; and enforcement of the grading levels no more than 10%
d. Enforcement of building codes (there is building now where no one would have built before)
e. Public Education

Additional Mitigation Strategies:
• Work on a multi-hazard warning plan
• Working with other governmental entities, organizations, businesses, and the public
• Incorporating the Plan’s natural hazards mitigation concepts, strategies, and policies into existing elements of Benzie County’s Master Comprehensive Plan 2020
The Benzie County Natural Hazards Mitigation Plan was recommended by the Benzie County Planning Commission on November 18, 2004 to the Benzie County Board of Commissioners for adoption. The Benzie County Board of Commissions approved the submission of the Plan on December 21, 2004. The Benzie County Planning Commission approved the amendments to the Plan and approved submission to FEMA by the County Board of Commissioners on April 19, 2005.
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 Benzie 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 Benzie County in the northwest region of the lower peninsula of Michigan, 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, extreme temperatures, wildfires, urban and riverine flooding, high or wind driven waters that cause shoreline flooding and erosion, 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

Benzie County is located in the northwest corner of Michigan's lower peninsula with its western border on Lake Michigan with a section of Sleeping Bear Dunes National Lakeshore located in the northwest corner. The county is covered with a rolling terrain, with many lakes and rivers throughout the area. The most prominent lake is Crystal Lake with many smaller lakes and rivers.

The community data located below is provided to describe Benzie County for planning and implementing the mitigation strategies. Please refer to Appendix E, Resources.

Major Geographic Features of Benzie County

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area in Water</td>
<td>16,960 acres</td>
</tr>
<tr>
<td>Inland Lakes</td>
<td>57</td>
</tr>
<tr>
<td>Miles of Great Lakes shoreline</td>
<td>60 miles</td>
</tr>
<tr>
<td>Forest Lands</td>
<td>146,600 acres, 71.4% of total land area</td>
</tr>
<tr>
<td>Wetlands</td>
<td>34,294 acres, 16.7% of total land area</td>
</tr>
<tr>
<td>Operating Farms (2002)</td>
<td>181</td>
</tr>
<tr>
<td>Farmland (2002)</td>
<td>23,055 acres</td>
</tr>
</tbody>
</table>

The total County population is **15,998**. The projected growth for 2010 is 19,418 and for 2020 it is 21,782. The seasonal population change can be up to 47% with an annual average of 27% or a change of 2,038 people. The population numbers are from the 2000 Census for the **12 Townships, 1 city and 6 major villages** covered by this plan are:

<table>
<thead>
<tr>
<th>Townships/Villages/City</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almira</td>
<td>2,811</td>
</tr>
<tr>
<td>Benzonia</td>
<td>2,405</td>
</tr>
<tr>
<td>Blaine</td>
<td>491</td>
</tr>
<tr>
<td>Colfax</td>
<td>585</td>
</tr>
<tr>
<td>Crystal Lake</td>
<td>960</td>
</tr>
<tr>
<td>Gilmore</td>
<td>850</td>
</tr>
<tr>
<td>Homestead</td>
<td>2,078</td>
</tr>
<tr>
<td>Inland</td>
<td>1,587</td>
</tr>
<tr>
<td>Joyfield</td>
<td>777</td>
</tr>
<tr>
<td>Lake</td>
<td>635</td>
</tr>
<tr>
<td>Platte</td>
<td>342</td>
</tr>
<tr>
<td>Weldon</td>
<td>530</td>
</tr>
<tr>
<td>Village of Benzonia</td>
<td>480</td>
</tr>
<tr>
<td>Village of Beulah</td>
<td>402</td>
</tr>
<tr>
<td>Village of Elberta</td>
<td>457</td>
</tr>
<tr>
<td>Village of Honor</td>
<td>299</td>
</tr>
<tr>
<td>Village of Lake Ann</td>
<td>276</td>
</tr>
<tr>
<td>Village of Thompsonville</td>
<td>457</td>
</tr>
<tr>
<td>City of Frankfort</td>
<td>1,513</td>
</tr>
</tbody>
</table>
Please see Attachment C. Population Density Map

County Resident Profile

1. There are 10,957 *Housing Units* in Benzie County with an average household size of 2.42 people per household. 41.2% of households have 2 persons.
2. The number of residents 65 years and over is 2,803, or 17.5% of the population.
3. The number of residents 19 years and under is 4,068, or 25% of the population.
4. The number of residents over 65 with a disability is 1,041, or 6% of the population.
5. The total number of residents with disability is 2,980, or 19% of the population.
6. The number of residents that have a language barrier or are linguistically isolated is 34, 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: 154
   - Income less than $15,000: 13.3%
   - Individuals in poverty: 1,103

1997/2002 Economic Census

<table>
<thead>
<tr>
<th>Industry Description</th>
<th>Number of Establishments</th>
<th>Number of Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>23</td>
<td>657</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Retail trade</td>
<td>87</td>
<td>540</td>
</tr>
<tr>
<td>Information</td>
<td>6</td>
<td>0-19</td>
</tr>
<tr>
<td>Real estate, rental, leasing</td>
<td>26</td>
<td>48</td>
</tr>
<tr>
<td>Professional, scientific, technical services</td>
<td>28</td>
<td>129</td>
</tr>
<tr>
<td>Administrative, support, waste management, remediation services</td>
<td>23</td>
<td>105</td>
</tr>
<tr>
<td>Educational services</td>
<td>1</td>
<td>0-19</td>
</tr>
<tr>
<td>Health care, social assistance</td>
<td>35</td>
<td>250-499</td>
</tr>
<tr>
<td>Arts, entertainment, recreation</td>
<td>15</td>
<td>20-99</td>
</tr>
<tr>
<td>Accommodation and food services</td>
<td>57</td>
<td>856</td>
</tr>
<tr>
<td>Other services (except public administration)</td>
<td>29</td>
<td>105</td>
</tr>
</tbody>
</table>

**Merchant Wholesalers**

<table>
<thead>
<tr>
<th>Wholesale trade</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*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

Benzie County staff identified the critical facilities and infrastructure on the base map with the Northwest Michigan Council of Governments’ GIS staff then digitizing the facilities as point files. Natural hazards points, polygons, and population centers data was then added to the base maps utilizing the following:

**Critical Infrastructure**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Airports</td>
</tr>
<tr>
<td>5</td>
<td>Bridges</td>
</tr>
<tr>
<td>1</td>
<td>Child Care</td>
</tr>
<tr>
<td>1</td>
<td>Church</td>
</tr>
<tr>
<td>2</td>
<td>Communications Facilities</td>
</tr>
<tr>
<td>10</td>
<td>Community Shelters</td>
</tr>
<tr>
<td>8</td>
<td>Dams</td>
</tr>
<tr>
<td>5</td>
<td>Fire Stations</td>
</tr>
<tr>
<td>2</td>
<td>Fish Hatcheries</td>
</tr>
<tr>
<td>21</td>
<td>Government Buildings</td>
</tr>
<tr>
<td></td>
<td>• Joyfield Township Office</td>
</tr>
<tr>
<td></td>
<td>• Weldon Township Office</td>
</tr>
<tr>
<td></td>
<td>• Thompsonville Village Office</td>
</tr>
<tr>
<td></td>
<td>• Inland Township Hall</td>
</tr>
<tr>
<td></td>
<td>• Platte Township Office</td>
</tr>
<tr>
<td></td>
<td>• Colfax Township Office</td>
</tr>
<tr>
<td></td>
<td>• Platte Grange Hall</td>
</tr>
<tr>
<td></td>
<td>• Honor Village Office</td>
</tr>
<tr>
<td></td>
<td>• Benzie County Road Commission Garage</td>
</tr>
<tr>
<td></td>
<td>• Homestead Township Office</td>
</tr>
<tr>
<td></td>
<td>• Beulah Village Office</td>
</tr>
<tr>
<td></td>
<td>• Benzie County Government Center</td>
</tr>
<tr>
<td></td>
<td>• Benzenia Township Office</td>
</tr>
<tr>
<td></td>
<td>• Lake Township Office</td>
</tr>
<tr>
<td></td>
<td>• Blaine Township Office</td>
</tr>
<tr>
<td></td>
<td>• Crystal Lake Township Office</td>
</tr>
<tr>
<td></td>
<td>• Gilmore Township Office</td>
</tr>
<tr>
<td></td>
<td>• Elberta Village Office</td>
</tr>
<tr>
<td></td>
<td>• Frankfort City Office</td>
</tr>
<tr>
<td></td>
<td>• Tribal Community Building</td>
</tr>
<tr>
<td>9</td>
<td>Hazardous Materials Sites or Facilities</td>
</tr>
<tr>
<td>8</td>
<td>Hospital and Medical Facilities</td>
</tr>
<tr>
<td></td>
<td>• Primary physicians per 100,000 population 1998 is 49.0</td>
</tr>
<tr>
<td>1</td>
<td>Military/US Coast Guard</td>
</tr>
<tr>
<td>3</td>
<td>Police Stations/Jails</td>
</tr>
<tr>
<td>4</td>
<td>Resort/Recreation</td>
</tr>
</tbody>
</table>
5 Schools
4 Senior Citizen Apartments/Center
9 Waste/Water/Sewage Treatment Facilities
  • Water: 20.9% public system or private company; 76.5% individual wells;
  • Sewer: 20.9% public sewer; 76.9% individual septic/cesspool; 2.2% other

**Flood Data**
Flood hazard information can usually be derived from the Flood Rate Insurance Maps (FIRM) available for jurisdictions. 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 deleted 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 (were 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 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.

**Other hazards** such as earthquakes and subsidence were considered but are shown not to be substantial risks.

The detailed Benzie 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 are average annual temperatures are increasing; severe rainstorms have become more frequent; winters are getting shorter; and the duration of lake ice cover is decreasing. 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, on freshwater from Lake Michigan, and on 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 will affect ecosystems and all 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 Hazard 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 Benzie 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 Benzie County are on the following list, including the number of events, dates, and descriptions of the most severe. NOAA has listed events that occurred on a region wide basis because they included Benzie County.

1. **Fire** – 1 event  
   - 15 acres Inland Township

2. **Flooding** – 4 events  
   - March 1993: (county and region)  
   - April 1993: $5 million (mostly southern, lower peninsula)
3. Funnel Clouds – 1 event
   • July 1995: Four funnel clouds were sighted over Lake Michigan (Frankfort)

4. Hail – 8 events
   • June 1955: 1.75 inches (county)
   • July 1982: 1.75 inches (county)
   • July 1987: 0.75 inches (county)
   • April 1993: 0.75 inches (Frankfort)
   • May 2002: 1.25 inches (Honor)
   • August 2003: (2) 0.75 inches and 0.88 inches (Lake Ann)
   • September 2003: 0.75 inches (Frankfort)

5. Snow and Ice – 45 events (12 inches or more of snow)
   • January 1993: Heavy snow (county and region) $50,000 property damage; 6-12 inches
   • March 1993: Freezing rain (county and region) .2 to .4 inches of ice
   • April 1993: Heavy snow (county and region) $50,000 property damage
   • December 1993: Heavy snow (county and region) 12 inches; 10-15 inches; 5-12 inches with 3 foot drifts; 6-12 inches blowing and drifting
   • January 1994: Heavy snow and freezing rain (statewide) $5.0 million; .1 to .3 inches of ice
   • March 1994: Freezing rain (county and region) .2 to .4 inches of ice
   • December 1996: Heavy snow (county) 8-12 inches
   • December 1998: Heavy snow (county and region) 6-12 inches
   • January 1999: Heavy snow (county and region) 6-12 inches
   • January 2000: Heavy snow (county – Frankfort)
   • February 2001: Ice storm (county and region) ¼ inch thick
   • December 2001: Heavy snow (county and region) over 12 inches
   • March 2002: Heavy snow (county and region) 10-16 inches
   • December 2002: Ice storm (county and region) 1 inch of ice
   • January 2004: Heavy snow (county and region) 20 inches

6. Thunderstorm and High Wind – 21 events
   • July 1995: Thunderstorm and winds (Frankfort) $1,000 property damage; trees and power lines down
   • November 1998: High wind (Frankfort) 80 to 90 mph wind gusts destroyed a hangar at the City-County airport and damaged 6 private planes
   • August 2003: Thunderstorm and wind (Frankfort) $15,000 property damage; 70 mph gust on the Lake Michigan shoreline with numerous trees and tree limbs down
   • November 2003: High wind (county and region) $155,000 property damage

7. Tornadoes – 4 events
   • April 1956: (county) F4 $250,000 property damage - 19 miles long and 400 yards wide; 2 deaths and 24 injuries
   • July 1983: (county) F1
   • June 1986: (county) F1 $3,000 property damage – 1 mile long and 20 yards wide
• October 1989: (county) F1 $25,000 property damage – 12 miles long and 20 yards wide

Other

8. Shoreline Erosion
The Michigan Hazard Analysis of 2006 identifies Benzie County as a High Risk Erosion Area with the Lake Michigan and Crystal Lake shorelines at risk. The Great Lakes experienced record high lake levels in 1985-86, and again in 1997-98. The National Climatic Data Center indicates that there have been no lake surf erosion events reported in Benzie County since 1950. While there were Governors Disaster Declarations for shoreline problems in the state in 1985-1986, these declarations did not include Benzie County.

9. Wildfires
The Michigan Hazard Analysis of 2006 identified around 125 wildfires occurred in Benzie County from 1981 to 2005, all of relatively small size.

10. Earthquakes
There has been no occurrence of earthquakes in the county in recent history and the closest ones have been in Ohio and Indiana which are about six hours from Benzie County.

11. Subsidence
The Michigan Hazard Analysis of 2006 and local information indicate that there have been no significant subsidence events in the county. Given the geological structure below the county, no significant subsidence issues are expected in the future.

3. Probability of Natural Hazards

The probability that a natural hazard such as hail, thunderstorm and high wind, 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 Benzie County.

The areas where natural hazards overlap in Benzie County can include heavy snow that causes trees and power lines down, and then melting, rain and flooding. Rising water levels with high winds can cause coastal landslides/debris flow/erosion.

Please see Appendix D: Risk Assessment Summary Table.

C. Benzie County Natural Hazards Task Force and Public Input
To create the Benzie County Natural Hazards Task Force, invitations for the meetings were sent to the following entities requesting their participation:

- County Administrator/Coordinator
- County Board of Commissioners
- County Sheriff/Emergency Services (911 Services Coordinators, Public Safety)
- County Emergency Manager/Coordinator
- County Public Works Director
- County Health Department Director
- County Planning or Community Development Director
- County Drain Commissioner/Soil Erosion Officers
- County Road Commission Director
- 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
- Tribes
- 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 12th, 2004** to identify the natural hazards priority areas and the second Task Force meeting was held on **July 12th, 2004** to develop the mitigation strategies for the priority areas. The following organizations/individuals participated in these meetings:

- Benzie County Commissioners (2)
- Planning Director
- Township Representative
- Emergency Management Coordinator
- Grand Traverse Band of Ottawa and Chippewa Indians
- U.S. Coast Guard
- Fire Department
- Hospital Representative

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 hazards 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. Seasonal populations (summer)
2. Tribal lands and facilities: High winds, storms
3. M-115 propane filling facility (2 bulk propane tanks)
4. Continental business – water tower supplies Fire Department
5. Low overhead barrier – environmental
6. Two dams US 31 S and M-115: Pond Road and Grace Road
7. Graceland Fruit plant in Frankfort
8. Lake Michigan erosion – a lot of areas; Crystal Downs/Grace Road development
9. Lower Herring dam – environmental; flooding when Lake Michigan rises and recedes
10. Sour gas wells – Thompsonville (2)
11. Gas pipeline to Kingsley
12. Grass Lake flooding dam – ecological
13. Crystal Mountain – large winter population and seasonal summer; residential, resort, hotel, water park, propane/natural gas, sewage treatment plant, direct groundwater wells – no tank or tower
14. Flooding: Honor area, Platte River (flash flooding); South Street bridge (Platte River) US 31
15. Erosion: Honor area
16. Fish Hatchery – dam/weir where they take care of high water on the Platte River
17. Outlet dam from Crystal Lake to Lake Michigan controls lake levels
18. Frankfort airport (paved)
19. Elberta area – industrial
20. Sleeping Bear Dunes National Lakeshore area – wildfire management
21. Fire load areas
22. Winds – mostly in November; trees down over roads
23. US 31 overpass in Beulah
24. Pilgrim Highway – west side area of Crystal Lake; trees vs. power lines
25. Lake Ann area – fire load vs. rapid development within pine plantations (potential lightening)
26. North Almira Township dam (gristmill)
27. Ice damage along Crystal Lake and Platte Lake; ice blockage problem, South Street and Zimmerman Road
28. Severe winter weather – snow loads; extreme temperatures (cold); small village water systems freeze up
29. Festivals – Frankfort, Honor, Beulah
30. Communications Towers - 10
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. **Potential Wildfire Areas:**
   - Lake Ann Area *(Village of Lake Ann, Almira Township)* where increased development in and around the red pine plantations have a high fire load. There are concerns about possible lightning strikes starting wildfires.
   - Sleeping Bear Dunes National Lakeshore *(National Park Service)* where there is the wildfire and development interface.

   In addition to the forest types that are most fire prone in these areas, additional factors that increase fire risk include lightning and human factors such as the number of persons residing in, camping in, or traveling through an area. There has been a tremendous increase of residential development in the Lake Ann area. Sleeping Bear Dunes National Lakeshore has a fire suppression policy and is presently developing their Wildfire Management Plan.

2. **Severe Winter Weather potential each year throughout the County** – heavy snow, extreme temperatures, ice damage occurrences on Crystal Lake *(Lake, Benzonia, Crystal Lake Townships, Village of Beulah)*.

   Benzie County has some snowbelt areas. 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 that it can be cleared in a timely fashion. Blowing and drifting with blizzard conditions cause driving hazards. Ice damages can occur when the ice is breaking up and strong wind occur pushing the ice onto shore.

3. **High Wind potential throughout the County** which cause downed trees over roads and downed power lines. These events usually occur during the month of November.

   There is a historical record of high wind events around the Frankfort 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 from downed power lines due to falling trees and limbs. High winds during the spring and winter also cause major shifts in lake ice damaging beaches and homes on the shoreline.

   There is a historical record of severe thunderstorms and high wind 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 bring potential lightning, flash flooding, hail, strong winds, and even tornadoes.

4. **Potential Flooding in these areas:** *(Village of Honor, Homestead, Crystal Lake, Blaine Township, Gilmore Townships, Village of Elberta)*
   - Honor/Platte River flash flooding area on and around U.S. Highway 31.
• Platte River Bridge
• South Street Bridge on U.S. Highway 31 Beulah
• Betsie Lake M-22
• East side of Upper Herring Lake (Mick and Garvan Roads)

In addition to the potential of “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.

5. **Lake Michigan Coastal Erosion Area located in the Crystal Downs development, Michabou Shores, and Village of Elberta.** *(Lake, Crystal Lake, Gilmore, Blaine Townships, Village of Elberta)*
**Other Erosion Areas in the Village of Honor area** *(Village of Honor, Homestead Township)*

In the Elberta area, Point Betsie and Marquette Road off of M-22 in Crystal Downs there has been relocation of homes away from the bluff (one house had to move twice). Shoreline erosion hazards involve the loss of property as sand or soil is removed by water action and carried away over time. This can cause structures to stand perilously close to waters or bluffs. The foundation of a structure, or underground utility pipes in the area, may become fully exposed and vulnerable to weather, extreme temperatures, water damage, or other sources of risk.

Shoreline roadways whose banks erode and cause the road surface to crack, become unstable, or more prone to deposits of sand, snow, water, and ice from nearby beaches and water bodies.

Soil erosion and stormwater runoff hazards can involve the loss of property along waterways and natural drainage areas as sand or soil is removed by water action and carried away over time. The foundation of a structure, or underground utility pipes in the area, may become fully exposed and vulnerable to weather, extreme temperatures, water damage, or other sources of risk. Roadways can also be washed away by stormwater and can cause the road surface to crack, become unstable, or more prone to deposits of sand, snow, water, and ice.

Please refer to Appendix B. #2 Priority Area Maps.

D. **Emergency Warning System Coverage**

There are no emergency warning systems in operation in Benzie County. There are a few warning sirens at some of the fire halls that have not been used in years.

E. **Economic Impact Analysis**

The total Damaging Events’ Costs recorded since 1950 with the National Oceanic and Atmospheric Administration for Benzie County, the region, and the state:

1. Flooding - $5,000,000
2. Thunderstorm and High Wind - $171,000
3. Tornadoes - $25,000
4. Snow and Ice - $5,055,000

NWMCOG staff worked with the Benzie County Equalization Department 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 SEV dollar amount times two (estimated fair market values) for each priority area. Estimated property values are from the 2004 Assessment Rolls. Assessments are updated annually.

1. The Township of Almira and the Village of Lake Ann - Wildfire

   Population: 
   - Almira Township = 2,811 plus seasonal in summer
   - Lake Ann = 276 plus seasonal in summer
   Total: 
   - Almira Township = $303,610,900
   - Lake Ann = $29,747,400

Sleeping Bear Dunes National Lakeshore Area

   Population: 
   - Lake Township = 635 plus seasonal in summer
   Total: 
   - Sleeping Bear Dunes = Federal government property
   - Crystal Downs = $35,103,798
   - Michabou Shores = $10,742,968

2. Benzie County and Crystal Lake Shoreline – Severe Winter Weather

   Population: 
   - County = 15,998 plus seasonal influx
   - Crystal Lake = 1,590 parcels
   Total: 
   - County = $2,651,450,354
   - Crystal Lake = $557,339,300

3. Benzie County and the City of Frankfort – High Winds

   Population: 
   - County = 15,998
   - Frankfort = 1,513
   Total: 
   - County = $2,651,450,354
   - Frankfort = $172,509,100

4. Platte River, Betsie Lake, Upper Herring Lake Areas - Flooding

   Village of Honor Area
   Population: 
   - 299 plus seasonal influx in summer
   Total: 
   - $22,040,800

   Betsie Lake M-22 Area
   Population: 
   - 1,970 plus seasonal influx in summer
   Total: 
   - $201,766,096

   East side of Upper Herring Lake Area
   Population: 
   - 491 plus seasonal influx in summer
Total: $119,172,000

5. *Lake Michigan Coastal Areas and Village of Honor Area - Erosion*

Population: 1,092 plus seasonal influx in summer
Total: Crystal Downs = $35,103,798
        Michabou Shores = $10,742,968
        Elberta = $29,256,996

*Village of Honor*
Population: 299 plus seasonal influx in summer
Total: $22,040,800
VIII. NATURAL HAZARDS MITIGATION GOALS AND OBJECTIVES

The mission of the Benzie 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 Benzie 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
B. Create or update ordinances to reflect building codes, shoreline protection rules, etc.
C. Incorporate natural hazards mitigation into basic land use regulation mechanisms
D. Develop community education programs and public warning systems
E. Strengthen the role of the Local Emergency Planning Committee in the land development process
F. Integrate natural hazards mitigation into the capital improvement planning process so that public infrastructure does not lead to development in natural hazards areas
G. 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

Objectives:
A. Provide a list of desired community mitigation measures to the State for possible future funding
B. Encourage the application for project funding from diverse 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:

- Reducing heat-trapping gas emissions will help curb the threat from a changing climate. This can be achieved, for example, 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.
- Minimizing pressures on the environment by improving air quality, protecting the quality and supply of water resources, protecting habitat, and limiting sprawl.
- Preparing for those 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 Benzie 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 impacted by the strategy.

By anticipating future problems, the County can reduce potential injury, structure losses, loss of power such as electric and gas, and prevent wasteful 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 other alternatives to create a list of the most desired alternatives/strategies for each. Please refer to Appendix B. #2.

Priority 1. Potential Wildfire Areas:
- Lake Ann Area (Village of Lake Ann, Almira Township) where increased development in and around the red pine plantations have a high fire potential or “fuel load”. There are concerns about possible lightning strikes starting wildfires
- Sleeping Bear Dunes National Lakeshore (National Park Service) where there is the wildfire and development interface

Wildfire Mitigation Strategies:
- Develop new building and zoning codes such as a 25 foot cleared space between houses/structures; defensible space
- Adjustments in the planning, design, and development process for area structures
c. Public education, awareness, and alertness – become a FIREWISE community; fuel management, diversity of and native vegetation; homeowner property maintenance
d. Visit campgrounds to advise campers of critical fire levels
e. Building code enforcement (only on new construction)

Priority 2. **Severe Winter Weather potential each year throughout the County – heavy snow, extreme temperatures, ice damage occurrences on Crystal Lake (Lake, Benzonia, Crystal Lake Townships, Village of Beulah)**

*Snow Load and Ice Build Up Mitigation Strategies:*
a. Adoption of stricter snow load building codes – for this area the load is 60 lbs. per sq. ft. and probably should be 100 lbs. per sq. ft.
b. Public education
c. Building code enforcement (only for new construction)

Priority 3. **High Wind potential throughout the County which cause downed trees over roads and downed power lines. These events usually occur during the month of November.**

*High Winds Mitigation Strategies:*
a. Shelters for Campground areas – Betsie River Campground, Lake Michigan Campground on the Platte River in Sleeping Bear Dunes National Lakeshore; Lake Ann Baptist Camp
b. Public Education for structural elements and tree management and promoting anchoring and tie downs for structures that need it
c. Building code enforcement (only for new construction) – 80 lbs. per sq. ft.
d. Building code enforcement for pavilions
e. Tree management by power companies on power line easements

Priority 4. **Potential Flooding in these areas: (Village of Honor, Homestead, Crystal Lake, Blaine Township, Gilmore Townships, Village of Elberta)**

- **Honor/Platte River flash flooding area on and around U.S. Highway 31**
- **Platte River Bridge**
- **South Street Bridge on U.S. Highway 31**
- **Betsie Lake M-22**
- **East side of Upper Herring Lake (Mick and Garvan Roads)**

*Flood Mitigation Strategies:*
a. Mapping of flood prone areas (Blueberry Creek/Trout Pond area off of US 31 west of Honor)
b. Wetland protection
c. Enforcement of stormwater/drainage control statutes/ordinances and other state and county ordinances – The County is working on creating a new 50 foot and 100 foot building/septic development setback for residential and commercial entities on all water bodies in The Sanitary Code and proposed as 50 to 75 feet for Crystal Lake and the Betsie River; presently only a 25 foot set back
d. Enforcement of building codes
e. Public education
Priority 5. **Lake Michigan Coastal Erosion Area located in the Crystal Downs development, Michabou Shores, and Village of Elberta** *(Lake, Crystal Lake, Gilmore, Blaine Townships, Village of Elberta)*; **Other Erosion Areas include the Village of Honor area** *(Village of Honor, Homestead Township)*

*Shoreline Erosion Mitigation Strategies:*

a. Promote the relocation of structures – property owner’s expense or demolition
b. Drainage control and placement of vegetation, utilizing native vegetation
c. Enforcement of soil erosion statutes/permits – water levels rising at new construction sites; and enforcement of the grading levels no more than 10%
d. Enforcement of building codes (there is building now where no one would have built before)
e. Public Education
X. Participation in the Development of the Benzie 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 Benzie Patriot – no comments were received.

Public Notice
The Northwest Michigan Council of Governments is requesting public comment on the Natural Hazards Mitigation Plan draft for Benzie County. The Plan is available for review at the Benzie County Planning Department, County Building, Beulah or at nwm.org, Community Resources, Community and Economic Development, Hazard Mitigation Planning Program, Benzie 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 that the draft plan was available for review at the County building and on the Northwest Michigan Council of Governments' website were sent to all the Township Supervisors – no comments were received.

D. The Natural Hazards Mitigation Plan was presented to the Benzie 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 Benzie 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.

F. During development of the plan, all townships and villages were provided the opportunity to formally comment on plan drafts and other related materials. They were given the opportunity via mailings of both meeting notices and draft copies of the plan for comment. Notification was also provided to them that the plans were
posted on the NWMCOG website and could be reviewed there. While no jurisdictions (other than the county) provided formal written comments, they did provide county staff (particularly the county emergency manager) with feedback via other informal means. This feedback took the form of phone calls, emails and conversations that occurred at various non-mitigation related meetings throughout the county. This information was provided back to NWMCOG staff by the county staff and used in development of the plan, including the risk assessment and community profile sections.

In addition, the townships and villages (whether or not they have their own zoning) have indicated to NWMCOG and the county emergency manager that they will follow the county’s lead in identifying mitigation projects and developing grant applications to fund those projects. Land use issues associated with those projects (where applicable) will be handled by each jurisdiction that controls zoning in the project area.

The Townships/Villages in the priority areas include:

1. Village of Lake Ann - Zoning
2. Almira Township - Zoning
3. Lake Township - Zoning
4. Benzonia Township
5. Crystal Lake Township
6. Village of Beulah - Zoning
7. Village of Honor - Zoning
8. Homestead Township
9. Blaine Township
10. Gilmore Township
11. Village of Elberta - Zoning
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<td>See paragraph F, above</td>
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<tr>
<td>Village of Benzonia</td>
<td>Yes</td>
<td>See paragraph F, above</td>
</tr>
<tr>
<td>Village of Beulah</td>
<td>Yes</td>
<td>See paragraph F, above</td>
</tr>
<tr>
<td>Village of Elberta</td>
<td>Yes</td>
<td>See paragraph F, above</td>
</tr>
<tr>
<td>Village of Honor</td>
<td>Yes</td>
<td>See paragraph F, above</td>
</tr>
<tr>
<td>Village of Lake Ann</td>
<td>Yes</td>
<td>See paragraph F, above</td>
</tr>
<tr>
<td>Village of Thompsonville</td>
<td>Yes</td>
<td>See paragraph F, above</td>
</tr>
<tr>
<td>City of Frankfort</td>
<td>Yes</td>
<td>See paragraph F, above</td>
</tr>
<tr>
<td>Grand Traverse Band of Ottawa</td>
<td>Yes**</td>
<td>Task Force meetings, review of draft plans</td>
</tr>
<tr>
<td>and Chippewa Indians</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Coast Guard</td>
<td>N/A</td>
<td>Task Force meetings, review of draft plans</td>
</tr>
<tr>
<td>Paul Oliver Hospital</td>
<td>N/A</td>
<td>Task Force meetings, review of draft plans</td>
</tr>
</tbody>
</table>

**The Grand Traverse Band has their own planning authority over lands they own that have been put in trust with the Federal Government. The County Natural Hazards Mitigation Plan would not cover the Tribe/lands, but the Tribes may adopt the approved County plan as their own.**

N/A = Not applicable; these are non-governmental authority entities
XI. IMPLEMENTATION OF THE BENZIE 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 Benzie 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.

Benzie County Government
Local governments such as townships, cities, and villages
Benzie County Conservation District
Benzie County Road Commission
Grand Traverse Band of Ottawa and Chippewa Indians
Grand Traverse Regional Land Conservancy
New Designs for Growth
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
U.S. National Park Service, Sleeping Bear Dunes National Lakeshore
Insurance Companies
Real Estate Companies

All natural hazards mitigation planning could be pursued with the new tool available to the 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 protection
- Developing an overlay zoning district that would cross jurisdictional boundaries that would be incorporated into existing independent units of government’s zoning ordinances
- Forming a new joint (multi-jurisdictional) planning commission or zoning board
- Sharing zoning administration
- Sharing 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.
3. **Action Agenda**

Following is summary for accomplishing the **recommended natural hazards mitigation actions** for Benzie County. There is county zoning and ten townships/villages with zoning out of nineteen.

**Action Agenda Layout:**

<table>
<thead>
<tr>
<th>Priority and Action Strategies</th>
<th>Responsible Parties</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Priority Area 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wildfire Mitigation Strategies:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Develop new building and zoning codes</td>
<td>County Planning Department, Emergency Management Coordinator, Building Inspector, Township, Village</td>
<td>1-3 years from adoption of the plan</td>
</tr>
<tr>
<td>b. Adjustments in the planning, design, and development process for area structures</td>
<td>County Building Inspector, County Planning Department, Emergency Management Coordinator, Township, Village</td>
<td>1-3 years from adoption of the plan</td>
</tr>
<tr>
<td>c. Public education, awareness, alertness – become a FIREWISE Community</td>
<td>County Planning Department, Emergency Management Coordinator, Building Inspector, County Conservation District, Township, Village</td>
<td>1-4 years from adoption of the plan</td>
</tr>
<tr>
<td>d. Visit campgrounds to advise campers of critical fire levels</td>
<td>Emergency Management Coordinator, County Conservation District, State/County Campground Managers, Township, Village</td>
<td>1-3 years from adoption of the plan</td>
</tr>
<tr>
<td>e. Building code enforcement for new construction</td>
<td>County Building Inspector</td>
<td>Ongoing</td>
</tr>
<tr>
<td><strong>Priority Area 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Snow Load and Ice Build Up Mitigation Strategies:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Adoption of stricter snow load building codes</td>
<td>County Planning, Emergency Management Coordinator, County Building Inspector, Townships, Villages</td>
<td>1-3 years from adoption of the plan</td>
</tr>
<tr>
<td>b. Public education</td>
<td>County Building Inspector, County Planning, Emergency Management Coordinator, Townships, Villages</td>
<td>1-3 years from adoption of the plan</td>
</tr>
<tr>
<td>c. Building Code enforcement for new construction</td>
<td>Building Inspector</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>
### Priority Area 3
**High Winds Mitigation Strategies:**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Responsible Parties</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Create shelters for campground areas</td>
<td>Emergency Management Coordinator County Planning County Building Inspector Townships, Villages</td>
<td>2-5 years from adoption of the plan</td>
</tr>
<tr>
<td>b. Public education for structural elements and tree management</td>
<td>Emergency Management Coordinator County Building Inspector County Soil Conservation District Townships, Villages</td>
<td>1-3 years from adoption of the plan</td>
</tr>
<tr>
<td>c. Building code enforcement for new construction</td>
<td>County Building Inspector</td>
<td>Ongoing</td>
</tr>
<tr>
<td>d. Building code enforcement for pavilions</td>
<td>County Building Inspector</td>
<td>Ongoing</td>
</tr>
<tr>
<td>e. Tree management by power companies</td>
<td>Emergency Management Coordinator Power Companies</td>
<td>1-3 year from adoption of the plan</td>
</tr>
</tbody>
</table>

### Priority Area 4
**Flood Mitigation Strategies:**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Responsible Parties</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Mapping of flood prone areas</td>
<td>County Planning Emergency Management Coordinator Drain Commissioner County Soil Conservation District MI Department of Environmental Quality</td>
<td>1-3 years from adoption of the plan</td>
</tr>
<tr>
<td>b. Wetland protection</td>
<td>County Planning Emergency Management Coordinator County Soil Conservation District MI Department of Environmental Quality</td>
<td>2011</td>
</tr>
<tr>
<td>c. Enforcement of stormwater and drainage control statutes and ordinances</td>
<td>County Planning County Building Inspector Emergency Management Coordinator Drain Commissioner County Soil Conservation District MI Department of Environmental Quality U.S. Army Corps of Engineers Non-profit conservation organizations</td>
<td>Ongoing</td>
</tr>
<tr>
<td>d. Enforcement of building codes</td>
<td>County Building Inspector</td>
<td>Ongoing</td>
</tr>
<tr>
<td>e. Public education</td>
<td>County Planning Emergency Management Coordinator County Soil Conservation District Drain Commissioner Townships, Villages</td>
<td>1-3 years from adoption of the plan</td>
</tr>
</tbody>
</table>

### Priority Area 5
**Shoreline Erosion Mitigation Strategies:**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Responsible Parties</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Promote the relocation of structures</td>
<td>Emergency Management Coordinator County Planning MI Department of Environmental Quality U.S. Army Corps of Engineers Townships, Villages</td>
<td>2-5 years from adoption of the plan</td>
</tr>
<tr>
<td>b. Drainage control and placement of vegetation, utilizing native vegetation</td>
<td>County Conservation District Drain Commissioner County Planning Emergency Management Coordinator Townships, Villages</td>
<td>1-3 years from adoption of the plan</td>
</tr>
<tr>
<td>c. Enforcement of soil erosion statutes/permits</td>
<td>County Soil Conservation District County Planning Emergency Management Coordinator MI Department of Environmental Quality U.S. Army Corps of Engineers</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>
d. Enforcement of building codes
County Building Inspector
Ongoing

e. Public Education
County Planning
Emergency Management Coordinator
County Soil Conservation District
Townships, Villages
1-3 years from adoption of the plan

**Additional Mitigation Strategies:**

- **Work on a multi-hazard warning plan**
- **Working with other governmental entities, organizations, businesses, and the public**
- **Incorporating the Plan’s natural hazards mitigation concepts, strategies, and policies into existing elements of Benzie County’s Master Comprehensive Plan 2020**

Benzie County can also utilize watershed management plans that have been developed with the county boundaries. Proposed watershed strategies have been laid out in the Platte River Watershed Management Plan.

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

- Safe, beneficial uses for natural hazard prone areas
- Concentration issues
- Proximity issues
- 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 Benzie County Natural Hazards Mitigation Plan will be monitored on a regular basis by the Emergency Management Coordinator and the Planning Department. Because Benzie 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 Benzie County Board of Commissioners.
XII. NATURAL HAZARDS MITIGATION PLAN ADOPTION RESOLUTION
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:

<table>
<thead>
<tr>
<th>F-Scale Number</th>
<th>Intensity Phrase</th>
<th>Wind Speed</th>
<th>Type of Damage Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>F0</td>
<td>Gale tornado</td>
<td>40-72 mph</td>
<td>Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.</td>
</tr>
<tr>
<td>F1</td>
<td>Moderate tornado</td>
<td>73-112 mph</td>
<td>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.</td>
</tr>
<tr>
<td>F2</td>
<td>Significant tornado</td>
<td>113-157 mph</td>
<td>Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.</td>
</tr>
<tr>
<td>F3</td>
<td>Severe tornado</td>
<td>158-206 mph</td>
<td>Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted</td>
</tr>
<tr>
<td>F4</td>
<td>Devastating tornado</td>
<td>207-260 mph</td>
<td>Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.</td>
</tr>
<tr>
<td>F5</td>
<td>Incredible tornado</td>
<td>261-318 mph</td>
<td>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.</td>
</tr>
<tr>
<td>F6</td>
<td>Inconceivable tornado</td>
<td>319-379 mph</td>
<td>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</td>
</tr>
</tbody>
</table>
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.

**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
## Risk Assessment Summary Table: BENZIE COUNTY

<table>
<thead>
<tr>
<th>HAZARD</th>
<th>How Frequently has the Hazard Occurred in the Past?</th>
<th>How Likely is the Hazard to Occur in the Future?</th>
<th>Potential Geographic Size of the Affected Area</th>
<th>Potential Population Impacted</th>
<th>Priority of Mitigation Activities</th>
<th>Detailed Damage and Estimated Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquakes</td>
<td>No recorded events</td>
<td>5% change</td>
<td>County</td>
<td>15,998</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Flooding</td>
<td>4 events</td>
<td>8% chance</td>
<td>Honor/Platte River-South Street Bridge US 31-Platte River Bridge County and Region</td>
<td>1,043</td>
<td>4</td>
<td>Property damage - $5,005,000</td>
</tr>
<tr>
<td>Hail</td>
<td>8 events</td>
<td>16% chance</td>
<td>County</td>
<td>15,998</td>
<td>1,513</td>
<td>.75 inch to 1.75 inches magnitude</td>
</tr>
<tr>
<td>Lightning / Fire</td>
<td>1 event</td>
<td>2% chance</td>
<td>Lake Ann Area Sleeping Bear Dunes Area Inland Township</td>
<td>2,811</td>
<td>635 + seasonal</td>
<td></td>
</tr>
<tr>
<td>Shoreline Erosion</td>
<td>1986, 1992</td>
<td>Cyclical water level change</td>
<td>Lake Michigan Coastal Erosion Areas-Crystal Downs, Grace Road</td>
<td>3,000 + seasonal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snow and Ice</td>
<td>45 events</td>
<td>90% chance</td>
<td>Crystal Lake Area County-wide County and Region</td>
<td>2,300</td>
<td>15,998</td>
<td>12 inches of snow or more</td>
</tr>
<tr>
<td>Subsidence</td>
<td>No recorded events</td>
<td>5% change</td>
<td>Unknown</td>
<td>Unknown</td>
<td>0</td>
<td>Trees and power lines down</td>
</tr>
<tr>
<td>Thunderstorms and High Winds</td>
<td>21 events</td>
<td>42% chance</td>
<td>Western portion of County County and Region</td>
<td>3,000 + seasonal</td>
<td>15,998</td>
<td>Property damage - $171,000</td>
</tr>
<tr>
<td>Tornadoes</td>
<td>1 Funnel Cloud, 4 events</td>
<td>2% chance, 8% chance</td>
<td>Frankfort area County</td>
<td>1,513</td>
<td>15,998 + seasonal</td>
<td>$278,000</td>
</tr>
<tr>
<td>Wildfire</td>
<td>125 events</td>
<td>20%</td>
<td>County</td>
<td>15,998</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
## Appendix E

### Examples of Past Mitigation Projects

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

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

The first Task Force meeting was held on **May 12th, 2004** to identify the natural hazards priority areas and the second Task Force meeting was held on **July 12th, 2004** to develop the mitigation strategies for the priority areas.

**AGENDA**  
*May 12, 2004*

I. Welcome  
Introductions

II. Hazard Mitigation Planning Overview

III. Data Sources

IV. Hazard Mitigation Maps

V. Breakout into Small Groups by Region  
   Analyze the maps for the top five potential hazard areas  
   List out the top five potential hazard areas

VI. Report Out from Each Group and Develop the Top Five Potential Hazard Areas for the Entire County

VII. Next Steps

**AGENDA**  
*July 12, 2004*

I. Welcome and Introductions  

II. List out Recommended Mitigation Strategies

The following is the list of participants:

**Benzie County Board of Commissioners**  
Don Howard  
Don Tanner

**Benzie County Emergency Management Coordinator**  
Rory Heckman

**Benzie County Planning Department**  
Dave Neiger

**Benzie County Equalization Director**  
Vickie Esch

**Benzie County Planning Commission**

**Fire Department**  
John Hanmer
Grand Traverse Band of Ottawa and Chippewa Indians
Warren Bailey, Police Captain

Platte Township Representative
Clarence Davis

United States Coast Guard
Douglas Leavell

Organizations
Paul Oliver Memorial Hospital
Appendix G

Resources

Benchmarks 2004, Northwest Michigan Council of Governments


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.


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


Northwest Michigan Council of Governments Website Data, nwm.org.

