Manistee County Michigan

Natural Hazards Mitigation Plan

2015

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I. ACKNOWLEDGEMENTS

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

Each jurisdiction within Manistee County is a continuing participant in the update of the Plan. The following is a list of key contributors who were instrumental in the development of the Manistee County Natural Hazards Mitigation Plan:

Manistee County Emergency Management Coordinator
Ken Falk

Manistee County Administrator
Tom Kaminski

Manistee County 911 Services
Jim Espvik

Manistee County Information Technician
Gordon Mcllelan

Manistee County Local Planning Team

Manistee County Planning
Rob Carson

Manistee County Road Commission
Mark Sohlden

Manistee County Sheriff
Dale Kowalkowski

Little River Band of Ottawa Indians
Frank Beaver

Others

- American Red Cross
- Bear Lake Fire Department
- District Health Department #10
- Manistee County Conservation District
- Manistee County Firefighters Association
- Manistee Fire Department
- Manistee Township Fire Department
- Michigan Department of Natural Resources
- Michigan State University Extension
- Morton
- Packaging Corporation of America
- Pleasanton Township
- West Shore Medical Center
- Department of Human Services
- 211
- Central Wellness

II. FEMA Letter of Approval

U.S. Department of Homeland Security
Region V
536 S. Clark St., 6th Floor
Chicago, IL 60605-1509

FEMA

JUL 06 2015

Mr. Matt Schnepp
State Hazard Mitigation Officer
Michigan State Police
Emergency Management and Homeland Security Division
4000 Collins Rd
Lansing, MI 48910

Dear Mr. Schnepp:

Thank you for submitting the adoption documentation for the Manistee County Hazard Mitigation Plan. The plan was reviewed based on the local plan criteria contained in 44 CFR Part 201, as authorized by the Disaster Mitigation Act of 2000. Manistee County met the required criteria for a multi-jurisdiction hazard mitigation plan and the plan is now approved for the County. Please submit the adoption resolutions for any remaining jurisdictions who participated in the planning process.

The approval of this plan ensures continued availability of the full complement of Hazard Mitigation Assistance (HMA) Grants. All requests for funding, however, will be evaluated individually according to the specific eligibility and other requirements of the particular program under which the application is submitted.

We encourage Manistee County to follow the plan's schedule for monitoring and updating the plan, and continue their efforts to implement the mitigation measures. The expiration date of the Manistee County Plan is five years from the date of this letter. In order to continue project grant eligibility, the plan must be reviewed, revised as appropriate, resubmitted, and approved no later than the plan expiration date.

Please pass on our congratulations to Manistee County for this significant action. If you or the communities have any questions, please contact Kirstin Kuenzi at (312) 408-4460 or Kirstin.Kuenzi@fema.dhs.gov.

Sincerely,

Christine Stack

Christine Stack, Director
Mitigation Division

www.fema.gov

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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.

The mission of the Manistee County Natural Hazard Mitigation Plan is to permanently eliminate or reduce long-term risks to people and property from natural hazards so that county assets such as transportation, infrastructure, commerce, and tourism can be sustained and strengthened. This can be accomplished through collaborative efforts/activities amongst agencies within Manistee County.

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, Manistee County is actively addressing the issue through the development and implementation of this plan. The many benefits to be realized from this effort are:

Community Benefits of a Natural Hazard Mitigation Plan
Protection of the public health and safety
Preservation of essential services
Prevention of property damage
Preservation of the local economic base

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

IV. EXECUTIVE SUMMARY

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

To meet this requirement, the Michigan State Police provided funding to encourage regional cooperation in the development of individual county Natural Hazards Mitigation Plans. The ***Northwest Michigan Hazard Mitigation Planning Project*** **update** was coordinated by the Northwest Michigan Council of Governments (NWMCOG) with Leelanau County being the Fiduciary. The update included Antrim, Kalkaska, Missaukee, Wexford, Grand Traverse, Leelanau, Benzie, and Manistee counties. NWMCOG worked with the Task Forces to update plans for these counties, which includes 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 Manistee County Natural Hazards Mitigation Plan focuses on natural hazards such as drought, wildfires, flooding, shoreline erosion, thunderstorms and high winds, and severe winter weather, earthquakes and subsidence 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 Manistee 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 Manistee 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:

Table 1: Planning Goals for Manistee County

Natural Hazards Mitigation Planning Goals for Manistee County
Goal 1: Increase local participation, strategies, and initiatives 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

Table 2: Priority Areas for Manistee County

Natural Hazards Mitigation Priority Areas
Priority Area 1: Flood prevention and dam infrastructure - Countywide affecting localized areas Mitigation Strategies: ***Flood***
Priority Area 2: Potential wildfire concerns - Countywide Mitigation Strategies: ***Wildfire***
Priority Area 3: Severe Winter Weather (Heavy snow, Extreme temperatures) - Countywide Mitigation Strategies: ***Snow and Ice***
Priority Area 4: Lake Michigan Coastal Erosion Areas – Coastal communities Mitigation Strategies: ***Landslide and Debris Flow***

Table 3: Mitigation Strategies for Manistee County

Frequent Natural Hazard	Mitigation Strategies
Wildfire	
	• Develop new building and zoning codes such as a cleared buffer space between houses/structures; defensible space
	• Fuel management, diversity and native vegetation
	• Homeowner property maintenance
	• Public education, awareness, and alertness
	• Building code enforcement for new construction
Snow and Ice	
	• Public education – suggested elderly services for 2-3 day storms; utilize Manistee County Road Commission video regarding travel plans, kits, and stranded car issues
	• Building code enforcement for new construction, especially pole barns – for Manistee County the load is 60 lbs. per sq. ft.
Flood	
	• Examine and review historic drainage districts; analyze purpose and need, existing use, land uses within districts, current habitat and ecological importance, notify residents and municipalities of district boundaries, and formulate recommendations for each individual district.
	• Regular inspections of dams
	• Acquisition of flood areas
	• Enforcement of state, county, and township ordinances
	• Enforcement of building and zoning codes
	• Public education, especially for fishing areas and campgrounds
Erosion	
	• Complete soil erosion control ordinance and enforcement of permits
	• Enforcement of the grading levels no more than 10%
	• Placement of vegetation and utilizing native vegetation
	• Sand dune protection
	• Green belt buffer zones – example: Filer Townships ordinance
	• Enforcement of building codes
	• Public Education
Various	
	• Working with the Little River Band of Ottawa Indians, other governmental entities, organizations, businesses, and the public
	• Incorporating the Plan's natural hazards mitigation concepts, strategies, and policies into existing elements of Manistee County's Master Land Use Plan

V. PURPOSE OF THE PLAN

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 referred to as hazard mitigation planning. FEMA requires government entities to have natural hazards mitigation plans in place and updated on a 5-year cycle as a condition for receiving grant money related to natural hazard remediation.

The **purpose of the Manistee 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 Manistee 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.

Steps in the Planning Process
Identification of natural hazards and risks
Preparation of draft plan
Identification of natural hazards mitigation goals and objectives for emergency management programs
Selection of evaluation criteria
Selection of mitigation strategies using locally chosen criteria
Public Comment
Completion of the final plan

What is a Hazard?

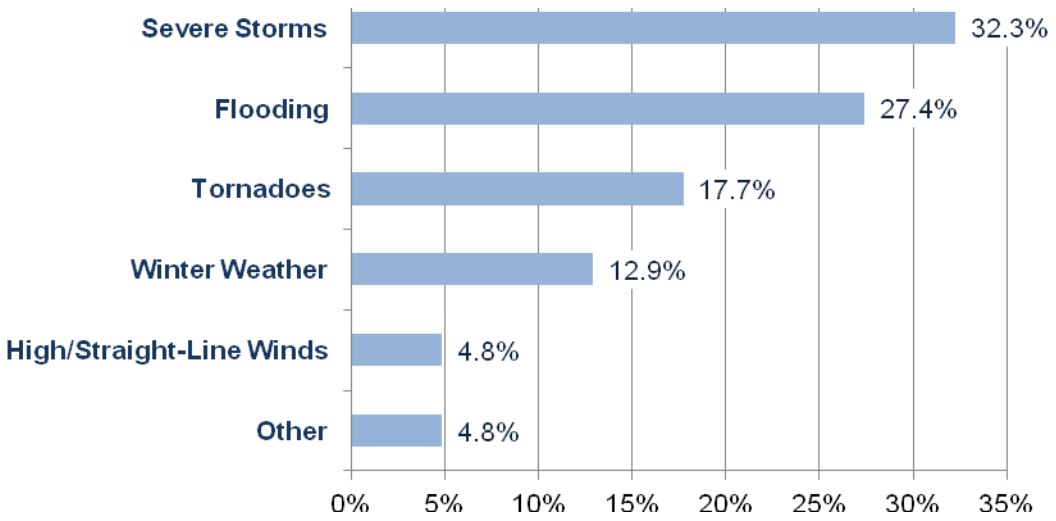
A **hazard** is an event or physical condition that has potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss. This plan focuses on principle natural hazards that occur in the northern lower region (see Page 12). 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.

Principle Natural Hazards in Northern Lower Michigan
Severe Storms (Thunderstorms, Winter storms)
High Winds
Tornadoes
Extreme Temperatures
Flooding
Shoreline Hazards
Dam Failures
Drought
Wildfires
Invasive Species
Subsidence

Source: FEMA

Percent of natural hazard events for all formal disaster declarations in the State of Michigan (1953 – 2014)

Figure 1: Disaster Declarations for the State of Michigan



Source: FEMA

What is Mitigation?

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

VI. COMMUNITY PROFILE

Manistee County is rich in history and natural beauty. The county seat, the City of Manistee is a Victorian Port City, with many Victorian buildings and homes called "Painted Ladies". This city is located on Lake Michigan, Manistee Lake, and the winding Manistee River. The economic base of the County is a mixture of industry, agriculture, and tourism. Throughout the county there is also the U.S. National Forest area, excellent recreational facilities, sport fishing, lakes, rivers, and museums. Many interesting villages and townships are also located in the County including Kaleva, Onekama, Arcadia, Bear Lake, Wellston, Copemish, and Brethren. There has not been any major infrastructure development, nor major hazard mitigation efforts, in the county since the last adoption of the Plan in 2007.

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

Table 4: Geographic features for Manistee County

Feature	Measure	Percentage
Area in Water	9,600 acres	2.6%
Forest Lands	235,300 acres	64.9%
Wetlands	73,503 acres	20.3%
Farmland	44,298 acres	12.2%
Operating Farms	324	NA
Miles of Great Lakes shoreline	25 miles	NA

Source: US Agricultural Census, 2012; County Data

The total County population is **24,733**. The projected growth for 2020 is 24,616. The population numbers from the 2010 Census for the **14 Townships, 1 City, and 5 villages** covered by this plan are:

Table 5: Breakdown of Manistee County Population

Township/City/Village	Population	Township/City/Village	Population
Arcadia Township	639	Onekama Township	1,329
Bear Lake Township	1,465	Pleasanton Township	818
Brown Township	747	Springdale Township	781
Cleon Township	763	Stronach Township	821
Dickson Township	993	City of Manistee	6,226
Filer Township	2,325	Village of Bear Lake	286
Manistee Township	4,084	Village of Copemish	194
Maple Grove Township	846	Village of Eastlake	512
Marilla Township	393	Village of Kaleva	470
Norman Township	918	Village of Onekama	411

Source: U.S. Census Bureau, 2008-2012 American Community Survey

- There are approximately 15,686 *Housing Units* in Manistee County with an average household size of 2.2 people per household.
- The number of residents 65 years and over is 20.8% of the population.
- The number of residents 19 years and under is 21.0% of the population.
- 37.9% of residents over 65 have a disability.
- The total number of residents with a disability is 18.7% of the non-institutionalized population.
- The number of residents that have a language barrier or are linguistically isolated is less than 0.5% of the population.
- February 2014 Poverty level:
    - $19,790 Family of 3
    - $11,670 Family of 1

Table 6: Poverty Statistics for Manistee County

Poverty	Statistics
Families in poverty	10.0%
Income less than $15,000	13.8%
Population in poverty	15.3%

Source: U.S. Census Bureau, 2008-2012 American Community Survey

Table 7: Economic Census for Manistee County

Industry Description	Number of Establishments	Number of Employees
All Industrial Codes	569	5,338
Forestry, fishing, hunting, agriculture support	5	NA
Mining	2	NA
Utilities	2	NA
Construction	64	141
Manufacturing	23	765
Wholesale Trade	15	NA
Retail Trade	107	914
Transportation and warehousing	19	NA
Information	7	NA
Finance and insurance	32	168
Real estate, rental and leasing	18	41
Professional, scientific and technical services	39	108
Admin, support, waste mgt, remediation services	25	127
Educational services	3	NA
Health care and social assistance	65	858
Arts, entertainment and recreation	18	43
Accommodation and food services	54	NA
Other services (except public admin)	67	352

Source: US Census Bureau: County Business Patterns 2008-2012

VII. THE DEVELOPMENT OF THE PLAN

Data Methodology and Map Development

Manistee County staff identified the critical facilities and infrastructure on the base map and provided updated GIS .shp files for mapping purposes.

Table 8: Critical Facilities and Infrastructure in Manistee County

1	Airport - Blacker
19	Banks
9	Bridges
9	Communication Facilities
2	Dams
3	Emergency Management Services Facilities
12	Fire Stations
20	Government Offices
13	Hazard Materials Sites
1	Hospital
15	Industrial Sites
4	Medical Facilities
4	Police Stations
25	Resort/Recreation Areas
11	Schools
9	Utilities
1	Waste Disposal
3	Waste Water Treatment Plants • Sewer: 27.5% public sewer • 71.1% individual septic/cesspool • 1.4% other
7	Water Wells/Towers • 27.5% public system or private company • 68.1% individual wells

Source: Manistee County Data

Flood Data

Flood hazard information may be obtained from the Flood Insurance Rate Maps (FIRM) available for jurisdictions. In order to delineate potential flood plain areas (seasonal floodplains) for each county, NWMCOG overlaid wetland, soils, and elevation data to determine the most likely flood prone areas. Once overlaid, isolated polygons (areas) were deleted in order to show a more accurate representation of potential flood prone areas along lakes, rivers, and streams. Sources: Temporary/Seasonally Flooded Areas data are from the National Wetland Inventory of the US Fish and Wildlife Service; Hydric soils data are from the county digital soil surveys (were available); and Digital Elevation Model data are from the Center for Geographic Information, Michigan Department of Information Technology.

Natural Flood Insurance Program (NFIP) participants:

- Onekama Township (19 policies, 2 paid losses for a total of $50,442 in damages paid, $3,608,000 in coverage. Joined in 1978)
- Manistee Township (1 policy, 5 paid loses for a total of $18,636, $280,000 in coverage. Joined in 1989)
- Arcadia Township (7 policies, 1 paid loss for a total of $18,954, $1,570,600 in coverage. Joined in 1986)
- Manistee City (7 policies, 2 paid losses for a total of $46,309, $1,136,000 in coverage. Joined in 1987)
- Stronach Township (3 policies, 1 paid loss for a total of $30,818, $217,100 in coverage. Joined in 1988)

The official FEMA list of NFIP repetitive loss properties contains one listing that at first appeared to be located in the county, but on closer inspection was suspected to instead be located in a distant part of Michigan, misclassified by a coding error. Since no other properties from Manistee were found on the list, it appears that the county contains no repetitive loss properties

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

Tornadoes National Weather Service

Damaging Winds - National Weather Service

Large Hail - National Weather Service

Winter Weather - National Weather Service

Landslide/Erosion
Shoreline erosion and landslide incident zones delineated by the US Geological Service. Digital Elevation Model data from the Center for Geographic Information, Michigan Department of Information Technology.

Other hazards such as earthquakes and subsidence were considered but are not substantial risks in Manistee County.

Natural Hazard Recorded Events

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

- Weather/Climate Events, Information, Assessments
- Climatology and Extreme Events
- NOAA Storm Event Database; 1950 to present, local storm reports, damage reports, events checked for Manistee County included: Drought (Drought) Flood (Flash Flood, Flood, Lakeshore Flood), Hail (Hail), Extreme Winter Weather (Blizzard, Extreme Cold/Wind Chill, Freezing Fog, Frost/Freeze, Heavy Snow, Ice Strom, Lake-effect Snow, Sleet, Winter Storm, Winter Weather), Tornado (Tornado, Funnel Cloud), Thunderstorm and High Wind (Heavy Rain, High Wind, Lightning, Strong Wind, Thunderstorm Wind), Wildfire (Wildfire)

The following list includes the frequency, dates, and descriptions of the most severe natural hazard events that have occurred within Manistee County, according to the NOAA Storm Event Database; January 1950 – August 2014. *Extreme Winter Weather* includes events with ice covering, property damage, and/or up to/over 12 in. of snow. *Severe Thunderstorm* include 50 knot winds + and property damage figures.

Flooding/Flash Flood: 11 events

Table 9: Flood Events for Manistee County

Month	Year	Location	Effect	Damage
January	1993	County/Region	NA	$5000
April	1993	County/Region	NA	$5,000,000
May	2000	Manistee	6 in. water covered city streets	NA
April	2001	Countywide	Runoff from snow and rain along Manistee River	NA
May	2001	South Portion	High water on Manistee River into yards	NA
July	2005	Manistee	4.35 in. rain in 2.5 hours, flash flooding	$500,000
June	2008	Oak Hill	Flash flood, soil erosion, asphalt and road signs washed into Lake Michigan, homes damaged	$970,000
June	2008*	Harlan	Heavy flooding along Manistee River	NA
May	2011	Manistee	Flash flood, significant street flooding, homes damaged	$40,000
May	2011	Wellston	Flash flood, roads closed	$10,000
April	2014	Countywide	Riverine flooding	NA

Hail: 22 events

Table 10: Hail Events for Manistee County

Month	Year	Location	Effect	Damage
July	1973	Countywide	1.75 in.	NA
June	1985	Countywide	0.75 in.	NA
August	1998	Onekama	1.75 in.	NA
September	1998	Bear Lake	2.00 in.	$35,000 (crop)
September	1998	Wellston	1.25 in.	NA
October	1999	Bear Lake	0.75 in.	NA
October	1999	Wellston	0.75 in.	NA
August	2000	Manistee	0.88 in.	NA
April	2003	Wellston	1.00 in.	NA
July	2003	Bear Lake	0.88 in.	NA
July	2005	Manistee	0.88 in.	NA
September	2005	Copemish	0.75 in.	NA
October	2006	Manistee	0.75 in.	NA
June	2008	Springdale	1.0 in.	NA
June	2008	Kaleva	0.75 in.	NA
June	2008	Wellston	0.75 in.	NA

Hail (continued)

May	2011	Norwalk	0.75 in.	NA
May	2011	Wellston	1.25 in.	NA
May	2011	Manistee	1.50 in.	NA
May	2012	Manistee	1.00 in.	NA
May	2012	Wellston	0.75 in.	NA

Extreme Winter Weather: 81 events

Table 11: Winter Weather Events for Manistee County

Month	Year	Location	Effect	Damage	Event
April	1993	County/Region	NA	$50,000	
January	1994	Statewide	NA	$5,000,000	Heavy Snow/Freezing Rain
January	1997	Countywide	8-12 in. snow	NA	Blizzard
March	1998	County/Region	8-12 in. snow/ gusts to 45 mph	NA	Blizzard
December	1998	County/Region	6-12 in. snow	NA	
January	1999	County/Region	10-18 in. snow	NA	Blizzard
January	1999	Countywide	6-12 in. snow	NA	
February	2001	Countywide	Trees and power lines down	NA	Ice Storm
March	2002	County/Region	10-16 in. snow, tree limbs and power lines down	NA	
January	2004	Countywide	6-12 in. snow	NA	
January	2005	County/Region	10-12 in. snow	NA	
January	2006	Countywide	8-12 in. snow	NA	
December	2006	Manistee	17 in. snow	NA	
February	2007	Countywide	- 20 to -30 wind chills	NA	Extreme Temp
December	2008	Countywide	16-23 in. snow	NA	
December	2010	County/Region	6-12 in. snow	NA	
February	2011	Countywide	6-12 in. snow	NA	
March	2012	County/Region	6-14 in. snow, trees and power lines down	NA	
April	2012	County/Region	90-100% crop loss	$10,000,000 (crop)	Killing Freeze
December	2012	Countywide	NA	NA	
January	2014	County/Region	-30 wind chills/12-16 in. snow	NA	Extreme Temp
February	2014	County/Region	40-45 mph gusts/ -15 to -20 wind chills	NA	Extreme Temp

Severe Thunderstorm, High Wind: 47 events

Table 12: Storm Events for Manistee County

Month	Year	Location	Effect	Damage
March	1966	Countywide	55 knot winds	NA
June	1997	Wellston	52 knot winds/ trees down	NA
July	1999	Manistee	50 knot winds/ trees down	NA
May	2000	Manistee	75 knot winds/ sever gusts	NA
July	2000	Bear Lake	50 knot winds/trees and power lines down	NA
August	2001	Parkdale	55 knot winds	NA
October	2001	County/Region	50 knot winds/trees and power lines down/power outages 20,000+	NA
April	2002	Manistee	50 knot winds/trees and power lines down	NA
July	2002	Manistee	50 knot winds/trees and power lines down	NA
October	2002	Manistee	50 knot winds/trees and power lines down	NA
August	2003	Manistee	50 knot winds/tree down	NA
November	2003	County/Region	68 knot winds	$155,000
July	2005	Wellston	52 knot winds/trees down	$2,000
September	2005	Manistee	55 knot winds/trees and power lines down	$6,000
November	2005	Countywide	55 knot winds/trees down/roof damage	$20,000
October	2006	Bear Lake	50 knot winds/power lines down	$1,000
October	2006	Manistee	65 knot winds/trees down/vehicle and structure damage/Manistee Natural Golf Course damaged	$50,000
June	2007	County/Region	42 knot winds/trees and power lines down	$5,000
June	2007	Manistee	55 knot winds/trees and power lines down/vehicle damage	$16,000
June	2007	Wellston	56 knot winds/62 mph gusts/tree down	$2,500
October	2007	County/Region	43 knot winds/trees and power lines down/vehicle damage	$40,000
October	2007	Wellston	54 knot winds/trees down	$4,000
April	2008	Countywide	54 knot winds/trees down	$6,000
April	2008	High Point	52 knot winds/trees down	$3,000
June	2008	Manistee	70 knot winds/trees down/structure damage	$195,000
June	2008	Kaleva	52 knot winds/60 mph gusts	NA
June	2008	Wellston	50 knot winds/trees and limbs down	$3,000
August	2009	Bear lake	50 knot winds/trees down	$2,000
October	2010	County/Region	55 knot winds/63 mph gusts/trees and power lines down/structure damage	$10,000
April	2011	Manistee	69 knot winds/trees down/structure damage	$120,000
May	2011	Onekama	52 knot winds/trees down/structure damage	$12,000
September	2011	Manistee	52 knot winds/ Trees and power lines down	$8,000
May	2012	Manistee	52 knot winds/trees and power lines down	$10,000
July	2013	Wellston	Trees and power lines down	$5,000

Severe Thunderstorm, High Wind (continued)

August	2013	Manistee	61 knot winds	NA
August	2013	Wildwood	54 knot winds/trees down	$7,000
August	2013	Wellston	52 knot winds/trees down/vehicle damage	$12,000

Tornado: 2 events

Table 13: Tornado Events for Manistee County

Month	Year	Location	Effect	Damage
April	1956*	County	F4/ 19 miles long, 400 yards wide, 2 deaths and 24 injuries	$250,000
June	2008	Stronach	EF0, 1.04 mi. long, 425 yards wide, 75-85 mph winds/trees and limbs down	$15,000

** Governor and Presidential Hazard Declaration*

Wildfires

The Michigan Hazard Analysis of 2012 identified around 49 wildfires occurred in Manistee County from 1981 to 2010.

Other Possible Natural Hazard Events

Shoreline Erosion

The Michigan Hazard Analysis of 2006 identifies Manistee County as a High Risk Erosion Area with the Lake Michigan shoreline at risk. The National Climatic Data Center indicates that there have been no lake surf erosion events reported in Manistee County since 1950. While there were Governor's Disaster Declarations for shoreline problems in the state in 1985 and 1986, these declarations did not include Manistee County. However, a severe storm event caused a wash-out of a City Major arterial street (see Risk Assessment Summary table)

Storm Surges (Seiches) and Rip Currents

Weather-related events can also cause lake fluctuations that can last from several hours to several days. For example, windstorms combined with differences in barometric pressure can temporarily tilt the surface of a lake up at one end by as much as eight feet. This phenomenon is called a storm surge or seiche and can drive lake waters inland over large areas, cause weakening and erosion of shoreline areas, make water travel hazardous, and cause flood damages, deaths, and injuries to occur.

A rip current is a strong flow of water returning seaward from the shore. When wind and waves push water towards the shore, the previous backwash is often pushed sideways. This water streams along the shoreline until it finds an exit back to the sea. The resulting rip current is usually narrow and located between sandbars, under piers or along jetties. The current is strongest at the surface, and can dampen incoming waves, leading to the illusion of a particularly calm area. Rip current speeds are typically 1-2 feet per second. However, speeds as high as 8 feet per second have been measured. Rip currents cause approximately 100 deaths annually in the United States, more than all other natural hazards except excessive heat. In the Great Lakes alone, the average over the last six years is 10 drownings per year caused by rip currents. About 80% of rescues by surf beach lifeguards are due to rip currents. According to the National Climatic Data Center, Michigan has experienced at least 17 deaths and 9 injuries caused by rip currents in just the past 10 years.

Drought

In Northern Michigan's forested regions, drought can adversely impact timber production and some tourism and recreational enterprises. This can also cause a drop in income, which impacts other economic sectors. The biggest problem drought presents, however, is the increased threat of wildfire. Many Northern Michigan counties are heavily forested and are therefore highly vulnerable to drought-related wildfire threats. The most extreme drought was in January 1931, when the Palmer index hit a record low of -8.07. Lengthy drought incidents took place in 1895-1896 (17 months), 1898-1899 (8 months), 1899-1901 (21 months), 1901-1902 (15 months), 1908-1911 (37 months), 1913-1914 (11 months), 1914-1915 (10 months), 1919-1920 (8 months), 1920-1922 (17months), 1925-1926 (17 months), 1929-1931 (28 months), 1935-1936 (20 months), 1955-1956 (13 months), and 1976-1977 (13 months).

Pandemics or other Public Health Emergencies

Naturally occurring pandemics may cause widespread precautions around the world. The District Health Department #10, which includes Manistee County, created a pandemic plan that serves as a template for responding to a large-scale outbreak of influenza and other highly infectious respiratory diseases.

Probability of Natural Hazards:

The probability that a natural hazard such as hail, thunderstorm and high wind, tornadoes, and snow and ice will affect the priority areas in this area of Michigan is a yearly possibility. The magnitude and severity depends on what type of season that is occurring with temperature, moisture in the air, ice cover on the lakes, etc. Also, the severity of an event is connected with the tourist activity number during the year, the pace of developing second homes, an increasing base population in northwest, lower Michigan which in turn creates more development. The events recorded by NOAA show that natural hazard events might be happening more frequently and that the geographic extent of the hazard's impact has remained the same in Manistee County.

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

Manistee County Natural Hazards Task Force and Public Input

The Manistee County Natural Hazards Task Force comprised of the County's Local Planning Team (LPT) which is a collection of first responders and local, regional, and state public entities that ensure the readiness of County entities by recommending equipment purchases, training and exercises, and public education on preparedness issues. The Task Force meetings were scheduled monthly in 2014, held in various locations throughout the county, and open to the public. Participants analyzed and updated the hazard priority maps, goals & objectives, hazard priority areas, mitigation measures, and the action agenda items.

The general list of hazard priorities and locations of concern was also reviewed and updated by the Task Force:

- Dam failures at Tippy and Hodenpyl that would cause bridge damage
- Wildfires, with the most recent in Pleasanton Township
- Heavy snow concerns for the City of Manistee and county
- Shoreline erosion along the Lake Michigan

The Natural Hazards Priority Areas have not changed since the original plan. However, the task force altered the chronological order of the priority list and placed “Flood prevention” as the top priority, due to proposed programming and immediate implementation of pre-disaster mitigation projects that will address these hazard issues, should funding become available.

Top Four Natural Hazards Priority Areas

1. **Flood prevention and Dam infrastructure Countywide affecting localized areas**
   Flood prevention infrastructure may be underperforming in certain Drainage Districts throughout the County due to heavy rains and/or Spring snowmelt.

   Dam failure may cause an uncontrollable high volume of water downstream, damaging bridges and other key infrastructure. The Michigan Hazard Analysis of 2012 identifies the Tippy and Hodenpyle Dams as a “high hazard”, meaning there is development downstream in the dam’s “hydraulic shadow.”

   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.

2. **Potential Wildfire Areas throughout the County**
   The most fire prone areas are populated with pines and hemlocks mostly located in the southern section of Manistee County. Other factors that increase fire risk include dead or dying Ash trees as a result of disease/invasive species, lightning strikes, and human factors such as the number of persons residing, camping, or traveling through these areas.

3. **Severe Winter Weather (heavy snow, extreme temperatures)**
   Manistee County experiences frequent heavy snow events due to its location in a “snow-belt” area. Heavy snow events have the potential of shutting down towns and businesses for a significant period of time. Blowing and drifting snow with blizzard conditions cause driving hazards. Ice damage may occur when high winds push lake water and ice past the shoreline, causing damage to public infrastructure and residential property.

4. **Lake Michigan Coastal Erosion Areas**
   Shoreline erosion hazards involve the loss of property as sand or soil is removed by water action and carried away over time. This can cause structures to stand perilously close to waters or bluffs. The foundation of a structure, or underground utility pipes in the area, may become fully exposed and vulnerable to weather, extreme temperatures, water damage, or other sources of risk. Roadways along the shoreline may experience bank erosion which contributes to cracking and overall structural instability (ex: W.12th St. in City of Manistee).

Emergency Warning System Coverage

The County utilizes a Wireless Emergency Notification System (WENS) where area residents can sign up at no cost for email, text and voice alerts for emergency situations within Manistee County.

Consumers Energy has four (4) emergency warning sirens on the Manistee River to alert the public of impending danger from rapidly rising waters due to an emergency at the Hodenpyl or Tippy Dams. The sirens are activated, accompanied with instructions, during an actual dam emergency.

Economic Impact Analysis

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

Table 14: Damage Cost by Natural Hazard for Manistee County

Manistee County	Property Damage Cost	Crop Damage Cost
Drought	NA	NA
Flood	$1,520,000	NA
Hail	NA	$35,000
Extreme Winter Weather	$5,050,000	$10,000,000
Tornado	$265,000	NA
Thunderstorm and High Wind	$589,500	NA
Wildfire	NA	NA

The Manistee County Equalization Department calculated each Priority Area's economic value through the State Equalized Values (SEV) for real and personal property (residential and commercial). The following includes 2010 Census data and 2014 SEV dollar amount times two (estimated fair market values) for each priority area. According to the 2014 Northwest Michigan Season Population Analysis, assume an 18% increase to account for the average seasonal population within the county.

Table 15: Geographic Economic Value for Manistee County

Priority Area(s)	Geography	Population	State Equalized Value
	Manistee County	24,733	$2,718,849,600
1	Manistee, Marilla, Dickson and Brown Townships	11,931	$505,917,200
4	Lake Michigan Coastal Areas	12,278	$1,345,213,200

VIII. NATURAL HAZARDS MITIGATION GOALS AND OBJECTIVES

The mission of the Manistee 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, request for comments on the draft plan, and the presentation of the plan to the Manistee County Planning Commission.

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

- Encourage cooperation and communication between planning and emergency management officials
- Encourage additional local governmental agencies to participate in the natural hazards mitigation process
- Encourage public and private organizations to participate
- Encourage use of the "Firewise Communities Program" (www.firewise.org) which offers both workshops and web-based interactive training geared toward homeowners, forestry professionals, firefighters and others on a variety of wildfire safety topics.

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

- Enforce and/or incorporate natural hazards mitigation provisions in building code standards, ordinances, and procedures; and into the county's comprehensive master plan
- Incorporate natural hazards mitigation into basic land use regulation mechanisms
- Update or create zoning ordinances to reflect any new building codes, shoreline protection rules, etc.
- Incorporate natural hazard area classifications into standard zoning classifications
- Develop community education and warning systems
- Integrate natural hazards mitigation into the capital improvement planning process so that public infrastructure does not lead to development in natural hazard areas
- 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

- Provide a list of desired community mitigation measures to the State for possible future funding
- Encourage the application for project funding from diverse entities

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

- Encourage public and business involvement in natural hazards mitigation projects

IX. IDENTIFICATION AND SELECTION OF MITIGATION STRATEGIES

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 Manistee County.

- The measure must be technically feasible.
- The measure must be financially feasible.
- The measure must be environmentally sound and not cause any permanent, significant environmental concerns.
- 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.

Priority Area 1: Flood prevention and Dam infrastructure affecting localized areas (US-31, Tippy and Hodenpyle Dams)
Flood Mitigation Strategies:

- Examine and review historic drainage districts; analyze purpose and need, existing use, land uses within districts, current habitat and ecological importance, notify residents and municipalities of district boundaries, and formulate recommendations for each individual district.
- Inventory of “significant” frequently flooded areas
- Regular inspections of dams
- Acquisition of flood areas
- Enforcement of state, county, and township ordinances
- Enforcement of building and zoning codes
- Public education especially for fishing areas and campgrounds

Priority Area 2: Potential Wildfire Areas throughout the County:
Wildfire Mitigation Strategies:

- Incorporate FIREWISE strategies into building codes and community master plans
- Develop new building and zoning codes such as a cleared buffer space between houses/structures; defensible space
- Fuel management, diversity and native vegetation
- Homeowner property maintenance
- Public education, awareness, and alertness
- Building code enforcement on new construction

Priority Area 3: Severe Winter Weather (heavy snow, extreme temperatures) – Countywide
Snow Load and Ice Build Up Mitigation Strategies:

- Public education – suggested elderly services for 2-3 day storms; utilize Manistee County Road Commission video regarding travel plans, kits, and stranded car issues
- Building code enforcement for new construction

Priority Area 4: Lake Michigan Coastal Erosion Areas
Landslide and Debris Flow Mitigation Strategies:

- Complete soil erosion control ordinance and enforcement of permits
- Enforcement of the grading levels no more than 10%
- Placement of vegetation and utilizing native vegetation
- Sand dune protection
- Green belt buffer zones (Filer Township’s ordinance)
- Enforcement of building codes
- Public Education

X. PARTICIPATION IN THE DEVELOPMENT OF THE MANISTEE COUNTY NATURAL HAZARDS MITIGATION PLAN

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

- A Public Notice was published in the Manistee Advocate, no comments were received

THE MANISTEE COUNTY Emergency Management Department is requesting public comment on the Natural Hazards Mitigation Plan draft for Manistee County. The Plan is available for review at the Manistee County Clerk's Office (415 Third St., Manistee, MI. 49660) and at the Manistee County Sheriff's Office (1525 E. Parkdale Ave., Manistee, MI. 49660). Please send comments to Lt. Kenneth O. Falk by 4:00 pm, January 21st 2015 – Mail: 1525 E. Parkdale Ave., Manistee, MI. 49660. Email: falkk@manisteesheriff.org. Phone: (231)-723-9970.
The mission of the Manistee County Natural Hazard Mitigation Plan is to permanently eliminate or reduce long-term risks to people and property from natural hazards so that county assets such as transportation, infrastructure, commerce and tourism can be sustained and strengthened.

- The Natural Hazards Mitigation Plan was presented to the Manistee County Planning Commission where the meetings are posted in the newspaper and are open to the public.

- The Natural Hazards Mitigation Plan was presented to the Manistee County Board of Commissioners where the meetings are posted in the newspaper and are open to the public.

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

In addition, the townships and villages 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.

Professional planning services have been provided by a professionally staffed planning department for decades. The planning department works with communities in developing master plans, administering zoning, and facilitating solutions to a myriad of problems. Also a key importance is their use of Geographic Information Systems (GIS). While planning in the County is decentralized, the use of the County Planning Commission and a professional planner provided local master plans and regulatory tools with review and coordination to help achieve some regional consistency. Building permits are issued by the State of Michigan, except in Stronach and Springdale townships where they are handled locally. Electrical, plumbing, and mechanical permits for all townships, except Springdale, are also issued by the state.

The Townships/City/Villages in the priority areas include:

Arcadia Township – Zoning
Bear Lake Township – Zoning
Brown Township – Zoning
Cleon Township – Zoning
Dickson Township – Zoning
Filer Township – Zoning
Manistee Township – Zoning
Maple Grove Township – Zoning
Marilla Township – Zoning
Norman Township – Zoning
Onekama Township – Zoning
Pleasanton Township – Zoning
Springdale Township
Stronach Township – Zoning
Village of Bear Lake – Zoning
Village of Copemish – Zoning
Village of East Lake – Zoning
Village of Kaleva – Zoning
Village of Onekama – Zoning
City of Manistee – Zoning

Table 16: Plan Participation

County/Township/Others	Zoning	Participation
Manistee County	No	Task Force meetings, review of draft plans, approval to submit plan: County Commissioners County Administrator Conservation District Drain Commissioner Emergency Management Coordinator Emergency Management Staff 911 Services Information Technician Local Emergency Planning Committee Equalization Department Planning Commission Planning Department Road Commission Sheriff Department
Arcadia Township	Yes	See last bullet point paragraph, above
Bear Lake Township	Yes	See last bullet point paragraph, above
Brown Township	Yes	See last bullet point paragraph, above
Cleon Township	Yes	See last bullet point paragraph, above
Dickson Township	Yes	See last bullet point paragraph, above
Filer Township	Yes	See last bullet point paragraph, above
Manistee Township	Yes	See last bullet point paragraph, above
Maple Grove Township	Yes	See last bullet point paragraph, above
Marilla Township	Yes	See last bullet point paragraph, above
Norman Township	Yes	See last bullet point paragraph, above
Onekama Township	Yes	See last bullet point paragraph, above
Pleasanton Township	Yes	See last bullet point paragraph, above
Springdale Township	No	See last bullet point paragraph, above
Stronach Township	Yes	See last bullet point paragraph, above
Village of Bear Lake	Yes	See last bullet point paragraph, above
Village of Copemish	Yes	See last bullet point paragraph, above
Village of East Lake	Yes	See last bullet point paragraph, above
Village of Kaleva	Yes	See last bullet point paragraph, above
Village of Onekama	Yes	See last bullet point paragraph, above
City of Manistee	Yes	See last bullet point paragraph, above
Little River Band of Ottawa Indians	N/A	See last bullet point paragraph, above
American Red Cross	N/A	See last bullet point paragraph, above
District Health Department #10 (2)	N/A	See last bullet point paragraph, above

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

N/A = Not applicable; these are non-governmental authority entities

XI. IMPLEMENTATION OF THE MANISTEE COUNTY NATURAL HAZARDS MITIGATION PLAN

Natural Hazards Mitigation Plan Managers and Technical Assistance

The Manistee County Board of Commissioners will lead the implementation of the Natural Hazards Mitigation Plan, with support from the Emergency Management Coordinator and the Planning Department. Working partnerships can be established with the following agencies to provide technical assistance to accomplish the goals and objectives of the Plan.

- Manistee County Government
- Manistee County Conservation District
- Manistee County Road Commission
- Townships, cities, and villages
- Little River Band of Ottawa Indians
- Grand Traverse Regional Land Conservancy
- Conservation Resource Alliance
- Michigan State University Extension
- Michigan Department of Environmental Quality
- Michigan Department of Natural Resources
- U.S. Environmental Protection Agency
- U.S. Army Corps of Engineers
- U.S. Department of Agriculture Natural Resources Conservation Service
- U.S. Forest Service
- Insurance Companies
- Real Estate Companies

All natural hazards mitigation planning could be pursued with the new tool available to the local governments which is the Michigan Public Act 134 of 2010, the Enrolled House Bill Number 6152; and Michigan Public Act 226 of 2003, the Joint Municipal Planning Act. These Acts provides for joint land use planning by cities, villages, and townships and allows two or more municipalities' legislative bodies to create a single joint planning commission to address planning issues. This tool helps with planning for the "big picture" issues such as natural hazards that cross jurisdictional boundaries.

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

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

Funding the Implementation of the Plan

To assist with the funding of the proposed natural hazards mitigation strategies, is a list of potential financial assistance entities to fund 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
- U.S. Department of Agriculture Forest Service Wildland Fire Management Program

Funding the Implementation of the Plan (continued)

- U.S. Army Corps of Engineers
- U.S. Department of Housing and Urban Development
- Michigan Department of Environmental Quality
- Michigan Department of Natural Resources
- Community, Regional Foundations
- Businesses

Action Agenda

The following is a summary for accomplishing the **recommended natural hazards mitigation actions** for Manistee County.

Table 17: Recommended Mitigation Actions for Manistee County

Priority and Action Strategies	Responsible Parties	Timeframe
Priority Area 1: Flood Mitigation Strategies		
a. Examine and review historic drainage districts; analyze purpose and need, existing use, land uses within districts, current habitat and ecological importance, notify residents and municipalities of district boundaries, and formulate recommendations for each individual district	Drain Commissioner Emergency Management Coordinator County Planning Conservation District State of Michigan DNR State of Michigan DEQ United States Forest Service Soil and Water Conservation District Local Units of Government	1-5 years after adoption of the plan
b. Regular inspections of dams	Emergency Management Coordinator MI Department of Natural Resources MI Department of Environmental Quality County Planning Drain Commissioner Conservation District	1-3 years from adoption of the plan
c. Acquisition of flood areas	County Planning County Conservation District MI Department of Environmental Quality MI Department of Natural Resources Non-profit conservation organizations	Ongoing
d. Enforcement of state, county and township ordinances	County Planning Townships	Ongoing
e. Enforcement of building and zoning codes	Townships	Ongoing
e. Public education especially for fishing areas and campgrounds	Emergency Management Coordinator County Planning Conservation District Business Owners Non-Profit Organizations Townships	1-3 years from adoption of the plan
Priority Area 2: Wildfire Mitigation Strategies		
b. Develop new building and zoning codes such as cleared buffer space between houses/structures; defensible space	County Road Commission County Planning Townships, City, Villages	1-3 years after adoption of the plan
c. Fuel management, diversity and native vegetation	County Planning Insurance Agencies MSU Extension Conservation District Emergency Management Coordinator	Ongoing

Priority and Action Strategies	Responsible Parties	Timeframe
Priority Area 2: Wildfire Mitigation Strategies (continued)		
d. Homeowner property maintenance	County Planning Insurance Agencies MSU Extension Personnel Emergency Management Coordinator	1-3 years from adoption of the plan
e. Public education, awareness, and alertness	County Planning Insurance Agencies MSU Extension Conservation District Emergency Management Coordinator	Ongoing
f. Building code enforcement	County Planning Townships, City, Villages	Ongoing
Priority Area 3: Severe Winter Weather Mitigation Strategies		
a. Public education	Emergency Management Coordinator County Planning Business Owners Non-Profit Organizations Townships, City, Villages	Ongoing
b. Building code enforcement for new construction, especially pole barns	County Planning Townships, City, Villages	Ongoing
Priority Area 4: Shoreline Erosion Mitigation Strategies		
a. Complete the soil erosion control ordinance and enforcement of permits	County Planning Conservation District Drain Commissioner Researchers, Engineers, and Architects Non-Profit Organizations	1-3 years after adoption of the plan
b. Enforcement of the grading levels no more than 10%	Road Commission Townships, City, Villages	Ongoing
c. Placement of vegetation and utilizing native vegetation	Conservation District Drain Commissioner Developers Non-Profit Organizations	Ongoing
d. Sand Dune Protection	County Planning Conservation District Non-Profit Conservation Organizations MI Department of Environmental Quality MI Department of Natural Resources Townships, City, Villages	1-3 years from adoption of the plan
e. Green belt buffer zones	County Planning Conservation District Non-Profit Conservation Organizations Townships, City, Villages	1-4 years from adoption of the plan
f. Enforcement of building codes		Ongoing
g. Public education	Emergency Management Coordinator County Planning Conservation District Business Owners Non-Profit Organizations Townships	Ongoing

Additional Mitigation Strategies

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
- Population density issues
- Location of public facilities and infrastructure
- Development standards for public facilities and infrastructure
- Effect of accumulated development on community systems and facilities

Monitoring and Evaluation

The Manistee County Natural Hazards Mitigation Plan describes, throughout, how existing authorities, policies, programs, and resources could be expanded on and improved to accomplish hazard mitigation for specific hazards/identified priority areas as well as general mitigation measures. The Plan will be monitored on a regular basis by the Emergency Management Coordinator and the Township Association.

To assess the effectiveness of the Plan, some questions to ask in the review include: 1) How many and which mitigation strategies were developed? Implemented? 2) Did any new natural hazards events take place the past year to report? This review will be administered by the Emergency Management Coordinator with the Local Emergency Planning Committee, the County Planning Commission, and 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 Manistee County Board of Commissioners.

XII. NATURAL HAZARDS MITIGATION PLAN ADOPTION RESOLUTION

Resolution #2015-12
Manistee County Board of Commissioners

HAZARD MITIGATION PLAN ADOPTION RESOLUTION

At a regular meeting of the Manistee County Board of Commissioners held in the Manistee County Courthouse & Government Center, 415 Third Street, Manistee, Michigan, on the 16th day of June, 2015.

PRESENT: Bergstrom, Dontz, Goodman, Hilliard, Marshall, Schmidt, Shafer

ABSENT: None

The following resolution was offered by Marshall and seconded by Shafer:

WHEREAS, the community of Manistee, Michigan has experienced risks that may damage commercial, residential and public properties, displace citizens and businesses, close streets and impair infrastructure, and present general public health and safety concerns; and

WHEREAS, the community of Manistee has prepared a *Hazard Mitigation Plan* that outlines the community's options to reduce damages and impacts from natural and technological hazards; and

WHEREAS, the *Hazard Mitigation Plan* has been reviewed by community residents, business owners, and federal, state and local agencies, and has been revised where appropriate to reflect their concerns;

NOW, THEREFORE, BE IT RESOLVED THAT, The *Hazard Mitigation Plan* is hereby adopted as an official plan of Manistee County;

BE IT FURTHER RESOLVED THAT, the Manistee County Emergency Management Coordinator is charged with supervising the implementation of the Plan's recommendations within the funding limitations as provided by the Manistee County Board of Commissioners or other sources.

STATE OF MICHIGAN)
)ss.
COUNTY OF MANISTEE)

I, Jill M. Nowak, County Clerk, do hereby certify that the foregoing is a true copy of a Resolution adopted by the Manistee County Board of Commissioners at a regular meeting held on the 16th day of June, 2015 by the following vote:

YEAS:	7	Bergstrom, Dontz, Goodman, Hilliard, Marshall, Schmidt, Shafer
NAYS:	0	None
NOT VOTING:	0	None

I further certify that the foregoing Resolution is a true, correct and complete transcript of the original of said Resolution appearing on file and of record in my office. I further certify that the meeting was held and the minutes therefore were filed in compliance with Act No. 267 of the Public Acts of 1976.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the Seal of the County of Manistee this 16th day of June, 2015

CLERK OF THE COUNTY COMMISSION
MANISTEE COUNTY, MICHIGAN

Jill M Nowak
Jill M. Nowak, County Clerk

[rn h:\resolutions\2015-12 Mitigation Plan]

XIII. APPENDICES

Appendix A

Glossary of Mitigation Planning Terms

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

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

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

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

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

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

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

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

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

Hazard: An event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss.

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

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

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

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

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

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

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

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

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

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

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

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

Tornado Classifications:

F-Scale Number	Intensity Phrase	Wind Speed	Type of Damage Done
F0	Gale tornado	40-72 mph	Some damage to chimneys, breaks branches off trees, pushes over shallow-rooted trees, damages sign boards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed, peels surface off roofs, mobile homes pushed off foundations or overturned, moving autos pushed off the roads, attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted, light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well constructed houses, trains overturned, most trees in forest uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled, structures with weak foundations blown off some distance, cars thrown and large missiles generated.
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate, automobile sized missiles fly through the air in excess of 100 meters, trees debarked, steel reinforced concrete

			structures badly damaged.
F6	**Inconceivable tornado**	**319-379 mph**	**These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not 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.

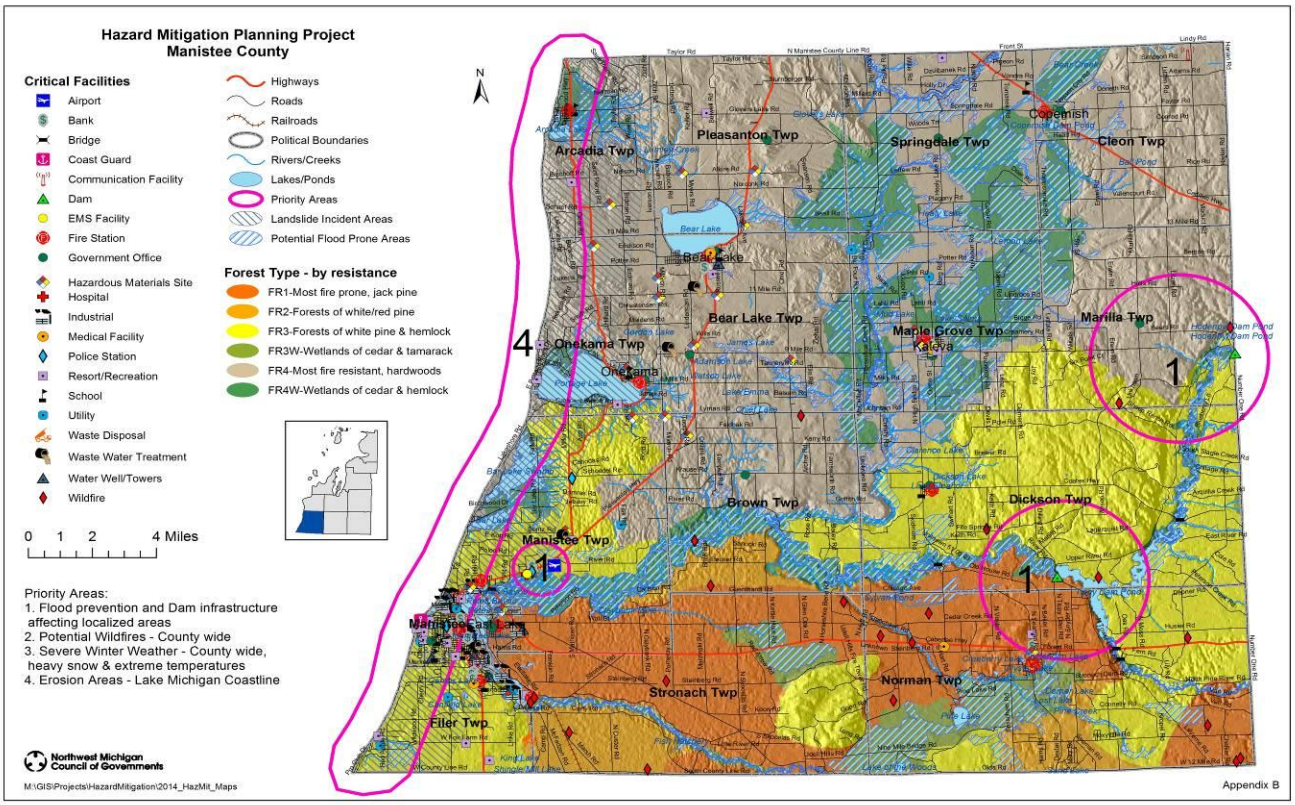
Urban/wildland interface: A developed area, also known as the "I-zone," occupying the boundary between an urban or settled area and a wildland characterized by vegetation that can serve as fuel for a forest fire.
Vulnerability: The level of exposure of human life and property to damage from natural hazards.

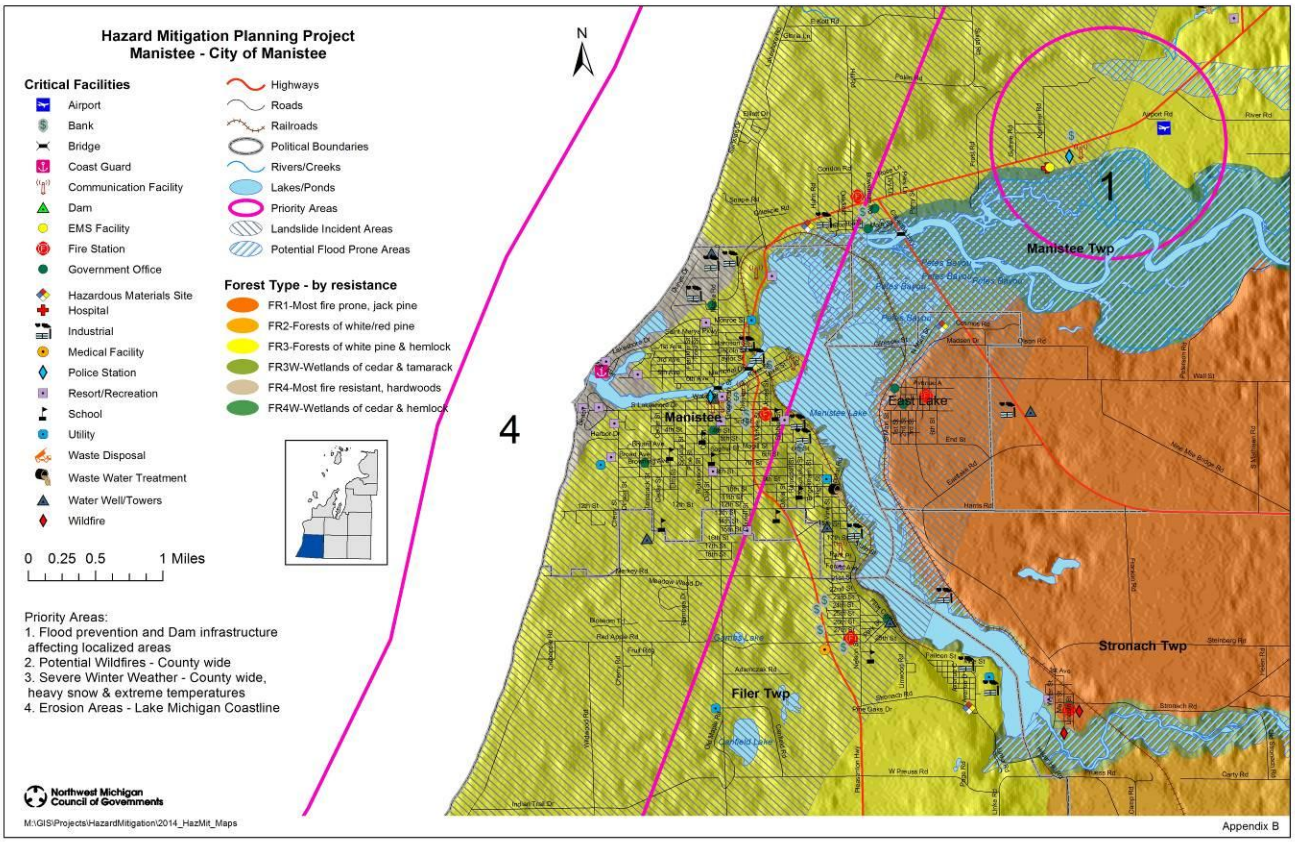
Watershed management: The implementation of a plan or plans for managing the quality of flow of water within a watershed, the naturally defined area within which water flows into a particular lake or river or its tributary. The aims of watershed management are holistic and concern the maintenance of 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





Hazard Mitigation Planning Project
Manistee Northeast

Critical Facilities
- Airport
- Bank
- Bridge
- Coast Guard
- Communication Facility
- Dam
- EMS Facility
- Fire Station
- Government Office
- Hazardous Materials Site
- Hospital
- Industrial
- Medical Facility
- Police Station
- Resort/Recreation
- School
- Utility
- Waste Disposal
- Waste Water Treatment
- Water Well/Towers
- Wildfire

- Highways
- Roads
- Railroads
- Political Boundaries
- Rivers/Creeks
- Lakes/Ponds
- Priority Areas
- Landslide Incident Areas
- Potential Flood Prone Areas

Forest Type - by resistance
- FR1-Most fire prone, jack pine
- FR2-Forests of white/red pine
- FR3-Forests of white pine & hemlock
- FR3W-Wetlands of cedar & tamarack
- FR4-Most fire resistant, hardwoods
- FR4W-Wetlands of cedar & hemlock

N

0 0.5 1 2 Miles

Priority Areas:
1. Flood prevention and Dam infrastructure affecting localized areas
2. Potential Wildfires - County wide
3. Severe Winter Weather - County wide, heavy snow & extreme temperatures
4. Erosion Areas - Lake Michigan Coastline

Northwest Michigan Council of Governments

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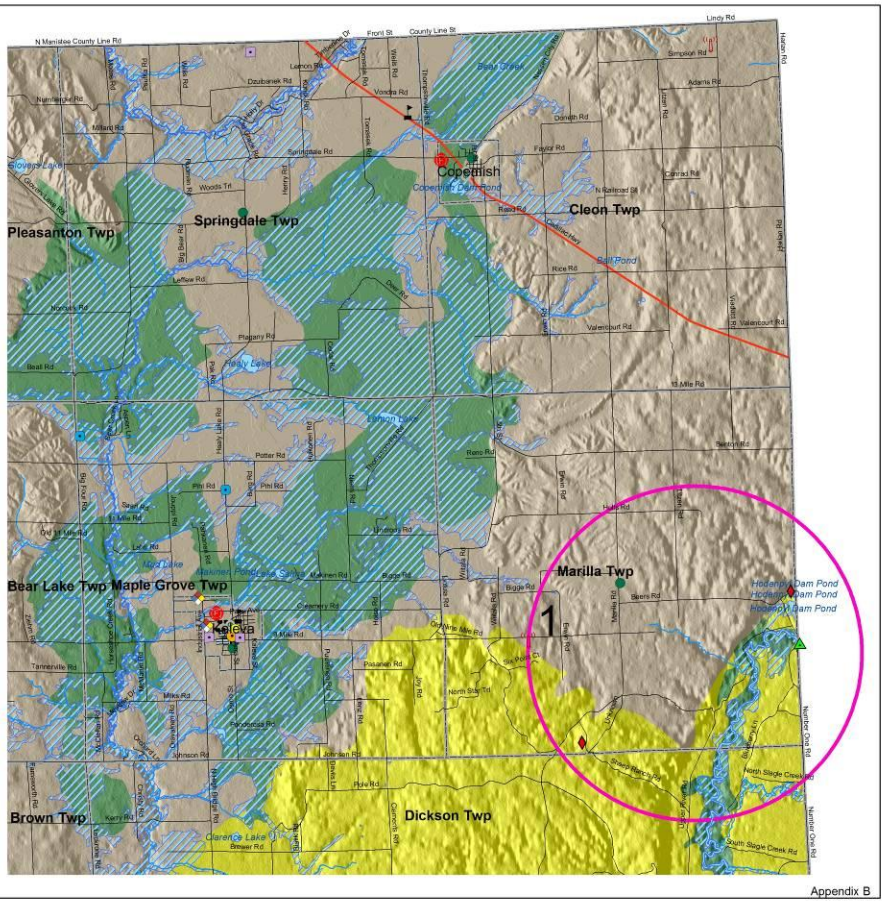

Appendix B

Hazard Mitigation Planning Project
Manistee - Northwest

Critical Facilities
- Airport
- Bank
- Bridge
- Coast Guard
- Communication Facility
- Dam
- EMS Facility
- Fire Station
- Government Office
- Hazardous Materials Site
- Hospital
- Industrial
- Medical Facility
- Police Station
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0 0.5 1 2 Miles

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1. Flood prevention and Dam infrastructure affecting localized areas
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3. Severe Winter Weather - County wide, heavy snow & extreme temperatures
4. Erosion Areas - Lake Michigan Coastline

Northwest Michigan Council of Governments

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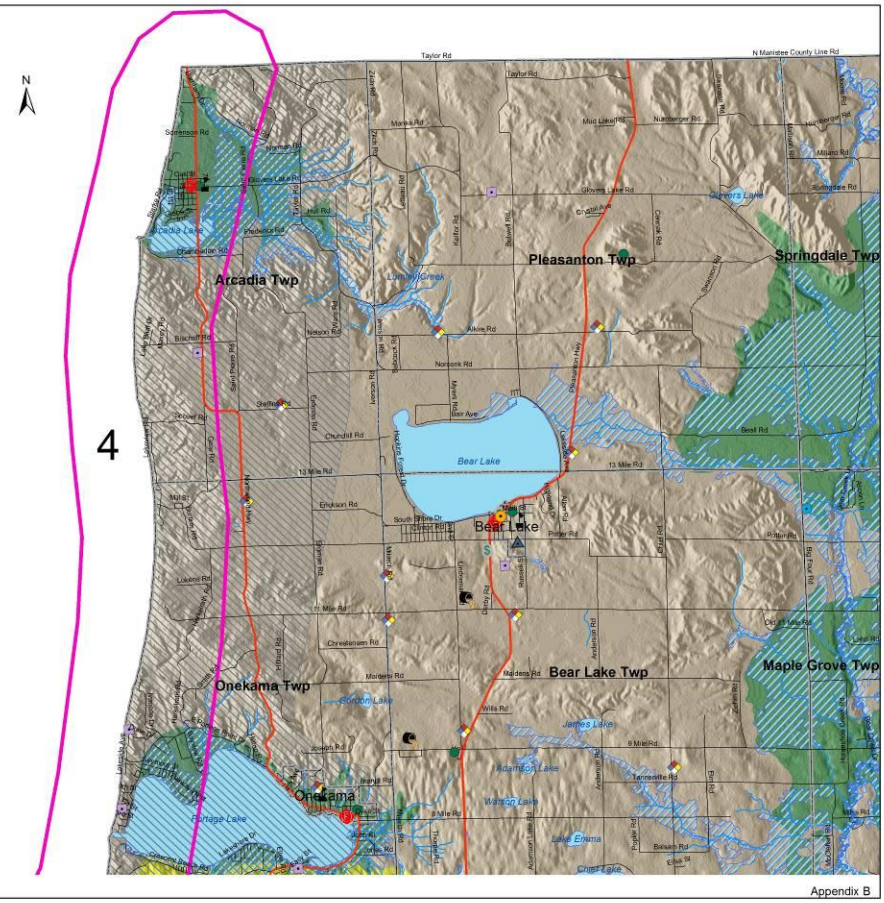
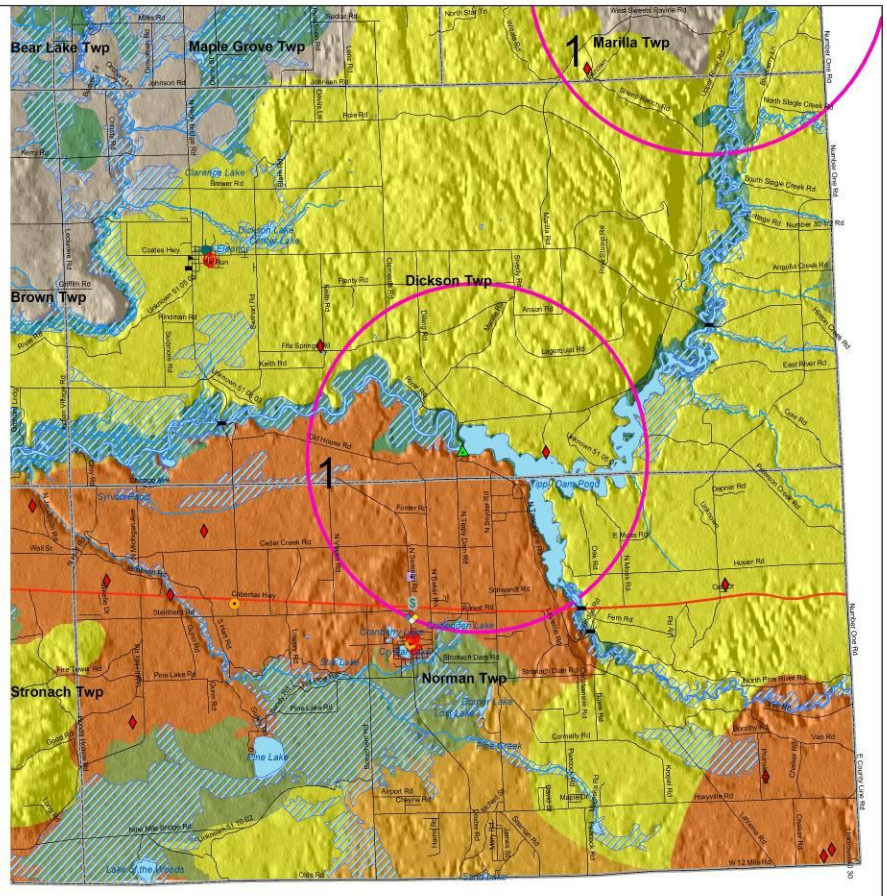


Appendix B

Hazard Mitigation Planning Project
Manistee Southeast



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0 0.5 1 2 Miles

Priority Areas:
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2. Potential Wildfires - County wide
3. Severe Winter Weather - County wide, heavy snow & extreme temperatures
4. Erosion Areas - Lake Michigan Coastline

Northwest Michigan Council of Governments

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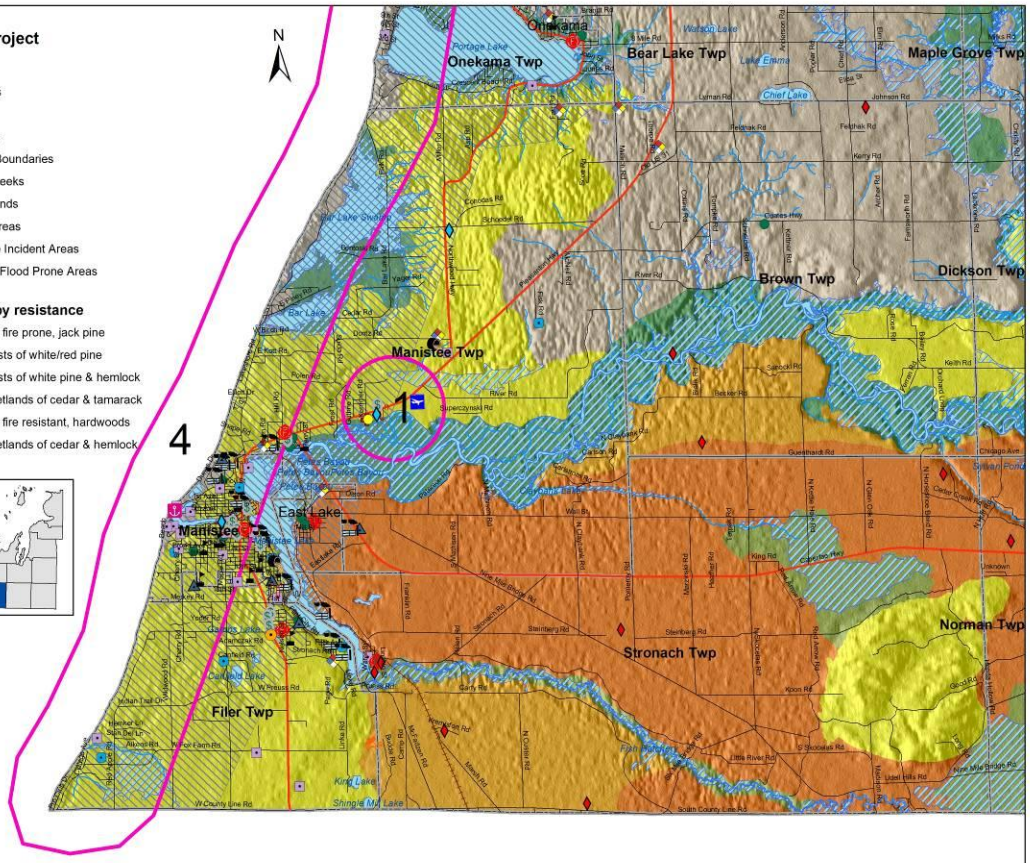
Appendix B

Hazard Mitigation Planning Project
Manistee Southwest



Critical Facilities

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0 0.5 1 2 Miles

Priority Areas:
1. Flood prevention and Dam infrastructure affecting localized areas
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3. Severe Winter Weather - County wide, heavy snow & extreme temperatures
4. Erosion Areas - Lake Michigan Coastline

Northwest Michigan Council of Governments

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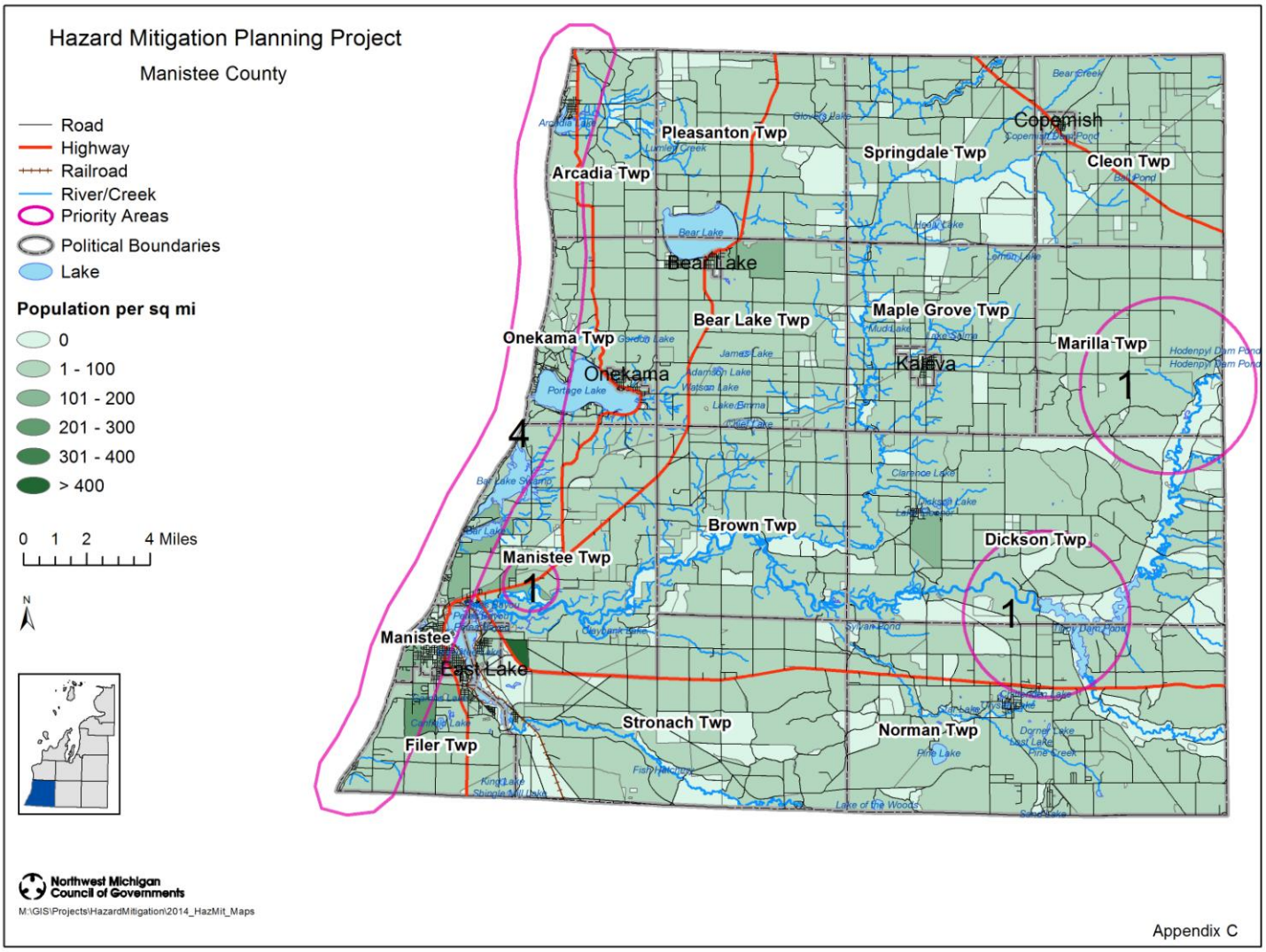
Appendix B

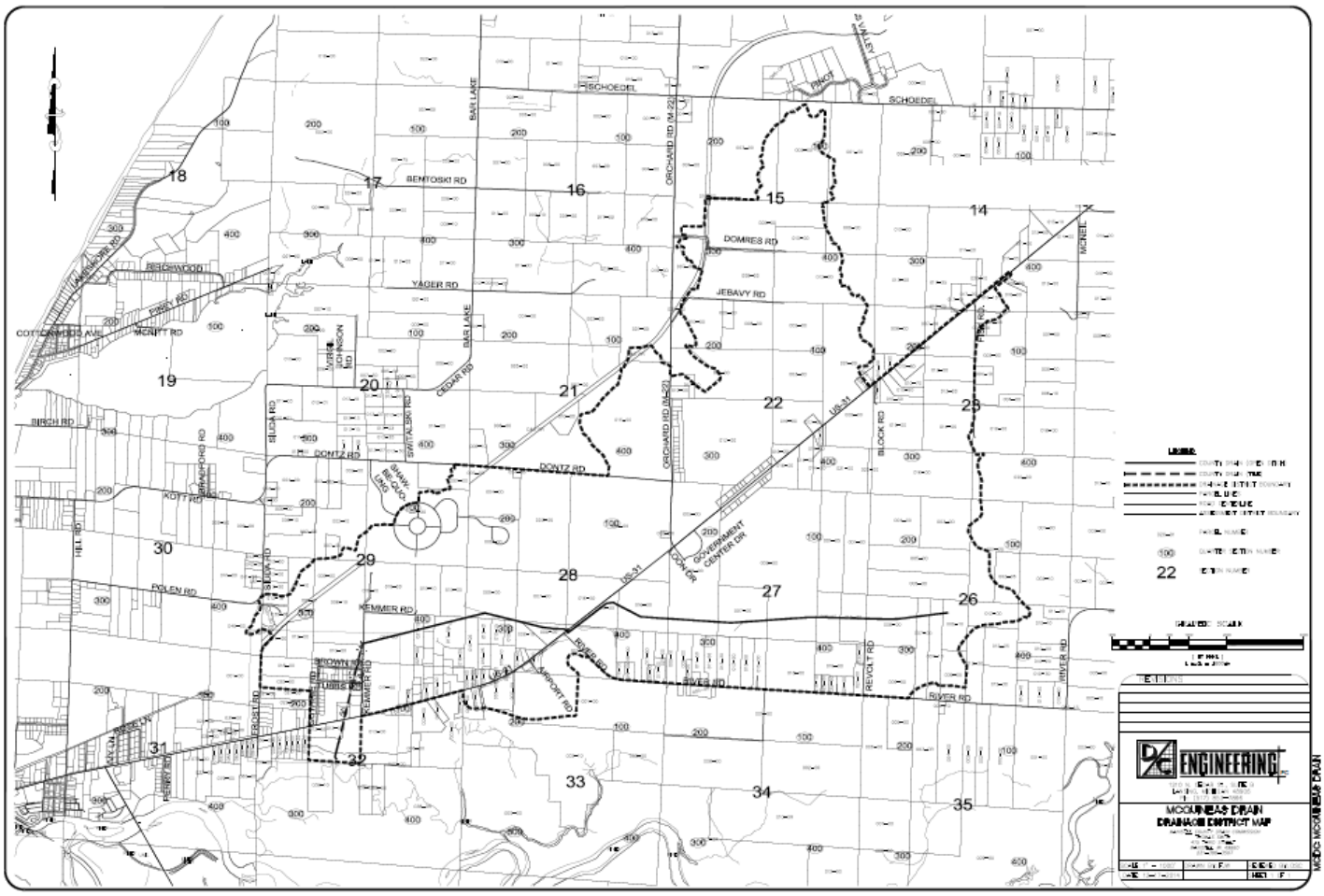
Appendix C

Population Density Map



Appendix D

Manistee County Drainage District Map



Appendix E

Risk Assessment Summary Table: MANISTEE COUNTY

HAZARD (Years of Record)	Number of Events	Probability**	Geographic Size Affected	Population Impacted	Specific Priority	Estimated Damage Known Costs
Flooding (1993 – 2014)	11 events	Frequent	Manistee Township Marilla Township Dickson Township Brown Township	6,187	1	$1,525,000 ($5,000,000 regionwide)
Hail (1973 – 2014)	22 events	Frequent	County	24,733	NA	$35,000 crop
Shoreline Erosion	Various	Occasional	Filer Township Manistee Township Onekama Township Arcadia Township City of Manistee	14,573	4	Road washed out – West end of 12th St (City of Manistee)
Extreme Winter Weather (1993 – 2014)	81 events	Frequent	Countywide	24,733	3	$50,000 ($5,000,000 statewide) $10,000,000 crop regionwide)
Thunderstorms and High Winds (1966 – 2014)	47 major events	Frequent	Countywide	24,733	NA	$3,180,000
Tornadoes (1956 – 2014)	2 events	Rare	Countywide	24,733	NA	$265,000
Wildfire (1981 – 2010)	49 events	Occasional	Countywide	24,733	2	NA

***Rare* - Hazard event is likely to occur less than once every 30 years.
Occasional - Hazard event is likely to occur less than once every 5 years, but more often that once every 30 years.
Frequent - Hazard event is likely to occur more than once every 5 years.

Appendix F

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 G

Resources

Benchmarks 2014, Northwest Michigan Council of Governments

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

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 2012, EMD-PUB 103, July 2012, Emergency Management and Homeland, Security 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 2010, 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).

Platte River Watershed Management Plan, Benzie County Conservation District, April 2002.

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.