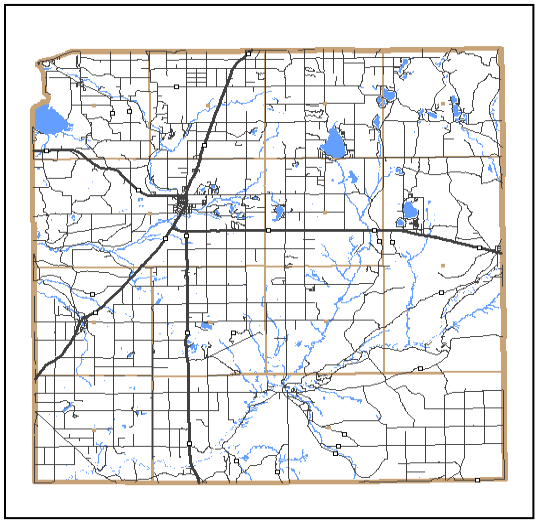
Natural Hazards Mitigation Plan

2007

Kalkaska County, Michigan



Produced by:
Northwest Michigan Council of Governments
2194 Dendrinos Drive
PO Box 506
Traverse City MI 49685
231-929-5000
fax: 231-929-5012
www.nwm.org

TABLE OF CONTENTS

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 development of the Kalkaska County Hazard Mitigation Plan:

Kalkaska County Conservation District

Kalkaska County Emergency Management Coordinator
Scott Yost

Kalkaska County Equalization Department

Kalkaska County Planning Commission

Kalkaska County Zoning Department
Jack Kelly

Rapid River Township
Mary Lou Montgomery

II. LETTER OF TRANSMITTAL

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 natural hazards such as 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. Pursue the opportunity for grants to purchase weather radios and educate individuals about the weather radios.
b. Promote underground utilities within and outside the Kalkaska city limits.
c. Public education for trailer, mobile, and modular homes to ensure safety; research if wind lift is taken into account for these homes.
d. Continue to assess and seek comment on the forecasting from the National Oceanic and Atmospheric Administration.

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. Educate 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. Continue enforcement of building code regarding snow load limits through the permitting process.
c. 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.
d. Public awareness regarding roof shoveling through public service announcements.

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.

Other mitigation strategies include:

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

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 Village** covered by this plan are:

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

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

2002 Economic Census

Industry Description	Number of Establishments	Number of Employees
Manufacturing	17	790
Wholesale trade	25	201
Retail trade	57	552
Information	6	20-99
Real estate, rental, leasing	16	62
Professional, scientific, technical services	18	20-99
Administrative, support, waste management, remediation services	14	152
Educational services	---	---
Health care, social assistance	26	250-499
Arts, entertainment, recreation	6	0-19
Accommodation and food services	33	270
Other services (except public administration)	33	141

*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 • 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 such as earthquakes may occur 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. The Michigan Hazard Analysis of 2006 identified that 409 wildfires occurred in Kalkaska County from 1981 to 2005.

   Wildfires: 10 acres or more – 23 events
   1985: 25 acres, Garfield Township
   1985: 12 acres, Orange Township

1986: 13 acres, Garfield Township
1986: 12 acres, Boardman Township
1986: 11 acres, Boardman Township
1987: 580 acres, Bear Lake Township
1987: 64 acres, Garfield Township
1987: 30 acres, Bear Lake Township
1987: 20 acres, Bear Lake Township
1987: 20 acres, Boardman Township
1987: 10 acres, Springfield Township
1988: 10 acres, Cold Springs township
1989: 28 acres, Kalkaska Township
1990: 62 acres, Kalkaska Township
1990: 52 acres, Clearwater Township
1991: 19 acres, Springfield Township
1991: 12 acres, Clearwater Township
1992: 22 acres, Springfield Township
1992, 10 acres, Garfield Township
1997: 20 acres, Bear Lake Township
1999: 10 acres, Garfield Township
1999: 10 acres, Garfield Township
2000: 18 acres, Garfield Township
2000: 17 acres, Rapid River Township
2000: 13 acres, Garfield Township

3. Flooding – 2 events
   - April 2001: (county); heavy rainfall was responsible for high water on the Boardman River
   - June 2006: (7 miles north/northeast of Kalkaska); $20,000 property damage; 4 inches of rain fell in a portion of the Rapid River Basin, flooding was enhanced by the failure of a beaver dam on a small creek, part of Wood Road was washed out by the high water, Smith and Holly Roads were also impacted, traffic on US 131 at the Rapid River Bridge was reduced to 1 land for a time as waters raged close to the underside

4. Hail – 9 events
   - October 1963: (county); 1.75 inch hail
   - July 8, 1996: (South Boardman) 1.75 inch hail
   - September 2004: (Kalkaska) .75 inch hail, marginally large hail
   - June 2006: (Kalkaska – six miles south) .88 inch hail, nickel sized hail; (Sharon) .88 inch hail

5. Lightning - 3 events
   - July 1995: 1 Fatality (Spencer) lightning struck a tree which fell and killed a man
   - September 2000: (county)
   - June 2005: (Kalkaska) 1 injury – a woman was briefly hospitalized after a lightning strike at her home

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 – 29 events
   - July 1995: thunderstorm/winds - $25,000 property damage (Barker Creek), $25,000 property damage (Rapid City), $25,000 property damage (Kalkaska), $5,000 property damage (Sharon) numerous trees and power lines down, power outages for two days, roads blocked; $5,000 property damage (Mancelona area), $5,000 property damage (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 (Kalkaska) $5,000 property damage, 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
   - July 2005: thunderstorm/winds (Darragh) $4,000 property damage; 52 knots; several trees were downed in the Bear Lake area knocking out power to local residents
   - September 2005: thunderstorm/winds (Kalkaska) $8,000 property damage; 55 knots; a number of trees and power lines were downed in Kalkaska and other parts of northern Kalkaska County
   - July 2006: thunderstorm/winds (10 miles northeast of Kalkaska) $4,000 property damage; 52 knots; trees downed at County Road 571 and Twin Lake Road
   - August 2006: thunderstorm/winds (Darragh) $3,000 property damage; 52 knots; trees downed

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

Other

9. Shoreline Erosion
   The Michigan Hazard Analysis of 2006 does not identify Kalkaska County as a High Risk Erosion Area.

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 five hours from Kalkaska 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.

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. The following organizations/individuals participated in these meetings:

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

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. Educate 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. Continue enforcement of building code regarding snow load limits through the permitting process.
c. 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.
d. Public awareness regarding roof shoveling through public service announcements.

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. PARTICIPATION IN THE DEVELOPMENT 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 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 and Village Supervisors and Manager – 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. There were no public comments.

E. During development of the plan, all townships and the village 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 most jurisdictions did not provide 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. Bear Lake Township
2. Blue Lake Township
3. Boardman Township – Zoning
4. Clearwater Township
5. Cold Springs Township
6. Excelsior Township
7. Garfield Township
8. Kalkaska Township
9. Oliver Township
10. Orange Township
11. Rapid River Township
12. Springfield Township
13. Village of Kalkaska – Zoning

Participation Layout:

County/Township/Others	Zoning	Participation
Kalkaska County	Yes	Task Force meetings, review of draft plans: Conservation District Emergency Management Coordinator Equalization Department Planning Commissioners Zoning Administrator
Bear Lake Township	No	See paragraph E, above
Blue Lake Township	No	See paragraph E, above
Boardman Township	Yes	See paragraph E, above
Clearwater Township	No	See paragraph E, above
Cold Springs Township	No	See paragraph E, above
Excelsior Township	No	See paragraph E, above
Garfield Township	No	See paragraph E, above
Kalkaska Township	No	See paragraph E, above
Oliver Township	No	See paragraph E, above
Orange Township	No	See paragraph E, above
Rapid River Township	No	Task Force Meeting, review of draft plan
Springfield Township	No	See paragraph E, above
Village of Kalkaska	Yes	See paragraph E, above

XI. 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.

Action Agenda Layout:

Priority and Action Strategies	Responsible Parties	Timeframe
Priority Area 1 **Thunderstorm, High Winds, Tornado Mitigation Strategies:**		
a. Pursue the opportunity for grants to purchase weather radios and educate individuals about them	Emergency Management Coordinator Emergency Responders	1-3 years after adoption of the plan
b. Promote underground utilities within and outside the Kalkaska city limits	Zoning Administrator County Building Inspector Utility Companies	Ongoing
c. Public education for trailer, mobile, and modular homes to ensure safety; research if wind lift is taken into account for these homes	County Building Inspector Emergency Management Coordinator Zoning Administrator Realtors Townships, City, Villages	1-3 years from adoption of the plan
d. Continue to assess and seek comment on the forecasting from the National Oceanic and Atmospheric Administration	Emergency Management Coordinator Fire and Emergency Response	Ongoing
Priority Area 2 ***Wildfire Mitigation Strategies:***		
a. Educate people about the MI Department of Natural Resources recommendations which is a joint local government and MDNR initiative; pass out information when development proposals are submitted	MI Department of Natural Resources Zoning Administrator Emergency Management Coordinator	1-3 years from adoption of the plan
b. Educate landowners about fuel safety	Emergency Management Coordinator Zoning Administrator County Building Inspector	Ongoing

	County Conservation District Fire and Emergency Response	
c. Real estate agents distribute information at time of sale	Realtors	Ongoing
Priority Area 3 ***Snow and Ice 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	Emergency Management Coordinator Zoning Administrator County Building Inspector Townships, City, Villages	1-3 years from adoption of the plan
b. Continue enforcement of building code regarding snow limits through the permitting process	County Building Inspector Townships, City, Villages	Ongoing
c. Public education by letting people know what they need to do to prepare for severe weather.	Emergency Management Coordinator Sheriff Department Commission on Aging Townships, City, Villages	Ongoing
d. Public awareness regarding roof shoveling through pubic service announcements	County Building Inspector Emergency Management Coordinator Housing Authority Townships, City, Villages Media	Ongoing
Priority Area 4 ***Flood Mitigation Strategies:***		
a. Continual maintenance and upkeep of the dam which is owned by the County	County Board of Commissioners County Planning Commission Emergency Management Coordinator Zoning Administrator Department of Public Works	Ongoing
b. County committed to maintaining the dam	County Board of Commissioners	Ongoing

Other mitigation strategies include:

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

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.

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.

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

			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

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 for this Hazard	Detailed Damaged and Estimated Costs (Population, Economic, Environment)
Drought	1 event	2% chance	County	16,571	0	
Earthquakes	No recorded events	5% chance	County	16,571	0	
Flooding	2 events	4% chance	Boardman River	6,203		$20,000 property damage
Hail	9 events	16% chance	County	16,571		
Lightning	3 events	5% chance	County	16,571	**1**	1 fatality, 1 injury
Snow and Ice	62 events of 12 or more inches of snow	116% chance	Snow belt area – Cold Springs and Blue Lake Townships County wide	2,195 16,571	**3** **3**	$590,000 property damage
Subsidence	No recorded events	5% chance	County	16,571	0	
Thunderstorms and High Winds	29 major events	52% chance	County-wide (Seasonal Campers)	16,571	**1**	$110,000 property damage
Tornadoes	6 events	11% chance	Kalkaska area and southwest area County	6,100 16,571	**1**	$53,000 property damage
Wildfires	1981 to 2005 – 33 events 23 events 10 acres and over	170% chance	County Kalkaska area and Southeast corner Clearwater, Rapid River, Coldsprings, Kalkaska, Bear Lake, Boardman, Orange, Springfield, Garfield	16,571 7,743 15,025	**2**	

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

The first Task Force meeting was held on **June 8th, 2004** to identify the natural hazards priority areas and the second Task Force meeting was held on **July 23rd, 2004** to develop the mitigation strategies for the priority areas.

AGENDA
June 8, 2004

I. Welcome
   a. Introductions
II. Hazard Mitigation Planning Overview
III. Data Sources
IV. Hazard Mitigation Maps
V. Breakout into Small Groups by Region
   a. Analyze the maps for the top five potential hazard areas
   b. 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 23, 2004

I. Welcome and Introductions
II. List out Recommended Mitigation Strategies

The following is the list of participants:

Kalkaska County Conservation District

Kalkaska County Emergency Management Coordinator
Scott Yost

Kalkaska County Equalization Department

Kalkaska County Planning Commission

Kalkaska County Zoning Department
Jack Kelly

Rapid River Township
Mary Lou Montgomery

Appendix G

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.