ONTONAGON COUNTY

2013-2018
HAZARD MITIGATION PLAN

Prepared for:  Ontonagon County
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Prepared by:  Western Upper Peninsula Planning and Development Region
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Table of Contents

Section 1: Community Profile

Why Plan for Hazard Mitigation in Ontonagon County? 5

1.1 Planning Process 6
1.2 County Overview 9
1.3 Population and Demographics 11
1.4 Geography and the Environment 12
1.5 Land and Development 15
1.6 Housing and Community Development 16
1.7 Employment and Industry 21
1.8 Public Works and Transportation 22
1.9 Police, Fire, and Emergency Services 23
1.10 Critical Facilities 26

Section 2: Hazard Profile

Overview of Hazards in Ontonagon County 30

2.1 Natural Disasters 30
   ➢ Earthquakes 31
   ➢ Dam Failure 33
   ➢ Riverine and Urban Flooding 35
   ➢ Shoreline Flooding and Erosion 39
   ➢ Scrap Tire Fires 40
   ➢ Structural Fires 41
   ➢ Wildfires 42
   ➢ Subsidence (Ground Collapse) 43

2.2 Weather Hazards 46
   ➢ Drought 47
   ➢ Extreme Temperatures 49
   ➢ Hail 50
   ➢ Ice and Sleet Storms 50
2.3 Technological Hazards
- Hazardous Materials: Fixed Site Incident
- Hazardous Materials: Transportation Incident
- Infrastructure Failure and Secondary
- Transportation Accidents (Passenger)
- Petroleum and Natural Gas Incidents

2.4 Human-Related Hazards
- Civil Disturbances
- Public Health Emergencies
- Sabotage/Terrorism

2.5 Ontonagon County Hazard Risk Assessment

2.6 Hazard Summary

Section 3: Hazard Mitigation

Mitigating Hazards in Ontonagon County
- Preventive Measures
- Property Protection
- Resource Protection
- Emergency Services
- Structural Projects
- Public Information

Section 4: Action Plan

Action Plan for Ontonagon County
- General Funding Sources
- Mitigation Program Action Items
- Administrative Action
Table of Figures

Section 1
1-1 Location Map 10
1-2 Watersheds Map 14
1-3 Land Cover/Use Map 17
1-4 Western Upper Peninsula Zoning Coverage Map 18
1-5 Major Roads and Transportation Map 24
1-6 Ontonagon County Critical Facilities Map 28
1-7 Village of Ontonagon Critical Facilities Map 29

Section 2
2-1 Flood Hazard Boundary Map 38
2-2 High-Risk Wildland Fire Areas Map 44
2-3 Upper Michigan NOAA Radio Coverage Map 48

Table of Tables

Section 1
1-1 Historic and Projected County Population 9
1-2 Population Change in Houghton County 11
1-3 Housing Statistics 16
1-4 Schools 19
1-5 Fire Departments 25
1-6 Siren Locations 26

Section 2
2-1 Vulnerability Summary by Jurisdiction 63
2-2 State-Equalized Value for Houghton County, 2010 64
2-3 Houghton County Hazard Profile and Evaluation 67
Section 1: Community Profile

Why Plan for Hazard Mitigation in Ontonagon County?

Hazard mitigation is any action taken before, during, or after a disaster to eliminate or reduce the risk to human life and property from natural, technological, or human-related hazards. This is accomplished through the coordination of resources, programs, and authorities. When successful, mitigation will lessen the impacts to such a degree that future events will remain only incidents and not become disasters.

Mitigation is an essential part of the emergency management process. When a disaster strikes and a community responds, often the focus of repairs and reconstruction is to restore damaged property to pre-disaster conditions as quickly as possible. These efforts expedite a return to normalcy, yet replication of pre-disaster conditions leaves the community vulnerable to the same hazards, resulting in a cycle of damage, reconstruction, and damage again. Hazard mitigation allows this cycle to be broken by ensuring that post-disaster repairs and reconstruction take place after damages are analyzed and that sounder, less vulnerable conditions are produced.

Mitigation planning forces a community to identify potential hazards, assess vulnerabilities, and develop mitigation strategies to deal with those hazards long before an event occurs. The hazards and vulnerabilities are determined based on historical events, incidents in nearby communities, and scientific data and trends. Mitigation measures can be implemented systematically, as grant monies become available, or, in the worst case, through repair and reconstruction after a hazard event occurs.

The Ontonagon County Hazard Mitigation Plan was created to protect the health, safety, and economic interests of the Ontonagon County residents and businesses by reducing potential hazard impacts through mitigation activities that can be undertaken by both the public and private sector. This document is intended to educate local policy makers and emergency service organizations about hazards and vulnerabilities in the County and to provide a comprehensive reference document for planning and mitigation activities.

Every community, including those in Ontonagon County, faces different hazards and has varying resources to deal with problems. Planning is one way to help mitigate the impact of hazards and ensure they are dealt with in an efficient way. Mitigation activities need funding, and an approved local mitigation plan is a requirement for pre-disaster federal mitigation...
funds under Section 104 of the Disaster Mitigation Act of 2000 (42 USC 5165). After November 1, 2004 a plan is needed for post-disaster mitigation funds under the Hazard Mitigation Grant Program. The requirements are spelled out in 44 CFR, Part 201, of the Code of Federal Regulations. The first hazard mitigation plan was prepared by Ontonagon County in 2005 to meet the requirements for obtaining funds through the Federal Emergency Management Agency (FEMA). To continue to be eligible for FEMA funds, the plan must be updated every five years. This 2012 plan update is intended to meet the ongoing requirements for obtaining funds through the Federal Emergency Management Agency.

1.1 Planning Process

Development of the 2012 Ontonagon County Hazard Mitigation Plan began with a review of the 2005 plan, gathering new information from local sources, statewide data, and university data in order to update hazard risks to municipalities within the County. WUPPDR staff then met with the Emergency Coordinator and an ad hoc committee to identify new projects to address existing and newly identified hazards. Two formal surveys were created and distributed throughout the County to solicit information regarding each jurisdiction’s particular hazards and potential mitigation measures. These surveys included a public survey for residents and a municipal survey delivered to all local units of government, Ontonagon County Road Commission, and Western U.P. Health Department. Information from returned surveys was gathered, evaluated, and incorporated into the Hazard Mitigation Plan update.

Three formal surveys were created and distributed throughout the County to solicit information regarding each jurisdiction’s particular hazards and potential mitigation measures. Of two initial surveys, one was for the general public, and another was directed toward local units of government and to other organizations interested in hazard mitigation, including the Ontonagon County Road Commission and Western Upper Peninsula Health Department. In 2013 a second, expanded survey was distributed to all local units of government to gather additional information. Personal contact was made with non-respondents. Information gathered through these means was evaluated and incorporated into the Hazard Mitigation Plan update.
Participants

Local officials have provided input to the plan upon request in order to complete necessary updates and revisions. Officials from whom information was directly received by survey or personal contact included:

- William Johnson, President (and County Emergency Manager), Village of Ontonagon
- Dale Kuivanen, Supervisor, Bergland Township
- LuAnn Hayrynen, Supervisor, Bohemia Township
- Doreen Vollmer, Treasurer, Carp Lake Township
- Joseph Pietala, Supervisor, Haight Township
- Andrew Aho, Supervisor, Interior Township
- Gerald Kitzman, Clerk, Matchwood Township
- Rockland Belongie, Supervisor, McMillan Township
- Steve Store, Supervisor, Ontonagon Township
- Roger Haapala, Jr., Supervisor, Rockland Township
- Bill Andrus, Supervisor, Stannard Township

Revisions

The 2005 Hazard Mitigation Plan has been revised to reflect completed action items and renewed project priorities, which focus on flooding and drainage issues in the Village of Ontonagon. Highly ranked hazards have not significantly changed except for Hazardous Materials – Fixed Site, which has been dropped as a result of a closed manufacturing plant. Apart from the Hazard Analysis and Action Plan, demographic and land use information were updated.

The preliminary draft plan was delivered in July 2013 to the Ontonagon County Courthouse and to all jurisdictions within Ontonagon County. Neighboring counties and local jurisdictions were also informed about availability of the draft for review and comment at www.wuppdr.org. The public was informed of the same (in addition to availability of the printed plan draft at the Courthouse) via news columns resulting from a press release in July. An informal opportunity for public comment was provided at an Ontonagon County Board meeting on August 20 to allow interested persons an opportunity to express comments. This was also publicized by a news column. All suggestions were noted and
incorporated as applicable into the final draft, which was presented to the Ontonagon County Board for a public hearing preceding adoption on September 17.

**Jurisdictional Involvement**

All units of government in Ontonagon County have participated in the development of the 2011 Ontonagon County Hazard Mitigation Plan as required for pre-disaster Federal mitigation funds under Section 104 of the Disaster Mitigation Act of 2000 (42 USC 5165). All units of government also participated in the 2005 Hazard Mitigation Plan. Local officials have reviewed the plan to ensure accuracy and provide updates and revisions as needed. Resolutions of support for the plan from Ontonagon County and the following units of government are included as Appendix A:

- Ontonagon County Board of Commissioners
- Village of Ontonagon
- Bergland Township
- Bohemia Township
- Carp Lake Township
- Greenland Township
- Haight Township
- Interior Township
- Matchwood Township
- McMillan Township
- Ontonagon Township
- Rockland Township
- Stannard Township

**Other Related Plans**

In order to avoid duplication of efforts, existing information, including Census data, climate and weather events, and other community characteristics and statistics were incorporated into this update.

The Village of Ontonagon has a Master Plan enacted in 2007. The plan draws attention to flooding problems in the Village which have been incorporated into this plan. The plan also inventories public resources related to hazard mitigation in more detail than is the scope of this document. No other jurisdictions in the County have plans with current relevance. This
plan conforms to the regional Comprehensive Economic Development Strategy. For more information about the role of existing master plans and related administrative mechanisms to carry out hazard mitigation, see Section 4.1.

The previous Hazard Mitigation Plan has, since its expiration in 2010, not always been relevant to specifically consider and explicitly include in other recent plans. After this updated plan is complete, hazard mitigation issues and priorities will be considered and incorporated as other plans are updated, with officials involved in hazard planning and response participating as appropriate. Mitigation actions will be included in capital improvements programs when applicable and feasible.

### 1.2 County Overview

Ontonagon County is located in the northwest corner of Michigan’s Upper Peninsula on the south shore of Lake Superior, nestled between the Porcupine Mountains and the Keweenaw Peninsula (see Figure 1-1). Ontonagon County was one of the four counties created in 1843 by the division of the Upper Peninsula. The founders of the village of Ontonagon came looking for a copper boulder that had been spoken of in Europe since the mid-1600s. The boulder, then an Indian shrine and place of worship, contained over a ton of pure metal. It was located and eventually brought to the Smithsonian Institute where it can be viewed today. The discovery brought a surge of prospectors to the area beginning in 1772 and culminating in the late 1800s. None of the mines did very well. After the initial copper boom, mining was carried on to some degree until about 1918, and then again from 1952 to 1995 at White Pine in the western part of the county. Historical population trends in the County parallel the success and decline of local industry. The population has steadily been declining since 1970 along with the decline of the mining industry (see Table 1-1).

| Table 1-1: Historic and Projected County Population |
|---|---|---|---|---|---|---|---|---|---|
| Ontonagon County | 3,217 | 12,428 | 10,282 | 10,548 | 9,861 | 8,854 | 7,818 | 6,780 | 7,000 |
Figure 1-1: Location Map
In the 1880s lumbering of the vast pine forests began to flourish in the county. An 1896 fire destroyed the village of Ontonagon and the largest lumber company in the region, but slowly the lumber industry recovered. Today, paper manufacturing and tourism remain the county’s primary economic resources. With over 24 waterfalls, dozens of rivers, and inland lakes, Lake Superior coastline, miles of sandy beaches, Nordic ski trails, hiking and snowmobile trails, Ontonagon County has become a vacation destination. Ontonagon County is the home of the Porcupine Mountains Wilderness State Park, which contains virgin forest, 87 miles of hiking trails, a downhill ski area, and rustic cabins. The northern half of Michigan’s largest inland lake, Lake Gogebic, is located in the southern part of the County. This lake provides 13,380 acres of prime fishing water. Ottawa National Forest also offers plenty of opportunities for outdoor recreation. The North Country Trail bisects Ontonagon County on its route from Vermont to North Dakota.

1.3 Population and Demographics

Ontonagon County is comprised of 11 townships and the Village of Ontonagon, which is the only incorporated community in the County. Other communities include White Pine, Bergland, Mass City, Greenland, Bruce Crossing, and Trout Creek.

According to the 2010 United States Census, the total population for Ontonagon County was 6,780. This represents a 13 percent drop from 7,818 in 2000. This was the highest rate of decline among the 83 counties in the state of Michigan. Population centers in the County were hit hard by the loss of several major employers during the 1990s, in particular the White Pine Mine (which closed in 1995) and the Lakeshore, Inc. shipyard in the Village of Ontonagon. Only one township in the County, Bohemia, saw its population increase (see Table 1-2).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bergland Township</td>
<td>550</td>
<td>467</td>
<td>-15.1%</td>
</tr>
<tr>
<td>Bohemia Township</td>
<td>77</td>
<td>82</td>
<td>6.5%</td>
</tr>
<tr>
<td>Carp Lake Township</td>
<td>891</td>
<td>722</td>
<td>-19.0%</td>
</tr>
<tr>
<td>Greenland Township</td>
<td>870</td>
<td>792</td>
<td>-9.0%</td>
</tr>
<tr>
<td>Haight Township</td>
<td>228</td>
<td>212</td>
<td>-7.0%</td>
</tr>
<tr>
<td>Interior Township</td>
<td>375</td>
<td>336</td>
<td>-10.4%</td>
</tr>
<tr>
<td>Matchwood Township</td>
<td>115</td>
<td>94</td>
<td>-18.3%</td>
</tr>
<tr>
<td>McMillan Township</td>
<td>601</td>
<td>478</td>
<td>-20.5%</td>
</tr>
</tbody>
</table>
Almost 98 percent of the population in Ontonagon County is White, with the largest minority being American Indian. Only 15 percent of the population is under the age of 18. This is eight percent lower than both Michigan and national averages. Between 2000 and 2010, there was a 30 percent drop in the number of people under 18 in Ontonagon County. The 20-34 age group also declined by 31.9 percent during the same time period. This, too, could reflect the loss of major employers, as young adults and families with children were forced to seek employment elsewhere. The 65-and-over population in Ontonagon County is 26.4 percent, well above the Michigan and national averages of about 12 percent.

1.4 Geography and the Environment

The total land area of Ontonagon County is about 1,316 square miles. The land is classified mainly as lake-border plains and hilly uplands. Elevations vary between 600 and 1800 feet. About 90 percent of the county, or 750,000 acres, is covered by forests, the majority of which are upland hardwood with some aspen. Lake Gogebic, Michigan's largest inland lake, occupies some 13,380 acres, about half of which are in southern Ontonagon County. The climate in Ontonagon County is cool with an average summer temperature of 65°F and an average winter temperature of 20°F. Average snowfall is about 150 inches, and there are typically 130 days or more each winter with at least one inch of snow on the ground. The last frost is typically around May 30. Annual rainfall is usually 31 to 35 inches.

Major Rivers

Ontonagon County makes up a portion of the Lake Superior Drainage Basin and has a total of 52 miles of shoreline in the coastal zone. The County has some 645 inland water bodies which occupy about 11,000 acres. These include 592 natural lakes and ponds accounting for 8,424 acres. Other water bodies include hydro-electric reservoirs, tailing ponds and pits, and other artificial ponds.
The County is dominated by the Ontonagon River with its East, West, Middle, and South Branches plus many small tributaries. The Ontonagon River has a drainage area approaching 1,453 square miles, which extends well beyond the boundaries of Ontonagon County. This river discharges into Lake Superior at the Village of Ontonagon. There are also some minor watersheds located along Lake Superior in the coastal plain. The actual rivers and streams in the County are estimated to account for 1.3 percent of the total area. The water resources of the County, including Lake Superior, inland lakes, streams, and rivers provide endless recreational opportunities to residents and visitors (see Figure 1-2).

**Climate**

Ontonagon County has a variety of microclimates due to the effects of Lake Superior, prevailing winds, varying elevations, and distance from the lake. The summers tend to be cool and dry while the winters have mild temperatures accompanied by heavy snowfalls. While the average annual precipitation is around 31 inches, winter snowfall ranges from 90 to 160 inches varying with distance from Lake Superior.

The moderating effect of the lake is evident in the spring and fall when the water temperatures tend to level out the temperature extremes and reduce the likelihood of frost. The mean temperature is 18 degrees Fahrenheit in the winter and 66.5 degrees Fahrenheit in the summer. The average frost dates are September 28th and May 28th. Lake Superior can also influence rapid weather changes with storm, cloudiness, and daily temperature variations.
Figure 1-2: Watersheds Map
**Geology**

The County is bisected through its center in a northeast-southwest line by a Precambrian rock landform of very rugged hills. The hills are typified by the Porcupine Mountains (Porkies) found in the northwest portion of the County close to Lake Superior. North of the Porkies these hills taper into a coastal plain that ends at the Lake Superior shoreline. The coastal plain is bisected with small river valleys. The remainder of the County – the southern part and particularly the southeast portion – is composed of rolling plateau-like highlands which are approximately 1,200 to 1,700 feet above sea level. Lake Superior is 602 feet above sea level. Discounting the rough broken hills and rock outcrops, Ontonagon County is predominately a glacial outwash of deep clayey soils with deep sandy soils along Lake Superior. These are traced to an ancient lake bed and accumulated as glaciers retreated. The exception to this is the glacial features of till plains and moraines found in the southern part of the County.

The soils found in the County were formed during the Pleistocene glaciation period. While the underlying bedrock influenced the development of present day soils, glacial debris was chiefly responsible for the dominant parent materials of these soils. This glacial veneer contained a great variety of mineral materials. Therefore, a wide myriad of soil types have since evolved from the heterogeneous parent material and climatic and erosion activities that have governed the soil profile’s development.

**1.5 Land and Development**

Nearly 40 percent of the forest land in Ontonagon County is owned by State and Federal governments, and 20 percent is owned by the forest industry. The rest is in private hands. Most of southern Ontonagon County is part of the Ottawa National Forest. In all, the forest encompasses almost a million acres and stretches from Lake Superior down to Wisconsin touching five counties. Almost one-third of the land in Ontonagon County is part of this forest. It contains over 30 developed recreation areas, in addition to three wilderness areas and lands harvested for timber. Most of the Porcupine Mountains Wilderness State Park is located in Ontonagon County, 15 miles west of the Village of Ontonagon on the shores of Lake Superior. The 92 square miles of the park are Michigan's largest area of undeveloped wilderness. The park was established in 1945 and contains virgin pine forest, scenic waterfalls, rugged Lake Superior shoreline, remote rustic cabins, secluded lakes, 87 miles of
hiking trails, the Porcupine Mountains Ski Area, and virtually no roads. Residential, commercial, and other urban development is centered in the Village of Ontonagon and other small communities, whereas agricultural land is scattered throughout the County (see Figure 1-3).

Land use and development is directed by zoning regulations in the Village of Ontonagon and all but two of the townships – Bohemia and Matchwood (see Figure 1-4). The lack of land use planning and zoning leaves these areas more vulnerable to land use-related hazards.

1.6 Housing and Community Development

There are 5,672 total housing units in Ontonagon County (see Table 1-3). These are overwhelmingly (84 percent) in the form of single-family detached housing. Mobile homes comprise another 9 percent. The homeownership rate is 86 percent, and the median home value is $75,300. Almost one-third of the housing was built in 1939 or earlier, while only four percent has been built since 2000. Much of the new housing can be attributed to seasonal housing and retirees moving to or back to the area. Nearly 34 percent of housing in Ontonagon County is seasonal or recreational. This is five times the proportion of seasonal housing in the state as a whole.

<table>
<thead>
<tr>
<th>Area</th>
<th>Housing Units</th>
<th>Occupied Units</th>
<th>Median Value</th>
<th>Seasonal Units</th>
<th>Built Before 1940</th>
<th>Built in last 10 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bergland Township</td>
<td>591</td>
<td>246</td>
<td>$125,800</td>
<td>304</td>
<td>119</td>
<td>68</td>
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<tr>
<td>Bohemia Township</td>
<td>212</td>
<td>51</td>
<td>$118,800</td>
<td>153</td>
<td>54</td>
<td>3</td>
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<tr>
<td>Carp Lake Township</td>
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<td>347</td>
<td>$56,800</td>
<td>195</td>
<td>107</td>
<td>0</td>
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<tr>
<td>Greenland Township</td>
<td>557</td>
<td>369</td>
<td>$57,000</td>
<td>138</td>
<td>292</td>
<td>20</td>
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<tr>
<td>Haight Township</td>
<td>294</td>
<td>106</td>
<td>$155,100</td>
<td>174</td>
<td>51</td>
<td>26</td>
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<tr>
<td>Interior Township</td>
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<td>162</td>
<td>$71,100</td>
<td>144</td>
<td>148</td>
<td>3</td>
</tr>
<tr>
<td>Matchwood Township</td>
<td>167</td>
<td>49</td>
<td>$97,100</td>
<td>111</td>
<td>65</td>
<td>5</td>
</tr>
<tr>
<td>McMillan Township</td>
<td>380</td>
<td>244</td>
<td>$67,400</td>
<td>100</td>
<td>147</td>
<td>17</td>
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<tr>
<td>Ontonagon Township</td>
<td>1,774</td>
<td>1,214</td>
<td>$75,500</td>
<td>387</td>
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<td>71</td>
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<tr>
<td>Rockland Township</td>
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<td>116</td>
<td>$59,000</td>
<td>68</td>
<td>85</td>
<td>7</td>
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<tr>
<td>Stannard Township</td>
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<td>354</td>
<td>$82,100</td>
<td>158</td>
<td>270</td>
<td>29</td>
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<tr>
<td>Village of Ontonagon²</td>
<td>910</td>
<td>717</td>
<td>$62,600</td>
<td>94</td>
<td>383</td>
<td>17</td>
</tr>
<tr>
<td>Ontonagon County</td>
<td>5,672</td>
<td>3,258</td>
<td>$75,300</td>
<td>1,932</td>
<td>1,852</td>
<td>249</td>
</tr>
</tbody>
</table>

¹To March 2003; ²Included in Ontonagon Township
Figure 1-3: Land Cover/Use Map
Figure 1-4: Western Upper Peninsula Zoning Coverage Map
Schools

Schools are some of the largest institutions in the county and could potentially see great impacts from the hazards discussed in this plan. Two school districts in Ontonagon and two outside the County provide for the educational needs of the area: Ewen-Trout Creek and Ontonagon Area Schools, Adams Township School District – Houghton County, and L'Anse Area Schools – Baraga County. The Ewen-Trout Creek Consolidated School District serves the entire southern half of Ontonagon County, extending from Merriweather on the western side to Kenton in Houghton County. The Ewen-Trout Creek School, which serves grades K-12, is located in Ewen. Ontonagon Area Schools, with its K-12 school in the Village of Ontonagon, covers the northern portion of Ontonagon County. Small parts of Bohemia Township, in northeastern Ontonagon County, are served by Adams Township School District in Houghton County and L'Anse Area Schools in Baraga County. The following table shows the breakdown of students by school, not including Bohemia Township students who travel to other counties (see Table 1-4).

Table 1-4: School Districts in Ontonagon County

<table>
<thead>
<tr>
<th>School District / School Name</th>
<th>Location</th>
<th>Grades</th>
<th>Students</th>
<th>Instructors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewen-Trout Creek Consolidated School District</td>
<td>Ewen</td>
<td>K – 12</td>
<td>244</td>
<td>17</td>
</tr>
<tr>
<td>Ontonagon Area Schools</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontonagon Area Elementary School</td>
<td>Ontonagon</td>
<td>K – 5</td>
<td>160</td>
<td>9</td>
</tr>
<tr>
<td>Ontonagon Area Jr.-Sr. High School</td>
<td>Ontonagon</td>
<td>6 – 12</td>
<td>250</td>
<td>15</td>
</tr>
</tbody>
</table>

Historic Features

Ontonagon County has a distinguished history of logging and mining, and is the site of the first telephone system in Michigan. The oldest standing log home village in the United States is located at Old Victoria, near the village of Rockland. In addition there are a number of State and National Register historic sites including:

*Marsi Homestead* – The Marsi Homestead is significant as the oldest in the surrounding Finnish settlement. According to local tradition it was built in 1889 by the Marsi family whose patriarch was a lay minister. It was abandoned c. 1950 and purchased c. 1982 for a private residence and farm. The Marsi Homestead is located on a 93-acre plot of open and wooded...
land. The homestead contains a log house, assorted sheds, and two log barns. Located in Bohemia Township on South Road, south of Misery Bay Road. State-registered site.

Methodist Episcopal Church (Minnesota Mine Church) – The Methodist Episcopal Church of the Minnesota Mine was paid for by the predominately Cornish miners at a cost of $2,000. The church is the community of Rockland’s oldest Methodist congregation and is also significant as the company town’s oldest house of worship. The church is a one-story, clapboard-sheathed, Gothic structure with a deeply-pitched gable roof and pointed arch windows. Located at the south end of Rockland on US-45 at Minnesota Mine Location. State-registered site.

Minnesota Mine – Copper mining has taken place here since about 3,000 BC, intensifying during the Late Archaic Period by the people of the old Copper Culture. This hill was again mined from 1848 to 1870 when it was owned by the Minnesota Mining Company. Located southeast of Rockland off US-45. State-registered site.

Ontonagon County Courthouse (Not In Use) – Completed in 1886 and renovated in 1897 after a fire that destroyed much of the Ontonagon Village, this Romanesque, two-story brick building with sandstone foundation served as a symbol of stability and governmental organization during the frontier days of Michigan’s Upper Peninsula. In 1980 a new courthouse was constructed, and the old courthouse is not in use. Located at 601 Trap Street in Ontonagon. National-registered site.

Ontonagon Lighthouse – The second light station constructed on the southern shore of Lake Superior is one of the oldest on the Great Lakes. The station was built in 1866 by Detroit contractor W.F. Chittenden to replace an older structure built in 1852. The light aided navigation during the height of the shipping boom and was operational until 1964. The site is currently being restored by the Ontonagon Historical Society. Located off M-64 at the mouth of the Ontonagon River. National-and state-registered site.

Porcupine Mountains – From Lake Superior the main range of mountains looks like a crouching porcupine, thus their name. Machinery, rock dumps, and old adits are reminders of forty mining ventures in the years from 1846 to 1928, none of which succeeded. In 1945, the area was made a state park to preserve its virgin splendor. Located in Carp Lake Township on M-107, 10 miles west of Silver City. State-registered site.
Soo Line Railroad Depot – The depot is one of the oldest buildings standing in the Township of Interior. It was built for the railroad which served two large saw mills. Located in Trout Creek. State-registered site.

Victoria Mining Company Town (Old Victoria) – The town is at the site of one of the earliest copper mines in Michigan and was the subject of an experiment using water power to provide compressed air to run the steam engine that helped run the mine. The town consists of ten log houses, four of which have been restored and three of which have been refurbished. Located at the intersection of Victoria Dam Road and Victoria Road near Rockland. State-registered site.

Walker, Elton B., House (Mass Mine Superintendent’s House) – Constructed between 1905 and 1910 along with two other houses, the houses were built for the foreman, assistant superintendent, and the superintendent of the Ridge Mine. Walker occupied the house until 1920 when the mine failed. The Walker House is the only remaining example of the row form of housing for the mine captains and is also significant as a stately Colonial Revival house. Located at 508 Ridge Road, between Greenland and Mass City. State-registered site.

### 1.7 Employment and Industry

The proportion of Ontonagon County residents with a high school diploma or higher is consistent with the Michigan state average. However, the proportion of residents with a bachelor’s degree, 16.5 percent, is significantly lower than the Michigan average of 25 percent. This may be a reflection of the age of the population or of the former dominance of mining, manufacturing, and construction industries—jobs that often did not require formal education.

Of those in the labor force, 15 percent were unemployed in Ontonagon County as of March 2012, a rate much higher than the national average of 8.4 percent but significantly lower than the high of 23.6 percent of December 2009. Over 45 percent of residents 16 and over were not in the labor force, largely due to the large proportion of retirees in the County. The County’s median household income of $35,269 and per capita income of $21,448 were well below the national figures of $51,914 and $27,334, respectively. However, the cost of living in Ontonagon County is much lower than the national average, and poverty rates were consistent with the Michigan average at about 13 percent.
Ontonagon has historically been focused on copper mining and forestry. In the later years of the last century the economy began to shift toward tourism. That became even more the case after major industrial employers, including the Copper Range Company’s White Pine Mine, and more recently Smurfit-Stone’s corrugated cardboard plant, closed in 1995 and 2009, respectively. These closures have contributed to out-migration of residents, including the largest percentage-based population loss of any Michigan county from 2000 to 2010. Aspirus Ontonagon Hospital is now the County’s largest private employer. Besides health services, employment numbers are greatest in retail and accommodations and food services. The largest private contributors to County earnings include utilities, retail trade, and construction firms. Many county residents also commute outside of the county to major education and health care institutions, construction firms, and service and retail establishments.

An increase in small businesses has occurred to support the growing tourism industry, which is built around snowmobiling, fishing, the Porcupine Mountains Wilderness State Park, the Ottawa National Forest, and various other recreation sites.

1.8 Public Works and Transportation

Public Works and Roads

Ontonagon County has a Road Commission that is responsible for maintaining county, State, and Federal roads and highways. Most townships have staff for maintenance of facilities. All such agencies and individuals are resources for implementation of related mitigation actions. There are 157 miles of State trunkline highway in Ontonagon County (see Figure 1-5). U.S. 45 is a direct route for persons traveling north through Wisconsin to Lake Superior. M-28 is the shortest easterly route across the Upper Peninsula and it makes a junction with U.S. 45 at Bruce Crossing. Highway M-64 extends north from Marenisco and follows the west shore of Lake Gogebic to the junction with M-107, the Porcupine Mountains Road, at Silver City, then turns east to the Village of Ontonagon. Other State trunkline highways bringing traffic into Ontonagon County are M-26 from Houghton and M-38 from Baraga. The State trunkline highway system is supplemented by over 570 miles of County roads and a well-maintained U.S. Forest Service system. The three road systems provide access to all recreation areas within the County.
Rail

The Canadian National (CN) Railroad accesses the White Pine Industrial Park from the south. The Escanaba and Lake Superior (ELS) Railroad accesses the Village of Ontonagon from the southeast.

Ports

The Village of Ontonagon has both a commercial harbor and a recreational marina.

Airports

Ontonagon County Airport (OGM) is located three miles west of the Village of Ontonagon at an elevation of 669 feet. The airport with its 3,500-foot paved runway is uncontrolled and unattended. Eleven aircraft are based at the field. The airport sees an average of 39 aircraft operations each week.

Transit

On-Tran, the Ontonagon County Transit bus system, provides local service from 6:00 am to 6:00 pm Monday through Friday. Seniors and handicappers comprise 57 percent of the annual ridership.

1.9 Police, Fire and Emergency Facilities

Police, fire, and other emergency agencies are vital community resources not only for emergency response but for implementation of mitigation actions.

Police

The Ontonagon County Sheriff’s Department, from its base in the Village of Ontonagon, provides local police service to the area. The County jail is also located in the Village. The Eighth District of the Michigan State Police provides road patrol to Ontonagon County.
Figure 1-5: Major Roads and Transportation Map
Fire

There are eight separate fire departments that provide services in Ontonagon County. Bohemia Township, which lacks a fire department or any notable communities, is served by Greenland and also contracts with Laird Township and Toivola in Houghton County. Mutual aid agreements are in place to supplement coverage (see Table 1-5):

Table 1-5: Fire Departments

<table>
<thead>
<tr>
<th>Fire Department</th>
<th>Location</th>
<th>Service Area</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bergland VFD</td>
<td>Bergland</td>
<td>140</td>
<td>610</td>
</tr>
<tr>
<td>McMillan FD</td>
<td>Ewen</td>
<td>180</td>
<td>1175</td>
</tr>
<tr>
<td>Greenland Twp FD</td>
<td>Mass City</td>
<td>150</td>
<td>500</td>
</tr>
<tr>
<td>Ontonagon FD</td>
<td>Ontonagon</td>
<td>350</td>
<td>3500</td>
</tr>
<tr>
<td>Rockland VFD</td>
<td>Rockland</td>
<td>97</td>
<td>450</td>
</tr>
<tr>
<td>Bruce Crossing VFD</td>
<td>Bruce Crossing</td>
<td>125</td>
<td>800</td>
</tr>
<tr>
<td>Trout Creek VFD</td>
<td>Trout Creek</td>
<td>500</td>
<td>900</td>
</tr>
<tr>
<td>Carp Lake Twp FD</td>
<td>White Pine</td>
<td>212</td>
<td>950</td>
</tr>
</tbody>
</table>

Source: Ontonagon County Emergency Management and Department Staff
*Staff includes paid, part-time, and volunteers

Medical

Aspirus Ontonagon Hospital in the Village of Ontonagon is a licensed 25-bed Critical Access Hospital dedicated to serving the residents of Ontonagon County and the surrounding area. The hospital offers an emergency department, an operating room, a pharmacy, physical and respiratory therapy, radiology, cardiac rehabilitation, a 46-bed long-term care unit, and a rehabilitation and fitness center. In addition to the hospital, the Village of Ontonagon has a family practice clinic, a long-term care facility, and two doctors’ clinics. Ewen has a basic medical service clinic staffed by one doctor.

Mental health assessment and treatment services, as well as crisis intervention, are offered by Copper Country Mental Health in the Village of Ontonagon. Emergency victim services and crisis intervention are offered through Dial Help, Inc. The Western U.P. District Health Department services Ontonagon County from its office in Hancock (Houghton County).

Siren Coverage

Ontonagon County is serviced by eight sirens, all located at local fire departments. The sirens are currently used for fire emergencies, not as public warning systems. The following
The table shows siren locations, range, and estimated population coverage for Ontonagon County (see Table 1-6):

### Table 1-6: Siren Locations

<table>
<thead>
<tr>
<th>VFD / Community</th>
<th>Siren</th>
<th>Remote Activation</th>
<th>Range (radius) (miles)</th>
<th>Estimated Population Covered</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontonagon Village VFD</td>
<td>Y</td>
<td>Y</td>
<td>1.5</td>
<td>500</td>
<td>River Street</td>
</tr>
<tr>
<td>White Pine VFD</td>
<td>Y</td>
<td>Y</td>
<td>.50</td>
<td>200</td>
<td>White Pine</td>
</tr>
<tr>
<td>Mass City VFD</td>
<td>Y</td>
<td>Y</td>
<td>3.0</td>
<td>300</td>
<td>180 W. Fox Road</td>
</tr>
<tr>
<td>Rockland VFD</td>
<td>Y</td>
<td>Y</td>
<td>.50</td>
<td>100</td>
<td>Main St.-US45</td>
</tr>
<tr>
<td>Bruce Crossing VFD</td>
<td>Y</td>
<td>Y</td>
<td>1.5</td>
<td>200</td>
<td>610 Larson Road</td>
</tr>
<tr>
<td>Ewen VFD</td>
<td>Y</td>
<td>Y</td>
<td>.50</td>
<td>200</td>
<td>Ewen</td>
</tr>
<tr>
<td>Trout Creek VFD</td>
<td>Y</td>
<td>Y</td>
<td>.50</td>
<td>100</td>
<td>3845 Golden Glow Road</td>
</tr>
<tr>
<td>Bergland VFD</td>
<td>Y</td>
<td>Y</td>
<td>.25</td>
<td>40</td>
<td>101 Pine Street</td>
</tr>
</tbody>
</table>

**Office of Emergency Management**

The Ontonagon County Office of Emergency Management, located at the Ontonagon County airport, promotes emergency and disaster education and awareness. The office performs dispatching and ensures interagency coordination before, during, and after disasters or emergencies.

### 1.10 Critical Facilities

When dealing with hazards, some facilities are more important than others and can be considered "critical facilities." Critical facilities can be defined as buildings or infrastructure that, when affected by a hazard, can impact the well-being of a large population. Facilities identified as critical generally fall into two categories:

1. Buildings or locations vital to public safety that can impact a disaster response and recovery effort; for example, police and fire stations, communications, etc.

2. Buildings or locations that, if damaged, could cause a secondary disaster such as hazardous material sites or nursing homes.
For this mitigation plan, critical facilities have been identified in the following categories, with examples:

**Emergency response facilities**: police and fire stations, public works sites, and emergency management office

**Utilities**: water and wastewater treatment plants, and electrical substations

**Other vital infrastructure**: bridges and primary roads

**Health facilities**: hospitals and nursing homes

**Schools**: public and private

**High-density population facilities**: housing facilities, casinos, and theaters

The following critical facilities maps identify the number and the distribution of identified critical facilities in Ontonagon County (see Figures 1-6 and 1-7).
Figure 1-7: Village of Ontonagon Critical Facilities
Section 2: Hazard Profile

Overview of Hazards in Ontonagon County

There are three categories of hazards evaluated in this plan including natural, technological, and social/societal hazards. Natural hazard threats to Michigan include flooding, fire, tornadoes, lightning, thunderstorms, severe winds, and severe winter weather. Technological hazard threats to Michigan include hazardous material incidents, transportation accidents, infrastructure failure, and petroleum and natural gas pipeline incidents. Social/societal hazard threats include public health, civil disturbances, and terrorism/sabotage.

The following hazard profile for Ontonagon County includes a general description of potential hazards and background for each hazard within the County. Hazard potential within the County varies depending on geography, population, and infrastructure. The following hazard profile includes a general description of potential hazards and background for each hazard within the County. Hazard potential within Ontonagon County varies depending on geography, population, and infrastructure. In accordance with FEMA guidelines, in each discussion of risk subsequent to the descriptions and background information, ratings of severity (or extent, which is used interchangeably) and probability of occurrence are assigned.

Severity (extent) ratings are defined as follows:

*Extreme*- Facilities/infrastructure in the affected area are damaged or contaminated beyond habitable use. Critical services are damaged beyond 75 percent of capacity. Most items/assets are lost or damaged beyond repair.

*High*- Facilities/infrastructure in the affected area are partially damaged or contaminated. Critical services are damaged up to 50 percent of capacity. Some items/assets are damaged, but structures and infrastructure remain mostly intact.

*Moderate*- Facilities or infrastructure in the affected area are temporarily closed. A limited number of assets may be damaged, but the majority of assets are not affected. Critical services are damaged up to 25 percent of capacity.
Low- Facilities/infrastructure in the affected area experience less than a four-hour impact on operations, with no major assets lost.

**Probability** of future occurrences is estimated based on one or more of the following categories of previous events: 1) in Ontonagon County over the past 6 to 12 years (depending on available data), 2) in Michigan and/or the United States, and 3) as predicted based on local situation and/or factors recently changed or developed. Generally an "event" is an occurrence formally recorded/declared by an appropriate authority or documented by the media, but undeclared events of a lesser magnitude (e.g. snowstorms that have significant consequences but for which warnings or advisories are not issued) may also be taken into account. Probability ratings are defined as follows:

- **Very Low**- Little possibility of occurrence
- **Low**- At least one event in past 10 years OR foreseeable possibility of occurrence based on current local conditions
- **Moderate**- Approximately one event per average year
- **High**- 2 to 9 events in average year
- **Very High**- 10 or more events in average year

More detailed assessments of countywide severity and vulnerability are presented in Table 2-3. General hazard **impacts**, which are discussed in the narratives, are also addressed explicitly in the matrices. Risk and vulnerability themselves are not quantitatively defined but arise from the severity and probability ratings. **Risk** is the overall degree of hazard concern based on a combination of severity and probability. **Vulnerability** is related to risk but also takes preparedness into account; i.e. a community that is ill-prepared for a high-risk disaster is highly vulnerable. Lack of preparedness for a low-risk disaster is less of a concern but still indicates a degree of vulnerability.

### 2.1 Natural Disasters

**Earthquakes**

An earthquake is a sudden motion or trembling in the earth caused by an abrupt release of slowly accumulating strain resulting in ground shaking, surface faulting, or ground failures.
Most areas of the country are subject to earthquakes, including parts of Michigan, and they occur thousands of times each year. Most earthquakes are minor tremors and result in little or no loss of life, property, or essential services. Earthquakes are dangerous because they can cause severe and sudden loss and devastation without warning. Deaths and injuries are caused indirectly through the collapse of structures. Earthquakes are measured by their magnitude (amount of energy released at the epicenter) and intensity (measure of damage done at one location; essentially the same as "severity" as classified throughout this plan). The Richter Magnitude Scale is commonly used to determine earthquake magnitude, and the Modified Mercalli Intensity Scale is used for intensity. A 5.0 on the Richter Scale is a moderate event, while an 8.0 is a catastrophic event. The Mercalli Intensity Scale describes 12 increasing levels from imperceptible to catastrophic.

Earthquake risks in Michigan are generally low, which means structures or utilities are not necessarily built to withstand even small seismic events. Due to low risk, Michigan may be more vulnerable to an earthquake because of poor preparation.

**Background**

Earthquake tremors have been felt in Michigan Territory, with the earliest recorded in 1811. Up to nine tremors from the New Madrid earthquake series were reportedly felt in Detroit. There have been a number of incidents since 1811, with the only questionable activity in the Upper Peninsula occurring in the Keweenaw Peninsula in 1905, 1906, and 1908. While there were explosions and ground shaking felt as far away as Marquette, it is believed to be from pillars collapsing in local mines.

**Risk Assessment**

Because of the Keweenaw Fault, which runs up the spine of the peninsula, and past minor incidents due to mining activities, earthquakes are an ongoing risk but one with very low probability throughout the County. Severity is predicted as low to moderate due to great distance from active fault zones. Slight vulnerability does exist due to a total lack of preparedness for this hazard.

*Probability:* very low throughout  
*Severity:* low to moderate
**Dam Failure**

Dam failure is a breach or collapse of an impoundment resulting in flooding downstream. Dam failure can result in extensive damage to property and natural resources miles downstream from the failure. Failure can occur during flood events which cause overtopping of the dam and as a result of poor operation, lack of maintenance, and vandalism. Most failures are catastrophic because they are unexpected with no evacuation time. Michigan has had over 260 dam failures in its history.

**Background**

Rainfall and melting snow throughout the 801-square mile watershed upstream of Victoria in central Ontonagon County eventually end up at Victoria Dam where the water is used for power generation. The Upper Peninsula Power Company (UPPCO) is able to operate the power station about 80 percent of the time each year because water can be stored upstream of Victoria for use and release during dry periods. The least amount of generation occurs during July and August when the river runs low. If the river flow exceeds the storage capacity of the Victoria Dam and the 850 cubic feet-per-second utilized by the turbines while operating at a full load, it is necessary to spill the excess water through the radial spill gates. Normally the greatest amount of water is spilled during the spring snowmelt. After the water passes through the turbines, it is discharged into the West Branch of the Ontonagon River, where it flows into the main Ontonagon River and finally into Lake Superior at the Village of Ontonagon.

UPPCO owns and maintains three storage dams upstream of Victoria Dam: Bond Falls Reservoir, Bergland Dam, and Cisco Dam. When released, the water held in storage at these facilities flows directly to Victoria. Bergland Dam is located on the West Branch of the Ontonagon River at the north end of Lake Gogebic. The low-head structure is built of vertical steel I-beams and wood plank flashboards and is 179 feet long by 4 feet high with a storage capacity of about 7,360,000 kilowatt-hours. Cisco Dam is on the Cisco Branch of the Ontonagon River at the north end of the Cisco Chain of Lakes. It is a low-head concrete structure 21 feet long and 5 feet high with two six-foot, eight-inch-wide concrete bays and a storage capacity of 1,800,000 kilowatt-hours.

Bond Falls Reservoir is located on the Middle Branch of the Ontonagon River. It consists of the main dam, control dam, three earth fill dikes, and a canal. Overall, it has a storage
capacity of 7,310,000 kilowatt-hours. The main dam is an earth-fill embankment approximately 900 feet long and 40 feet high with a sheet-pile core wall. The steel gate of the main dam is 13 feet high by 26 feet wide. The control dam is similar to the main dam in design, but it is 850 feet long, 40 feet high, and equipped with a steel slide gate five feet square. The three dikes vary in length from 110 to 250 feet and in height from 5 to 15 feet. The 7,500-foot by 20-foot canal diverts water from the main dam and the Middle Branch of the Ontonagon River to the south and west branches of the river.

Risk Assessment

The hydroelectric dams within the county are regularly maintained and have plans in place to deal with emergencies. UPPCO has worked with the local emergency managers to ensure people understand the need to be prepared to evacuate areas below the dams during floods. Standard operating procedures for each dam are updated at least annually, and regular full-scale exercises are performed to minimize risk and vulnerability.

Dam failure is a risk within the county because of the large area downstream potentially affected by failure of the facilities. Excessive rainfall and expedited spring melt-off can have an effect on the potential failure of dams within the county. Stream reaches below the Victoria Dam and the three hydroelectric dams on the Middle Branch of the Ontonagon River are areas where people could be impacted by a sudden, unanticipated water release. Probability of dam failure is low, but severity of failure of the Victoria Dam, in particular, would be high to extreme. The 100-year floodplain outlined for riverine and urban flooding in the Village of Ontonagon in the following section is very similar to the inundation that would occur at a full breach of Victoria Dam. There is limited development in areas that would be affected by the failure of the Bond Falls, Bergland, and Cisco Dams; therefore, severity of failure of these dams is predicted to be only moderate.
Probability: low throughout
Severity: high in Ontonagon and Rockland Townships and Village of Ontonagon; moderate in Bergland, Haight, Matchwood, and McMillan Townships; low elsewhere

**Riverine and Urban Flooding**

Riverine flooding is defined as periodic occurrence of overbank flows of streams and rivers resulting in the inundation of the adjacent floodplain. Riverine floods are caused by prolonged, intense rainfall, snowmelt, ice jams, dam failures, or any combination of these factors. Such overbank flows are natural and may occur on a regular basis and occur on river systems that drain large geographic areas and many river basins. Floods on large river systems may extend several days. Many areas of Michigan are subject to riverine flooding.

Flash floods are brief, heavy flows on small streams or normally dry creeks and differ from riverine floods in extent and duration. The usual cause of flash floods is locally intense thunderstorms with significant rainfall resulting in high velocity water, which often carries large amounts of debris. These conditions can be exacerbated by secondary or cascading events such as beaver dam failure. Spring is highest-risk, when saturated or frozen ground with little infiltration capacity is met with a quick rise in temperature, rapid snowmelt, and intense precipitation.

Urban flooding is the overflow of storm sewer systems, which is usually caused by inadequate drainage following heavy rainfall or rapid snowmelt.

**Background**

A review of the storm incidents recorded by NOAA’s National Climatic Data Center recorded the following flood events in Ontonagon County between 7/30/2001 and 7/30/2011:

- 4/12/2002 – Spring runoff due to record temperatures resulted in flooding along the Ontonagon River and other small creeks and streams. Local roads and structures were flooded, resulting in the closure of M-28 near Bergland and Merriweather for three days. Six Western Upper Peninsula counties and Dickinson, Marquette, and Menominee Counties were affected. Estimated damage for the U.P. was $18.5 million.

- 5/11/03 – Flooding due to spring runoff resulted in the closure of M-28. The Western U.P. was affected with $2 million in damage.
• 5/25/2010 – The Ontonagon County Sheriff’s Department reported that roads in and near Ontonagon washed out due to heavy rainfall of two to three inches which fell in less than an hour. **Flooding** on River Street in Ontonagon forced water over the sidewalks and into some area businesses. Damage was estimated at $15,000.

• Late April 2013 – Rapid melting of a heavy snowpack caused flooding throughout the region. The Highway M-28 bridge over the South Branch of the Ontonagon River in Ewen was inundated by floodwaters. This required a multiple-day closure of the highway from Bruce Crossing to Bergland, resulting in a long detour for travelers. Several county roads were also reduced to one traffic lane. Meanwhile, the spillway of the Victoria Dam near Rockland ran at full capacity but suffered no damage. Small stream flooding also occurred throughout the region. The Village of Ontonagon saw little detrimental impact from this particular flood.

A number of areas in Ontonagon County are susceptible to riverine and urban flooding. Flooding along the Ontonagon River has a distinct past with occurrences recorded as far back as 1912. Riverbanks and areas with inadequate culverts became overburdened, thus experiencing certain degrees of flooding and washouts. To minimize these risks, upgrading of storm sewers and culvert replacement is an ongoing activity within the County.

In Ontonagon County, communities that participate in the FEMA National Flood Insurance Program (NFIP) are Carp Lake Township, Ontonagon Township, and the Village of Ontonagon. There are 20,000 communities nationwide that participate in the program. The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in communities that adopt and enforce floodplain management ordinances. Other compliance and implementation activities are encouraged. Accordingly, the Village of Ontonagon Master Plan discusses the Village floodplain early on, ensuring that the threat of flooding remains at the forefront of development decisions. Many of the projects in the Action Plan are intended to address flooding in the Village. NFIP puts special focus on mediation of insured structures that have suffered more than one loss of at least $1,000 within a rolling 10-year period since 1978; these are referred to as "repetitive loss properties." Ontonagon County has no such properties insured under NFIP.

FEMA, during a flood hazard assessment, develops a Flood Insurance Study and Flood Insurance Rate Map (FIRM). The FIRM is used by lenders to determine flood insurance requirements and by insurance agents to determine flood insurance premium rates for
specific properties. The FIRM includes areas within the 100-year flood boundary, which are termed "Special Flood Hazard Areas" (SFHAs). A 100-year flood does not refer to a flood that occurs every 100 years, but refers to a flood level with a one percent or greater chance of being equaled or exceeded in any given year (see Figure 2-1).

Risk Assessment

Riverine and urban flooding is a moderate risk within Ontonagon County. Large areas in the Village of Ontonagon that have previously been subjected to flooding, including established residential, commercial, and industrial areas, remain subject to a 100-year flood. Ice jams near the mouth of the river often add to the problem during spring snow-melt. SFHAs along a number of other rivers have also been identified including the Iron River, Firesteel River, Sleeping River, McCarthy Creek, Cranberry River, Flintsteel River, and Paddy's Creek. A few inland lakes are also affected, including: Lake of the Clouds, Bass Lake, and Clark Lake. McMillan Township, including the community of Ewen, has been affected by flooding of the Ontonagon River, particularly of the Middle Branch at Bond Falls. In Bergland and Matchwood Townships, flooding has occasionally inundated and required closure of Highway M-28.

Communities within the County recognize the problems associated with their location and have taken steps to prevent loss by upgrading facilities to deal with the flood risk and identifying evacuation areas. Because of unpredictable river discharge and heavy ice jams, potential for flooding is evident. Probability is low to moderate based on three events in a 10-year period. Within the County, highest probability is in the Village of Ontonagon. Severity is low to moderate in most jurisdictions but extreme in the Village of Ontonagon.

The Real Property State Equalized Values (SEVs) in the designated 100-year flood zone in the Village of Ontonagon total over $5,000,000, and the Personal Property SEVs for the same area total $9,000,000. Additionally, the Village Office, the Department of Public Works, and the Ontonagon Fire Hall are located within the deepest area of the floodplain. Specific data regarding impact on other identified flood areas in Ontonagon County are unavailable.

Probability: moderate in Village of Ontonagon (urban and riverine); moderate (riverine) in Bergland, McMillan, and Matchwood Townships; low elsewhere

Severity: low to moderate except extreme in Village of Ontonagon
Figure 2-1: Flood Hazard Boundary Map
Shoreline Flooding and Erosion

Flooding and erosion along the Lake Superior shoreline are typically a result of high water levels, storm surges, or high winds. These are natural processes that can occur at normal or even low water levels. However, during periods of high water, flooding and erosion are more frequent and serious, causing damage to homes, businesses, roads, water distribution and treatment facilities, and other structures in coastal communities. Storm surges that drive lake water inland over large areas occur when windstorms and differences in barometric pressure temporarily tilt the surface of a lake up at one end—in extreme cases by as much as eight feet.

Background

Lake Superior levels have fluctuated since prehistoric times. Accurate measurements of this fluctuation are available for the last 160 years. According to research conducted by the United States Geological Survey, the peaks of this fluctuation have been higher during this century than they were in the past. The modern range of fluctuation between periods of high and low water is one meter. Periods of higher and lower levels result from natural climate changes in the region and will continue. The impact of possible global warming on the magnitude and frequency of water-level changes remains uncertain.

In addition to climate change, changes in the surface of the earth affect lake levels. The land in the Great Lakes region is slowly recovering from the last glacial period when ice loaded and depressed the land surface. The land is rebounding from the weight of the former glaciers at different rates. The outlet channel to Lake Superior at Sault Ste. Marie is rising more rapidly than most other points along the U.S. shore, resulting in a tilting of the lake. The amount of inundation is greatest at Duluth, Minnesota, where as much as 5.4 meters of inundation has occurred over the past 2,000 years. Maximum inundation over this period for the Michigan shore occurred near Ontonagon where as much as 3 meters is noted.

The current level of Lake Superior is 600.1 feet. This is 10 inches below what is
considered normal and only 4 inches above the lowest level recorded, which was measured in 1926.

Although many areas in Ontonagon County saw notable high-risk shoreline erosion in past years, a 2013 DEQ update study revealed no high-risk erosion areas in the County.

Risk Assessment

The probability of significant shoreline erosion and flooding is high in shoreline jurisdictions. Even though high-risk erosion areas are currently not designated by DEQ, both processes are active, ongoing processes within Ontonagon County. The mandatory setbacks required for shoreline development minimize the vulnerability of Ontonagon County to these hazards.

*Probability:* high in Carp Lake, Ontonagon, and Bohemia Townships and Village of Ontonagon; none elsewhere

*Severity:* low to moderate in Carp Lake, Ontonagon, and Bohemia Townships and Village of Ontonagon; none elsewhere

Scrap Tire Fires

A scrap tire fire is a large, uncontrolled fire that burns scrap tires that are being stored for recycling or re-use. Michigan generates 7.5 to 9 million scrap tires annually. Tires end up at disposal sites both legal and illegal, some of which store several hundred thousand tires. Scrap tire fires are dangerous because they can require significant resources to control and extinguish, often beyond the capability of local government. The environmental consequences are significant, and the extreme heat from the fire converts a standard passenger vehicle tire into about two gallons of oily residue which can leach into soil or migrate to streams.

Background

There are no licensed scrap tire facilities in Ontonagon County.

Risk Assessment
There is a small risk of scrap tire fires due to possible unknown and unlicensed storage areas. Probability is low and severity site-specific so cannot be determined.

*Probability:* low throughout  
*Severity:* cannot be determined

**Structural Fires**

A structural fire is any instance of uncontrolled burning resulting in structural damage to residential, commercial, industrial, institutional, or other properties in developed areas. In terms of average annual loss of life and property, structural fires are by far the greatest hazard facing most communities in Michigan and across the country. According to some sources, structural fires cause more loss of life and property than all types of natural disasters combined. It is estimated that 46.3 percent of accidental fires occur through neglect or carelessness with items such as candles, cigarettes, pipes, cigars, matches, lighters, and fireworks – especially when those items are in the hands of children. Another main cause is from improper use or maintenance of items such as clothes dryers, holiday decorations, and cooking equipment. Many fires can be prevented through awareness and education.

**Background**

Over 40 percent of all fires reported in the state in 2000 started inside buildings. (The rest occurred outside or caused damage to mobile property.) Nearly 75 percent of these building fires occurred in dwellings as opposed to commercial structures. In fact, the home – the place where most people feel the safest, accounts for 75 to 85 percent of all fire fatalities statewide.

Structural fires are a concern in Ontonagon County because many of the older homes, as well as numerous camps and cabins in the woods, are heated by wood-burning stoves that increase the risk of fire. Older buildings are also susceptible, and their close proximity can result in devastating damage such as the 2008 Village of Ontonagon fire that consumed six buildings.

In 2008, Ontonagon County had 40 fires resulting in $119,448 in damage. Of the total fires, eight percent were suspicious or determined to be arson.
Risk Assessment

Due to an older housing stock comprised of 25 percent built before 1940, compact development in the Village of Ontonagon and other towns, and a large amount of remote development, Ontonagon County is highly susceptible to fire. The County has a number of fire departments available to respond to and mutual aid agreements in place to deal with structural fires. Education and operational fire detectors can often mitigate the loss from this type of hazard. Frequency of fires in Ontonagon County is 40 per year based on 2008 statistics. The number of and damage incurred by structural fires varies greatly from year to year. Unfortunately, local fire departments do not maintain archived records of previous loss, making an estimate of impact difficult and unreliable.

*Probability:* very high throughout  
*Severity:* low to extreme

Wildfires

A wildfire is an uncontrolled fire in grass, brush lands, or forested areas. The most immediate dangers from wildfires are the potential injury or death of persons who live or recreate in the affected area and the destruction of homes, timber, and wildlife. Long-term effects include scorched and barren land, soil erosion, landslides, water sedimentation, and loss of recreational opportunities.

Background

Forests cover approximately 90 percent of Ontonagon County. This forest cover is an asset for both industry and recreation. However, it also leaves the county highly vulnerable to wildfires. Increased development in and around rural areas has changed the nature of the threat from wildfires. Not only can acres of valuable timber and wildlife habitat be lost, but also life and property. Ontonagon County has a harrowing wildfire history: In 1896, the Village of Ontonagon and surrounding rural areas were devastated by a wildfire that destroyed almost every building in the Village. In more recent times, Ontonagon County had 94 wildfires under the jurisdiction of the DNR from 1981 to 2010 that burned 1,438.1 acres.
**Risk Assessment**

Ontonagon County has an ongoing risk of wildfires due to the tremendous amount of high risk forest cover and increasing urban infringement in rural areas (see Figure 2-2). With a frequency of 3 per year, probability of a wildfire is high throughout the County. Severity is moderate to potentially extreme in the heavily forested environment; however, in recent decades an average of only 48 acres per year has been lost due to wildfires. Increased development in rural areas can increase the potential damage from wildfires. Ensuring that new development has adequate emergency access and protective buffers is one way to mitigate some of the risk.

*Probability*: high throughout  
*Severity*: moderate to extreme

**Subsidence (Ground Collapse)**

Subsidence is defined as depressions, cracks, and sinkholes in the ground surface, which can threaten people and property. While the sudden collapse of the ground surface to form sinkholes poses an immediate threat to life and property, subsidence depressions normally occur over a period varying from many days to a few years. Collapses continue until the underground voids stabilize. They may damage structures with low strain tolerances, such as dams and utility infrastructure.

Nationally, the greatest risk of subsidence is related to changes in water content of surface or subsurface layers of earth. The primary processes affecting water content are aquifer depletion (which lowers the supporting water table) and drainage of moisture from organic soils. Both of these occur mainly as a result of human activity (development and agriculture, respectively). Aquifer depletion can have the same consequences as deterioration of subsurface layers of earth since liquid serves much the same role as solids in supporting overlying earth.

A lesser water-related cause of subsidence, but one that has become prominent in media coverage in recent years, is dissolution of certain types of rock into groundwater. The rock types most susceptible to this process are salt and gypsum, but limestone is the type most closely associated in popular knowledge with subsidence. Over time, dissolution of rock into
the aquifer can create a void subject to sudden and catastrophic collapse, creating a sinkhole.

Figure 2-2: High-Risk Wildland Fire Areas Map
In Michigan, the greatest risk of subsidence is associated with underground mining. The population most at risk lives in areas where industrial or residential development has occurred above active or abandoned mines where underground cavities are present near the surface. Strain from geological movements and additional loading on the surface can cause the ground above and around the old mines to sink or collapse. Vibrations from truck traffic and other industrial machinery can destabilize areas underground. The roof of a hollow area may slowly erode, particularly when flowing water is present, causing the depth of the layer over the cavern to decrease. The roofs of the old mine tunnels were often supported by timbers or pillars, which may have deteriorated over the course of 100 years, placing them at risk of structural failure. Lateral flow of subsurface materials, which can occur on the thick glacial clay deposits in the Great Lakes region, results in gradual lowering of the ground surface as load-bearing walls slowly move away from one another.

There are over 800 underground mines in Michigan with more than 2,300 shafts or other openings to the surface. Many were established in the 1840s, and even though many old mines have been inspected by the county mine inspector, some are still unknown and/or unmarked. There are very limited records of the locations of shafts, and the full extent of the mine voids and proximity to the surface may be unknown.

Subsidence is a potential danger near many of these abandoned underground mines. Strain from geological movements and additional loading on the surface can cause the ground above and around the old mines to sink, cave, or collapse. Vibrations from heavy equipment, truck traffic, and industrial machinery can destabilize areas underground. The roof of a hollow area may slowly erode, particularly when flowing water is present, causing the depth of the layer over the cavern to decrease. The roofs of old mine tunnels were often supported by timbers or pillars. These may have deteriorated over the course of 100 years, putting the tunnels at risk of structural failure. Lateral flow of subsurface materials, which can occur on the thick glacial clay deposits in the Great Lakes region, results in gradual lowering of the ground surface as load-bearing walls slowly move away from one another.

Background

Ontonagon County has a long and varied history of mining and exploration. Subsidence can also occur over old foundations or lauders, which are rock pipes installed by mine
companies to be used as storm drains. The extensive White Pine Mine and older copper mines are subject to subsidence problems.

**Risk Assessment**

Subsidence will continue to pose some risk into the future because of both known and unknown potential hazards. A Michigan Abandoned Underground Mine Inventory was completed in late 1998. The inventory includes information on about 800 mine locations with nearly 2,000 openings to the surface. Distribution of the report was limited to the DNR, County Mine Inspectors, and related agencies, for the counties containing the old mines. Distribution was limited in order to prevent the documents from becoming guides to potentially dangerous locations for adventurous people who may enter unsafe areas and be hurt or killed. Additionally, a 1999 study identified over 130 shafts that were in need of immediate mitigation throughout the Western Upper Peninsula. Mines on State of Michigan land were addressed through a FEMA grant. However, most shafts are located on private lands and continue to pose a risk.

Because there is not a recent history of subsidence, probability is low, but this evaluation does not take into account the number of failures that likely go unreported each year. Carp Lake Township experiences a higher risk due to the previous operations of the White Pine Mine. Severity is highly variable and site-specific. Vulnerability is high due to the slight history and lack of available data on specific dangerous locations.

*Probability:* low throughout but highest in Carp Lake Township  
*Severity:* cannot be predicted

**2.2 Weather Hazards**

Because of its location, Ontonagon County sees low temperatures, harsh winds, and large quantities of winter snow. The average low temperature in winter is about 18 degrees Fahrenheit. Cold winds passing over the warmer waters of Lake Superior produce lake-effect snow in quantities that vary with distance from the lake. Snowfall in the County ranges from 90 to 160 inches. For the most part, residents and businesses are accustomed to the climate. The Ontonagon County Road Commission has a fleet of snowplows and other equipment charged with plowing and sanding many miles of county roads.
Despite the overall preparedness for harsh weather, occasionally weather events result in utility outages and closure of roads, businesses, and schools. Such events include extreme cold, snowstorms, ice storms, floods, high winds, thunderstorms, lightning, and hail. A review of weather incidents recorded by NOAA’s National Climatic Data Center shows that 221 events were reported in Ontonagon County between 7/31/2001 and 7/31/2011. During this 10-year period only a handful of events caused recordable damage in Ontonagon County.

Weather hazards in Ontonagon County vary greatly and are dependent on season. Ontonagon County is prepared to handle severe winter weather, limiting damage through snow management. Collapsing roofs are a variable problem depending on the age of buildings and building codes.

Thunderstorms, hail, high winds, extreme temperatures, and flooding hazards are variable and dependent upon many factors. Due to the variability of these types of storm events, response plans are the best mitigation for these incidents. Flooding over the last few years has been an expected spring condition, and the capacity of storm systems to handle these conditions has been improving. All of Ontonagon County is covered by NOAA weather radio broadcast from Houghton, though coverage varies and is unavailable in scattered locations, particularly the Porcupine Mountains (see Figure 2-3). Probability of a significant weather event resulting in recordable damage is 40 percent.

**Drought**

A drought is an extended periods of decline in precipitation from levels normally experienced in an area. A drought is uniquely difficult to define among natural disasters in that it usually cannot be recognized until it is already underway and in that it has no clear starting and ending points. A drought may occur in four types based on its primary defining characteristic: meteorological (variation from normal precipitation climate), hydrological (regarding surface and groundwater levels), agricultural (regarding conditions for crop growth), and socioeconomic (resulting from human demand for water exceeding supply).

One of the greatest impacts of a drought is its effect on agricultural areas during key planting and growing seasons. Drought can also affect urban areas that are dependent on reservoirs for water, as decreased water levels due to low precipitation can result in use restrictions. Timing and length of droughts are difficult to predict. Increased pumping of
groundwater and surface irrigation during drought periods can result in land subsidence problems in some areas of the country. Almost all areas of the country are impacted by drought. Some impacts include reduced agricultural outputs, reduced water supply, land subsidence, power outages caused by excessive energy use, increased wildfire risk, and reduced capacity for marine transportation. The arid southwest and Great Plains are the most vulnerable to drought.

Figure 2-3: Michigan NOAA Radio Coverage Map

Risk Assessment

Ontonagon County has not suffered any notable localized droughts but has been affected by regional droughts, which, based on a variety of media reports and weather recording organizations, the United States Midwest has experienced in at least four seasons since 1981. Meteorological conditions are the best indicator of drought in Ontonagon County, as its secondary vulnerabilities are few. Ontonagon County is not at risk of a drinking water
shortage, as groundwater supplies local systems; agricultural operations are of small scale and are not a significant part of the economy; and supply limitations would be unlikely due to the abundance of sources in relation to the County's population.

Regardless of the obvious conditions commonly associated with droughts, climatic conditions always fluctuate over the long term between dry and less dry periods. In recent years the Upper Great Lakes Region has been experiencing a dry period as indicated most clearly by decreased water levels and susceptibility to wildfires. The latter is the consequence that most clearly affects Ontonagon County. Even minor periods of dryness can significantly increase wildfire risk, which is a concern throughout the County because of a high percentage of forest cover. Seasonal dry conditions have been known to increase the frequency and severity of wildfires throughout the Upper Peninsula and will continue to do so during this dry climatic period. In consideration of these factors and impacts, Ontonagon County has a high probability of experiencing some degree of drought conditions in any given year, but severity is predicted as low to moderate. Any drought conditions occur uniformly throughout the County.

*Probability*: high  
*Severity*: low to moderate

**Extreme Temperatures**

Extreme temperatures refer to prolonged periods of very low or very high temperatures, often exacerbated by conditions such as high humidity and lack of rain, or heavy snowfall and high winds. Extreme temperatures primarily affect the most vulnerable segments of the population, including the elderly, the impoverished, children, and people in poor health. Threats from extreme heat include heat stroke, which is a medical emergency, and heat exhaustion. Extreme heat is more of a problem in urban areas where the high temperature and humidity can be more intense. Threats of extreme cold are hypothermia, which is a medical emergency, and frostbite. All areas of Michigan are subject to extreme temperatures. Ontonagon County, having inland locations, can experience high temperatures and severe cold temperatures. Another risk during winter months is freezing pipes due to limited snow cover insulation. There have been eight extreme temperature events over the past ten years. Only one, on July 31, 2006, was for extreme heat.
Risk Assessment

Ontonagon County experienced seven extreme cold events and one extreme heat event from 2001 to 2011, so the frequency of extreme temperature events is 0.8 per year; thus, probability is moderate. Severity is low to moderate, with limited impact on a population accustomed to this hazard. Impacts are generally limited to temperature-related health issues and damaged utilities; a monetary damage estimate is not available. The County is somewhat more vulnerable to extreme heat than extreme cold, as residents are less accustomed to the former.

Hail

Hail is the formation, during thunderstorms, of atmospheric water particles into rounded or irregular lumps of ice that fall to the earth. Hail typically falls near the center of the storm along with the heaviest rain. At times strong winds at high altitudes in the thunderstorm blow the hail away from the storm center, causing hazards in unexpected places. Hailstones can be the size of a pea to a golf ball but are sometimes larger than baseballs. Hailstones can damage crops, dent automobiles, and injure wildlife and people. Hail causes one billion dollars in damage nationwide annually.

Risk Assessment

Thirty-two hail events were recorded in Ontonagon County from 2001 to 2011, for a frequency of 3.2 per year. Probability of future events in any given year is high. There was no damage reported for any of these events; therefore, severity and impact are both low to moderate throughout the County. Damages resulting from hail in Ontonagon County are generally minor and incurred by individual property owners.

Probability: high throughout
Severity: low to moderate

Ice and Sleet Storms

Severe winter weather hazards can include sleet storms and ice storms. Sleet storms occur when frozen raindrops or ice pellets fall from the sky. Though sleet does not stick to tires,
sleet in sufficient depth causes hazardous driving conditions. Ice storms are the result of cold rain that freezes upon contact with a cold surface, coating the ground, trees, buildings, and overhead wires with ice, at times causing extensive damage.

**Risk Assessment**

Only one ice storm, on May 11, 2006, was recorded in Ontonagon County from 2001 to 2011. Damage was minimal, at $3,000. The probability of a similar event is low in any given year but quite likely to happen at some point. Severity can be predicted as low to moderate. Critical services such as electricity and telephone systems can potentially be disrupted in such an event, and icy weather conditions can slow emergency response. The County does have notable vulnerability to this hazard since, though residents are accustomed to snowstorms, ice and sleet storms have unique aspects that residents may not be prepared for.

*Probability:* low throughout  
*Severity:* low to moderate

**Lightning**

The discharge of electricity from a thunderstorm is lightning. Lightning is often perceived as a minor hazard, but it damages many structures and kills and injures more people in the United States each year (on average) than tornadoes or hurricanes. Michigan ranks second in the nation in both lightning-related deaths and injuries. Many deaths and injuries could be avoided if people were educated about the threat of lightning.

**Risk Assessment**

No lightning incidents in Ontonagon County were recorded from 2001 through 2011, but 31 thunderstorms were recorded from 2001 to 2011 for a frequency of 2.8 per year. No lightning-related damage was reported for any of these storms. Future probability of lightning is high since some degree of lightning is inherent to thunderstorms, but severity can vary widely based on site and other factors. The County is vulnerable to lightning due to difficulty in mitigating it.

*Probability:* high throughout
Severity: cannot be predicted

Severe Winds

Winds 58 miles per hour or greater are classified as a windstorm by the National Weather Service and are a fairly common occurrence in many areas of Michigan. Along the Great Lakes shoreline, high winds occur regularly, and hurricane-velocity gusts (over 74 miles per hour) occasionally occur with a storm system. Severe winds cause damage to homes and businesses, power lines, trees, and agricultural crops. Power outages can result in the need for sheltering of those without power for extended times. Along with the Great Lakes shorelines, windstorms in Michigan occur most often in the central and southern parts of the Lower Peninsula.

Risk Assessment

Ontonagon County has experienced seven high wind events from 2001 to 2011, for a frequency of about 0.7 per year. Two events yielded recordable damage: A November 9, 2005 event totaled $150,000 (including other counties), and a June 6, 2011 event totaled $3,000. The damage was primarily to trees and power lines. It is not possible to provide a monetary estimate of damage, as jurisdiction-specific figures are unavailable. The potential for widespread damage throughout the county adds to this difficulty. While the Lake Superior shoreline faces an elevated risk, it is important to note that high winds are among the most common and prevalent hazards encountered in Ontonagon County resulting in recordable damage.

Probability: moderate along Lake Superior shore in Carp Lake, Ontonagon, and Bohemia Townships; low to moderate elsewhere
Severity: moderate to high; highest along Lake Superior shore

Snowstorms

Snowstorms are defined as periods of rapid accumulation of snow, which is often accompanied by high winds, cold temperatures, and low visibility. Blizzards are the most dramatic and perilous of all snowstorms, as the snow is accompanied by low temperatures and strong winds. Snow associated with a blizzard is in the form of fine, powdery particles windblown in such great quantities that visibility is at times reduced to only a few feet.
Risk Assessment

Ontonagon County recorded 105 snow events from 2001 to 2011, for a frequency of 10.5 per year and very high future probability. Severity is low to moderate throughout the County in the context of an accustomed population. Determination of jurisdiction-specific impact is not possible, as damage estimates do not include this information. The cost of a typical snowstorm is difficult to estimate, as a series of small events can have the financial impact of one large event.

*Probability*: very high throughout  
*Severity*: low to moderate

Tornadoes

A tornado is a violently rotating column of air extending to the ground from a cumulonimbus cloud. The funnel associated with a tornado may have winds up to 300 miles per hour and interior air pressure that is 10 to 20 percent below that of the surrounding atmosphere. The typical length of a tornado path is 16 miles, but tracks up to 200 miles have been reported. Path widths are typically less than a quarter mile but can be over a mile. Historically, tornadoes have resulted in a greater loss of life than any other natural hazard, with a national average death toll of 111 persons. Property damage resulting from tornadoes totals hundreds of millions of dollars every year. The average annual number of tornadoes in Michigan is 18, with most occurring in the southern Lower Peninsula. Ontonagon has had three recorded tornadoes since 1950: an F1 in 1953 that caused $250,000 in damage, an F0 in 1988 with no reported damage, and an F0 in August 2011 that resulted in an estimated $100,000 in damages.

Risk Assessment

There have been only three tornadoes recorded in 58 years in Ontonagon County. The strongest tornado was the 1953 incident that was recorded as an F1 and caused $250,000 in property damage. Probability of a future event is low: The sparse history of tornadoes in Ontonagon County places its risk of a similar event in any given year at less than five percent. Severity cannot be predicted for a specific event but is expected to be at least
moderate. The County is vulnerable to tornadoes due to their low frequency and residents' resulting low level of preparedness.

**Probability:** very low to low throughout  
**Severity:** moderate to high

### 2.3 Technological Hazards

**Hazardous Materials: Fixed Site Incident**

A fixed site incident is an uncontrolled release of hazardous materials from a stationary location, capable of posing a risk to health, safety, property, and the environment. Hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other community facilities. Hazardous materials or substances pose a threat to life, health, property, and environment if released, because of their chemical, physical, or biological nature. Hazardous materials are carefully regulated by the government in order to reduce risk, but accidental releases can occur during the manufacture, transport, storage, use, and disposal of the materials. Areas at highest risk are within a one- to five-mile radius of identified hazardous materials sites. Many communities have detailed response plans in place in order to mitigate the harm to people, property, and the environment from hazardous materials.

**Background**

There are only a few facilities within Ontonagon County with supplies of Extremely Hazardous Substances that require reporting under the Superfund Amendments and Reauthorization Act (SARA) Title III. Title III identifies what steps facilities, the state, and local communities must take in order to protect the public from hazardous materials accidents. The only facility within Ontonagon County that is required to report under Title III is Interstate Batteries in Trout Creek.

**Risk Assessment**

Chemicals that are being used in Ontonagon County, whether reportable or not, are isolated and in relatively small quantities. Probability of an event is low throughout the County, and
severity is estimated as low to moderate. Vulnerability is low since emergency responders are generally well-prepared to deal with an event.

**Probability:** low throughout

**Severity:** low to moderate

**Hazardous Materials: Transportation Incident**

A hazardous materials transportation incident is the uncontrolled release of hazardous materials during transport, capable of posing a risk to health, safety, property, or the environment. Highway, railroad, seaway, airway, and pipeline systems carry thousands of hazardous materials shipments daily. A transportation incident with hazardous materials could cause a local emergency. Areas at risk are those within one to five miles from major transportation routes for hazardous materials. The U.S. Department of Transportation regulates the transport and shipment of over 18,000 different materials. All areas of Michigan are vulnerable to a hazardous materials transportation incident, while more urbanized and industrialized areas are at greater risk due to the high population concentration and large number of transportation routes in these areas.

**Background**

Highway M-28 through southern Ontonagon County is a major transportation route for trucks traveling to and from Canada. The types and amounts of hazardous materials transported on trucks traveling this route are often unknown. While there are State and Federal Government restrictions for the transport of hazardous materials, this information is not required to be passed on to the local units of government which could potentially be affected by a transportation accident. Highway U.S. 45 cuts a north-south swath through the west end of the County north to Ontonagon and also carries some truck traffic, as do segments of M-38 and M-64. Two railroad lines run through the County: the Escanaba and Lake Superior Railroad runs southeast from the Village of Ontonagon to the County border, and the Canadian Northern Railroad runs south and west from White Pine. A third track, which originally connected the other two, has been abandoned. The active lines may carry certain hazardous freight materials but receives light use if any. Ontonagon County also has many miles of shoreline susceptible to shipping accidents on Lake Superior.
Risk Assessment

A hazardous materials transportation incident is possible in Ontonagon County. There is moderate risk based on the high level of Canadian and American truck traffic (especially along M-28 through a number of townships), possible light rail traffic, and the County's proximity to shipping channels, which put all jurisdictions in the County at risk. Probability of a transportation accident is still low and severity unpredictable due to case-specificity and lack of previous events from which to judge. This unpredictability contributes to making this type of incident one of the greatest hazard risks in Ontonagon County.

Probability: low throughout
Severity: cannot be predicted

Infrastructure Failure and Secondary Technological Hazards

An infrastructure failure is a failure of critical public or private transportation or utilities infrastructure resulting in temporary loss of essential functions and/or services. Public and private utilities provide essential services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. The failure of one or more of the utility systems—even for a short time—can have devastating consequences. During power outages, people can die in their homes from extreme heat or cold. When water or wastewater treatment facilities are inoperable, serious health problems can arise, and action must be taken immediately to prevent outbreaks of disease. If infrastructure failure results from a natural hazard event, it is termed a secondary or cascading technological hazard.

Background

Though many of the hazards considered in this plan could result in infrastructure failures, these failures are dangerous in and of themselves due to the harsh climate and remoteness of the county. The County is served by a number of systems including power, water treatment, and phone, and the loss of any or all of the systems can have a detrimental impact on the functioning of the County. A failure of infrastructure or utilities can include anything from power outages to water treatment failure. The most frequent events in Ontonagon County in this category are losses of electrical power on a number of occasions. While power outages are usually of a short duration—up to a few hours—the implications of
an extended outage could affect the health and safety of a community. Some municipalities also have aging sewage systems that are prone to leakage and contamination. Carp Lake Township has indicated this as a concern.

A less predictable event occurred on January 26, 2013 when Rockland Township’s entire 200,000-gallon public water tank rapidly drained as the result of a leak. Several days passed before the leak source could be pinpointed and full water service restored. Meanwhile, 150 households were left without water, leaving them to rely on bottled water for drinking and National Guard-supplied non-potable water at the Township’s fire hall. Although the event was an anomaly, it illustrates the potential impact of infrastructure failure to a larger population and institutions that cannot so easily adjust.

Risk Assessment

Loss of power to the area grid can affect the entire region. Due to the area’s rural nature, trees can fall on power lines in remote locations causing a delay in restoration of service. Trimming trees adjacent to power lines decreases this risk. Water systems, wastewater systems, and phone service can also be affected by failure or secondary failure, and this may be due to aging facilities. Probability is high throughout the County, since there are no truly urbanized locations at greater or lesser likelihood of being affected by any infrastructure failure. Frequency is estimated to be two events per year based on recent history of power outages in Ontonagon County. Severity is generally low to moderate but difficult to predict since numerous factors contribute to the impact of an infrastructure failure, including services affected, weather conditions, response capabilities, and time of day.

*Probability:* high throughout
*Severity:* low to moderate

Transportation Accidents (Passenger)

A transportation accident is a crash or accident involving an air, land, or water-based commercial passenger carrier resulting in death or serious injuries. The most vulnerable areas are communities with or near an airport with commercial passenger service, communities with railroad tracks and commercial rail freight or passenger service, communities with commercial intercity bus or local transit bus service, communities with school bus service, and communities in which commercial marine passenger ferry service is
provided. A serious accident involving any of these modes of transportation could result in mass casualties, requiring immediate life-saving response, and a marine accident would require water rescue, possibly in dangerous Great Lakes conditions. Michigan has approximately 19 airports with commercial passenger service, 130 certified intercity bus carriers serving 220 communities, 72 local bus transit systems serving 85 million passengers, 19 marine passenger ferry services, and three intercity rail passenger routes operating on 568 miles of track along three corridors serving 22 communities.

Background

Ontonagon County has school bus service, tour buses, public transit, and an airport without scheduled commercial passenger service. There is not a history of a large passenger transportation accident in Ontonagon County.

Risk Assessment

The risk of a large-scale passenger transportation accident is limited by the types of services available in Ontonagon County. Probability is low, and the low volume of commercial passenger traffic indicates any potential incident is likely to be isolated and of a small scale, so potential severity is predicted as low to moderate. Mitigating potential accidents is difficult due to the unpredictability of and lack of experience with this type of event, leaving the County somewhat vulnerable. Emergency response plans and awareness of hazardous intersections and roadways are ways to prepare for this type of hazard.

*Probability*: low

*Severity*: low to moderate

Petroleum and Natural Gas Incidents

These incidents result in the uncontrolled release of petroleum, natural gas, or hydrogen sulfide, a poisonous by-product. Though often overlooked as a threat because much of the petroleum and gas infrastructure in Michigan is located underground, petroleum and gas pipelines can leak, erupt, or explode. This can result in property damage, environmental contamination, injuries, and loss of life. In addition, if hydrogen sulfide is released, it is an extremely poisonous gas that is explosive when mixed with air at temperatures of 500
degrees Fahrenheit or above. These dangers can be found around oil and gas wells, pipeline terminals, storage facilities, and transportation facilities, as well as in pipelines.

Oil and gas are produced from fields in over 60 counties in the Lower Peninsula, with over 40,000 wells in these counties. Of that total, approximately 20,000 have produced oil or gas, and over 1.1 billion barrels of oil and 3.6 trillion cubic feet of gas have been withdrawn from these wells.

**Background**

Northern Natural Gas has a large inter-county natural gas pipeline that delivers natural gas to markets in Ontonagon County and surrounding areas. The pipeline runs along Highway M-28 across the southern portion of Ontonagon County and also has a spur that heads north along M-64 to the Village of Ontonagon. There are two propane storage facilities in Ontonagon County: Settler’s Co-op in Bruce Crossing and FerrellGas in Ontonagon.

**Risk Assessment**

There is a risk of a petroleum or natural gas incident in Ontonagon County due to aging transmission lines or sabotage. The transmission lines may be at greater risk due to the remoteness of the area, allowing a leak to go undetected for an extended period of time. It is not terribly unusual for minor leaks to occur, but these are normally detected and repaired in short order. In jurisdictions where a pipeline is present, probability of a significant pipeline incident is low to moderate, and severity cannot be predicted. Impact of this hazard would be mostly ecological or environmental, as the pipeline is located underground and mainly in undeveloped or sparsely developed areas. Propane incidents have low probability in affected jurisdictions and are predicted to have low to high potential severity.

*Probability:* low to moderate (pipeline) in Bergland, Carp Lake, Interior, Matchwood, McMillan, Ontonagon, and Stannard Townships and Village of Ontonagon; low (pipeline) in Haight Township; low (propane) in Ontonagon and Stannard Townships and Village of Ontonagon; none elsewhere

*Severity:* low (pipeline) in Haight Township; cannot be predicted (pipeline) elsewhere; low to high (propane) in Ontonagon and Stannard Townships and Village of Ontonagon; none (propane) elsewhere
2.4 Human-Related Hazards

Civil Disturbances

A civil disturbance is a public demonstration or gathering, or an uprising in a prison or other institution, resulting in some disruption of essential community functions or in rioting, looting, arson, or other unlawful behavior. Large-scale disturbances, although rare, are typically the result of labor disputes, controversial or high-profile judicial proceedings, governmental actions or implementation of controversial laws, resource shortages due to a catastrophic event, disagreements by special interest groups, or a perceived-unjust injury or death of a person held in high regard by a segment of society. Places that may be subject to or impacted by this type of disturbance are government buildings, military bases, universities, businesses, nuclear power plants, and critical service facilities such as police and fire stations. Prison uprisings occur when inmates are upset over rules, operating procedures, or living conditions, or during problems between rival groups or gangs within the facility.

Background

Ontonagon County is not the center of serious civil disturbance-prone venues or activities such as prisons or controversial governmental operations, and no such events have occurred.

Risk Assessment

The probability of civil disturbance is low in Ontonagon County. Governmental offices in the area could be a target, but such an unlikely event would be anticipated and could be moderated by existing response plans. Severity of an incident is predicted as low to moderate.

Probability: low, but highest in Village of Ontonagon
Severity: low to moderate
Public Health Emergencies

A public health emergency is the result of 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. Public health emergencies can take many forms: disease epidemics; large-scale food or water contamination; extended periods without adequate water or sewer services; harmful exposure to chemical, radiological, or biological agents; or large-scale infestations of disease-carrying insects or rodents. Public health emergencies can occur by themselves or may be a secondary event caused by other emergencies or disasters such as a flood or hazardous materials incident. Public health emergencies can be statewide, regional, or localized in scope and magnitude, but the common characteristic is that they adversely impact or have the potential to impact a large number of people.

Background

There is no recent history of widespread public health emergencies. Although small influenza outbreaks and similar minor epidemics occur, these emergencies would have limited extent. There is potential in Ontonagon County for disease outbreaks and contamination as an isolated event or as a secondary event to flooding or other incidents.

Risk Assessment

Ontonagon County is aware of and prepared to deal with impacts associated with public health emergencies. While awareness and planning are the key, a large-magnitude epidemic could overload limited facilities that are equipped to deal with this type of emergency. The remoteness of the County could also be a factor during a large-scale emergency. Probability is low. Potential severity, while difficult to predict, can generally be assumed to be low to moderate, due in large part to the County's widely dispersed rural population and low level of impact from thru travelers. The impact to the county from a public health emergency is also difficult to calculate, as this hazard has the potential to impact the entire population, either through illness, injury, or death, but little likelihood of doing so.

Probability: low throughout
Severity: low to moderate
Sabotage/Terrorism

Sabotage or terrorism is 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 or terrorism can take many forms, including bombings; assassinations; organized extortion; use of nuclear, chemical, and biological weapons; information warfare; ethnic, religious, or gender intimidation (hate crimes); advocacy of overthrow of the U.S. Government; and disruption of legitimate scientific research or resource-related activities (eco-extremism).

Because sabotage and terrorism objectives are so widely varied, so too are the potential targets of such actions. Virtually any public facility or place of public assembly is a potential target. Businesses engaged in controversial activities are also potential targets. Large computer systems operated by government agencies, financial institutions, large businesses, healthcare facilities, and universities are becoming increasingly at risk.

Background

Although no high-profile sabotage/terrorist events have occurred in Ontonagon County, the area is not immune to this problem. Logging businesses and any other large industries that develop could be targets for eco-activists, while there is also a possibility of small militia-type uprisings.

Risk Assessment

Ontonagon County has a short list of targets of sabotage/terrorist activities, but the likelihood of an event to have a detrimental impact on the County is minimal. Probability is low, but severity is widely variable depending on the nature of the threat. An event is most likely to be isolated with a specific target, and this unpredictability leads to some vulnerability.

Probability: low throughout
Severity: cannot be predicted
2.5 Ontonagon County Hazard Risk Assessment

Currently there is not a reliable way to accurately estimate costs associated with many hazards that affect Ontonagon County. Numerous variables can affect the vulnerability of the County to hazards, including location, scale, and time of day. The time of year also affects vulnerability, as the population in many jurisdictions varies by season, and response capabilities are often compromised in winter.

While Ontonagon County is susceptible to many types of hazards, each jurisdiction varies in its level of vulnerability to certain hazards. Vulnerability to most weather hazards, fire hazards, flooding due to spring runoff, and all technological and societal hazards, have been determined to be similar for most of Ontonagon County. The following table provides a summary of the hazards within the County and notes any differences between communities (see Table 2-1).

Table 2-1: Vulnerability Summary by Jurisdiction

<table>
<thead>
<tr>
<th>Jurisdiction (Population)</th>
<th>Vulnerability Summary</th>
</tr>
</thead>
</table>
| Ontonagon County (6,780)  | Hazards of similar threat to all of Houghton County include:  
                           • Earthquake  
                           • Fire (all types)  
                           • Weather (all types)  
                           • Technological hazards (most)  
                           • Societal hazards (all) |
| Bergland Township (467)  | Flooding (riverine from runoff, inundating M-28)  
                           • Hazardous materials – transportation (along M-28) |
| Bohemia Township (82)    | High winds (Lake Superior shoreline)  
                           • Lake Superior shoreline flooding and erosion |
| Carp Lake Township (722) | Flooding (riverine from runoff)  
                           • Subsidence risk due to former White Pine Copper Mine  
                           • High winds (Lake Superior shoreline)  
                           • Lake Superior shoreline flooding and erosion |
| Greenland Township (792) | No township-specific vulnerability identified |
| Haight Township (212)    | No township-specific vulnerability identified |
| Interior Township (336)  | Hazardous materials – transportation (along M-28) |
| Matchwood Township (94)  | Flooding (riverine from runoff, inundating M-28)  
                           • Hazardous materials – transportation (along M-28) |
| McMillan Township (478)  | Flooding (riverine, seasonal)  
                           • Hazardous materials – transportation (along M-28) |
Table 2-1: Vulnerability Summary by Jurisdiction

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Vulnerability Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontonagon Township</td>
<td>• Dam failure (Victoria Dam and others upstream)</td>
</tr>
<tr>
<td>(2,579*)</td>
<td>• Flooding (riverine, Ontonagon River)</td>
</tr>
<tr>
<td></td>
<td>• High winds (Lake Superior shoreline)</td>
</tr>
<tr>
<td></td>
<td>• Lake Superior shoreline flooding and erosion</td>
</tr>
<tr>
<td>Rockland Township</td>
<td>• Dam failure (Victoria Dam and others upstream [including Kitchin])</td>
</tr>
<tr>
<td>(228)</td>
<td></td>
</tr>
<tr>
<td>Stannard Township</td>
<td>• Hazardous materials – transportation (along M-28)</td>
</tr>
<tr>
<td>(790)</td>
<td>• Hazardous materials – transportation (along M-28)</td>
</tr>
<tr>
<td>Village of Ontonagon</td>
<td>• Dam failure (Victoria Dam and others upstream)</td>
</tr>
<tr>
<td>(1,494)</td>
<td>• Flooding (riverine from runoff and urban)</td>
</tr>
<tr>
<td></td>
<td>• Structural fires (due to compact downtown development)</td>
</tr>
<tr>
<td></td>
<td>• High winds (Lake Superior shoreline)</td>
</tr>
<tr>
<td></td>
<td>• Lake Superior shoreline flooding and erosion</td>
</tr>
</tbody>
</table>

*Includes Village of Ontonagon

Technical expertise is necessary to estimate the costs of each potential hazard. The value of property in Ontonagon County and its communities can, at a minimum, provide an overview of property that can be affected by hazards. The table below shows the State Equalized Value (SEV) of properties in Ontonagon County by location and class (see Table 2-2). Vulnerability estimates that are provided in this plan are based on a most likely scenario.

Table 2-2: State Equalized Values for Ontonagon County, 2010

<table>
<thead>
<tr>
<th>Township</th>
<th>Agriculture</th>
<th>Commercial</th>
<th>Industrial</th>
<th>Residential</th>
<th>Timber-Cutover</th>
<th>Total Real</th>
<th>Personal</th>
<th>Total Real &amp; Personal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bergland</td>
<td>0</td>
<td>2,619,750</td>
<td>8,400</td>
<td>46,509,750</td>
<td>788,450</td>
<td>49,926,350</td>
<td>1,946,550</td>
<td>51,872,900</td>
</tr>
<tr>
<td>Bohemia</td>
<td>0</td>
<td>27,534</td>
<td>10,280</td>
<td>13,919,011</td>
<td>1,209,813</td>
<td>15,166,638</td>
<td>268,190</td>
<td>15,434,828</td>
</tr>
<tr>
<td>Carp Lake</td>
<td>15,000</td>
<td>2,920,850</td>
<td>3,037,850</td>
<td>28,496,950</td>
<td>5,983,900</td>
<td>40,454,550</td>
<td>11,336,600</td>
<td>51,791,150</td>
</tr>
<tr>
<td>Greenland</td>
<td>2,230,800</td>
<td>17,498,950</td>
<td>31,950</td>
<td>18,532,100</td>
<td>3,034,900</td>
<td>25,579,700</td>
<td>1,284,750</td>
<td>26,864,450</td>
</tr>
<tr>
<td>Haight</td>
<td>910,700</td>
<td>2,389,250</td>
<td>1,806,700</td>
<td>16,346,700</td>
<td>2,269,750</td>
<td>21,572,100</td>
<td>314,350</td>
<td>21,886,450</td>
</tr>
<tr>
<td>Interior</td>
<td>804,550</td>
<td>410,270</td>
<td>606,840</td>
<td>12,663,550</td>
<td>1,234,430</td>
<td>15,719,640</td>
<td>602,566</td>
<td>16,322,206</td>
</tr>
<tr>
<td>Matchwood</td>
<td>2,430,750</td>
<td>240,050</td>
<td>99,000</td>
<td>7,005,300</td>
<td>3,193,850</td>
<td>12,968,950</td>
<td>840,026</td>
<td>13,808,976</td>
</tr>
<tr>
<td>McMillan</td>
<td>2,603,600</td>
<td>1,599,300</td>
<td>9,550</td>
<td>14,298,850</td>
<td>1,719,500</td>
<td>20,230,100</td>
<td>980,300</td>
<td>21,211,100</td>
</tr>
<tr>
<td>Ontonagon</td>
<td>1,323,450</td>
<td>6,888,200</td>
<td>4,084,700</td>
<td>89,237,800</td>
<td>5,965,250</td>
<td>107,499,400</td>
<td>8,885,700</td>
<td>116,385,100</td>
</tr>
<tr>
<td>Rockland</td>
<td>124,650</td>
<td>349,800</td>
<td>15,614,300</td>
<td>6,736,700</td>
<td>2,006,800</td>
<td>24,832,250</td>
<td>1,254,250</td>
<td>26,086,500</td>
</tr>
<tr>
<td>Stannard</td>
<td>2,236,300</td>
<td>1,994,200</td>
<td>34,200</td>
<td>21,551,900</td>
<td>3,115,750</td>
<td>28,932,350</td>
<td>1,851,800</td>
<td>30,784,150</td>
</tr>
<tr>
<td>County Total Real</td>
<td>392,447,810</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Villages are included in townships where applicable
2.5 Hazard Priority Ranking

Mitigation activities for Ontonagon County are prioritized by hazard ranking based on the following criteria: historical occurrence, affected area, speed of onset, impact, economic effects, duration, seasonal pattern, predictability, collateral damage, availability of warnings, and mitigation potential. A score of 1 (least risk) to 10 (greatest risk) was assigned for each of the risk factors for all hazards in Ontonagon County in order to develop an overall score and ranking. The scoring for each hazard was based on the following:

**Historical Occurrence**: Low Occurrence (1 pt) – High Occurrence (10 pts)

**Affected Areas**: Single Site (1 pt) – Large Area (10 pts)

**Speed of Onset**: Greater than 24 hrs (1 pt) – Minimal/No Warning (10 pts)

**Population Impact**: No Impact (1 pt) – High Impact (10 pts)

**Economic Effects**: Minimal Effects (1 pt) – Significant Effects (10 pts)

**Duration**: Minimal Duration (1 pt) – Long Duration (10 pts)

**Seasonal Pattern**: One Season (1 pt) – Year-Round (10 pts)

**Predictability**: Highly Predictable (1 pt) – Unpredictable (10 pts)

**Collateral Damage**: No Possibility (1 pt) – High Possibility (10 pts)

**Availability of Warnings**: Warnings Available (1 pt) – Not Available (10 pts)

**Mitigation Potential**: Easy to Mitigate (1 pt) – Impossible to Mitigate (10 pts)

The following total scores represent results of the hazard priority ranking completed by the Ontonagon County Hazard Mitigation Committee. *Earthquakes are not included in the hazard evaluation because they are very unlikely to occur in Ontonagon County.*

- Hazardous Materials – Transportation Accidents (82 points)
- Sabotage/Terrorism (81)
- Infrastructure Failures/Secondary Technological Hazard (78)
- Petroleum/Natural Gas Incident (78)
- Public Health Epidemic (74)
- Structural Fires (73)
- Snowstorms (71)
- Wildfires (70)
- Subsidence (69)
- Dam Failure (67)
Ice and Sleet Storms (66)
Severe Winds (65)
Civil Disturbance (65)
Tornadoes (64)
Scrap Tire Fires (63)
Drought (63)
Extreme Temperatures (63)
Transportation Accident (62)
Riverine and Urban Flooding (60)
Hail (57)
Shoreline Flooding and Erosion (56)
Lightning (56)

See Table 2-3 for complete hazard ranking scores.

**2.6 Hazard Summary**

Although many of the hazards identified can and do occur throughout Ontonagon County, the highest priority hazards include:

- Hazardous Materials – Transportation Accident
- Sabotage/Terrorism
- Infrastructure Failures/Secondary Technological Hazard
- Petroleum/Natural Gas Incident
- Public Health Epidemic

Hazard mitigation activities will focus on mitigating loss due to these priority hazards in Ontonagon County while also considering activities that may mitigate loss due to lower ranking hazards.
<table>
<thead>
<tr>
<th>Hazard</th>
<th>Historical Occurrence</th>
<th>Affected Area</th>
<th>Speed of Onset</th>
<th>Popul. Impact (casualties)</th>
<th>Economic Effects</th>
<th>Duration</th>
<th>Seasonal Pattern</th>
<th>Predictability</th>
<th>Collateral Damage</th>
<th>Availability of Warnings</th>
<th>Mitigative Potential</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dam Failure</td>
<td>1</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>9</td>
<td>5</td>
<td>6</td>
<td>67</td>
</tr>
<tr>
<td>Riverine &amp; Urban Flooding</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>Shore, Erosion &amp; Flooding</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>56</td>
</tr>
<tr>
<td>Scrap Tire Fires</td>
<td>3</td>
<td>3</td>
<td>10</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>10</td>
<td>5</td>
<td>9</td>
<td>4</td>
<td>63</td>
</tr>
<tr>
<td>Structural Fires</td>
<td>5</td>
<td>4</td>
<td>10</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>73</td>
</tr>
<tr>
<td>Wildfires</td>
<td>4</td>
<td>6</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>9</td>
<td>5</td>
<td>9</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>70</td>
</tr>
<tr>
<td>Subsidence</td>
<td>1</td>
<td>4</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>6</td>
<td>9</td>
<td>6</td>
<td>69</td>
</tr>
<tr>
<td>Drought</td>
<td>3</td>
<td>9</td>
<td>1</td>
<td>7</td>
<td>7</td>
<td>10</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>7</td>
<td>63</td>
</tr>
<tr>
<td>Extreme Temperatures</td>
<td>5</td>
<td>9</td>
<td>2</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>7</td>
<td>63</td>
</tr>
<tr>
<td>Hail</td>
<td>2</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>57</td>
</tr>
<tr>
<td>Ice and Sleet Storms</td>
<td>4</td>
<td>10</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>8</td>
<td>4</td>
<td>7</td>
<td>66</td>
</tr>
<tr>
<td>Lightning</td>
<td>5</td>
<td>9</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>7</td>
<td>56</td>
</tr>
<tr>
<td>Severe Winds</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>8</td>
<td>65</td>
</tr>
<tr>
<td>Snowstorms</td>
<td>7</td>
<td>10</td>
<td>5</td>
<td>10</td>
<td>8</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>71</td>
</tr>
<tr>
<td>Tornadoes</td>
<td>1</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>9</td>
<td>5</td>
<td>8</td>
<td>64</td>
</tr>
<tr>
<td>Haz-material, Fix. Site Incld.</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>9</td>
<td>5</td>
<td>51</td>
</tr>
<tr>
<td>Haz-material, Transp. Accids</td>
<td>2</td>
<td>6</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>9</td>
<td>6</td>
<td>82</td>
</tr>
<tr>
<td>Infra Failure/ Secnd. TechHaz</td>
<td>1</td>
<td>6</td>
<td>10</td>
<td>8</td>
<td>9</td>
<td>7</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>78</td>
</tr>
<tr>
<td>Petroleum/Nat. Gas Accident</td>
<td>2</td>
<td>6</td>
<td>10</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>10</td>
<td>10</td>
<td>7</td>
<td>9</td>
<td>6</td>
<td>78</td>
</tr>
<tr>
<td>Transp. Accid. (Passenger)</td>
<td>3</td>
<td>4</td>
<td>10</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>9</td>
<td>4</td>
<td>62</td>
</tr>
<tr>
<td>Civil Disturbance</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>3</td>
<td>10</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>65</td>
</tr>
<tr>
<td>Public Health Epidemic</td>
<td>2</td>
<td>9</td>
<td>6</td>
<td>9</td>
<td>7</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>74</td>
</tr>
<tr>
<td>Sabotage/ Terrorism</td>
<td>1</td>
<td>5</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>9</td>
<td>7</td>
<td>81</td>
</tr>
</tbody>
</table>
Mitigating Hazards in Ontonagon County

Goals for the Ontonagon County Hazard Mitigation Plan were established to address the highest priority hazards identified in Section 2 of this plan (Hazardous Materials – Transportation Accident, Hazardous Materials – Fixed Site Incident, Sabotage/Terrorism, Infrastructure Failure/Secondary Technological Hazard, and Petroleum/Natural Gas Incident) while also considering efforts that could assist with lower-ranking or unknown hazards that may affect the County. Four general goals were established to guide mitigation efforts. The goals are considered comprehensive and give guidance to identifying mitigation activities in Ontonagon County.

**Goal 1:** Protect lives and property within Ontonagon County from all known hazards while focusing on priority hazards.

**Goal 2:** Identify feasible projects throughout the County that will help mitigate future problems.

**Goal 3:** Be proactive in protecting public facilities and critical facilities through up-to-date response plans and upgrades as needed.

**Goal 4:** Educate citizens in order to encourage self-help and the mitigation of hazards on private property.

Mitigation activities can fall into a number of categories, including preventive measures, property protection, emergency services, structural projects, natural resource protection, and public information. The following is an overview of potential activities by category and general recommendations within each activity category for Ontonagon County.

### 3.1 Preventive Measures

The purpose of preventive measures is to protect new development from hazards and ensure that potential loss is not increased. Preventive measures are typically guided through planning activities and enforced through zoning and building codes at the local level. A number of activities in the preventive measures category can be implemented at the local level, including:
Building Codes: Building codes are an effective way to address many hazards identified in this plan. Through building code enforcement, all new and improved buildings can be built or rehabilitated to withstand the impacts of certain hazards such as snow load, high winds, extreme temperatures, and flooding.


Thorough inspection of property during and after construction ensures that builders are incorporating all the current standards and requirements in effect. Administration and enforcement of the statewide codes varies by municipality in Ontonagon County according to the following table (see Table 3-1).

<table>
<thead>
<tr>
<th>Unit of Government</th>
<th>Building</th>
<th>Electrical</th>
<th>Mechanical</th>
<th>Plumbing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontonagon County</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Village of Ontonagon</td>
<td>State</td>
<td>State</td>
<td>State</td>
<td>State</td>
</tr>
<tr>
<td>Township of Bergland</td>
<td>Local</td>
<td>State</td>
<td>State</td>
<td>State</td>
</tr>
<tr>
<td>Township of Bohemia</td>
<td>State</td>
<td>State</td>
<td>State</td>
<td>State</td>
</tr>
<tr>
<td>Township of Carp Lake</td>
<td>Local</td>
<td>State</td>
<td>State</td>
<td>State</td>
</tr>
<tr>
<td>Township of Greenland</td>
<td>Local</td>
<td>State</td>
<td>State</td>
<td>State</td>
</tr>
<tr>
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Planning and Zoning

Planning and zoning guides where development should occur based on suitability and compatibility. Planning and zoning keeps development away from sensitive areas such as floodplains and wetlands, which can protect property from certain types of natural hazards.

Comprehensive plans are the primary way for a local unit of government to guide future development within their community. Through a planning process that reviews a community’s background, current land use and projected needs, guidance can be given to future development. Unfortunately, comprehensive plans serve only as a guide and do not regulate land use.

Zoning regulations are the primary tool to implement comprehensive plans and control land use. A community can guide development by identifying different zones or districts within its boundaries. Zoning puts restrictions on lot use, size, setbacks, and other characteristics, but can be combined with more creative regulations such as a "planned unit development" option that allows for more flexibility in the development process. Zoning is enforced by the local unit of government and should be based on a comprehensive plan for the community.

All townships in Ontonagon County are zoned except Matchwood. The Village of Ontonagon is zoned and operates in accordance with a Master Plan completed in 2007. The Plan emphasizes changes in land use and traffic patterns as a result of the rerouting of Highway M-64 in conjunction with a new bridge over the Ontonagon River constructed in 2006. These changes remain in flux.

Land Division (Subdivision) Regulations

In Michigan, the Land Division Act (Public Act 288 of 1967, amended by Public Act 591 of 1996 and Public Act 87 of 1997) calls for all divisions of property to be approved by the local unit of government. The act regulates the division of land in order to promote the public health, safety and general welfare; to further the orderly layout and use of land; and to require the land be suitable for building sites and public improvements, among other things. The new law authorizes municipal approval with basic, objective rules, including lot shape, minimum width and size standards, an adequate description, and safe access; it sets a 45-day time limit on municipal approval.
Open Space Preservation

Open space preservation is a way to keep hazardous areas free from development and is especially effective in floodplain areas. Prohibiting new development in hazard-prone areas is the best way to mitigate future problems. An additional benefit to open space preservation is the maintenance of agricultural areas and green space/parks. Comprehensive plans can help identify suitable areas to preserve through any number of means including acquisition, easement, donation by developers, or regulated setbacks and buffers where development is restricted.

Storm Water Management

Storm water management is a way to control flooding, both urban and riverine. While natural groundcover serves to absorb water, development (such as paving) can increase runoff in a watershed. Increased runoff can cause flooding, overloaded drainage systems, erosion, and impaired water quality. An effective method of storm water management is to regulate all development, particularly in floodplains, to manage runoff.

Under the National Flood Insurance Program, participating communities have minimum development and height requirements in a floodplain in order to mitigate future losses. Development regulations can also require that storm water does not leave a new development at a higher rate than pre-development conditions. Storm water can be managed through natural vegetation, buffers, and retention basins. Storm water runoff impacts an entire watershed, and a coordinated effort amongst affected municipalities is the most effective way to address the larger problem.

Ontonagon County Project Recommendations

Ontonagon County is guided by a number of current plans and regulations. Local planning and zoning officials should prioritize updating plans and ordinances as necessary to reflect changing land use patterns and address hazard mitigation.

Storm water management in the Village can be studied to determine whether new development has contributed to flooding hazards in the County. If studies determine problems exist, new storm water management requirements can be built into local regulations.
3.2 Property Protection

The purpose of property protection measures is to prevent a hazard from damaging a building. Property protection measures are typically implemented by homeowners, but government can often provide technical and sometimes financial assistance. There are four general activities that can be classified as property protection:

- Keep Hazards Away
- Retrofitting
- Insurance Coverage
- Demolition

Property protection is typically the responsibility of the property owner but can be encouraged through mandates if information and incentives don’t encourage property owners to take action. The federal government requires public facilities to be insured as a condition of receiving Federal disaster assistance. Local government is expected to protect critical facilities including fire stations, water treatment plants, and others. Protecting these facilities through retrofitting and sufficient, comprehensive insurance should be a priority.

Financial assistance, including grants and low-interest or forgivable loans, can also sometimes be provided to property owners by communities to assist with protective measures. Often with a little incentive, homeowners will take the initiative to build upon the opportunity with additional work on protective measures.

Outside financial assistance for pre-disaster preventive measures can include:

- FEMA’s Pre-Disaster Mitigation (PDM) grants
- FEMA’s Flood Mitigation Assistance (FMA) grants
- FEMA’s Hazard Mitigation Grant Program
- Community Development Block Grants

Post-disaster financial assistance includes insurance claims, FEMA Hazard Mitigation Grant Program and disaster assistance, Small Business Administration Disaster Loans (for non-governmental properties), and Federal Highway Administration Emergency Relief Program.
The government should also take a role as an educator by providing basic information to citizens on property protection measures.

**Keep Hazards Away**

Hazard impact is typically measured by the amount of damage to people and property. There are a number of ways to protect property and depending on the hazard, including erecting a barrier, moving a building from a hazard prone area, elevating buildings above flood elevation, keeping hazardous materials such as fire-prone vegetation away from structures, and purchase of open space.

Barriers can be erected that keep hazards from reaching structures. Seawalls can restrict shoreline erosion and flooding, and berms can aid against shallow flooding. Because barriers are so susceptible to changing environmental conditions, proper design and maintenance are needed for structures to be effective.

Relocating structures is often the best way to prevent future loss. Many flood-prone areas are not proper locations for any type of structure. If feasible, relocation to safer areas is the best way to protect structures currently in hazard-prone areas. Relocation includes moving a structure elsewhere on a lot or completely off-site.

Elevating structures is a method to keep structures out of harm’s way. Often a base flood elevation has been determined, and raising a structure above this level prevents the hazard from affecting the property. Elevation can be done during new construction or by raising existing structures and can be more cost-effective than relocation.

Structures that are permanently or regularly damaged by hazards can be addressed through demolition. It is often cheaper to relocate and build anew than to protect an existing structure that is heavily damaged or regularly affected by hazards such as flooding. Demolition is most effective on structures that are difficult to relocate or are dilapidated with no salvage value.

**Retrofitting**

An alternative to keeping a hazard away from a property is modifying or ‘retrofitting’ the building or site to withstand hazard impact. Methods of retrofitting a structure for flooding can include dry flood-proofing, such as waterproof coating and sealing, or wet flood-proofing, such as elevating items and using water resistant materials. Other methods of
Protecting a home from flooding include installation of adequate floor drains, sump pumps, and backflow protection valves.

Retrofitting can also protect homes from high winds, thunderstorms, hail storms, and winter storms. Effective improvements include tie downs, stronger windows and doors, buried utility lines, storm shutters, lightning rods, more durable roofing materials, improved insulation, relocation of water lines indoors, improved sealing, and storm windows.

**Insurance Coverage**

Although insurance does not mitigate hazards, it helps property owners rebuild, repair, and hopefully improve their property. Most homeowner’s policies will cover property damage due to tornado, wind, hail, and winter storms. Some insurance companies also offer sump pump failure and sewer backup coverage that can be added to an existing policy. However, separate coverage is needed from the National Flood Insurance Program for flooding.

**Demolition**

The removal of unsound or at-risk buildings through demolition is one way to mitigate loss. In the case of a regularly flooded structure, demolition is a way to prevent further loss—specifically when relocation would be too costly and the structure is of no historic value.

**Ontonagon County Project Recommendations**

Ontonagon County has not been severely affected by repetitive loss due to natural hazards. Periodic flooding has affected the Village of Ontonagon’s downtown, and certain roads are occasionally submerged. The best proactive measures for residents, businesses, and government in Ontonagon County are to participate in the National Flood Insurance Program and maintain insurance if their properties are susceptible to flooding. Key facilities such as the fire station can consider relocating to higher ground outside of the floodplain.

For cold weather problems, insulation is a measure to protect public and private pipes and utility lines potentially affected by cold weather. Retrofitting these existing structures will prevent future problems.
3.3 Resource Protection

Resource protection mitigation activities are a way to enable land to function in a natural way. There are many benefits to naturally functioning watersheds, floodplains, and wetlands. Examples include:

- Reduction in runoff from rainwater and snowmelt
- Infiltration and velocity control during overland flow
- Filtering of excess nutrients, pollutants, and sediments
- Floodwater storage
- Water quality improvement
- Groundwater recharge
- Habitat availability
- Recreation and aesthetic qualities

Because many natural areas have been affected by development and will be affected by development in the future, there are a number of ways to protect and restore the environment. Examples of resource protection activities include:

- Wetland protection
- Erosion and sedimentation control
- River restoration
- Best management practices
- Dumping regulations
- Urban forestry
- Farmland protection

Wetlands

Wetlands are a valuable resource that provides a number of mitigation functions including storage of floodwaters and filtration and habitat for fish, wildlife, and plants. Wetlands are regulated in Michigan by Part 303, Wetland Protection, of the Natural Resources and Environmental Protection Act (Act 451 of 1995). The Michigan Department of Environmental Quality administers the permit program. In Michigan a permit is required to deposit fill material in a wetland; dredge or remove soil or minerals from a wetland; construct, operate, or maintain any use or development in a wetland; or drain surface water from a wetland.
Wetlands are specifically defined under the act, and certain activities are exempted under the act.

Local units of government can play a role in wetland protection and should serve as stewards over their water resources. Wetland protection measures can be implemented on a local level, and public education is a key to protecting this valuable resource.

**Erosion and Sedimentation Control**

Surface water can easily erode soil in large exposed areas, including farmlands, construction sites, and forested areas. In addition to exposed areas, erosion often occurs along stream banks and shorelines with high-velocity currents and wave action. The erosion carries sediments and deposits them downstream where they can cause problems for storm sewers, culverts, and ditches by reducing the capacity of the systems. Erosion also results in sediment in the water which reduces light and oxygen in the water. Heavy metals and other contaminants are the reason that sediment is identified as the number one non-point source pollutant for aquatic life.

Erosion and sedimentation can be controlled through phased construction, minimal clearing, and stabilization of bare ground with vegetation and other means. Sediment can be captured on-site with traps and filters, while water velocity can be slowed by terraces, temporary cover, constructed wetlands, and impoundments.

Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act regulates only earth change activities (primarily construction projects which disturb one or more acres of land or are within 500 feet of the water’s edge of a lake or stream). Part 31, Water Resources Protection, of NREPA addresses most other sources of sediment. In Ontonagon County, the County is the Enforcing Agency. Locally, municipalities may adopt additional protection measures dependent on NREPA or the Planning and Zoning Enabling Acts.

**River Restoration**

History has proved that returning streams and adjacent land to a natural condition reduces erosion. The restoration of vegetation along stream banks protects the water by:

- Reducing the amount of sediment (and pollutants) entering the water
- Providing habitat for wildlife
- Slowing the velocity of water, thus reducing flood damage and erosion
- Providing recreational opportunities and aesthetic value
- Reducing long-term maintenance costs

**Best Management Practices**

Non-point source pollutants including fertilizers, pesticides, animal wastes, chemicals, and sediment are washed away by storm water and distributed in storm sewers, ditches, and streams. The term "best management practices" (BMPs) refers to the design, construction, and maintenance practices and criteria that minimize the impact of storm water runoff.

**Dumping Regulations**

Dumping regulations attempt to regulate the disposal of solid matter that can end up in streams and wetlands. Solid waste can pollute water, obstruct water flow, and reduce the ability of the stream or wetland to clean storm water. Dumping of waste materials such as garbage and other materials is illegal, but the dumping of yard waste, such as leaves and branches, can also affect a watercourse. People often do not realize the impact of obstructing a watercourse. Public information should be a central focus of a dumping enforcement program.

**Urban Forestry**

Damage caused by wind, ice, and snowstorms is often due to their impacts on trees. Downed trees and branches can upset power lines, damage buildings, and harm property under them. An urban forestry program can reduce the damage potential of trees through maintenance and monitoring. Through better tree selection, proper pruning, and evaluation, communities can also mitigate damage caused by downed trees.

**Farmland Protection**

The purpose of farmland protection is to provide ways to keep prime, unique, or important agricultural land intact. Farmland is being converted to nonagricultural uses at an alarming rate. This results in increased runoff, residential development that needs more infrastructure, and emergency management difficulties. Farmland protection parallels open space protection in that it keeps the land open for future generations but also helps with storm water runoff, ecosystem maintenance, and scenic enhancement.
Ontonagon County Project Recommendations

Ontonagon County is traversed by numerous rivers and streams that can be affected by erosion problems. By monitoring the rivers, the County can react to problems that may surface due to land management practices. With proactive best management practices, erosion and sedimentation control, and other resource protection measures, the County can ensure protection of natural functions.

3.4 Emergency Services

Local emergency services authorities, resources, and facilities throughout Ontonagon County are documented in Section 1 of this plan. Although all authorities are effective in conducting their internal and incident response activities, there is an opportunity to further educate the public about their operations – for example, through dissemination of hazard-related materials. Furthermore, several agencies lack necessary equipment to meet their emergency response needs. Current and future funding sources are likely to be insufficient to remedy this problem.

Emergency services provide protection for people both during and after a disaster. A thorough emergency services program addresses all hazards and involves all response departments and facilities. In Michigan, emergency services are supervised by the Michigan State Police and are coordinated through county emergency management offices. There are a number of components to emergency services, including:

- Threat recognition
- Warning
- Response
- Critical facilities protection
- Post-disaster recovery and mitigation

Threat Recognition

The first step in responding to a hazard is being aware that there is potential for an event to occur. With a threat recognition system, adequate warnings can be disseminated and other response actions undertaken. Flood threats can be evaluated by measuring rainfall, soil moisture, and stream flows upstream and then calculating flood levels for downstream locations. Discerning the time and height of a potential flood crest allows more efficient
evacuations. Some streams have gauges that establish threat levels. Under threat conditions, the National Weather Service (NWS) may issue flood watches for affected areas.

NWS is the agency that predicts meteorological threats and is able to issue public warnings.

**Warning**

After a threat is identified, the Office of Emergency Management (OEM) notifies municipalities and other agencies that an event is possible or occurring. Early notification is necessary to distribute information to all affected parties. The NWS notifies the public using two levels: "watch" and "warning."

*Watch:* conditions are right for flooding, thunderstorms, tornadoes or winter storms.

*Warning:* a flood, tornado, etc. has started or has been observed.

A more specific warning may be disseminated in a number of ways, including:

- Warning sirens (outdoor and on public safety vehicles)
- Commercial radio or TV (news and weather channels)
- NOAA Weather Radio (where available)
- Mass telephone notification
- Tone-activated receivers in key facilities
- Door-to-door contact
- Mobile public address systems
- Internet/e-mail notification

All of the systems have their limitations because they reach only certain audiences. TV and radio are only effective if people have them turned on. NOAA radio will only reach those with access to a weather radio. Outdoor warnings can indicate to tune into another information source such as TV or radio, but this type of warning has limited reach and may not be heard by people indoors or in noisy environments. Door-to-door contact is time consuming but preferred when there is sufficient lead time for an incident. The best warning system is a redundant system that provides notification via numerous methods in order to reach as much of the population as necessary.
The warning system should also include information as to the response action to take, such as staying indoors during a tornado warning or staying off roads in the event of a severe winter storm.

Response

Effective response, in combination with threat recognition and warnings, is another way for a community to mitigate impact from hazards. A community typically reacts to hazards through an emergency operations center that coordinates response activities based on an emergency action plan. An emergency action plan ensures that the community responds efficiently and appropriately to a threat. Emergency action plans need to be regularly updated in order to keep names and contact information current.

Response activities may include a variety of agencies/offices and measures such as closing streets and bridges, shutting off power to threatened areas, ordering an evacuation and opening evacuation centers, monitoring water levels, and implementing security measures.

Critical Facilities Protection

"Critical facilities," identified in Chapter One, are the vital facilities that keep a community functioning. Critical facilities must be prepared to respond during an emergency situation. Most critical facilities have their own response plans in place and are also included in emergency action plans of the municipality. The best protections are early warning, response planning, and coordination in the event of an emergency.

Post-Disaster Recovery and Mitigation

Communities must be prepared for recovery and mitigation of future problems after an incident. While the main focus is on recovery, it is also important to recognize mitigation methods to prevent the incident from reoccurring at the same magnitude.

During recovery a number of actions take place, including patrolling, cleaning up, providing services, monitoring impact, and regulating reconstruction. During this recovery time, mitigation activities can include public information efforts aimed at educating residents on how to protect themselves in the future, evaluating methods of reconstruction that includes mitigation measures, and seeking funding for recovery efforts.
**Ontonagon County Project Recommendations**

Emergency services are of primary importance in mitigating hazards in Ontonagon County. Ontonagon should focus on increasing the ability of the County to respond to threats through coordinated response activities. Employing well-trained responders and an efficient public notification system lessens the impact of hazards on a community. Areas to focus on include improved public notification, such as PSAs, community warning systems, and NOAA Weather Radio; facility protection; law enforcement; response and backup equipment; and mutual aid agreements; as well as having adequate medical supplies and shelter facilities.

### 3.5 Structural Projects

Structural projects are intended to protect people and infrastructure from damage due to natural hazards. Structural projects are typically used to manage and control flood waters. The complexity and cost of structural projects can vary greatly and are dependent on individual circumstances. Structural projects are undertaken where nonstructural measures would not be effective. Structural projects may include:

- Reservoirs and detention areas
- Roadway and crossing improvements
- Levees/floodwalls/seawalls
- Drainage and storm water improvements/maintenance
- Channel improvements

Because of the construction costs, maintenance, and impacts of structural projects, they are often undertaken and funded by larger agencies with coordination at the local level. Agencies including the Michigan Department of Natural Resources, U.S. Army Corps of Engineers, and USDA Natural Resources Conservation Service are often involved in structural projects.

**Reservoirs and Detention**

Reservoirs are intended to protect development downstream by temporarily storing flood waters. Reservoirs hold water behind dams or in storage/detention basins until flood waters subside. The detained water is then released downstream at a rate the river or stream can
accommodate. Reservoirs are built to address existing problems or may be built to handle increased runoff from new development.

**Roadway and Road Crossing Improvements**

Flooding can often affect accessibility by overtopping roadways, culverts, bridges, driveways, and other transportation infrastructure. There are a number of things that can be done to maintain access when alternative access is not available. A number of measures can improve conditions at roadways and crossings, including elevating the road bed, enlarging culverts to increase channel capacity, or replacing culverts with bridges. The biggest concern when undertaking these types of improvements is the impact to downstream locations with the increased capacity of the water system when it is no longer constricted up stream.

**Levees, Floodwalls, and Seawalls**

One of the most popular flood control measures is the construction of an earth levee or concrete floodwall to protect property. The purpose of these structures is to keep a stream within its channel by providing higher "banks." Levees require extensive design in order to address large floods, erosion, river access and views, and cost of construction and maintenance.

Seawalls are often used to protect from erosion due to storm surges along Lake Superior's edge. Seawalls are built along a property edge and are designed to protect a property from storm surges. Along the Great Lakes, seawalls can be significantly impacted by ice movement during the winter months and often have difficulty resisting lake forces.

**Drainage and Storm Water Improvements/Maintenance**

Man-made ditches and storm sewers assist in guiding runoff where surface drainage is inadequate. These systems allow water to be conveyed quickly to other locations and are thus most appropriate where the receiving location has adequate capacity. Storm sewer improvements may include installing new sewers, enlarging pipes, and preventing back flows. Other improvements in combination with drainage enhancements may include wetland detention, vegetated trenches, and practices that reduce the quantity and velocity of runoff.
It is also important to maintain storm water and drainage systems. This includes keeping channels, ditches, and culverts cleared of debris; maintaining overgrowth; and remediating stream bank erosion sites. Debris can be any number of materials, from tree limbs and branches to illegally dumped trash. Maintenance of public drainage systems is the responsibility of government agencies.

**Channel Improvements**

Channel improvements are another method of increasing stream capacity, thereby allowing more water to travel at a faster rate. Improvements can be made through dredging, "channelization," or diversion. Dredging can increase capacity by removing material along the bottom of the stream. Channelization does so by straightening, widening, and/or deepening of a stream. Diversion is the practice of creating a new channel to send floodwaters to an alternate location.

**Ontonagon County Project Recommendations**

Primary structural projects in Ontonagon County have focused on improvements to the current drainage system. The Ontonagon County Road Commission continuously identifies and upgrades inadequate culverts and problem roadways. The Village of Ontonagon has been affected by flooding, and upgrading storm water capacity in the Village of Ontonagon would help with this periodic problem. Where roadways are impeded by flooding, upgrades to drainage and bridges should be considered.

The County should request updated shoreline erosion maps in order to review problem areas. Structural projects should be considered as necessary, in addition to preventive measures, to address persistent problems.

**3.6 Public Information**

Public information is a mitigation strategy that has broad-reaching impact across both the public and private sector. Activities that provide local officials, property owners, renters, businesses, and other stakeholders with information about how to protect themselves and others from potential hazards may have the greatest impact of all mitigation strategies. Information empowers people to protect their own property and lives.
There are many ways to get information out to the public through community outreach. Community outreach entails informing and involving the public through news media, community newsletters, direct mailings, presentations, displays, signs, the internet, brochures, technical assistance, and other methods. Because methods are diverse, it is best to analyze each community to find out how people obtain information and use that to build an outreach plan. While in some communities a local newsletter is distributed, other communities may rely on a newspaper to get information.

While all public information on hazards is important, it is particularly important to inform people of methods to address hazards. Outreach projects should include information on hazards, safety, health, and property protection measures at the local level. Community offices and libraries are good places to provide information, while increasing internet use indicates web distribution is also an effective way to disseminate information. Information on a website can easily be linked to an infinite number of available resources.

Technical assistance can further assist people in protecting their property. Assistance can be in the form of hazard identification assistance or through property protection assistance. Examples include direction from building department staff and FEMA Flood Map clarification with the assistance of community staff.

**Ontonagon County Project Recommendations**

In Ontonagon County and in all municipalities, education is the key to an informed citizenry. By providing the information and tools necessary, much can be done to further mitigate efforts in Ontonagon County. An ongoing education program and availability of limited technical assistance can provide the public the ability to protect themselves. It is recommended that Ontonagon County institute an additional educational program within the County for its citizens, businesses, and others that builds upon current initiatives.
Section 4: Action Plan

<table>
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<th>Action Plan for Ontonagon County</th>
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<tbody>
<tr>
<td>The final step in the mitigation process is to build upon the general recommendations for mitigation activities suggested in Section 3 and identify specific action items for Ontonagon County. All the activities identified in this section are consistent with the Mitigation Goals identified in Section 3:</td>
</tr>
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</table>

**Goal 1:** Protect lives and property within Ontonagon County from all known hazards while focusing on priority hazards.

**Goal 2:** Identify feasible projects throughout the County that will help mitigate future problems.

**Goal 3:** Be proactive in protecting public facilities and critical facilities through proper maintenance and upgrades.

**Goal 4:** Educate citizens in order to encourage self-help and the mitigation of hazards on private property.

**Project Priorities**

Projects vary from structural measures to education. The projects are prioritized based on impact on persistent, known hazards and potential resources available to complete the project. Although projects are prioritized on a county-wide basis, this does not limit the County’s or a local community’s ability to pursue identified projects as funding becomes available. A number of the projects are ongoing action activities that will be accomplished as time and resources permit. Identified action items include a short description of the activity, the responsible agency or agencies, timeline, projected costs if available, and ways that Ontonagon County and its citizens may benefit.

Cost-benefit consideration – both financial and otherwise – and implementation-readiness are major factors in the prioritization of action items. As a result, action priorities are not entirely consistent with the rankings in the Hazard Profile. For example, flooding and drainage issues in the Village of Ontonagon are not the greatest hazard threats in the area, but the corresponding projects are essential with a demonstrated long-term need. These
have been planned for some time and are locally recognized as urgent. Implementation of these items will have relatively low resistance due to public perception and official support.

**Changes from Previous Plan**

Some action items are carried over from the 2005 Hazard Mitigation Plan. Several of these are ongoing activities that will continue indefinitely. The highest-priority 2005 action item was fully completed in 2012. The remaining Village projects that had target completion dates are narrower in focus and/or have high infrastructure costs, so the projects are more difficult to find funding for but have become no less important.

On a countywide scale, there have been no significant land development changes since 2005. Most construction has been incremental within or adjacent to already-developed areas. However, in the Village of Ontonagon, which is the main focus of the Action Plan, the County's largest employer, Smurfit-Stone, closed its cardboard manufacturing facility in 2009. This closure greatly impacted the socioeconomic and physical landscape of the Village area. The structure was dismantled in 2012, eliminating one active hazardous materials user. Transport of industrial products has also decreased, lowering the probability of a transportation incident. A major change in transportation routes also occurred following the 2005 plan: A new Highway M-64 bridge over the Ontonagon River diverted traffic from the downtown area and changed potential hazardous materials transportation flows.

As earlier noted, the Village completed a Master Plan in 2007 and a new Zoning Ordinance in 2012, but these themselves have not yet resulted in any major land use changes. The former Lakeshore Industrial site, which had been closed prior to the 2005 plan, remains vacant and an impediment to development and economic prosperity in its part of the community. This is the most likely site of land development in the Village for the foreseeable future. Industrial development is also occurring in White Pine, where a chopstick factory (bringing potential risk of fire) is under development and the former copper mine remains available for possible re-use.

### 4.1 General Funding Sources

There are two types of resources: existing institutional establishments, such as government agencies and continuing programs, and funding sources to undertake specific projects. Many of the former are described in Section 1 of the plan. The following list is intended to
provide examples of funding sources for both current and future mitigation projects and should not be considered comprehensive. Potential new sources for mitigation funding should be added as identified. Project-specific funding options are included in the respective Action Items identified in Section 5.3.

**Federal**

- FEMA: Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, and additional programs (including funds routed through Michigan Department of Environmental Quality [MDEQ])
- U.S. Department of Defense: Army Corps of Engineers (USACE)
- U.S. Department of Homeland Security (DHS)
- U.S. Department of Transportation (DOT)
- U.S. Department of the Interior (DOI)
- U.S. Department of Justice (DOJ)
- U.S. Department of Commerce (DOC)
- U.S. Department of Agriculture (USDA)
- U.S. Department of Housing and Urban Development (HUD)
- U.S. Department of Health and Human Services (DHHS)
- U.S. Environmental Protection Agency (EPA)

**State**

- Michigan Department of Environmental Quality (DEQ)
- Michigan Department of Natural Resources (DNR)
- Michigan Department of Transportation (MDOT)
- Michigan Economic Development Corporation (MEDC)
- Michigan State University (MSU) Extension

**Other**

- Local tax revenues (general fund and special millage/assessment)
- Foundation grants
4.2 Progress on Previous Mitigation Program Action Items

Table 4-1 illustrates the status of mitigation action items from the 2005 Ontonagon County Hazard Mitigation Plan.

Table 4-1: Progress on Previous (2005) Mitigation Program Action Items

<table>
<thead>
<tr>
<th>2005 Item</th>
<th>Status</th>
<th>Corresponding 2013 Item</th>
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<tbody>
<tr>
<td>1. Update Village of Ontonagon Land Use Plans and Zoning</td>
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<tr>
<td>2. Ontonagon Harbor Dredging</td>
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<tr>
<td>3. Village Drainage Study and Improvement</td>
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<tr>
<td>4. Update Stormwater Management Plans and Flood Maps</td>
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<tr>
<td>5. Improved Emergency Response</td>
<td>Ongoing</td>
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<tr>
<td>6. Review Plans and Development Regulations</td>
<td>Ongoing</td>
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<td>7. New West Branch Bridge/M-28</td>
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<td>8. Mine Shaft Safety</td>
<td>Not Completed</td>
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<td>9. Update Shoreline Erosion Map and Identify Future Mitigation Activities</td>
<td>Partially Completed</td>
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<tr>
<td>10. Public Information/Education Program</td>
<td>Not Completed but now Ongoing</td>
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</tr>
<tr>
<td>11. Insurance</td>
<td>Ongoing</td>
<td>11</td>
</tr>
<tr>
<td>12. Relocation of Village Office, Department of Public Works, and Fire Hall</td>
<td>Not Completed</td>
<td>12</td>
</tr>
</tbody>
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4.2 Mitigation Program Action Items

Action Item 1: Ontonagon Harbor Dredging

Ontonagon Harbor needs annual dredging to prevent spring ice dam and flooding problems as well as to ensure harbor access. This is currently done by the Corps of Engineers to the extent needed, but indications are that funding may be eliminated, so alternate measures must be considered. Furthermore, dredging of sufficient depth to accommodate commercial freight (19 feet) generally cannot be funded by USACE unless shipping operations are already occurring. This policy essentially eliminates more extensive dredging given the harbor’s current inactivity. This item remains an ongoing high priority since 2005. USACE recently reaffirmed the Port of Ontonagon’s status as eligible for continued dredging.

*Responsible Agency:* Ontonagon County

*Deadline:* Ongoing
Cost: Approximately $400,000/year

Potential Funding Sources: FEMA Hazard Mitigation Grant Program and Corps of Engineers

Benefits: Previous flooding in Ontonagon Village has been attributed to buildup of silt at the mouth of the Ontonagon River. By keeping the harbor dredged, the ice flows will not become ice dams. Annually 100,000 to 300,000 tons are removed from the harbor.

Action Item 2: Village Drainage Study and Improvements

The Village of Ontonagon is susceptible to periodic flooding problems. By increasing the capacity of the Village to handle storm water, the impacts of flooding on the Village can be mitigated. Some work has been done on catch basins; however, additional work is needed. This project is carried over from the 2005 plan, as funding has not been available.

Responsible Agency: Village of Ontonagon and MDOT

Deadline: 2015

Cost: Unknown

Potential Funding Sources: USDA – Rural Development

Benefits: By identifying improvements to the storm water system, the Village can mitigate the problem, thus preventing future problems associated with spring runoff and excessive precipitation.

Action Item 3: Snow Removal

Winter is the most critical of seasons within Ontonagon County, and the ability of the County Road Commission to keep roads sanded and clear is vital to protecting the public. Snow removal equipment must be purchased as needed.

Responsible Agency: Ontonagon County Road Commission

Deadline: Ongoing

Cost: $5 to $6 million

Potential Funding Sources: FEMA – Hazard Mitigation Grant Program, local
Benefits: Maintenance of safe travel throughout the County is vital to the public, business, and emergency response capabilities.

**Action Item 4: Update Stormwater Management Plans and Flood Maps**

Due to changing land use and upgraded storm systems in the Village of Ontonagon, storm water management plans and flood maps should be updated to address changing conditions. This project is carried over from the 2005 plan, as funding has not been available.

*Responsible Agency:* Ontonagon County and Village of Ontonagon

*Deadline:* 2016

*Cost:* Staff time

*Potential Funding Sources:* FEMA and organization/agency operating budgets

*Benefits:* The Village will benefit by being able to make informed decisions based on accurate storm water and flood information that incorporates upgrades that are planned, underway, or completed.

**Action Item 5: Drainage Improvements and Maintenance**

Drainage systems are insufficient to handle runoff in several areas throughout the County. Ditches should be added and dredged, and culverts must be kept clear. *McMillan Township* has identified particular problems with ditch conditions.

*Responsible Agency:* Ontonagon County Road Commission and Township public works

*Deadline:* Ongoing

*Cost:* Unknown (varies by project)

*Potential Funding Sources:* FEMA Pre-Disaster Mitigation Program, FEMA Hazard Mitigation Grant Program, and organization/agency operating budgets

*Benefits:* Inspection and maintenance of the existing drainage system will prevent flooding caused by plugged culverts, insufficient ditches and storm sewers, and improper elevation
and leveling of land. Problems will be alleviated in areas where materials are washed into waterways regularly during spring flood conditions. Studies and improvements in the highway corridors will address ongoing spring runoff problems.

**Action Item 6: Improved Emergency Response**

Conduct ongoing reviews of response plans and programs in order to keep emergency contacts up-to-date, ensure critical facility information is current, and identify and incorporate new and improved methods of warning and response. Adequacy of shelter facilities, response equipment, and training can be evaluated during these ongoing reviews. Communications and response throughout the region, including cell tower coverage should continue to be a focus.

*Responsible Agency: Ontonagon County Emergency Manager*

*Deadline: Ongoing (incorporate changes and updates into annual emergency plan revision process)*

*Cost: Staff time*

*Potential Funding Sources: Local*

*Benefits: Emergency plans that are up to date and incorporate all available methods of warning and response will be most effective in emergency situations, thus mitigating loss from hazards.*

**Action Item 7: Review Plans and Development Regulations**

Ontonagon County’s emergency manager will work with the County Board and County Planning Commission to ensure hazard mitigation is included in ongoing county planning activities. During updates to County plans and regulations, the County will consider actions and recommendations that divert new development from identified hazards, ensure adequate fire and emergency access, require buried utility lines, and preserve open space to protect properties from flooding.

As local land use plans, comprehensive plans, zoning, building codes, and other plans/regulations become due for revision, appropriate hazard mitigation provisions will be considered and incorporated. The Ontonagon County Planning Commission can ensure
hazard mitigation measures are addressed during required comment period under the Michigan Planning Enabling Act.

*Responsible Agency:* Emergency Manager and Ontonagon County Planning Commission

*Deadline:* Ongoing as plans and ordinances are reviewed

*Cost:* Staff and Commission time

*Potential Funding Sources:* Organization/agency operating budgets

*Benefits:* Citizens of Ontonagon County will benefit from plans that protect new development from known hazards and from awareness of methods to do so.

**Action Item 8: New South Branch Bridge / M28**

The South Branch of the Ontonagon River has had previous problems with overtopping during high flow conditions. A new bridge at this location would protect this primary transportation corridor during flood conditions. This project replaces the West Branch bridge project that was included in the 2005 plan.

*Responsible Agency:* Michigan Department of Transportation

*Deadline:* 2017

*Cost:* Unknown

*Potential Funding Sources:* MDOT

*Benefits:* By improving this crossing with a new bridge, the County can protect this highly traveled corridor from closures.

**Action Item 9: Mine Shaft Safety**

An ongoing program of mine shaft safety that includes capping and other measures should be implemented. As funding becomes available, the County will prioritize and address hazardous shafts.

*Responsible Agency:* Ontonagon County, including Mine Inspector

*Deadline:* Ongoing
Cost: $20,000 minimum for protective measures and up to $75,000 for capping per shaft/opening

Potential Funding Sources: FEMA Hazard Mitigation Grant Program and DOI Abandoned Mines Reclamation Program

Benefits: Action to address the numerous abandoned mine shafts throughout the region is necessary to protect people and property. The long history of mining has led to a persistent problem with mine shaft openings and shafts that are reopening due to improper capping with materials such as rotting logs and rusting cars.

Action Item 10: Public Information/Education Program

Public information is the key to mitigating many of the potential hazards in Ontonagon County. A number of projects can help to educate the public on potential hazards and how to protect themselves from hazards. Recommended projects include preparing and gathering education materials on hazards affecting Ontonagon County and how people can help with mitigation. These materials should be organized and made available at government offices, schools and other easily accessible public facilities as well as on the internet.

Responsible Agency: Ontonagon County Emergency Manager, MSU Extension, Red Cross

Deadline: Ongoing

Cost: Staff time

Potential Funding Sources: Organization/agency operating budgets

Benefits: Organizing locally applicable materials and making them available to the public ensures that the message is getting out. Through use of newspapers and internet, the public can be easily informed with a consistent message. This action item helps inform the public and provides assistance to people who want to learn more about property protection and how to reduce their risk.

Action Item 11: Insurance

Not all hazards can be mitigated prior to occurrence, but by maintaining insurance, property owners can protect themselves from loss due to hazards.
Responsible Agency: Municipalities, residents, business owners, and others

Deadline: Ongoing

Cost: Unknown—specific to site

Potential Funding Sources: FEMA NFIP, organization/agency operating budgets, and individual property owners

Benefits: All residents benefit by protecting themselves and their community facilities from loss. Conventional insurance policies will protect people from most hazards, while in municipalities participating in the NFIP, residents also have access to flood insurance. The County and its local jurisdictions can also educate citizens on the importance of maintaining adequate property insurance.

Action Item 12: Relocate of Village Office, Department of Public Works and Fire Hall

These Village of Ontonagon Critical Facilities are located in the deepest part of an identified floodplain. Relocation of the facilities outside of the floodplain would insure the facilities’ protection. This project is carried over from the 2005 plan; its extensive cost has precluded implementation.

Responsible Agency: Village of Ontonagon

Deadline: 2018

Cost: $3 to $4.5 million

Potential Funding Sources: FEMA Hazard Mitigation Grant Program and local

Benefits: The Village of Ontonagon is the largest community in the County and the center for response activities. Relocation of the Village Office, Department of Public Works, and Fire Hall would protect these critical structures from flooding and would improve response during an incident.

Action Item 13: Backup Power for Emergency Facilities/Designated Shelters

Critical facilities needed during emergency times need back up power to operate. Identify the critical and shelter facilities, and purchase generators that can supply adequate support when needed.
**Responsible Agency**: Emergency Manager

**Deadline**: 2015

**Cost**: $500,000

**Potential Funding Sources**: FEMA Hazard Mitigation Grant Program and local

**Benefits**: Part of emergency response is the ability to operate key functions and provide for the needs of community members. Adequately equipped facilities and shelters are core requirements for meeting this need.

### 4.3 Administrative Action

**Action Item: Adopt Hazard Mitigation Plan and Update Regularly**

By adopting the Ontonagon County Hazard Mitigation Plan, the County and its municipalities formally recognize the need to incorporate hazard mitigation activities into everyday decisions at the County and local levels. The plan will be reviewed annually by the Emergency Manager in coordination with the Emergency Operations Plan update to determine if revisions are needed.

The Hazard Mitigation Plan will be **updated every 5 years** in order to address changing priorities and remain eligible for FEMA mitigation funding programs. The Emergency Manager will convene a Hazard Mitigation Committee representing local agencies and concerned parties to evaluate progress and update the plan in accordance with FEMA regulations. The Committee will review the plan to determine the sections that need to be updated or modified based on changing conditions or alterations in State or Federal requirements. Goals, objectives, and strategies will also be reviewed to determine if they thoroughly address new or changing conditions.

The Emergency Manager will work with Ontonagon County to update the plan based on Hazard Mitigation Committee and State Hazard Mitigation Officer recommendations. The public will be notified of any plan updates, and copies will be made available at all local government offices and online if feasible. The public will be provided with and notified of comment opportunities during all interim and five-year plan updates.

**Responsible Agency**: Emergency Manager
Cost: Staff time

Potential Funding Sources: FEMA and organization/agency operating budgets

Benefits: The adoption of the Hazard Mitigation Plan commits Ontonagon County and its communities to working on mitigation efforts within its boundaries. Through implementation of mitigation strategies in the Plan, the County and municipalities will be actively working to prevent future problems within Ontonagon County.