Roscommon County Hazard Mitigation Plan

September 2016

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CHAPTER 1: INTRODUCTION

Roscommon County is located in the mid-section of the lower peninsula of Michigan. The County is bordered on the north by Crawford County, on the west by Missaukee County, on the south by Gladwin and Clare Counties, and on the east by Ogemaw County. According to the U.S Census, the County covers an area of 370,951 acres or about 580 square miles. Using the 2010 US Census population figure of 24,449, the population density of the county is roughly 42 people per square mile. The County consists of eleven townships and one village. The county seat is located in the Village of Roscommon.

The main river in the county is the Muskegon River which flows on the western side of the county north to south eventually into Lake Michigan. Other major waterways are the South Branch Au Sable River, Wolf Creek, Denton Creek, and Bear Creek. Two of the largest inland lakes in Michigan are located in Roscommon County, and they are Higgins Lake and Houghton Lake. Forests, inland waters, and wetlands comprise over 90% of the County's surface area. Agricultural uses account for approximately 1.2% of the County.

North-south access is provided by I-75 in the northeast and M-18 in the middle portion of the county with US-127 on the western side of the county. East-west access is provided by M-55 through the middle of the county. Business Loop 75 spurs off M-18 through the Village of Roscommon and connects back to Interstate 75.

What is Hazard Mitigation?

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, societal, and technological hazards. Hazard mitigation, along with preparedness, response, and recovery comprise the four phases of emergency management. There is a cyclical relationship between these four phases of emergency management: a community prepares for disaster, including hazard mitigation activities, and then responds to a disaster when it occurs. Following the response, there is a transition into the recovery process, during which hazard mitigation measures can be evaluated and adopted. This in turn, improves the resilience of the community for the next incident, and so on. When successful, hazard mitigation will lessen future impacts to such a degree that succeeding occurrences will remain incidents and not become disasters.

Hazard mitigation strives to reduce the impact of hazards on people and property through the coordination of resources, programs, and authorities so that, at the very least, communities do not contribute to the increasing severity of the problem. When repairs and reconstruction are completed as quickly as possible to pre-disaster conditions, then pre-disaster conditions may simply result in a cycle of repeated damages. However, post-disaster repairs and reconstruction provide an opportunity to strengthen a community's resilience. Recovery projects can rebuild things in a safer manner, informed by the lessons of past disasters, so that future disasters will not have as much of an impact.

Hazard mitigation 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. Hazard mitigation provides the mechanism by which communities and individuals can break the cycle of damage, reconstruction, and damage again.

Recognizing the importance of reducing community vulnerability to natural and technological hazards, Roscommon County is actively addressing the issue through the development and subsequent implementation of this plan. The many benefits to be realized from this effort – protection of the public health and safety, preservation of essential services, prevention of property damage, and preservation of the local economic base, to mention just a few – will help ensure that Roscommon County remains a vibrant, safe, and enjoyable place in which to live, raise a family, and conduct business.

Under the Disaster Mitigation Act of 2000, state and local governments are required to develop local hazard mitigation plans in order to be eligible for pre- and post-disaster funding from the federal government. The Plan was prepared in accordance with the Federal Emergency Management Act (FEMA) documents: Local Mitigation Handbook and the Local Mitigation Plan Review Guide, and the Michigan State Police Emergency Management Division (MSP/EMD) publication 207: Local Hazard Mitigation Workbook.

The Roscommon County Hazard Mitigation Plan (the "Plan") serves as the foundation for hazard mitigation activities within the community. Implementation of the plan's recommendations will assist in the reduction of injuries, loss of life, and destruction of property due to natural and technological hazards. The Plan provides a path toward continuous, proactive reduction of vulnerability to the most frequent hazards that result in repetitive and often severe social, economic and physical damage. The ideal end-state would be the total integration of hazard mitigation activities, programs, capabilities, and actions into normal, day-to-day governmental functions and management practices.

Roscommon County Emergency Management Director and the Local Planning Team (LPT) worked with the East Michigan Council of Governments (EMCOG) and the MSP/EMD to develop this Plan. The intent of the Plan is to work with those familiar with Roscommon County to describe the County, and to create an action plan to protect the health, safety, and economic interests of residents through hazard mitigation, planning, awareness, and implementation.

In the Plan, the hazard analysis section describes the major categories of hazards that affect Roscommon County (and provides some additional information about lesser hazards). The analysis of hazards makes use of community profile information that includes a description of community organization and potential resources. The major hazards have been identified as severe weather, geological threats, fires, floods/drought, hazardous materials, infrastructure problems, public health emergencies, transportation incidents, seasonal population shifts, and civil unrest and war. For each of the major hazards, the following is provided:

- Description of the hazard;
- Explanation of how it affects the County;
- Requirements/Rules affecting the County;
- Hazard mitigation Goal(s) that that have been identified; and
- Description and explanation of the Action Item proposed.

This new Plan updates the previous Roscommon County Hazard Mitigation Plan that was approved in 2007. This process began in 2012, as recertification of the Hazard Mitigation Plan shall take place at least once every five (5) years. It has been modified so that it is easier to find and use information contained

within it. This should be helpful for stakeholders to more easily find and review the information that is most relevant for their jurisdictions and areas of expertise/interest.

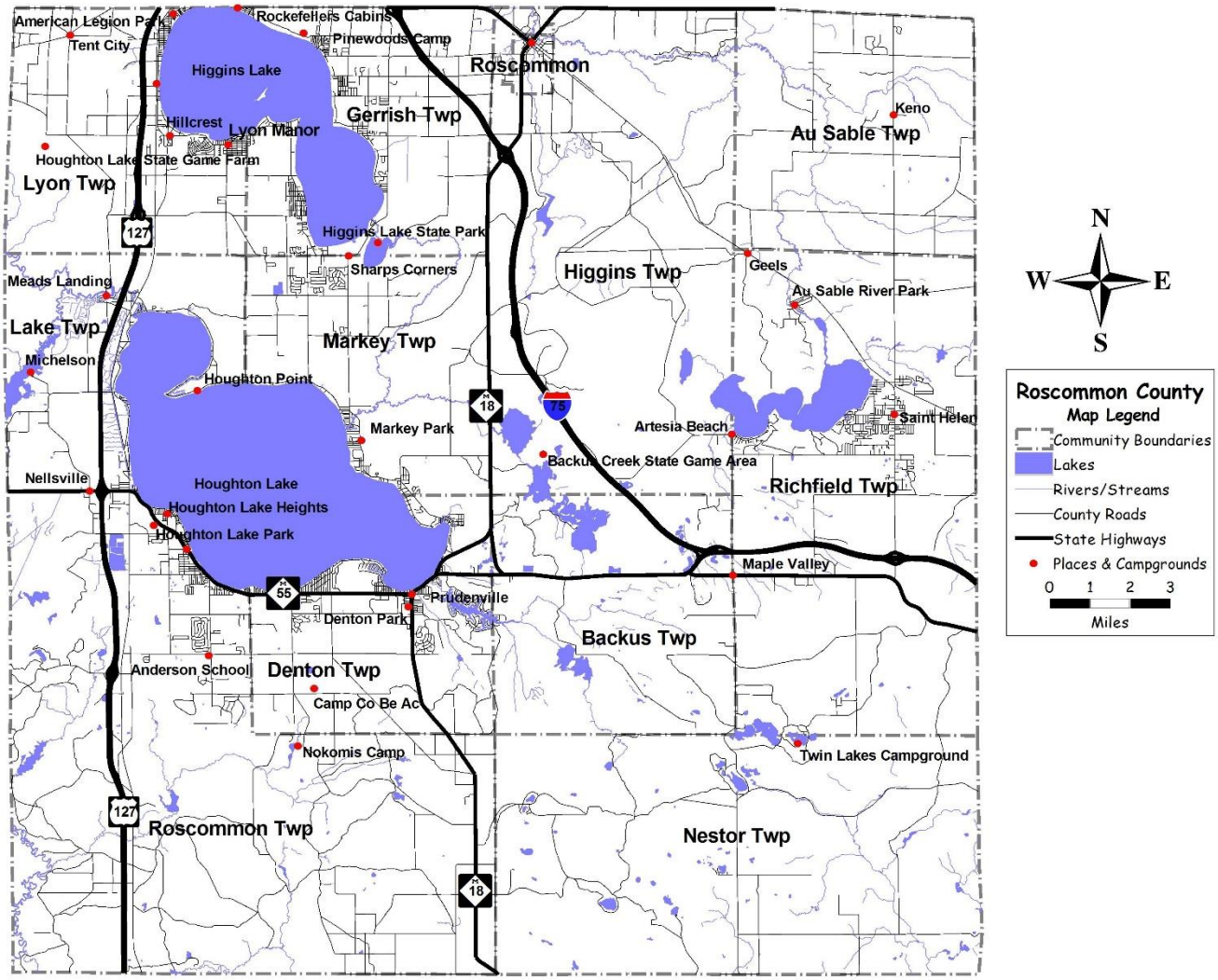
Certain information that is considered confidential or too sensitive for widespread public distribution has been kept out of this document, and will only be distributed at the discretion of the Roscommon County Office of Emergency Management.

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 their technical assistance and contributions of time and ideas this plan could not have been completed.

A map of Roscommon County identifying the local units of government follows.

Roscommon County Governmental Agencies

MAP 1.1



Executive Summary

The Plan was created to protect the health, safety, and economic interests of the Roscommon County residents and businesses by reducing the impacts of natural and technological hazards through hazard mitigation planning, awareness, and implementation. The Plan serves as the foundation for hazard mitigation activities and actions within Roscommon County. Implementation of recommendations will reduce loss of life, destruction of property, and economic losses due to natural and technological hazards. The Plan provides a path toward continuous, proactive reduction of vulnerability to hazards which result in repetitive and oftentimes severe social, economic, and physical damage. The ideal end state is full integration of hazard mitigation concepts into day-to-day governmental and business functions and management practices.

This Plan employs a broad perspective in examining multi-hazard mitigation activities and opportunities in Roscommon County. Emphasis is placed on hazards which have resulted in threats to the public health, safety and welfare, as well as the social, economic and physical fabric of the community. This plan addresses such hazards as floods, tornadoes, windstorms, winter storms, forest fires, structural fires, hazardous material incidents and secondary technological hazards which result from natural hazard events. Each hazard is analyzed from a historical perspective, evaluated for potential risk, and considered for possible mitigation actions. The plan also describes some of tools to be used for its implementation.

Local Units of Government
While the Hazard Mitigation Plan was completed by Roscommon County, the process to develop the Plan involved the participation of the communities within the County. Roscommon County's communities consist of one village and eleven townships. They are listed below:

Village
Roscommon

Townships
Au Sable, Backus, Denton, Gerrish, Higgins, Lake, Lyon, Markey, Nester, Richfield, Roscommon

Roscommon County Community Information and Participation Status

TABLE 1.1

Community Name	2000 Pop.	2010 Pop.	Change	Participated In 2006 Plan	Currently a Participant In 2015 Plan	NFIP Digitalized Map Available	NFIP Participant	NFIP Map Date
Roscommon County	25,469	24,449	-4.0%	YES	YES			
Au Sable Twp.	281	255	-9.3%			YES		
Backus Twp.	350	330	-5.7%	YES	YES	YES (Partial)	No	
Denton Twp.	5817	5557	-4.5%	YES	YES	YES	Yes	1/18/12
Gerrish Twp.	3072	2993	-2.6%	YES	YES	YES	No	
Higgins Twp.	928	857	-6.3%	YES			Yes	1/18/12
Lake Twp.	1351	1215	-10.1%	YES	YES	YES (Partial)	Yes	1/18/12
Lyon Twp.	1462	1370	-6.3%	YES	YES	YES (Partial)	No	
Markey Twp.	2424	2360	-2.6%	YES	YES	YES	No	
Nester Twp.	263	295	12.2%					
Richfield Twp.	4139	3731	-9.9%		YES	YES (Partial)	No	
Roscommon Twp.	4249	4411	3.8%	YES		YES (Partial)	No	
Village of Roscommon	1133	1075	-5.1%	YES	YES		Yes	1/18/12

CHAPTER 2: THE PLANNING PROCESS

In 2013, the Roscommon County Emergency Management staff began the update process by hosting a meeting at the Roscommon County Building with the East Michigan Council of Governments (EMCOG) staff and the Michigan State Police Emergency Management and Homeland Security Division (EMHSD) Staff. The purpose of the meeting was to advise the public and Roscommon County representatives of the need to update the 2007 Roscommon County Hazard Mitigation Plan (Plan) and the process that would be utilized.

This update was made possible after the County, along with four other counties were awarded a grant from the Federal Emergency Management Agency (FEMA) through the Michigan State Police to update their hazard mitigation plans. EMCOG staff worked with the Roscommon County Emergency Management Director and the Roscommon County Local Planning Team (RCLPT) who was designated as the steering committee for the Plan update. The RCLPT is currently led by Emergency Management Director (EMD), Mike Beaty. Prior to January 1, 2016, the position was held by Lt. Eric Tiepel, who also worked for the Roscommon County Sheriff's Department.

The RCLPT is composed of volunteers and professionals from county municipalities and various agencies located throughout the county/region, including the Michigan State Police, American Red Cross, Michigan Department of Health and Human Services, and the Department of Natural Resources.

To further promote the update and municipal participation, questionnaires and surveys were sent to the municipal governments for their input on the update process. The questionnaire sought information on the hazards and how they impacted the County. The follow-up survey sought information on the mitigation measures to address the hazards and what measures would be most beneficial for each municipality in order to mitigate the damages resulting from the hazard events. Copies of the questionnaire and survey are included in Appendix B, which also includes a summary of the questionnaire and survey responses. In addition, the EMD and EMCOG staff on two separate occasions met with Roscommon County Township officials at their monthly meetings to further encourage their participation in the monthly update meetings as well as respond to the questionnaire and survey. The responses from the municipal governments were incorporated into the final mitigation actions found in Chapter 5.

Through a series of open meetings to the public, the EMD and EMCOG staff directed the RCLPT through an assessment of the Plan in order to determine what changes, if any, would be necessary for the update. The RCLPT and municipal officials were provided meeting agendas and any accompanying memos regarding the Plan update before each meeting, at which time the agendas were also posted on the public bulletin board at the Roscommon County Building. The following table (Table 2.1) identifies the meeting dates, locations, and subject matter for the RCLPT and township association meetings. At the end of this chapter are two tables identifying the agencies represented at the meetings (Table 2.2) and the individuals at each meeting (Table 2.3). Appendix A includes the sign-in sheets for all the public meetings for this update.

Roscommon County Local Planning Team
Meeting Schedule/Discussion Topic
Table 2.1

Meeting Date	Meeting Location	Discussion Topic(s)
5-8-13	Roscommon County Building 500 Lake Street, Roscommon	Kick-off meeting with Roscommon public officials and municipal representatives to discuss Hazard Mitigation Plan update process.
7-15-14	Roscommon County Building	Initial meeting of RCLPT, they were provided an overview of the process, and a lengthy discussion took place on what hazards were and if/when they occur in Roscommon County.
8-19-14	Roscommon County Building	Discussion continued on the hazards and events that occurred in Roscommon County.
9-16-14	Roscommon County Building	Discussion on the hazards and the hazard assessment criteria was discussed.
10-21-14	Roscommon County Building	Discussion continued on the hazard assessment and the ranking criteria. (EMCOG staff was not present, and discussion was led by EMD Tiepel.
11-18-14	Roscommon County Building	Completed hazard assessment. Initiated discussion on goals and objectives for the Plan update. Bill requested information on events to be included in the Plan update.
12-16-14	Roscommon County Building	Completed discussion on goals and objectives, began a discussion on vulnerability assessment. Discussed the need to complete a municipal survey to get input on hazards and how they impact each municipality.
2-11-15	Roscommon County Road Commission 820 E. West Branch Rd., Prudenville	Meet with township officials to discuss the Plan update and requesting their input on hazards impacting each township. Advised them of their need to participate in the update process and provided them with questionnaire on local hazards.
2-17-15	Roscommon County Building	Discussed Chapter 2: Community Profile and asked for volunteers to proof. Explained that the mitigation strategies (action steps) would be discussed beginning in March and also identified that mitigation strategies would have to be developed for the update.
3-17-15	Roscommon County Building	Discussed the status of the mitigation strategies identified in the 2007 Plan.

4-21-15	Roscommon County Building	Distributed the 2007 strategies for review and comment. Initiated the 2015(6) strategies' discussion. Asked again for input on notable hazard events provided criteria for the events as approved by the EMD.
5-19-15	Roscommon County Building	Discussed events that make up the hazards, began to discuss strategies to address the events.
6-11-15	Roscommon County Building	Meeting with EMD and Assistant Director to discuss the strategies and to reduce the number to a workable number by combining ideas and eliminating redundant strategies.
7-16-15	Roscommon County Building	Meeting with EMD and Assistant Director to further reduce the strategies and to begin to develop an action list for the update.
8-18-15	Roscommon County Building	Finalized the mitigation strategies, developed the hazard priority list based on risk assessment, likelihood of occurrence, and vulnerability assessment.
9-15-15	Roscommon County Building	Finalized the priority ranking and began identifying action list items for plan update.
10-20-15	Roscommon County Building	Discussed action list items, developed a list of 19 potential items. LPT asked for a table of actions from the five counties.
10-26-15	Roscommon County Building	Met with municipal representatives for input on the plan update, discussed the need for input and the submittals of the questionnaire.
11-17-15	Roscommon County Building	Completed the list of action items, identified that high priority items would be life-safety items and property related items would receive medium/moderated ratings. Ranking within the priority would be based on the frequency of the hazard event.
1-19-16	Roscommon County Building	Completed the information for the action list items.
2-1-16	Meeting with newly appointed Drain Commissioner at the Roscommon County Building	EMD and EMCOG regional planner met with newly appointed Drainage Commissioner to advise him of the update, seek input on the action list items, and for any potential additions to the action list.

Through the meetings above, the chapters of the Plan were evaluated and modified accordingly. Below are the results of the chapter reviews for each chapter in the Plan.

- Reviewed and updated Chapter 1: Introduction. Reviewed and updated information on Roscommon County, as well as on the process. Information is included in Chapters 1: Introduction and Chapter 2: Planning Process of the update.

- Reviewed and updated Chapter 2: Environment. Reviewed and updated information on the physical characteristics of Roscommon County. Information is included in Chapter 3: Community Profile of the update.
- Reviewed and updated Chapter 3: Social Features. Reviewed, updated, and modified the social and demographic data of Roscommon County. Information is included in Chapter 3: Community Profile of the update.
- Reviewed and updated Chapter 4: Land Use Characteristics. Reviewed land use characteristics of Roscommon County. Information is included in Chapter 4: Hazard Analysis of the update.
- Reviewed and updated Chapter 5: Public Facilities and Services. Updated and reviewed the public services being available in Roscommon County. Information is included in Chapter 3: Community Profile of the update.
- Reviewed and updated Chapter 6: Advanced Analysis. Reviewed and updated the analyses for the hazards identified in Roscommon County. Information is included in Chapter 4: Hazard Analysis of the update.
- Reviewed and updated Chapter 7: Risk and Vulnerability Assessment. Reviewed and updated the risk and vulnerability assessments for Roscommon County. Information is included in Chapter 2: Planning Process of the update.
- Reviewed and updated Chapter 8: Goals and Objectives. Reviewed and updated the goals and objectives for Roscommon County. Updated goals and objectives are found in Chapter 6: Action Items.
- Reviewed and updated Chapter 9: Mitigation Strategies and Priorities. Reviewed the mitigation strategies and priorities for Roscommon County. Status of the mitigation strategies is found in Chapter 5: Evaluation of Alternatives. Updated priorities are found in Appendix C.
- Reviewed and updated Chapter 10: Approval and Implementation. Reviewed and updated the approval and implementation schedule for Roscommon County. The revised implementation process is included in Chapter 7: Follow-up.

This update process included the review of the Roscommon County Master Plan, the 2014 Michigan Hazard Mitigation Plan, county maps and studies, municipal master plans, as well as ongoing planning activities. This included the review of informational sources such as: U.S. Census, National Weather Services, master plans, emergency management plans, Michigan Department of Transportation, Michigan Department of Natural Resources, and local health departments.

In January 2016, the action list was sent to the EMHSD staff for their review and comment. This list was then sent to FEMA staff for their comments. In February, the EMD and EMCOG staff were notified that FEMA staff suggested that a larger proportion of action items involve mitigation activities rather than education and preparedness activities.

Also, in February 2016 the EMD and the EMCOG regional planner discussed the proofing of the draft document and to plan the scheduling for the approval of the Plan. This scheduling included the timing for the public hearing, the approval of the plan by EMHSD staff, FEMA staff, and the adoption of the Plan by the County Board and other municipal agencies.

On April 7, 2016 a notice was published in the Houghton Lake Resorter advising the public of the public hearing and identifying the five locations throughout the County where the plan was available for review as well as advising them that comments would be accepted for 30 days after the public hearing on April 13th. On April 13, 2016, a public hearing was held at the Roscommon County Board of Commissioners

meeting to discuss the final draft of the Plan and to seek input from the public on the draft. In addition to the public hearing letters were sent to the emergency management directors of the adjoining counties of: Clare, Gladwin, Crawford, Ogema Shafer and Missaukee County for their comments.

The only public comments that were received were regarding spelling errors, changes in elected county officials, and corrections to county information, such as area of Houghton Lake, etc. However, the Fujita Scale for tornado intensity was changed to the Enhanced Fujita Scale, based on a comment received for a different plan.

In addition to the public comments, comments were also received from the MSP/EMHSD staff. These comments/questions were addressing the following: adding information on the public hearing process, adding information on the frequency/probability of natural hazard events, adding information on properties that have repetitive losses due to flooding, report on municipalities that have their flood insurance rate maps (FIRMs) digitalized, information on communities participating in the national flood insurance program (NFIP), a brief description on the how the selection of action plan items was determined, how the selection of action plan items differed from the 2007 plan, and a reference to encourage the inclusion of hazard mitigation into comprehensive land use/master plans. These items have been addressed are included in the appropriate sections throughout the plan.

Roscommon County Local Planning Team
Attendance Table-Agency
TABLE 2.2

Participating Agency or **Jurisdiction**	Returned Questionnaire (Q) and Survey (S)	Meeting Attended																				
		5-13	7-14	8-14	9-14	10-14	11-14	12-14	2-15	2-15	3-15	4-15	5-15	6-15	7-15	8-15	9-15	10-15	10-15	11-15	1-16	2-16
East Michigan Council of Governments			X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Roscommon County	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Village of Roscommon	S						X												X			
Au Sable Township																						
Backus Township									X													
Denton Township	Q	X	X		X	X	X	X			X	X	X			X	X			X		
Gerrish Township	Q S	X						X	X	X						X		X		X	X	
Higgins Township	Q S																		X			
Lake Township	Q S	X							X										X			
Lyon Township	Q S						X		X													
Markey Township	Q								X	X												
Nester Township																						
Richfield Township	Q						X		X													
Roscommon Township	Q	X							X													
Amateur Radio	NA				X																	
American Red Cross	NA		X		X			X		X	X		X			X		X		X	X	
Central Michigan District Health Department	NA		X	X			X	X		X	X		X							X	X	
Houghton Lake Assoc.	NA								X													
Kirtland Community College	NA	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	
Michigan State Police	NA		X		X			X			X		X					X		X	X	
Michigan Department of Human Services	NA		X	X		X	X				X											
Mid-Michigan Health Park	NA					X												X		X		

Mobile Medical Response	NA																					
RAPS	NA		X		X	X																
Roscommon County 911	NA		X	X	X	X	X				X	X	X			X		X		X		
Roscommon County Drain Commission	NA																					X
Roscommon County HazMAT	NA	X	X	X	X	X	X					X						X				
Roscommon County Road Commission	NA	X						X	X									X			X	
Roscommon County Sheriff's Dept.	NA	X	X		X		X			X	X					X	X			X	X	
Salvation Army	NA																					

Jurisdictions in bold font have contributed to the Plan update.

Roscommon County Local Planning Team
Attendance Table-Individual
TABLE 2.3

Person	Agency	Local Planning Team Member	Number of Meetings Attended
Art Allen		X	
Kelly Annis	**Village of Roscommon**		**1**
Carol Asher	**Denton Township**		**2**
Mike Beaty	Roscommon County Emergency Mgmt.	X	3
Phil Bendily	Roscommon County	X	
Bill Bohlen	**Village of Roscommon**		**1**
John Card	**MSP**		**2**
Derrick Carroll	**MSP**		**1**
Fred Chidester	**Roscommon County Road Commission**		**1**
Stan Christler	**Lake Township**		**2**
Craig Cotterman	**Denton Township**		**2**
William Cromwell	**Amateur Radio**		**2**
Anna Curnalia	Salvation Army	X	
Christina Curtis	American Red Cross	X	5
Melissa DeRoche	Central Michigan District Health Dept.	X	4
Red Duggan		X	
Rick Dupon	Denton Township EMS	X	10
Bill Ernat	**EMCOG**		**16**
Ken Forst	Kirtland Community College Public Safety	X	15
Paula Fuller	**Denton Township**		**1**
Norm Fullmer	**Markey Township**		**2**
Robert Green	**Michigan State Police (MSP)**		**2**
Dave Gutierrez	American Red Cross	X	
Steve Hall	Central Michigan District Health Dept.	X	
Brian Hill	**Gerrish Township Police Dept.**		**3**
Jill Howell		X	
Susan Huffman	**American Red Cross**		**6**
Pat Inman	**Houghton Lake Lake Association**		**1**
David Johnson	**MSP**		**1**
Kathy Kent		X	
Lorelei King	**Mid-Michigan Health Park**		**3**
Nichole King		X	
Carol Laprade		X	
Josh Lator	**MSP**		**2**
James Lippert	Gerrish Township Fire Dept.	X	6
Ben Lowe	**Roscommon County Sheriff's Dept.**		**2**
Dan Lowery	**Central Michigan District Health Dept.**		**5**
Cheryl Mallard	**Roscommon County**		**1**
Joe Meadows	Roscommon Area Public Schools (RAPS)	X	3
Ken Melvin	Roscommon County Board	X	1

Paul Menghini		X	
Tim Mepham	Higgins Township Fire Dept.	X	1
Louise Nagy	**Backus Township**		**1**
Ed Nellist	**Lyon Township**		**1**
Ed Nettle	Roscommon County 911	X	3
Robert Nixon	Michigan Dept. of Human Services	X	1
Tim O'Rourke	Roscommon County Road Commission	X	5
Kathleen Patchin	**Gerrish Township**		**1**
Carrie Perialas	Roscommon County 911	X	3
Jim Porath	**Roscommon County Road Commission**		**1**
Dave Putnam		X	
Anna Reno	**Lyon Township**		**2**
Cindy Russo	**Lake Township**		**1**
David Russo	Roscommon County Board	X	3
Pamela Scott	**Richfield Township**		**1**
Dick Pederson	**Denton Township**		**1**
Bob Schneider		X	
Ron Smith	Michigan Dept. of Human Services	X	1
Mike Sobocinski	**Michigan State Police EMHSD**		**1**
Ed Stern	Roscommon County Sheriff's Dept.	X	5
Barb Stevenson	**Roscommon Township**		**2**
Michelle Stevenson	Roscommon County	X	2
Randy Stevenson	Roscommon County Sheriff's Dept.	X	3
Vance Stringham	Roscommon County 911	X	3
Dennis Szagesh	Michigan Dept. of Human Services	X	3
Frank Thibert	Roscommon County HazMat	X	8
Marie Thompson		X	
Eric Tiepel	Roscommon County Emergency Mgmt./ Sheriff's Dept.	X	18
Paul Tiepel	Denton Township Fire Dept.	X	8
Dave Tuck		X	
Leasa Tugetske	**Gerrish Township**		**1**
Sheryl Tussey	**Markey Township**		**1**
Rex Wolfson	**Roscommon County Drain Commissioner**		**1**
James Van Wormer	**Richfield Township**		**1**

Bold print denotes a person not on the RCLPT

CHAPTER 3: COMMUNITY PROFILE

NATURAL FEATURES OF ROSCOMMON COUNTY

Roscommon County is in the mid-section of the lower peninsula of Michigan. The County is bordered on the north by Crawford County, on the west by Missaukee County, on the south by Gladwin and Clare Counties, and on the east by Ogemaw Counties. The County covers an area of 370,951 acres or about 580 square miles. Using the 2000 US Census population figures, the population density of the county is roughly 43.9 people per square mile. The County consists of eleven townships, one village, and three Census-designated Places (CDPs). The county seat in located in the Village of Roscommon. The Information on the CDPs were not separated out, but included in the appropriate township information.

The main river in the county is the Muskegon River which flows on the western side of the county north to south eventually into Lake Michigan. Other major waterways are the South Branch Au Sable River, Wolf Creek, Denton Creek, and Bear Creek. Two of the largest inland lakes in Michigan are located in Roscommon County, and they are Higgins Lake and Houghton Lake. Forests, inland waters, and wetlands comprise over 90% of the County's surface area. Agricultural uses account for approximately 1.2% of the area. Also there are many residential areas along the lakeshores of Higgins Lake, Houghton Lake, and Lake St. Helen.

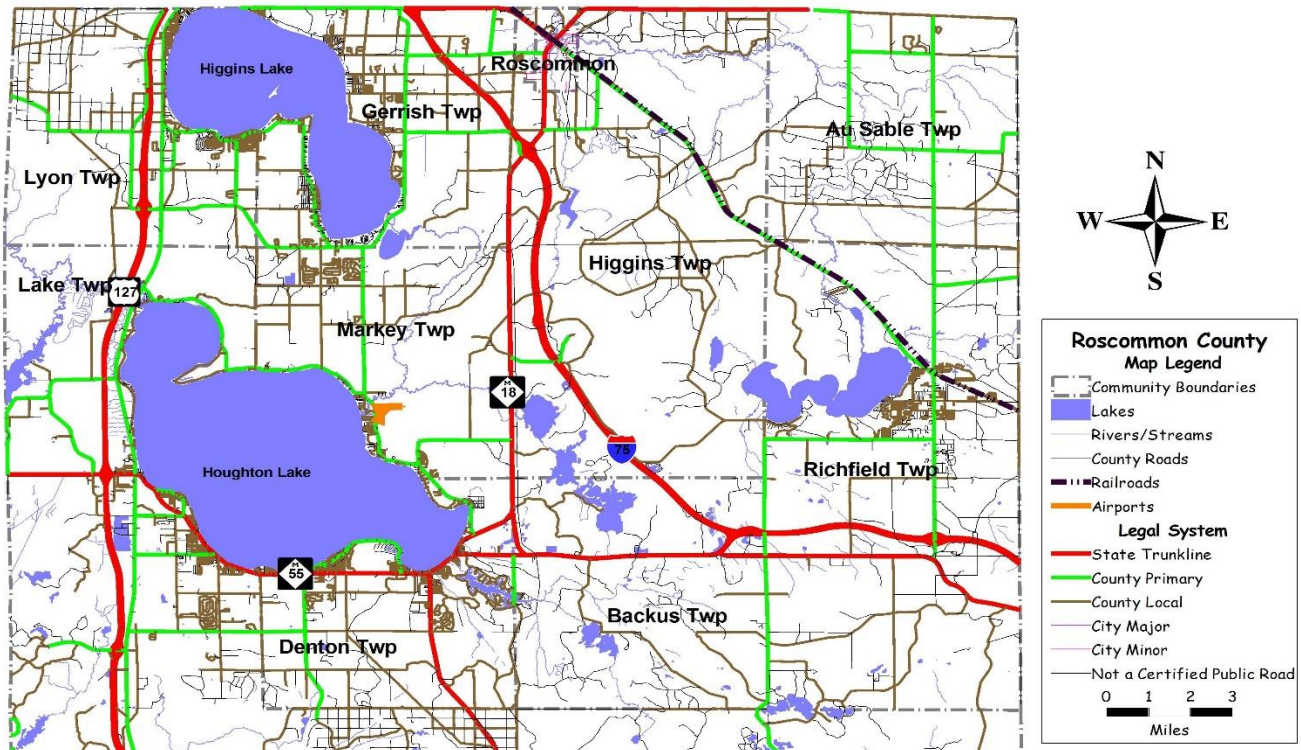
North-south access is provided by I-75 in the northeast and M-18 in the middle portion of the county with US-127 on the western side of the county. East-West access is provided by M-55 through the middle of the county. Business Loop 75 spurs off M-18 through the Village of Roscommon and connects back to Interstate 75.

Roscommon County contains twelve (12) local units of government, including eleven (11) townships, one incorporated village and no cities. The Village of Roscommon is the County seat. These communities are represented by a five (5) member Roscommon County Board of Commissioners which cover as many districts. The 2010 census of the County was 24,449.

Roscommon County is covered by District 7 of the Emergency Management & Homeland Security Division of the Michigan State Police.

Roscommon County

MAP 3.1



Roscommon County Population

TABLE 3.1

Municipality	2000 Population	2010 Population	Change in population
Au Sable Twp.	281	255	-9.3%
Backus Twp.	350	330	-5.7%
Denton Twp.	5817	5557	-4.5%
Gerrish Twp.	3072	2993	-2.6%
Higgins Twp.	928	857	-6.3%
Lake Twp.	1351	1215	-10.1%
Lyon Twp.	1462	1370	-6.3%
Markey Twp.	2424	2360	-2.6%
Nester Twp.	263	295	12.2%
Richfield Twp.	4139	3731	-9.9%
Roscommon Twp.	4249	4411	3.8%
Village of Roscommon	1133	1075	-5.1%
TOTAL	25,469	24,449	-4.0%

Source: 2000 and 2010 U.S. Census

Higgins Township population does not include the population of the Village of Roscommon.

Principal Employers In Roscommon County

TABLE 3.2

EMPLOYER	NO. OF EMPLOYEES
Lear Corporation	470
Roscommon County	180
COOR ISD	120
Kirtland Community College	160
Home Depot	105
King Nursing & Rehabilitation	62
Kmart Corporation	46
Walmart	185
Houghton Lake School District	222
Roscommon School District	119

Source: Region 7B Michigan Works – Top Employers as of January 2013

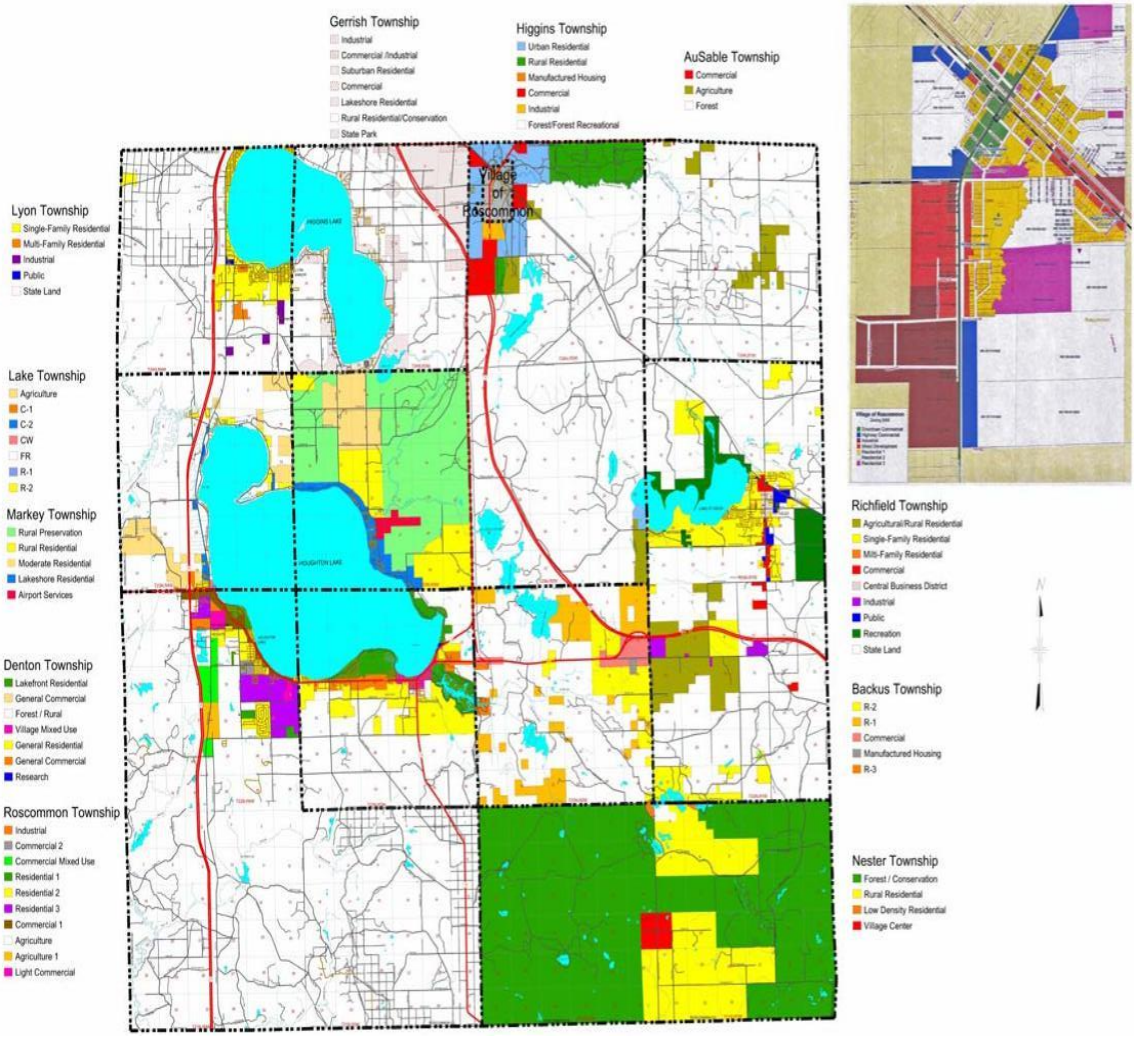
LAND USE

Roscommon County covers 580 square miles, or some 370,951 acres. The major land use is forest land which covers 70.3% of the county. Approximately 1.2% is devoted to agricultural production. The majority of development in Roscommon County is located near the Village of Roscommon, St. Helen CDP, Prudenville CDP, Houghton Lake CDP, and around the lakes. Urbanized areas take up approximately 4.3% of the County's land area. The majority of development in urbanized areas involves tourist and resort

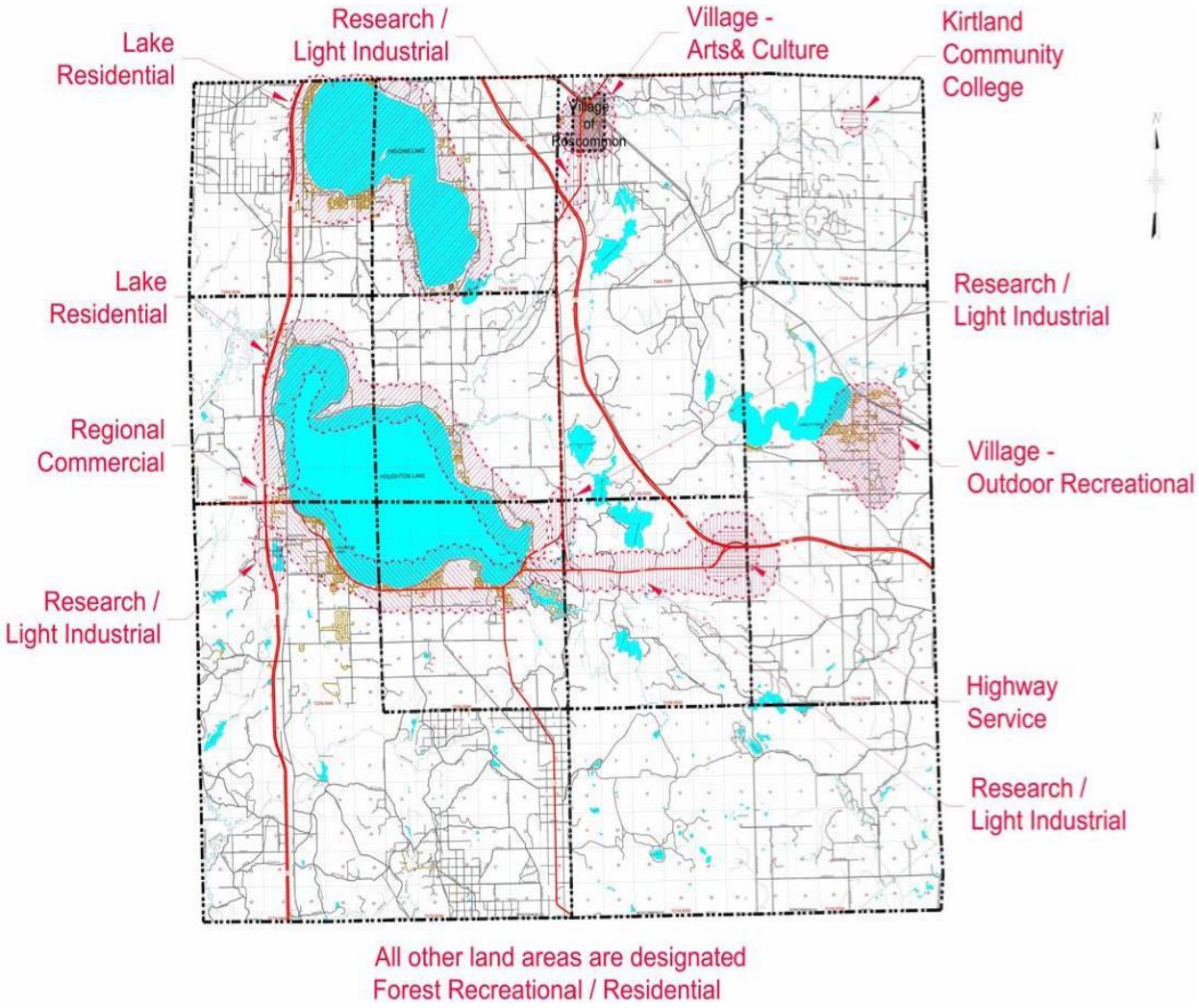
attractions. Inland waters and wetlands comprise over 20.2% of the County's surface area. All of the townships and cities in Roscommon County separately have prepared Land Use and/or Zoning Ordinances.

Roscommon County Current Land Use Map

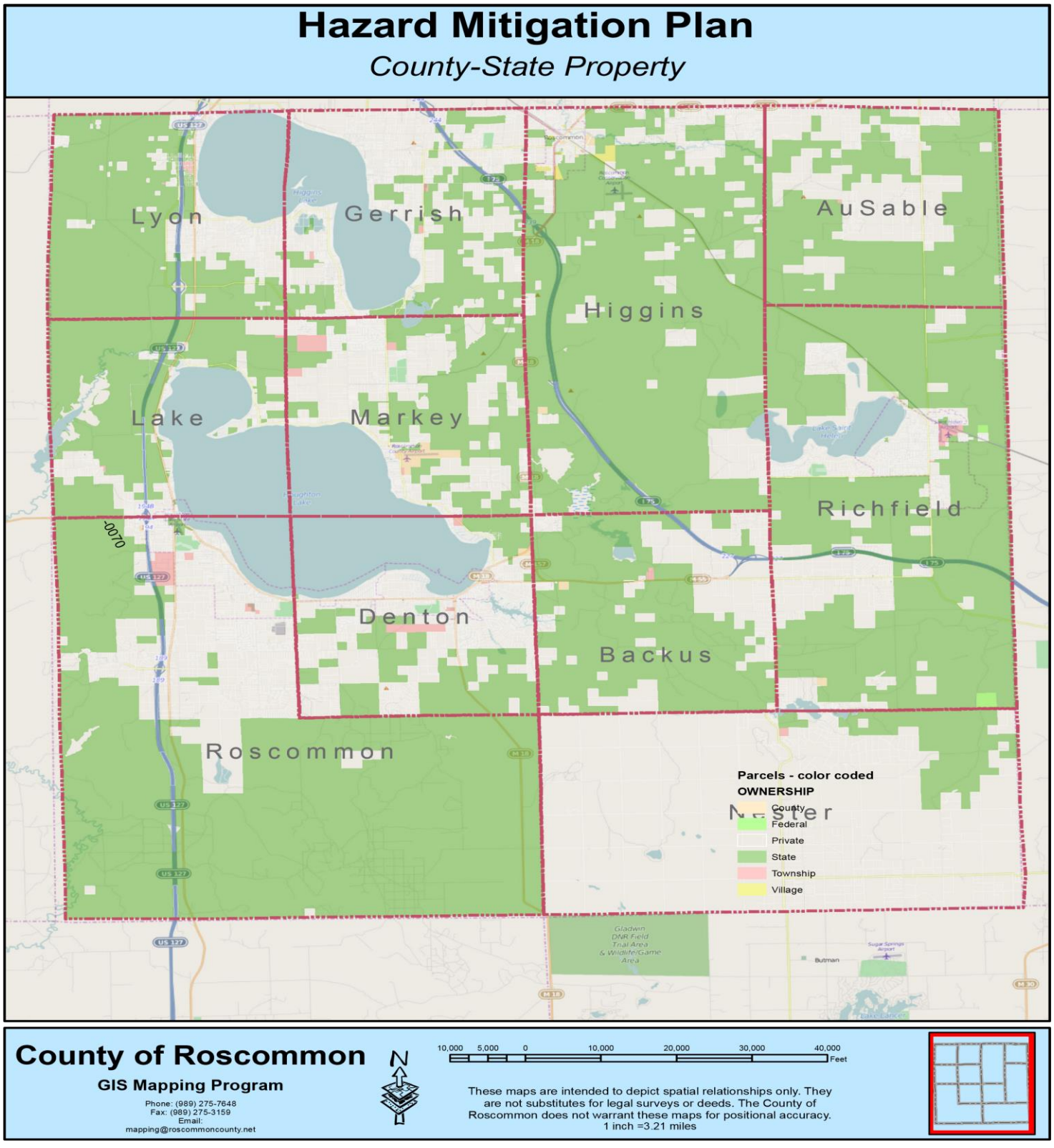
MAP 3.2



ROSCOMMON COUNTY FUTURE LAND USE
MAP 3.3



Roscommon County State/County-Owned Land
MAP 3.4

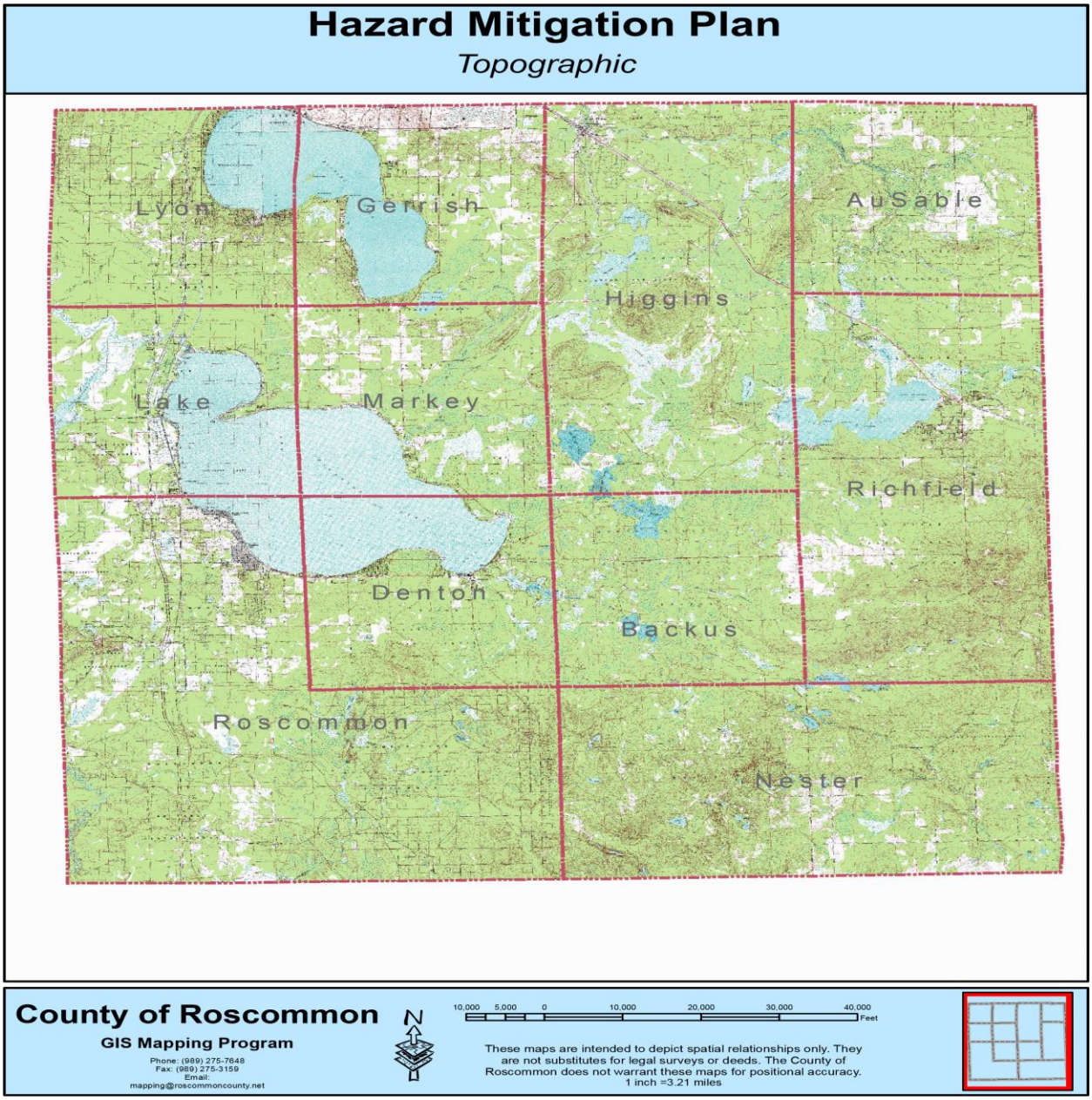


NATURAL FEATURES - TOPOGRAPHY

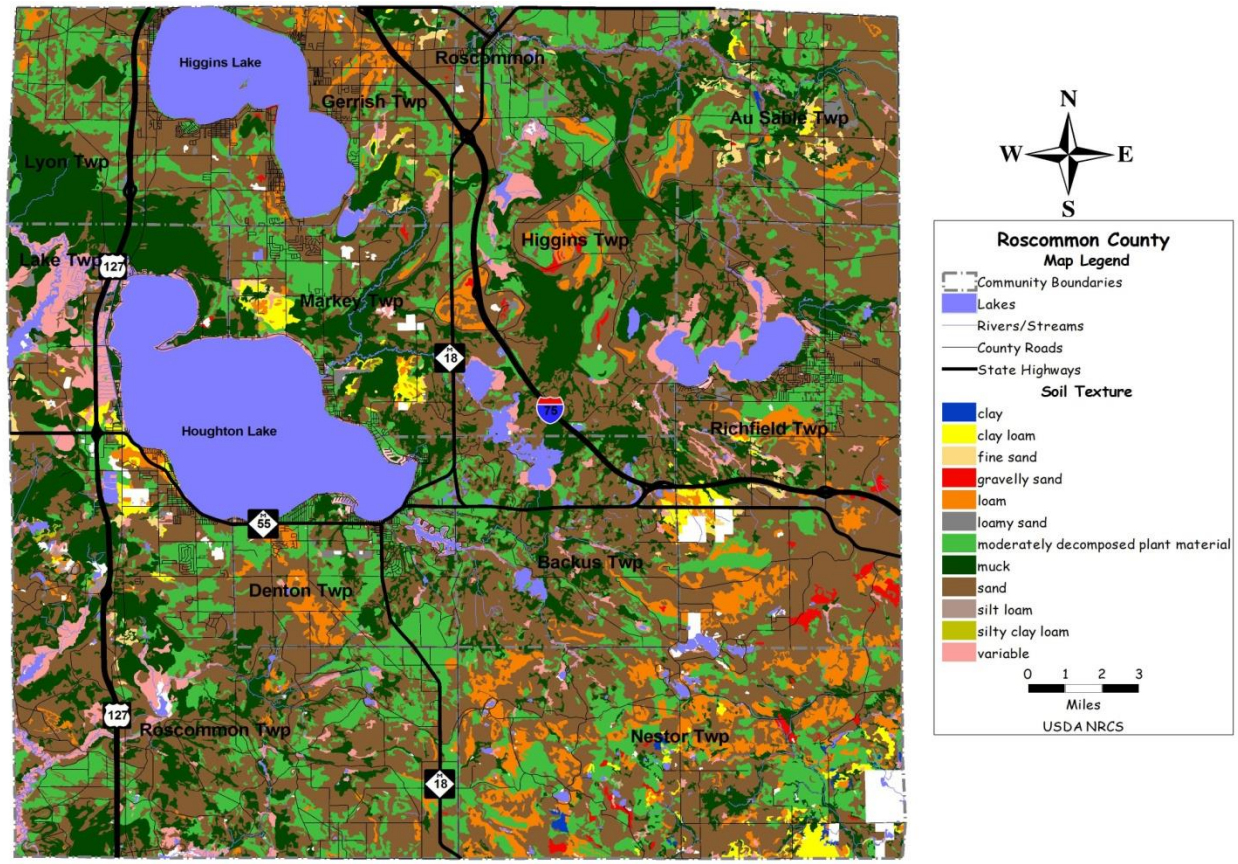
Topography

Roscommon County's topography will indicate a total relief of about 721 feet with the lower points being at the southeast corner with an elevation of 853 ft. Elevations increased moving in towards the northeastern area of the county with an area of steeper slopes and an elevation of 1,574 feet. Generally speaking, the terrain in the county varies from flat areas to gently rolling or hilly areas. The most significant relief and topographic features can be seen in the southeastern area of the county.

Roscommon County Topographic Map
MAP 3.5



Roscommon County General Soils Map
MAP 3.6



CLIMATE

Roscommon County's climate varies greatly throughout the year, as does most of Michigan. In the winter the average temperature is 20.1 degrees F, with the lowest recorded temperature being –48 degrees F on February 1, 1918. In the summer the average temperature is 65.6 degrees, with the record high of 107 degrees on June 1, 1934. Total annual precipitation is 28.8 inches. The most precipitation falls between April and September adding up to 17.5 inches. Most thunderstorms occur in the month of July with an average of about 28 days of each year. The heaviest one-day rainfall of record fell on July 8, 1957 -- 5.18 inches. The average snowfall is 64 inches. On average, 108 days a year have at least one inch of snow on the ground. The greatest recorded seasonal snowfall of 124.1 inches fell in the winter of 1970-71. The lowest recorded seasonal snowfall was 24.0 inches in 1936-37.

The National Weather Service office at Houghton Lake (Roscommon County Airport) reports that the average relative humidity in mid-afternoon is about 64%. Humidity is higher at night, and average at dawn is about 85%. The sun shines 68 percent of time possible in summer and 32% in winter. The prevailing wind is from the southwest. Average wind speed is highest, 10.1 miles per hour, in January.

Freezing temperatures typically include the months of November through March with occasional freezes in September, April and May. The frost-free season is about 120 days. The average last killing frost is June 10th and the earliest is September 10th but killing frosts have been recorded in every month of the year.

These climate factors, as well as the relatively poor quality of soils for agriculture previously discussed, have made attempts to farm in Roscommon County mostly unsuccessful. There are still a few cattle raising operations, but, by and large, the county has developed as part of a residential, tourism and light industrial region.

Water Features and Estimated Floodplains

Roscommon County has a variety of water features such as rivers, streams, lakes and wetlands. The County has about 36,207 acres of lake surface and 38,617 acres of wetlands. Together they account for 20.2% of the County's total acreage.

Seventeen lakes are more than 100 acres within the County and provide ample opportunity for water related activities such as fishing and boating. The most significant lakes include: Houghton Lake (20,040 acres), Higgins Lake (10,160 acres), Lake Saint Helen, Marl Lake, Backus Lake, Robinson Lake, Lake James, West Twin Lake, Shadow Lake, and Russell Lake.

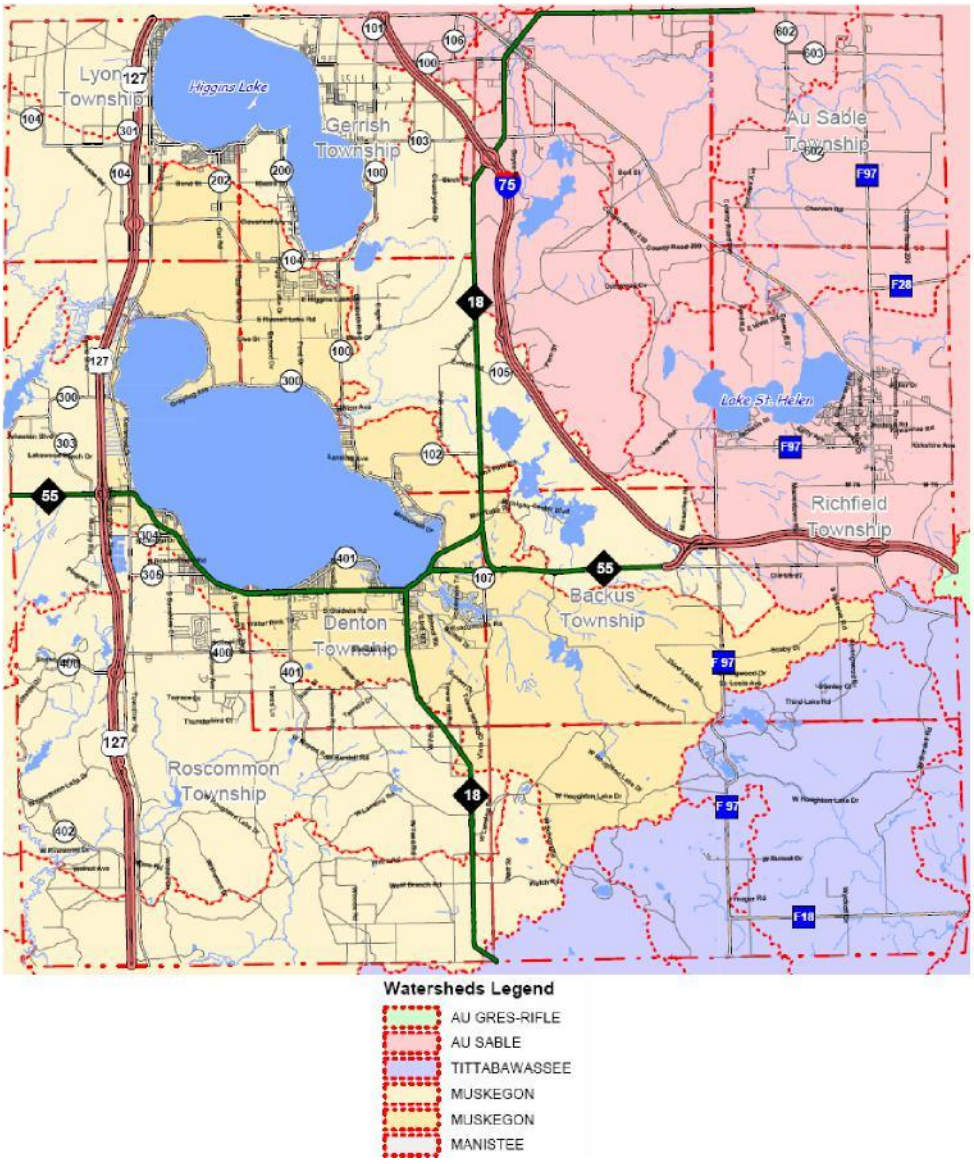
There are three watersheds that are within the county. Those watersheds are the Muskegon, Au Sable, and Tittabawasee. The Au Sable and Tittabawasee Watersheds eventually drain into Lake Huron while the Muskegon eventually drains into Lake Michigan.

Wetlands are defined by the existence of water, either on or near the surface for a portion of the year and by the type of vegetation is present. Wetlands may have many names and are often referred to as bogs, marshes, and swamps. Wetlands are an important resource to the people of Roscommon County. They improve the water quality of lakes and streams by filtering polluting nutrients and chemicals. More importantly, wetlands recharge aquifers, support wildlife and vegetation, and protect shorelines from erosion. The western side of the county has a significant amount of wetlands that cover large continuous areas along the Muskegon River. The middle of the township has a considerable amount of wetlands including a large area located around Lake Saint Helen. The townships that have considerable amount of wetlands include Lake Twp, Roscommon Township, Markey Township, Backus Township, Higgins Township, and Richfield Township.

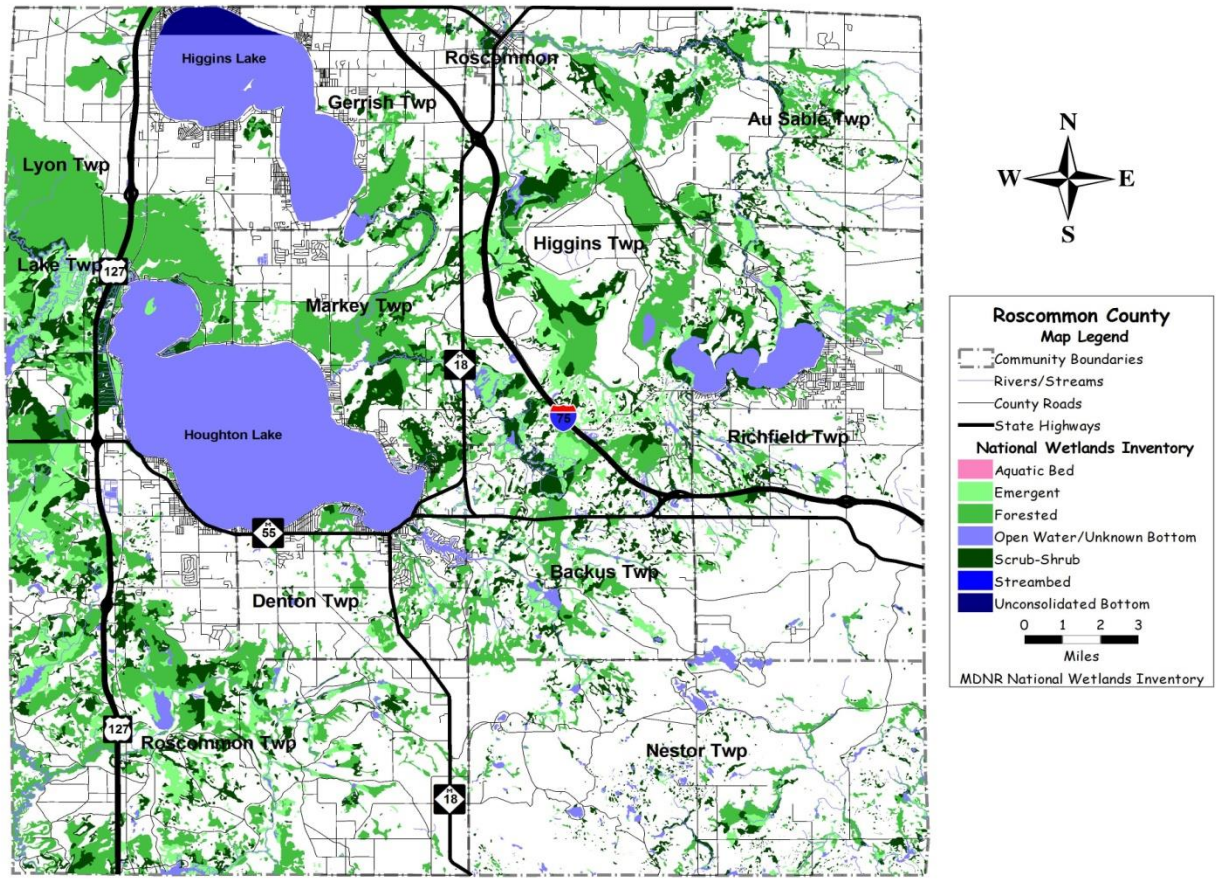
Roscommon County has many flood prone areas. These municipalities are in FEMA's National Flood Insurance Program: Denton Twp, Higgins Twp, Lake Twp, and Village of Roscommon.

Roscommon County Watersheds

MAP 3.7



Roscommon County Wetlands Map
MAP 3.8



Forest Cover

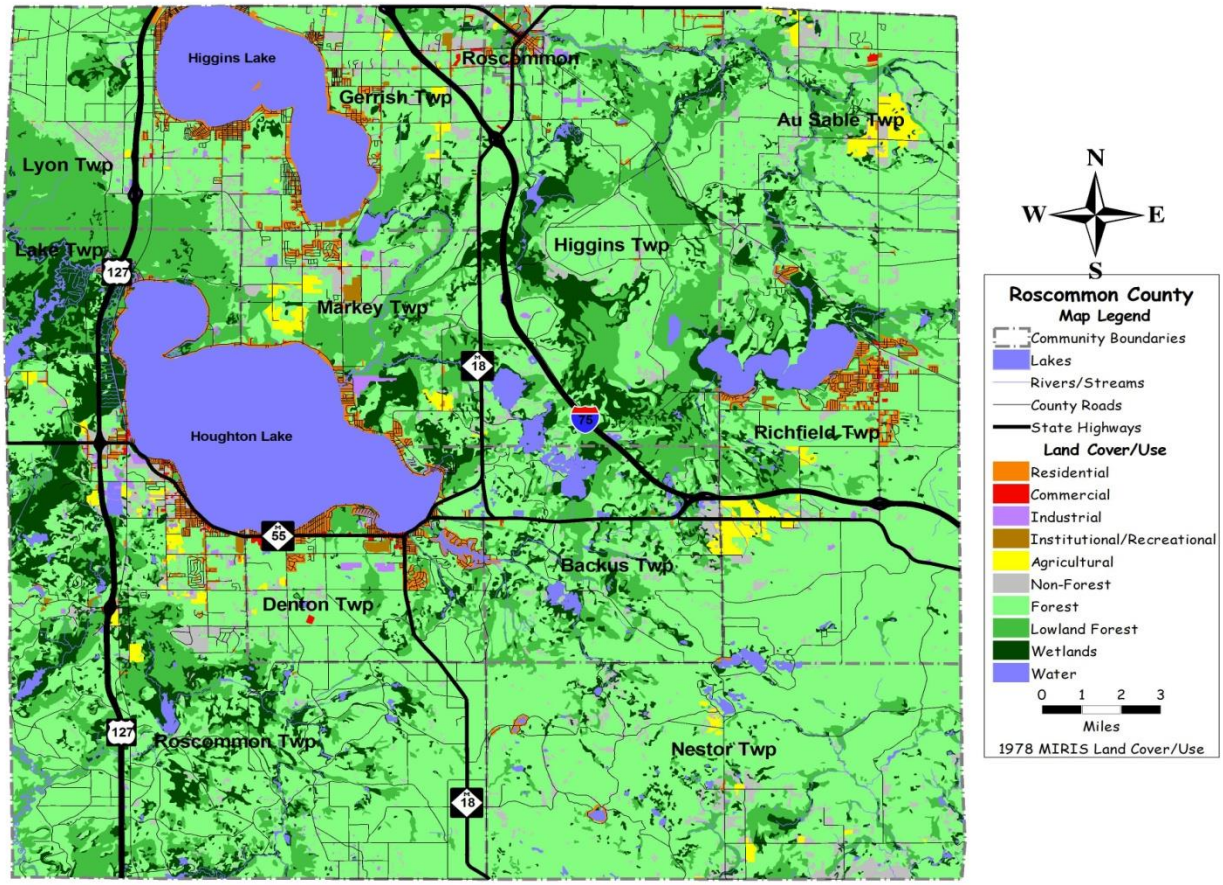
About 70 percent of the county is forested and, an analysis of forest types will assist in defining vulnerable areas and populations. The Michigan Resource Information Systems (MIRIS) 1978 land use inventory compiled land cover maps that depict forest types in the county. Tree species vary depending upon the soils, moisture and past activities such as logging, fires and land clearing. Aspen-Birch, central hardwoods, and pine are the most common forest types. Under dry spring conditions forest fires can occur in any forest type. However some forest types have higher risks. Jack and red pine forests have a high risk for wildfires. Oak and white pine forests have a moderate risk for wildfires. Draughty, low fertility sandy soils, found in outwash plains and channels, supported pre-settlement pine forests that for thousands of years were perpetuated by wildfires. Today, residential development has occurred within the same wildfire prone areas. There is a concentration of pine forest types in Au Sable Twp, Backus Twp, Denton Twp, Gerrish Twp, Higgins Twp, Lake Twp, Lyon Twp, Richfield Twp, Roscommon Twp, and the Village of Roscommon. There is a concentration of central hardwoods in Nestor Twp.

Red jack and white pine forest types are included in the pine forest category. Bigtooth aspen, quaking aspen, white birch, red maple and red oak are the primary tree species found in the aspen-birch type. Red oak, white oak, black oak and northern pin oak are the primary species growing in the oak forests. Northern hardwoods include species such as sugar maple, red maple, American beech, basswood and yellow birch.

Poorly drained, lowland areas support northern white cedar, tamarack, balsam fir, black spruce, eastern hemlock, white pine, balsam poplar, trembling aspen, paper birch, black ash, speckled alder and shrub willows. Northern white cedar dominates the wetland areas where there is good lateral water movement and the soils are high in organic content. Lowland forests are typically located adjacent to water features and function as riparian forests and water quality buffers. The network of lowland forests, associated with rivers and creeks, also function as wildlife corridors and are the backbone of large regional ecological corridors. Lowland forests adjacent to the Great Lakes are prone to flooding during periods of high lake levels. Lowland forests adjacent to rivers and streams are prone to flooding during the spring snowmelt, particularly when combined with heavy spring rains. Extensive areas of lowland forests can be found in Au Sable Twp, Backus Twp, Denton Twp, Gerrish Twp, Higgins Twp, Lake Twp, Lyon Twp, Markey Twp, Richfield Twp, and Roscommon Twp. See map that follows.

ROSCOMMON COUNTY FORESTED AREAS

MAP 3.9



COMMUNITY ORGANIZATION AND RESOURCES FOR HAZARD MITIGATION including County and Local Community Agencies, Departments and organizations potentially relevant for Hazard Mitigation.

Emergency Services

Emergency services are very important for the Hazard Mitigation Process. These services help serve the public in times of natural disasters and other emergency situations. It is crucial for the public to know a) that these services exist b) where they are located and c) how to reach them in times of need.

Roscommon County Emergency Management
Mike Beaty, Director
101 South Second Street
Roscommon, MI 48653
989-275-8740
beatym@roscommoncounty.net

This office was established under the provisions of the Michigan Emergency Management Act, PA 390 of 1976, as amended, to ensure a coordinated public response in the event of a natural or man-made disaster. The purpose of Emergency Management is to plan and prepare for high impact, low probability events. The Roscommon County Emergency management office assesses local capabilities to respond to emergency and disaster situations, and advocate emergency preparedness in both the public and private sectors and works to assure a comprehensive approach is used involving a range of public and private agencies including local police, fire and EMS agencies, the Michigan State Police Emergency Management and Homeland Security Division, the Michigan Department of Environmental Quality, the Homeland Security Board and the National Weather Service. Other agencies coordinating with emergency management include the American Red Cross, local and state health departments, educators and amateur radio operators. This office tends to be central for all major threats and incidents within the county. This office also handles all 211 Services, NOAA Weather alerts, Broadband, and Homeland Security matters.

Warning Sirens or System

Roscommon County has no active warning sirens.

Police

Roscommon County has one (1) County-specific police department within the County. In addition, there is also police presence provided by the Michigan State Police Post in Houghton Lake. The County has three (3) township police departments.

Roscommon County Sheriff's Department
111 South Second Street, P. O. Box 206
Roscommon, MI 48653
989-275-5101
989-275-5858 (Fax)
www.roscommoncounty.net

Michigan State Police Post #75
9011 W. Lake City Rd.
Houghton Lake, MI 48629
989-422-5103

Gerrish Township Police
3075 E. Higgins Lake Dr.
Roscommon, MI 48653
989-821-5207
www.gerrishpolice.org

Denton Township Police Department
2559 S. Gladwin Rd.
Prudenville, MI 48651
989-366-4518

Richfield Township Public Safety
PO Box 128
Saint Helen, MI 48656
989-389-4071
www.richfieldtownship.org/Police.php

Fire

There are ten (10) Fire Departments and Fire Stations in Roscommon County. There is a county-wide mutual aid agreement between all ten departments. Below are the areas of coverage and the fire department responsible for the area.

Gladwin, MI – One (1) Fire Department – Nester Township
Higgins Lake, MI - One (1) Fire Department – Lyon Township
Houghton Lake, MI – Twp (3) Fire Departments – Roscommon Township, Markey Township, and Lake Township
Prudenville, MI – One (1) Fire Department – Denton Township
Roscommon, MI – Three (3) Fire Departments – MI DNR – Roscommon Management Unit, Higgins Township, and Gerrish Township Fire – EMS
St. Helen, MI – One (1) Fire Department – Richfield Township Public Safety – Fire Division

Ambulance

The county has two (2) full time and five (5) volunteer ambulance services. They are:

Gerrish Twp EMS
Denton Twp EMS (full time)
Higgins Twp EMS
Houghton Lake EMS (full time)
Lyon Twp EMS
Markey Twp EMS
Nester Twp EMS
Richfield Twp EMS

Health Care

Medical Control Authority: North Central Medical Control, Grayling Mercy Hospital in Grayling, MI

Area Hospitals and Emergency Rooms: Hospitals and ER's are located in Grayling and West Branch. There are no hospitals located in Roscommon County but there are several clinics for the population.

Central Michigan District Health Department
Roscommon County Branch Office
1015 Short Dr.
P.O. Box 739
Prudenville, MI

Government Facilities

Government facilities may have a large impact on how emergencies are handled. They provide services to the public such as shelter in times of natural disasters. They also serve as a way to distribute information on how to handle emergency circumstances.

Roscommon County Government Contacts

TABLE 3.3

Township Contact Information	
AuSable Township	9181 N. Keno Road St. Helen, MI 48656 989-389-3541
Backus Township No regular hall hours	3888 S. Maple Valley Road St. Helen, MI 48656 989-389-3271
Denton Township	2565 S. Gladwin Road., PO Box 289 Prudenville, MI 48651 989-366-5913, 989-366-7123 (Fax)
Gerrish Township	2997 E. Higgins Lake Drive Roscommon, MI 48653 989-821-9313 989-821-8627 (Fax)
Higgins Township M-Thursday: 9 to 1	700 S. Fifth Street, P.O. Box 576 Roscommon, MI 48653 989-275-8112 989-275-8990 – Fax
Lake Township No regular hall hours	1380 North Michelson Road, PO Box 536 Houghton Lake, MI 48629 989- 422-4577 989-422-7505 – Fax
Lyon Township (Hall Hours 9-2 M-Th; clerk@lyontownship.org	7851 West Higgins lake Drive, P. O. Box 48 Higgins Lake, MI 48627 989-821-9694 989-821-5118 – Fax
Markey Township	4974 East Houghton Lake Drive Houghton Lake, MI 48629 989-366-9614 989-366-8631 – Fax clerk@markeytownship.org
Nester Township No regular hall hours	7855 Maple Valley Road St. Helen, MI 48656 989-389-1199
Richfield Township	1410 North M-76, P. O. Box 128 St. Helen, MI 48656 989-389-4994 989-389-2013 - Fax

Township Contact Information	
Roscommon Township Mon-Friday: 8:30 – 4:30	8555 Knapp Road, P. O. Box 610 Houghton Lake, MI 48629 989-422-4116 or 989-422-4093 989-422-6115 - Fax
Village Contact Information	
Village of Roscommon	214 S. Main Street P. O. Box 236 Roscommon, MI 48653 989-275-5743 989-275-5998 - Fax
Roscommon County Commissioners	
District 1 David Russo (989) 275-8021 (Courthouse) davidrusso@roscommoncounty.net	District 2 Ken Melvin 989-275-8021 (Courthouse) kenmelvin@roscommoncounty.net
District 3 Bob Schneider, Chairman 989-275-8021 (Courthouse bobschneider@roscommoncounty.net	District 4 Mark J. Milburn, Vice Chair 989-275-8021 (Courthouse) marcmilburn@roscommoncounty.net
District 5 Gary Stefanko 989-275-8021 (Courthouse) garystefanko@roscommoncounty.net	Jodi Valentino, Controller 500 Lake Street Roscommon, MI 48653 989-275-7861 989-275-3161 – Fax controller@roscommoncounty.net
Mail to: **Roscommon County Board of Commissioners** **Attn. Name of Commissioner** **500 Lake Street** **Roscommon, MI 48653**	

Schools

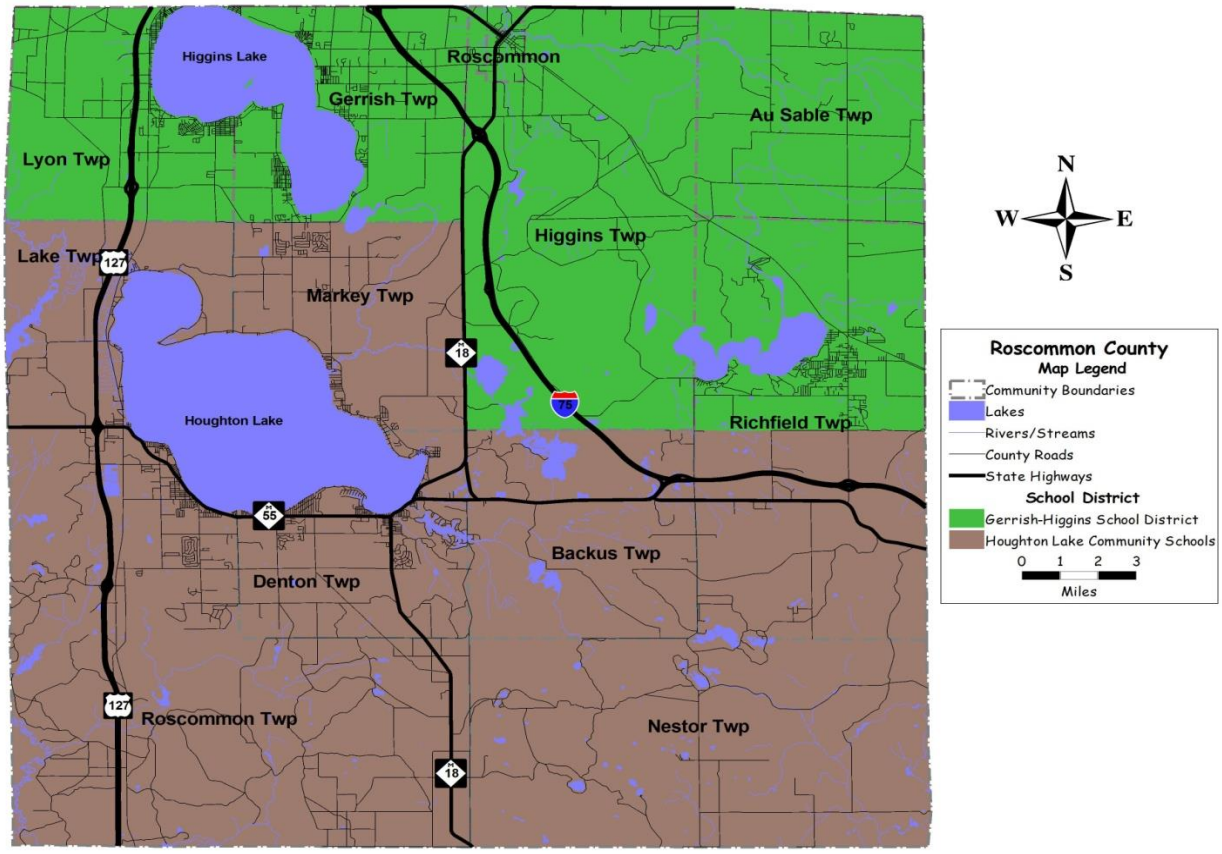
There are two school districts in Roscommon County – Gerrish Higgins School District and Houghton lake Community School District. There are eighty (8) public schools and two (2) private. There is one Charter Academy located in the Village of St. Helen. The following table lists the name and location of each school along with the district that each school belongs too.

Roscommon County Schools

TABLE 3.4

Name	Address	District	# Students
Collins Elementary School Grades: K-3	4451 W. Houghton Lake Drive Houghton Lake, MI 48629 989-366-2048	Houghton Lake Community School District	407
Houghton Lake Middle School Grades: 4-7	4441 W. Houghton Lake Dr. Houghton Lake, MI 48629 989-366-2000	Houghton Lake Community School District	467
Houghton Lake High School Grades: 8-12	4433 West Houghton Lake Dr. Houghton Lake, MI 48629 989-366-2005	Houghton Lake Community School District	
Houghton Lake Adult Ed Grades: 9-12	179 Cloverleaf Lane Houghton Lake, MI 48629 989-422-6161	Houghton Lake Community School District	NA
Roscommon Elementary School Grades: K-5	175 West Sunset Drive Roscommon, MI 48653 989-275-6610 989-275-4745 – Fax	Gerrish Higgins School District	496
Roscommon Area Public Schools Grades: 6-8	299 West Sunset Drive Roscommon, MI 48653 989-275-6640	Gerrish Higgins School District	421
Roscommon High School Grades: 9-12	10600 Oakwood Drive Roscommon, MI 48653 989-275-6053	Gerrish Higgins School District	475
Charlton Heston Academy (Patriots) Grades: K-8	1350 N. St. Helen Rd. St. Helen, MI 48656 989-632-3390 989-632-3393 – Fax	Charter School	NA
Private Institutions			
Our Lady of the Lake Elementary Grades: Pre-K to 8	1039 West Houghton Lake Dr. Prudenville, MI 48651	Parochial	94
Immanuel Christian Grades: K-12	2794 West Maplehurst Dr. Roscommon, MI 48653	Parochial	31

Roscommon County School District Map
MAP 3.10



Institutions of Higher Learning

There is one institution of higher learning in Roscommon County – Kirtland Community College. Kirtland Community College is the largest community college geographically in the state of Michigan covering approximately 2,500 square miles and servicing all of Ogemaw, Oscoda, Roscommon and Crawford counties and parts of five additional surrounding counties. The College also has sites in Gaylord and West Branch, Michigan.

Kirtland's central campus, located at 10775 N. St. Helen Road, Roscommon, Michigan, approximately eight miles north of St. Helen, is close to the geographic center of the college's district, is accessible by F-97 from the north and south and by M-18 to County Road 603 from the west. The location is very rural and is approximately 170 miles north of Detroit, Michigan.

Kirtland offers 63 degrees and certifications including transfers of credits.

Utilities

Information on the utilities provided to communities within the County is essential to distribute information to the public in times of need. Also, certain locations that provide these services may be the source of emergency situations (transformer problems, gas leaks, etc.).

Consumers Energy Company provides electric utility service to Roscommon County, while DTE provides gas utility service to county residents.

Utility gas is the most common form of heating fuel type for households in the county. Bottled, tank or LP gas, however, also provides a large portion of the heat fuel to houses that are located primarily beyond traditional gas utility lines found in urbanized areas.

Telephone Service
The following Roscommon County information was obtained by accessing the Michigan Public Services Commission at (http://www.michigan.gov/mpsc).

Incumbent Telephone Companies:
AT&T, CenturyTel of Michigan, Frontier North

Competitive Telephone Companies:
Access One, Access Point, ACD Telecom, ACN Communications Services, Advanced Integrated Technologies, Airespring, American Broadband and Telecommunications, AT&T Corp., Bandwidth.com, Birch Telecom of the Great Lakes, Broadwing Communications, Budget Phone, Bullseye Telecom, Call Giant, Call One, Castle Wire, Cavalier Telephone, Cbeyond Communications, CenturyTel Acquisition, CenturyTel Solutions, Charter Fiberlink-Michigan, Cincinnati Bell Any Distance, Clear Rate Communications, Comcast Phone of MI dba CIMCO, Crexendo Business Solutions, CynergyComm.net, dPi Teleconnect, Entelegent Solutions, Farm Bureau Connection, First Communications, France Telecom Corporate Solutions, Global Connection Inc. of America, Global Crossing Local Services,, Globalcom dba First Communications of IL, Granite Telecommunications, Grid 4 Communications, IBC Telecom, ITELECOM, Level 3 Communications, Lightyear Network Solutions, Lucre, Lynx Network Group, Mass Communications, Matrix Telecom, McGraw Communications, MClmetro Access Transmissions Services, McLeodUSA, MetTel, Michigan Access, Navigator Telecommunications, Nexus Communications, Norlight, NOS Communications, Onvoy Voice Services, PNG Telecommunications, QuantumShift Communications, Quick Communications, Qwest Communications Company, RACC Enterprises, Sage Telecom, Superior Spectrum Telephone & Data, TC3 Telecom, TDS Metrocom, TelCove Operations, Teleport Communications America, Telnet Worldwide, Three Rivers Telecom, TNCI, TouchTone Communications, tw telecom data services, US Xchange of Michigan dba Earthlink Business, Velocity the Greatest Telephone Company Ever, Westphalia Broadband, Wholesale Carrier Services, Winn Telecom, XO Communications Services.

Transportation
There are four highways in Roscommon County. M-18, US-27, and Interstate 75 are north/south trunk lines while M-55 is a major east/west trunk line. The county and local governments maintain all road networks. MDOT contracts with the County to maintain their roadways.

General aviation and or freight air service is available at the Roscommon County Blodgett Memorial Airport in southern Markey Twp and at Houghton Lake State Airport in Roscommon Township.

Road Commission
Roscommon County Road Commission
820 E. West Branch Rd.
P.O. Box 710
Prudenville, MI 48651
989-366-0333
989-366-0299 – Fax
www.roscommoncrc.com

Airports
Houghton Lake -Roscommon County Blodgett Memorial Airport
5218 E. Houghton Lake Dr.
Houghton Lake, MI 48629
989-366-7660
Erich Jaroch, Airport Manager
Cell: 989-390-2398
eric.jaroch@gmail.com

Houghton Lake State Airport
8717 N. Roscommon
Roscommon, MI 48653
(989) 275-5151
Bill Green, Airport Manager

Transportation Services
Roscommon County Transportation Authority (RCTA)
2665 S. Townline Rd.
P.O. Box 284
Prudenville, MI 48651
989-366-5309
989-366-4122 – Fax
transit@rcta-transit.net
RCTA also connects to Indian Trails for longer distance travel

MDOT Gaylord Transportation Service Center
Region Office (North)
1088 M-32 East
Gaylord, MI 49735
989-731-5090
989-731-0536 - Fax
Toll-free – 1-888-304-6368

ROSCOMMON COUNTY (2010 population: 24,449)

Roscommon County Drain Commissioner/Soil Erosion
500 Lake Street
Roscommon, MI 48653
989-275-8323
989-275-5675 – Fax
Drain Commissioner – Sheridan Cole
drains@roscommoncounty.net
The mission of this office is to provide for the health, safety and welfare of Roscommon County citizens, the protection of surface waters and the environment, and to promote the long-term environmental sustainability of Roscommon County by providing storm water management, flood

control, soil erosion controls and education. The office is particularly relevant for hydrological hazards.

Roscommon County Community Mental Health
2715 Townline Road
Houghton Lake, MI 48629
1.800.492-5742
989-366-8550

Central Michigan District Health Department
Roscommon County Branch Office
1015 Short Drive, P. O. Box 739
Prudenville, MI 48651
989-366-9166
989-366-8921 - Fax
The mission of the Central Michigan District Health Department exists is to promote health and physical well-being by providing preventive health care, education and environmental safety to all members of the community and to become recognized by the public as the local advocate in promoting, assessing and safeguarding public health and the environment. This will be done through coordinated planning, resource development, and service delivery. The human impacts of hazards may require their involvement. Public health emergencies threatening the area would certainly involve this department.

Michigan State University Extension Service - Roscommon Office
500 Lake Street
Roscommon, MI 48653
989-275-5043
989-275-8864 – Fax
Msue.roscommon@county.msu.edu
The office is involved in various educational and outreach activities involving agriculture and health. They should be valuable in events concerning such matters, such as droughts, pandemics, etc.

Roscommon County Planning Commission
500 Lake Street
Roscommon, MI 48653
989-275-3163
The mission of the Roscommon County Planning Commission is to assist with the creation of a healthy, safe and sustainable community of choice, through leadership, education, partnerships and stewardship of resources and assets. The Planning Commission works closely with the Department of Community Development.

Roscommon County Road Commission
820 East West Branch Road
Prudenville, MI 48651
989-366-0333
989-366-0299 – Fax
www.roscommoncrc.com
The Roscommon County Road Commission uses their expertise, energy, and funds to provide the safest and most convenient road system possible, and contributes to economic development and the

high quality of life throughout the county. Their goal is to maintain a county road system that is safe and convenient for public travel and to manage the roadside environment, with a view toward preservation.

Roscommon County Sheriff's Office
111S. Second Street
Roscommon, MI 48653
Phone: (989) 275-5101
www.rosco.homestead.com
The Sheriff's Office provides law enforcement and services to protect the lives and property of Roscommon County citizens—enforcing State laws and local ordinances, investigating crimes, and detaining prisoners remanded to the county jail. This is accomplished in a manner that maintains the highest degree of professional excellence, integrity, and courtesy. Sheriff's Office personnel would be involved in protective actions during a serious community emergency.

Roscommon County Transit Authority (RCTA)
2665 S. Townline Road, P. O. Box 284
Prudenville, MI 48651
989-366-5309
989-366-4122 – Fax
www.roscota.net
The purpose of the Roscommon County Transit Authority (RCTA) is to plan, promote, finance, acquire, improve, enlarge, extend, own, construct, operate, maintain, replace, and contract for public transportation service by means of one or more public transportation systems and public transportation facilities within the jurisdictional boundaries of the County of Roscommon. They may have resources useful for the transportation or evacuation of residents during emergency situations.

Village of Roscommon (2010 population – 1,075)
214 S. Main Street, P. O. Box 236
Roscommon, MI 48653
989-275-5743
089-275-5998 - Fax
www.roscommonvillage.com
Founded in the 19th Century, the village is the County seat and provides a wide array of activities and recreational opportunities for residents and visitors. The following village department is the most relevant to emergency management and hazard mitigation considerations.

Village of Roscommon Department Public Works
1050 S. Main Street
Roscommon, MI 48653
989-275-8222
Greg MacIntosh, Director
dpwdirector@roscommonvillage.com
The department oversees the provision of village services such as waste disposal, fresh water supply, and storm drainage systems. They would have important resources to help deal with disasters or emergencies involving debris, water, and drainage systems.

AUTHORITIES, CENTERS, PROGRAMS, ETC. THAT ADDRESS VARIOUS HAZARDS

Sabotage/Terrorism/Weapons of Mass Destruction (WMD)
The federal Office of Homeland Security coordinates the many counter-terrorism functions scattered across numerous federal agencies and organizations, and works closely with state and local police and fire agencies, emergency response teams, and emergency management agencies in formulating and carrying out the National Homeland Security Strategy.

Metropolitan Medical Response System:
One of the key features of the federal response element is the formation of highly skilled and mobile Metropolitan Medical Response Systems (MMRS) to provide medical care in incidents involving nuclear, chemical or biological terrorism. The nearest MMRS facility is in Grand Rapids. In case of an incident that may involve nuclear, chemical or biological weapons, this MMRS would be mobilized to provide initial, on-site response, in addition to providing for patient transportation to hospital emergency rooms. The MMRS are self-contained and capable of providing both medical and mental health care to victims. Should local health care resources be overrun, they will assist in preparing to move victims to other regions. The U.S. Department of Health and Human Services (HHS) coordinates the MMRS program. There are current three Metropolitan Medical Response Systems in Michigan – Grand Rapids, Warren and Detroit. These entities maintain a goal of coordinating the efforts of local law enforcement, fire, HAZMAT, EMS, hospital, public health and other personnel to improve response capabilities in case of a terrorist attack.

51st WMD Civil Support Team
The Michigan National Guard, 51st Western Military District (WMD)/Civil Support Team, provides additional support for the RRTN. Stationed at Fort Custer (Battle Creek), the 51st WMD/Civil Support Team deploys to a Weapon of Mass Destruction or suspected Weapon of Mass Destruction incident in support of the local incident commander to: assess a suspected nuclear, chemical, biological or radiological event; advise the Incident Commander on appropriate courses of action to protect the local population; assist with appropriate requests for state additional support. They also provide informational briefings, exercises, and cross training activities with state and local first responders.

SNS – The Strategic National Stockpile Program:
Presidential Decision Directive 62, issued by President Clinton in May 1998 ordered federal agencies to take significantly expanded and better-coordinated steps to protect against the consequences of biological and other unconventional attacks, especially potential bio-terrorism directed at civilian populations. One of the major bio- terrorism initiatives of the U.S. Department of Health and Human Services (HHS) in response to this PDD is the development of the Strategic National Stockpile – a national repository of lifesaving pharmaceuticals and medical materials that will be delivered to the site of a major medical emergency in order to reduce morbidity and mortality in civilian populations. The decision to send the SNS is a collaborative effort between local, state, and federal officials in a process whereby local health departments and emergency management officials contact the Michigan State police Emergency Management Division, and state health officials who recommend to the Governor that a formal request for the SNS is made to the CDC.

The stockpile is activated to support a local and or state response to an emergency within the US or its territories. The two major components of the stockpile are the 12 Hour Push Pack and the Vendor Managed Inventory (VMI). Push Packs contain 50 tons of medical materiel that will treat a variety of illnesses. The VMI will re-supply the Push Pack or supplies will be sent immediately to the emergency site if the biological agent is known.

School Safety Information Act: 102 P.A. 1999:
In response to the rash of school shootings that occurred in the late 1990s, the Michigan Legislature passed Act 102 in July 1999 – The Michigan School Safety Information Act – which requires local school districts to meet with law enforcement officials to develop emergency plans to handle violent situations. School superintendents are then required to educate local communities about the plans. The plans spell out, among other things, how to evacuate schools, bring first aid and emergency resources to the scene, and handle parents that want to pick up their children. The law also requires the development and implementation of a statewide school safety information policy, the reporting and compiling of certain school safety information, and the expulsion of pupils for certain assaults.

H.B. 4713 – Act 12 of Public Acts of 2014 February 2014:
The bill amends the Fire Prevention Code to modify school drill requirements. The bill also requires the governing body of a school to adopt and implement a school cardiac emergency response plan. The bill takes effect on July 1, 2014. Currently, a school that operates any of grades kindergarten through 12 must hold at least six fire drills and two "lockdown" drills during each school year. The bill requires a K-12 school to hold a minimum of five fire drills and three lockdown drills, according to a schedule prescribed in the bill. The Code requires a K-12 school to hold at least two tornado safety drills for each school year. Under the bill, at least one tornado safety drill would have to be held in March.

The bill would require the governing body of a K-12 school to ensure that documentation of a completed school safety drill was posted on its website (or on its intermediate school district's website) within 30 days of completing the drill, and maintained for at least three years. By September 15, the chief administrator of a K-12 school would have to give a list of scheduled drill days to the county emergency management coordinator, who would have to provide the information to the local emergency management coordinator, if any, and certain local officials. This information would be exempt from disclosure under the Freedom of Information Act. If a drill were not conducted as scheduled, it would have to be rescheduled and the chief administrator would have to notify the county emergency management coordinator of the rescheduled date. The governing body of a school that operates any of grades kindergarten through 12 would have to adopt and implement a cardiac emergency response plan for the school. The plan would have to address all of the following: use and maintenance of automated external defibrillators (AEDs), if available; activation of a cardiac emergency response team during an identified emergency; effective and efficient communication throughout the school campus; a training plan for the use of an AED and CPR techniques, in a school with grades 9 to 12; integration of the local emergency response system and emergency response agencies with the school's plan; and an annual review and evaluation of the cardiac emergency response plan.

Michigan Office of Safe Schools:
In 1998 the Michigan Legislature established the Michigan Office of Safe Schools within the Michigan Department of Education. The Office of Safe Schools began operating in October of 1999. Its mission is to collect and distribute information about school safety. The Office of Safe Schools maintains a web site that serves as a one-stop clearinghouse for information on school safety, school bus safety, food safety and current and proposed school safety legislation.

In March 2001, the Michigan Office of Safe Schools established a toll-free School Violence Hotline to provide a means for students to anonymously report specific threats of imminent school violence or other suspicious or criminal conduct. The toll-free hotline is operational 24-hours per day, 365 days a year, at 1-800-815-TIPS.

Michigan State Agencies:
Sabotage/terrorism is being addressed on a variety of other fronts within Michigan State Government. The Michigan Department of State Police oversees and coordinates state agency actions related to homeland security and terrorism response – including the investigation of suspected or potential criminal enterprises and activities that might involve sabotage or terrorism. In addition, the State Police (in conjunction with other state agencies as well as federal and local counterparts) continuously prepares for terrorist incidents through emergency planning, training, information sharing and exercising efforts.

Nuclear Attack
Roscommon County is not in an area known to be a specific nuclear attack target. However, mitigation of a Nuclear Attack on the local level is limited to preparation for personal, community, and infrastructure preparations. Ongoing participation by the community in general preparative activities, such as those of the Red Cross, Fire Drills, Scouting, 4-H, Private Industry, Homeland Security, Advisory Bulletins from the MSU Extension Office, and personal storm protection by citizenry contribute to a general personal readiness that would be extremely useful should threat of a nuclear attack occur.

Earthquakes
In January 1990, Executive Order (EO) 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction, was signed into law. This EO requires that appropriate seismic design and construction standards and practices be adopted for any new construction or replacement of a federal building or federally building during or after an earthquake.

Weather Hazards (General)

National Weather Service Doppler Radar:
The National Weather Service (NWS) has completed a major modernization program designed to improve the quality and reliability of weather forecasting. The keystone of this improvement is Doppler Weather Surveillance Radar, which can more easily detect severe weather events that threaten life and property. The lead-time and specificity of warnings for severe weather have improved significantly. Doppler technology calculates both the speed and the direction of motion of severe storms. By providing data on the wind patterns within developing storms, the new system allows forecasters to better identify the conditions leading to severe weather such as tornadoes, severe straight-line winds, lightning and damaging hail. This means early detection of the precursors to severe storms, as well as information on the direction and speed of storms once they form.

National Weather Service Watches/Warnings:
The National Weather Service issues severe thunderstorm watches for areas when the meteorological conditions are conducive to the development of severe thunderstorms. People in the watch area are instructed to stay tuned to National Oceanic and Atmospheric Administration (NOAA) weather radio and local radio or television stations for weather updates, and watch for developing storms. Once radar or a trained Skywarn spotter detects the existence of a severe thunderstorm, the National Weather Service will issue a severe thunderstorm warning. The warning will identify where the storm is located, the direction in which it is moving and the time frame during which the storm is expected to be in the area. Persons in the warning area are instructed to seek shelter immediately. The State and local government agencies are warned via the Law Enforcement Information Network (LEIN), NOAA weather radio and the Emergency Managers Weather Information Network (EMWIN). Public warning is provided through the Emergency Alert System (EAS). The National Weather Service stations in Michigan transmit information directly to radio and television stations, which in turn pass the warning on to the public. The National Weather Service also provides detailed warning information on the Internet through the Interactive Weather Information Network (IWIN).

National Weather Service Education:
The National Weather Service issues severe thunderstorm watches and warnings when there is a threat of severe thunderstorms. However, lightning, by itself, is not sufficient criteria for the issuance of a watch or warning (every storm would require a watch or warning). The National Weather Service has an extensive public information program aimed at educating citizens about the dangers of lightning and ways to prevent lightning-related deaths and injuries.

Severe Weather Awareness Week:
Each spring, the Emergency Management Division, Michigan Department of State Police, in conjunction with the Michigan Committee for Severe Weather Awareness, sponsors Severe Weather Awareness Week. This annual public information and education campaign focuses on such severe weather events as tornadoes, thunderstorms, hail, high winds, flooding and lightning. Informational materials on lightning hazards are disseminated to schools, hospitals, nursing homes, other interested community groups, facilities, and the public.

Tornado National Weather Service Watches/Warnings:
The National Weather Service issues tornado watches for areas when the meteorological conditions are conducive to the development of a tornado. People in the watch area are instructed to stay tuned to NOAA weather radio and local radio or television stations for weather updates, and watch for developing storms. Once a tornado has been sighted and its existence is confirmed and reported, or Doppler Radar shows strong probability of the development or occurrence of a tornado, the National Weather Service will issue a tornado warning. The warning will identify where the tornado was sighted, the direction in which it is moving and the time frame during which the tornado is expected to be in the area. Persons in the warning area are instructed to seek shelter immediately.

The State and local government agencies are warned via the Law Enforcement Information Network (LEIN), National Oceanic and Atmospheric Administration (NOAA) weather radio and the Emergency Managers Weather Information Network (EMWIN). Public warning is provided through the Emergency Alert System (EAS). The National Weather Service stations in Michigan transmit information directly to radio and television stations, which in turn pass the warning on to the public. The National Weather Service also provides detailed warning information on the Internet, through the Interactive Weather Information Network (IWIN).

Tornado Warning Systems:
Outdoor warning siren systems warn the public about impending tornadoes and other hazards. Most of these systems were originally purchased to warn residents of a nuclear attack, but that purpose was expanded to include severe weather hazards as well. These systems can be very effective at saving lives in densely populated areas where the siren warning tone is most audible. In more sparsely populated areas where warning sirens are not as effective, communities are turning to NOAA weather alert warning systems to supplement or supplant outdoor warning siren systems. Unfortunately, several of the communities within Roscommon County do not have adequate public warning systems in place to warn their residents of severe weather or other hazards.

Michigan Office of Fire Safety:
The Michigan Department of Licensing and Regulatory Affairs' Office of Fire Safety is responsible for conducting fire safety and prevention inspections in state-regulated facilities and certain other facilities. Specific services provided include: 1) fire safety inspections of adult foster care, correctional and health care facilities, and hotels/motels; 2) plan review and construction inspections of the regulated facilities in

item (1), as well as schools, colleges, universities, and school dormitories; 3) coordination of fire inspector training programs; and 4) coordination of fire alarm and fire suppression system installation in regulated facilities. These activities are important mitigation activities designed to save lives and protect property from structural fire hazards. The State Fire Safety Board, also housed within the Michigan Department of Licensing and Regulatory Affairs, Bureau of Construction Codes and Fire Safety, promulgates rules covering the construction, operation and maintenance of schools, dormitories, health care facilities, and correctional facilities. These rules are designed to protect life and property at these facilities from fire, smoke, hazardous materials and fire-related panic.

Fire Safety Rules for Michigan Dormitories:
Even before the Seton Hall University dormitory fire in January, 2000, the State Fire Safety Board took action to enhance the fire and life safety protection of Michigan's college and university dormitories. On December 21, 1999 two new sets of rules took effect governing the construction, operation, and maintenance of school, college and university instructional facilities and dormitories. These sets of rules were updated to meet the most current nationally recognized standards from the National Fire Protection Association. The new rules adopted the 1997 edition of NFPA 101, Life Safety Code. NFPA standards provide the minimum requirements necessary to establish a reasonable level of fire and life safety and property protection from hazards created by fire and explosion. The new rules require, among other things, that fire sprinklers be installed in newly constructed dormitories or those undergoing major renovations. However, existing dormitories don't fall under the new rules and therefore do not have to be retrofitted unless they are being renovated.

Wild Fires
Because the vast majority of wildfires are caused by human activity, the Michigan Department of Natural Resources established, in 1981, the Michigan Interagency Wildfire Prevention Group. It was the first such group in the nation (promoting wildfire prevention and awareness) that had the full involvement of the state's fire agencies. In 1993, the Michigan Interagency Wildfire Prevention Group was expanded to form the Michigan Interagency Wildland Fire Protection Association (MIWFPA). The MIWFPA promotes interagency cooperation in fire prevention, training, fire technology, and firefighting operations. Members of the MIWFPA include the: 1) MDNR Forest Management Division; 2) USDA Forest Service - Huron-Manistee, Hiawatha, and Ottawa National Forests; 3) USDI National Park Service - Pictured Rocks and Sleeping Bear Dunes National Lakeshores; 4) USDI Fish and Wildlife Service – Seney National Wildlife Refuge; 5) USDI Bureau of Indian Affairs; 6) Michigan Department of State Police – fire investigation; 7) Michigan State Firemen's Association; and the 8) Michigan Fire Chief's Association. While the risk of wildfires is low, Roscommon County can reduce its vulnerability to wildfires by: 1) participating in multi-state and interagency mitigation efforts.

Scrap Tire Fires
The Scrap Tire Regulatory Program is implemented by the Waste Management Division of the Michigan Department of Environmental Quality, under the authority of Part 169 of the Natural Resources and Environmental Protection Act (451 P.A. 1994), as amended. Policies and regulations established under this law provide the basis for the MDEQ to implement and administer an effective scrap tire management program per the following initiatives: 1) a compliance and enforcement program was implemented; 2) a scrap tire policy recycling hierarchy was established; 3) special uses of scrap tires were approved; and 4) a grant program was established to address abandoned tires.

Riverine and Urban Flooding

National Flood Insurance Program
For many years, the response to reducing flood damages followed a structural approach of building dams,

levees and making channel modifications. However, this approach did not slow the rising cost of flood damage, plus individuals could not purchase insurance to protect themselves from flood damage. It became apparent that a different approach was needed. The National Flood Insurance Program (NFIP) was instituted in 1968 to make flood insurance available in those communities agreeing to regulate future floodplain development. As a participant in the NFIP, a community must adopt regulations that: 1) require any new residential construction within the 100-year floodplain to have the lowest floor, including the basement, elevated above the 100-year flood elevation; 2) allow non-residential structures to be elevated or dry flood proofed (the flood proofing must be certified by a registered professional engineer or architect); and 3) require anchoring of manufactured homes in flood prone areas. The community must also maintain a record of all lowest floor elevations or the elevations to which buildings in flood hazard areas have been flood proofed. In return for adopting floodplain management regulations, the federal government makes flood insurance available to the citizens of the community. In 1973, the NFIP was amended to mandate the purchase of flood insurance as a condition of any federally regulated, supervised or insured loan on any construction or building within the 100-year floodplain.

Michigan Flood Hazard Regulatory Authorities:

Land Division Act, 591 P.A. 1996, as amended by 87 P.A. 1997:
The Land Division Act governs the subdivision of land in Michigan. The Act requires review at the local, County and state levels to ensure the land being subdivided is suitable for development. From a flood hazards viewpoint, a proposed subdivision is reviewed by the County Drain Commissioner for proper drainage, and for floodplain impacts by the Department of Environmental Quality, Land and Water Management Division.

Provisions of the Act and its Administrative Rules require that the floodplain limits be defined and prescribe minimum standards for developments for residential purposes and occupancy, within or affected by the floodplain. Restrictive deed covenants are filed with the final plat which stipulates that any building used, or capable of being used, for residential purposes and occupancy within or affected by the floodplain shall meet the following conditions:

- Be located on a lot having a buildable site of 3,000 square feet of area at its natural grade above the floodplain limit. (Lots with less than 3,000 square feet of buildable area may be filled to achieve that area.)

- Be served by streets within the proposed subdivision having surfaces not lower than one foot below the elevation defining the floodplain limits. Have lower floors, excluding basements, not lower than the elevation defining the floodplain limits. Have openings into the basement not lower than the elevation defining the floodplain limits.

- Have basement walls and floors below the elevation defining the floodplain limits, watertight and designed to withstand hydrostatic pressures. Be equipped with a positive means of preventing sewer backup from sewer lines and drains serving the building. Be properly anchored to prevent flotation. Floodplain Regulatory Authority, found in Water Resources, Part 31 of the Natural Resources and Environmental Act, 451 P.A. 1994, as amended.

The floodplain regulatory portion of Act 451 restricts residential occupation of high-risk flood hazard areas and ensures that other occupations do not obstruct flood flows. A permit is required from the Department of Environmental Quality for any occupation or alteration of the 100-year floodplain. In

general, construction and fill may be permitted in the portions of the floodplain that are not floodway, provided local ordinances and building standards are met. (Floodways are the channel of a river or stream and those portions of the floodplain adjoining the channel which are reasonably required to carry and discharge the 100-year flood. These are areas of moving water during floods.) New residential construction is specifically prohibited in the floodway. Non-residential construction may be permitted in the floodway, although a hydraulic analysis may be required to demonstrate that the proposed construction will not harmfully affect the stage-discharge characteristics of the watercourse. The Act does not apply to watersheds that have a drainage area of less than two square miles. Those small watersheds are considered to be local drainage systems, and do not fall under the Floodplain Regulatory Authority.

Soil Erosion and Sedimentation Control, Part 91 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

This portion of the Act seeks to control soil erosion and protect the waters of the state from sedimentation. A permit is required for all earth changes that disturb one or more acres of land, as well as those earth changes that are within 500 feet of a lake or stream. The Act itself does not address flood hazards, per se. However, if sedimentation is not controlled, it can clog streams, block culverts, and result in continual flooding and drain maintenance problems.

Inland Lakes and Streams, Part 301 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

This portion of the Act regulates all construction, excavation and commercial marina operations on the State's inland waters. It ensures that proposed actions do not adversely affect inland lakes, streams, connecting waters and the uses of all such waters. Structures are prohibited that interfere with the navigation and/or natural flow of an inland lake or stream. Though reduction of flooding is not a specific goal of this Act, minimizing restrictions on a stream can help to reduce flooding conditions.

Wetlands Protection, Part 303 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

This portion of the Act requires a permit from the Department of Environmental Quality for any dredging, filling, draining or alteration of a wetland. This permitting process helps preserve, manages, and protect wetlands and the public functions they provide – including flood and storm water runoff control. The hydrologic absorption and storage capacity of the wetland allows wetlands to serve as natural floodwater and sedimentation storage areas. The Act recognizes that the elimination of wetland areas can result in increased downstream flood discharges and an increase in flood damage. Permits for wetland alterations are generally not issued unless there is no feasible alternative and the applicant can demonstrate that the proposal would not have a detrimental impact upon the wetland functions.

Natural Rivers Program, Part 305 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

The Natural Rivers Act was originally passed in 1970, and has been incorporated as Part 305 of the Natural Resources and Environmental Protection Act. The purpose of this program is to establish and maintain a system of outstanding rivers in Michigan, and to preserve, protect, and enhance their multi-faceted values. Through the natural rivers designation process, a Natural River District is established (typically 400 feet either side of the riverbank) and a zoning ordinance is adopted. Within the Natural River District, permits are required for building construction, land alteration, platting of lots, cutting of vegetation, and bridge construction. Not all of the zoning ordinances on the natural rivers have the same requirements, but they all have building setback and vegetative strip requirements. Although the purpose is not specifically to reduce flood losses, by requiring building setbacks (in many cases prohibiting construction in the 100-year floodplain), flood hazard mitigation benefits can be realized.

Dam Safety, Part 315 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:
The Dam Safety Unit within the Land and Water Management Division, Department of Environmental Quality, has the primary responsibility to ensure dam safety within the state. Following the September, 1986 flood in central Lower Michigan, the current Dam Safety Act was passed to ensure that dams are built and maintained with necessary engineering and inspections for safety of the public and the environment. The Department of Environmental Quality is required to review applications involving construction, reconstruction, enlargement, alteration, abandonment and removal for dams that impound more than five acres of water and have a height of six feet or more.

Manufactured Housing Commission Act, 96 P.A. 1987, as amended:
The Michigan Manufactured Housing Commission Act and its implementing Administrative Rules provide regulation on the placement of manufactured homes and establishes construction criteria. Manufactured homes are prohibited from being placed within a floodway, as determined by the Department of Environmental Quality. In addition, manufactured homes sited within a floodplain must install an approved anchoring system to prevent the home from being moved from the site by floodwaters (or high winds), and be elevated above the 100 year flood elevation.

Local River Management Act, 253 P.A. 1964:
Enacted in 1964, the Local River Management Act provides for the coordination of planning between local units of government in order to carry out a coordinated water management program. Implementation of the water management program occurs via the establishment of watershed councils. These councils conduct studies on watershed problems, water quality and the types of land uses occurring within the watershed. Watershed councils have the authority to develop River Management Districts for the purpose of acquisition, construction, operation and the financing of water storage and other river control facilities necessary for river management. The provision to allow acquisition of land adjacent to the river for the purpose of management aids in regulating development of land prone to flooding.

Floodplain Service Program:
The need to identify a flood hazard area before construction is essential to the goal of flood hazard mitigation. The Department of Environmental Quality regularly provides floodplain information to public and private interests as part of its Floodplain Service Program under the Land and Water Management Division. The goal of the program is to provide 100-year floodplain information to interested parties so that informed purchase or development decisions can be made. In addition to providing floodplain information, the MDEQ will provide information on land and water “interface” permit requirements and on building requirements relating to construction in flood hazard areas.

Dam Failures
Both the MDEQ and the Federal Energy Regulatory Commission (FERC) classify and regulate dams in Michigan. Under state and federal legislation, certain dam owners are required to develop a survey of the downriver area, develop flood-prone area maps and develop emergency action plans (EAPs). Furthermore, the FERC requires the owners of such dams to exercise these plans; the MDEQ has initiated an effort to encourage owners of state-regulated dams to voluntarily perform exercises of their EAPs. In Michigan, well over 100 dams are covered by Emergency Action Plans. Dams in Michigan are regulated by Part 315 of The Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Part 315, Dam Safety provides for the inspection of dams. This statute requires the MDEQ to rate each dam as either "high," "significant," or "low" hazard potential, according to the potential downstream impact if the dam were to fail (not according to the physical condition of the dam). The MDEQ has identified and rated over

2,400 dams. Dams over 6 feet in height that create an impoundment with a surface area of 5 acres or more are regulated by this statute. Dam owners are required to maintain an EAP for "high" and "significant" hazard potential dams. Owners are also required to coordinate with local emergency management officials to assure consistency with local emergency operations plans. Dams regulated by FERC, such as hydroelectric power dams, are generally exempt from this statute. The FERC licenses water power projects (including dams) that are developed by non-federal entities, including individuals, private firms, states and municipalities. Under provisions of the Federal Power Act and federal regulations, the licensee of the project must prepare an EAP. This plan must include a description of actions to be taken by the licensee in case of an emergency. Inundation maps showing approximate expected inundation areas must also be prepared. Licensees must conduct a functional exercise at certain projects, in cooperation with local emergency management officials.

Shoreline Flooding and Erosion
Not Applicable to Roscommon - No Great Lakes Boundaries.

Drought

U.S. Geological Survey:
The U.S. Geological Survey (USGS) is the primary federal agency that collects and analyzes stream flow data, another good index of the relative severity of drought. The agency provides a handy "Drought Watch" web site at http://waterwatch.usgs.gov/. The site presents a map that is continually updated through an automated analysis of USGS stream gauging stations. Additional drought-related links can be accessed through the Michigan-specific web page: http://waterwatch.usgs.gov/new/index.php?m=dryw&r=mi) by clicking on the map (or proceeding directly to the specific web page at http://mi.water.usgs.gov/midroughtwatch.php).

Fixed Site Hazardous Material Incidents (including explosions and industrial accidents)

Resource Conservation and Recovery Act - 42 U.S.C. s/s 6901 et seq. (1976)
RCRA (pronounced "rick-rah") gave EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes. The 1986 amendments to RCRA enabled EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances. RCRA focuses only on active and future. The Federal Hazardous and Solid Waste Amendments are the 1984 amendments to RCRA that required phasing out land disposal of hazardous waste. Some of the other mandates of this strict law include increased enforcement authority for EPA, more stringent hazardous waste management standards and a comprehensive underground storage tank program.

Within Roscommon County, efforts are ongoing to enhance general awareness and specialized training for HAZMAT emergencies.

Hazardous Material Transportation Incidents

Superfund Amendments and Reauthorization Act (SARA), Title III:
As explained earlier, the Bhopal, India tragedy initiated a chain of events aimed at enhancing preparedness activities to minimize the potential for a similar event to occur in the United States. On October 17, 1986 the Superfund Amendments and Reauthorization Act (SARA) was signed into law. A major SARA provision is Title III (the Emergency Planning and Community Right-To-Know Act, also known

as SARA Title III), which establishes hazardous material emergency planning, reporting, and training requirements for federal, state and local governments, and private industry. In Michigan, the SARA Title III program is jointly administered and implemented by two state departments—the Michigan State Police and the Michigan Department of Environmental Quality.

Local Emergency Planning Committees (LEPC)

One of the major provisions of SARA Title III is the establishment of Local Emergency Planning Committees (LEPCs) for designated planning districts. The LEPCs are responsible for developing emergency response plans for communities that have facilities in their jurisdiction subject to SARA Title III emergency planning requirements. The LEPC is the primary mechanism through which local SARA Title III planning, training and exercising activities are implemented. Michigan has 88 designated LEPCs – one for each of the 83 counties and 5 in major cities. Nearly 2,800 facilities across the state have been identified as being subject to Title III emergency planning provisions. A facility is subject to SARA Title III provisions if extremely hazardous substances (as determined by the U.S. Environmental Protection Agency) are present at the facility in quantities at or above the minimum threshold quantities established in Section 302 of the Act.

Note: Many of the programs and initiatives designed to mitigate, prepare for, respond to, and recover from fixed- site hazardous material incidents have the dual purpose of also protecting against hazardous material transportation incidents.

Federal Hazardous Material Transportation Regulations:

The transportation, manufacturing, storage and disposal processes for hazardous materials are highly regulated by federal and state agencies in order to reduce risk to the public. At the federal level, the U.S. Department of Transportation, Office of Hazardous Materials Safety (USDOT/OHMS), is the regulating agency for all modes of hazardous material transportation. In addition to enforcing federal hazardous material transportation regulations, the USDOT/OHMS is also involved in a number of other areas aimed at improving the safety of hazardous material shipping. Those areas include: 1) research and development of improved containment/packaging and other technological aspects of hazardous material shipping; 2) interagency coordination efforts in hazardous material transportation planning and standards setting; 3) management of data information systems pertaining to hazardous material transportation; and 4) development of hazardous material safety training policies and programs.

In Michigan, the Motor Carrier Division, Department of State Police, oversees, coordinates and implements the commercial truck safety aspects of the USDOT regulations. The Michigan Department of Transportation oversees programs aimed at enhancing railroad safety and improving the rail infrastructure (which helps reduce the likelihood of a hazardous material rail transportation accident).

Hazardous Materials Transportation Uniform Safety Act:

The federal Hazardous Materials Transportation Uniform Safety Act (HMTUSA), enacted in 1990, provides funding for the training of emergency responders and the development of emergency response plans for both fixed site facilities and transportation-related incidents. (This funding mechanism under the HMTUSA is referred to as Hazardous Material Emergency Preparedness [HMEP] grants.) In Michigan, the HMTUSA/HMEP program is coordinated and implemented by the Emergency Management Division, Department of State Police. Since the program's inception, over $326,000 in grants have been allocated to 80 Michigan communities for hazardous material planning and training activities.

Federal/State Hazardous Material Response Resources:

There are numerous groups at the federal, state and local levels and in private industry that are trained to deal with hazardous material fixed-site and transportation incidents. These groups include the

National Response Team (NRT), Regional Response Teams (RRTs), and state and local hazardous material response teams. The Chemical Manufacturers Association established the Chemical Transportation Emergency Center (CHEMTREC) to provide 24-hour technical advice to emergency responders. The National Response Center (NRC), which operates much like CHEMTREC, was established to provide technical advice and coordinate federal response to a hazardous material incident.

In Michigan, a 24-hour statewide notification system called the Pollution Emergency Alerting System (PEAS) was established for reporting chemical spills to the Department of Environmental Quality. As a companion to the PEAS, the Michigan Department of Agriculture (MDA) has established a 24-hour Agriculture Pollution Emergency Hotline for use by agrichemical users to report fertilizer and pesticide spills. Callers to the MDA hotline gain immediate access to appropriate technical assistance, regulatory guidance for remediation, and common sense approaches for addressing the problem.

Oil and Natural Gas Well Accidents

Local Emergency Capability:
Communities that may be affected by oil or natural gas well accidents should have adequate procedures in their Emergency Operations Plans to address the unique types of problems associated with this hazard, including rescue and evacuation. Affected communities must work closely with company officials and surrounding jurisdictions to ensure compatibility of procedures for a fast, coordinated response. Mitigation possibilities include the use of community zoning regulations to provide suitable open, unoccupied "buffer" areas around refineries and compressor stations. Michigan Department of Environmental Quality regulations provide for buffer zones around wells and treatment and storage facilities.

Pipeline Accidents (Petroleum and Natural Gas)

MPSC Pipeline Safety Inspections:
Safety engineers from the MPSC are certified by the USDOT/OPS to conduct inspections on natural gas pipelines to ensure structural and operational integrity of the systems. If violations are found, the pipeline company can be ordered to take corrective actions; in addition, the pipeline operator may be fined. The MPSC safety engineers also respond to accidents involving natural gas pipelines (to ensure compliance with federal and state law and to offer technical assistance to emergency responders).

Protection of Underground Facilities Act / MISS DIG Program:
Michigan's first line of defense against pipeline and other utility line breaks from construction excavation is The "MISS DIG" Program established with the passage of Act 53 in 1974 – The Protection of Underground Facilities. MISS DIG System, Inc., is a 24-hour utility communications system that helps contractors comply with the state law (Act 53) which requires notification of utilities at least three working (but not more than 21 calendar) days before commencing excavation, tunneling, demolishing, drilling or boring procedures, or discharging explosives for a project. When properly administered and followed, the MISS DIG safety system does an excellent job of minimizing pipeline and utility line accidents.

Programs and Initiatives:
Pipeline jurisdiction and oversight in Michigan is complex, determined primarily by the type and function of a pipeline and its location. Agencies involved include 1) the MPSC Gas Safety Office; 2) the USDOT/OPS in Kansas City, Missouri; and 3) the Michigan Department of Environmental Quality, Geological Survey Division (MDEQ/GSD). The table below is a breakdown of jurisdictional and inspection responsibilities for

the various types of pipelines present in Michigan:

Pipeline Safety Regulation in Michigan

TABLE 3.5

Pipeline Type	Jurisdiction	Applicable Code	Inspected by
Inter-state natural gas	USDOT/OPS	49 CFR Part 192	MPSC Gas Safety Intrastate
Inter-state natural gas	State of MI/MPSC	Michigan Gas Safety Standards	MPSC Gas Safety
Liquid Petroleum	USDOT/OPS	49 CFR Parts 193/195	USDOT/OPS
Gathering Lines*	MDEQ/GSD	Oil/Gas Administrative rules under Part 165, 1994 P.A. 451	
*Note: Gathering lines are run from a production facility (i.e., well) to a pre-processing plant (i.e., dehydration facility, separator, compression station). Source: Michigan Public Service Commission, Gas Safety Office			

Local Emergency Capability:
Procedures in the Emergency Operations Plans address the unique types of problems associated with this hazard, including specific functions such as rescue and evacuation. Communities work closely with company officials and surrounding jurisdictions to ensure a fast, coordinated response. Mitigation possibilities include the use of community zoning regulations to provide suitable open, unoccupied "buffer" areas around pipelines, storage fields, refineries and compressor stations.

Nuclear Power Plant Accidents
Mitigation of nuclear power plant hazards on the local County level is primarily limited to the detection of radiation, alerting the public, and providing directions for evacuation and/or housing – the latter three issues are addressed in other sections of this mitigation action item section of the mitigation plan.

Infrastructure Failures

Infrastructure Failures in Roscommon County
Most of Roscommon County's infrastructure failures are secondary hazards caused by other major events such as floods, windstorms, snow and ice storms. The main infrastructure failures are power outages, which are normally restored in a matter of hours. However, if the power were out for a longer period of time, the local chapter of the American Red Cross would be called to set up temporary shelters.

Water/Electrical Infrastructure Failure
The Federal Clean Water Act regulates the discharge from community wastewater collection and treatment systems. The regulatory aspects of the Act that pertain to municipalities have been delegated to the MDEQ Surface Water Quality Division for surface water discharge facilities, and the MDEQ Waste Management Division for groundwater discharge facilities. Authority for the oversight of planning, facility design review, and construction permitting of sewerage systems collection, transportation and treatment facilities, is derived from Part 41 of the Michigan Natural Resources and Environmental Protection Act (451 P.A. 1994) and Administrative Rules promulgated under authority of Part 41. The two MDEQ divisions assist communities with the development and maintenance of their wastewater collection and treatment systems. In addition, they monitor and regulate these systems to ensure pollution abatement and health conditions are met. Although the regulatory authority vested in the

MDEQ is primarily aimed at preventing pollution of waters of the state, there are requirements in place under 451 P.A. 1994 regarding the design, construction, and operational integrity and reliability of wastewater collection and treatment systems.

Electrical system
Disaster-related damage to electric power facilities and systems is a concern that is being actively addressed by utility companies across the state. Detroit Edison, Consumers Energy and other major electric utility companies have active, ongoing programs to improve system reliability and protect facilities from damage by wind, snow and ice, and other hazards. Typically, these programs focus on trimming trees to prevent encroachment of overhead lines, strengthening vulnerable system components, protecting equipment from lightning strikes, and placing new distribution systems underground. The Michigan Public Service Commission (MPSC) monitors power system reliability to help minimize the scope and duration of power outages.

Telecommunications System
Like electric utility companies, telecommunications companies are concerned with the issue of protecting facilities and systems from disaster-related damage. Major telecommunications companies have programs to improve system reliability and physically protect facilities and system components from wind, snow and ice, and other hazards, utilizing many of the same techniques as the electric utility companies.

Surface Drainage Systems:
Michigan's first drain laws appeared on the books as Territorial laws – years before Michigan achieved statehood. After attaining statehood in 1837, the State passed its first drain law in 1839. Since that time, there have been 45 separate acts passed regarding drainage, up to the most recent re-codification of drain law in 1956. Since 1956, the present drain code has been amended over 200 times – an indication of how important and dynamic the issue of drainage continues to be in Michigan. The Michigan Drain Code provides for the maintenance and improvement of the vast system of intra-County (County) and inter-County drainage facilities. Each drain has a corresponding special assessment district (watershed), a defined route and course, an established length, and is conferred the status of a public corporation with powers of taxation, condemnation, ability to contract, hold, manage and dispose of property, and to sue and be sued. Drainage districts and drains are established by petition of the affected landowners and/or municipalities. County drains, with a special assessment district entirely within the County, are administered by the locally elected County Drain Commissioner. Inter-County drains, with a special assessment district in more than one (1) County, are administered by a drainage board that consists of the drain commissioners of the affected counties, and is chaired by the Director of the Michigan Department of Agriculture (MDA) or an MDA Deputy Director.

Water Distribution Systems:
Michigan's public water supplies are regulated under the Federal Safe Drinking Water Act. The Michigan Department of Environmental Quality (MDEQ), as a primary agency for the Federal government, provides supervision and control of Michigan's public water supplies (including their operation and physical improvements) under the Michigan Safe Drinking Water Act (399 P.A. 1976).

The MDEQ Drinking Water and Radiological Protection Division regulates, through a permit process, the design, construction and alteration of public water supply systems. Water supply construction must be conducted within the framework of the Michigan Safe Drinking Water Act, as well as the Architecture, Professional Engineering and Land Surveying Act (240 P.A. 1937, which requires professional engineering preparation of construction documents for water works construction costing over $15,000). Most communities in Michigan, including Mt. Pleasant have, in conjunction with the MDEQ, developed water

system master plans that conform to the requirements of the Michigan Safe Drinking Water Act. From a hazard mitigation standpoint, that is important because it helps ensure that all new water system construction and alterations to existing systems will conform to the minimum standards set in the Act. While not making water infrastructure "disaster-proof", the standards provide at least a basic level of design, structural and operational integrity to new or renovated portions of a community's water supply system.

Public Health Emergencies

Michigan Department of Community Health:
The Director of the Department of Community Health, and local public health officers, have the authority (under the Michigan Public Health Code—1978 PA 368, as amended) to take those steps determined necessary and prudent to prevent epidemics and the spread of hazardous communicable diseases, or to effectively mitigate other conditions or practices that constitute a menace to public health. The Director and local public health officers can issue written orders to implement the required preventive steps and/or responses, and those orders can be enforced through the imposition of civil and criminal penalties for failure to comply. State and local health departments have detailed, written emergency operations plans that address public health emergencies.

U.S. Centers for Disease Control and Prevention:
At the national level, the U.S. Centers for Disease Control and Prevention (CDC), a branch of the Department of Health and Human Services, has the responsibility and authority to investigate public health emergencies to determine their cause, probable extent of impact, and appropriate mitigation measures. The CDC can also assist state and local public health officials in establishing health surveillance and monitoring systems/programs, and in disseminating information on prevention and treatment to the general public. The CDC announced dedicated funding for bioterrorism response, and Michigan has been strengthening its surveillance and intervention infrastructures with these funds. Since 2001, the CDC has also provided dedicated funding for public health emergency preparedness programs. In 2002, the MDCH Office of Public Health Preparedness was established to oversee these cooperative agreements. In the 2009 Influenza A (H1N1) event, CDC coordinated with numerous health departments across the country, tracked influenza cases, and provided information about outbreak trends. Tests were also performed, to verify whether flu cases were indeed of the correct type.

Michigan Pandemic Influenza Plan:
In October 2009, the Michigan Department of Community Health updated the "Michigan Pandemic Influenza Plan," to provide response guidelines for an influenza pandemic affecting Michigan. Although the plan cannot eliminate the disease, it will aid in reducing the impact by enabling state and local agencies to anticipate, prepare for, and respond efficiently and effectively to the disease. The plan, which is divided into pre-pandemic, pandemic, and post-pandemic phases, details necessary activities at the state and local level related to:

- command and management,
- crisis communications,
- surveillance,
- laboratory testing,
- community containment,
- infection control in health care facilities,
- vaccines and antivirals/medical management,
- data management,
- border/travel issues

- recovery

The Michigan Pandemic Influenza Plan is available for review and downloading at http://www.michigan.gov/flu

Transportation Accidents

Air Transportation:

The Michigan Aeronautics Commission of the MDOT administers several programs aimed at improving aviation safety and promoting airport development. The Commission's safety programs include: 1) registering aircraft dealers, aircraft, and engine manufacturers; 2) licensing airports and flight schools; 3) inspecting surfaces and markings on airport runways; and 4) assisting in removal of airspace hazards at airports. The Commission's airport development program includes providing state funds for airport development and airport capital improvements – many of which contribute to overall air transportation safety. The Federal Aviation Administration (FAA) contracts with the MDOT for the inspection of the state's 238 public- use airports on an annual basis. The FAA has regulatory jurisdiction over operational safety and aircraft worthiness. The National Transportation Safety Board (NTSB) investigates all aircraft crashes that involve a fatality and publishes reports on its findings (see the NTSB section below).

Bus Safety:

School bus safety programs and initiatives generally fall into two categories: 1) driver skill enhancement, competency training and 2) physical inspections of bus mechanical and safety equipment. The Motor Carrier Division, Michigan Department of State Police, inspects all school buses and other school transportation vehicles (21,000 units) on an annual basis. In addition, all school bus drivers in Michigan must take and pass a bus driver education and training program, and then take regular refresher courses to maintain their certification to operate a school bus. School bus drivers must also pass an annual medical examination.

CHAPTER 4: HAZARD ANALYSIS

Natural Hazards-Severe Summer Weather

HAIL

Condition where atmospheric water particles from thunderstorms form into rounded or irregular lumps of ice that falls to the earth.

Hazard Description

Hail is a product of strong thunderstorms. Hail is formed when strong updrafts within the storm carry water droplets above the freezing level, where they remain suspended and continue to grow larger until their weight can no longer be supported by the winds. They finally fall to the ground, battering crops, denting autos, and injuring wildlife and people. As one of these thunderstorms passes over, hail usually falls near the center of the storm, along with the heaviest rain. Most hailstones range in size from a pea to a golf ball, but hailstones larger than baseballs have been reported. Large hail is a characteristic of severe thunderstorms, and it may precede the occurrence of a tornado.

Hailstorms in Roscommon County

There were 49 Hail events, on 41 days reported by the National Climatic Data Center (NCDC) for Roscommon County, Michigan between 01/01/1950 and 12/31/2015. This is an average of .75 hailstorms per year. These storms were located throughout the County and were not specific to any region within the County. The largest reported hail was 1.75 inches, which is slightly larger than a golf ball (1.68 inches); however, the average-sized hail is between .75 and .88 inches, which is slightly smaller than a nickel.

Hail Overview

There were no damages reported to the NCDC within the County; however, the data from these events may be incomplete as not all damages were reported to the NCDC. According to the 2014 Michigan Hazard Mitigation Plan (MHMP), the counties surrounding Roscommon all have reported damages as a result of hailstorms. Therefore, it is safe to presume that even though no damages have been reported in recent years, because of the damages reported in the surrounding counties and the likelihood of hailstorms occurring in Roscommon County, damages may occur in the future as a result of hailstorms. Due to the lack of reported damages as a result of these events, hail was given a moderate (low) priority to address.

LIGHTNING

The discharge of electricity from within a thunderstorm.

Hazard Description

Most direct impacts from lightning are relatively site-specific in scope, and therefore do not have a tremendous impact on the community as a whole. With the temperature of a bolt of lightning approaching 50,000 degrees Fahrenheit in a split second, the most common direct damage from lightning is fire. The most common indirect effect of lightning is power outages. This indirect effect can have an impact on a much larger segment of the community, leaving hundreds and sometimes thousands of homes without electricity.

Lightning is a random and unpredictable product of a thunderstorm's tremendous energy. The energy in the storm produces an intense electrical field like a giant battery, with the positive charge concentrated at the top and the negative charge concentrated at the bottom. Lightning strikes when a thunderstorm's electrical potential (the difference between its positive and negative charges) becomes great enough to overcome the resistance of the surrounding air. Bridging that difference, lightning can jump from cloud to cloud, cloud to ground, ground to cloud, or even from the cloud to the air surrounding the thunderstorm. Lightning strikes can generate current levels of 30,000 to 40,000 amperes, with air temperatures often superheated to higher than 50,000 degrees Fahrenheit (hotter than the surface of the sun) and speeds approaching one-third the speed of light.

Globally, there are about 2,000 thunderstorms occurring at any given time, and those thunderstorms cause approximately 100 lightning strikes to earth each second. In the United States, approximately 100,000 thunderstorms occur each year, and every one of those storms generates lightning. It is commonplace for a single thunderstorm to produce hundreds or even thousands of lightning strikes. However, to the majority of the public, lightning is perceived as a minor hazard. That perception lingers despite the fact that lightning damages many structures and kills and injures more people in the United States per year, on average, than tornadoes or hurricanes. Many lightning deaths and injuries could be avoided if people would have more respect for the threat lightning presents to their safety.

Lightning deaths are usually caused by the electrical force shocking the heart into cardiac arrest or throwing the heartbeat out of its usual rhythm. Lightning can also cut off breathing by paralyzing the chest muscles or damaging the respiratory center in the brain stem. It takes only about one-hundredth of an ampere of electric current to stop the human heartbeat or send it into ventricular fibrillation. Lightning can also cause severe skin burns that can lead to death if complications from infection set in.

Statistics compiled by the National Oceanic and Atmospheric Administration (NOAA) and the National Lightning Safety Institute (NLSI) for the period 1959-1994 revealed the following about lightning fatalities, injuries and damage in the United States:

Location of Lightning Strikes:

- 40% are at unspecified locations
- 27% occur in open fields and recreation areas (not golf courses)
- 14% occur to someone under a tree (not on golf course)
- 8% are water-related (boating, fishing, swimming, etc.)
- 5% are golf related
- 3% are related to heavy equipment and machinery
- 2.4% are telephone-related
- 0.7% are radio, transmitter and antenna-related

The NLSI estimates that 85% of lightning victims are children and young men (ages 10-35) engaged in recreation or work-related activities. Approximately 20% of lightning strike victims die, and 70% of survivors suffer serious long-term after-effects such as memory and attention deficits, sleep disturbance, fatigue, dizziness and numbness.

Unfortunately, lightning prevention or protection in an absolute sense is impossible. However, the consequences of lightning strikes have been diminished (both in terms of deaths and injuries and property damage) through the implementation of programs and initiatives.

Lightning Events in Roscommon County

2 lightning events were reported by the National Climatic Data Center (NCDC) for Roscommon County, Michigan between 01/01/1950 and 12/31/2015. The estimated damages were in the amount of $55,000; however, the data from these events is incomplete as not all damages that occurred were reported.

On 6/11/1999 scattered strong to severe storms with lightning strikes caused a house fire in the Houghton Lake area.

On 7/26/2005 several waves of thunderstorms moved through northern Lower Michigan in the overnight hours. Most were not severe, though the storms did bring heavy rain and considerable lightning. Lightning struck a radio tower, damaging equipment in a nearby building near Prudenville.

Lightning Overview

Only two reported lightning strikes in Roscommon County during the past 65 years resulted in damage to property. Many other lightning events took place in the County during the time period, fortunately no other events were reported to result in the loss of life, injuries, or loss of property. Even though there has only been two reported events during this time period, lightning is a severe weather event and has been given a medium priority to address.

TORNADOS

A violently whirling column of air extending downward to the ground from a cumulonimbus cloud.

Hazard Description

Tornadoes in Michigan are most frequent in spring and early summer when warm, moist air from the Gulf of Mexico collides with cold air from the Polar Regions to generate severe thunderstorms. These thunderstorms often produce tornadoes. A tornado may have winds up to 300 miles per hour and an interior air pressure that is 10 to 20 percent below that of the surrounding atmosphere. The typical length of a tornado path is approximately 16 miles, but tracks up to 200 miles have been reported. Tornado path widths are generally less than one-quarter mile wide. Historically, tornadoes have resulted in tremendous loss of life, with a national average of 111 deaths per year. Property damage from tornadoes is in the hundreds of millions of dollars every year in the United States.

Michigan is located on the northeast fringe of the Midwest tornado belt. The lower frequency of tornadoes occurring in Michigan may be, in part, the result of the colder water of Lake Michigan during the spring and early summer months, a prime period of tornado activity. During a time frame between 1950 -1999, Roscommon County had a total of 8 tornadoes.

Like severe wind events, tornado disasters require that communities plan and prepare for the mass care of residents left without electrical power and the clearance of trees and other debris from roadways. These are two primary challenges that face all Michigan communities in such an event. The planning and preparedness effort should include the identification of mass care facilities and supplies. In Roscommon County, the local chapter of the American Red Cross would be called to prepare shelters.

In addition, each community should develop debris management procedures (including the identification of multiple debris storage, processing and disposal sites) so that the stream of tree and construction debris can be handled in the most expedient, efficient, and environmentally safe manner possible. Both FEMA and the Michigan Department of State Police Emergency Management Division offer debris management

courses to provide local, State, and Federal management personnel at all levels with an overview of issues and recommended action necessary to plan for, respond to, and recover from a major debris generating event. Such a course would be useful for local government leaders in developing a debris management plan.

Tornado Intensity

Tornado intensity is measured on the Fujita Scale, which examines the damage caused by a tornado on homes, commercial buildings, and other man-made structures. The Fujita Scale rates the intensity of a tornado based on damage caused, not by its size. It is important to remember that the size of a tornado is not necessarily an indication of its intensity. Large tornadoes can be weak, and small tornadoes can be extremely strong. It is very difficult to judge the intensity and power of a tornado while it is occurring. Generally, that can only be done after the tornado has passed (see following page for scale.)

The Enhanced Fujita Scale of Tornado Intensity

TABLE 4.1

EF-Scale Number	Intensity Description	Wind Speed (mph)	Type/Intensity of Damage
EF-0	Gale tornado	65-85 mph	**Light damage**. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF-1	Moderate Tornado	86-110 mph	**Moderate damage.** The lower limit is the beginning of hurricane wind speed; roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF-2	Strong Tornado	111-135 mph	**Considerable damage.** Roofs torn off well-constructed houses; foundation of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF-3	Severe Tornado	136-165 mph	**Severe damage.** Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; foundations blown away some distance.
EF-4	Devastating tornado	166-200 mph	**Devastating damage.** Whole frame houses, well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF-5	Incredible Tornado	200 mph+	**Incredible damage**. Strong frame houses lifted off foundations and carried considerable distances; automobile sized missiles fly through the air in excess of 100 meters; high-rise buildings have significant structural deformation; incredible phenomena will occur

Source: Storm Prediction Center

Tornado Events in Roscommon County

Eight tornados were reported in Roscommon County, Michigan between 01/01/1950 and 12/31/2015. Of the reported seven tornadoes, two caused major destruction, four resulted in minor damages and two tornados had no reported damages as a result if its actions. The two major events were F1 storms and are described as follows:

On 6/17/1992 a funnel cloud was seen aloft by spotters on County Road 100 and Mohawk Drive. Extensive damage was reported on the ground. Several oak trees were uprooted, a three-inch diameter branch was driven into the roof of a house, power and telephone lines were downed, boats were flipped over, a large oak tree was downed and demolished a care and a small commercial store was shifted 0.5 inches off its foundation. Over $250,000 in damages were incurred as a result of the tornado.

On 6/27/1995 a funnel developed and touched down several times in the Houghton Lake area. After touching down on land the tornado did widespread damage, cutting a 150-foot wide swath damaging large pines and hardwood trees. Structural damage occurred to cottages and homes due to the uprooted trees and debris. In addition numerous pontoons boats were damaged or destroyed. In total approximately $500,000 in damages were recorded.

Tornadoes Overview

In over the 65 year reporting period, only eight tornadoes were reported in Roscommon County. His is an average of one tornado every eight years. Even though there appears to be in increase in major storm activity in recent years, tornado presence has not been reported in the past 15+ years. Tornado presence has increased in the past few years and while they have not been reported in Roscommon County, several of the neighboring counties have reported damages as a result of them. Although tornadoes cannot be predicted until almost the last moment or prevented, their potential impact on the citizens of Roscommon County can certainly be reduced with the appropriate forethought and preparation. With limited exposure to tornadoes, they were identified as a low priority to address.

SEVERE WINDS

Non-tornadic winds 58 miles per hour (mph) or 50.4 knots per hour (kph) or greater.

Hazard Description

Severe winds, or straight-line winds sometimes occur during thunderstorms and other weather systems, and can be very damaging to communities. Often, when straight-line winds, occur, the presence of the forceful winds, with velocities over 58 mph (50.4 kph) may be confused with a tornado occurrence. Severe winds have the potential to cause loss of life, property damage, and flying debris, but tend not to cause as many deaths as tornadoes do. However, the property damage from straight-line winds can be more widespread than a tornado, usually affecting multiple counties at a time. In addition to property damage to buildings, there is a risk for infrastructure damage from downed power lines due to falling limbs and trees. Large scale power failures are common during straight-line wind events.

Severe winds spawned by thunderstorms and other weather events can have devastating effects in terms of loss of life, injuries, and property damage. According to data compiled by the National Weather Service Michigan has experienced over 9,000 severe wind events (not including tornadoes) that resulted in 122 deaths and millions of dollars in damage since 1970. Severe wind events are characterized by wind velocities of 58 mph or greater, with gusts sometimes exceeding 74 mph (hurricane velocity), but do not include tornadoes.

Wind Events in Roscommon County

Ninety-one severe wind events were reported by the National Climatic Data Center (NCDC) for Roscommon County, Michigan between 01/01/1950 and 12/31/2015. While many of these events occurred during thunderstorms, they were not limited to thunderstorm activity. There were two deaths and one injury as a result of these storms. In addition over $50 million in property and crop damages were also reported.

On 7/13/1995 thunderstorm winds did widespread tree damage across all but extreme southeast Roscommon County, with well over 100 trees down. Most of the trees brought down were the largest and healthiest, as they had the highest tops and heaviest foliage. Widespread damage to residences, cottages, garages, and vehicles was caused by falling trees, while the winds damaged and destroyed docks and boats on the lee shores of county lakes. Consumers Power Company estimated over 100 miles of phone and power lines were downed in the County and electrical service remained out to thousands of homes and cottages for periods ranging from a few days to over a week. Average wind gusts in most areas were estimated to be in the 65-80 mph range. There was over $50 million in damages that resulted from this storm.

Two deaths also resulted from this storm. The first was an 11-year old female, accompanied by four family members was killed when the pontoon boat she was in flipped while returning to its dock. She became trapped under the boat and rescue efforts were delayed by blocked roads in the area. The second was a man riding the ORV trails of St. Helen with his wife when they were stranded by trees brought down by the winds. The man suffered a heart attack and as his wife sought assistance she was delayed due to the downed trees. He was found dead when she returned with assistance.

On 7/18/2010 a line of showers and thunderstorms moved through Central Lower Michigan early in the afternoon followed by sunshine, creating an unstable atmosphere. Thunderstorms redeveloped late in the afternoon. One home east of Prudenville was struck by a fallen tree, injuring a man on the porch. He suffered minor injuries from broken glass. There was also over $20,000 in damages as a result of the storm.

Severe Winds Overview

Since 1950 there have been approximately 90 severe wind events with more than half of them being in the past 20 years. It can be anticipated that the trend for strong wind events to occur will continue, based on the changing weather patterns, and the number of events will continue to rise. On an average, severe wind events can be expected 3-4 times per year in the northern Lower Peninsula. These figures refer to winds from thunderstorms and other forms of severe weather not tornadoes.

The recent trend in weather conditions has seen an increase annual severe winds in Roscommon County. Because of their impact and secondary impact to the special needs populations, they were identified as a high priority to address.

FOG

Condensed water vapor in cloudlike masses lying close to the ground and limiting visibility.

Hazard Description

Fog forms near the ground when water vapor condenses into tiny liquid water droplets that remain suspended in the air. Many different processes can lead to the formation of fog, but the main factor is saturated air. Two ways that air can become saturated are by cooling it to its dew point temperature or

by evaporating moisture into it to increase its water vapor content. Although most fog, by itself, is not a hazard because it does not actually apply destructive forces, the interaction between humans and fog can be a dangerous situation, sometimes resulting in disastrous consequences.

Haze and Smog

Haze occurs when dust, smoke and other pollutant particles obscure the normal clarity of the sky. It occurs when dust and smoke particles accumulate in relatively dry air. When weather conditions block the dispersal of smoke and other pollutants, they concentrate and form a usually low-hanging shroud that impairs visibility and may become a respiratory health threat, as well as make safe driving more difficult. Dense haze caused by industrial pollution is also known as smog. This hazard may cause public health problems, so it is mentioned in this subsection but is not given particular emphasis since this plan has more of an emergency management focus. It is noted here as an area of potential overlap and future coordination with other agencies. The Michigan Department of Community Health and the Michigan Department of Natural Resources may do more with this issue in the future, if the effects become severe enough. Since it may be possible that climate change issues cause this to be a more frequent and ongoing concern in Michigan, it is mentioned here. In general, however, air quality has generally improved since the effects of the Clean Air Act, other legislation, regulatory measures, and shifts away from heavy industry in Michigan's economy.

Smoke-producing hazards may have an effect that seems visually comparable to fog. For example, wildfires, hazardous materials incidents, structural fires, major transportation accidents, or industrial accidents may produce clouds of smoke that can obscure visibility and increase the risk of transportation accidents.

Hazard Analysis

In considering severe and high-impact meteorological events, attention can easily become focused on the more dramatic storms. Tornadoes and hurricanes for example, are readily recognized by the general public and the meteorological community alike for their devastating consequences. Fog, on the other hand, does not lend itself as readily to this categorization. Yet, both in cost and casualties, fog has consistently impacted society, and in particular the transportation sector - sometimes with deadly consequences. Fog has played a contributing role in several multi-vehicle accidents over the past several years. While statistics suggest that highway accidents and fatalities, in general, have fallen, that trend is not evident with respect to accidents and fatalities caused by fog.

Fog can be very dangerous because it reduces visibility. Although some forms of transport can penetrate fog using radar, road vehicles have to travel slowly and use more lights. Localized fog is especially dangerous, as drivers can be caught by surprise. Fog is particularly hazardous at airports, where some attempts have been made to develop methods (such as using heating or spraying salt particles) to aid fog dispersal. These methods have seen some success at temperatures below freezing.

One major fog event is estimated to occur in Michigan approximately every two years. Property damage can be significant for vehicles, although real property and structures are usually unaffected. Fog has not yet been identified as one of the most significant hazards in any of Michigan's local hazard mitigation plans.

Fog Overview

No major events have occurred in Roscommon County in recent years. One major fog event is estimated to occur in Michigan approximately every two years. Property damage can be significant for vehicles,

although real property and structures are usually unaffected. However, based on their recent impact, or lack thereof, fog was given a moderate priority to address.

EXTREME TEMPERATURES (HEAT)

Prolonged periods of very high temperatures, often accompanied by exacerbating conditions such as high humidity and lack of rain.

Hazard Description

Extreme temperatures – whether it be extreme heat or extreme cold – share a commonality in that they both primarily affect the most vulnerable segments of society such as the elderly, children, impoverished individuals, and people in poor health. The major threats of extreme heat are heatstroke (a major medical emergency), and heat exhaustion. Extreme heat is a more serious problem in urban areas, where the combined effects of high temperature and high humidity are more intense.

Roscommon County is susceptible to extreme heat. The temperate climate of southern Michigan, combined with the unsettling effect of Lake Huron, make for extreme deviations in temperature. 50-degree swings in the temperature in a 24-hour period are not uncommon. These events occur regularly depending on the year.

Prolonged periods of extreme heat can pose severe and often life-threatening problems for Roscommon County's citizens. Extreme summer weather is characterized by a combination of very high temperatures and humid conditions. When persisting over a long period of time, this phenomenon is commonly called a heat wave. The major threats of extreme summer heat are **heatstroke** (a major medical emergency), and **heat exhaustion**. **Heatstroke** often results in high body temperatures, and the victim may be delirious, stuporous, or comatose. Rapid cooling is critical to preventing permanent neurological damage or death. Heat exhaustion is a less severe condition than heatstroke, although it can still cause problems involving dizziness, weakness and fatigue. **Heat exhaustion** is often the result of fluid imbalance due to increased perspiration in response to the intense heat. Treatment generally consists of restoring fluids and staying indoors in a cooler environment until the body returns to normal. Other, less serious risks associated with extreme heat are often exercise-related and include heat syncope (a loss of consciousness by persons not acclimated to hot weather), and heat cramps (an imbalance of fluids that occurs when people unaccustomed to heat exercise outdoors).

How our bodies respond to heat is impacted by a combination of the air temperature and the relative humidity. Hydration and cooling needs are different for a 90°F day with 30% humidity versus a 90°F day with 90% humidity. The NWS has devised a measurement system known as the heat index (HI) to estimate the temperature a person is exposed to over a common temperature and humidity range. The NWS will initiate alert procedures when the HI is expected to exceed 105°- 110°F for at least two consecutive days. The chart below shows the HI that corresponds to the actual air temperature and relative humidity.

Because the combined effects of high temperatures and high humidity are more intense in urban centers, heatstroke and heat exhaustion are a greater problem in cities than in suburban or rural area. Nationwide, approximately 170 deaths a year are directly attributable to extreme heat. In Michigan, approximately 7% of weather-related fatalities (about 5 deaths per year) are attributed to extreme heat (according to the Michigan Department of Community Health and the National Weather Service). Extreme summer heat is also hazardous to livestock and agricultural crops, and it can cause water shortages, exacerbate fire hazards, and prompt excessive demands for energy. Roads, bridges, railroad

tracks and other infrastructure are susceptible to damage from extreme heat (due to the effects of thermal expansion of the materials).

Air conditioning is probably the most effective measure for mitigating the effects of extreme summer heat on people. Unfortunately, many of those most vulnerable to this hazard do not live or work in air-conditioned environments, especially in major urban centers where the vulnerability is highest. The use of fans to move air may help some, but recent research indicates that increased air movement may actually exacerbate heat stress in many individuals.

Extreme Heat Events in Roscommon County

No extreme heat events were reported by the National Climatic Data Center (NCDC) for Roscommon County, Michigan between 1/1/1950 and 12/31/2015.

Extreme Heat Overview

While there have been minimal excessive heat conditions, high heat events occur annually in Roscommon County and are a risk to the resident and visitors. Air conditioning is probably the most effective measure for mitigating the effects of extreme summer heat on people. Unfortunately, many of those most vulnerable to this hazard (children, elderly, and homeless individuals, and the critically ill) do not have access to air-conditioned environments. Because of its effect on special needs population excessive heat was given a medium priority to address.

Natural Hazards-Severe Winter Weather

ICE/SLEET STORMS

A storm that generates sufficient quantities of ice or sleet to result in hazardous conditions and/or property damage.

Hazard Description

Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is similar to hail only smaller and can be easily identified as frozen rain drops (ice pellets) which bounce when hitting the ground or other objects. Sleet does not stick to trees and wires, but sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage. When electric lines are downed, households may be without power for several days, resulting in significant economic loss and disruption of essential services in affected communities.

Ice and Sleet Storms in Roscommon County

A total of three ice/sleet storms were reported by the NCDC for Roscommon County, Michigan between 1/1/1950 and 12/31/2015. No damages were estimated as a result of these storms; however, the data from these events is incomplete as not all damages that may have occurred have been reported.

Ice and Sleet Storms Overview

Since 1950 there have been three reported ice storms or approximately one every 20 years. However, all three storms occurred in the past 20 years, possibly indicating that there may be change in the weather patterns, and that more events can be anticipated in the future, possibly one in every 6-7 years.

One of the biggest problems with ice and sleet storms is loss of power. The weight of the ice causes power lines to snap and break. Sometimes it can take days to restore power. If this happens temporary shelters may need to be set up. The local chapter of the American Red Cross would be called. Also with the power loss would come loss of heat, which could cause death from hypothermia especially with the elderly population. Another problem caused by ice and sleet storms would be debris cleanup. The weight of the ice could cause tree limbs to snap and break.

Approximately 87% of ice storms occur during the months of January, February, March and April, when conditions are most conducive for the development of ice and sleet. By listening for winter storm watches and warnings, people can be better prepared and lessen the impact of this hazard. The best way to avoid any consequences from an ice storm would be to stay inside and not travel unless absolutely necessary. As a result of their potential and their secondary impact, ice/sleet storms were given a high priority to address.

SNOWSTORMS

A period of rapid accumulation of snow often accompanied by high winds, cold temperatures, and low visibility.

Hazard Description

As a result of being surrounded by the Great Lakes, Michigan experiences large differences in snowfall in relatively short distances. The annual mean accumulation ranges from 30 to 170 inches of snow. The highest accumulations are in the northern and western parts of the Upper Peninsula. In Lower Michigan, the highest snowfall accumulations occur near Lake Michigan and in the higher elevations of northern Lower Michigan.

Blizzards are the most dramatic and perilous of all snowstorms, characterized by low temperatures and strong winds (35+ miles per hour) bearing enormous amounts of snow. Most of the snow accompanying a blizzard is in the form of fine, powdery particles that are wind-blown in such great quantities that, at times, visibility is reduced to only a few feet. Blizzards have the potential to result in property damage and loss of life. Just the cost of clearing the snow can be enormous.

The western Upper Peninsula experiences the most snowstorms in Michigan each year. The western half of the Lower Peninsula also experiences a relatively large number of snowstorms. One reason for this is the “lake effect”, a process by which cold winter air moving across Lakes Michigan and Superior picks up moisture from the warmer lake waters, resulting in significant snowfall amounts in the western part of the state.

Snowstorms in Roscommon County

There have been a total of 52 events in the snowstorm category (blizzards, winter storms, winter weather, and heavy snows) from 1/1/1950 to 12/3/-2015. No damages or human-related injuries were reported as a result of these storms; however, the data from these events is incomplete as not all damages that may have occurred were reported. Following are examples of the different types of snowstorms in this category that have affected the County.

Blizzard-On 1/2/1999 to 1/3/1999 an intense winter storm which developed over the southern plains lifted northeastward across lower Michigan from the evening of the 2nd through the morning of the 3rd producing blizzard conditions across the region. Winds increased steadily during Saturday the 2nd…with heavy snow starting to lift across northern lower Michigan during the afternoon and early evening hours.

The snow reached eastern upper Michigan overnight. System snows tapered off during the morning of the 3rd. Across northern lower Michigan…snowfall totals generally ranged from 10-to 18 inches…with localized totals around 20 inches. Wind gusts of around 35 mph were common during the peak of the storm…with some gusts of 40 to 50 mph reported along Lake Huron shoreline where winds were onshore. The strong winds caused extensive blowing and drifting of the snow and greatly limited visibilities. Drifts as high as 6 to 8 feet were reported across portions of the region.

Heavy snows-On 2/08/2001 south winds intersecting a warm front that extended across the southern Great Lakes region triggered an area of heavy snow across portions of northern lower Michigan. The snowfall began late in the evening on the 7th. However, the snowfall did not become heavy until the early morning hours of the 8th. By noon on the 8th, 12-hour snowfall amounts totaled greater than 6 inches across portions of northern lower Michigan. The heaviest snow fell across northern Roscommon, Ogemaw and Iosco Counties, where accumulations ranged from 12 to 15 inches.

Winter storms-on 2/27/97 a surface low tracking across the lower Great Lakes and an upper low crossing northern lower Michigan combined to bring heavy snows to the region. Snow occasionally fell at the rate of 1 to 2 inches per hour. Strong winds combined with snow to cause significant blowing and drifting…with near whiteout conditions at times. Total snowfall across the county ranged from 6 to 10 inches.

Winter weather-On 11/10/2006 to 11/11/2006 a potent upper level disturbance produced a period of intense snowfall across most of northern lower Michigan, centered on the evening of the 10th. Thunder and lightning accompanied the snow for several hours. The snow was very sloppy and wet, with snow-to-liquid ratios around 6-1. Thus, though the precipitation was heavy, snowfall amounts were generally only 3 to 6 inches, or a bit under the warning criteria. However, the weight of the snow brought down a number of tree limbs and power lines across the region. Parts of Presque Isle, Wexford, and Missaukee Counties were without power for 48 hours.

Snowstorms Overview

All of the 52 reported storms have occurred in the past 20 years, which averages to 2.6 per year. In addition, the trend over the past 20 years shows that the storms are increasing in recent years.

Severe snowstorms can affect every Michigan community. They can cause power outages and block the roadways for several days at a time in some occasions. Listening for the severe storm watches and warnings can lessen the impact of these storms. People should have adequate time to prepare for these storms like getting food, wood, fuel etc. into their homes. Another way to lessen the impact of the storm would be to stay off the roads unless it is absolutely necessary to travel. Even though these events can render a community helpless, because they are often identified will in advance, they were given a medium priority to address.

EXTREME TEMPERATURES (COLD)

Prolonged periods of very low temperatures, often accompanied by exacerbating conditions such as heavy snowfall and high winds.

Extreme temperatures – whether it be extreme heat or extreme cold – share a commonality in that they both primarily affect the most vulnerable segments of society such as the elderly, children, impoverished individuals, and people in poor health. The major threats of extreme cold are hypothermia (also a major medical emergency) and frostbite. Michigan is subject to both temperature extremes.

Hazard Description

Prolonged periods of extreme cold can pose severe and often life-threatening problems for Roscommon County's citizens. Like heat waves, periods of prolonged, unusually cold weather can result in a significant number of temperature-related deaths. Each year in the United States, approximately 700 people die as a result of severe cold temperature-related causes. This is substantially higher than the average of 170 heat-related deaths each year. It should be noted that a significant number of cold-related deaths are not the direct result of "freezing" conditions. Rather, many deaths are the result of illnesses and diseases that are negatively impacted by severe cold weather, such as stroke, heart disease and pneumonia. It could be convincingly argued that, were it not for the extreme cold temperatures, death in many cases would not have occurred at the time it did from the illness or disease alone.

Hypothermia (the unintentional lowering of core body temperature), and **frostbite** (damage from tissue being frozen) are probably the two conditions most closely associated with cold temperature-related injury and death. Hypothermia is usually the result of over-exposure to the cold, and is generally thought to be clinically significant when core body temperature reaches 95 degrees or less. As body temperature drops, the victim may slip in and out of consciousness, and appear confused or disoriented. Treatment normally involves re-warming the victim, although there is some controversy in the medical community as to exactly how that should be done. Frostbite rarely results in death, but in extreme cases it can result in amputation of the affected body tissue.

Hypothermia usually occurs in one of two sets of circumstances. One situation involves hypothermia associated with prolonged exposure to cold while participating in outdoor sports such as skiing, hiking, or camping. Most victims of this form of hypothermia tend to be young, generally healthy individuals who may lack experience in dealing with extreme cold temperature. The second situation involves a particularly vulnerable person who is subjected to only a moderate, indoor cold stress. A common example would be that of an elderly person living in an inadequately heated home. In such circumstances, hypothermia may not occur until days or perhaps weeks after the cold stress begins.

The special vulnerability of elderly persons to hypothermia has become readily apparent. Over half of the approximately 700 persons who die each year due to cold exposure are 60 years of age or older, even though this age group only represents about 20% of the country's population. This remarkable statistic may be due, in part, to the fact that elderly persons appear to perceive cold less well than younger persons and may voluntarily set thermostats to relatively low temperatures. In addition, high energy costs and the relative poverty among some elderly people may discourage their setting thermostats high enough to maintain adequate warmth. Because many elderly people live alone and do not have regular visitors, the cold conditions may persist for several days or weeks, thus allowing hypothermia to set in.

Babies and very young children are also very vulnerable to hypothermia. In addition, statistics indicate that death due to cold is more frequent among males than females in virtually all age groups. Part of that may be explained by differences in risk factors, and part may be due to different rates of cold exposure between the sexes.

Roscommon County is susceptible to extreme cold. The temperate climate of southern Michigan, combined with the unsettling effect of Lake Huron, make for extreme deviations in temperature. 50-degree swings in the temperature in a 24-hour period are not uncommon. These events occur regularly depending on the year.

Extreme Cold Events in Roscommon County

Four extreme cold events were reported by the National Climatic Data Center (NCDC) for Roscommon County, Michigan between 1/1/1950 and 12/31/2015.

On 2/4/2007 to 2/5/2007 exceptionally old air surged into Northern Michigan. High temperatures on the 4th were around zero, with low temperatures that night from five to ten below zero. Gusty northwest winds produced hazardous wind chills of 20 to 30 below zero, along with blowing and drifting snow. Many area schools closed on the 5th, due to the extreme cold and poor road conditions.

On 2/19/2015 a second excessive cold event within a week hit northern Michigan. This event featured colder air than the first event, including the coldest high temperature ever recorded in Gaylord. (Gaylord is approximately 40 miles north of the Village of Roscommon). Wind chills reached -30 to -40 across northern lower Michigan.

Extreme Cold Overview

Since 1950 there have been four reported extreme cold events. However, all four of these events have occurred in the past ten years. With an apparent increase in all of the severe weather events in recent years, these events may continue to be more prevalent in the future.

While there have been minimal conditions with excessive cold, cold events occur annually in Roscommon County and are a risk to the residents. Unfortunately, many of those most vulnerable to this hazard (children, elderly, and homeless individuals, and the critically ill) may not have access to sufficiently heated environments. Even though there has not been many events of this type, due to the impact on the most vulnerable populations, excessive cold was given a medium priority to address.

Hydrological Hazards

DAM FAILURES

The collapse or failure of an impoundment (water held back by a dam) resulting in downstream flooding.

Hazard Description

A dam failure can result in loss of life and extensive property or natural resource damage for miles downstream from the dam. Dam failures occur not only during flood events, which may cause overtopping of a dam, but also as a result of misoperation, lack of maintenance and repair, or vandalism. A common form of dam failure occurs when tree roots disrupt the integrity of an earthen dam. Water can pass through the dam where the soil has been broken apart by the roots. Such failures can be catastrophic because they occur unexpectedly, with no time for evacuation.

In Michigan, all dams over 6 feet high that create an impoundment with a surface area of more than 5 acres are regulated by Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act (451 P.A. 1994), as amended. This statute requires the Michigan Department of Environmental Quality (DEQ) to rate each dam as either a low, significant, or high hazard potential this rating system is based solely on the potential downstream impact if the dam were to fail, and is not according to the physical condition of the dam.

The National Inventory of Dams lists 15 dams within Roscommon County with one (1) dam identified as High Hazard Potential Dams and three (3) identified as Significant Hazard Potential Dams. The definitions

for these ratings by Michigan Law (Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act) are as follows:

"High hazard potential dam" means a dam located in an area where a failure may cause serious damage to inhabited homes, agricultural buildings, campgrounds, recreational facilities, industrial or commercial buildings, public utilities, main highways, or class I carrier railroads, or where environmental degradation would be significant, or where danger to individuals exists with the potential for loss of life.

"Significant hazard potential dam" means a dam located in an area where its failure may cause damage limited to isolated inhabited homes, agricultural buildings, structures, secondary highways, short line railroads, or public utilities, where environmental degradation may be significant, or where danger to individuals exists.

Dam Failures in Roscommon County

On 4-15-2014, the Wraco Lodge Dam collapsed causing water to flow into an already flooded Muskegon River. The dam was considered to be a low risk dam as this additional water caused the wash out of several roads, but did not cause any damage to property or harm to human life.

Dam Failure Overview

According to the National Inventory of Dams Roscommon County has one (1) dam that is rated as a High Hazard Potential Dams and three (3) dams rated as Significant Hazard Potential Dam. The High Hazard Potential Dam that is located in Roscommon County is James Lake Dam. The three (3) Significant Hazard Potential Dams are: Priddy Dam, Denton Flooding Dam, and Little Mudlake Dam.

The Federal Emergency Response Commission (FERC) has emergency planning oversight of the dams. Dam owners are required to maintain an emergency action plan (EAP) for significant and high hazard potential dams. Owners are also required to coordinate with local emergency management officials to assure consistency with local emergency operations plans. Dam failures have been given a medium priority to address.

RIVERINE FLOODING

The overflowing of rivers, streams, drains and lakes due to excessive rainfall, rapid snowmelt or ice.

Hazard Description

Flooding of land adjoining the normal course of a stream or river has been a natural occurrence since the beginning of time. If these floodplain areas were left in their natural state, floods would not cause significant damage. Development has increased the potential for serious flooding because rainfall that used to soak into the ground or take several days to reach a river or stream via a natural drainage basin now quickly runs off streets, parking lots, and rooftops, and through man-made channels and pipes.

Floods can damage or destroy public and private property, disable utilities, make roads and bridges impassable, destroy crops and agricultural lands, cause disruption to emergency services, and result in fatalities. People may be stranded in their homes for several days without power or heat, or they may be unable to reach their homes at all. Long-term collateral dangers include the outbreak of disease, widespread animal death, broken sewer lines causing water supply pollution, downed power lines, broken gas lines, fires, and the release of hazardous materials.

Most riverine flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Ice jams also cause flooding in winter and early spring. Severe thunderstorms may cause flooding during the summer or fall, although these are normally localized and have more impact on watercourses with smaller drainage areas. Oftentimes, flooding may not necessarily be directly attributable to a river, stream or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are often not in a floodplain. That type of flooding is becoming increasingly prevalent in Michigan, as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow. Flooding also occurs due to combined storm and sanitary sewers that cannot handle the tremendous flow of water that often accompanies storm events. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns.

Ice Jams

Cold winters like those we experience in Roscommon County can produce thick river ice and the potential for ice jams. An ice jam develops when pieces of snow and ice buildup along a river. As the ice buildup increases, water passes slowly, and flooding develops behind the dam of ice. Water levels can also rise rapidly when temperatures rise and result in snowmelt runoff or rain, thus adding more water to the river behind an ice jam.

In the spring, or when temperatures rise, the ice buildup will thaw and break up, and may unleash all of the damned up water in a short period of time. When this occurs, flooding can rapidly result downstream from the ice jam. The combination of ice, debris, and water released from the ice jam can cause tremendous physical damage to homes, docks, and other structures.

Monthly Mean Precipitation in Roscommon County, 1919-2015

TABLE 4.2

Month	Roscommon	
	1919-2000	2001-2015
January	1.50	1.55
February	1.25	1.31
March	1.93	1.61
April	2.46	3.38
May	2.73	3.27
June	3.05	3.22
July	2.77	2.54
August	3.01	2.50
September	3.14	2.54
October	2.50	2.79
November	2.35	2.21
December	1.70	1.86
Annual Average	28.40	28.77

Source: National Weather Service

Measurement is liquid equivalent in inches

The data from the past 15 years does not suggest a significant change in the precipitation patterns from the previous 80 years.

Riverine Flooding in Roscommon County

One flood incident was reported by the NCDC for Roscommon County, Michigan between 1/1/1950 and 12/31/2015. A second incident was created when the Wraco Lodge Dam collapsed, causing water to flow into an already flooded Muskegon River. The dam was considered to be a low risk dam as this additional water caused the wash out of several roads, but did not cause any damage to property or harm to human life.

On 9/26/2005 persistent rain and embedded thunderstorms produced heavy rain in part of central and lower Michigan. An observer in St. Helen reported 5.79 inches of rain in the 24 hours preceding 8 am EDT on the 26th. Five inches of rain fell on Lupton, with 3.66 inches in Gladwin. The West Branch of the Rifle River rose out of its banks near the City of West Branch, though no property damage was reported. Significant flooding of side roads occurred in parts of Roscommon County. Damages of $4,000 were reported regarding this event.

Riverine and Urban Flooding Overview

Since 1950 only one flood was reported in Roscommon County. However, many of the surrounding counties experienced more flooding during this same time period especially in the past five years. The frequency for future floods may be increased with the changing weather patterns, and an increase in floods in the immediate area.

Currently there are only four participating municipalities in Roscommon County that are able to purchase flood insurance from the National Flood Insurance Program (NFIP). In order to maintain their participation in the NFIP ordinances have been adopted that prohibit new construction within floodplains and modifications to existing buildings within floodplains have to be approved by a certified floodplain manager within the County. With limited properties affected by flooding, this event was given a moderate priority to address. According to information received from FEMA, Roscommon County has no repetitive loss properties.

DROUGHT

"A water shortage caused by a deficiency of rainfall, generally lasting for an extended period of time."

Hazard Description

Drought is the consequence of a reduction in the amount of precipitation that was expected over an extended period of time, usually a season or more in length. The severity of a drought depends not only on its location, duration, and geographical extent, but also on the water supply demands made by human activities and vegetation.

A drought can cause many severe hardships for communities and regions. Probably one of the most common and severe impacts to a community like Roscommon County would be the threat of wildfires as sixty-three percent of the County is forests. Also there would be a drop in the quantity and quality of agricultural crops. Other negative impacts that can be attributed to a drought include water shortages for human consumption, industrial, business and agricultural uses, recreation and navigation, declines in water quality in lakes, streams and other natural bodies of water, malnourishment of wildlife and

livestock, increases in fires and wildfire related losses to timber, homes, and other property, increases in wind erosion, and declines in tourism in areas dependent on water-related activities.

These direct impacts can further result in indirect impacts to a community, such as reduced revenue due to income losses in agriculture, retail, tourism and other economic sectors; declines in land values due to physical damage from the drought conditions and decreased functional use of the property, and possible loss of human life due to extreme heat, fire, and other heat-related problems.

Two common measurement tools of dry weather conditions are the Palmer Drought Indices (including the Palmer Drought Severity Index and the Palmer Hydrological Drought Index) and the Crop Moisture Index. The Palmer Drought Severity Index is a good long-term drought monitoring tool. It is a monthly index that indicates the severity of a wet or dry spell. This index is based on average temperature and rainfall information for a particular location in a formula to determine dryness. It uses a value of 0 for the normal amount of rainfall in a particular location, and drought is shown in terms of negative numbers, for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought. Any value above 0 demonstrates that there has been above normal amounts of precipitation. This index can be used for indicating lake levels and surface water supply abnormalities but is not all that good for monitoring climatic impacts on vegetation, especially crops.

The Crop Moisture Index (CMI) evaluates short-term moisture conditions across crop producing regions. The CMI measures how much moisture is in the plant root zone of the soil. This index is based on the mean temperature and total precipitation that occurs each week, as well as the CMI from the previous week. The CMI changes as quickly as the weather changes. A heavy rainstorm can dramatically change the CMI for a region. Since this index changes so quickly and in response to a single weather event, the CMI is not considered a good long-term drought measurement tool.

Droughts/Drought Related Events in Roscommon County

While drought occurs periodically, in Roscommon County, the Palmer Drought Index indicated drought conditions reached extreme severity only 2% of the time. There were no drought events reported in Roscommon County between 1/1/1950 and 12/31/ 2015.

Drought Overview

With nearly 70 percent of Roscommon County being forested lands, the biggest problem drought presents is the increased threat of wildfire. A drought impacted landscape could quickly turn a small fire into a raging out of control blaze. Wildfires could destroy homes, businesses, and other property located in the County's rural residential areas. However, as extreme droughts rarely occur, droughts were given a moderate priority to address.

Transportation Hazards

TRANSPORTATION ACCIDENTS: AIR, LAND, AND WATER

A crash or accident involving an air, land or water-based commercial passenger carrier resulting in death or serious injury.

Hazard Description

Air Transportation Accidents

There are four circumstances that can result in an air transportation accident:

1. An airliner colliding with another aircraft in the air.
2. An airliner crashing while in the cruise phase of a flight due to mechanical problems, sabotage, or other cause.
3. An airliner crashing while in the takeoff or landing phases of a flight.
4. Two or more airliners colliding with one another on the ground during staging or taxi operations.

When responding to any of these types of air transportation accidents, emergency personnel may be confronted with a number of problems, including:

1. Suppressing fires.
2. Rescuing and providing emergency first aid for survivors.
3. Establishing mortuary facilities for victims.
4. Detecting the presence of explosive or radioactive materials.
5. Providing crash site security, crowd and traffic control, and protection of evidence.

Land Transportation Accidents

A land transportation accident in Michigan could involve a commercial intercity passenger bus, a local public transit bus, a school bus, or an intercity passenger train. Although these modes of land transportation have a good safety record, accidents do occur. Typically, the bus slipping off a roadway in inclement weather, or colliding with another vehicle causes bus accidents. Intercity passenger train accidents usually involve a collision with a vehicle attempting to cross the railroad tracks before the train arrives at the crossing. Unless the train accident results in a major derailment, serious injuries are usually kept to a minimum. Bus accidents, on the other hand, can be quite serious – especially if the bus has tipped over. Numerous injuries are a very real possibility in those types of situations.

Existing Prevention Programs

Air Transportation

The Michigan Aeronautics Commission of the Michigan Department of Transportation administers several programs aimed at improving aviation safety and promoting airport development. The Commission's safety programs include:

1. Registering aircraft dealers, aircraft, and engine manufacturers.
2. Licensing airports and flight schools.
3. Inspecting surfaces and markings on airport runways.
4. Assisting in removal of airspace hazards at airports.

The Commission's airport development program includes providing state funds for airport development and airport capital improvements – many of which contribute to overall air transportation safety.

The Federal Aviation Administration (FAA) contracts with the Michigan Department of Transportation for the inspection of the state's 238 public-use airports on an annual basis. The FAA has regulatory jurisdiction over operational safety and aircraft worthiness. The National Transportation Safety Board (NTSB) investigates all aircraft crashes that involve a fatality and publishes reports on its findings. (See the NTSB section below). A map identifying all the airports within the state is included in this section.

Land Transportation

School bus safety programs and initiatives generally fall into two categories:

1. Driver skill enhancement and competency training.
2. Physical inspections of bus mechanical and safety equipment.

The Motor Carrier Division, Michigan Department of State Police, inspects all school buses and other school transportation vehicles (21,000 units) on an annual basis. In addition, all school bus drivers in Michigan must a take and pass a bus driver education and training program, and then take regular refresher courses to maintain their certification to operate a school bus. School bus drivers must also pass an annual medical examination.

Local transit and intercity bus safety falls under the purview of the Michigan Department of Transportation's Bureau of Urban and Public Transportation. Generally, the issue of intercity and transit bus safety is handled on a partnership basis with the service providers, with MDOT providing oversight of the initiatives undertaken by the providers to ensure mechanical and operational safety.

The Michigan Department of Transportation is the state regulatory agency for railroad-highway grade crossing safety issues. In this role, MDOT conducts biennial, on-site crossing reviews for Michigan's 5,535 public crossings, and reports observed crossing maintenance deficiencies to the responsible railroad or roadway authority. In addition, MDOT conducts diagnostic study team reviews at selected crossings to determine whether the current level of warning device requires enhancement. At the present time, 42% of Michigan's public crossings have at least automatic side-of-street flashing light signals, and 16% have automatic gates.

In January 2001 an amendment (367 P.A. 2000) to the Michigan Vehicle Code went into effect allowing the MSP, MDOT, or specified local officials to install video cameras at railroad crossings to serve as a deterrent to motorists who might attempt to go around or through activated railroad crossing lights and gates. Although the ultimate purpose of this law is to reduce pedestrian and vehicular deaths and injuries at railroad crossings, the law will also likely reduce passenger train accidents caused by collisions with vehicles on the tracks – a major cause of many passenger train derailments.

Michigan's "Operation Lifesaver" Coalition – part of a national, non-profit education and awareness program dedicated to ending tragic collisions, fatalities and injuries at highway-rail grade crossings and on railroad rights of way- has helped reduce the number of serious crashes at railroad crossing in the state. The Operation Lifesaver coalition in Michigan is spearheaded by the MSP and MDOT and is comprised of state and local government officials, law enforcement, and employees of the railroad companies operating in Michigan. The Operation Lifesaver program emphasizes education and enforcement and its efforts appear to be working. Since 1996, the number of crashes, injuries, and fatalities at railroad crossing in Michigan has shown a steady decline. Any reduction in vehicle-train crashes at railroad crossings helps reduce the likelihood of a passenger transportation accident involving a train, school bus, local transit bus, or commercial intercity passenger bus.

Another MDOT program that can help improve rail safety is the Michigan Rail Loan Assistance Program. Established under Act 117, P.A. 1997, this program was initiated to help finance capital improvements on Michigan's rail infrastructure. Although the program is designed primarily to help preserve and improve rail freight service, any improvements made to the rail infrastructure that serves passenger rail service can only help improve passenger rail safety. Track rehabilitation is one of the eligible projects that can be funded under this program, and the safety value of a project is one of the primary selection criteria. (The Roscommon County road map and a map of Michigan's Rail system are included in this section. On the Rail map, Roscommon County is highlighted in yellow.)

National Transportation Safety Board

The National Transportation Safety Board is an independent federal agency responsible for promoting aviation, highway, railroad, marine, pipeline, and hazardous materials transportation safety. The NTSB is

mandated to investigate significant transportation accidents, determine the probable cause of such accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews. Although the NTSV has no regulatory or enforcement powers, it has nonetheless been successful in seeing the adoption and implementation of over 80% of its transportation accident recommendations.

An example of an NTSB recommendation that is being implemented is the recent agreement between the FAA and the Boeing Aircraft Company to redesign the rudder system on the company's popular 737 jetliners and to replace the rudder valve system in every one of the 3,200 737 jets now in service. The rudder retrofit program will cost Boeing nearly one-quarter of a billion dollars. (The 737 rudder system came under close scrutiny of the NTSB after crashes of 737s in 1991 and 1994 resulted in over 150 deaths. The NTSB believes the rudder system on the two jets might have been a contributing factor in the crashes.)

Hazardous Material Incidents

HAZARDOUS MATERIAL INCIDENTS - TRANSPORTATION

An uncontrolled release of hazardous materials during transport, capable of posing a risk to health, safety, property or the environment.

Hazard Description

As a result of the extensive use of chemicals in our society, all modes of transportation – highway, rail, air, marine, and pipeline – are carrying thousands of hazardous materials shipments on a daily basis through local communities. A transportation accident involving any one of those hazardous material shipments could cause a local emergency affecting many people.

Michigan has had numerous hazardous material transportation incidents that affected the immediate vicinity of an accident site or a small portion of the surrounding community. Those types of incidents, while problematic for the affected community, are fairly commonplace. They are effectively dealt with by local and state emergency responders and hazardous material response teams. Larger incidents, however, pose a whole new set of problems and concerns for the affected community. Large-scale or serious hazardous material transportation incidents that involve a widespread release of harmful material (or have the potential for such a release) can adversely impact the life safety and/or health and well-being of those in the immediate vicinity of the accident site, as well as those who come in contact with the spill or airborne plume. In addition, damage to property and the environment can be severe as well. Statistics show almost all hazardous material transportation incidents are the result of an accident or other human error. Rarely are they caused simply by mechanical failure of the carrying vessel.

Hazardous Material Incidents: Transportation Overview

Although there have not been any significant hazardous materials transportation incidents, there have been many minor petroleum and hazardous materials spills throughout the years. Most major highways within the county are primarily two lanes and interstates. These routes are heavily congested in the summer months and often icy or impassible in the winter. It may be only a matter of time before a serious hazardous materials incident occurs on a county roadway, railway, or waterway. These events were given a moderate priority to address.

OIL/GAS WELL INCIDENT

An uncontrolled release of oil or gas, or the poisonous by-product hydrogen sulfide, from wells.

Hazard Description

Oil and natural gas are produced from fields scattered across 63 counties in the Lower Peninsula. Since 1925 over 44,000 oil and natural gas wells have been drilled in Michigan, of which roughly half have produced oil and gas. To date, Michigan wells have produced approximately 1.4 billion barrels of crude oil and 4 trillion cubic feet of gas.

The petroleum and natural gas industry is highly regulated and has a fine safety record, but the threat of accidental releases, fires and explosions still exists. In addition to these hazards, many of Michigan's oil and gas wells contain extremely poisonous hydrogen sulfide (H2S) gas. Hydrogen sulfide is a naturally occurring gas mixed with natural gas or dissolved in the oil or brine and released upon exposure to atmospheric conditions. Over 1,300 wells in Michigan have been identified as having H2S levels exceeding 300 parts per million (ppm).

As the table below indicates, at concentrations of 700 ppm, as little as one breath of hydrogen sulfide can kill. Although hydrogen sulfide can be detected by a "rotten egg" odor in concentrations from .03 ppm to 150ppm, larger concentrations paralyze a person's olfactory nerves so that odor is no longer an indicator of the hazard. Within humans, small concentrations can cause coughing, nausea, severe headaches, irritation of mucous membranes, vertigo, and loss of consciousness. Hydrogen sulfide forms explosive mixtures with air at temperatures of 500 degrees Fahrenheit or above, and is dangerously reactive with powerful oxidizing materials. Hydrogen sulfide can also cause the failure of high-strength steels and other metals. This requires that all company and government responders be familiar not only with emergency procedures for the well site, but also with the kinds of materials that are safe for use in sour gas well response.

Physiological Response to H2S

TABLE 4.3

Parts per Million	Effect on Humans
10ppm	Beginning eye irritation
50-100 ppm	Slight conjunctivitis and respiratory tract irritation after 1 hour exposure
100 ppm	Coughing, eye irritation, loss of sense of smell after 2-15 minutes. Altered respiration, pain in the eyes and drowsiness after 15-30 minutes followed by throat irritation after 1 hour. Several hours of exposure results in gradual increase in severity of these symptoms and death may occur within the next 48 hours.
200-300 ppm	Marked conjunctivitis and respiratory tract irritation after 1 hour of exposure.
500-700 ppm	Loss of consciousness and possibly death in 30 minutes to 1 hour.
700-1000 ppm	Rapid unconsciousness, cessation of respiration and death.
1000-2000 ppm	Unconsciousness at once, with early cessation of respiration and death in a few minutes. Death may occur even if the individual is removed to fresh air at once.

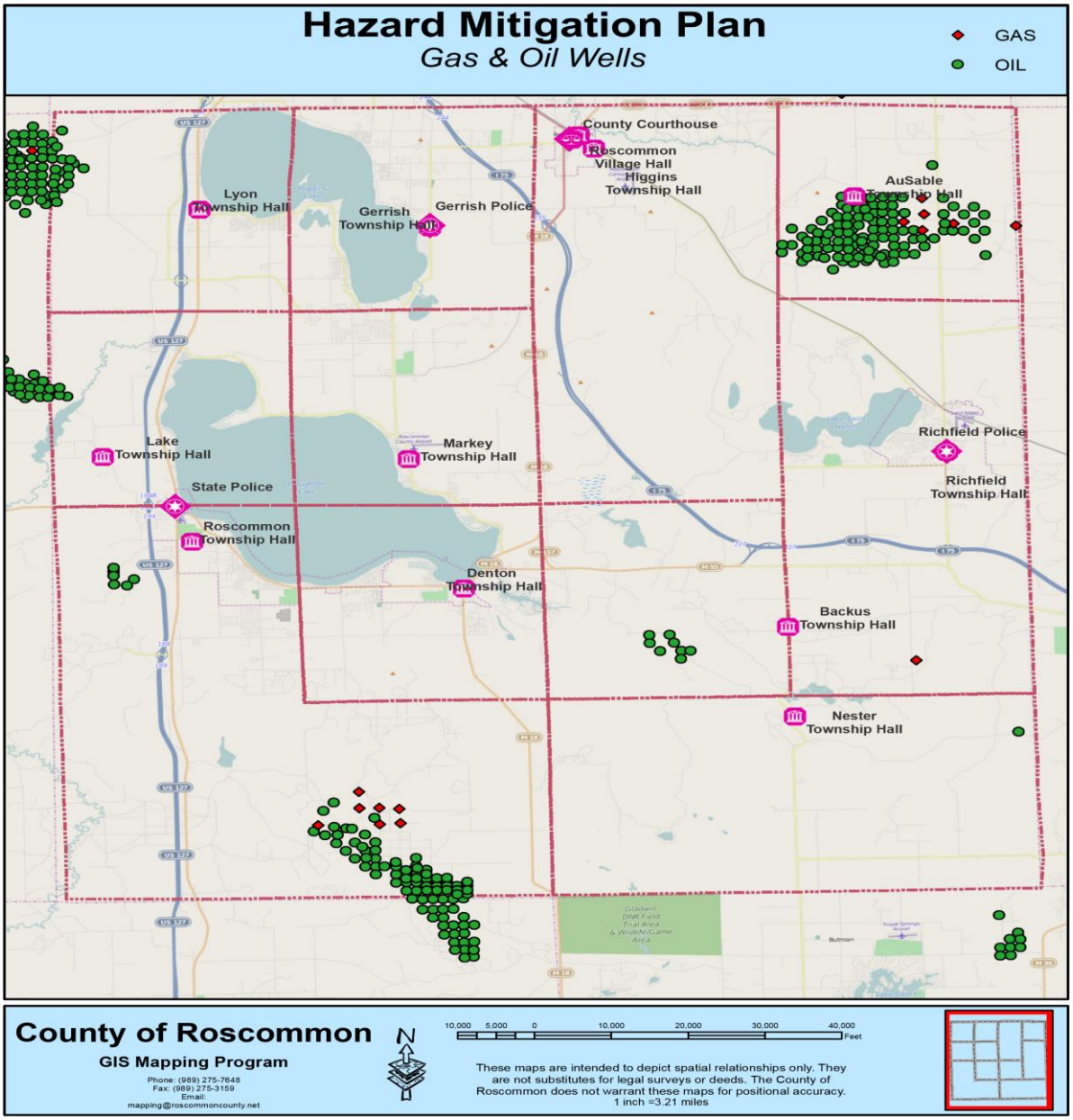
Oil and Gas Well Accidents Overview

There are 443 oil and natural gas wells in Roscommon County. This is a relatively small quantity when compared with state leader, Otsego County, with over 5700 wells. Of almost as great a concern is the fact that a combination of multiple organizations and individuals own the wells. As a general rule, most gas companies prefer to respond to incidents involving their wells themselves – and in the vast majority of cases that is what happens. Because gas companies often have controlled burns, and deal with wells on

a daily basis, it is impossible to ascertain how many incidents have actually occurred in the county. However, there is still the possibility that an emergency response agency could find themselves in the situation of responding to an incident at a gas well. Responders must understand the dangers associated with HS2 and must have a working knowledge of these wells that are in their areas of responsibility.

Oil and Gas Wells in Roscommon County

MAP 4.1



Petroleum and Natural Gas Pipeline Accidents

An uncontrolled release of petroleum or natural gas, or the poisonous by-product hydrogen sulfide, from a pipeline.

Hazard Description

Though often overlooked, petroleum and natural gas pipelines pose a real threat in many Michigan communities. Petroleum and natural gas pipelines can leak or fracture and cause property damage, environmental, contamination, injuries, and even loss of life. The vast majority of pipeline accidents that occur in Michigan are caused by third party damage to the pipeline, often due to construction or some other activity that involves trenching or digging operations.

Michigan is both a major consumer and producer of natural gas and petroleum products. According to the Michigan Public Service Commission (MPSC), approximately 25% of the natural gas consumed in Michigan is produced within the state. The remaining 75% is imported by five interstate pipeline companies that have access to the major natural gas producing regions in North America. Michigan cycles more natural gas through its storage system than any other state. Michigan ranks 11th in the nation in production of natural gas, and ranks 6th in consumption at 937.2 billion cubic feet. Michigan's petroleum product consumption in 1997 was 189 million barrels, ranking it 10th nationally. These figures underscore the fact that vast quantities of petroleum and natural gas are extracted from, transported through, and stored in the state, making many areas vulnerable to petroleum and natural gas emergencies. Michigan's gas and petroleum networks are highly developed and extensive, representing every sector of the two industries – from wells and production facilities, to cross-country transmission pipelines that bring the products to market, to storage facilities, and finally to local distribution systems.

While it is true that the petroleum and natural gas industries have historically had a fine safety record, and that pipelines are by far the safest form of transportation for these products, the threat of fires, explosions, ruptures, and spills nevertheless exists. In addition to these hazards, there is the danger of hydrogen sulfide (H2S) release. These dangers (fully explained in the Oil and Natural Gas Well Accidents section) can be found around oil and gas wells, pipeline terminals, storage facilities, and transportation facilities where the gas or oil has a high sulfur content. Hydrogen sulfide is not only an extremely poisonous gas, but is also explosive when mixed with air at temperatures of 500 degrees Fahrenheit or above.

Petroleum and Natural Gas Pipeline Accidents in Roscommon County

No recent accidents have been reported in Roscommon County.

Petroleum and Natural Gas Pipeline Accidents Overview

There are several petroleum and natural gas pipelines running throughout the County. Roscommon County has several compressor stations and storage fields in the area. In the Emergency Service Office are plans and emergency contact numbers for these locations. One point that is stressed in most of these plans is for local emergency crews not to do anything on scene until a representative from the company arrives.

Because petroleum and natural gas pipeline accidents are an inevitable occurrence, affected local communities must be prepared to respond to the accident, institute necessary protective actions, and coordinate with federal and state officials and the pipeline company emergency crews to effectively manage and recover from the accident. That can best be accomplished through collaborative planning, training, and exercising of emergency procedures with all potentially involved parties.

HAZARDOUS MATERIAL INCIDENTS - FIXED SITE AND PROPANE STORAGE SITES

Hazardous Material Incident-An uncontrolled release of hazardous materials from a fixed site, capable of posing a risk to health, safety, property, and the environment.

Industrial Accidents-A fire, explosion, or other severe accident (especially if it involves hazardous materials) at an industrial facility that results in serious property damage, injury, or loss of life.

Hazard Description (Hazardous Material Incidents)

Hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other community facilities. Hazardous materials are materials or

substances which, because of their chemical, physical, or biological nature, pose a potential threat to life, health, property and the environment if they are released. Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gases.

Hazardous materials are highly regulated by the government to reduce risk to the general public, property and the environment. Despite precautions taken to ensure careful handling during the manufacture, transport, storage, use and disposal of these materials, accidental releases are bound to occur. Areas at most risk are within a 1-5 mile radius of identified hazardous material sites. Many communities have detailed plans and procedures in place for responding to incidents at these sites, but release can still cause severe harm to people, property, and the environment if proper mitigative action is not taken in a timely manner.

Hazard Description-Industrial Accidents

Industrial accidents differ from hazardous material incidents in the scope and magnitude of offsite impacts. Whereas hazardous material incidents typically involve an uncontrolled release of material into the surrounding community and environment that may require evacuations or in-place sheltering of the affected population, the impacts from industrial accidents are often confined to the site or facility itself, with minimal physical outside impacts. Nonetheless, industrial accidents, such as fires, explosions, and excessive exposure to hazardous materials, may cause injury or loss of life to workers at the facility, and significant property damage. In addition, industrial accidents can cause severe economic disruption to the facility and surrounding community, as well as significant long-term impacts on the families of the workers injured or killed.

Hazardous Material Incidents/Industrial Accidents in Roscommon County

No recent hazardous material incidents have been reported in Roscommon County.

Hazardous Material Incidents/Industrial Accidents Overview

Like all heavily industrialized states, Michigan will always be concerned with the risk of accidental hazardous material releases. However, the threat of accidental hazardous material releases that can affect life, health, property or the environment can be greatly reduced by: 1) developing and maintaining adequate community hazardous material response plans and procedures; 2) adequately training hazardous material workers and off-site emergency responders; 3) educating the public about hazardous materials safety; 4) enforcing basic hazardous material safety regulations; and 5) mitigating, wherever possible, the threat of accidental hazardous material releases. Fortunately, many Michigan communities are making great strides in these important areas. These events were given a moderate priority to address.

Nuclear Power Plant Accidents

An actual or potential release of radioactive material at a commercial nuclear power plant or other nuclear facility, in sufficient quantity to constitute a threat to the health and safety of the off-site population.

Hazard Description

Such an occurrence, though not probable, could affect the short and long-term health and safety of the public living near the nuclear power plant, and cause long-term environmental contamination around the plant. As a result, the construction and operation of nuclear power plants are closely monitored and regulated by the Federal government.

Nuclear Power Plant Failures Summary

Communities with a nuclear power plant must develop detailed plans for responding to and recovering from such an incident, focusing on the 10 mile Emergency Planning Zone (EPZ) around the plant, and a 50 mile Secondary EPZ that exists to prevent the introduction of radioactive contamination into the food chain. Michigan has 3 active and 1 inactive commercial nuclear power plants, in addition to 4 small nuclear testing/research facilities located at 3 state universities and within the City of Midland.

Roscommon County does not have a nuclear power plant, nor does Roscommon County have a nuclear power plant located within 50 miles and is not within the Secondary EPZ or ingestion pathway zone. Thus, they are not required to have a plans in place for that zone. The closest active Nuclear Power Plant is located within the US is 142 miles, which is the Point Beach Nuclear Plant in Wisconsin, and the closest nuclear plant in Michigan is 169 miles, which is the Palisades Nuclear Generating Station. Due to the proximity of nuclear power plants to Roscommon County, these events were given a moderate priority to address.

Technological Failures

INFRASTRUCTURE FAILURES

A failure of critical public or private utility infrastructure resulting in a temporary loss of essential functions and/or services.

Hazard Description

Michigan's citizens are dependent on the public and private utility infrastructure to provide essential life supporting services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. When one or more of these independent, yet interrelated systems fail due to disaster or other cause – even for a short period of time – it can have devastating consequences. For example, when power is lost during periods of extreme heat or cold, people can literally die in their homes if immediate mitigative action is not taken. When the water or waste treatment systems in a community are inoperable, serious public health problems arise that must be addressed immediately to prevent outbreaks of disease. When storm drainage systems fail due to damage or an overload of capacity, serious flooding can occur.

These are just some examples of the types of infrastructure failures that can occur, and all of these situations can lead to disastrous public health and safety consequences if immediate mitigative actions are not taken. Typically, it is the most vulnerable members of society (i.e., the elderly, children, impoverished individuals, and people in poor health) that are the most heavily impacted by an infrastructure failure. If the failure involves more than one system, or is large enough in scope and magnitude, whole communities and possibly even regions can be severely impacted.

Communication Loss

Communication loss can be catastrophic in emergency situations in the county. Power outages or direct damage to communication equipment could mean life or death in certain situations. The population is dependent on emergency services getting to the incident site in a timely manner, and if there is damage to the equipment, the services may not reach their destination at all. The elderly population in the county is especially vulnerable to power outages and times of extreme weather, and these times are the most important to get services to them. In that case, there needs to be an alternative way of communication for the emergency services to reach their destination.

The county has come up with a few ideas to help solve this problem. They suggested that Mutual aid assistance for failures in utility and communications systems (including 9-1-1) could help alleviate the problem. Alternative 9-1-1 access could be done through radio operators whose homes are identified through special markings. Also, they could use generators for backup power at critical facilities. Finally, the replacement or renovation of aging structures and equipment (to make as hazard-resistant as economically possible).

Infrastructure Failures Overview

Most of Roscommon County's infrastructure failures are secondary hazards caused by other major events such as wildfires, windstorms, snow and ice storms. The main infrastructure failures are power outages, which are normally restored in a matter of hours. However, if the power were out for a longer period of time, the local chapter of the American Red Cross would be called to set up temporary shelters. These failures have been given a high priority to address, based on their impact to the life safety of the residents of the County.

Fire Hazards

WILDFIRES

An uncontrolled fire in grass or brushlands, or forested areas.

Hazard Description

Contrary to popular belief, lightning strikes are not a leading cause of wildfires in Michigan. Today, lightning causes only 2 percent of all wildfires, and the rest are caused by human activity. Outdoor burning is the leading cause of wildfires in Michigan. Debris burning was responsible for 32 percent of the wildfires in Michigan in 1999. Incendiary, or intentional, fires accounted for another 12 percent of the total wildfires.

Upon examination of the causes of fire, it becomes apparent that most Michigan wildfires occur close to where people live and recreate, which puts both people and property at risk. The immediate danger from uncontrolled wildfires is the destruction of timber, structures, other property, wildlife, and injury or loss of life to people who live in the affected area or who are using recreational facilities in the area.

Wildfire Events in Roscommon County

Between 1/1/2000 to 12/31/2015 the Roscommon field office of the Michigan DNR reported over 175 wildfires within Roscommon County. Many of these wildfires were small in nature and were less than an acre in area. However, their records did not include the wildfires that they were not informed of by the local fire departments, which were also smaller in area.

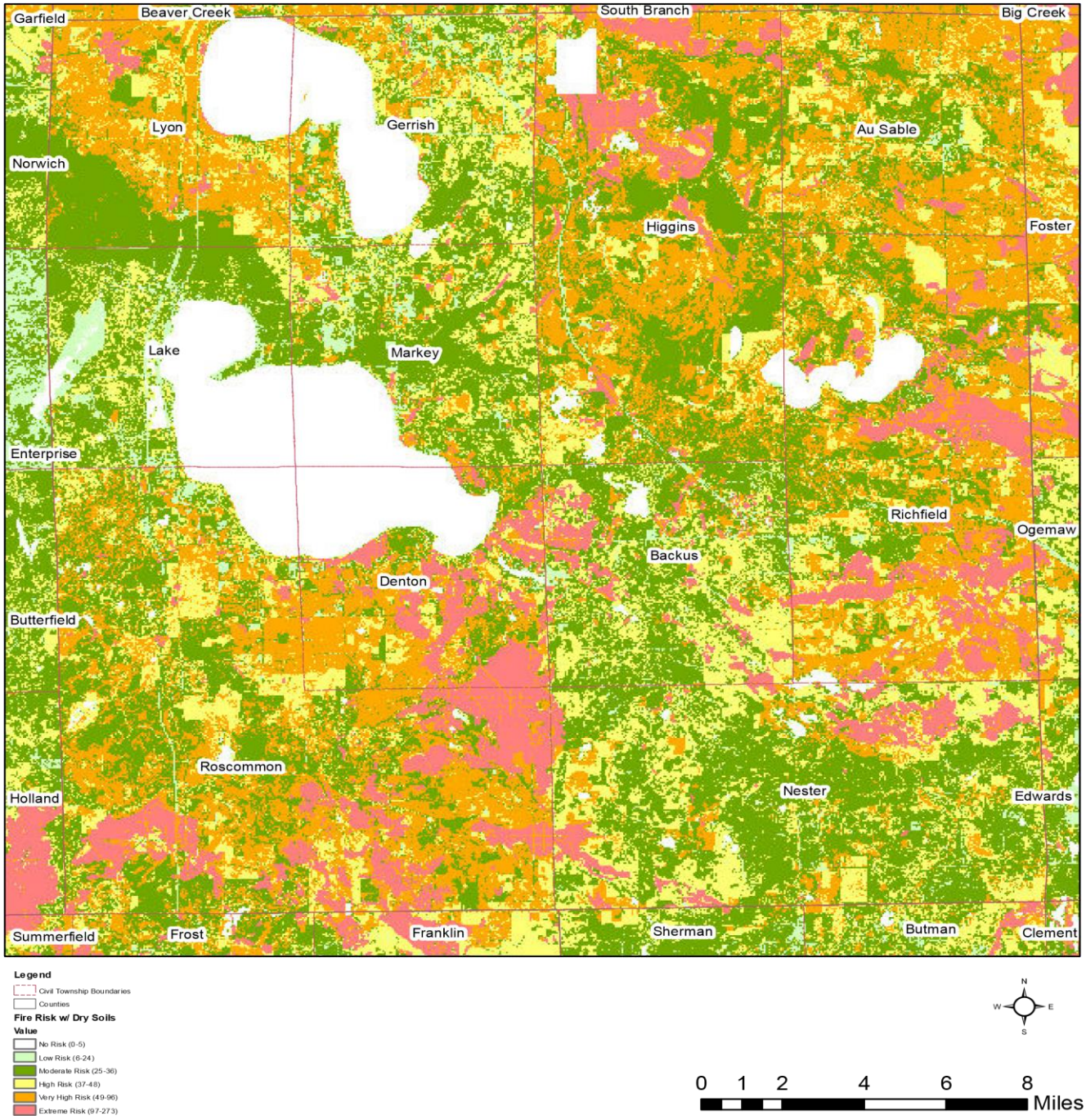
On 4/16/2005 the NCDC reported that a fire was started in Nester Township of unknown origin and burned for several days. Over 1500 acres were burned in total. No damages were reported though 16 homes were evacuated.

Wildfire Overview

Wildfires have been identified as the high priority to address. Nearly 70 percent of the land in covered in forests, with much of that land being jack pine, a high risk fuel. To address this concern, a Community Wildfire Protection Plan is currently in the planning stages and upon its completion will be incorporated into this Plan.

Roscommon County Wildfire Risk Map

MAP 4.2



Map and information provided by Michigan Department of Natural Resources

STRUCTURAL FIRES

A fire, of any origin that ignites one or more structures, causing loss of life and/or property.

Hazard Description

In terms of average annual loss of life and property, structural fires – often referred to as the "universal hazard" because they occur in virtually every community – are by far the biggest hazard facing most communities in Michigan and across the country. Each year in the United States, fires result in approximately 5,000 deaths and 25,000 injuries requiring medical treatment. According to some sources, structural fires cause more loss of life and property damage than all types of natural disasters combined. Direct property losses due to fire exceed $9 billion per year – and much of that figure is the result of structural fire.

According to the Federal Emergency Management Agency's National Fire Data Center, residential fires represent 74% of all structural fires and cause 80% of all fire fatalities. Approximately 85% of those fatalities occur in single- family homes and duplexes. Perhaps the most tragic statistic of all is that over 40% of residential fires and 60% of residential fatalities occur in homes with no smoke alarms.

According to statistics compiled by the Fire Marshal Division, Michigan Department of State Police for 2003 (the last year for which statewide statistics are available), nearly 19,000 structural fires occurred in Michigan, resulting in 161 deaths and 624 injuries. Dollar losses for structural fires were estimated at nearly $230 million. The Fire Marshal Division estimated that a structural fire occurred in Michigan every 28 minutes in 2003. Nationally, Michigan's fire death rates in 2007 of 15.4 persons per million (population) puts it in the upper third of all states in the nation.

A major challenge facing the Michigan fire service is the lack of a state-mandated fire safety code and code enforcement program for all occupancies.

Structural Fires in Roscommon County

Annually, there are multiple structural fires in Roscommon County. Most recently in 2014 and 2015 resulted in the destruction of homes, but no injuries or deaths resulted from these two fires.

Structural Fires Overview

Major impacts occur every year, beyond the ordinary single-home fires that happen in every community. Fires were given a medium priority to address.

SCRAP TIRE FIRES

A large fire that burns scrap tires being stored for recycling/re-use.

Hazard Description

Michigan generates some 7.5 to 9 million scrap tires each year. Although responsible means of disposal have become more common, tire dumps of the last forty years present environmental and safety hazards that will last into the foreseeable future. By 2001, the State of Michigan had identified a total in excess of 24 million scrap tires in disposal sites scattered around the state.

The Scrap Tire Regulatory Program is implemented by the Waste Management Division of the Michigan Department of Environmental Quality, under the authority of Part 169 of the Natural Resources and Environmental Protection Act (451 P.A. 1994), as amended. Policies and regulations established under this law provide the basis for the MDEQ to implement and administer an effective scrap tire management program per the following initiatives: 1) a compliance and enforcement program was implemented; 2) a scrap tire policy recycling hierarchy was established; 3) special uses of scrap tires were approved; and 4) a grant program was established to address abandoned tires.

In 1997, Part 169 was amended to require that a statewide emergency response plan be put into place to address response to fires at collection sites.

Scrap Tire Fires in Roscommon County

Roscommon County has not had a significant tire fire in recent memory, and the estimated scrap tires that were identified in 2001 have since been removed from the County.

Scrap Tire Overview

With the elimination if scrap tire sites within Roscommon County, the hazard has been greatly reduced. However, tires still remain at car dealerships and other sites. This hazard has not been totally eliminated and was given a medium priority as it was combined with structural fires.

Seasonal Population Increase

SEASONAL POPULATION INCREASE

A population, in the county, beyond the normal level of people to which resources are allocated.

Hazard Description

As more and more people vacation to the northern portions of Michigan, local communities in northern Michigan are going to find it harder to maintain levels of safety and resources to keep the population in the jurisdictions comfortable and safe. The trend of people buying summer homes or cottages is growing, and with the advent of Baby-Boomers reaching retirement age, the seasonal and permanent populations of the northern counties will continue to slowly grow.

Many stresses are put on local governmental agencies such as fire departments, police departments, as well as hospitals, the road commission, and ambulance services to maintain the status quo of service for their county. With more people relocating to the northern counties for extended periods of time, the level of staff and resources may not suffice to the needs of the population.

Roscommon County is no exception to seasonal population spikes in the summer, deer season, and to a lesser extent, the winter months. With seasonal homes accounting for nearly 50 percent of the homes in the County, it is imperative that the local authorities (public safety personnel) are aware of the location of these homes and when they are occupied.

Seasonal Population Increases in Roscommon County

With the power outages across the country in the summer of 2003, Roscommon County experienced a high influx of people from the Detroit area going to their seasonal homes. The emergency management

office reported that there were low supplies of food and stresses on emergency services in Roscommon County.

Seasonal Population Increase Overview

Seasonal population increase will continue to be a problem in Roscommon County unless there are preventative measures taken to solve it. The population of Roscommon County is projected to steadily increase and with budget cuts, Roscommon County is finding it hard to maintain the status quo for emergency services. The seasonal population influx makes the situation harder to manage. Also, infrastructure problems in southern Michigan can be a factor that directly affects Roscommon County.

Civil Disturbances

CIVIL DISTURBANCES

Collective behavior that results in a significant level of law-breaking, perceived threat to public order, or disruption of essential functions and quality of life.

Hazard Description

Civil disturbances can be classified within the following four types: (1) acts or demonstrations of protest, (2) hooliganism, (3) riots, or (4) insurrection. Since most of these types of disturbance share similarities with each other, and the classifications presented here are not absolute and mutually exclusive, it is recommended that this entire section be studied as a whole. The descriptions that follow, while roughly organized by type of disturbance, provide information of interest in evaluating and understanding all types of civil disturbance, and therefore should not be treated as independent subsections or read in isolation from each other.

The first type, demonstrations of protest, usually contains some level of formal organization or shared discontent that allows goal oriented activities to be collectively pursued. This first category includes political protests and labor disputes. Many protest actions and demonstrations are orderly, lawful, and peaceful, but some may become threatening, disruptive, and even deliberately malicious (on the part of at least some of those involved either in the protest itself or in reaction to the protest). It is only the latter type of event that should properly be classified as a civil disturbance. The destruction of property, interruption of services, interference with lawful behaviors of ordinary citizens and/or emergency responders, the use of intimidation or civil rights violations, and threats or actual acts of physical violence may all occur during civil disturbance events. Actual Michigan events have included the willful destruction of property and impeded property access during labor strikes, and heated conflicts between opposing participants at political rallies or issue-driven demonstrations. Different risks and forms of disturbance are connected with the nature and perceived importance of the cause, the degree of organization among those who are active in the protest, and the amount of group cohesion among those who are involved.

The second category of civil disturbance, hooliganism, is relatively unorganized and involves individual or collective acts of deviance inspired by the presence of crowds, in which the means (and responsibility) for ordinary levels of social control are perceived to have slackened or broken down. Certain types of events, such as sporting events, “block parties,” or concerts, become widely publicized and, in addition to normal citizens who merely seek entertainment, tend to also attract certain types of persons who seek situations in which anonymity, confusion, and a degree of social disorder may allow them to behave in unlawful, victimizing, or unusually expressive ways that would normally be considered unacceptable by most ordinary people. An Example includes the disorder that has followed various championship sporting

events. Although the majority of persons present are ordinary citizens (although many may have some level of intoxication), a minority of persons begin making itself known through unlawful or extreme acts of deviance, and it is from this part of the crowd that the hazard primarily stems.

Common problems include the widespread destruction of property, numerous types of assault and disorderly conduct, and criminal victimization. It should also be noted that many persons who are normally law-abiding may temporarily behave in unusually aggressive ways during these events, often prompted by an understandably defensive anxiety about the disorder and behavior exhibited by the deviant minority, but also possibly exacerbated by a level of alcoholic intoxication as well as the temptation by some to engage in appealing deviant behaviors that under normal circumstances of social control would not be selected. Many citizens remain law-abiding, but may remain in the area of a civil disturbance either because they live in the area, have activities (including social and recreational ones) that they wish to continue engaging in, have legitimate business to conduct, or because they are curious or concerned and wish to observe or witness the situation as it occurs. The majority of such law-abiding citizens will leave the area in an orderly way when given clear instructions by a legally-recognized authority to do so. There are cases in which hooliganism may become combined with protest, and thus complicate the situation for law enforcement personnel. In some circumstances, elements of protest are added only by a small minority of participants after the disturbances have already begun, but in other circumstances, protest activity may arise out of concerns regarding the extent and nature of pre-emptive law enforcement activities that were intended to prevent a civil disturbance.

The third type, riots, may stem from motivations of protest, but lacks the organization that formal protests include. Although legitimate and peaceful protests may spontaneously form when people gather publicly with the perception that they already share certain values and beliefs, riots tend to involve violent gatherings of persons whose level of shared values and goals is not sufficiently similar to allow their collective concerns or efforts to coalesce in a relatively organized manner. Instead, there tends to be a diffuse sense of shared discontent, but relatively few norms to shape these strivings into clearly coherent action. For example, widespread discontent within a community that is sufficiently cohesive may quickly take on a set of shared leaders and clear organization, such as a march or chant that is clearly in the form of a protest or demonstration, but in an area that doesn't have the same cohesiveness and shared norms and values, a relatively chaotic form of expression may take place instead, involving assaults, intimidation, and unlawfully destructive expressions of discontent, possibly including the victimization of innocent citizens or businesses who have been selected by part of the crowd to function as scapegoats during their expression of discontent. In addition to the sentiments of discontent that may have sparked the initial activities, however, elements of hooliganism may emerge and even come to predominate, as certain persons may attempt to exploit the social disorder for their own individual ends. In other cases, elements of legitimate protest may also form within this type of civil disturbance, and pockets of organized protest may help to channel and contain the negative elements of hooliganism, looting, etc. that might otherwise threaten all area residents. The complexity of these events for law enforcement can be very great, demanding carefully calculated efforts to analyze the nature of the disturbance, and difficult decisions about how to approach and possibly involve the numerous types of persons, gatherings, groups, and behaviors that may have the potential to either mitigate or exacerbate the situation.

The fourth type of civil disturbance, insurrection, involves a deliberate collective effort to disrupt or replace the established authority of a government or its representatives, by persons within a society or under its authority. Some prison uprisings may fall into this category, although others may more properly be classified as riots or protests, depending upon the presence and extent of specific goals and organization, and the type of action used in achieving such goals. An insurrection has the deliberate goal of either replacing established authorities with a new distribution of power, or with the destruction of

established power structures in favor of (usually temporary) anarchy or a smaller-scale set of recognized criminal (gang), ethnic, or other group networks and power structures. The latter circumstances tend to involve disturbances that exist on a relatively small scale, such as in a single local area or involving a prison network or "cult compound" (or any other similarly self-aware group or subculture with identified collective interests and a network that allows rapid communication). However, larger-scale insurrections are also possible, involving issues of class conflict or other widespread social inequalities, highly divisive political issues, or other important large-scale events that disrupt the social equilibrium because they illuminate areas in which cultural values are not sufficiently shared throughout the society or region that is experiencing the conflict, disruption, or strain. In many cases, this kind of large-scale social strain has developed gradually over time, and involves an entire series of compromises, concessions, and migrations that may temporarily relieve the disruptive social and value conflicts, only to reemerge after another period of changes and population growth has caused a breakdown in previous arrangements. This description of the causes of social discontent applies to many protests and riots, as well as insurrection. In cases involving the formation or emergence of significant subcultures or counterculture, such as during the Vietnam era, or when dominant values break down or fail to be established on important key issues or mores, there is the potential for insurrection on a larger scale. The Civil War of 1861-1865 was one such instance, in which the authority of the federal government was either accepted or rejected by various states which then aligned themselves in opposition to each other. Between these two extremes (of a purely localized civil disturbance and a national civil war) are numerous other possibilities for regional, political, class, or ethnic conflicts that may involve one or more categories of citizen in conflict with others. Examples could include prisoners versus law enforcement personnel, a countercultural group versus the establishment, or a violent political activist group in conflict with selected representatives of a contrary viewpoint. (Some such actions may overlap with those of terrorism, q.v.)

Civil Disturbances Overview

Civil disturbances occur infrequently and have not posed a major threat to the residents of Roscommon County. However, with the ever increasing threats throughout society, including rural America, this is a growing problem that will not be resolved at the local level. Should a major event occur, the Michigan State Police may be called in to assist local public safety personnel.

NUCLEAR ATTACK

A hostile action taken against the United States which involves nuclear weapons and results in destruction of property and/or loss of life.

Hazard Description

Any hostile attack against the United States, using nuclear weapons, which results in destruction of military and/or civilian targets. All areas of the United States are conceivably subject to the threat of nuclear attack. However, the strategic importance of military bases, population centers and certain types of industries place these areas at greater risk than others. The nature of the nuclear attack threat against the U.S. has changed dramatically with the end of the "Cold War" and the conversion of previous adversaries to more democratic forms of government. Even so, the threat still exists for a nuclear attack against this country. Despite the dismantling of thousands of nuclear warheads aimed at U.S. targets, there still exists in the world a large number of nuclear weapons capable of destroying multiple locations simultaneously. In addition, the number of countries capable of developing nuclear weapons continues to grow despite the ratification of an international nuclear non-proliferation treaty. It seems highly plausible that the threat of nuclear attack will continue to be a hazard in this country for some time in the future.

At this point, attack-planning guidance prepared by the Federal government in the late 1980s still provides the best basis for a population protection strategy for Michigan. That guidance has identified 25 potential target areas in Michigan, and 4 in Ohio and Indiana that would impact Michigan communities, classified as follows: 1) commercial power plants; 2) chemical facilities; 3) counterforce military installations; 4) other military bases; 5) military support industries; 6) refineries; and 7) political targets. For each of these target areas, detailed plans have been developed for evacuating and sheltering the impacted population, protecting critical resources, and resuming vital governmental functions in the post-attack environment. Even though Iosco County has an airbase; the threat of a nuclear attack has been lowered due to the end of the "Cold War" and the closure of the base. There still may be a small threat to the former base because it could still be reused for B-52 MStratfortress bomber operations in case the current Stratfortress base is destroyed. The airfield could also have the potential for terrorism/sabotage and is being looked at under that category.

Nuclear weapons are explosive devices that manipulate atoms to release enormous amounts of energy. Compared to normal chemical explosives such as TNT or gunpowder, nuclear weapons are far more powerful and create harmful effects not seen with conventional bombs. A single nuclear weapon is able to devastate an area several miles across and inflict thousands of casualties. Although nuclear attack is an unlikely threat, the severe damage that would be caused by even one weapon requires the danger to be taken seriously.

The threat of nuclear attack has primarily been associated with the Cold War between the United States and the Soviet Union in the last half of the 20th Century. Although the Cold War is over, there remains a threat of nuclear attack. More nations have developed nuclear weapons and there is also the possibility that terrorists could use a nuclear weapon against the United States.

Hazard Analysis

Understanding Nuclear Weapons

The following information about nuclear weapons is important for understanding the threat of nuclear attack: (1) types of nuclear weapons, (2) measures of weapon power, (3) forms of attack, and (4) types of delivery systems.

Nuclear weapons have been built in a wide variety of types for several different purposes. The first weapons relied on nuclear fission, or the splitting of heavy atoms to release energy and create an explosion. Later, new weapons were invented that used a combination of fission and fusion, which involves the creation of heavier atoms from lighter ones. Fusion bombs are also referred to as hydrogen bombs or H-bombs. For emergency planning purposes, the important differences are that (1) fusion bombs are more difficult to build and (2) that they can be much more powerful. Otherwise, all types of nuclear weapons create the same types of effects.

The power of nuclear weapons is measured by comparing the energy released by the weapon to the energy released by large amounts of conventional high explosive. The strengths of smaller weapons are measured in kilotons (or thousands of tons) of TNT explosive. A twenty-kiloton bomb produces as much energy as twenty thousand tons of TNT exploded all at once. The strength of larger weapons is measured in megatons, or millions of tons of TNT. A two-megaton bomb produces as much energy as two million tons of high explosive.

Smaller nuclear weapons are generally designed to be used against military targets on the battlefield. These are called tactical nuclear weapons. Larger devices designed to attack cities, infrastructure, and military bases are called strategic nuclear weapons. Bombs can be set off at varying heights above the target. If the bomb is set off high in the air, its effects are spread out over a wider area and generally more

damage is done. This is called an air burst. A bomb that is set off at or near the Earth's surface level wastes much of its energy against the ground. This is called a ground burst. Ground bursts have some specific military uses and terrorists may use ground bursts because they are unable to lift their weapons high enough to create an air burst.

Like any weapon, a nuclear device must be carried to its target by a delivery system. The first nuclear weapons were bombs dropped out of aircraft. Later, tactical weapons were made small enough to fire out of cannons or carry in large backpacks. Intercontinental ballistic missiles (ICBMs) are rockets that can carry one or more nuclear weapons across thousands of miles in less than an hour. Terrorists may lack sophisticated missiles, but they could create effective delivery systems by transporting a nuclear weapon in the back of a truck, aboard a cargo plane, or within a shipping container.

Effects of Nuclear Weapons

The effects of nuclear weapons are more complicated than those of conventional explosives. Nuclear devices cause damage through six major effects: (1) thermal pulse, (2) blast, (3) prompt radiation, (4) electromagnetic effects, (5) mass fire, and (6) residual radiation.

THERMAL PULSE is an intense flash of light and heat released within the first few seconds of a nuclear explosion. The damage from thermal pulse is almost instantaneous and covers a wide area. People and animals exposed to the pulse can be badly burned. Flammable objects such as buildings, vehicles, and trees may be set on fire. The flash is strongest close to the bomb and becomes weaker with distance. Even people located far away from the explosion may still be blinded by the intense light of the pulse.

BLAST is a powerful wave of force that moves out from the center of the explosion through the air and the ground. The farther the blast travels, the weaker it becomes. Very close to the bomb, the blast will destroy even the most strongly built buildings and will kill everyone not hidden deep underground. Farther away, buildings may survive, but with severe damage, and people will be injured by being picked up and smashed against objects. At still greater ranges, buildings will be less damaged and injuries will largely result from shattered glass and thrown debris. At all distances, a powerful wind follows the initial blast wave and adds to the destruction. The blast from a ground burst will dig a large crater into the ground, but this cratering will not occur with an air burst.

PROMPT RADIATION is the harmful blast of high energy radiation given off at the same time as the thermal pulse. Prompt radiation includes gamma rays and neutron radiation. This radiation is capable of killing or injuring living beings by damaging tissues and organs. Prompt radiation is quickly absorbed by the atmosphere and does not impact as wide an area as other nuclear weapons effects. In most instances, a person close enough to receive a harmful dose of prompt radiation is also close enough to be immediately killed by the explosion's thermal pulse or blast. However in unusual cases, some people who survive the immediate effects of the bomb may sicken or die days later, from radiation poisoning.

ELECTROMAGNETIC EFFECTS occur immediately after a nuclear explosion and may damage communications equipment, computers, and electronics. Radios, cell phones, and power lines are especially vulnerable. In most cases, the effects are limited to an area near to the explosion. Some equipment may recover after a period of time, while other devices will need to be replaced. One special type of nuclear attack might cause more widespread electromagnetic effects: a very large nuclear weapon carried high into the atmosphere by a missile is capable of damaging communications and electronics over a very large area.

MASS FIRE results from the ignition of thousands of individual fires by a bomb's thermal pulse, combined with widespread destruction from its blast. Over a period of hours, small fires merge and feed on damaged buildings and debris. Controlling these fires would be very difficult, due to damaged water mains, destroyed fire-fighting equipment, and blocked roads. The result is an extremely intense fire that can spread quickly and reach very high temperatures. Mass fire may significantly expand the area devastated by a bomb, destroying areas that might otherwise be only lightly damaged by other types of effects.

RESIDUAL RADIATION is unlike prompt radiation in that it lasts well after the nuclear explosion has ended. The ground immediately underneath the center of the explosion will be dangerously radioactive for several days due to "induced radiation." There will also be some radioactive dust and debris that will drift downwind of the explosion. This radioactive dust is called "fallout." Fallout will be a minor problem in the case of an air burst explosion, but will be very intense in the case of a ground burst attack. Regardless of the type of attack, the danger from fallout will tend to be greatest close to the site of the attack. The cloud of fallout will weaken the longer it lasts and the farther it travels.

Note that the effects of a nuclear attack will depend on the size of the weapon. A larger bomb will cause damage over a wider area. The importance of different types of damage will also vary with the weapon. Large strategic nuclear weapons will create most of their damage though thermal pulse and mass fires, while with small tactical bombs the blast effect and prompt radiation will be relatively more important.

Nuclear Attack Overview

Nuclear attack is an unlikely hazard, but even a single weapon could cause death and destruction on a massive scale. Nuclear weapons inflict damage over a wide area and through a variety of effects, including thermal pulse, blast, fire, and radiation. Despite the end of the Cold War, nuclear attack by foreign nations remains a real possibility, and this danger has been joined by the threat of terrorist nuclear attack. It makes sense to continue to prepare for the nuclear attack hazard as part of an overall emergency management strategy.

Hazard Mitigation Alternatives for Nuclear Attack

- Designated fallout shelters and public warning systems.
- Construction of concrete safe rooms (or shelters) in houses, trailer parks, community facilities, and business districts.
- Using laminated glass, metal shutters, structural bracing, and other hazard-resistant, durable construction techniques in public buildings and critical facilities.
- Increased coverage and use of NOAA Weather Radio (which can provide notification to the **c**ommunity during any period of emergency, including enemy attack).

(Note: Should a nuclear attack occur, the emergency management response will be taken over by the Department of Homeland Security.)

SABOTAGE (TERRORISM)

An intentional, unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, social, or religious objectives.

Hazard Description

Sabotage/terrorism can take many forms or have many vehicles for delivery, including: 1) bombings; 2) assassinations; 3) organized extortion; 4) use of nuclear, chemical, radiological, and biological weapons;

5) information warfare; 6) ethnic/religious/gender intimidation (hate crimes); 7) state and local militia groups that advocate overthrowing the U.S. Government; 8) eco-extremism, designed to destroy or disrupt specific research or resource-related activities; and 9) widespread and organized narcotics smuggling and distribution organizations. Because sabotage/terrorism objectives are so widely varied, so too are the potential targets of such actions. Virtually any public facility or infrastructure, or place of public assembly, can be considered a potential target. In addition, certain types of businesses engaged in controversial activities are also potential targets, as are large computer systems operated by government agencies, banks, financial institutions, large businesses, health care facilities, and colleges/universities.

One of the first acts of domestic sabotage/terrorism ever carried out occurred in Michigan on May 18, 1927, in Bath. A disgruntled taxpayer and farmer detonated 1,000 pounds of explosives under the newly constructed Bath Consolidated School killing 38 students and 3 teachers and injuring 58 others. The perpetrator then blew himself up, along with the school superintendent. As tragic as that event was, it could have been worse were it not for the fact that half of the explosives failed to detonate as planned, which certainly would have killed many more students and teachers. Concentrated activities to prevent terrorist activities have become even more vital with the passage of time and in the wake of the 9/11 events of destruction in New York City and Washington D.C. Many more resources may anticipate to be mobilized to prevent terrorist activities in the near future.

Although at first it might appear Roscommon County is an unlikely target for terrorism, it cannot be totally discounted. Potential targets include the dams, the water treatment plant, the runways at the airports, and all industrial sites in the area. Furthermore, any government building, school, or individual can become a target of domestic terrorism.

Sabotage and Terrorism include a broad range of potential hazards that affect a community from a variety of perspectives. This hazard is defined as an intentional, unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, social, or religious objectives. Sabotage/terrorism can take many forms or have many vehicles for delivery, including: 1) bombings; 2) assassinations; 3) organized extortion; 4) use of nuclear, chemical, radiological, and biological weapons; 5) information warfare; 6) ethnic/religious/ gender intimidation (hate crimes); 7) state and local militia groups that advocate overthrowing the U.S. Government; 8) eco-extremism, designed to destroy or disrupt specific research or resource-related activities; and 9) widespread and organized narcotics smuggling and distribution organizations.

Sabotage Overview

Even though there have not been any recently recorded sabotage/terrorism events occurring recently in Roscommon County, the RCLPT recognized the possibility that an event could exist and assessed the event as a medium priority to address. The Emergency Management staff has scheduled training events to address these circumstances. With the ever-growing threat of local acts, the County is working to prepare their personnel should an event occur.

Public Health Emergencies

PUBLIC HEALTH EMERGENCIES

A widespread and/or severe epidemic, incident of contamination, or other situation that presents a danger to or otherwise negatively impacts the general health and well-being of the public.

Hazard Description

Public health emergencies can take many forms: 1) disease epidemics; 2) large-scale incidents of food or water contamination; 3) extended periods without adequate water and sewer services; 4) harmful exposure to chemical, radiological, or biological agents; 5) large scale infestations of disease-carrying insects or rodents. Public health emergencies can occur as primary events by themselves, or they may be secondary events another disaster or emergency, such as flood, tornado, or hazardous material incident. The common characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, a large number of people. Public health emergencies can be statewide, regional, or localized in scope and magnitude.

Perhaps the greatest emerging public health threat would be the intentional release of a radiological, chemical, or biological agent with the potential to adversely impact a large number of people. Such a release would most likely be an act of sabotage aimed at the government or at a specific organization or segment of the population. Fortunately, Michigan has not yet experienced such a release aimed at mass destruction.

Public Health Emergencies in Roscommon County

The most common type of public health emergency involves influenza that spreads through educational institutions, the workplace and other entities that experience a large volume of public traffic. Influenza typically kills between 200 and 500 individuals in Michigan alone and has the potential to change its structure and rapidly affect large populations.

Occurrences of influenza and disease are common to residents, students and visitors to Roscommon County and typically impact only a small portion of the population. Although most of public health related events occur in schools and are quickly managed, the potential does exist for these events to rapidly spread to adjacent populations.

Most public health emergencies in Roscommon County impact only a small number of individuals and occur more than once annually. The potential for these events to continue is high and can be effectively managed. However, increased public awareness to potential outbreaks of influenza or other disease has also raised the real possibility that a large scale event could occur. For this reason, development and testing of surveillance systems and integrated planning between local, state and federal sources continues to receive much needed attention.

Public Health Emergency Overview

Michigan has had several large-scale public health emergencies in recent history, but fortunately nothing that caused widespread severe injury or death. One of Michigan's most serious emergencies to hit Michigan occurred in 1973 when a local farmer fed polybrominated biphenyls (PBB) laced feed to his dairy herd. Michigan Chemical Corporation had accidentally supplied the Michigan Farm Bureau Services with sacks of fire-proofing chemical PBB, which is known to cause cancer, genetic mutation, and birth defects, and the PBB was inadvertently substituted for magnesium oxide (commonly used in antacid tablets used for human consumption) in a custom dairy feed # 402. During the crucial eight-month period between the farmer's first observations and the discovery of the accident, serious contamination had already occurred. By 1975 the state had quarantined more than 500 farms. Condemned for slaughter were more than 17,000 cattle; 3,415 hogs; 1.5 million chickens and 4.8 million eggs. The 1973 PBB contamination incident is unprecedented in U.S. history, but the long-term implications of contamination may be less than was feared.

In the 1980s, the state health department confirmed that 95 percent of Michigan's population had PBB in their bodies from eating beef, drinking milk or consuming other products from contaminated farms. A cancer epidemic was feared. Although one has not occurred, so far anyway, studies do show the most exposed families have increased breast and digestive cancer, and lymphoma. Among the effects observed in the exposed populations the daughters of the most highly exposed women began menstruation, on average, before they reached their twelfth birthdays.

Similarly, the northern Michigan water and sewer infrastructure disaster of 1994 is also unprecedented in scope, magnitude, and public health and safety implications for the affected communities. These events, though unusual, have heightened awareness of the broad nature of threats that can result in a public health emergency. Such emergencies no longer simply involve the spread of disease, but rather can arise out of a variety of situations and circumstances.

In 2001, Michigan health officials were introduced to the emerging health threats posed by foot-and-mouth disease and the West Nile encephalitis virus. Although foot-and-mouth disease is a highly contagious disease that only affects animals, a widespread outbreak such as that which occurred in parts of the United Kingdom in the spring of 2001 could have significant public health implications for humans as well, due to the potentially large numbers of dead animal carcasses that would have to be disposed of to prevent disease outbreaks. The Michigan Department of Agriculture and Rural Development, in conjunction with numerous other federal, state and local agencies and the agriculture industry, continues to monitor the foot-and-mouth disease situation and take the necessary steps to prevent the introduction and spread of the disease in the United States.

The RCLPT has assessed public health emergencies as a medium priority to address and works with the regional public health office in scheduling training sessions.

Geological Hazards

EARTHQUAKES

A shaking or trembling of the crust of the earth caused by the breaking and shifting of rock beneath the surface.

Hazard Description

Earthquakes range in intensity from slight tremors to great shocks. They may last from a few seconds to several minutes, or come as a series of tremors over a period of several days. The energy of an earthquake is released in seismic waves. Earthquakes usually occur without warning. In some instances, advance warnings of unusual geophysical events may be issued. However, scientists cannot yet predict exactly when or where an earthquake will occur. Earthquakes tend to strike repeatedly along fault lines, which are formed where large plates of the earth's crust below the surface constantly push and move against one another. Risk maps have been produced which show areas where an earthquake is more likely to occur. Earthquake monitoring is conducted by the U.S. Geological Survey, the National Oceanic and Atmospheric Administration, and universities throughout the country.

The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Most casualties result from falling objects and debris. Disruption of communications systems, electric power lines, gas, sewer and water mains can be expected. Water supplies can become contaminated by seepage

around water mains. Damage to roadways and other transportation systems may create food and other resource shortages if transportation is interrupted. In addition, earthquakes may trigger other emergencies such as fires and hazardous material spills, thereby compounding the situation.

Earthquake Overview

No severely destructive earthquake has ever been documented in Michigan. However, several mildly damaging earthquakes have been felt since the early 1800s. The exact number is difficult to determine, as scientific opinion on the matter varies. With most of these earthquakes, damage (if any) was limited to cracked plaster, broken dishes, damaged chimneys, and broken windows. (Biggest Michigan threats would be to pipelines, buildings that are poorly designed and constructed, and shelving, furniture, mirrors, gas cylinders, etc. within structures that could fall and cause injury or personal property damage)

The greatest impact on Roscommon County would probably come from damage to natural gas and petroleum pipelines. If the earthquake occurs in the winter, areas of the state could be severely impacted by fuel shortages - which could translate into temporary shortages in Roscommon. Being just off the I-75 corridor, the City of Roscommon is in a good position to receive shipments from major suppliers to the South.

Damage would probably be negligible in well-designed and constructed buildings. However, poorly designed and constructed buildings could suffer considerable damage under the right circumstances.

In January 1990, Executive Order (EO) 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction, was signed into law. This EO requires that appropriate seismic design and construction standards and practices be adopted for any new construction or replacement of a federal building or federally building during or after an earthquake.

Earthquake Overview

Roscommon County is not in an area designated as high risk to ground movement; yet by encouraging awareness of the hazards of poor construction practices and/or routine evaluations of existing structures for deficiencies, vulnerabilities can be identified and repaired before loss is sustained.

There is some chance of a moderate earthquake over the next few decades, which might be strong enough to damage some property and underground infrastructure. Earthquakes were given a moderate priority to address.

SUBSIDENCE

The lowering or collapse of the land surface caused by natural or human-induced activities that erode or remove subsurface support.

Hazard Description

Subsidence is the lowering or collapse of the land surface due to loss of subsurface support. It can be caused by a variety of natural or human-induced activities. Natural subsidence occurs when the ground collapses into underground cavities produced by the solution of limestone or other soluble materials by groundwater. Human- induced subsidence is caused principally by groundwater withdrawal, drainage of organic soils, and underground mining. In the United States, these activities have caused nearly 17,000 square miles of surface subsidence, with groundwater withdrawal (10,000 square miles of subsidence)

being the primary culprit. In addition, approximately 18% of the United States land surface is underlain by cavernous limestone, gypsum, salt, or marble, making the surface of these areas susceptible to collapse into sinkholes.

Generally, subsidence poses a greater risk to property than to life. Nationally, the average annual damage from all types of subsidence is conservatively estimated to be at least $125 million.

Mine Subsidence

In Michigan, the primary cause of subsidence is underground mining. Although mine subsidence is not as significant a hazard in Michigan as in other parts of the country, many areas in Michigan are potentially vulnerable to mine subsidence hazards. Mine subsidence is a geologic hazard that can strike with little or no warning and can result in very costly damage. Mine subsidence occurs when the ground surface collapses into underground mined areas. In addition, the collapse of improperly stabilized mine openings is also a form of subsidence. About the only good thing about mine subsidence is that it generally affects very few people, unlike other natural hazards that may impact a large number of people. Mine subsidence can cause damage to buildings, disrupt underground utilities, and be a potential threat to human life. In extreme cases, mine subsidence can literally swallow whole buildings or sections of ground into sinkholes, endangering anyone that may be present at that site. Mine subsidence may take years to manifest. Examples of collapses occurring decades after mines were abandoned have been documented in several areas of the country.

Michigan's Mining Experience

Michigan's rich mining heritage has played a significant role in the State's development into a world economic power. Due to its diverse geology, Michigan has a wide variety of mineral resources, most notable of which are copper ore, iron ore, coal, sand, gravel, gypsum, salt, oil and gas. It is not surprising then that underground mining has occurred on a significant scale throughout Michigan's history. The principal types of underground mining that occurs, or has occurred in Michigan, include coal mining, metallic mineral mining, salt mining, gypsum mining, and solution mining.

Copper Mining

Copper mining, in particular, put Michigan on the map as a major mining area. Although native copper ore occurs in other parts of the world, at one time the quantity of Michigan's native ore was unsurpassed. From the mid to late 1800s, Michigan's Keweenaw Peninsula mines produced more native copper ore than any other mining area in North America. As those resources became depleted, copper mining began near White Pine in Ontonagon County. The target strata in the White Pine mining operations were on an anticline that was mined both at depths as shallow as 100 feet and as deep as 2900 feet. Over-mining of pillars in shallow parts of the mine caused collapse and subsidence at the surface, on mine property, during the 1980s. The "Copper County" area generally crosses Ontonagon, Houghton, and Keweenaw Counties.

Iron Ore Mining

Michigan's Lake Superior region has been home to significant iron ore mining operations since the mid-1800s. The iron producing areas are referred to as ranges, since the iron deposits generally occur on the slopes or at the base of remnants of ancient mountain ranges. Michigan has three ranges: 1) Gogebic Range, which extends from Gogebic County into Wisconsin; 2) Marquette Range, in Marquette County; and 3) Menominee Range, in Dickinson and Iron Counties. Most near-surface iron deposits in these three ranges have been exhausted, so underground mining has become the primary extraction technique. Nearly two billion tons of iron ore have been extracted from these areas. Unfortunately, economics have

forced the closure of many of the underground iron mining operations, although one five counties of Baraga, Dickinson, Gogebic, Iron, and Marquette.

Salt/Solution Mining

Michigan also has one of the world's largest underground salt accumulations. The thickest salt beds lie under most of the Lower Peninsula. These formations are, in some places, over 3,000 feet thick and composed of layers of salt and other minerals. Michigan ranked first or second in national salt production from 1880 to the late 1920s. The bulk of the salt production was from natural brines pumped from six salt formations. Salt was also produced from artificial brines that were derived by injecting freshwater into salt formations and retrieving the resulting brines (called solution mining). The old Detroit salt mine produced rock salt using the "room and pillar" method until 1983. (The room and pillar method involves creating large underground expanses [rooms] in which to mine, supported by pillars [natural or artificial structural members] that held in place the roofs of these rooms.) The Detroit salt mine was approximately 1,100 feet below ground, and encompassed approximately 1,100 acres of subsurface land. The room and pillar method is being used only in the single salt mine that is still operating in Michigan, by the Detroit Salt Company, which has an excellent safety record. Salt is also being produced from brines extracted at various locations within the state.

Gypsum Mining

Gypsum has been mined in Michigan since 1841. In the Grand Rapids area, gypsum is mined by the "room and pillar" method. Open pit mining is used in the Alabaster region (Iosco County). In both of these areas, gypsum beds directly underlie thin layers of glacial drift. Closed topographic lows observed in both areas are believed to be due to groundwater solution of the gypsum and subsequent collapse of the overlying material.

Coal Mining

Michigan also once supported a thriving coal mining industry. Records indicate that over 165 different coal mines operated in Michigan's coal-bearing region, which includes 31 counties in the south-central portion of the lower Peninsula. Over 100 of the 165 known coal mines in the state were located in the Saginaw Bay area. Coal was first discovered in Michigan in 1835 in Jackson County. From that discovery, several small underground and surface coal mines were opened in that area of the state. In 1861, coal was discovered near Bay City, and in 1897 commercial coal mining began in Bay County. That led to the establishment of numerous additional mines in Saginaw, Tuscola and Genesee counties, which tended to be larger, deeper and more extensive mines. That was the start of Michigan's coal mining industry.

The state's underground coal mines were an average of 110 feet deep, and were worked by the "room and pillar" method. Michigan had continuous coal mining from 1897 to 1952, when the last underground coal mine near St. Charles, Saginaw County, closed. From 1860 (the year mine records were first kept) until 1975 (the year the last surface coal mine closed), the 165 commercial coal mines produced a total output of over 46 million tons of coal. The maximum coal output was achieved in 1907, when Michigan's 37 operating coal mines produced two million tons per year - enough to supply 16% of Michigan's total demand for coal.

Subsidence Overview

The legacy of underground mining can be felt in numerous locations across the state. Many of the underground mining areas, whether active or abandoned, are vulnerable to subsidence in some form. The map on the previous page indicates the areas in the state that are potentially vulnerable to mine subsidence. Unfortunately, records of abandoned mines are often sketchy and sometimes non-existent.

Therefore, it is often difficult to determine exactly where the mines were located. Many areas of Michigan may have developed over abandoned mines and may not even be aware of it. Often, the only way a community or home/business owner becomes aware of a potential hazard is when subsidence actually occurs and damage or destruction results. Subsidence was identified as a moderate priority to address.

CHAPTER 5: ANALYSIS OF ALTERNATIVE ACTIONS

Prior to the development of the mitigation strategies, goals and objectives were developed. Upon the development of the goals and objectives, mitigation actions were then determined, based on the six categories of mitigation actions. Below are the goals and objectives, and the mitigation action categories as determined for the 2007 Hazard Mitigation Plan. Revised goals and objectives for the 2015 Plan, as determined by the Roscommon County Local Planning Team members, will appear in Chapter 5: Action Plan.

Goals are general guidelines that explain what a community wants to accomplish. Goals are often long term and represent broad visions. **Objectives** define strategies or implementation steps to attain the identified goals. They are specific, measurable and may have completion dates.

ROSCOMMON COUNTY GOALS AND OBJECTIVES

GOAL 1: Protect Public Health and Safety

OBJECTIVES

- Provide community wide hazard warning systems (natural, health and terrorism)
- Provide information and resources to increase hazard awareness and education
- Maintain existing resources and provide necessary training
- Identify and obtain necessary resources and equipment to prevent or minimize hazard effects
- Provide guidelines to public/staff on ways to address the hazard effects

GOAL 2: Minimize damage to public and private property

OBJECTIVES

- Adopt policies to make property less vulnerable
- Apply proactive mitigation measures to prevent hazard damage
- Obtain necessary equipment (i.e. contractors with cranes to help with dams), resources and training, especially fire departments, to protect property if hazard occurs
- Conduct training sessions and exercises to prepare for possible hazards to both public and professional staff

GOAL 3: Maintain essential services

OBJECTIVES

- Identify, inspect and maintain all critical infrastructure and facilities
- Security for the County Courthouse
- Repair or replace critical infrastructure and facilities that are damaged or degraded
- Protect critical infrastructure and facilities from hazard damage
- Obtain necessary resources and equipment to insure essential services are maintained in the event of a hazard
- Planning the succession of hierarchy or responsibilities for local agencies in the event of an emergency

GOAL 4: Manage growth/development

OBJECTIVES

- Develop hazard resistant growth policies
- Discourage development in high hazard areas

- Integrate hazard mitigation planning into land use planning
- Encourage sustainable development
- Protect and conserve natural resources

The next steps in the 2007 hazard mitigation planning process were to identify mitigation actions suitable to the community, evaluate the effect the action will have on the specified mitigation objective and prioritize actions to decide what sequence or order these actions should be pursued. This step will also be utilized in the 2015 Plan and will be located in Chapter 5: Action Plan.

Mitigation Strategies

1. **Prevention**-government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.
2. **Property Protection**-actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from a hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
3. **Public Education and Awareness**-actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, Fire-Wise Program, real estate disclosure, hazard information centers, and school-age and adult education programs.
4. **Natural Resource Protection**-actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
5. **Emergency Services**-actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
6. **Structural Projects**-actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

ROSCOMMOM COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**
A. Multi-Hazard Actions			
Enhance and expand all hazards education and awareness program in schools, which includes classroom presentations and incorporating wildfire and weather hazard preparedness into school curriculums.	High	Ongoing	Red Cross-Programs, Pillow Case Project/Fire Dept.-Fire Safety Week, Demonstrations/Police Dept.-School Resource Officer
Organize outreach program to vulnerable populations during and after hazard events, including wildfires, extreme winter and summer weather events, periods of extreme temperatures, public health emergencies, and other hazards that can impact the community.	High	Ongoing	Red Cross Presentations/ FD/PD
Communities will acquire and maintain an adequate level of emergency power generators to supply emergency water needs, wastewater processing, emergency communications, emergency health care, and shelters.	High	Ongoing	Red Cross-shelters/Communities responsible for generators for 911 and water
Enhance and expand a public education program for all natural hazards that threaten the community.	High	Ongoing	Red Cross-Programs/FD-Firewise Program, Wildfire Education/ Emergency Management (EM)
Produce and distribute family emergency preparedness information relating to all natural hazards affecting the County.	Med.	Ongoing	Red Cross/FD-FEMA Brochures/Public Health
Conduct workshops at community gatherings to encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.	Med.	Ongoing	Red Cross/EM
Public warning systems and networks	Med.	Ongoing	911/FD/Nixle
Continue to develop Emergency Response Team program to help prepare for all hazard events in the county.	Med.	Ongoing	Hazmat Team/Red Cross-Disaster Assistance Team/CERT Team
Individual communities should prepare future land use plans and capital improvement programs to plan for their future needs.	Med.	Ongoing	County/Road Commission
Ensure that the County and individual communities have adequate equipment, staff, and training to respond to transportation-related accidents specific to their needs.	Med.	Ongoing	Hazmat Team-snowmobiles, ORVs/FD-Dive Team

ROSCOMMOM COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**
B. Weather (Winter/Summer)			
Using snow fences or "living snow fences" (rows of trees or vegetation) to limit blowing and drifting of snow over critical roadway segments.	High	Not Started	Project funded through MDOT
Installing lightning protection devices on the community's communications infrastructure.	High	In Process	Primary equipment completed in 2015
Proper building/site design and code enforcement relating to snow loads, roof slope, snow removal and storage, etc.	Med.	Ongoing	Road Commission-Road Restrictions/ Local Communities-Building Codes
Public early warning systems and networks.	Med.	In Process	National Weather Service
Maintaining adequate road and debris clearing capabilities.	Med.	Ongoing	Road Commission
Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)	Med.	Ongoing	Consumers Energy
Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.	Med.	Ongoing	Red Cross/EM
Establishing heating centers/shelters for vulnerable populations.	Med.	Ongoing	Red Cross/PD/EM
Buried/protected power and utility lines.	Med.	Ongoing	Consumers Energy/Other Public Utility Companies/Private Industry-Fiber Cable
Pre-planning for debris management staging and storage areas. (Debris is usually the sleet and ice itself being cleared from roads and roofs, or vegetation such as tree branches that have fallen under the impact of winds or the weight of ice. Broken power or phone lines that had frozen or been weighted down by ice or fallen branches could be part of the problem. In some cases, roofs may collapse under the weight of ice and snow. Some storage areas will definitely be needed for snow removal during blizzards.)	Med.	Ongoing	Road Commission/Townships-compost

ROSCOMMOM COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**
Establishing safe and appropriate locations for temporary debris disposal sites.	Med.	Ongoing	Road Commission/Townships-compost
Organizing outreach to isolated, vulnerable, or special-needs populations.	Med.	Ongoing	Red Cross/EM/911/Department of Human Services/Meals on Wheels
Pre-planning for debris management staging and storage areas. (Debris could be rubble, vehicles, objects from destroyed/damaged structures, vegetation or other items knocked down or blown by winds, or broken power or phone lines that had frozen or been weighted down by fallen branches and trees.)	Med.	Ongoing	Road Commission/Townships-compost
Public education and awareness of thunderstorm dangers.	Med.	Ongoing	Red Cross/EM
C. Communication Loss			
Use of generators for backup power at critical facilities.	High	Complete	911-purchased in 2014, tested weekly/PD-2014
Replacement or renovation of aging structures and equipment (to be made as hazard-resistant as economically possible).	Med.	Ongoing	Municipal Capital Improvement Plans
Alternative 9-1-1 access through radio operators whose homes are identified through special markings.	Low	Not Started	Not enough operators, no longer a viable option.
D. Dam Failure			
Ensuring consistency of dam Emergency Action Plan (EAP) with the local Emergency Operations Plan (EOP).	High	Ongoing	EM works with DNR
Garnering community support for removal or repair of dams in disrepair.	Med.	Not Started	Dam in question destroyed.
E. Transportation Accidents			
Improved design, routing, and traffic control at problem roadway areas.	High	Ongoing	MDOT-Plans and Improves Major Roadways/Road Commission-County Roadways
Training, planning, and preparedness for mass-casualty incidents involving all modes of public transportation.	High	Ongoing	FD/Sheriff Dept./PD/EM
Trained, equipped, and prepared search and rescue teams.	Med.	Ongoing	CERT/Search and Rescue Teams/FD
Airport maintenance, security, and safety programs.	Med.	Ongoing	Owners to maintain property
Marine safety and general boater awareness programs.	Med.	Ongoing	Coast Guard/DNR/Sheriff

ROSCOMMOM COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**
Railroad inspections and improved designs at problem railway/roadway intersections (at grade crossings, rural signs/signals for RR crossing).	Low	Ongoing	Road Commission/DNR/EM
Enforcement of weight and travel restrictions.	Low	Ongoing	MSP/Sheriff/Road Commission
Improvements in driver education, traffic law enforcement, and transportation planning that balance needs of public transportation conveyers with the safety of the general public.	Low	Ongoing	Done Through Private Market
Use of designated truck routes.	Low	Ongoing	MDOT/Road Commission
F. County Security 1			
Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.	High	Ongoing	Schools/Private Entities-responsible for own plans.
Development of a thorough community risk and threat assessment that identifies potential vulnerabilities and targets for a sabotage/terrorism/WMD attack.	High	Ongoing	Schools/Local Emergency Planning Commission (LEPC)
Alertness, awareness, and monitoring of organizations and activities that may threaten the community.	Med.	Ongoing	PD/Sheriff
Implementing school safety and violence prevention programs.	Med.	Ongoing	Schools/PD/Sheriff
Heightening security at public gatherings, special events, and critical community facilities and industries.	Med.	Ongoing	MSP-Bring in Extra Resources/DNR-More Personnel
Training, planning, and preparedness by local law enforcement and other responders for terrorist/sabotage/ WMD attacks.	Med.	Ongoing	PD/Sheriff
Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.	Med.	Ongoing	Red Cross Emergency Management
Using laminated glass and other hazard-resistant, durable construction techniques in public buildings and critical facilities.	Low	Not Started	No construction completed.
Establishing avenues of reporting (and rewards) for information preventing terrorist incidents and sabotage.	Low	Ongoing	Crimestoppers

ROSCOMMOM COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**
Pre-planning for debris management staging and storage areas. (Debris could be rubble, vehicles, etc. that would get in the way or be left over following an attack or incident. The area may simultaneously need to be treated as a crime scene, site of urban search and rescue, area of hazardous materials, and/or a public health threat.)	Low	Ongoing	Road Commission/Townships-compost
Consistent use of computer data back-up systems and anti-virus software.	Low	Complete	Industrial Standard to Complete Back-ups
G. HazMat Transportation			
Locating schools, nursing homes, and other special facilities away from major hazardous material transportation routes.	High	Not Started	No new schools anticipated.
Compliance with and enforcement of USDOT and MDOT regulations regarding hazardous materials transport.	High	Ongoing	MDOT/MSP/Sheriff
Improved design, routing, and traffic control at problem roadway areas.	High	Ongoing	MDOT
Proper planning, design, maintenance of, and enhancements to designated truck routes.	High	Ongoing	Road Commission/MDOT
Long-term planning that provides more connector roads for reduced congestion of arterial roads.	Med.	Complete	Limited Population-More Connector Roads Necessary
Enforcement of weight and travel restrictions for truck traffic.	Med.	Ongoing	MSP/Sheriff/Road Commission
Trained, equipped and prepared local hazardous materials emergency response teams.	Med.	Ongoing	CERT/Search and Rescue Teams/FD
Improvements in driver education, traffic law enforcement, and transportation planning that balance the needs of hazardous material transporters with the safety of the general public.	Med	Ongoing	Done Through Private Market/Trucking Companies
Railroad inspections and improved designs at problem railway/roadway intersections (at grade crossings, rural signs/signals for RR crossing).	Med.	Ongoing	Road Commission/DNR/EM
Training, planning, and preparedness for hazardous material incidents along roadways and railways (in addition to fixed site emergencies).	Med.	Ongoing	CERT/HazMat/Annual Train Inspections

ROSCOMMOM COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**
Evacuation plans and community awareness of them.	Med.	Ongoing	MDOT/Sheriff/MSP
Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.	Med.	Ongoing	Red Cross Emergency Management
Elimination of rolling drug and methamphetamine laboratories through law enforcement and public education	Med.	Ongoing	MSP/Sheriff-School Resource Officer/ PD
Road closures and traffic control in accident areas.	Med.	Complete	Plans are with MSP-MDOT
Public warning systems and networks.	Low	Ongoing	911/FD/Nixle
H. Infrastructure Failure			
Backup in utility and communications systems, especially "lifeline" systems.	High	In Process	County 911/Village of Roscommon/ Private Utility Companies
Proper location, design, and maintenance of water and sewer systems (to include insulation of critical components to prevent damage from ground freeze).	High	In Process	Village of Roscommon
Burying electrical and phone lines, where possible, to resist damage from severe winds, lightning, ice, and other hazards.	High	Ongoing	Consumers Energy/Other Public Utility Companies/Private Industry-Fiber Cable
Use of generators for backup power at critical facilities.	High	Complete	911-purchased in 2014, tested weekly/PD-2014
Protecting electrical and communications systems from lightning strikes.	Med.	Complete	911 system protected.
Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.	Med.	Ongoing	Red Cross Emergency Management
Separation and/or expansion of sewer system to handle anticipated stormwater volumes.	Med.	Ongoing	Road Commission/Village of Roscommon
Programs/networks for contacting elderly or homebound persons during periods of infrastructure failure, to assess whether they have unmet needs.	Low	Ongoing	FD/CERT/EM/Nixle
"Rolling blackouts" in electrical systems that will otherwise fail completely due to overloading.	Low	Not Started	Blackouts not necessary due to limited population.
Replacement or renovation of aging structures and equipment (to be made as hazard-resistant as economically possible).	Low	Ongoing	Municipal Capital Improvement Plans

ROSCOMMOM COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**
Increasing public awareness and widespread use of the "MISS DIG" utility damage prevention service (1-800-482-7171).	Low	Complete	EM/Internet/TV
I. Oil/Gas Pipeline/Well Accident			
Using buffer strips to segregate wells, storage tanks, and other production facilities from transportation routes and adjacent land uses, in accordance with state regulations, and consistent with the level of risk.	High	Ongoing	Private Industry that Own Wells
Proper pipeline design, construction, maintenance and inspection.	High	Complete	State Regulated
Community and operator compliance with industry safety regulations and standards.	Med.	Ongoing	State Regulated
Locating pipelines away from dense development, critical facilities, special needs populations, and environmentally vulnerable areas whenever possible.	Med.	Complete	No new pipelines installed or anticipated.
Increasing public awareness and widespread use of the "MISS DIG" utility damage prevention service (800-482-7171).	Med.	Complete	EM/Internet/TV
Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.	Med.	Ongoing	Red Cross Emergency Management
Increasing public awareness of pipeline locations and appropriate emergency procedures.	Low	Not Started	Not applicable.
Awareness of hydrogen sulfide gas dangers and personal protection actions for these dangers.	Low	Ongoing	EM
Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.	Low	Ongoing	Schools/Private Entities-responsible for own plans.
Contingency plans for worker and public protection, including the inclusion of rescue and evacuation procedures for well hazard areas in the local emergency operations plan.	Low	Ongoing	Private Industry/CERT

ROSCOMMOM COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**
J. Wildfire 1			
Safe disposal of yard and house waste rather than through open burning.	High	Ongoing	DNR/Townships
Arson prevention activities, including reduction of blight (cleaning up areas of abandoned or collapsed structures, accumulated junk or debris, and with any history of flammable substances stored, spilled, or dumped on them).	High	Ongoing	Local Building Codes/FD/DNR
Public education on smoking hazards and recreational fires.	High	Ongoing	DNR/Red Cross
Training and exercises for response personnel.	High	Ongoing	FD/DNR/US Forest Service
Use of fire spotters, towers, planes.	High	Ongoing	DNR
Keep handy household items that can be used as fire tools; a rake, axe, hand/chainsaw, bucket and shovel. Install and maintain smoke detectors and fire extinguishers. Install a smoke alarm on each floor of buildings and homes. Test monthly and change the batteries two times each year. Teach family members how to use the fire extinguisher.	High	Ongoing	Red Cross/DNR/FD
Post fire emergency telephone numbers.	High	Complete	911 Posted Throughout County
Organizing neighborhood wildfire safety coalitions (to plan how the neighborhood could work together to prevent a wildfire).	High	Not Started	Not applicable.
Proper maintenance and separation of power lines. Ask the power company to clear branches from power lines.	Med.	Ongoing	Consumers Energy
Residents should plan several escape routes away from their homes - by car and by foot.	Med.	Ongoing	Red Cross
Efficient response to fallen power lines.	Med.	Ongoing	FD/Utility Company
Mutual aid pacts with neighboring communities.	Med.	Complete	Renewed Annually
K. Population Increase (Seasonal/Other)			
Ensure water and food supplies can be maintained.	High	Ongoing	Private Industry
Provide training for Law, Fire, EMS and other emergency services to meet the increased demand.	High	Ongoing	Annual Training done Locally

ROSCOMMOM COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**
Acquire portable/changeable message signs to direct crowds and provide information.	High	Ongoing	MDOT
Ensure capacities for water/sewer systems.	Med.	Ongoing	Monitored by public works departments.
Maintain infrastructure such as schools, hospitals, prisons, roads, and systems for the disposal of waste.	Med.	Ongoing	Public Utility
Include environmental degradation, air and traffic congestion, and pollution of all kinds, water shortages, increased crowding, and social stress.	Med.	Ongoing	County works with MDOT, DEQ on these matters.
Economic impact on community.	Low	Ongoing	Local Chambers of Commerce
Provide list of motel/cottages where people can stay. Provide lists of alternate rooms in surrounding counties.	Low	Complete	Local Chambers of Commerce
L. HazMat (Fixed Site, Propane Yards)			
Public warning systems and networks for hazardous material releases.	High	Ongoing	911/Nixle/EM/NWS
Maintaining an active and viable Local Emergency Planning Committee (LEPC).	High	Ongoing	Quarterly Meetings
Development of Risk Management Plans for sites that manufacture, store, or handle hazardous materials, to comply with EPA regulations.	High	Complete	Plans Completed for SARA III Sites
Training in and compliance with all safety procedures and systems related to the manufacture, storage, transport, use, and disposal of hazardous materials.	High	Ongoing	HazMat/CERT
Developing and exercising site emergency plans and community response plans as required under SARA Title III	Med.	Ongoing	EM/LEPC
Elimination of clandestine methamphetamine laboratories through law enforcement and public education.	Med.	Ongoing	MSP/Sheriff/PD
Policies stressing the importance of safety above other considerations.	Med.	Ongoing	MSP/Sheriff/PD-Standard Operating Procedures
Road closures and traffic control in accident areas.	Med.	Complete	Plans are with MSP-MDOT
Trained, equipped, and prepared site and local hazardous material emergency response teams	Med.	Ongoing	Hazmat Team/Red Cross-Disaster Assistance Team/CERT Team
Compliance with/enforcement of Resource Conservation and Recovery Act (RCRA) standards.	Med.	Ongoing	Waste is disposed of properly.

ROSCOMMOM COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**
Proper separation and buffering between industrial areas and other land uses.	Med.	Ongoing	Local Zoning Ordinances
Location of industrial areas away from schools, nursing homes, etc.	Med.	Ongoing	Local Zoning Ordinances
Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.	Med.	Ongoing	Schools/Private Entities-responsible for own plans.
Compliance with all industrial, fire, and safety regulations	Med.	Not Started	Not applicable
Evacuation plans and community awareness of them.	Low	Not Started	Not applicable
Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.	Low	Ongoing	Red Cross Emergency Management
Trained, equipped, and prepared search and rescue teams.	Low	Ongoing	Hazmat Team/Red Cross-Disaster Assistance Team/CERT Team
Hazardous material public awareness and worker education programs.	Low	Ongoing	OSHA/MIOSHA/HazMat
Enhanced security and anti-terrorist/ sabotage/civil disturbance measures.	Low	Not Started	Not applicable
Facility and community training and exercise programs.	Low	Not Started	Not applicable

CHAPTER 6: ACTION PLAN

Through a systematic process, that included the review of all action items identified in the Roscommon County 2007 Hazard Mitigation Plan (2007 Plan) and the possible mitigation strategies as identified in the 2007 Local Hazard Mitigation Planning Workbook (Workbook), the Roscommon County Local Planning Team (RCLPT) was able to identify the following strategies to be the most effective strategies for hazard mitigation for 2016 Hazard Mitigation Plan for Roscommon County. The actions include mitigation actions identified in the 2007 Plan that are ongoing or have not been completed and are still considered to be relevant, as well as new strategies that have been identified by the RCLPT.

The RCLPT initiated the selection process with a review of the goals and objectives as identified in the 2007 Plan and modified them to fit the needs of Roscommon County in 2016 and beyond. These goals and objectives are identified below.

GOAL 1: Protect Public Health and Safety

OBJECTIVES

- Provide community wide hazard warning systems (natural, health and terrorism)
- Provide information and resources to increase hazard awareness and education
- Maintain existing resources and provide necessary training
- Identify and obtain necessary resources and equipment to prevent or minimize hazard effects
- Provide guidelines to public/staff on ways to address the hazard effects

GOAL 2: Minimize damage to public and private property

OBJECTIVES

- Adopt policies to make property less vulnerable
- Apply proactive mitigation measures to prevent hazard damage
- Obtain necessary equipment (i.e. contractors with cranes to help with dams), resources and training, especially fire departments, to protect property if hazard occurs
- Conduct training sessions and exercises to prepare for possible hazards to both public and professional staff

GOAL 3: Maintain essential services

OBJECTIVES

- Identify, inspect and maintain all critical infrastructure and facilities
- Security for the County Courthouse
- Repair or replace critical infrastructure and facilities that are damaged or degraded
- Protect critical infrastructure and facilities from hazard damage
- Obtain necessary resources and equipment to insure essential services are maintained in the event of a hazard
- Planning the succession of hierarchy or responsibilities for local agencies in the event of an emergency

GOAL 4: Manage growth/development

OBJECTIVES

- Develop hazard resistant growth policies

- Discourage development in high hazard areas
- Integrate hazard mitigation planning into land use planning
- Encourage sustainable development
- Protect and conserve natural resources

The action plan items from the 2007 Plan were then evaluated and those items that were deemed complete or no longer applicable were eliminated from this plan (see Chapter 5: Analysis of Alternative Actions for review of all 2007 items). The RCLPT then began review of the possible mitigation strategies as identified in the Workbook. After identifying and reviewing over 250 possible mitigation strategies the Roscommon County Emergency Management Director, Assistant Emergency Management Director, and Regional Planner from EMCOG were able to combine and/or eliminate duplicate strategies to reduce the number of possible strategies to 44. The final list of strategies is found in Appendix C. The original list of possible strategies is found in Appendix D.

The RCLPT was then asked to develop a list of projects/processes that would address the items on the list of strategies. Projects that have a greater impact to reduce the loss of human lives or injuries were given a high priority. Projects that impact human losses to a lesser degree were given a medium priority. Projects that minimally reduce human loss or injury were given a moderate priority and are identified In Appendix E. All projects that were identified are included in Appendix E. It should be noted that those projects that met the high or medium priority criteria, but were identified as not being as cost effective as other projects, were ranked lower in the priority or were given a lower priority.

The list of action items (projects) has been greatly reduced from the 2007 Plan, which had approximately 125 actions. This reduction was per the suggestion of the MSP/EMHSD staff. The 2007 prioritization process was based on the number of mitigation activities found for each hazard, votes or the action item in that hazard. Therefore, each hazard had high, medium, and low priority projects. The prioritization of the proposed action list is based on impact in saving human lives and property, and their cost effectiveness. There is not specifically a high priority project for each hazard, as was done in the 2007 Plan.

Multiple actions identified in the 2016 Plan have been purposely re-worded to be less specific than in the 2007 Plan, which allows those items to address multi-hazard actions, rather than the hazard-by-hazard approach in the previous plan. New items not identified in the 2007 Plan have been labeled as “NEW” in their descriptions.

HIGH PRIORITY HAZARD MITIGATION ACTIONS

Action Item 1: (NEW)
CodeRED/NIXLE
Action: Upgrade the current system (free NIXLE) to a higher grade system that allows notification to targeted populations and areas.

- Location: County-wide
- Lead Agency: Office of Emergency Management (OEM)
- Other participating Agencies: Local public safety departments, MSP, and Roscommon County
- Hazards Addressed: Severe All hazards

- Potential Funding Source(s): Roscommon County
- Project Costs: $5,000-$30,000 annually- TBD
- Schedule: ongoing
- Priority: High
- Benefit(s): Better, more complete pre-warning of oncoming disastrous situations and other situations to residents, businesses, and visitors.

Action Item 2

Add warning sirens where needed to fill gaps in Roscommon County's current warning system and educate the public on the usage.

Action: Complete an analysis of warning siren system to determine if/where gaps exist and establish locations to fill in those gaps. Purchas sirens. Educate the public of the warning system and the how to properly respond in case of emergencies.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: Roscommon County 911 Services, National Weather Service (NWS), MSP, Sheriff's Department, Higgins Township, Lyon Township, Markey Township, Richfield Township, Gerrish Township, Village of Roscommon, and local public safety departments (should funding be available)
- Hazards Addressed: All hazards
- Potential Funding Source(s): Federal Emergency Management Agency (FEMA) and local governments
- Project Costs: $18,00-$20,000 per siren - TBD
- Schedule: Study to determine location of sirens will begin in 2017. Installation of sirens will be completed after the sites for the sirens have been determined.
- Priority: High
- Benefit(s): Saving of lives/reducing injuries with a better warning system and a more informed public that will accompany the installation of the system.

Action Item 3

Promote the need to complete disaster awareness/emergency planning, including but not limited to major storm events, public health emergencies, or hazard material spills, for special events, schools, governmental agencies, large employers, and businesses.

Action: Encourage the development of disaster awareness/emergency plans for special events and buildings that house large populations. The disaster awareness/emergency plans can be used for multiple reasons and would provide a more organized method to address disasters or other times of crises.

- Location: County-wide
- Lead Agency: OEM
- Participating Agencies: Local businesses, special event coordinators, Sheriff's department, Higgins Township, Lyon Township, Lake Township, Richfield Township, Roscommon Township, Village of Roscommon, and local public safety departments (should funding be made available)
- Hazards Addressed: All hazards
- Potential Funding Source(s): NA
- Project Cost: NA

- Schedule: Ongoing
- Priority: High
- Benefit(s): By developing a plan, information would be made available to attendees of events or occupants of a building on how to address or where to go in emergency situations.

Action Item 4 (NEW)
Complete the Community Wildfire Protection Plan for the County.
Action: Complete the Community Wildfire Protection Plan (CWPP) that will encompass Roscommon County. The CWPP will identify the hazards associated with wildfires, their fuels, and impacts to the County, and will identify measures to mitigate damages that result from future wildfires.

- Location: County-wide
- Lead Agency: Roscommon County Office of Emergency Management
- Other Participating Agencies: Michigan Department of Natural Resources, U,S. Fire Service, Roscommon County, Markey Fire Department, Higgins Fire Department, Gerrish Fire Department, Lyon Fire Department, Roscommon Fire Department, and Richfield Fire Department
- Hazards Addressed: Wildfires
- Potential Funding Source(s): Michigan Department of Natural Resources (MDNR)
- Project Costs: $25,000
- Schedule: Project is ongoing and schedule to be completed in 2016.
- Priority: High
- Benefit(s): The residents, property owners, visitors, and business owners of Roscommon County will all benefit. Once the CWPP is complete, measures will begin to take place to mitigate the effects of the wildfires.

Item 5 (NEW)
Encourage the inclusion of hazard mitigation into other planning documents
Action: Encourage municipal agencies to include hazard mitigation into master plans/comprehensive land use plans and other planning documents.

- Location: County-wide
- Lead Agency: OEM
- Participating Agencies: Roscommon County, all townships as appropriate
- Hazards Addressed: all hazards
- Potential Funding Source(s): NA
- Project Cost: NA
- Schedule: 2016 to completion
- Priority: High
- Benefit(s): Hazard Mitigation is identified in the local municipal planning documents, thereby increasing community awareness of hazard mitigation and increasing the opportunity for community resiliency.

MEDIUM PRIORITY HAZARD MITIGATION ACTIONS

Action Item 1

Purchase of generators/pre-wiring of facilities-to be used for back-up power at warning sirens, municipal buildings, other critical county governmental facilities, senior centers, long-term facilities, and other critical non-governmental agencies.

Action: Complete a survey of governmental, senior centers, long-term facilities, and other critical facilities to determine locations without generators. Purchase generators for facilities.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: Higgins Township, Lyon Township, Markey Township, Richfield Township, Gerrish Township, Village of Roscommon, and other local government agencies (should funding become available)
- Hazards Addressed: All Hazards
- Potential Funding Source(s): Grants
- Project Cost: TBD
- Schedule: 2017/18
- Priority: Medium
- Benefit(s): Critical governmental and non-governmental agencies, including critical care facilities, will be able to remain in operation during power outages.

Action Item 2 (NEW)

Construct Safe Rooms at campgrounds and mobile home parks throughout the County.

Action: Complete an analysis of campgrounds and mobile home parks throughout the County to determine which sites do not have sufficient safe areas during times of extreme weather conditions and develop a plan to construct safe rooms accordingly. Educate the public of the safe rooms and how to properly respond in case of emergencies.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: DNR, privately-owned campgrounds, Federal Emergency Management Agency (FEMA)
- Hazards Addressed: All hazards
- Potential Funding Source(s): FEMA and local governments
- Project Costs: TBD
- Schedule: Study to determine location of safe rooms will begin in 2018. Construction of safe rooms will begin after the sites for them has been determined.
- Priority: Medium
- Benefit(s): Saving of lives/reducing injuries with a safe environment in which to be located during severe weather conditions as well as a more informed public that will accompany the construction of the safe rooms.

Action Item 3 (NEW)

Educate the public on the benefits of NIXLE/CodeRED Systems.

Action: Conduct a publicity campaign on the benefits of NIXLE/CodeRED and the importance for residents to sign up for the service.

- Location: County-wide
- Lead Agency: OEM

- Other Participating Agencies: Roscommon Sheriff, MSP, Public Health, Markey Township, Lyon Township, Denton Township, and other local municipalities (should funding become available)
- Hazards Addressed: All hazards
- Potential Funding Source(s): Roscommon County
- Project Cost: TBD
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Users of the service will be provided with early warnings of storms and other disasters. In addition, other notification such as amber alerts will also be included in the service.

Action Item 4
Purchase portable electronic message signs.
Action: Purchase four (4) additional portable traffic directional signs. Investigate the sources to purchase the signs and identify agencies/organizations that could use the signs on a temporary basis.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: Roscommon County Road Commission, Sheriff's Department, MSP, local municipalities as funding becomes available
- Hazards Addressed: All hazards
- Potential Funding Source(s): Grants
- Project Cost: $120,000
- Schedule: 2017/18
- Priority: Medium
- Benefit(s): By redirecting traffic away from hazardous situations, further problems may be averted.

Action Item 5 (NEW)
Research the need for improving communications to the physically impaired, through the use of sign language and Braille.
Action: Assess the need to improve communications to the physically impaired through the use of sign language and Braille.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: Red Cross, Public Health, School Districts, DHHS, Roscommon County 911
- Hazards Addressed: All hazards
- Potential Funding Source(s): TBD
- Project Cost: TBD
- Schedule: 2017/18
- Priority: Medium
- Benefit(s): The physically impaired population will be able to receive communications of hazardous situations.

Action Item 6

Dam repairs in accordance with the dam Emergency Action Plans and the local Emergency Operations Plan.

Action: Assess all county dams, repair public dams as needed, and work with the owners of the privately-owned dams to have them repaired.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: DNR, Drain Commissioner, Army Corps of Engineers, owners of privately-owned dams
- Hazards Addressed: Flooding, infrastructure failure
- Potential Funding Source(s): TBD
- Project Cost: TBD
- Schedule: 2017
- Priority: Medium
- Benefit(s): Dams will be in a better state of repair, which would minimize flooding due to dam disrepair.

Action Item 7

Educate the public on the dangers of hazards and the need to be prepared when they occur.

Action: Education of the public will include the dangers of meth labs, how to respond to all hazardous situations, how to develop Family Disaster Plans, and the need for Family Disaster Kits. This item will also include distribution of the information to public campgrounds.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: Sheriff's department, Red Cross, Public Health, Gerrish Township Police Department, Denton Township Police Department, Lyon Township, and Richfield Towmship
- Hazards Addressed: All hazards
- Potential Funding Source(s): TBD
- Project Cost: TBD
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Educating the general public would bring more information to them on all hazards and the need to develop a Family Disaster Kit. In addition, campers would be more informed of safe havens during storms as well as being provided emergency contact information.

Action Item 8

Plant living snow fences along designated roadways.

Action: Continue to develop living snow fences along designated roadways to reduce drifting snow.

- Location: County-wide
- Lead Agency: Roscommon County Road Commission
- Other Participating Agencies: MDOT
- Hazards Addressed: Severe winter conditions, transportation accidents
- Potential Funding Source(s): Safety funds, Road Commission, Local road millages
- Project Cost: $6-10 per linear foot of road
- Schedule: 2016 for assessment, 2017/20 for installation

- Priority: Medium
- Benefit(s): Live snow fences would reduce drifting of snow on roads. With the reduced drifting road conditions would improve, which would result in fewer traffic accidents, better response times and more public safety personnel available for responding to all emergencies.

Action Item 9

Promote the need to develop emergency evacuation plans for special events, schools, governmental agencies, large employers, and businesses.

Action: Encourage the development of evacuation plans for special events and buildings that house large populations. The evacuation plans would be used for multiple reasons and provide a more organized method to evacuate during disasters or other times of crises.

- Location: County-wide
- Lead Agency: OEM
- Participating Agencies: Special event coordinators, Roscommon Sheriff's Office, Gerrish Township Police Department, Denton Township Police Department
- Hazards Addressed: All hazards
- Potential Funding Source(s): NA
- Project Cost: NA
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): By developing an evacuation plan, information would be made available to attendees of events or occupants of a building on how to egress the event/building and where to go in emergency situations.

CHAPTER 7: FOLLOW-UP

The follow-up for Roscommon County is an important part of the planning process. Follow-up is the process in which the plan will be monitored, evaluated, and updated within a five-year cycle. When updated, the plan will be reviewed, revised, and resubmitted to the Michigan State Police, Emergency Management and Homeland Security Division for approval by the Federal Emergency Management Agency (FEMA). As appropriate, the plan will also be evaluated after a disaster, or after unexpected changes in land use or demographics in or near hazard areas. The Roscommon County Local Planning Team (RCLPT) will also be kept apprised of a change in federal regulations, programs and policies, such as a change in the allocation of FEMA's funding for mitigation grant programs. These evaluations will be addressed in the plan and may affect the action items for mitigation goals and activities. The hazard mitigation plan should be considered by community planners within Roscommon County, when future updates of their comprehensive plans are taking place.

The RCLPT will continue to monitor the status and track the progress of the plan elements on an annual basis. The RCLPT will oversee the progress made on the implementation of the identified action items and update the plan as needed to reflect changing conditions. Representatives will also meet annually to evaluate plan progress and recommend updates. The Roscommon County Emergency Management Director will facilitate the meetings.

Evaluation of the plan will not only include checking the implementation status of mitigation action items, but also assessing their degree of effectiveness and assessing whether other natural hazards need to be addressed and added to the plan. This will be accomplished by reviewing the benefits (or avoided losses) of the mitigation activities that were in place within each jurisdiction and the County. These will be compared to the goals the Plan has set to achieve. The RCLPT will also evaluate whether mitigation action items need to be discontinued or modified in light of new developments or changes within the County.

As required, this plan will be updated within five (5) years of the date of FEMA's approval of the plan. The plan may be updated earlier, at the discretion of the RCLPT and its jurisdictions. The RCLPT's ability to update the mitigation process by adding new data and incorporating it into the mitigation plan will allow for the efficient use of available resources, staff, and programs. They will meet to discuss the plan and document data collected including hazard events, completed mitigation activities, new mitigation activities, and FEMA grant application efforts. The information will be used for the five (5) year update. The Roscommon County Emergency Management Director will coordinate the annual meeting and keep records of the participants and information received.

In order to have continued public support of the mitigation process, it is important that the public be involved not only in the preparation of the initial plan, but also in any modifications or updates to the plan. The public is invited to the quarterly meetings, in compliance with the Public Meetings Act.

To ensure that public support is maintained, the following actions may be taken by RCLPT:

- Updates to the plan.
- The Roscommon County plan has been web posted along with contact information that allows any citizen to read it and provide feedback.
- Develop informational mailings to be distributed to the public about mitigation efforts in the county and updates made to the plan.

- Develop mitigation flyers or mailings that contain mitigation activities and action items that promote reducing damages and risks of natural hazards.

APPENDIX A –
ROSCOMMON COUNTY
LOCAL PLANNING TEAM SIGN-IN SHEETS

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

1-19-16

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Round Trip)
Bill Ernst	Bill Ernst	EMCOG	—
Mike Beaty	Michael Beaty	Emergency Management	—
JIM LIPPERT		GERRISA	14
Ken Melvin	Ken Melvin	Rosc County Comm	—
Josh Lator		MSP	—40
Brian Hill		GTPD	—
Susan Huffman	Susan Huffman	Red Cross	4
Ken Foust		Kirtland/Rosc. Em	20
Sandra Bhattarai		CMDHD	0
Jason Johnson		CMDHD	0
Melissa DeRoche	Melissa DeRoche	CMDHD	0
Tim O'Rourke		RCRC	24
Ben Lane		RCSO	0
Eric Tieper		RCSO	0

11-17-15 LPT Mtg (Roscommon County)

NAME	ORGANIZATION	ROUND TRIP MILES
BILL ERNAT	EMCOG	—
SUSAN HUFFMAN	RED CROSS	4
JIM LIPPERT	GERRISH	14
ERIC TIEPEL	ROSCO EMD	—
Brad Lowe	RCSO	0
Vance J. Stringham	TRC911	∅
Josh Lator	MSP 72	30
Michelle Stevenson	PIO	∅
KEN FORST	EMD/KCC	20
Richard Dupuis	DHS/Denton	30
Paul Tiepel	Fire	30
Melissa DeRoche	CMDHD	∅
LORELEI KING RN	MIDMICH COMMUNITY HEALTH SVCS	66

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date 10-26-15

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Round Trip)
Bill Ernst	Bill Ernst	EMCOG	—
Kelly Annis	Kelly A. Annis	Village of Roscommon	2
Stan Christler	Stanley J. Christler	Lake Township	40
Eric Tiepel		Roscommon Co EM	
Tim Mepham		Higgins Twp Fire Dept.	14

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date 10-20-15

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Round Trip)
Bill Ernst	Bill Ernst	EMCOG	—
Lorelei King	Lorelei King RN	MidMichigan Health Services	66
Tim O'Rourke	Tim O'Rourke	Roscommon County Road Commission	30 ea
David Johnson	David W. Johnson	MSP Houghton Lake	40
Frank Thibert	Frank Thibert	Rosc. Co. HazMat + E.M	42
Vance J. Steinborn	Vance J. Steinborn	Roscommon 911	0
Ken Forst	Ken Forst	KCC Public Safety / Rosc. EMD	20
Susan Huffman	Susan Huffman	Red Cross	4
Carrie Perialas	Carrie Perialas	911	—
Brian Hill	Brian Hill	Gerrish Twp Police	—
Katy Hintzen	Katy Hintzen	Michigan Sea Grant / MSU Extension	—

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date 9-15-15

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Round Trip)
Bill Ernat	Bill Ernat	EMCOG	—
Ken Foest	Ken	KCC	20
Edward Stern	Edward Stern	Roscommon Co S/O	0
Paul Tiepel	Paul Tiepel	" " Fire	36
Kelly Dunn		EMS	36
Eric Tiepel	Eric Tiepel	EM	—

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date 8-18-15

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Round Trip)
Bill Ernat	Bill Ernst	EMCOG	—
Vance J. Stringham	Vance	Roscommon 911	—
Edward Stern	Edward D Stern	Roscommon Co Sheriff's office	—
Eric Tieper		Roscommon EM	—
Rick Dupont	RDup	Denton EMS	30
Jim Lippert		Gerrish Twp FD/EMS	14
Sue Huffman	Susan Huffman	RED CROSS	—
Brian Hill		Gerrish Twp P.D.	—

11-10-15 Roscommon County

Bill Ernst	EM COG	—
Eric Tieper	EM	
Ken Fast	ROS. EM ASST.	20

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date 6-11-15

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Round Trip)
KEN FORST	[signature]	KIRTLAND COLLEGE/ROSC. COUNTY	20
Bill ERNAT	[signature]	EMCOG	
ERIC TIERZ	[signature]	Roscommon Co EMD	

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date 5-19-15

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Round Trip)
BILL ERNST		EMCOG	—
RICK DUPON		EMS	40
DAVID RUSSO		ROSCOMMON COUNTY	—
Susan Huffman		Red Cross	4
CARRIE PERIALAS		911	0
KEN FORST		ROSC. EMD.	10
Dan Lowery		CMDHD	—
JOHN CARD		MSP	50

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date April 21, 2015

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Round Trip)
ERIK TIEPEL			—
PAUL TIEPEL			32
FRANK THIBERT			42
Jake J. Stinchcomb			0
Rick Dupuis			32
Bill Ernat		EMCOG	—

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date 3-17-15

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Round Trip)
Bill Ernst	Bill Ernst	EMCOG	—
ERIC TIEPER	Eric Tieper	Rosco EMD	—
Paul Tieper	Paul Tieper	" Fire Dept/Twp	36
Christina Curtis	Christina Curtis	Red Cross	80
JOHN CARD	John Card	MSP	50
Dan Lowery	Dan Lowery	Central MI District Health Dept	—
Dennis Szafoni	Dennis Szafoni	DHS	
Vance J. Stringham	Vance J. Stringham	Central Dispatch 911	-0-
KEN FORST	Ken Forst	KIRTLAND COLLEGE	20
Edward Stern	Edward Stern	Roscommon County Sheriff Office	0

Roscommon County

2-17-15

Name	Organization	Miles Round Trip
Bill Grunt	EMCOG	—
Christina Curtis	Red Cross	85
Ken Forst	Rosc. Em | KCC	20
Randall Stevenson	sheriff	✓
Jim Leppert	GERRISH TWP	18
Mark Rose	Roscommon County	—
Dan Lowery	Central MI District Health Dept.	—
Eric Tieper	Roscommon Co EM	
Norm Fullmer	Markey Township	30

ROSCOMMON COUNTY
TOWNSHIP MEETING
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date February 11, 2015

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Round Trip)
Leesa Tulgetske	Leesa Tulgetske	Gerrish	24
Kathleen Patchin	Kathleen Patchin	Gerrish	24
Fred Chidester	Fred Chidester	RCRC	16
Louise Nagy	Louise Nagy	Backus	14
Ed NELLIST	Ed Nellist	LYON	30
Anne Reno	Anne Reno	Lyon	30
PAT INMAN	Patricia Inman	Houghton Lake Lake Assn	10
Jim Porath	Jim Porath	RCRC	
BJ Stevenson	BJ Stevenson	Roscommon Twp	10 x 2
Paula Fuller	Paula Fuller	Denton Twp.	2 x 2
Pamela Scott	Pamela Scott	Richfield Township	10
Rick Pedersen	R Peder	Denton	8
Carol A Asher	Carol A Asher	Denton	6
Bill Ernst	Bill Ernst	EMCOG	—
ERIC TIEFER		Roscommon Co EM	—
Sheryl Tussey	Sheryl Tussey	Markey	8 16
Norm Fullmer	Norman Fullmer	Markey	14
TIM O'ROURKE		RCRC	0
STAN Christner	Stan Christner	Lake Twp.	—

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

December 16, 2014

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Round Trip)
Bill Ernst	Bill Ernst	EMCOG	—
Christina Curtis	Christina Curtis	American Red Cross	80
Jim O'Rourke		RCRC	—
Ken Forst	Ken Forst	KCC Public Safety/ROSC EMD	20
Jim Lippert		Gerrish Twp	10
David Rush		Roscommon County	0
Dan Lowery	Dan Lowery	Central MI District Health Department	—
Derrick Carroll		State Police Houghton Lake	40
Richard Dunn		Denton Twp. EMS	40
Eric Tieper		Roscommon Co EM	—

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Nov 18th, 2014

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN
Paul Tiepel	[signature]	Denton Fire	30
Rick Dunn	[signature]	EMS	30
Eric Tiepel	[signature]	RCEM	—
Ken Forst	[signature]	RCEM	10
Randy Stevenson	[signature]	Sheriff	—
David Russo	[signature]	County of Roscommon	—
Carrie Perialas	[signature]	911	—
Edwin Thibert	Haz Mat Chief	EOC	44
James VanWormer	[signature]	Richfield Twp	12
Dan Lowery	[signature]	Central MI District Health Dept.	—
K. Smith	[signature]	DHS	—
Craig Coffman	[signature]	Denton twp.	
William Bitten	[signature]	Village of Roscommon	/
Anna Reno	[signature]	Lyon twp.	16
Bill Ernst	Bill Ernst	NEMCOG	—

10/21/14

Roscommon Co LPT Meeting

Eric Tieper	EMD
Frank Thibert	Haz Mat - EM
Rick Dupuy	EMS
Ken Forst	EMD
Lorelei King. RN	Midmich Health Park
Carrie Perialas	9-1-1
Joe Meadows	RAPS
Dennis Szagesh	DHS

Sept 16, 2014
July ~~15, 2014~~

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN
Rick Dupon		DENTON EMD	15/30
Paul Tiegel		Denton Fire	~~18~~ 36
Eric Tiefer		Roscommon Co EM	
Ed Nettle		Roscommon Co. 911 - Dispatch	-0-
Christina Curtis		American Red Cross -	20 X2=80
Frank Thibert	Hazmat / Emergency Mgt.		44 miles
Edward Stern		Roscommon county Sheriff's office	
Robert Green		Michigan State Police	—
William Cromwell		Denton CERT - Radio	—
Joe Mendoza		RARS	—
Bill Ernat		EMCOG	—

August 19, 2014

Roscommon Co LPT/LEPC Meeting

Eric Tiepel	EM
Melissa DeRoche	CMDHD
Ken Forst	Rosc. EMD
Frank Thibert	Hazmat Team
Paul Tiegel	[illegible]
[illegible]	911
Bill Ernat	EMCOG
Robert Nixon	DHS

ROSCOMMON COUNTY LEPT MEETING
JULY 15th 2014

NAME	ENTITY
Megan Crist	Denton
Bill Elliott	MSP EMHSD
[illegible]	[illegible]
Ed Rettle	911 Dispatch
[illegible] Stevenson	Sheriff
[illegible]	[illegible]
Susan Huffman	Red Cross
[illegible]	[illegible] Clerk/ROD
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	
MIKE SOBOCINSKI	MSP EMHSD
[illegible]	
ERIC TIEFER	RCEM

ROSCOMMON COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

July 15, 2014

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN
Rick Dupont		DENTON EMS	15/30
Paul Thiesel		Denton Fire	18 36
Eric Tiefer		Roscommon Co EM	
Ed NETTZE	Edward Nett	Roscommon Co 911 - Dispatch	-0-
Christina Curtis	Christina Curtis	American Red Cross -	20 x2=80
FRANK THIBERT	HAZMAT / EMERGENCY MGT.		44 miles
Edward Stern		Roscommon County Sheiff's office	
Robert Greer		Michigan State Police	—
William Cromwell	William Cromwell	Denton CERT - Radio	—
JOE MENDOZA		RARS	—

EMCOG Hazard Mitgation 2013-14 Sign-in Sheet

	Meeting Date	5-6-13		(Round Trip)
	Meeting Location	Roscommon,		
	Name	**Agency Represented**	**E-mail address/phone #**	**Total Miles Driven**
1	Cheryl Mallard	County Controller	Mallardc@charter.net	36
2	JIM DLIPPERT	GERRISH TWP	ASST.CHIEF@GERRISHTOWNSHIP.ORG	18
3	FRANK TALIBERT	ROSC. CO. HAZMAT/EM.	haz_1201@yahoo.com	42
4	Carol A ASHER	DENTON TWP	asher@i2k.net	32
5	Cindy Russo	Lake Twp	lakeTwpclerk@charternet	38
6	Tim O'ROURKE	RCRC	OROURKET@ROSCOMMONCRC.COM	36
7	ERIC TIEFEL	Roscommon Co Sheriff/EM	tiepole@roscommoncounty.net	30
8	Barb Stevenson	ROSC TWP	Clerk@roscommontownship.com	108
9	KEN FORST	KIRTLAND COLLEGE	Ken.forst@Kirtland.edu	20
10	Craig Cotterman	Denton Twp	Supervisor@dentontownship	32
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				

APPENDIX B –

ROSCOMMON COUNTY LOCAL COMMUNITY SUBSECTIONS

All local communities were encouraged to participate in the update of the Hazard Mitigation Plan ("Plan") update. Their input was requested on two different levels, participation in the Plan itself, and the submittal of a survey that addressed the issues of that particular community.

Participation in the Plan update included attending any of a number of meetings of the Roscommon County Local Planning Team (RCLPT), which was used in advisory capacity for the Roscommon County data. The RCLPT have regularly scheduled monthly meetings and the Hazard Mitigation Plan update was included on the agenda in order to complete the Plan in a timely manner. The second means to participate was the completion of a community survey. The results of the survey are found below and provide feedback on the issues facing each community. As a follow-up to the survey, the Emergency Management Director (EMD) and the East Michigan Council of Governments (EMCOG) staff met with the survey participants to secure supplemental information not included in the survey.

Below is a list of the participating communities and their local representatives.

Village of Roscommon: Kelly Annis, Bill Bohlen
Au Sable Township:
Backus Township: Louis Nagy
Denton Township: Carol Asher, Rick Dupon, Paul Tiepel, Craig Cotterman, Paula Fuller
Gerrish Township: Frank Homola, James Lippert, Brian Hill, Kathleen Patchin
Higgins Township: Tim Mepham
Lake Township: Stan Christler, Cindy Russo
Lyon Township: Bill Cleeves, Anna Russo
Markey Township: Norm Fullmer, Sheryl Tussey
Nestor Township:
Richfield Township: James Van Wormer, Pamela Scott
Roscommon Township: Barb Stevenson

The townships of Au Sable, Backus, and Nestor did not respond to either questionnaire, thus were not included in the information provided on the following pages.

It should be noted that the language within this Appendix was shaped by the EMD and EMCOG staff, in order to better reflect FEMA planning requirements, and thus was not a verbatim response provided by these local representatives. Inquiries about this may be directed to the Roscommon County OEM as well as local community representatives.

1. **Does your community have large seasonal shifts in population? Are there a significant number of seasonal homes in the community? What is the reason for the large influx of population? Does the influx of population create a threat to your community, and if so why?**
   Village of Roscommon: Yes. Yes. Seasonal Tourists. No.
   Denton Township: Yes. Yes. Summer homes. No.
   Gerrish Township: Yes. Yes. Approximately 50 % of homes are seasonal homes. Yes-Increase threat of wildfires and public safety concerns.
   Higgins Township: Yes. Yes. Tourists. Yes-Increase in wildfires.
   Lake Township: Yes. Yes. Seasonal/vacation homes. No.
   Lyon Township: Yes. Yes. Seasonal homes. Yes-traffic and water safety concerns.
   Markey Township: Yes. Yes. Tourists. No.
   Richfield Township: Yes. Yes. Tourists. Yes-strain on infrastructure.
   Roscommon Township: Yes. Yes. Tourists. Yes-traffic concerns.

2. **Are there any annual events held in the community that attract large numbers of people? If so, describe the event(s), location, dates and approximate attendance.**
   Village of Roscommon: Yes. Firemen's Memorial, Riverfest, Christmas Parade. Art Festival, 4th of July.
   Denton Township: Yes. Tip-Up Town in January, and Bud Bash in August.
   Gerrish Township: Yes. Holidays, plus major events.
   Higgins Township: Yes. Firemen's Memorial, Christmas in the Village, 4th of July, hinting season.
   Lake Township: Yes. Tip-Up Town, and Bud Bash.
   Lyon Township: Yes. Firemen's Memorial, Bud Bash.
   Markey Township: No.
   Richfield Township: Yes. Bluegill Festival (500-1000 people), 4th of July Fireworks (3,000-5,000 People)
   Roscommon Township: Yes. Movies in the Park-2nd Saturday in August, 400 families

3. Please rate the following natural hazards 1-10, with 1 being a low threat to your community and 10 a high threat. Hazards are considered events that can cause death or injury, damage property or the environment, or disrupt business or services.

	A	B	C	D	E	F	G	H	I	J	K	L	M
Village of Roscommon:	10	5	1	10	7	6	6	3	1	7	6	3	4
Denton Township:	10	8	1	10	5	5	3	10	1	10	1	5	8
Gerrish Township:	5	1	1	5	5	5	5	6	1	6	5	3	5
Higgins Township:	9	2	1	4	3	5	7	10	1	7	3	4	5
Lake Township:	5	6	1	5	3	3	3	6	1	6	6	6	1
Lyon Township:	5	2	0	6	1	3	1	7	0	6	7	4	5
Markey Township:	5	3	1	3	3	3	1	7	1	8	2	4	2
Richfield Township:	5	4	1	7	5	5	5	7	2	8	7	4	5
Roscommon Township:	4	3	1	7	6	3	6	10	4	1	7	5	4

A-Severe Winds; B-Riverine Flooding; C-Earthquake; D-Ice/Sleet Storm; E-Hail; F-Lightning; G-Drought; H-Wildfires; I-Subsidence; J-Snowstorms; K-Extreme Temperatures; L-Tornadoes; M-Fog

4. Please rate the following technological hazards 1-10, with 1 being a low threat to your community and 10 a high threat.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Village of Roscommon:	1	2	4	1	1	7	4	2	2	4	1	1	2	3
Denton Township:	3	10	10	1	1	7	10	10	10	10	10	1	10	5
Gerrish Township:	2	1	3	1	2	3	3	4	5	5	2	1	6	4
Higgins Township:	3	1	5	1	7	7	5	7	8	7	5	1	7	5
Lake Township:	1	3	3	1	1	2	3	5	4	4	4	1	3	5
Lyon Township:	2	1	5	1	3	5	6	7	10	4	6	1	7	9
Markey Township:	1	1	3	1	1	4	1	1	6	5	1	1	5	4
Richfield Township:	3	5	6	6	4	6	6	7	5	5	6	2	7	5
Roscommon Township:	7	8	8	2	6	9	2	3	8	8	6	2	6	7

A-Civil Disturbance; B-Dam Failure; C-Infrastructure Failure; D-Nuclear Attack; E-Terrorism/Sabotage; F- Public Health Emergency; G-Pipeline Accidents; H-Seasonal/Major Population Change; I-Transportation Accident; J-Fixed Site Hazmat Incident; K-Oil/Gas Well Accidents; L-Nuclear Power Plant Failure; M-Transportation Hazmat Accident; N-Structural or Scrap Tire Fire

5. **What type of hazard (natural or technological) do you feel your community is best prepared for? Why?**

Village of Roscommon: Water system emergency-emergency plan in place.
Denton Township: None.
Gerrish Township: Fire, Wind, Snow-Public Safety and CERT personnel well-trained.
Higgins Township: Wildfires-Equipment in place, DNR availability/proximity, HazMAT-HazMAT team.
Lake Township: Fire-Fire team in place, mutual aid available.
Lyon Township: Transportation accidents, Fires (structural and wildfires), and Ice/water rescue-Trained personnel.
Markey Township: Fire and traffic incidents-trained personnel.
Richfield Township: Civil disorder, wildfire, public health-trained personnel.
Roscommon Township: Ice, wildfire, snowstorm, drought.

6. **What type of hazard (natural or technological) do you feel your community is least prepared for? Why?**

Village of Roscommon: Airborne hazard-emergency notification is not sufficient
Denton Township: None.
Gerrish Township: Chemical spills, air disasters-lack of equipment, and specialized training.
Higgins Township: Nuclear, biological, and terrorist attack.
Lake Township: Nuclear attack.
Lyon Township: Health emergencies, weather conditions-more training and radios needed.
Markey Township: Terrorism/civil disorder-no police department.
Richfield Township: Nuclear attack.
Roscommon Township: earthquake.

7. **What types of initiatives, improvements or efforts do you think could be implemented that would help reduce your community's vulnerability to specific hazards?**

Village of Roscommon: Installation of an all-purpose warning siren.
Denton Township: No response.
Gerrish Township: Improved communications, additional training, and additional grant funds for equipment.
Higgins Township: All-purpose warning siren(s), generators to provide power during power outages.
Lake Township: Improved communication.
Lyon Township: Update radio system county-wide.
Markey Township: No response.
Richfield Township: No response.
Roscommon Township: Unknown.

8. **Are you aware of any properties that have experienced flood damage to their homes on multiple occasions as a result of flood waters?**

Village of Roscommon: None.
Denton Township: No response.
Gerrish Township: Pine Bluff area and Johnson Subdivision experience flooding.
Higgins Township: None.
Lake Township: West Shore Dr.

Lyon Township: No.
Markey Township: (**Waiting on response from Roscommon County officials.)**
Richfield Township: No.
Roscommon Township: No.

9. Please identify mitigation measures that would benefit your community.

Village of Roscommon: Removal of tree limbs near power lines.
Denton Township: No response.
Gerrish Township: All-purpose warning sirens and protective (safe) housing during severe weather.
Higgins Township: Improved education to community for wildfires/chimney fires, removal of tree limbs near power lines.
Lake Township: All-purpose warning sirens, especially for severe weather conditions.
Lyon Township: Mutual aid for firefighting, improved training of personnel for transportation/HazMAT accidents, terrorism and sabotage events, and public health emergencies.
Markey Township: No response.
Richfield Township: No response.
Roscommon Township: No response.

APPENDIX C -
ROSCOMMON COUNTY FINAL MITIGATION STRATEGIES

1. Increased coverage and use of NOAA Weather Radio.
2. Using surge protectors on critical electronic equipment.
3. Using appropriate wind engineering measures and construction techniques (e.g. structural bracing, straps and clips, anchor bolts, laminated or impact-resistant glass, reinforced entry and garage doors, window shutters, waterproof adhesive sealing strips, and interlocking roof shingles) to strengthen public and private structures against severe wind damage.
4. Proper anchoring of manufactured homes and exterior structures such as carports and porches.
5. Construction of concrete safe rooms in homes and shelter areas in mobile home parks, fairgrounds, shopping malls, or other vulnerable public areas.
6. Home and public building maintenance to prevent roof and wall damage from "ice dams."
7. Proper maintenance of property in or near wildland areas (including short grass; thinned trees and removal of low hanging branches; selection of fire-resistant vegetation; use of fire resistant roofing and building materials; use of functional shutters on windows; keeping flammables such as curtains securely away from windows or using heavy fire-resistant drapes; creating and maintaining a buffer zone (defensible space) between structures and adjacent wild lands; use of the fire department's home safety inspections; sweeping/ cleaning dead or dry leaves, needles, twigs, and combustibles from roofs, decks, eaves, porches, and yards; keeping woodpiles and other combustibles away from structures; use of boxed or enclosed eaves on house; thorough cleaning-up of spilled flammable fluids; and keeping garage areas protected from blowing embers).
8. Use of structural fire mitigation systems such as interior and exterior sprinklers, smoke detectors, and fire extinguishers.
9. Prescribed burns and fuel management (thinning of flammable vegetation, possibly including selective logging to thin out some areas. Fuels cleared can be given away as firewood or chipped into wood chips for distribution.)
10. The creation of fuel breaks (areas where the spread of wildfires will be slowed or stopped due to removal of fuels, or the use of fire-retardant materials/vegetation) in high-risk forest or other areas.
11. Enclosing the foundations of homes and buildings rather than leaving them open and the underside exposed to blown embers or materials.
12. Have adequate water supplies for emergency firefighting (in accordance with NFPA standards). For residents, identify and maintain an adequate outside water source such as a small pond, cistern, well, swimming pool or hydrant; have a garden hose that is long enough to reach any area of the home and other structures on the property; install freeze-proof exterior water outlets on at least two sides of the home and near other structures on the property. Install additional outlets at least 50 feet from the home; consider obtaining a portable gasoline powered pump in case electrical power is cut off.
13. Pump and flood gate installation/automation.
14. Flood plain/Coastal zone management – planning acceptable uses for areas prone to flooding (through comprehensive planning, code enforcement, zoning, open space requirements, subdivision regulations, land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
15. Dry/wet floodproofing of structures within known flood areas.
16. Elevation of flood-prone structures above the 100-year flood level.
17. Dredging and clearance of sediment and debris from drainage channels.
18. Protection (or restoration) of wetlands and natural water retention areas.

19. Structural projects to channel water away from people and property (dikes, levees, floodwalls) or to increase drainage or absorption capacities (spillways, water detention and retention basins, relief drains, drain widening/dredging or rerouting, debris detention basins, logjam and debris removal, extra culverts, bridge modification, dike setbacks, flood gates and pumps, wetlands protection and restoration).
20. Higher engineering standards for drain and sewer capacity.
21. Installing (or re-routing or increasing the capacity of) storm drainage systems, including the separation of storm and sanitary sewage systems.
22. Monitoring of water levels with stream gauges and trained monitors.
23. Detection and prevention/discouragement of illegal discharges into storm-water sewer systems, from home footing drains, downspouts and sump pumps.
24. Purchase or transfer of development rights – to discourage development in floodplain areas.
25. Identification of radioactive soils and high-radon areas.
26. Use of ITS (intelligent transportation systems) technology.
27. Communities will acquire and maintain an adequate level of emergency power generators to supply emergency water needs, wastewater processing, emergency communications, emergency health care, and shelters.
28. Ensure that the County and individual communities have adequate equipment, staff, and training to respond to transportation-related accidents specific to their needs.
29. Using snow fences or "living snow fences" (rows of trees or vegetation) to limit blowing and drifting of snow over critical roadway segments.
30. Installing lightning protection devices on the community's communications infrastructure.
31. Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)
32. Replacement or renovation of aging structures and equipment (to be made as hazard-resistant as economically possible).
33. Improved design, routing, and traffic control at problem roadway areas.
34. Airport maintenance, security, and safety programs.
35. Using laminated glass and other hazard-resistant, durable construction techniques in public buildings and critical facilities.
36. Consistent use of computer data back-up systems and anti-virus software.
37. Backup in utility and communications systems, especially "lifeline" systems.
38. Proper location, design, and maintenance of water and sewer systems (to include insulation of critical components to prevent damage from ground freeze).
39. Separation and/or expansion of sewer system to handle anticipated stormwater volumes.
40. Locating pipelines away from dense development, critical facilities, special needs populations, and environmentally vulnerable areas whenever possible.
41. Arson prevention activities, including reduction of blight (cleaning up areas of abandoned or collapsed structures, accumulated junk or debris, and with any history of flammable substances stored, spilled, or dumped on them).
42. Acquire portable/changeable message signs to direct crowds and provide information.
43. Compliance with all industrial, fire, and safety regulations.
44. Enhanced security and anti-terrorist/sabotage/civil disturbance measures.

APPENDIX D -
ROSCOMMON COUNTY POSSIBLE MITIGATION STRATEGIES

Thunderstorm Hazards

1. Increased coverage and use of NOAA Weather Radio.
2. Producing and distributing family emergency preparedness information relating to thunderstorm weather and non-weather hazards, including but not limited to medical emergencies, thunderstorms, fire safety, etc.
3. Public education and awareness of thunderstorm dangers.
4. Training and increased use of weather spotters.
5. Public early warning systems and networks.
6. Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)
7. Buried/protected power and utility lines.
8. Inclusion of safety strategies for severe weather events in driver education classes and materials.
9. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.
10. Pre-planning for debris management staging and storage areas. (Debris could be rubble, vehicles, and objects from destroyed/damaged structures, vegetation or other items knocked down or blown by winds.)
11. Pre-planning for debris management staging and storage areas. (Debris is usually vegetation such as tree branches that have fallen under the impact of hail, or broken power or phone lines that had frozen or been weighted down by ice or fallen branches.)
12. Using surge protectors on critical electronic equipment.
13. Installing lightning protection devices on the community's communications infrastructure.
14. Using appropriate wind engineering measures and construction techniques (e.g. structural bracing, straps and clips, anchor bolts, laminated or impact-resistant glass, reinforced entry and garage doors, window shutters, waterproof adhesive sealing strips, and interlocking roof shingles) to strengthen public and private structures against severe wind damage.
15. Proper anchoring of manufactured homes and exterior structures such as carports and porches.
16. Establishing safe and appropriate locations for temporary debris disposal sites.
17. Construction of concrete safe rooms in homes and shelter areas in mobile home parks, fairgrounds, shopping malls, or other vulnerable public areas.
18. Pre-planning for debris management staging and storage areas. (Debris could be rubble, vehicles, objects from destroyed/damaged structures, vegetation or other items knocked down or blown by winds, or broken power or phone lines that had frozen or been weighted down by fallen branches and trees.)

Drought

19. Obtaining agricultural insurance.

Winter Weather Hazards

20. Increased coverage and use of NOAA Weather Radio.
21. Producing and distributing family emergency preparedness information relating to severe winter weather hazards.

22. Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)
23. Buried/protected power and utility lines.
24. Establishing heating centers/shelters for vulnerable populations.
25. Organizing outreach to isolated, vulnerable, or special-needs populations.
26. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.
27. Pre-planning for debris management staging and storage areas. (Debris is usually the snow and ice itself, or vegetation such as tree branches that have fallen under the impact of winds or the weight of ice. Broken power or phone lines that had frozen or been weighted down by ice or fallen branches could be part of the problem. Some storage areas will definitely be needed for snow removal during blizzards.)
28. Home and public building maintenance to prevent roof and wall damage from "ice dams."
29. Pre-planning for debris management staging and storage areas. (Debris is usually the sleet and ice itself being cleared from roads and roofs, or vegetation such as tree branches that have fallen under the impact of winds or the weight of ice. Broken power or phone lines that had frozen or been weighted down by ice or fallen branches could be part of the problem. In some cases, roofs may collapse under the weight of ice and snow.)
30. Farmer preparedness to address livestock needs/problems.
31. Pre-arranging for shelters for stranded motorists/travelers, and others.
32. Maintaining adequate road and debris clearing capabilities.
33. Pre-planning for debris management staging and storage areas. (Debris is usually the sleet and ice itself being cleared from roads and roofs, or vegetation such as tree branches that have fallen under the impact of winds or the weight of ice. Broken power or phone lines that had frozen or been weighted down by ice or fallen branches could be part of the problem. In some cases, roofs may collapse under the weight of ice and snow. Some storage areas will definitely be needed for snow removal during blizzards.)

Extreme Temperatures

34. Organizing outreach to vulnerable populations during periods of extreme temperatures, including establishing and building awareness of accessible heating and/or cooling centers in the community, and other public information campaigns about this hazard.
35. Increased coverage and use of NOAA Weather Radio.
36. Special arrangements for payment of heating bills.

Wildfires

37. Proper maintenance of property in or near wildland areas (including short grass; thinned trees and removal of low hanging branches; selection of fire-resistant vegetation; use of fire resistant roofing and building materials; use of functional shutters on windows; keeping flammables such as curtains securely away from windows or using heavy fire-resistant drapes; creating and maintaining a buffer zone (defensible space) between structures and adjacent wild lands; use of the fire department's home safety inspections; sweeping/ cleaning dead or dry leaves, needles, twigs, and combustibles from roofs, decks, eaves, porches, and yards; keeping woodpiles and other combustibles away from structures; use of boxed or enclosed eaves on house; thorough cleaning-up of spilled flammable fluids; and keeping garage areas protected from blowing embers).
38. Safe disposal of yard and house waste rather than through open burning.
39. Use of fire spotters, towers, planes.
40. Keep handy household items that can be used as fire tools; a rake, axe, hand/chainsaw, bucket and shovel. Install and maintain smoke detectors and fire extinguishers. Install a smoke alarm on each

floor of buildings and homes. Test monthly and change the batteries two times each year. Teach family members how to use the fire extinguisher.

41. Post fire emergency telephone numbers.
42. Organizing neighborhood wildfire safety coalitions (to plan how the neighborhood could work together to prevent a wildfire).
43. Residents should plan several escape routes away from their homes - by car and by foot.
44. Use of structural fire mitigation systems such as interior and exterior sprinklers, smoke detectors, and fire extinguishers.
45. Arson prevention activities, including reduction of blight (cleaning up areas of abandoned or collapsed structures, accumulated junk or debris, and with any history of flammable substances stored, spilled, or dumped on them).
46. Public education on smoking hazards and recreational fires.
47. Proper maintenance and separation of power lines. Ask the power company to clear branches from power lines.
48. Efficient response to fallen power lines.
49. Training, equipment, and exercises for search and rescue, and response personnel.
50. GIS mapping of vegetative coverage, for use in planning decisions and analyses through comparison with topography, zoning, developments, infrastructure, etc.
51. Media broadcasts of fire weather and fire warnings.
52. Create and enforce local ordinances that require burn permits and restrict campfires and outdoor burning. Adopt and/or enforce local, state and federal codes and ordinances to protect property from hazards, without infringing upon one's rights.
53. Mutual aid pacts with neighboring communities and agencies.
54. Prescribed burns and fuel management (thinning of flammable vegetation, possibly including selective logging to thin out some areas. Fuels cleared can be given away as firewood or chipped into wood chips for distribution.)
55. The creation of fuel breaks (areas where the spread of wildfires will be slowed or stopped due to removal of fuels, or the use of fire-retardant materials/vegetation) in high-risk forest or other areas.
56. Keeping roads and driveways accessible to vehicles and fire equipment—driveways should be relatively straight and flat, with at least some open spaces to turn, bridges that can support emergency vehicles, and clearance wide and high enough for two-way traffic and emergency vehicle access (spare keys to gates around property should be provided to the local fire department, and an address should be visible from the road so homes can be located quickly).
57. Enclosing the foundations of homes and buildings rather than leaving them open and the underside exposed to blown embers or materials.
58. Safe use and maintenance/cleaning of fireplaces and chimneys (with the use of spark arresters and emphasis on proper storage of flammable items). Residents should be encouraged to inspect chimneys at least twice a year and clean them at least once a year.
59. Have adequate water supplies for emergency firefighting (in accordance with NFPA standards). For residents, identify and maintain an adequate outside water source such as a small pond, cistern, well, swimming pool or hydrant; have a garden hose that is long enough to reach any area of the home and other structures on the property; install freeze-proof exterior water outlets on at least two sides of the home and near other structures on the property. Install additional outlets at least 50 feet from the home; consider obtaining a portable gasoline powered pump in case electrical power is cut off.
60. Obtaining insurance.
61. Including wildfire safety information in materials provided by insurance companies to area residents.

62. Residents should be instructed on proper evacuation procedures, such as wearing protective clothing (sturdy shoes, cotton or woolen clothing, long pants, a long-sleeved shirt, gloves and a handkerchief to protect the face); taking a Disaster Supplies Kit; and choosing a route away from fire hazards.
63. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Dam Failures

64. Ensuring consistency of dam Emergency Action Plan (EAP) with the local Emergency Operations Plan (EOP).
65. Garnering community support for removal or repair of dams in disrepair.
66. Regulate development in the dam's hydraulic shadow (where flooding would occur if there was a severe dam failure).
67. Public awareness and warning systems.
68. Obtaining insurance.
69. Greater local support for/assistance with dam inspections and enforcement of the Dam Safety Program (Part 315 of the Natural Resources and Environmental Protection Act) requirements and goals.
70. Increased coverage and use of NOAA Weather Radio
71. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
72. Pump and flood gate installation/automation.
73. Real estate disclosure laws that identify a home's location within a dam's hydraulic shadow.
74. Trained, equipped, and prepared search and rescue teams.
75. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Riverine, Urban and Shoreline Flooding and Erosion Control

76. Accurate identification and mapping of flood-prone areas.
77. Flood plain/Coastal zone management – planning acceptable uses for areas prone to flooding (through comprehensive planning, code enforcement, zoning, open space requirements, subdivision regulations, land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
78. Dry***/wet*** floodproofing of structures within known flood areas (strengthening walls, sealing openings, use of waterproof compounds or plastic sheeting on walls).
79. Wet floodproofing of structures (controlled flooding of structures to balance water forces and discourage structural collapse during floods).
80. Elevation of flood-prone structures above the 100-year flood level.
81. Public awareness of the need for permits (MDEQ Part 31) for building in floodplain areas.
82. Dredging and clearance of sediment and debris from drainage channels.
83. Protection (or restoration) of wetlands and natural water retention areas.
84. Enforcement of basic building code requirements related to flood mitigation.
85. Formation of a watershed council.
86. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
87. Obtaining insurance.
88. Joining the National Flood Insurance Program. **VERY IMPORTANT!**
89. Participating in the Community Rating System (CRS).

90. Structural projects to channel water away from people and property (dikes, levees, floodwalls) or to increase drainage or absorption capacities (spillways, water detention and retention basins, relief drains, drain widening/dredging or rerouting, debris detention basins, logjam and debris removal, extra culverts, bridge modification, dike setbacks, flood gates and pumps, wetlands protection and restoration).
91. Higher engineering standards for drain and sewer capacity.
92. Installing (or re-routing or increasing the capacity of) storm drainage systems, including the separation of storm and sanitary sewage systems.
93. Farmland and open space preservation.
94. Elevating mechanical and utility devices above expected flood levels.
95. Improved/updated floodplain mapping.
96. Real estate disclosure laws.
97. Public education and flood warning systems.
98. Monitoring of water levels with stream gauges and trained monitors.
99. Increased coverage and use of NOAA Weather Radio.
100. Training for local officials on flood fighting, floodplain management, floodproofing, etc.
101. Anchoring of manufactured homes to a permanent foundation, but preferably these structures would be readily movable if necessary or else permanently relocated outside of flood-prone areas.
102. Road closures and traffic control in flooded areas.
103. Trained, equipped, and prepared search and rescue teams.
104. Back-up generators for pumping and lift stations in sanitary sewer systems, and other measures (alarms, meters, remote controls, switchgear upgrades) to ensure that drainage infrastructure is not impeded.
105. Detection and prevention/discouragement of illegal discharges into storm-water sewer systems, from home footing drains, downspouts and sump pumps.
106. Purchase or transfer of development rights – to discourage development in floodplain areas.
107. Stormwater management ordinances or amendments.
108. Wetlands protection regulations and policies.
109. Regional/watershed cooperation.
110. Use of check valves, sump pumps and backflow preventers in homes and buildings.
111. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Shoreline Flooding and Erosion

112. Accurate identification and mapping of flood-prone areas.
113. Floodplain/coastal zone management – planning acceptable uses for areas prone to flooding (comprehensive planning, zoning, open space requirements, subdivision regulations, land use and capital improvements planning).
114. Dry floodproofing of structures within known flood areas (strengthening walls, sealing openings, use of waterproof compounds or plastic sheeting on walls).
115. Wet floodproofing of structures (controlled flooding of structures to balance water forces and discourage structural collapse during floods).
116. Elevation of flood-prone structures above the 100-year flood level.
117. Enforcement of basic building code requirements related to flood mitigation.
118. Obtaining insurance.
119. Joining the National Flood Insurance Program. **VERY IMPORTANT!**
120. Participating in the Community Rating System (CRS).

121. Structural projects to channel water away from people and property (dikes, levees, floodwalls) or to increase drainage or absorption capacities (spillways, water detention and retention basins, relief drains, drain widening/dredging or rerouting, debris detention basins, logjam and debris removal, extra culverts, bridge modification, dike setbacks, flood gates and pumps, wetlands protection and restoration).
122. Elevating mechanical and utility devices above expected flood levels.
123. Public education and flood warning systems.
124. Monitoring of water levels with stream gauges and trained monitors.
125. Anchoring of manufactured homes to a permanent foundation in flood areas, but preferably these structures would be readily movable if necessary or else permanently relocated outside of flood-prone areas and erosion areas.
126. Trained, equipped, and prepared search and rescue teams.
127. Real estate disclosure laws.
128. Increased coverage and use of NOAA Weather Radio.
129. Road closures and traffic control in flooded areas.
130. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Fixed Site Hazardous Material Incidents (including explosions and industrial accidents)

131. Maintaining an active and viable Local Emergency Planning Committee (LEPC).
132. Developing and exercising site emergency plans and community response plans as required under SARA Title III.
133. Development of Risk Management Plans for sites that manufacture, store, or handle hazardous materials, to comply with EPA regulations. (For guidance, see the EPA's CEPPO web site at http://www.epa.gov/swercepp/acc-pre.html .)
134. Training in and compliance with all safety procedures and systems related to the manufacture, storage, transport, use, and disposal of hazardous materials.
135. Policies stressing the importance of safety above other considerations.
136. Trained, equipped, and prepared site and local hazardous material emergency response teams.
137. Elimination of clandestine methamphetamine laboratories through law enforcement and public education.
138. Hazardous material public awareness and worker education programs.
139. Facility and community training and exercise programs.
140. Brownfield cleanup activities.
141. Identification of radioactive soils and high-radon areas
142. Evacuation plans and community awareness of them.
143. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
144. Public warning systems and networks for hazardous material releases.
145. Increased coverage and use of NOAA Weather Radio (which can provide notification to the community during any period of emergency, including large scale hazardous material incidents).
146. Road closures and traffic control in accident areas.
147. Trained, equipped, and prepared search and rescue teams.
148. Compliance with all industrial, fire, and safety regulations.
149. Insurance coverage.
150. Enhanced security and anti-terrorist/sabotage/civil disturbance measures.
151. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Hazardous Material Transportation Incidents

152. Improved design, routing, and traffic control at problem roadway areas.
153. Long-term planning that provides more connector roads for reduced congestion of arterial roads.
154. Railroad inspections and improved designs at problem railway/roadway intersections (at grade crossings, rural signs/signals for RR crossing).
155. Proper planning, design, maintenance of, and enhancements to designated truck routes.
156. Enforcement of weight and travel restrictions for truck traffic.
157. Training, planning, and preparedness for hazardous material incidents along roadways and railways (in addition to fixed site emergencies).
158. Public warning systems and networks.
159. Increased coverage and use of NOAA Weather Radio (which can provide notification to the community during any period of emergency, including large scale hazardous material incidents).
160. Use of ITS (intelligent transportation systems) technology.
161. Compliance with and enforcement of USDOT and MDOT regulations regarding hazardous materials transport.
162. Locating schools, nursing homes, and other special facilities away from major hazardous material transportation routes.
163. Road closures and traffic control in accident areas.
164. Trained, equipped and prepared local hazardous materials emergency response teams.
165. Trained, equipped, and prepared search and rescue teams.
166. Evacuation plans and community awareness of them.
167. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Infrastructure Failures

168. Proper location, design, and maintenance of water and sewer systems (to include insulation of critical components to prevent damage from ground freeze).
169. Burying electrical and phone lines, where possible, to resist damage from severe winds, lightning, ice, and other hazards.
170. Redundancies in utility and communications systems, especially "lifeline" systems.
171. Mutual aid assistance for failures in utility and communications systems (including 9-1-1).
172. Programs/networks for contacting elderly or homebound persons during periods of infrastructure failure, to assess whether they have unmet needs.
173. Use of generators for backup power at critical facilities.
174. Regular maintenance and equipment checks.
175. Replacement or renovation of aging structures and equipment (to be made as hazard-resistant as economically possible).
176. Protecting electrical and communications systems from lightning strikes.
177. Tree-trimming programs to protect utility wires from falling branches. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)
178. Increasing public awareness and widespread use of the "MISS DIG" utility damage prevention service (1-800-482-7171).
179. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Oil and Natural Gas Well Accidents

180. Community and operator compliance with industry safety regulations and standards.

181. Awareness of hydrogen sulfide gas dangers and personal protection actions for these dangers.
182. Using buffer strips to segregate wells, storage tanks, and other production facilities from transportation routes and adjacent land uses, in accordance with state regulations, and consistent with the level of risk.
183. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
184. Contingency plans for worker and public protection, including the inclusion of rescue and evacuation procedures for well hazard areas in the local emergency operations plan.
185. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Public Health Emergencies

186. Encouraging residents to receive immunizations against communicable diseases.
187. Increasing public awareness of radon dangers and the prevention efforts that can be taken to reduce concentrations of radon in homes and buildings.
188. Maintaining community water and sewer infrastructure at acceptable operating standards.
189. Providing back-up generators for water and wastewater treatment facilities to maintain acceptable operating levels during power failures.
190. Demolition and clearance of vacant condemned structures to prevent rodent infestations.
191. Maintaining a community public health system with sufficient disease monitoring and surveillance capabilities to adequately protect the population from large-scale outbreaks.
192. Increasing public awareness of the causes, symptoms, and protective actions for disease outbreaks and other potential public health emergencies.
193. Community support of free or reduced-expense clinics and school health services.
194. Preventing public contact with contaminated sites or waters (including floodwaters).
195. Brownfield and urban blight clean-up activities.
196. Pollution control, enforcement, and cleanup; proper disposal of chemicals and scrap materials.
197. Proper location, installation, cleaning, monitoring, and maintenance of septic tanks.
198. Separation of storm and sanitary sewer systems.

Sabotage/Terrorism/Weapons of Mass Destruction (WMD)

199. Development of a thorough community risk and threat assessment that identifies potential vulnerabilities and targets for a sabotage/terrorism/WMD attack.
200. Alertness, awareness, and monitoring of organizations and activities that may threaten the community.
201. Implementing school safety and violence prevention programs.
202. Providing legitimate channels of political and public expression.
203. Heightening security at public gatherings, special events, and critical community facilities and industries.
204. Using laminated glass and other hazard-resistant, durable construction techniques in public buildings and critical facilities.
205. Greater awareness of, and provision for, mental health services in schools, workplaces, and institutional settings.
206. Training, planning, and preparedness by local law enforcement and other responders for terrorist/sabotage/WMD attacks.
207. The development and testing of internal emergency plans and procedures by businesses and organizations.
208. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.

209. Establishing avenues of reporting (and rewards) for information preventing terrorist incidents and sabotage.
210. Consistent use of computer data back-up systems and anti-virus software.
211. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.
212. Pre-planning for debris management staging and storage areas. (Debris could be rubble, vehicles, etc. that would get in the way or be left over following an attack or incident. The area may simultaneously need to be treated as a crime scene, site of urban search and rescue, area of hazardous materials, and/or a public health threat.

Population Increase (Seasonal/Event)

213. Provide personnel on a temporary basis to handle greater loads on public services.
214. Provide for emergency equipment to deal with higher call rates.
215. Ensure water and food supplies can be maintained.
216. Provide training for Law, Fire, and EMS and other emergency services to meet the increased demand.
217. Acquire portable/changeable message signs to direct crowds and provide information.
218. Provide list of motel/cottages where people can stay. Provide list of alternate housing in surrounding communities.

Civil Disturbances (prison or institutional rebellions, disruptive political gatherings, violent labor disputes, urban protests or riots, or large-scale uncontrolled festivities)

219. Law enforcement training, staffing, and resource provision.
220. Incident anticipation and planning, and video documentation of events for later study and use.
221. Local law enforcement mutual aid, and support from the Michigan State Police and National Guard.
222. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
223. Design requirements for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, etc. that take into consideration emergency and security needs.

Earthquakes (biggest Michigan threats would be to pipelines, buildings that are poorly designed and constructed, and shelving, furniture, mirrors, gas cylinders, etc. within structures that could fall and cause injury or personal property damage)

224. Adopt and enforce appropriate building codes.
225. Obtain insurance.
226. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Structural Fires

227. Code existence and enforcement.
228. Designs that include the use of firewalls and sprinkler systems (especially in tall buildings, dormitories, attached structures, and special facilities).
229. Public education and school programs (especially about the use of stoves, heaters, fireworks, matches/ lighters, etc.)
230. Landlords and families can install and maintain smoke detectors and fire extinguishers. Install a smoke alarm on each level of homes (to be tested monthly, with the batteries changed twice each year).
231. Family members and residents should know how to use a fire extinguisher.

232. Proper installation and maintenance of heating systems (especially those requiring regular cleaning, those using hand-loaded fuels such as wood, or using concentrated fuels such as liquid propane).
233. Safe and responsible use of electric and "space" heaters (placed at least 3 feet from objects, with space near hot elements free of combustibles).
234. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
235. Safe use and maintenance/cleaning of fireplaces and chimneys (with the use of spark arresters and emphasis on proper storage of flammable items). Residents should be encouraged to inspect chimneys at least twice a year and clean them at least once a year.
236. Post fire emergency telephone numbers. (**Complete)**
237. Education and practice of safe cigarette handling and disposal (also candles, fireworks, campfires, holiday lights)
238. Proper workplace procedures, training and exercising, and handling of explosive and flammable materials and substances.
239. Pre-planned escape routes and fire alert responses.
240. Improved and continuing training for emergency responders, and provision of equipment for them.
241. Defensible space around structures in fire-prone wildland areas.
242. Proper maintenance of power lines, and efficient response to fallen power lines.
243. Transportation planning that provides roads, overpasses, etc. to maximize access and improve emergency response times, and evacuation potential, for all inhabited or developed areas of a community (not just designing for the minimum amount of road capacity to handle normal traffic volumes in the community.) This includes transportation access <u>within</u> developed sites (shopping malls, stadiums, office & commercial parking lots, etc.)
244. Control of civil disturbances and criminal activities that could lead to arson.
245. Enforced fireworks regulations.
246. Elimination of clandestine methamphetamine laboratories through law enforcement and public education.
247. Condominium-type associations for maintaining safety in attached housing/building units or multi-unit structures.
248. Obtain insurance.
249. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Nuclear Attack (HOMELAND SECURITY)

250. Community awareness of designated fallout shelters and attack warning systems.
251. Developing and promoting workable population protection plans (evacuation and in-place sheltering plans, as appropriate).
252. Construction of concrete safe rooms (or shelters) in houses, trailer parks, community facilities, and business districts.
253. Using laminated glass and other hazard-resistant, durable construction techniques in public buildings and critical facilities.
254. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
255. Increased coverage and use of NOAA Weather Radio (which can provide notification to the community during any period of emergency, including enemy attack).
256. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Nuclear Power Plant Accidents (HOMELAND SECURITY)

257. Proper awareness of, training on, and implementation of radiological emergency procedures (to include both primary and secondary Emergency Planning Zones, as appropriate).
258. Community awareness of designated shelters and accident warning systems.
259. Increased coverage and use of NOAA Weather Radio (which can provide notification to the community during any period of emergency, including enemy attack).
260. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
261. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Pipeline Accidents (Petroleum and Natural Gas)

262. Locating pipelines away from dense development, critical facilities, special needs populations, and environmentally vulnerable areas whenever possible.
263. Increasing public awareness of pipeline locations and appropriate emergency procedures.
264. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
265. Increasing public awareness and widespread use of the “MISS DIG” utility damage prevention service (800 482-7171).
266. Proper pipeline design, construction, maintenance and inspection.
267. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Transportation Accidents

268. Improvements in driver education, traffic law enforcement, and transportation planning that balance the needs of hazardous material transporters with the safety of the general public.
269. Improved design, routing, and traffic control at problem roadway areas.
270. Long-term planning that provides more connector roads for reduced congestion of arterial roads.
271. Railroad inspections and improved designs at problem railway/roadway intersections (at grade crossings, rural signs/signals for RR crossing).
272. Enforcement of weight and travel restrictions for truck traffic.
273. Use of ITS (intelligent transportation systems) technology.
274. Use of designated truck routes.
275. Marine safety and general boater awareness programs.
276. Commercial operator training and skill enhancement programs.
277. Training, planning, and preparedness for mass-casualty incidents involving all modes of public transportation.
278. Trained, equipped, and prepared search and rescue teams.

APPENDIX E -
PROPOSED ROSCOMMON COUNTY ACTION ITEMS

Item 1: (NEW)
CodeRED/NIXLE
Action: Upgrade the current system (free NIXLE) to a higher grade system that allows notification to targeted populations and areas.

- Location: County-wide
- Lead Agency: Office of Emergency Management (OEM)
- Other participating Agencies: Local public safety departments, MSP, and Roscommon County
- Hazards Addressed: Severe All hazards
- Potential Funding Source(s): Roscommon County
- Project Costs: $5,000-$30,000 annually- TBD
- Schedule: ongoing
- Priority: High
- Benefit(s): Better, more complete pre-warning of oncoming disastrous situations and other situations to residents, businesses, and visitors.

Item 2
Add warning sirens where needed to fill gaps in Roscommon County's current warning system and educate the public on the usage.
Action: Complete an analysis of warning siren system to determine if/where gaps exist and establish locations to fill in those gaps. Purchas sirens. Educate the public of the warning system and the how to properly respond in case of emergencies.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: Roscommon County 911 Services, National Weather Service (NWS), MSP, Sheriff's Department, and local public safety departments (should funding be available)
- Hazards Addressed: All hazards
- Potential Funding Source(s): Federal Emergency Management Agency (FEMA) and local governments
- Project Costs: $18,00-$20,000 per siren - TBD
- Schedule: Study to determine location of sirens will begin in 2017. Installation of sirens will be completed after the sites for the sirens have been determined.
- Priority: High
- Benefit(s): Saving of lives/reducing injuries with a better warning system and a more informed public that will accompany the installation of the system.

Item 3
Promote the need to complete disaster awareness/emergency planning, including but not limited to major storm events, public health emergencies, or hazard material spills, for special events, schools, governmental agencies, large employers, and businesses.
Action: Encourage the development of disaster awareness/emergency plans for special events and buildings that house large populations. The disaster awareness/emergency plans can be used for multiple reasons and would provide a more organized method to address disasters or other times of crises.

- Location: County-wide
- Lead Agency: OEM
- Participating Agencies: Local businesses, special event coordinators, Sheriff's department, and local public safety departments (should funding be made available)
- Hazards Addressed: All hazards
- Potential Funding Source(s): NA
- Project Cost: NA
- Schedule: Ongoing
- Priority: High
- Benefit(s): By developing a plan, information would be made available to attendees of events or occupants of a building on how to address or where to go in emergency situations.

Item 4 (NEW)

Complete the Community Wildfire Protection Plan for the County.

Action: Complete the Community Wildfire Protection Plan (CWPP) that will encompass Roscommon County. The CWPP will identify the hazards associated with wildfires, their fuels, and impacts to the County, and will identify measures to mitigate damages that result from future wildfires.

- Location: County-wide
- Lead Agency: Roscommon County Office of Emergency Management
- Other Participating Agencies: Michigan Department of Natural Resources, U,S. Fire Service, Roscommon County, Markey Fire Department, Higgins Fire Department, Gerrish Fire Department
- Hazards Addressed: Wildfires
- Potential Funding Source(s): Michigan Department of Natural Resources (MDNR)
- Project Costs: $25,000
- Schedule: Project is ongoing and schedule to be completed in 2016.
- Priority: High
- Benefit(s): The residents, property owners, visitors, and business owners of Roscommon County will all benefit. Once the CWPP is complete, measures will begin to take place to mitigate the effects of the wildfires.

Item 5 (NEW)

Encourage the inclusion of hazard mitigation into other planning documents

Action: Encourage municipal agencies to include hazard mitigation into master plans/comprehensive land use plans and other planning documents.

- Location: County-wide
- Lead Agency: OEM
- Participating Agencies: Roscommon County, all townships as appropriate
- Hazards Addressed: all hazards
- Potential Funding Source(s): NA
- Project Cost: NA
- Schedule: 2016 to completion
- Priority: High
- Benefit(s): Hazard Mitigation is identified in the local municipal planning documents, thereby increasing community awareness of hazard mitigation and increasing the opportunity for community resiliency.

Item 6

Purchase of generators/pre-wiring of facilities-to be used for back-up power at warning sirens, municipal buildings, other critical county governmental facilities, senior centers, long-term facilities, and other critical non-governmental agencies.

Action: Complete a survey of governmental, senior centers, long-term facilities, and other critical facilities to determine locations without generators. Purchase generators for facilities.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: local government agencies (should funding become available)
- Hazards Addressed: All Hazards
- Potential Funding Source(s): Grants
- Project Cost: TBD
- Schedule: 2017/18
- Priority: Medium
- Benefit(s): Critical governmental and non-governmental agencies, including critical care facilities, will be able to remain in operation during power outages.

Item 7 (NEW)

Construct Safe Rooms at campgrounds and mobile home parks throughout the County.

Action: Complete an analysis of campgrounds and mobile home parks throughout the County to determine which sites do not have sufficient safe areas during times of extreme weather conditions and develop a plan to construct safe rooms accordingly. Educate the public of the safe rooms and how to properly respond in case of emergencies.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: DNR, privately-owned campgrounds, Federal Emergency Management Agency (FEMA)
- Hazards Addressed: All hazards
- Potential Funding Source(s): FEMA and local governments
- Project Costs: TBD
- Schedule: Study to determine location of safe rooms will begin in 2018. Construction of safe rooms will begin after the sites for them has been determined.
- Priority: Medium
- Benefit(s): Saving of lives/reducing injuries with a safe environment in which to be located during severe weather conditions as well as a more informed public that will accompany the construction of the safe rooms.

Item 8 (NEW)

Educate the public on the benefits of NIXLE/CodeRED Systems.

Action: Conduct a publicity campaign on the benefits of NIXLE/CodeRED and the importance for residents to sign up for the service.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: Roscommon Sheriff, MSP, Public Health
- Hazards Addressed: All hazards
- Potential Funding Source(s): Roscommon County
- Project Cost: TBD
- Schedule: Ongoing

- Priority: Medium
- Benefit(s): Users of the service will be provided with early warnings of storms and other disasters. In addition, other notification such as amber alerts will also be included in the service.

Item 9
Purchase portable electronic message signs.
Action: Purchase four (4) additional portable traffic directional signs. Investigate the sources to purchase the signs and identify agencies/organizations that could use the signs on a temporary basis.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: Roscommon County Road Commission, Sheriff's Department, MSP, local municipalities as funding becomes available
- Hazards Addressed: All hazards
- Potential Funding Source(s): Grants
- Project Cost: $120,000
- Schedule: 2017/18
- Priority: Medium
- Benefit(s): By redirecting traffic away from hazardous situations, further problems may be averted.

Item 10 (NEW)
Research the need for improving communications to the physically impaired, through the use of sign language and Braille.
Action: Assess the need to improve communications to the physically impaired through the use of sign language and Braille.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: Red Cross, Public Health, School Districts, DHHS, Roscommon County 911
- Hazards Addressed: All hazards
- Potential Funding Source(s): TBD
- Project Cost: TBD
- Schedule: 2017/18
- Priority: Medium
- Benefit(s): The physically impaired population will be able to receive communications of hazardous situations.

Item 11
Dam repairs in accordance with the dam Emergency Action Plans and the local Emergency Operations Plan.
Action: Assess all county dams, repair public dams as needed, and work with the owners of the privately-owned dams to have them repaired.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: DNR, Drain Commissioner, Army Corps of Engineers, owners of privately-owned dams
- Hazards Addressed: Flooding, infrastructure failure

- Potential Funding Source(s): TBD
- Project Cost: TBD
- Schedule: 2017
- Priority: Medium
- Benefit(s): Dams will be in a better state of repair, which would minimize flooding due to dam disrepair.

Item 12

Educate the public on the dangers of hazards and the need to be prepared when they occur.

Action: Education of the public will include the dangers of meth labs, how to respond to all hazardous situations, how to develop Family Disaster Plans, and the need for Family Disaster Kits. This item will also include distribution of the information to public campgrounds.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: Sheriff's department, Red Cross, Public Health, Gerrish Township Police Department, Denton Township Police Department
- Hazards Addressed: All hazards
- Potential Funding Source(s): TBD
- Project Cost: TBD
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Educating the general public would bring more information to them on all hazards and the need to develop a Family Disaster Kit. In addition, campers would be more informed of safe havens during storms as well as being provided emergency contact information.

Item 13

Plant living snow fences along designated roadways.

Action: Continue to develop living snow fences along designated roadways to reduce drifting snow.

- Location: County-wide
- Lead Agency: Roscommon County Road Commission
- Other Participating Agencies: MDOT
- Hazards Addressed: Severe winter conditions, transportation accidents
- Potential Funding Source(s): Safety funds, Road Commission, Local road millages
- Project Cost: $6-10 per linear foot of road
- Schedule: 2016 for assessment, 2017/20 for installation
- Priority: Medium
- Benefit(s): Live snow fences would reduce drifting of snow on roads. With the reduced drifting road conditions would improve, which would result in fewer traffic accidents, better response times and more public safety personnel available for responding to all emergencies.

Item 14

Promote the need to develop emergency evacuation plans for special events, schools, governmental agencies, large employers, and businesses.

Action: Encourage the development of evacuation plans for special events and buildings that house large populations. The evacuation plans would be used for multiple reasons and provide a more organized method to evacuate during disasters or other times of crises.

- Location: County-wide

- Lead Agency: OEM
- Participating Agencies: Special event coordinators, Roscommon Sheriff's Office, Gerrish Township Police Department, Denton Township Police Department
- Hazards Addressed: All hazards
- Potential Funding Source(s): NA
- Project Cost: NA
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): By developing an evacuation plan, information would be made available to attendees of events or occupants of a building on how to egress the event/building and where to go in emergency situations.

Item 15 (NEW)
Investigate expanding the use of the Intelligent Transportation System (ITS) in order to determine how it could be better utilized.
Action: Research the current use of ITS and its capabilities in order to determine the expansion of its use in Roscommon County.

- Location: County-wide
- Lead Agency: Roscommon County Road Commission
- Other Participating Agencies: local public safety departments, Sheriff's department, MSP, MDOT
- Hazards Addressed: Transportation accidents
- Potential Funding Source(s): TBD
- Project Cost: TBD
- Schedule: 2018
- Priority: Moderate
- Benefit(s): Expanding the ITS in Roscommon would benefit both the motorists on the highways and the public safety personnel responsible for maintain safe passable highways.

Item 16
Purchase of weather radios-NOAA-schools, municipal buildings, nursing homes and other care facilities, hospitals and other healthcare facilities.
Action: Complete a study to determine the need for additional weather radios. Purchase radios accordingly.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: Local municipalities, health care facilities, schools, Red Cross
- Hazards Addressed: All hazards
- Potential Funding Source(s): TBD
- Project Cost: TBD
- Schedule: 2017/18
- Priority: Moderate
- Benefit(s): Weather radios would provide an additional means to inform the public of oncoming disastrous situations which may not otherwise be informed of the dangers.

Item 17 NEW)
Installation of identification markers and water height gauges on recreational waterways.

Action: Research the recreational waterways to determine which locations would be appropriate for the markers/gauges. Purchase the gauges and install them accordingly.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: Watershed groups (Muskegon, Tittabawasee, and Au Sable Rivers), Trout Unlimited, DNR, Medical response personnel
- Hazards Addressed: Public health and safety
- Potential Funding Source(s): TBD
- Project Cost: TBD
- Schedule: 2017/18
- Priority: Moderate
- Benefit(s): The markers will allow all users of the waterways to identify their location in a more precise manner in case of a life/death emergency. The gauges would also alert users of the waterways of flooding concerns.

Item 18 (NEW)

Develop a network of HAM radio operators throughout the County to notify public of hazardous events.

Action: Work with existing HAM radio operators to expand their members in order to increase their capacity to send out information.

- Location: County-wide
- Lead Agency: OEM
- Other Participating Agencies: HAM radio operators, 911 Center, Medical response personnel, public safety personnel
- Hazards Addressed: All Hazards
- Potential Funding Source(s): TBD
- Project Cost: TBD
- Schedule: 2017
- Priority: Moderate
- Benefit(s): Provides another means to inform the residents, businesses, and visitors of the County of impending hazardous events

Item 19

Increase tree-trimming efforts near utility lines.

Action: Complete a survey of the power lines throughout the County to determine where tree trimming would be most productive in reducing power outages due to falling tree limbs.

- Location: County-wide
- Lead Agency: Roscommon County Road Commission
- Other Participating Agencies: DNR, Consumers Energy, Frontier Internet, and Charter Communications
- Hazards Addressed: Severe weather conditions and infrastructure failure
- Potential Funding Source(s): Roscommon County Road Commission funds, DNR, and utility companies
- Project Cost: TBD
- Schedule: Ongoing
- Priority: Moderate
- Benefit(s): Reduced interruptions in infrastructure service, which is critical in times of severe weather conditions.