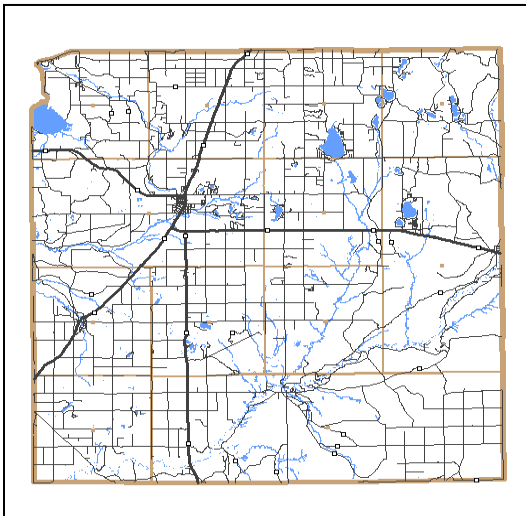


Natural Hazards Mitigation Plan

DRAFT

Kalkaska County, Michigan



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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 key contributors to the Plan, who participated in the Kalkaska County Hazard Mitigation Planning Task Force:

Kalkaska County Conservation District

Kalkaska County Emergency Management Coordinator

Scott Yost

Kalkaska County Equalization Department

Kalkaska County Zoning Department

Jack Kelly

Rapid River Township

Mary Lou Montgomery

II. LETTER OF TRANSMITTAL

Date

Michigan State Police

Dear

Enclosed, please find the Kalkaska County Natural Hazards Mitigation Plan. This Plan has been developed in conjunction with the County Emergency Management Coordinator, Kalkaska County Zoning Administrator, 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 Kalkaska County, and the mitigation strategies to protect lives and property in the County.

This transmittal letter serves notice that all future development in Kalkaska County will be urged to 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 Kalkaska County Emergency Management Coordinator, Scott Yost at 231.258.3334

Sincerely,

Kalkaska County Board Chair

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 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, Kalkaska 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 Kalkaska 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, 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 Kalkaska 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 Kalkaska 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 Kalkaska 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:

Hazard Mitigation Planning Goals for Kalkaska 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 Kalkaska County Task Force participants designated the following top Natural Hazards Mitigation Priority Areas:

- 1. Kalkaska County: The potential of severe thunderstorms and high and straight line winds, and tornadoes*
- 2. Kalkaska County: Potential wildfire/urban interface area*
- 3. Kalkaska County: The potential of severe winter weather with snow and ice hazards*
- 4. The Rugg Dam and Antrim (Rugg) Pond Area of the Rapid River: The potential of dam failure with a low possibility of flooding*

And, recommended the following mitigation strategies:

Priority Area 1. Kalkaska County: The potential of severe thunderstorms, high winds, straight line winds, and tornadoes

Thunderstorm, High Winds, and Tornado Mitigation Strategies:

- a. Underground utilities within and outside the Kalkaska city limits.
- b. Continue to assess and seek comment on the forecasting from the National Oceanic and Atmospheric Administration's forecasting.
- c. Public education for trailer, mobile, and modular homes to ensure safety; research if wind lift is taken into account for these homes.
- d. Pursue the opportunity for grants to purchase \$50 weather radios and educate individuals about the weather radios.

Priority Area 2. Kalkaska County: Potential wildfire/urban interface area

Wildfire Mitigation Strategies:

- a. Educate people about the Michigan Department of Natural Resources (MDNR) recommendations which is a joint local government and MDNR initiative; pass out information when development proposals are submitted.
- b. Educating landowners about fuel safety.
- c. Real Estate agents distribute information at time of sale.

Priority Area 3. Kalkaska County: The potential of severe winter weather with snow and ice hazards.

Snow Load and Ice Build Up Mitigation Strategies:

- a. Emergency Operations Center has response information about available shelters and is in the process of signing contracts with churches, township halls, fire halls, and the Kaliseum for additional shelter space.
- b. Public education by letting people know what they need to do to prepare for severe weather. Can utilize the Commission on Aging and the Sheriff's Department.
- c. Public awareness regarding roof shoveling through service announcements.
- d. Continue enforcement of building code regarding snow load limits through the permitting process.

Priority Area 4. The Rugg Dam and Antrim Pond Area of the Rapid River: The potential of dam failure with a low possibility of flooding

Flood Mitigation Strategies:

- a. Continual maintenance and upkeep of the dam which is owned by the County.
- b. County committed to maintaining the dam.

The Kalkaska County Natural Hazards Mitigation Plan was recommended by the Kalkaska County Planning Commission on _____ to the Kalkaska County Board of Commissioners for adoption. The Kalkaska County Board of Commissions adopted the Plan on _____.

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 natural hazards 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 Kalkaska 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 Kalkaska 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 alternatives/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)

And from that list, the top natural hazards are 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 from natural hazards 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

In Kalkaska County, state forestland constitutes a majority of the area. There are over 80 inland lakes and 225 miles of streams and rivers that provide activities for fishermen, campers, boaters, and canoeists. The population and labor force of Kalkaska County continues to grow.

This community data is provided to describe Kalkaska County for planning and implementing the mitigation strategies.

Major Geographic Features of Kalkaska County

| | |
|------------------------|---|
| Area in Water | 4,736 acres |
| Forest Lands | 271,100 acres 75.5% of total land area |
| Wetlands | 50,507 acres 14.1% of total land area |
| Operating Farms (2002) | 175 |
| Farmland (2002) | 24,104 acres |

The total County population is **16,571**. The projected growth for 2010 is 18,493 and for 2020 it is 19,677. The population numbers from the 2000 Census for the **12 Townships and 1 City**:

| Township | Population |
|--------------|------------|
| Bear Lake | 746 |
| Blue Lake | 428 |
| Boardman | 1,373 |
| Clearwater | 2,382 |
| Cold Springs | 1,449 |
| Excelsior | 855 |
| Garfield | 794 |
| Kalkaska | 4,830 |
| -- Kalkaska | 2,226 |
| Oliver | 263 |
| Orange | 1,176 |
| Rapid River | 1,005 |
| Springfield | 1,270 |

Please see Attachment C. Population Density Map

County Resident Profile

1. There are approximately 11,234 Housing Units in Kalkaska County with an average household size of 2.55 people per household. 39.0% of the households have 2 persons.
2. The number of residents 65 years and over is 2,278, or 13.7% of the population.

3. The number of residents 19 years and under 4,664, or 28% of the population.
4. The number if residents over 65 with a disability is 768, or 5% of the population.
5. The total number of residents with a disability is 3,228, or 19% of the population.
6. Percent below poverty level:
February 2004 Poverty level: \$15,670 Family of 3 and \$9,310 Family of 1
 - Families in poverty with children: 292
 - Income less than \$15,000: 10.5%
 - Individuals in poverty: 1,708

1997 Economic Census

| Industry Description | Number of Establishments | Number of Employees |
|---|--------------------------|---------------------|
| Manufacturing | 19 | 1,187 |
| Wholesale trade | 27 | 225 |
| Retail trade | 70 | 660 |
| Real estate, rental, leasing | 15 | 56 |
| Professional, scientific, technical services | 13 | 42 |
| Administrative, support, waste management, remediation services | 13 | 117 |
| Educational services | 1 | 0-19 |
| Health care, social assistance | 14 | 73 |
| Arts, entertainment, recreation | 8 | 33 |
| Accommodation and food services | 29 | 296 |
| Other services (except public administration) | 26 | 174 |
| Merchant Wholesalers | | |
| Wholesale trade | 24 | 213 |
| Manufacturer' Sales Branches and Sales Offices | | |
| Wholesale trade | 3 | 12 |

*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

Kalkaska 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

| | |
|----|--|
| 1 | Airport |
| 11 | Bridges – 9 on the County system, 2 on the State |
| 3 | Communications Facilities – MDOT, KCRC, Sheriff |
| 1 | Community Shelter |
| 2 | Dams – South Boardman, Rugg Pond |
| 7 | Fire Stations |
| 8 | Government Buildings |
| 1 | Hospital Facility -- Primary physicians per 100,000 population 1998 is 12.9 |
| 4 | Industrial Facilities |
| 3 | Police Stations |
| 1 | Recreational Facility |
| 1 | School System with various buildings – Forest Area, Kalkaska, Rapid City |
| 6 | Utility Facilities |
| 1 | Water and Sewage Treatment Facility <ul style="list-style-type: none">• Water: 10.3% public system or private company; 89.9% individual wells;• Sewer: 10.3% public sewer; 87.3% individual septic/cesspool; 2.4% other |
| 1 | Water Well/Tower |

Flood Data

Flood hazard information can usually be derived from the Flood Rate Insurance Maps (FIRM) available for jurisdictions. In northwest Michigan, FIRM maps were only available for a few townships in Manistee County. 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 may exist in northwest Michigan communities, but are not considered to be substantial risks.

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

B. Natural Hazards Information

1. 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 Kalkaska 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 Kalkaska County are listed below, including the number of events, dates, and descriptions of the most severe.

1. Drought – August 2001 (county): The stress on the crops was most noted for corn, but also impacted hay crops to a lesser extent.
2. Fire 10 acres or more – 23 events
 - Clearwater Township: 12 acres, 52 acres
 - Rapid River Township: 17 acres
 - Coldsprings Township: 10 acres
 - Kalkaska Township: 28 acres, 62 acres
 - Bear Lake Township: 20 acres, 20 acres, 30 acres, 580 acres

- Boardman Township: 12 acres, 20 acres, 11 acres
 - Orange Township: 12 acres
 - Springfield Township: 22 acres, 19 acres
 - Garfield Township: 13 acres, 10 acres, 25 acres, 81 acres, 64 acres, 13 acres, 10 acres
3. Flooding – 1 event
 - April 2001: (county); heavy rainfall was responsible for high water on the Boardman River
 4. Hail – 6 events
 - October 1963: (county); 1.75 inch hail
 - July 8, 1996: (South Boardman) 1.75 inch hail
 5. Lightning - 2 events
 - July 1995: 1 Fatality (Spencer) lightning struck a tree which fell and killed a man
 - September 2000: (county)
 6. Snow and Ice – 62 events (12 inches or more of snow)
 - March 1993: \$500,000 property damage (region) heavy snow
 - April 1993: \$50,000 property damage (region) heavy snow
 - November 1996: 20 to 40 inches of heavy snow (county)
 - December 1996: 12 to 18 inches of heavy snow (county)
 - March 1997: 8 to 12 inches of snowfall; winter storm (county)
 - November 2003: \$40,000 property damage (region) winter storm
 - December 2003: 10 to 15 inches of heavy snow (Kalkaska)
 7. Thunderstorm and High Wind – 26 events
 - July 1995: thunderstorm/winds - \$25,000 (Barker Creek), \$25,000 (Rapid City), \$25,000 (Kalkaska), \$5,000 (Sharon) numerous trees and power lines down, power outages for two days, roads blocked; \$5,000 (Mancelona area), \$5,000 (Sigma) many trees and a few power lines were down
 - May 1998: thunderstorm/winds 70 knots (north of Kalkaska) strong straight line winds tore the roof off a building, (northeast of Kalkaska) gusts to 90 mph tore the roof off of one home and toppled trees onto several others
 - June 1998: thunderstorm/winds (northeast of Darragh) strong winds downed numerous trees near Blue Lakes
 - June 1999: thunderstorm/winds (Kalkaska) trees and power lines down
 - July 1999: thunderstorm/winds (Kalkaska and Darragh) trees down
 - August 2001: thunderstorm/winds (Kalkaska) trees and power lines down
 - April 2002: thunderstorm/winds (Kalkaska) trees and power lines down, camper overturned, severe hail
 - July 2002: thunderstorm/winds (Kalkaska and South Boardman) several 10-15 inch diameter trees down, several other trees and power lines down
 - June 2003: thunderstorm/winds \$5,000 (Kalkaska) a barn roof was torn off and blown 200 yards to the northeast, a number of trees were downed, marginally large hail
 - August 2003: thunderstorm/winds (Rapid City) trees down

8. Tornadoes – 6 events
 - July 1974: (county) F1; 6 miles long, 33 yards wide; \$3,000 property damage
 - June 1976: (county) F1; not known; \$25,000 property damage
 - July 1976: (county) F2; 3 miles long, 83 yards wide; \$25,000 property damage; five injuries
 - July 1994: (South Boardman) F0; 0 miles, 20 yards
 - May 1998: (Kalkaska) F1; 7 miles, 100 yards; intermittently on the ground destroyed one mobile home and damaged two others
 - June 1998: (Kalkaska) F0; 0 miles, 30 yards; brief tornado touchdown with no reported damage

2. *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 Kalkaska County.

The areas where natural hazards overlap in Kalkaska 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. Kalkaska County Natural Hazards Task Force and Public Input

To create the Kalkaska 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
Environmental/Conservation Groups/Organizations
American Red Cross
Groundwater Protection
Housing Associations
Chambers of Commerce
National Weather Service (Gaylord)
Michigan Family Independence Agencies

The first Task Force meeting was held on **June 8th, 2004** to identify the hazard priority areas and the second Task Force meeting was held on **July 23rd, 2004** to develop the mitigation strategies for the priority issues. Participants in the meetings included representatives from:

Emergency Management Coordinator
Building and Zoning Administrator
Kalkaska Soil Conservation District
Rapid River Township

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 hazards map was available for review.

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. Potential fire areas; fire loads; look over fire incident maps
2. The Michigan Section 302 site is the telephone exchange batteries
3. Snow load in the snow belt of Blue Lake and Cold springs Townships
4. Rugg Dam – Rugg (Antrim) Pond is considered a potentially “high hazard” dam due to the height of the head and the size of the impoundment (per information provided by the Kalkaska County Soil and Water Conservation District)
5. Flooding – not much because Kalkaska sits on the Michigan “divide” where storm water leaves the county quickly or is absorbed by the sandy soil. The County is at the top of all three of the watersheds in the county (Manistee River, Rapid River, and Boardman River) and the flood potential is low due to topography and sandy soils.
6. Winds – severe thunderstorms and camp areas (Kalkaska RV campground, church camps on Manistee Lake and Grass Lake); the State forest area is 48% of the county.

The participants than took the complete list 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.

1. Kalkaska County: The potential of severe thunderstorms, high winds, straight line winds, and 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 from 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, but there is concern of the potential regarding the utility facility.

2. Kalkaska County: Potential wildfire/urban interface area

The forest types that are most fire prone are located in this area. Additional factors that increase fire risk include lightning and human factors are the number of persons residing in, camping in, or traveling through an area.

3. Kalkaska County: The potential of especially severe winter weather with snow and ice hazards (i.e. lake effect snowfall)

Kalkaska 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 that it can be cleared in a timely fashion. Blowing and drifting with blizzard conditions cause driving hazards.

4. The Rugg Dam and Antrim (Rugg) Pond Area of the Rapid River: The potential of dam failure with a low possibility of flooding

The risk of the dam failing is low. The dam was rebuilt 22 years ago and was originally built in 1904 for power generation. The County pays for regular inspections and the Department of Public Works inspects the dam monthly. Homes are set back from the water's edge. Damages will be greater from flash flood types of events than they would from gradual floodplain inundation.

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.

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

D. Emergency Warning System Coverage

One siren is located in the Village of Kalkaska and is an audible warning device effective for the village and local environs only. It is used for fire and tornado warning and is used each time the Kalkaska Township Fire Department is dispatched. There are no other public warning sirens in the County. The County would also utilize (per the warning section of the County Emergency Plans), public notification via EAS alerts over TV/Radio/NOAA Weather Radio; door-to-door, and telephonic contact for warning.

E. Economic Impact Analysis

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

1. Snow and Ice - \$590,000
2. Thunderstorm and High Wind - \$95,000
3. Tornadoes - \$53,000

NWMCOG staff worked with the Kalkaska 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 the SEV dollar amount times two (estimated fair market values) for each priority area.

1. *Kalkaska County – severe thunderstorms, high winds, straight line winds, tornadoes*

Population: 16,571 plus seasonal influx during the summer
Total: \$1,545,711,388

2. *Kalkaska County - wildfire*

Population: 16,571 plus seasonal influx during the summer
Total: \$1,545,711,388

3. *Kalkaska County – severe winter weather*

Population: 16,571
Total: \$1,545,711,388

4. *The Rugg Dam and Antrim (Rugg) Pond Area of the Rapid River - flooding*

Population: Approximately 80 people; Kalkaska County owns the land around the pond in the southwest corner of Rapid River Township
Total: \$2,029,800

VIII. NATURAL HAZARDS MITIGATION GOALS AND OBJECTIVES

The mission of the Kaskaska 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 Kaskaska 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 comprehensive master plan
- B. Integrate natural hazards mitigation into the capital improvement planning process so that public infrastructure does not lead to development in natural hazards areas
- C. Encourage county agencies to review 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. 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 Kalkaska 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 alternatives, matched them with each of the natural hazards priority areas, and also suggested other alternatives to create a list of the most desired alternatives/strategies for each.

1. Kalkaska County: The potential of severe thunderstorms, high winds, straight line winds, and tornadoes

Thunderstorm, High Winds, and Tornado Mitigation Strategies:

- a. Underground utilities within and outside the Kalkaska city limits.
- b. Continue to assess and seek comment on the forecasting from the National Oceanic and Atmospheric Administration's forecasting.
- c. Public education for trailer, mobile, and modular homes to ensure safety; research if wind lift is taken into account for these homes.
- d. Pursue the opportunity for grants to purchase \$50 weather radios and educate individuals about the weather radios.

2. Kalkaska County: Potential wildfire/urban interface area

Wildfire Mitigation Strategies:

- a. Educate people about the Michigan Department of Natural Resources (MDNR) recommendations which is a joint local government and MDNR initiative; pass out information when development proposals are submitted.
- b. Educating landowners about fuel safety.
- c. Real Estate agents distribute information at time of sale.

3. Kalkaska County: The potential of severe winter weather with snow and ice hazards.

Snow Load and Ice Build Up Mitigation Strategies:

- a. Emergency Operations Center has response information about available shelters and is in the process of signing contracts with churches, township halls, fire halls, and the Kaliseum for additional shelter space.

- b. Public education by letting people know what they need to do to prepare for severe weather. Can utilize the Commission on Aging and the Sheriff's Department.
 - c. Public awareness regarding roof shoveling through service announcements
 - d. Continue enforcement of building code regarding snow load limits through the permitting process.
- 4. The Rugg Dam and Antrim Pond Area of the Rapid River: The potential of dam failure with a low possibility of flooding**

Flood Mitigation Strategies:

- a. Continual maintenance and upkeep of the dam which is owned by the County
- b. County committed to maintaining the dam

X. IMPLEMENTATION OF THE KALKASKA 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 Kalkaska County Board of Commissioners, with the staff leaders being the Emergency Management Coordinator and the Zoning Administrator. Working partnerships can be established with the following to provide technical assistance to accomplish the goals and objectives of the Plan.

Kalkaska County Government
Townships, cities, and villages
Kalkaska County Conservation District
Kalkaska County Road Commission
Conservation Resource Alliance
Watershed Center Grand Traverse Bay
Michigan State University Extension
Michigan Department of Environmental Quality
Michigan Department of Natural Resources
U.S. Environmental Protection Agency
U.S. Department of Agriculture Natural Resources Conservation Service
American Red Cross
Local Hospitals
Insurance Companies
Real Estate Companies
Natural Gas and Electric Companies
Pipeline Companies
Fiber Optic and Broadband Cable 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. This Act 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.

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

3. Action Agenda

Following is summary for accomplishing the **recommended natural hazards mitigation actions** for Kalkaska County.

1. Kalkaska County: The potential of severe thunderstorms, high winds, straight line winds, and tornadoes

Thunderstorm, High Winds, and Tornado Mitigation Strategies:

- a. Underground utilities within and outside the Kalkaska city limits.
- b. Continue to assess and seek comment on the forecasting from the National Oceanic and Atmospheric Administration's forecasting.
- c. Public education for trailer, mobile, and modular homes to ensure safety; research if wind lift is taken into account for these homes.
- d. Pursue the opportunity for grants to purchase \$50 weather radios and educate individuals about the weather radios.
- e. Improve shelter availability.

2. Kalkaska County: Potential wildfire/urban interface area

Wildfire Mitigation Strategies:

- a. Educate people about the Michigan Department of Natural Resources (MDNR) recommendations which is a joint local government and MDNR initiative; pass out information when development proposals are submitted.
- b. Educating landowners about fuel safety.
- c. Real Estate agents distribute information at time of sale.

3. Kalkaska County: The potential of severe winter weather with snow and ice hazards.

Snow Load and Ice Build Up Mitigation Strategies:

- a. Emergency Operations Center has response information about available shelters and is in the process of signing contracts with churches, township halls, fire halls, and the Kaliseum for additional shelter space.
- b. Public education by letting people know what they need to do to prepare for severe weather. Utilize the Commission on Aging and the Sheriff's Department.
- c. Public awareness regarding roof shoveling through service announcements.
- d. Continue enforcement of building code regarding snow load limits through the permitting process.

4. The Rugg Dam and Antrim Pond Area of the Rapid River: The potential of dam failure with a low possibility of flooding

Flood Mitigation Strategies:

- a. Continual maintenance and upkeep of the dam which is owned by the County.
- b. County committed to maintaining the dam.

Other mitigation strategies include:

- Work on a multi-hazard warning plan.
- Work with other governmental entities, organizations, businesses, and the public.
- Incorporate the Plan's natural hazards mitigation concepts, strategies, and policies into existing elements of Kalkaska County's Master Land Use Plan.

Kalkaska County can also utilize watershed management plans that have been developed within the county boundaries. Proposed mitigation strategies that have been laid out in the Grand Traverse Bay Watershed Management Plans include:

- Inventory shoreline erosion sites.
- Reduce the magnitude of overland stormwater runoff to streams.
- Minimize the change of terrestrial vegetation types from forest/shrub species to turf species.
- Utilize maps for potential flood areas and wetlands.
- Work to stop wetland and other types of lowland filling.
- Protect critical riparian areas.
- Limit habitat fragmentation by maintaining compact communities.
- Adequate setbacks for buildings.
- Minimize development clearings by landowners.
- Establish riparian buffers along waterways.
- Establish and support stormwater best management practices.
- Reduce the amount of impervious surfaces in the watershed, especially in areas of high groundwater recharge.
- Regularly inform the public about the watershed, activities, study findings, successes/example projects, and opportunities for contribution.
- Provide focused information to residents, visitors, local governments, and other target groups on priority topics.

- Involve the citizens, public agencies, user groups and landowners in implementation of the watershed plan through meetings and workshops with individuals or groups.

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 Land Use 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 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 Kalkaska County Natural Hazards Mitigation Plan will be reviewed and revised as needed by the Emergency Management Coordinator and the Zoning Department. Because Kalkaska 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 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 would be administered by the Emergency Management Coordinator with the Local Emergency Planning Committee, the County Planning Commission, 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 Kalkaska County Board of Commissioners.

XI. Review of the Kalkaska 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 Kalkaskian Leader – no comments were received.

Public Notice

The Northwest Michigan Council of Governments is requesting public comment on the Natural Hazards Mitigation Plan draft for Kalkaska County. The Plan is available for review at the Kalkaska County Planning and Zoning Department, County Building, Kalkaska or at nwm.org, Community Resources, Community and Economic Development, Hazard Mitigation Planning Program, Kalkaska 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 Kalkaska County Planning Commission, where the meetings are posted in the newspaper and are open to the public.

****To be done yet:**

- E. The Natural Hazards Mitigation Plan was presented to the Kalkaska 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

WHEREAS, Kalkaska County, Michigan has experienced a few 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, Kalkaska 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 *Kalkaska County Natural Hazards Mitigation Plan* is hereby adopted as an official plan of Kalkaska County, Michigan.
2. The Emergency Management Coordinator, Zoning Department, and Planning Commission are charged with supervising the implementation of the Plan's recommendations within the funding limitations as provided by the Kalkaska County Board of Commissioners or other sources.
3. Priority attention shall be given to the following action items recommended by the *Kalkaska Natural Hazards Mitigation Plan* from X. 3., page 22-23:
 1. **Kalkaska County: The potential of severe thunderstorms, high winds, straight line winds, and tornadoes**
Thunderstorm, High Winds, and Tornado Mitigation Strategies:
 - a. Underground utilities within and outside the Kalkaska city limits.
 - b. Continue to assess and seek comment on the forecasting from the National Oceanic and Atmospheric Administration's forecasting.
 - c. Public education for trailer, mobile, and modular homes to ensure safety; research if wind lift is taken into account for these homes.
 - d. Pursue the opportunity for grants to purchase \$50 weather radios and educate individuals about the weather radios.
 - e. Improve shelter availability.
 2. **Kalkaska County: Potential wildfire/urban interface area**
Wildfire Mitigation Strategies:
 - a. Educate people about the Michigan Department of Natural Resources (MDNR) recommendations which is a joint local government and MDNR initiative; pass out information when development proposals are submitted.
 - b. Educating landowners about fuel safety.
 - c. Real Estate agents distribute information at time of sale.
 3. **Kalkaska County: The potential of severe winter weather with snow and ice hazards.**
Snow Load and Ice Build Up Mitigation Strategies:
 - a. Emergency Operations Center has response information about available shelters and is in the process of signing contracts with churches, township halls, fire halls, and the Kaliseum for additional shelter space.
 - b. Public education by letting people know what they need to do to prepare for severe weather. Utilize the Commission on Aging and the Sheriff's Department.
 - c. Public awareness regarding roof shoveling through service announcements.

d. Continue enforcement of building code regarding snow load limits through the permitting process.

4. The Rugg Dam and Antrim Pond Area of the Rapid River: The potential of dam failure with a low possibility of flooding

Flood Mitigation Strategies:

- a. Continual maintenance and upkeep of the dam which is owned by the County.
- b. County committed to maintaining the dam.

Other mitigation strategies include:

- Work on a multi-hazard warning plan.
- Work with other governmental entities, organizations, businesses, and the public.
- Incorporate the Plan's natural hazards mitigation concepts, strategies, and policies into existing elements of Kaskaska County's Master Land Use Plan.

4. The Emergency Management Coordinator and Zoning Department shall convene the Natural Hazards Mitigation Task Force once per year. The Group 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 _____ day of _____.

Signed by: _____

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.

Hydric Soils: A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic (a situation in which oxygen is absent from the environment) conditions in the upper part of the soil.

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>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</p> |
|--|--|--|---|

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: KALKASKA COUNTY

| NATURAL 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) |
|-------------------------------------|--|---|---|--------------------------------------|--|---|
| Drought | 1 event | 2% | County | 16,571 | | Economic |
| Fire | 1985 to present – 33 events 23 events 10 acres and over | 173% 121% | Kalkaska area and Southeast corner Clearwater, Rapid River, Coldsprings, Kalkaska, Bear Lake, Boardman, Orange, Springfield, Garfield | 7,743 15,025 | 2 | Population, Economic, Environment |
| Flooding | 1 event | 2% | Boardman River | 6,203 | | Population, Economic, Environment |
| Hail | 6 events | 11% | County | 16,571 | | Economic |
| Lightning | 2 events | 4% | County | 16,571 | | Population, Economic, Environment |
| Snow and Ice | 62 events of 12 or more inches of snow | 115% | Snow belt area – Cold Springs and Blue Lake Townships County wide | 2,195 16,571 | 3 3 | Population, Economic Economic \$590,000 |
| Thunderstorms and High Winds | 26 major events | 48% | County-wide (Seasonal Campers) | 16,571 | 1 | Population, Economic \$95,000, Environment |
| Tornadoes | 6 events | 11% | Kalkaska area and southwest area County | 6,100 16,571 | 1 | Population, Economic \$53,000, 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 | T-storm/Lightning Projects | Wildfire Projects |
| 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

Grand Traverse Bay Watershed Protection Plan, Watershed Center Grand Traverse Bay, December 2003, www.gtbay.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.

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

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

Northwest Michigan Council of Governments Website Data, 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.