Lenawee County, Michigan

# Hazard Mitigation Plan

Prepared by the Lenawee County Planning Commission and
The Lenawee County Hazard Mitigation Planning Committee
for the Lenawee County Board of Commissioners
and Local Units of Government within Lenawee County
March, 2012

# Table of Contents

**Introduction** ..... **8**
**Plan Preparation and Local Unit Involvement and Participation** ..... **14**
Staff Involvement ..... 14
Lenawee County Planning Commission ..... 14
Opportunities for Participation of Neighboring Communities ..... 16
Coordination with the Lenawee County Comprehensive Land Use Plan ..... 16
Local Land Use Planning and Zoning ..... 17
**Community Profile** ..... **20**
Regional Location ..... 20
Political Jurisdictions ..... 20
Community Characteristics ..... 22
Population Density ..... 22
Population with Special Needs ..... 22
School Populations ..... 24
Public Safety Organizations ..... 26
Seasonal Housing ..... 27
Median Home Values ..... 28
Future Land Use ..... 28
Emergency Warning Sirens ..... 28
**Potential Hazards** ..... **32**
Civil Disturbances ..... 34
Earthquakes ..... 35
Subsidence ..... 36
Scrap Tire Fires ..... 36
Structural Fires ..... 37
Wildfires ..... 41
Riverine Flooding ..... 41

Dam Failures ..... 51
Energy Emergencies ..... 55
Infrastructure Failures ..... 55
Passenger Transportation Accidents ..... 58
Hazardous Material Incidents: Fixed Site and Transportation ..... 60
Nuclear Power Plant Accidents ..... 62
Oil and Natural Gas Well Accidents ..... 63
Oil and Natural Gas Pipeline Accidents ..... 64
Nuclear Attacks ..... 65
Sabotage/Terrorism/WMD ..... 66
Public Health Emergencies ..... 68
Drought ..... 69
Extreme Temperatures ..... 71
Hail ..... 77
Lightning ..... 83
Tornadoes ..... 86
Severe Winds ..... 91
Snowstorms ..... 110
Ice and Sleet Storms ..... 117
**Priority, Risk and Vulnerability Assessment ..... 122**
Hazard Assessment ..... 124
**Goals and Objectives ..... 131**
**Hazard Mitigation Plan and Strategies ..... 135**
Plan and Mitigation Strategies to Address all Hazards ..... 136
Mitigation Strategies for Specifically Identified Hazards ..... 137
Extreme Temperatures ..... 138
Snowstorms ..... 138
Significant Infrastructure Failures ..... 139
Ice and Sleet Storms ..... 139

Lightning ..... 140
Hail ..... 140
Severe Winds ..... 140
Structural Fires ..... 141
Riverine Flooding ..... 141
Drought ..... 142
Tornadoes ..... 142
Pipeline Accidents ..... 142
Hazardous Materials Incidents: Fixed Site and Transportation ..... 142
Mitigation Strategy Prioritization and Implementation ..... 143
Strategy Prioritization ..... 144
Responsible Lead Organization, Funding, and Time Frame for Implementation ..... 146
Implementation of Strategies by Local Units of Government ..... 150
**Plan Maintenance and Implementation ..... 154**
Implementation ..... 156
The Monitoring of Progress ..... 156
Plan Update ..... 157
Public Participation ..... 157
Appendix A – Documents Pertaining to the Activities of the Hazard Mitigation Planning Committee ..... 2
Appendix B – Minutes of the August 19, 2010 Lenawee County Planning Commission ..... 14
Appendix C – Summary of Community Survey Results ..... 19

# MAPS

Composite Land Use Plan ..... 16
Location Map ..... 20
Lenawee County Communities ..... 21
Lenawee County Communities - Population Density ..... 22
Lenawee County Communities – Elderly Population ..... 23
Lenawee County Communities – Disabled Population ..... 23
Lenawee County Communities – Speaking a Language Other than English at Home ..... 24
Lenawee County Communities – School Facilities ..... 26
Lenawee County Communities – Future Land Use ..... 28
Lenawee County Emergency Siren Coverage ..... 29
Earthquake Vulnerability ..... 35
Lenawee County Watersheds ..... 43
Lenawee County Highways, Roads and Streets ..... 60
Lenawee County Railroads ..... 61
Michigan's Nuclear Power Facilities ..... 62
Lenawee County Oil and Gas Well Locations ..... 63
Lenawee County Oil and Gas Pipelines ..... 64
Michigan's Potential Nuclear Targets ..... 65

# INTRODUCTION

# Introduction

## Purpose

In recent years, natural disasters have rocked our country and the world. Lenawee County has experienced hazards such as ice and snow storms, powerful electrical storms, tornadoes, and riverine flooding. These natural disasters affect the County's economy and quality of life. Disasters are costly, disruptive, and they threaten the health, safety, and welfare of the community. Too often we ask, after the disaster, what could have been done to avoid, or lessen the impact of these catastrophic events?

The Federal Emergency Management Agency (FEMA) and the Michigan State Police Emergency Management and Homeland Security Division (MPS-EMD) have created a partnership to encourage communities to plan for disasters and to develop and implement mitigation strategies to reduce the likely severity of these types of disasters. Incentives have been provided to communities through FEMA grant programs for hazard mitigation planning and implementation in an effort to reduce the potential threat to life and property damage caused by natural hazards.

This Hazard Mitigation Plan anticipates natural and human-related disasters and identifies actions and activities to implement before disasters occur. This is done to minimize damage to property and harm to our citizens. Hazard mitigation planning does not include emergency preparedness, nor does it include planning for emergency responses. Emergency preparedness and the planning for emergency responses are the responsibility of local law enforcement agencies, including in particular the Lenawee County Emergency Management Coordinator, the Lenawee County Sheriff Department, and the Lenawee County Health Department.

Hazard Mitigation Plans have a pre-disaster focus. They develop strategies and actions to implement prior to the occurrence of disasters to minimize the negative impacts associated with these disasters. Hazard mitigation planning is comprehensive, addressing multiple hazards. Plans are implementation-oriented and locally relevant. They contain both short and long-range action strategies.

Lenawee County faces a variety of possible hazards including several of the following:

| | |
|---|---|
| × Civil Disturbances<br>× Earthquakes<br>× Subsidence<br>× Scrap Tire Fires<br>× Structural Fires<br>× Wildfires<br>× Riverine Flooding<br>× Dam Failures<br>× Energy Emergencies<br>× Infrastructure Failures<br>× Passenger Transportation Accidents<br>× Hazardous Material Incidents<br>× Nuclear Power Plant Accidents | × Oil and Natural Gas Well Accidents<br>× Oil and Natural Gas Pipeline Accidents<br>× Nuclear Attacks<br>× Sabotage/Terrorism/WMD<br>× Public Health Emergencies<br>× Drought<br>× Extreme Temperatures<br>× Hail<br>× Lightning<br>× Severe Wind Events<br>× Tornados<br>× Snowstorms<br>× Ice and Sleet Storms |

This Hazard Mitigation Plan includes a review of these potential threats and an analysis to determine which threats are most likely to occur in Lenawee County. The Plan identifies strategies which address the hazards most likely to occur; affect a high percentage of population; have potential for severity; have a potential for negative impacts on the economy; and trigger the occurrence of other hazards. The preparation of this hazard mitigation plan required the involvement of agencies and governmental departments who have responsibilities in emergency response, businesses, public utilities, elected officials of local units of government, planners, and citizens. The planning process offered opportunities for community collaboration in an attempt to maximize the effectiveness and efficiency of mitigation efforts. This maximization of efficiency and effectiveness helped to ensure the maximum community benefit, and to avoid expenditures for the mitigation of hazards which have low risk to the community.

The Lenawee County Hazard Mitigation Plan contains a community profile, the identification of hazards and risks facing the community, an assessment of vulnerabilities, goals and objectives for the community, mitigation strategies, the hazard mitigation plan, implementation measures, and a means for monitoring the effectiveness of plan recommendations. Just

as there is a wide range of hazards which face Lenawee County, there is a wide range of alternative approaches for mitigating these hazards. Available options include:

**We can:**

1. Remove the hazard.
2. Keep the hazard away from people.
3. Keep the people away from the hazard.
4. Alter design or construction to reduce the hazard.
5. Provide warnings and awareness to the community.

Approaches to the mitigation of hazards generally fall into the following categories:

1. Corrective measures. These include the acquisition of land, the relocation of people or businesses, redevelopment of an area, or the modification of an area to mitigate potential negative impacts.
2. Public works measures.
3. Planning and regulatory measures including planning, the use of zoning, regulations and codes, disclosure, moratoria, the purchase of development rights, and open space planning.
4. Persuasion and encouragement, including the use of incentives.
5. Public education and awareness including public information, dissemination, public relations, public hearings, and surveys.

It is important that hazard mitigation planning be incorporated into the community planning process. Many of the mitigation strategies intended to reduce the severity of hazards also contribute to community sustainability and the enhancement of quality of life. Good community planning offers the opportunity to recognize synergies whereby the collective impact of actions can result in the realization of community goals. From this context, efficiency can be obtained in the expenditure of scarce resources, with a maximization of community benefits. In addition, in order to further attempt to incorporate hazard mitigation into the community planning process, local units of government will be asked to adopt resolutions in support of the Lenawee County Hazard Mitigation Plan when the plan is approved by FEMA and adopted by the Lenawee County Board of Commissioners.

# PLAN PREPARATION

## Plan Preparation and Local Unit Involvement and Participation

### Staff Involvement

The Lenawee County Hazard Mitigation Plan was prepared by the staff of the Region 2 Planning Commission. Timothy Anderson, Principal Planner, Grant Bauman, Principal Planner, and Charles Reisdorf, Executive Director were responsible for data collection and analysis in the preparation of the plan. Assistance in word processing was provided by Executive Secretary Kimberly Hines. Staff accountant Julie Hill was responsible for budget and cost considerations.

### Lenawee County Planning Commission

Oversight for preparation of the Lenawee County Hazard Mitigation Plan was provided by the Lenawee County Planning Commission (LCPC). The LCPC functions under the state enabling authorization provided by the Michigan Planning Enabling Act, or MPEA (Public Act 33 of 2008). Included among the responsibilities of the LCPC are maintenance of the Lenawee County Comprehensive Land Use Plan, review of local master plans, zoning recommendations, oversight of solid waste activities, the Lenawee County Airport Zoning Board, and other related planning responsibilities. The LCPC and the Lenawee County Board of Commissioners adopted the Lenawee County Comprehensive Land Use Plan in 2002.

The LCPC is a seven-member body and is composed of the following members:

James Tipton, Chairman (Blissfield Township)

Ralph Tillotson, Vice-Chairman (Lenawee County Board of Commissioners)

Karol “KZ” Bolton, (Lenawee County Board of Commissioners)

Keith Dersham (City of Adrian)

Howard Keller (Lenawee Intermediate School District)

Becky Liedel (Madison Charter Township)

Bill Saunders (Dover Township)

The role of the LCPC as the steering committee in the hazard mitigation effort was established in February, 2010. The LCPC formed an ad hoc hazard mitigation planning committee to create a draft of the plan and report to the LCPC. At the April 15, 2010 Lenawee County Planning Commission Annual Planning Conference, a presentation was given by Lenawee County Emergency Management Coordinator Curtis Parsons. The event was attended by several local units of government in Lenawee County, and was an opportune occasion to bring local units of governments into the hazard mitigation planning process.

The ad hoc committee was known as the Lenawee County Hazard Mitigation Planning Committee. This committee consisted of the following members and representation:

| Member | Agency (s) | Representation |
|---|---|---|
| Curtis Parsons | Lenawee County Emergency Management Coordinator | Emergency Management |
| Ralph Tillotson | Lenawee County Board of Commissioners, Region 2 Planning Commission | County Board of Commissioners, Regional Planning Agency, Local Business, LCPC |
| Al Boggs | Rome Township | Township Supervisor |
| Susie Dice, Health Educator | Lenawee County Health Department | Health Department |
| Howard Keller, President | Lenawee County Intermediate School District | Education, LCPC |
| Alfred Boggs, Chairman | Michigan Townships Association, Lenawee Chapter, Rome Township Supervisor | Local Units of Government |
| Rick Renard, Fire Chief | Raisin Charter Township Fire Dept. | Local Emergency Services |
| Joseph Thatcher, Safety Director | Chemtura | Chemical Industry |
| Steven May, Lenawee County Drain Commissioner | Lenawee County Drain Commission | Drain Commissioner's Office |
| Karol Bolton | Lenawee County Board of Commissioners | County Board of Commissioners, LCPC |

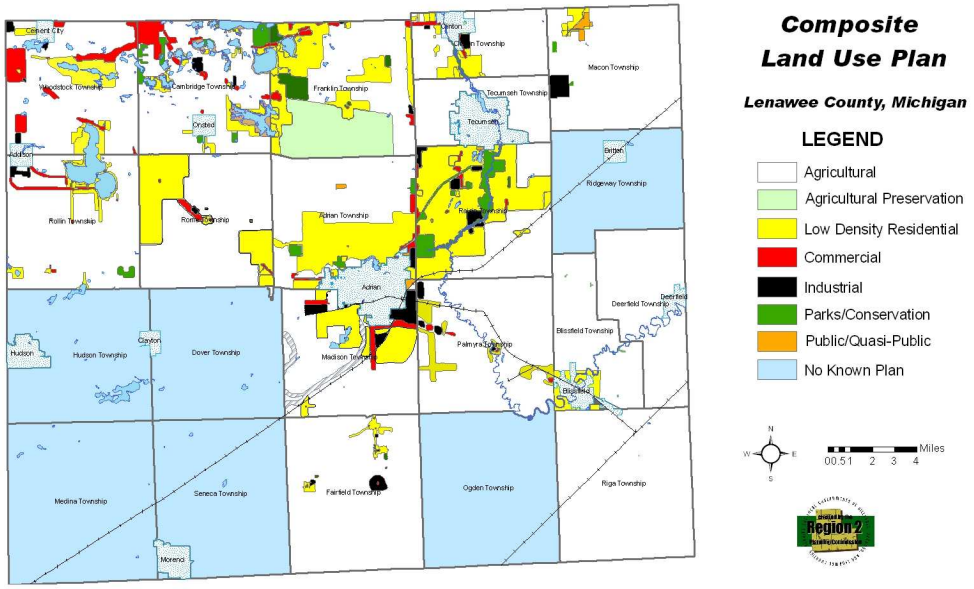
Several methods to involve the public and local units of government were identified by the LCPC including posting the plan on the Region 2 Planning Commission (www.region2planning.com) and Emergency Management Coordinator

(www.lenawee.mi.us/emergency_management/index.html) web sites; regular status reports at Region 2 Planning Commission meetings; and Lenawee Legislative dinners. The staff of Region 2 Planning Commission also attends many local planning commission meetings and local legislative functions and those were viewed as opportunities to inform local units about the plan.

Meetings of the Lenawee County Planning Commission are open to the public. Meetings are published on an annual basis and included on the meeting calendar on the Region 2 Planning Commission web site. These postings also comply with the Michigan Open Meetings Act. Citizens are offered the opportunity to participate at each meeting, and citizen input is desired and valued by Committee members. Meetings of the Hazard Mitigation Planning Committee were advertised in local newspapers and resulted in public input. Appendix A contains further information regarding the activities of the Hazard Mitigation Planning Committee.

**Opportunities for Participation of Neighboring Communities**

Neighboring counties and local units of government were provided opportunities to participate in the planning process by posting drafts of the plan on the Region 2 Planning Commission and Lenawee County web sites. In addition, all pertinent meetings of the Hazard Mitigation Planning Committee and Lenawee County Planning Commission that dealt were advertised in local newspapers and posted in accordance with the requirements of Michigan's Open Meetings Act.




**Coordination with the Lenawee County Comprehensive Land Use Plan**

The Lenawee County Comprehensive Land Use Plan was adopted in 2002 by the Lenawee County Planning Commission and the Lenawee County Board of Commissioners. Among the issues to be addressed in that Plan were water quality

and natural resource preservation. The Lenawee County Hazard Mitigation Plan seeks to address these issues in part by developing mitigation measures for hazards such as pipeline explosions, oil and gas well leaks, hazardous material accidents, and infrastructure failures.

**Local Land Use Planning and Zoning**

Lenawee County has not adopted a county-wide zoning ordinance. Each local unit administers its zoning ordinance independently.

The townships of Ogden, Deerfield, and Dover have not enacted zoning ordinances. Other than those communities, zoning is in force in the cities, villages, and townships of Lenawee County. While many community plans have recently been updated, or are in the process of being updated, others are dated or functionally obsolete. Communities with a history of high growth rates have tended to maintain their plans but several townships have not updated their plans within the past several decades. The update of community plans will provide an opportunity to instill hazard mitigation planning and implementation into local community planning and implementation processes.

Upon FEMA approval of the county-wide hazard mitigation plan, local units of government in Lenawee County will be asked to approve the Plan by resolution of the local legislative body. In approving the County Plan, local units will be eligible to apply for FEMA hazard mitigation grant funding.

**Summary of Community Participation**

The following Lenawee County communities participated in this plan (in the described manner): City of Adrian (responded to survey, participant on LCPC), Blissfield Village (responded to survey, participant on LCPC), Cement City Village (responded to survey), Clinton Township (responded to survey), Clinton Village (responded to survey), Dover Township (participant on LCPC), Fairfield Township (responded to survey), Franklin Township (responded to survey), City of Hudson (responded to survey), Lenawee County (participant on LCPC and Hazard Mitigation Planning Committee), Macon Township (responded to survey), Madison Township (responded to survey, participant on LCPC), Medina Township (responded to survey), Ogden Township (responded to survey), Raisin Township (responded to survey, participant on Hazard Mitigation Planning Committee), Rollin Township (responded to survey), Rome Township (responded to survey, participant in Hazard Mitigation Planning Committee), City of Tecumseh (responded to survey), and Tecumseh Township (responded to survey). These are the communities that, through their subsequent adoption of this plan, seek eligibility for FEMA hazard mitigation project grants in the future. Other, non-participating communities, as an integral part of Lenawee County, were still analyzed in this plan.

# COMMUNITY PROFILE

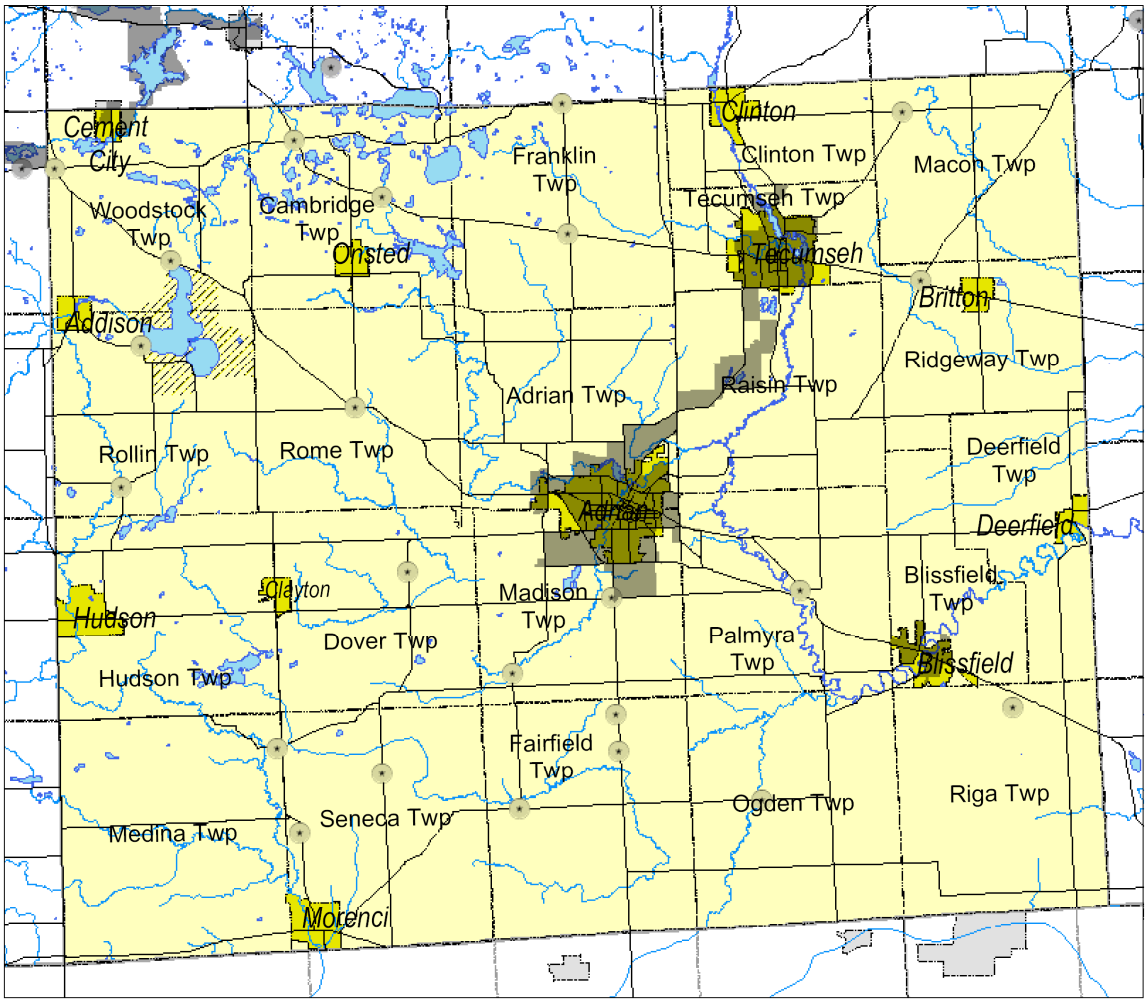
## Community Profile

### Regional Location

Lenawee County is located in the south-central portion of the Lower Peninsula of Michigan. Adrian, the most populous city in the County and the County Seat, is within a two-hour drive from Detroit, Toledo, Ann Arbor, Lansing, and Jackson. The meridian —utilized by surveyors, land owners and other powers to identify the location of real property in Michigan— forms much of Lenawee County's western border.


### Political Jurisdictions

The County includes 22 townships, eight villages, four cities, and a variety of crossroads hamlets and other small settlements. The townships, villages, and cities are governed by elected boards and councils. County residents are also represented by a County Board of Commissioners which consists of members each serving one of nine districts in the County. The entire county is also part of Michigan District 7 of the US House of Representatives. Cambridge Township is included in Michigan House District 65 but the majority of the county is included in District 57. The entire county is located in Michigan Senate District 16.




# Lenawee County Communities

**Municipalities**

- Cities & Villages
- Townships
- ★ Unincorporated Settlements

**Census Defined Geography**

- Urbanized Areas
- Census Defined Place

**Transportation Facilities**

- State Highways

Source:
Center for Geographic Information, State of Michigan

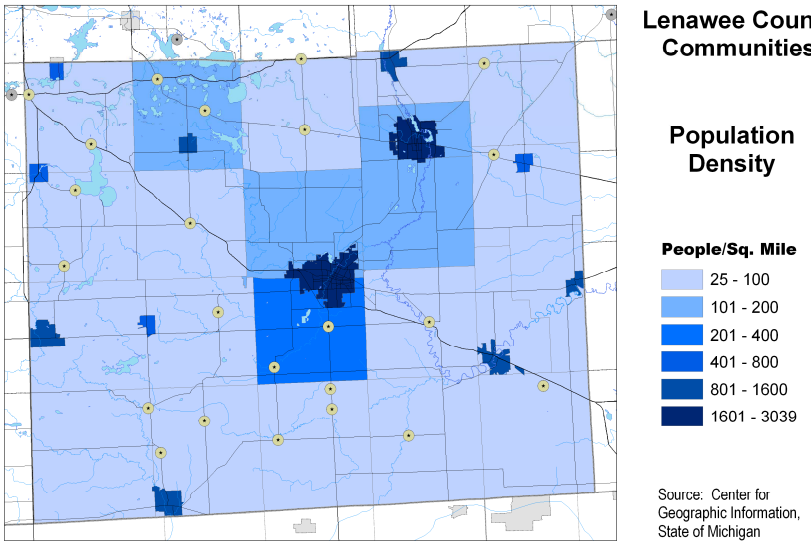
## Community Characteristics

The population of Lenawee County was 98,890 in 2000. By 2010, the population had grown to an estimated 99,892. In the course of the decade, Census Bureau estimates indicate that the population had grown to a maximum of 101,249 in 2006, but had declined since that year.

The Census Bureau identifies three urban areas in Lenawee County. These include: (1) the cities of Adrian and Tecumseh and the densely-settled area between the two cities; (2) the Village of Blissfield; and (3) a portion of the Irish Hills (including the Village of Cement City) associated with the Village of Brooklyn in Jackson County. Over one-half of Lenawee County residents reside in townships.

## Population Density

The overall population density of Lenawee County was 132 people per square mile (ppsm) in 2000. Population density varies widely across the County ranging from a high of 3,039 ppsm in the City of Adrian to a low of 25 ppsm in Ogden Township. Densities ranged from 408-1,649 ppsm in the villages and smaller cities and township densities were as high as 267 ppsm. Unincorporated settlements were settled, and in some cases, abandoned, long ago and tend to have a relatively high population density in comparison with their surrounding townships.




## Populations with Special Needs

Several population groups within the County have special needs. These population groups include the elderly, disabled, impoverished, and foreign language speakers.

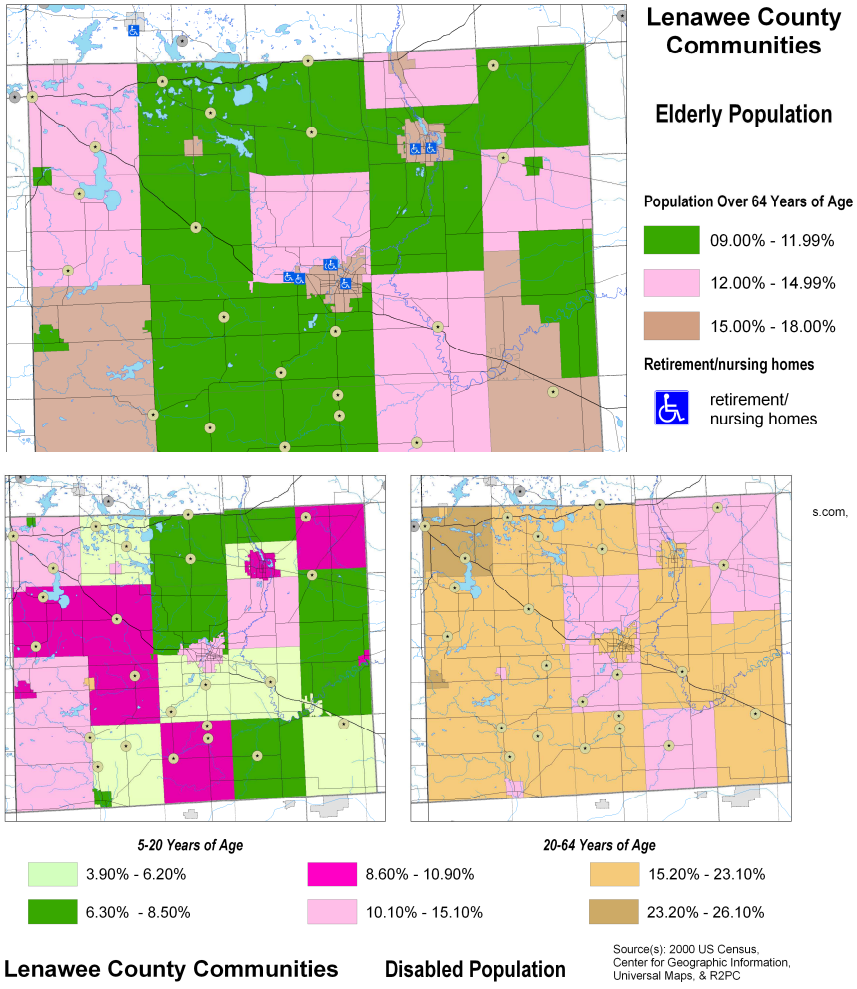
*Elderly Residents*

Nearly 13 percent of Lenawee County residents were at least 65 years old in 2000. This percentage is somewhat uniform within communities in the County ranging from the highest senior citizen percentages in the Village of Blissfield (15.8%) and townships of Hudson (17.1%) and Blissfield (15.6%), to the lowest percentages in the townships of Franklin (9.4%), Rome (9.3%), and Raisin (8.5%). The cities of Adrian and Tecumseh and their surrounding areas are the location of eight residential facilities geared toward serving the elderly population.

*Disabled Residents*

Data from the 2000 Census provide a breakout of disabled residents according to age groups:

- **5-20 years of age:** Approximately 9.1% of Lenawee County residents within the age group between 5 and 20 were disabled in some manner with significant variability in distribution among local units of governments. The villages of Clayton (23.1%) and Addison (15.1%), and Medina Township (13.7%) had the highest percentages in this category while the townships of Cambridge (4.9%); Seneca (3.9%), and Tecumseh (3.9%) had the lowest percentages.
- **21-64 years of age:** Almost 18% of Lenawee County residents between the ages of 21 and 65 were disabled in 2000. Distribution of disabled population in this category was somewhat varied throughout the County ranging from the greatest percentages in the City of Hudson (26.1%), the Village of Cement City (23.2%); and Woodstock Township (23.2%), to the lowest rate in Tecumseh Township (9.4%).

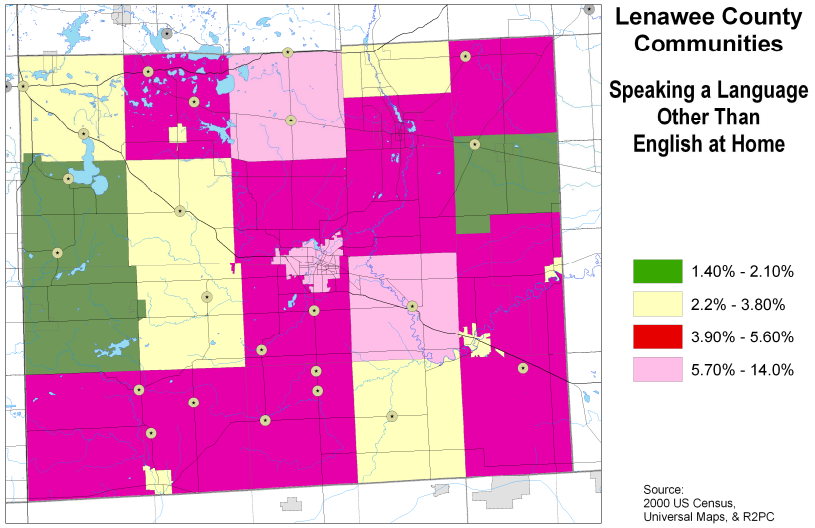



*Impoverished Residents*

Approximately seven percent of the residents of Lenawee County fell below the poverty level in 1999. The distribution of county residents below the poverty level varies widely among communities in the County. The highest percentages were found in the City of Adrian (13.9%) and Dover Township (10.7%) while the smallest percentage of poverty was found among the residents of Macon Township (1.6%).

*Foreign Language Speakers*

Approximately 5.7% of Lenawee County residents spoke a language other than English at home in 2000. The Census indicated that 309 households included residents that do not speak English very well, and 84 persons who speak no English. The highest percentages of non-English speakers are found in the City of Adrian and the townships of Franklin and Palmyra.




## School Populations

Children congregate daily during the school year at public and private schools in Lenawee County. The various schools are described in this section.

### Public School Facilities

The public school facilities located within the County are listed according to school district:

#### Lenawee Intermediate School District

Most of the local districts providing schools within the County are part of the Lenawee Intermediate School District:

- **Addison Community Schools.** Wayne Gray Elementary (K-5) and Addison Middle (6-8), and High (9-12);
- **Adrian City School District.** Alexander Elementary (K-5), Garfield Elementary (K-5), Lincoln Elementary (K-5), McKinley Elementary (K-5), Michener Elementary (K-5), Drager Middle (K-8), Springbrook Middle (6-8) and Adrian High (9-12);
- **Blissfield Community Schools.** Blissfield Elementary (K-5), Middle (6-8), and High (9-12);
- **Britton-Macon Area School District.** Britton-Macon Area School (K-12 on a single campus);
- **Clinton Community Schools**. Clinton Elementary (K-5), Middle (6-8) and High (9-12);
- **Deerfield Public Schools.** Deerfield Public School (K-12 located on a single campus);

- **Hudson Area Schools.** Lincoln Elementary (K-5) and Hudson Middle and High (6-12 on a single campus);
- **Madison School District.** Madison Elementary, Middle , and High (K-12, on a single campus);
- **Morenci Area Schools.** Morenci Elementary (K-5), Middle (6-8), and High (9-12);
- **Onsted Community Schools.** Onsted Elementary, Intermediate, Middle, and Community High (K-12 on a single campus) and Alternative Education (9-12);
- **Sand Creek Community Schools.** Ruth McGregor Elementary (K-6) and Sand Creek High (7-12);
- **Tecumseh Public Schools.** Herrick Park Elementary (K-4), Patterson Elementary (K-4), Sutton Elementary (K-4), Tecumseh Acres (K-4), Tecumseh Middle (5-8), High (9-12), and Options Institute (9-12).

**Other Local School Districts**

Neighboring school districts also provide access to public schools for County residents. However, only one of those districts provides any facilities within Lenawee County.

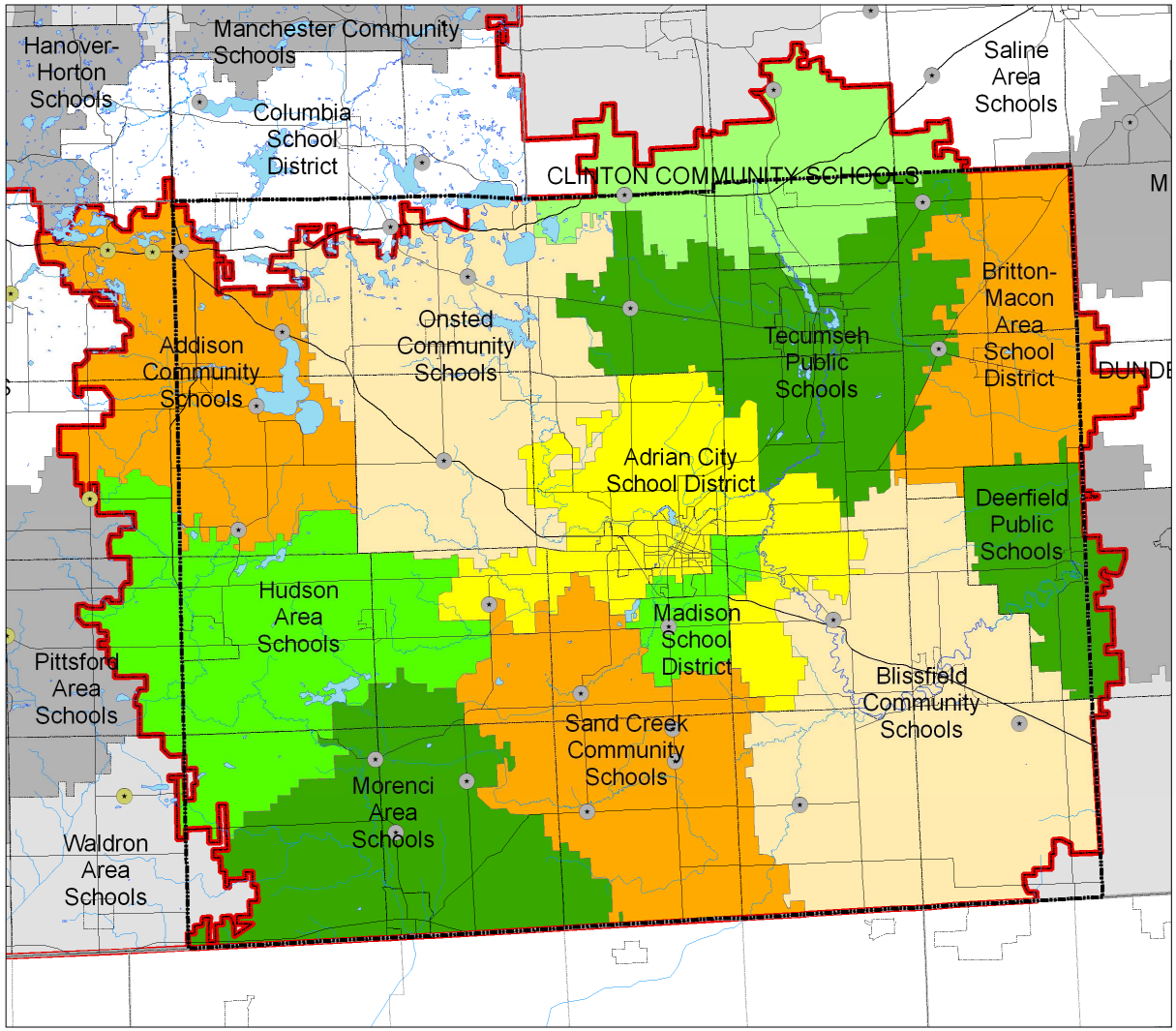
- **Columbia School District.** Miller Elementary (1-2).

Other neighboring districts whose boundaries penetrate into Lenawee County include Waldron Area Schools and the Whiteford Agricultural School District.

**Private School Facilities**

At least four private schools also operate in Lenawee County: Lenawee Christian School (PK-12), St John's Lutheran School (PK-8), St Joseph Montessori (PK-8), and St. Steven Lutheran (PK-8).

## Public Safety Organizations




# Lenawee County Communities

## School Facilities

Lenawee County Boundary

Intermediate School District Boundaries

Local School Districts in the Jackson Intermediate School District

Local School Districts in other Intermediate School Districts

Source:
www.greatschools.net & R2PC

Organizations that provide fire protection, emergency medical services (EMS), and police protection are found throughout Lenawee County.

*Fire Departments*

There are 18 fire departments serving the County. The Addison FD is located on Main St., the Adrian City FD is located on Main St., the Blissfield Township FD is located on Russell Rd., the Dover-Hudson Township Clayton FD is located on Center Hwy., the Deerfield FD is located on Carey St., the Fairfield Township Volunteer FD is located on Brown Rd., the Hudson FD is located on Main St., the Morenci FD is located on Main St., the Cambridge FD is located on Main St., the Riga Township FD is located on Riga Hwy., the Sand Lake Volunteer FD is located on Michigan Ave. and Tipton Hwy., the Adrian Township FD is located on Tipton Hwy., the Tecumseh FD is located on Russell Rd., the Madison FD and EMS is located on Adrian Hwy., and the Raisin Township DPS is located on Occidental Hwy.

*EMS*

The Jackson Community Ambulance (JCA) operates paramedic units in the City of Adrian on Maumee St., the City of Tecumseh on Kilbuck St., and in the Irish Hills on US-12.

*Police Departments*

County residents are served by a number of law enforcement agencies on a day-to-day basis**:**

- **State Police Posts.** State Police Post #18 serves Lenawee County and is located on Adrian St. in Adrian.
- **Sheriffs Office.** The County Sheriffs Office is located in Adrian on Winter St.
- **Local Police Stations.** There are 7 local police departments in the County. The Adrian PD located on Church St., Blissfield PD located on Chicago St., Clinton PD located on Michigan Ave., Hudson PD located on Railroad St., Morenci PD located on Orchard St., and Tecumseh PD located on Chicago Blvd.

**Seasonal Housing**

Less than 10% of Lenawee County housing units were considered seasonal in 2000. There is considerable variability in this statistic among the local units of government. The greatest amount of seasonable housing tends to be among communities with lakes. For example, the townships of Rollin, Cambridge, and Woodstock in the northwest quarter of Lenawee County exceeded 20% seasonal housing.

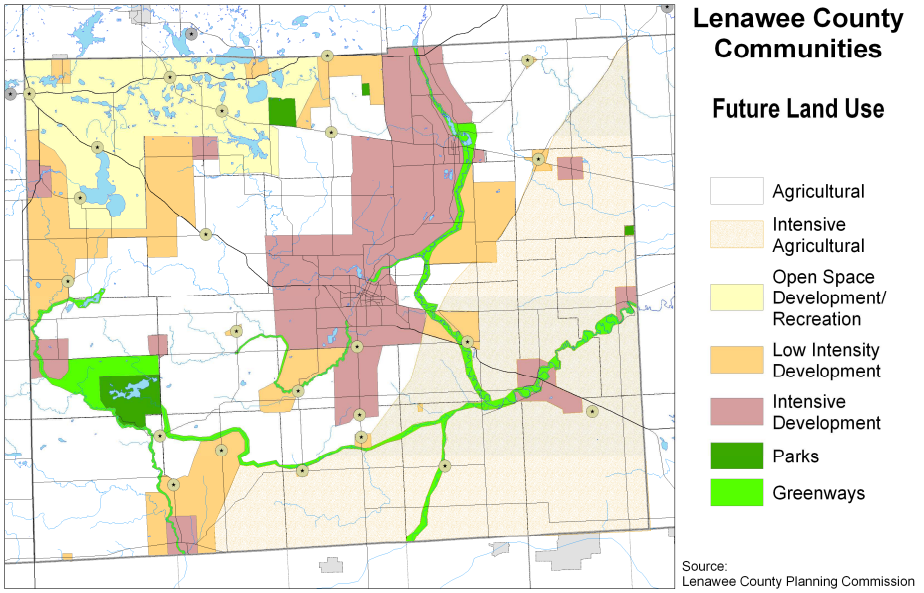
Other seasonal housing includes at least one organized camp, nine campgrounds, two college campuses, and two residential institutions (e.g., Boysville and the Adrian State Training School) which are scattered throughout the County.

**Median Home Values**

The median home value in Lenawee County in 2000 was $109,500 with an aggregate value of $2.62 billion. The gap in housing values among the local units of government was wide ranging from the highs in the townships of Cambridge ($159,000) and Tecumseh ($157,800) to lows in the City of Hudson ($67,600) and the Village of Clayton ($71,000).

**Future Land Use**

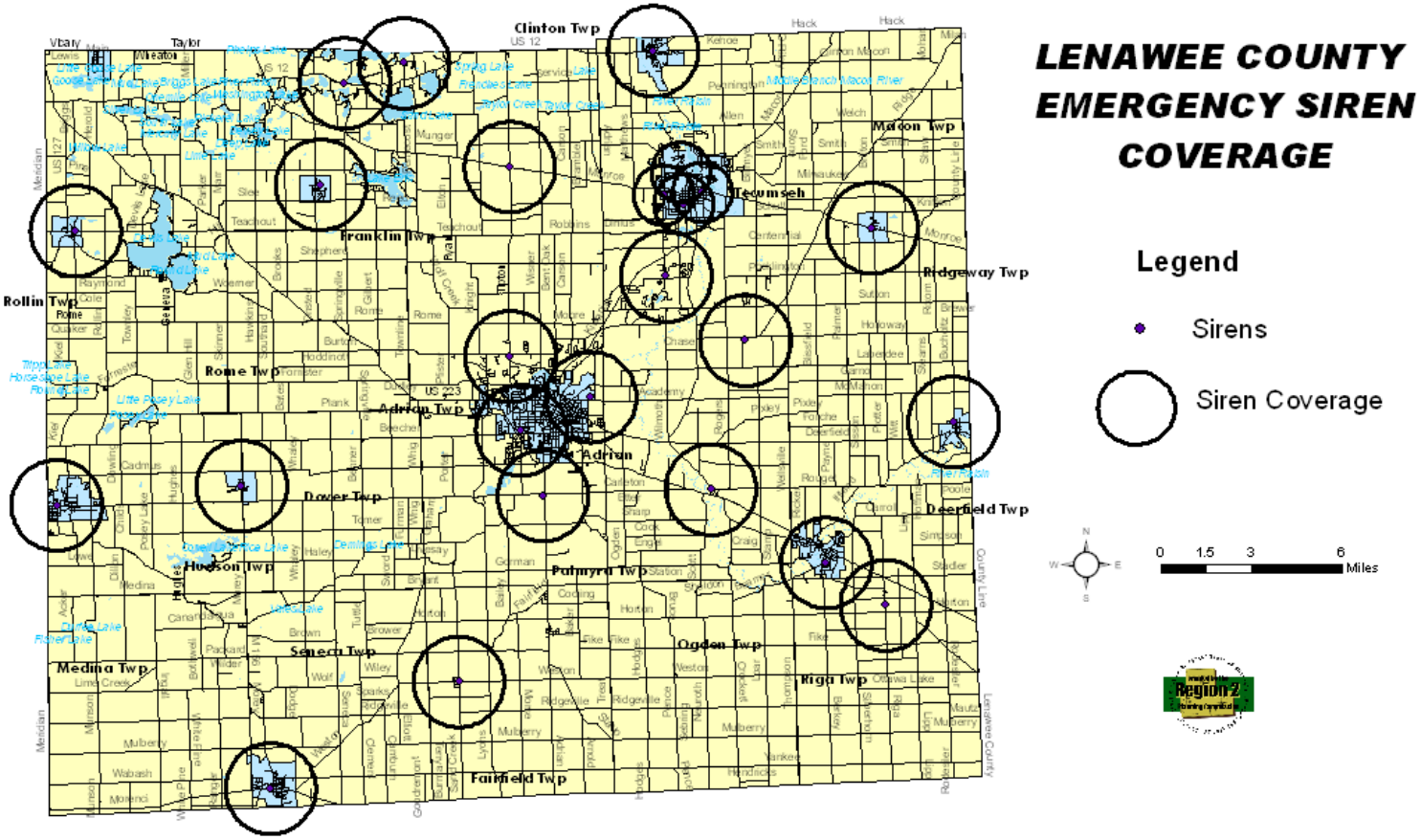
The Lenawee County Comprehensive Land Use Plan calls for the concentration of residential, commercial, and industrial land uses in the vicinity of cities and villages. The highest-intensity development is called for in the Urban Core from Clinton and Tecumseh in the north to the City of Adrian and Madison Charter Township to the south. Lower-intensity development, such as low- and moderate-density residential, small-scale commercial and industrial operations, and institutional and government uses, is called for in the periphery of the Urban Core and semi-rural areas. Intensive agriculture is planned in the southeast portion of the county where the most productive soils are located and agricultural uses are called for in other rural areas.




**Emergency Warning Sirens**

Each fire department in Lenawee County other than the City of Adrian has at least one emergency siren. Two sirens exist in Adrian which are operated by Adrian College and Siena Heights University. The City of Tecumseh has four sirens operational at this time. Cambridge Township has three emergency sirens – one at US-12 and Egan High-

way, one on the south shore of Wamplers Lake, and one in Onsted. The following map provides information on siren coverage in Lenawee County. The map shows that most densely-occupied areas of the county are provided with emergency siren coverage. However, rural areas are generally left without siren coverage.



# POTENTIAL HAZARDS

## Potential Hazards

A wide variety of hazards are known, or have the potential, to occur in Lenawee County. The following man-made and natural hazards are given consideration in this chapter:

**Civil Disturbances**

1. Correctional Facility Uprisings and Other Civil Disturbances

**Earthquakes and Subsidence**

2. Earthquakes
3. Subsidence

**Fire Hazards**

4. Scrap Tire Fires
5. Structural Fires
6. Wildfires

**Flooding Hazards**

7. Riverine Flooding
8. Dam Failures

**Energy and Utility/Infrastructure Failures**

9. Energy Emergencies
10. Infrastructure Failures
11. Passenger Transportation Accidents

**Hazardous Materials Incidents**

12. Fixed Site and Transportation-Related Hazardous Materials Incidents
13. Nuclear Power Plant Accidents
14. Oil and Natural Gas Well Accidents
15. Oil and Natural Gas Pipeline Accidents

**Homeland Security**

16. Nuclear Attacks
17. Terrorism/Sabotage/WMD
18. Public Health Emergencies

**Extreme Weather**

19. Drought
20. Extreme Temperatures
21. Hail
22. Lightning
23. Tornadoes
24. Severe Winds
25. Snowstorms
26. Ice and Sleet Storms

It is the intent of this chapter to describe each of these hazards and relate the history of occurrences in Lenawee County. This will provide the basis for the hazard assessment which follows this section.

## 1. Civil Disturbances - Correctional Facility Uprisings and Other Civil Disturbances

Civil disturbances fall into two categories; correctional facility uprisings and other civil disturbances.

### Correctional Facility Uprisings

Correctional facility uprisings consist of riots and other disturbances at correctional facilities. These are often related to perceived unjust rules or living conditions, or gang rivalries. Three correctional facilities are located in and around the City of Adrian.

### Other Civil Disturbances

Other disturbances, including large-scale civil disturbances, rarely occur. When they do they are usually an offshoot or result of one or more of the following events:

- Labor disputes when there is a high degree of animosity between the participating parties;
- High-profile/controversial judicial proceedings;
- Implementation of controversial laws or other governmental actions;
- Resource shortages caused by a catastrophic event;
- Disagreements between special interest groups over a particular issue or cause;
- Perceived unjust death or injury to a person held in high esteem or regard.

**Correctional Facilities**

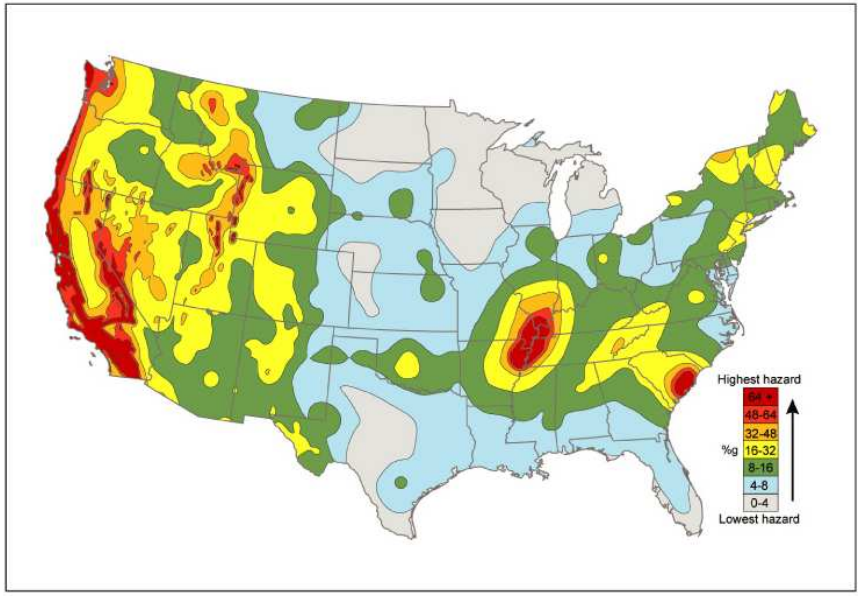
| Name | City |
|---|---|
| Gus Harrison Correction Facility | Madison Township |
| Lenawee County Jail | Adrian |
| Parr Highway Correctional Facility | Madison Township |

### Lenawee County Perspective

While the Michigan Hazard Analysis indicates that no correctional facility uprisings have occurred in Lenawee County, the Hazard Mitigation Committee identified (without documentation) a disturbance that occurred in the late 1990's at the Gus Harrison Correctional Facility. Otherwise, Lenawee County has not experienced a large-scale civil disturbance, though the potential exists for such an occurrence. The presence of the Gus Harrison Correctional Facility in Madison Township (2727 East Beecher) and the Lenawee County Jail in downtown Adrian are the most likely sites of such disturbances. Based on one occurrence of a civil disturbance in Lenawee County since the Gus Harrison Correctional opened in 1991, there exists about a 6% probability of an event of this type occurring in a given year in Lenawee County. Impacts are expected to be limited to the facilities themselves, and their immediate surroundings. For example, nearby roads might be closed for responders to better control site access and create staging areas for responding to the situation, slightly impairing transportation access in the area. Some alerts may require area respondents to take precautions.

## 2. Earthquakes

Lenawee County is located in an area in which there is a low probability of earthquakes. The New Madrid Seismic Zone near Memphis, Tennessee poses the most significant threat. If an earthquake were to hit Lenawee County, there would only be a 1-in-50 chance of the resulting horizontal shaking accelerating more than 4-8% in the next 50 years. Fortunately, less than 1.5% of the land in the County is subject to landslides which further reduces the risk that earthquakes pose in Lenawee County. A 1986 earthquake near the southern shore of Lake Erie in Northeast Ohio was a Level II-III on the Modified Mercalli Intensity Scale in Lenawee county. A Level II, according to the USGS, can be felt only by a few persons at rest, especially on upper floors of buildings. A Level III can be felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Vibrations are similar to the passing of a truck.




**Lenawee County Perspective**

Earthquakes are not considered a threat in Lenawee County and no instances of property damage or fatalities have occurred in the County as a result of earthquakes. The greatest impact on Lenawee County would likely come from possible damage to natural gas and petroleum pipelines. Were this to occur in the winter, the County would likely be severely impacted by fuel shortages. Damage would probably be negligible in well-designed and constructed buildings. Poorly designed and constructed buildings could suffer some damage under the right circumstances. Because there has not been a significant earthquake in Lenawee County in recorded history, the probability of such an event occurring is negligible. The impacts have been limited to a moderate amount of ground shaking during an event, sometimes not discernable to the ordinary person unless felt in the upper floors of a structure, and these sensations of movement and vibration have quickly passed, usually leaving little or no damage. Very fragile and unsecured items, such as glassware on a shelf, may fall and break.

## 3. Subsidence

Subsidence is the lowering or collapse of the land surface due to loss of subsurface support. It can be caused by a variety of natural or human-induced activities. Natural subsidence occurs when the ground collapses into underground cavities produced by the solution (e.g., erosion) of limestone or other soluble materials by groundwater. Human-induced subsidence is caused principally by groundwater withdrawal, drainage of organic soils, and underground mining. Generally, subsidence poses a greater risk to property than to life. In Southern Lower Michigan, the primary causes of subsidence salt mining, gypsum mining, and coal mining.

**Lenawee County Perspective**
Although subsidence cannot be entirely discounted, it is not considered a threat in Lenawee County due to stable bedrock and distance from susceptible areas. The northeastern Lower Peninsula of Michigan, in and around Presque Isle County, is susceptible to sinkholes because of their limestone bedrock which tends to dissolve in weak acids such as rainwater. Because there has not been a significant subsidence event in Lenawee County in recorded history, the probability of such an event occurring is negligible. The worst likely impact would involve a hole of moderate size forming and cause a person to fall or a vehicle to become damaged or trapped within, possibly causing a few casualties. There are no areas known to be particularly vulnerable to this kind of incident.

## 4. Scrap Tire Fires

Scrap tires can be a major economic and environmental issue. From an emergency management perspective, the most serious problem that scrap tire disposal sites pose is that they can be a fire hazard if not properly designed and managed. The Michigan Department of Natural Resources and Environment requires registration of scrap tire sites in Michigan. Sites are classified according to the number of tires on site. Classifications include general (500 or more scrap tires), retailers (1,500 or more tires), and recyclers (2,500 or more tires).

**Lenawee County Perspective**
According to the Michigan Department of Natural Resources and Environment, there are no registered or unregistered outdoor scrap tire collection sites in Lenawee County (as of July, 2010). The risk of a large-scale scrap tire fire is negligible. The situation needs to be monitored to ensure that any new scrap tire facilities are well-designed and properly maintained. Because there is no major scrap tire collection site in Lenawee County, the probability of such an event occurring is low, and an event's impact would probably not exceed that of an average industrial fire.

## 5. Structural Fires

In terms of average annual loss of life and property, structural fires are by far the largest hazard facing most communities in Michigan. The greatest risk occurs during the winter when wood stoves and space heaters are used the most. Each year in the United States, fires result in approximately 5,000 deaths and 25,000 injuries requiring medical treatment. Over 1.7 million fires occurred in the State of Michigan during the period of 1975-2002 resulting in an average of over 63,000 fires a year, with an annual average loss of $360.7 million.

Unfortunately, death can be an outcome of structural fires, and Michigan's fire death rate in 1996 of 21.2 persons per million people puts it in the upper third of all states in the nation. According to the Office of the State Fire Marshal, an average of 254 persons a year died in Michigan fires during the period of 1975-2002.

**2002 Michigan Fire Statistics**

| | Incidents | Injuries | Deaths | Loss ($) |
|---|---|---|---|---|
| Residential | 13,018 | 643 | 145 | $477,072,842 |
| Public Assembly/Stores | 1,200 | 13 | 1 | $54,926,043 |
| Industry | 2,040 | 34 | 3 | $25,047,373 |

Fires can occur in industrial and public assembly/mercantile structures as well as residences, which are located throughout the entire county. Disaster-level fires could occur anywhere that a large number of persons are present, or where important production and service functions are provided. As the above table illustrates residential fires constituted 80% of the total number of fires and 86% of the monetary losses. Fires in stores and other places of public assembly totaled 7% of the total number of fires and 10% of the monetary losses. Industrial fires accounted for 13% of the total number of fires and 4% of the monetary losses.

Structural fires can cause displacement and homelessness, in addition to serious injuries, death, and economic losses. Beyond the small-scale structural fires that only affect a single home or two at a time, emergency management authorities are primarily focused on disaster-level events involving multiple or major structures such as hotels, college residence halls, and major employers and community facilities (such as schools and hospitals). The impacts upon local services and economies can be severe in such cases, due to the number of residents served and the di-

versity of needs being met by these facilities. Structural fires occur more frequently than other hazards, and also cause more deaths, injuries, and property damage.

Air pollution issues are inherent to structural fire events, including vast amounts of carbon released from the flames, various chemicals burning within the building's materials, other forms of air pollution, and ash spread widely across the area. Large, dark, and thick smoke plumes from the burning structure can alter atmospheric conditions and lead to shifting wind patterns that affect other areas. Where combustible building materials have been used, fires may spread to other structures and to natural vegetation, negatively affecting the environment. The burning of nearby native forests, trees, and grasslands, as well as the burning of property, houses, and farms, are all environmental consequences of structural fires. Chemicals from combustion may contaminate nearby water in lakes, reservoirs, rivers, and swamps. Agricultural structural fires can also affect farm animals and ruin agricultural products. The waters used to quell fires can spread the combustion products (chemicals, soot, ash) into nearby areas, and into municipal sewer systems where they may affect the environment at system outlet locations.

**Lenawee County Perspective**

Table 5-1 provides the number of fires, cost in damages, and average loss per fire in Lenawee County for the period from 2002-2009. Lenawee County suffered 1,018 fires in the eight-year time frame (average of 127 fires per year) with property loss total of $19.1 million. This averages to $18,741 per structural fire during the period.

**Table 5-1, Lenawee County Fires, 2002-2009**

| Year | Number of Fires | Property Damage ($) | Average Cost Per Fire ($) |
|---|---|---|---|
| 2002 | 156 | 2,965,200 | 19,008 |
| 2003 | 149 | 2,263,103 | 15,189 |
| 2004 | 116 | 912,580 | 7,867 |
| 2005 | 116 | 1,691,400 | 14,581 |
| 2006 | 133 | 3,820,100 | 28,723 |
| 2007 | 131 | 2,614,850 | 19,961 |
| 2008 | 90 | 2,691,125 | 29,901 |
| 2009 | 127 | 2,119,925 | 16,692 |
| **Total** | **1,018** | **19,078,283** | **18,741** |

Source: NFIRS

Although many factors come into play when considering fire risk, areas with higher percentages of older housing stock can be vulnerable to structural fire due to outdated building materials and faulty electrical wiring. Table 5-2 provides the number of older housing units by community in Lenawee County.

| Table 5-2, Number of Pre-1960 Housing Structures in Lenawee County, 2000 | |
|---|---|
| **Community** | **Number of Structures Constructed Prior to 1960** |
| Lenawee County (total) | 20,588 |
| Addison | 153 |
| Adrian | 5,343 |
| Adrian Township | 608 |
| Blissfield Township | 1,028 |
| Blissfield | 837 |
| Britton | 202 |
| Cambridge Township | 898 |
| Clayton | 113 |
| Cement City | 108 |
| Clinton Township | 689 |
| Clinton | 501 |
| Deerfield Township | 429 |
| Deerfield | 243 |
| Dover Township | 367 |
| Fairfield Township | 451 |
| Franklin Township | 532 |
| Hudson | 771 |
| Hudson Township | 332 |
| Macon Township | 271 |
| Madison Township | 1,074 |
| Medina Township | 318 |
| Morenci | 635 |
| Ogden Township | 330 |
| Onsted | 184 |
| Palmyra Township | 564 |
| Raisin Township | 622 |
| Ridgeway Township | 426 |
| Riga Township | 416 |
| Rollin Township | 1,107 |
| Rome Township | 278 |

| Table 5-2, Number of Pre-1960 Housing Structures in Lenawee County, 2000 | |
|---|---|
| **Community** | **Number of Structures Constructed Prior to 1960** |
| Seneca Township | 290 |
| Tecumseh | 1,804 |
| Tecumseh Township | 196 |
| Woodstock Township | 809 |

Source: U.S. Census Bureau

The worst likely impacts from a large fire might include something that closes down one of the county's critical facilities (medical, caregiving, educational, government, utilities, etc., as described in the Community Profile section of this plan), or its major employers. Some portions of the cities, and some villages, have a dense "Main Street" arrangement of connected storefronts and structures, and if a severe fire got out of control at these locations, could have multiple effects upon the area's businesses and the services these provide to local residents. These areas exist in Adrian, Blissfield, Britton, Clinton, Deerfield, Hudson, Morenci, Onsted, and Tecumseh. Such a worst-case scenario might affect dozens of local residents directly, but probably not much more.

## 6. Wildfires

Michigan has the nation's fifth largest timberland acreage with 4.2 million acres of softwoods and 13.1 million acres of hardwoods. That vast forest cover is a boon for both industry and recreation but it also brings vulnerability to wildfires in many areas of Michigan. Because Michigan's landscape has changed substantially over the last several decades as a result of land development, the potential danger from wildfires has become more severe. Increased development in and around rural areas (a 60% increase in the number of rural homes since the 1980s) has increased the potential for loss of life and property from wildfires.

**Lenawee County Perspective**

Much of the recent development in Lenawee County is exurban in nature. The Irish Hills (i.e., Cambridge and Woodstock Townships) is an area of specific concern due to the exurban development which exists around its many lakes.

NFIRS reports indicate that there were 39 occurrences of "wild land fires" in Lenawee County from 2000-2009, or a probability of 4 occurrence per annum. These fires occurred primarily in rural areas and all of them were extinguished in a short period of time. These fires do not affect large tracts of land such as those that occur on a regular basis in the western United States. The impacts are also far less than wildfire events in northern Michigan—typically involving just the area responder agencies and not creating a large disruption for area residents.

## 7. Riverine Flooding

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

Most riverine flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snow melt. Ice jams are also a cause of flooding in winter and early spring. Log jams can also cause streams and rivers to be clogged up, and the backed-up waters to overflow the stream's banks. Either ice jams or log jams can cause dangerous flash flooding to occur if the makeshift dam-effect caused by the ice or logs suddenly gives way. Severe thunderstorms may cause flooding during the summer or fall, although these are normally localized and have more impact on watercourses with smaller drainage areas.

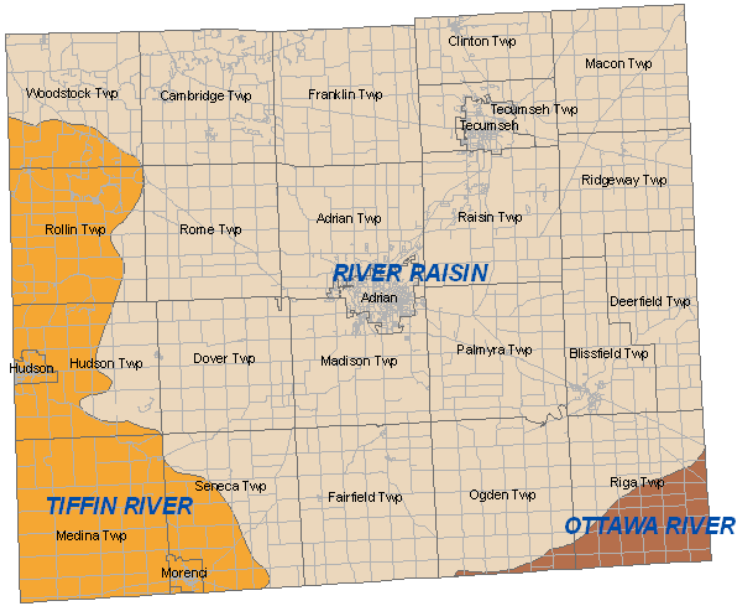
Flooding may not always be directly attributable to a river, stream or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are often not in a floodplain. That type of flooding is becoming increasingly prevalent in Michigan, as development outstrips the ability of the drainage infrastructure to properly carry and disperse the water flow. Flooding also occurs due to combined storm and sanitary sewers that cannot handle the tremendous flow of water that often accompanies storm events. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns. Other cases involve the ponding of waters across roads or in other low-lying areas. These additional types of flooding have not been given a separate chapter in this plan, but instead have been included in the descriptions of the Riverine flood hazards within this section.

Public impacts of riverine flooding have caused displacement, property damage, and impacts on the health of residents. In some cases, utility providers have had facilities located in floodplain areas, and these facilities have been negatively impacted by flooding. Floodwaters can also prevent normal access to structures and facilities. Flooding is a hazard whose risks are routinely underestimated by the public, who may be inclined to attempt to walk or drive through shallow waters, or to allow their children and pets to play in the water as if it were part of a beach or swimming pool. Public education is vital so that there is widespread knowledge of the contaminants and germs that floodwaters contain, and a greater awareness of the risks that floodwaters pose to drivers and pedestrians. Drivers need to know that roads and bridges are often weakened and degraded by flood impacts, and that the road they assume is still there under shallow waters may no longer be intact. Less than a foot of flowing water can cause travelers to end up in a ditch or sinkhole, where persons may find that it is impossible to escape from a submerged vehicle under the pressures exerted by flowing water. Those who are tempted to walk through floodwaters should be informed that the waters tend to conceal the presence of open manholes and dangerous debris, such as rusty nails and metal, or live electrical wires that can cause harmful shocks.

Flooding is generally part of a natural cycle that has many important and beneficial functions for the environment. Flooding raises the water table in wetlands, maintains biodiversity, and replenishes nutrients back into the soil. Additionally, higher water tables allow fish and water plants to recolonize and may also help to control some invasive species. Flooding, however, becomes a problem in the built environment. Drainage systems and city sewers can become overwhelmed, causing raw sewage to back up in basements and onto roadways. Flooding in urban areas can also cause increased runoff, which may carry pollutants through storm sewers into rivers and lakes. Urban runoff can be toxic, as it may contain garbage, fertilizers, oil and other residues from city streets.

**Lenawee County Perspective**

Lenawee County's rivers have overflowed their banks on numerous occasions in the past - often, but not exclusively, as a result of the flooding of the River Raisin. As historical data from the Adrian River Raisin monitoring station indicate, the river reached annual peaks that exceeded its 13.0' flood stage for 20 out of the 56 years that were recorded from 1954 to 2009. During that period, 36% of the years saw the River exceed flood stage – an average of one out every 2.8 years seeing some flooding (possibly multiple times during each such year).[1] The highest recorded annual flood peak was recorded on February 25, 1985 when the Adrian monitoring station recorded a gage height of 15.77 feet, or 2.77 feet above the flood stage.




Two types of flooding are prevalent in Lenawee County – flash floods and other riv-

[1] United States Geological Survey, Peak Streamflow near Adrian, Michigan 1954-2009.

erine floods. These categories and historic flood events in Lenawee County are described in detail within the following pages.

**Flash Floods** – "Flash" floods differ from other types of floods. Flash floods develop quickly, sometimes without any signs of precipitation. Flash floods often feature a dangerous "wall" of water carrying rocks, mud, and debris and can sweep away most things in its path. A total of nine flash floods and two flash flood warnings were recorded in Lenawee County from 1995 through 2009. Most flash floods occurred in communities along the River Raisin. However, there were several floods and warnings in unspecified Lenawee County locations and two flash floods in the western portion of the County. Flash floods resulted in approximately $350,000 property damage and one reported injury.

**Other Riverine Floods** – A total of 27 riverine flood events (including flash floods) occurred in Lenawee County from 1995 through 2009, or a probability of 1.8 floods per year. These hazards resulted in an estimated $675,000 in Lenawee County. While one event on May 23, 2004 resulted in a reported $100 million loss statewide, no individual information is available for Lenawee County in relation to that event so losses are not included in the Lenawee County total. Flood events that resulted in property losses or injuries attributable solely to Lenawee County are summarized in the following table:

**Table 7-1 – Floods Causing Known Property Damage in Lenawee County, 1995-2009**

| Date | Location | River or Stream | Damages |
|---|---|---|---|
| 3/14/1997 | River Raisin in Lenawee County | River Raisin | $50,000 |
| 1/24/1999 | River Raisin in Lenawee County | River Raisin | $25,000 |
| 5/18/2000 | Unspecified location | Unspecified | $20,000 |
| 9/11/2000 | Adrian | River Raisin | $15,000 |
| 2/10/2001 | Adrian, Deerfield, Blissfield | River Raisin | $15,000, 1 injury |
| 6/21/2006 | Blissfield, other unspecified locations | River Raisin | $150,000 ("very rough estimate") |
| 6/21/2008 | Adrian area | River Raisin | $100,000 property damage |
| 7/2/2008 | Western and southern Lenawee County | All western and southern streams and creeks | $100,000 |
| 3/10/2009 | Eastern Lenawee County | River Raisin | $200,000 |
| **TOTAL** | | | **$675,000 property damage, 1 injury** |

The following table provides a history of flood events from 1995 to 2009 in Lenawee County.

| Table 7-2, Lenawee County Flood Events, 1995-2009 | | |
|---|---|---|
| **Date** | **Description** | **Location** |
| **07/15/1995** | 2000: Flash Flood. Thunderstorms produced heavy rainfall of around three inches in an hour and five inches in two hours. Some roads and major intersection were flooded for a time along with farm fields. No injuries or major damage reported. | Lenawee County |
| **08/15/1995** | 1600: Flash Flood. Thunderstorms training over the western part of the county produced four to five inches of rain. Many creeks and streams over-flowed their banks flooding mainly secondary roads. No major damage or injuries were reported, just minor damage to some roads. | Western Lenawee County |
| **05/09/1996** | 08:00 PM: Flash Flood (countywide). Several road washouts were reported across the county after heavy thunderstorms moved through the area. | Lenawee County |
| **05/10/1996** | 08:00 AM: Flood. Heavy rains along a stationary front in southern Michigan resulted in flooding on the Raisin River at Tecumseh, in Lenawee county. The river went above its 9.0 foot flood stage at 0800 EST on the 10th and ultimately crested at 10.0 feet. | Tecumseh |
| **05/11/1996** | 01:00 AM: Flood. Heavy rains along a stationary front across southern Michigan resulted in flooding along the Raisin River at Adrian, in Lenawee county. The river went above its 11.0 foot flood stage at 0100 EST on the 11th and ultimately crested at 11.5 feet. | Adrian |
| **06/19/1996** | 08:00 AM: Flood. The River Raisin at Tecumseh went above its 9.0 foot flood stage at 9 am EDT on the 19th. The river crested at 9.5 feet at 6 pm on the 19th and fell below flood stage at 11 pm EDT on the 20th.<br>10:00 AM: Flood. The River Raisin at Adrian went above its 11.0 foot flood stage at 11 am EDT on the 19th. The river crested at 11.7 feet at noon EDT on the 20th, and fell below flood stage at 11 am EDT on the 21st.<br>07:00 PM: Flood. The River Raisin at Blissfield went above its 683.0 foot flood stage at 8 pm EDT on the 19th. The river crested at 683.5 feet at 8 pm EDT on the 20th, then went below flood stage at 11 am EDT on the 21st. | Tecumseh<br>Blissfield<br>Blissfield |
| **02/21/1997** | 01:00 PM: Flood. The River Raisin at Tecumseh went above its 9.0 foot flood stage at 1 pm EST on the 21st. The river crested at 10.0 feet at 6 am EST on the 22d, and fell below flood stage at 9 am EST on the 25th. | Tecumseh |
| **02/22/1997** | 02:00 AM: Flood. The River Raisin at Adrian went above its 11.0 foot flood stage at 2 am EST on the 22d. The river crested at 12.7 feet at 3 pm EST on the 23rd, and fell back below flood stage at 9 pm EST on the 24th. | Adrian |
| **02/27/1997** | 11:00 AM: Flood. The Raisin River at Tecumseh went above its 9.0 foot flood stage at 1100 am EST on the 27th. The river crested at 9.7 feet at 10 am EST on March 2, and fell back below flood stage at 9 am EST March 4th.<br>06:00 PM: Flood. The Raisin River near Adrian went above its 11.0 foot flood stage at 6 pm EST on the 27th. The river crested at 11.9 feet at 11 pm EST on the 28th, and fell back below flood stage at 5 am EST | Tecumseh<br>Adrian |

| Table 7-2, Lenawee County Flood Events, 1995-2009 | | |
|---|---|---|
| **Date** | **Description** | **Location** |
| | on March 2d. | |
| **03/14/1997** | 04:00 AM: Flood, $50,000 property damage. The same storm that brought heavy ice accumulations to southeast Michigan also brought flooding to many areas from Detroit south to the Ohio state-line. Some of the higher totals included 2.27 inches at Tecumseh and 2.18 inches at Morenci. In addition, there was some minor river flooding throughout far southeast lower Michigan.<br>03:00 PM: Flood. The Raisin River at Tecumseh went above its 9.0 foot flood stage at 3 pm on the 14th. The river crested at 10.5 feet at 11 am on the 15th, and fell back below flood stage at 4 pm on the 17th.<br>09:00 PM: Flood. The Raisin River at Adrian went above its 11.0 foot flood stage at 9 pm on the 14th. The river crested at 12.1 feet at 9 am on the 17th, and fell back below flood stage at 4 pm on the 17th. | Tecumseh<br><br>Adrian |
| **06/03/1997** | 08:00 AM: Flood. The River Raisin at Tecumseh went above its 9 foot flood stage at 8 am EST on the 3rd. The river crested at 9.5 feet at 5 pm EST on the 3rd, then fell back below flood stage at 330 pm EST on the 4th. The River Raisin at Adrian went above its 11 foot flood stage at 8 am EST on the 3rd. The river crested at 11.4 feet at 3 pm EST on the 3rd and fell back below flood stage at 3 am EST on the 5th. | Tecumseh |
| **02/19/1998** | 09:00 AM: Flood. The River Raisin at Blissfield went above its 683 foot flood stage at 9 am EST on the 19th. The river crested at 684.1 feet at 1 am EST on the 20th, then fell back below flood stage at 3 pm EST on the 21st. | Blissfield |
| **01/24/1999** | 12:00 AM: Flood, $25,000 property damage. The River Raisin exceeded flood stage along virtually its entire length. At Adrian, the River Raisin rose above flood stage of 13.0 feet at 5 am on the 25th. The river crested at 13.8 feet at 2 pm, then fell below flood stage at 7 am on the 26th. At Blissfield, the River Raisin rose above flood stage of 683.0 feet at noon on the 24th. The river crested at 684.0 feet at 5 pm on the 25th, then fell below flood stage at 10 am on the 27th. At Dundee, the River Raisin rose above flood stage of 650.0 feet at 10 am on the 26th. The river crested at 650.5 feet at 1 am on the 27th, then fell below flood stage at 4 pm. | Adrian, Blissfield |
| **05/18/2000** | 03:00 PM: Flood, $20,000 property damage. Thunderstorms developed and a number of them became severe, producing marginally severe hail. The storms produced a healthy amount of lightning. Small creeks and streams, and urban areas, saw some flooding develop in the afternoon. Flood waters lingered into the next morning, with some rutting of rural roads, and flooding of yards along the smaller creeks. Minor river flooding also resulted over the next few days. Flood warnings were issued in Lenawee County. | Lenawee County |
| **05/19/2000** | 01:30 PM: Flood. Up to 4 inches of rain fell from the storms on the 18th. Minor river flooding resulted in the River Raisin basin. The River Raisin at Adrian exceeded flood stage of 13 feet at 1230 pm EDT on the 20th. The river crested at 13.3 feet at 7 pm, then fell back below flood stage at 4 am on the 21st. | Adrian |
| **09/11/2000** | Flash flood warnings and flood warnings were issued.<br>05:10 PM: Flood at Adrian, $15,000 property damage. Low lying intersections in Adrian flooded rapidly. Water was high on many streets in the city, flooding and damaging several vehicles. Separate areas of thunderstorms merged over Metro Detroit in the late afternoon and early evening, producing tremendous amounts of rain. Many places had seen heavy rain the day before, and thus the area was quite vulnerable to flooding. At Detroit Metro Airport, 3.71 inches of rain fell on the 11th. This was the wettest September | Adrian |

| Table 7-2, Lenawee County Flood Events, 1995-2009 | | |
|---|---|---|
| **Date** | **Description** | **Location** |
| | day ever in Detroit, and the 5th wettest day of all time. This was on top of the 1.65 inches that had fallen the day before.<br>07:30 PM: High water levels were reported on the streets of Adrian.<br>08:39 PM: Widespread flooding continued across the county. Street flooding was reported in Adrian. Flooding of many low-lying spots occurred across the county.<br>09:00 PM: Other reports were made of streets and low-lying areas flooding in the county, especially around Adrian. | |
| **02/10/2001** | 10:00 AM: Flood, $15,000 property damage. The River Raisin at Adrian exceeded flood stage of 13 feet at 1 pm on the 10th. The river crested at 14.9 feet at 130 pm on the 11th. Downstream, the River Raisin at Blissfield rose above flood stage of 683 feet at 1 pm on the 11th. There, the crest was 683.2 feet at 7 pm on the 11th. Water remained over some roads in the Blissfield area into the 12th. Roads were also flooded west of Adrian, and near Hudson. One vehicle was floated by the flood waters - the occupants were rescued off the hood of the car.<br>11:57 AM: A local "flash report" described flooding conditions on the River Raisin, affecting Villages of Deerfield and Blissfield, with 1 injury reported and several roadways with deep water over the road. The County Road Commission had run out of signs and barricades.<br>09:11 PM: River Flood Warnings were issued for the River Raisin near Adrian, with an observed stage of 13.2', exceeding the flood stage of 13.0' (the previous crest was 13.3' on 5-20-2000), with minor flooding forecast from Suttons Rd. downstream to US-223 and a projected crest of 13.5'. For the River Raisin at Blissfield, minor flooding was forecast. | Adrian, Blissfield,<br>Hudson<br>Deerfield, Blissfield<br>Adrian, Blissfield |
| **02/11/2001** | Flood warnings continued for the River Raisin near Adrian (13.2' observed stage vs. 13.0' flood stage; crest of 13.4' was estimated shortly after midnight, down to 13.0' at 1400, 12.2' by 2100; previous crest 13.3' May 20, 2000) and for the River Raisin at Blissfield (estimated crest near flood stage of 683.0' at 1900, expected to fall below flood stage on 2-12). | Adrian, Blissfield |
| **02/12/2001** | Flood warnings continued due to the combination of heavy rain and snowmelt, but river levels were projected to fall below flood stage during the morning. | Lenawee County |
| **02/25/2001** | Flood Warnings were issued for the River Raisin, near Tecumseh and near Adrian | Tecumseh, Adrian |
| **05/15/2001** | Flash Flood Warnings were issued in Lenawee County. | Lenawee County |
| **05/13/2002** | 12:00 AM: Flood. The River Raisin at Blissfield rose above flood stage of 683.0 feet at 1 AM EDT May, 13th, and fell below flood stage at 2 PM EDT May 14th. The river crested at a stage of 683.5 feet at 3 PM May, 13th. Minor flooding was reported in Bachmayer and Ellis parks in Blissfield. Flood warnings were issued for the River Raisin at Blissfield. Minor flooding was occurring, with a stage of 683.2 feet and rising (flood stage there is 683.0 feet). | Blissfield |
| **05/14/2002** | Flood warnings issued for the River Raisin at Blissfield. Estimated stage was 683.6 feet and rising. Flood stage is 683.0 feet. | Blissfield |
| **06/21/2002** | 12:50 PM: Flash Flood at Adrian. Law enforcement reported 3 to 4 feet of water over roads on the east | Adrian |

| Table 7-2, Lenawee County Flood Events, 1995-2009 | | |
|---|---|---|
| **Date** | **Description** | **Location** |
| | side of Adrian.<br>01:00 PM: Lightning 5 Miles South East of Adrian. Lightning struck a home in Palmyra Township. No damage was reported (reported under lightning). Scattered thunderstorms produced hail and very heavy rainfall. Slow storm movement and the intense rainfall led to flooding in some locations. The most persistent heavy rainfall occurred from Adrian to Monroe to the southern suburbs of Detroit, where rainfall rates of 2 inches per hour were reported.<br>Severe thunderstorm warnings were issued, along with flash flood warnings issued. Reports came in of stranded cars and 3 to 4 feet of water covering low lying areas. | |
| **03/05/2004** | Flood warnings were issued for Lenawee. | Lenawee County |
| **05/21/2004** | 11:00 PM: Flash flood at Deerfield. Roads were reported closed due to flooding. | Deerfield |
| **05/23/2004** | 03:00 AM: Flood, $100.0 million property damage. Severe thunderstorms and heavy rains caused widespread flooding over Southeast Michigan. Much of the rainfall occurred in saturated areas that had experienced well-above average precipitation for the month of May. In fact, May 2004 will go down as the wettest May on record at Detroit. Over a 36 hour period (12 am May 22nd to 8 am May 23rd), 2 to 6 inches of rain fell across Southeast Michigan. In Lenawee county, numerous roads were closed near Deerfield. | Deerfield |
| **01/14/2005** | 04:00 PM: Flood. The River Raisin at Blissfield went above its 683 foot stage at 4 pm EST on the 14th. The river crested at 683.65 feet at 8 am EST on the 15th, then fell back below flood stage at midnight of the 17th. | Blissfield |
| **06/21/2006** | 04:54 PM: On June 21st, rapid thunderstorm development occurred across the southern two tiers of counties in southeast Michigan. Flash flooding was reported across Lenawee and Monroe counties.<br>08:00 PM: Flash flood, $150,000 property damage. On the evening of Wednesday June 21st, severe thunderstorms trained across the southern half of Lenawee County. Up to 5 inches of rain fell that evening on top of about an inch that fell in the morning. This caused flash flooding across the area. Several roads were reported being washed out, especially around the Blissfield area where portions of US-223 and M-34 were closed with several feet of water reported flowing across portions of these roadways. Yards across nearly this entire area were under water with several reports of water entering the first floor of homes. At least two vehicle rescues took place across Lenawee County. An SUV fell approximately 12 feet when a culvert washed out, creating a large sink hole and causing the road to give way beneath it. No injuries or deaths were reported. Total property damage was very roughly estimated at $150K. | Lenawee County<br><br>Blissfield |
| **06/21/2008** | 14:45 PM: Flash flood from 3 Miles West North West of Adrian, LAT/LON: 41°55'N / 84°04'W, to 1 Mile South West of Raisin Center, LAT/LON: 41°54'N / 83° 58'W, $100,000 property damage. Law enforcement reported flash flooding with water up to car hoods on some local roads in the city of Adrian. Scattered severe thunderstorms had occurred along and near an Adrian to Port Huron line. | Adrian |
| **07/02/2008** | 20:35 PM: Flash flood from 1 Mile South of Addison, LAT/LON: 41°58'N / 84°21'W, to 3 Miles East South East of Holloway, LAT/LON: 41°54'N / 83°52'W, $100, 000 property damage. Local dispatch reported widespread flooding across western and southern sections of Lenawee county. | Addison |
| **03/10/2009** | 06:00 AM: Flood from 2 Miles South East of Palmyra, LAT/LON: 41°51'N / 83°54'W to 2 Miles North North | Palmyra, Blissfield, |

| Table 7-2, Lenawee County Flood Events, 1995-2009 | | |
|---|---|---|
| **Date** | **Description** | **Location** |
| | West of Deerfield, LAT/LON: 41°54'N / 83°47'W, $200 ,000 property damage. Heavy rain fell between the 7th and 11th, bringing 3 or more inches of rainfall to a good portion of southeast lower Michigan, with the River Raisin basin getting hit the worst with 4 to 5 inches in that period. This caused flooding along several rivers with moderate flooding on the Huron at Hamburg and the reach from Blissfield down to Monroe getting moderate to major flooding. Many roads and homes along the Raisin where flooded. | Deerfield |

Sources: Michigan Hazard Analysis, the National Climatic Data Center (NCDC) storm events database, reports from the Law Enforcement Information Network (LEIN), and input from plan participants.

The greatest number of flood events occurred in Adrian with 13; followed by Blissfield with 12 events; Tecumseh and Lenawee County overall with seven each; Deerfield with four; and Addison, Palmyra, western Lenawee County, and Hudson each with one event. According to a FEMA report dated March 31, 2010, there are two "repetitive loss properties" within Lenawee County. One is in the Village of Deerfield and the other is in Deerfield Township, and both are single-family residential structures. They have suffered $14,000 in damages since 1981.

In order to provide property insurance for property owners within Lenawee County floodplains, the following Lenawee communities have been mapped and participate in the National Flood Insurance Program: The cities of Adrian, Hudson, and Tecumseh; the villages of Blissfield, Clinton, and Deerfield; and the township of Adrian. The cities of Adrian, Hudson, Tecumseh, and the villages of Blissfield and Clinton have adopted ordinance provisions that supplement FEMA flood regulations. Mapping modifications resulting from FEMA's Map Mod program are being reviewed by participating communities. The following table indicates the adoption date of FIRM maps in these communities.

| Community | FIRM Adoption Date |
|---|---|
| City of Adrian | June 19, 1982 |
| City of Tecumseh | June 1, 1982 |
| City of Hudson | November 4, 1981 |
| Blissfield village | February 17, 1988 |
| Clinton village | July 17, 1982 |
| Deerfield village | April 1, 1981 |
| Adrian Township | November 16, 1990 |

Source: FEMA

Continued compliance with NFIP provisions can be ensured with mapping updates in flood-prone areas, and efforts to obtain and apply additional information to identify and address issues of floodplain development regulations and floodprone property mitigation (including the seeking of fundable flood mitigation projects through FEMA grant sources). Floodplains are to be kept clear of obstructions which have the potential to interfere with the free flow of rivers and streams during flood events. As previously mentioned, several communities make use of 100-year flood plain overlays as part of their zoning ordinances to implement and enhance FEMA floodplain regulations.

Those Lenawee County communities that do not participate in the flood insurance program either have no special flood hazard areas or otherwise have chosen not to adopt flood regulations.

According to NFIP flood maps for the City of Adrian, there may be a few houses that are vulnerable to riverine flooding at the north end of Meadowbrook Drive and possibly near the curve in nearby Brookfield Court. Adjustments have been made over the years within Adrian, to accommodate flood areas, but some road segments, an industrial area, and a high-rise near the River where it crosses Highway 223 may be partially affected by floodwater during an event. A couple of large parks are likely to be heavily affected during a flood, and one or two structures on the north side of town may also be at risk. At least a couple of residential homes and several utility structures appear to be located in a floodplain area on Merrick Street, and possibly a few homes in the area on and south of Beecher Street, near the river. Within adjacent Adrian Township, Southgate Lane, a nearby portion of Hooks Mill Road, and Devonshire Court appear to be within the floodplain, with several residential homes (and access to others) at risk. A portion of nearby Country Club Road may also be vulnerable, along with a couple of homes on Birnwick Drive. Some structures that are very close to Lake Adrian may also be vulnerable.

In the southwest corner of the Village of Blissfield, a segment of South Monroe Street, and several nearby homes, appears to be located within the floodplain identified in the Village's Flood Insurance Rate Map. A few homes also appear to be at risk in the floodway area just east of South Monroe Street nearer to the downtown (south of Highway 223). To the southeast of this area, a large portion of a village park is located within the floodplain. There may be a couple of at-risk houses located just to the east of this park (on Pearl Street). On the north side of the village, multiple houses are located in the floodplain at the dead-end eastern portions of Franklin Street and River Street. In the northeastern part of the Village, a couple of street extensions (allowing Fairhaven to connect with Grant Street) have gone into the identified floodplain area, and this area has new developments taking place within it, which so far seem to have placed several new houses in the floodplain area. It is not clear at this time whether special engineering, flood retention, or letters of map amendment activities were involved in this development process, but since Blissfield is an NFIP participant, any development should be taking place in accordance with

good floodplain management practices. This includes the area in which it appears that Woodmont Street will be extended to the south, to link up with Grant Street.

The Village of Clinton has some floodplain areas that overlap with a park in one section, and come very close to some houses in a couple other places, but otherwise appears to have decent separation between its identified floodplain and its developed areas. In the Village of Deerfield, a few homes may be at-risk in the floodplain area between Drew Avenue and West River Street. The rest of the village appears to be in pretty good shape, although there are several homes that are extremely close to the floodplain near the intersection of Rodesiler Highway and East River Street, and also in the area near Witts End and West River Street.

In the City of Hudson, there appear to be several homes in a floodplain area at South Market Street and to its east (along and around Park and St. Giles Streets). Sewage disposal facilities, and their access drive, are also situated within this floodplain. In the City of Tecumseh, Brown Road seems to have been extended through a floodplain, to connect with Occidental Highway, and there may be several new residential structures now built in this area. Since Tecumseh is an NFIP participant, any development should be taking place in accordance with good floodplain management practices.

## 8. Dam Failures

Dam failures can result in loss of life and extensive property or natural resource damage for miles downstream. Dam failures occur not only during flood events, which may cause overtopping of a dam, but also as a result of improper operation, lack of maintenance and repair, and vandalism. Such failures can be catastrophic because they occur unexpectedly, with no time for evacuation.

The impacts of dam failures have generally been similar to those of riverine flooding, except that dam failures present the possibility for a faster release and inundation of the affected areas, and that failed dams may have served important functions for the area's hydrology and infrastructure. (For example, hydroelectric dams may need to be shut down in the event of a breach, causing impacts on the power supply of an area, or local economic effects.) Dam failure also has the potential to cause great harm to the natural ecosystem by pushing sedimentation throughout the floodplain. Dam failure can push water onto agricultural land, which can then carry fertilizers and pesticides into other areas.

The MDNRE rates dams in Michigan according to their potential to cause damage to property, crops, transportation facilities, utilities, and the environment in the event of dam failure. Table 8-1 provides the classifications and their definitions.

| Table 8-1, MDNRE Dam Hazard Potential Classifications | |
|---|---|
| **Dam Hazard Class** | **Definition** |
| *High-Hazard Potential Dam* | A dam located in an area where a failure may cause serious damage to inhabited homes, agricultural buildings, campgrounds, recreational facilities, industrial or commercial buildings, public utilities, main highways, or class I carrier railroads, or where environmental degradation would be significant, or where danger to individuals exists with the potential for loss of life. |
| *Significant-Hazard Potential Dam* | A dam located in an area where its failure may cause damage limited to isolated inhabited homes, agricultural buildings, structures, secondary highways, short line railroads, or public utilities, where environmental degradation may be significant, or where danger to individuals exists. |
| *Low-Hazard Potential Dam* | A dam located in an area where failure may cause damage limited to agriculture, uninhabited buildings, structures, or township or county roads, where environmental degradation would be minimal, and where danger to individuals is slight or non-existent. |

Source: NEPA, 1994 PA 451, Part 315, as amended

**Lenawee County Perspective**

Table 8-2 lists the dams in Lenawee County. Some of the dams are managed by the MDNRE and some are managed by private parties or other government entities. The Table indicates that three dams in Lenawee County are classified as high hazard dams and have the potential to cause much damage in the event of failure. These dams are located in Adrian, Clinton, and Addison. Five dams are listed under the category of significant hazard potential. These dams are located on Loch Erin in Cambridge and Franklin townships, three in Tecumseh, and one in Adrian. The remaining dams are rated as having low hazard potential.

Dams located in one county can sometimes wreak havoc on areas located downstream. In the case of Lenawee County, two such dams are the Lake Columbia Dam in Jackson County's Columbia Township and the Manchester Dam in the Village of Manchester in Washtenaw County. Were either of those dams to fail, the impact would likely be felt in areas along the course of the River Raisin in Lenawee County.

The MDNRE has documented two dam failures in Lenawee County. The first was when the Rollin Mill Dam was struck by a tornado in 1939 (and not rebuilt). Years later, according to the Daily Telegram (newspaper, on 9-24-1975), the Globe Mill Dam was washed out in a June 1969 flood, with all the water from the race and pond flowing away and causing the area to dry up. The Globe Mill was soon rebuilt, refilling the pond and race with water.

Given that there have been two dam failures in the 70-year period from 1939-2009, the probability of a dam failure in any given year is approximately 3%.

| Table 8-2, Lenawee County Dams | | | | | |
|---|---|---|---|---|---|
| **Dam Name** | **Pond Name** | **Hazard Potential** | **Owner** | **River** | **Community** |
| Loch Erin Dam | Loch Erin | Significant | Lenawee County Drain Commissioner | Wolf Creek | Cambridge |
| Globe Mill Dam | Globe Mill Pond | Significant | City of Tecumseh | River Raisin | Tecumseh |
| Lake Hudson Dam | Lake Hudson | Low | MDNR Parks & Recreation | Bear Creek | Hudson |
| Atles Mill Dam | | High | Water Wheel Estates | River Raisin | Clinton |
| Blissfield Dam | Raisin River | Low | City of Blissfield | River Raisin | Blissfield |
| Springville Mill Dam | Killarney Lake | Significant | City of Adrian | Wolf Creek | Adrian |
| Standish Dam | Standish Pond | Significant | City of Tecumseh | River Raisin | Tecumseh |
| Tecumseh Dam | Red Mill Pond | Significant | Red Mill Pond LLC | River Raisin | Tecumseh |
| Lake Adrian Dam | Lake Adrian | High | City of Adrian | Wolf Creek | Adrian |
| Sparrow Dam | | Low | Individually owned | Hazen Creek | Rome |
| Fry Lake Dam | Fry Lake | Low | Individually owned | Squaw Creek | Cambridge |
| Addison Mill Pond Dam | Addison Mill Pond | High | Village of Addison | Bean Creek | Addison |
| Pratt Dam | Cambridge Lake | Low | Lenawee County Drain Commissioner | Wolf Creek | Cambridge |
| Spencer Dam | | Low | Individually owned | Tributary to Posey Lake | Hudson |
| Pickerel Lake Dam | Pickerel Lake & South Lake | Low | Individually owned | South Lake | Woodstock |
| O'Neal Dam | | Low | Individually owned | Macon Creek | Macon |
| Vreba-Hoff #1 Treatment Cell | | Low | Vreba Hoff Dairy, LLC | N/A | Seneca |
| Vreba-Hoff #1 | | Low | Vreba Hoff Dairy, LLC | N/A | Seneca |

| Table 8-2, Lenawee County Dams | | | | | |
|---|---|---|---|---|---|
| **Dam Name** | **Pond Name** | **Hazard Potential** | **Owner** | **River** | **Community** |
| Storage Cell | | | | | |
| Greg Ries Dam | | Low | Individually owned | Tributary to Posey Lake | Hudson |
| Juniper Hills Dam | | Low | Juniper Hills Inc | Brigs Lake Creek | Woodstock |
| Burr Park Dam | City Recrea-tion Ponds | Low | City of Adrian | Trib to S Br River Raisin | Adrian |
| Springville Dam | | Low | Hubbard | Tributary to Wolf Creek | Adrian Township |
| Devils Lake Level Control Structure | Devils and Round Lakes | Low | Lenawee County | Bean Creek | Rollin Township |
| Dewey Lake Level Control Structure | Dewey Lake | Low | Lenawee County Drain Commissioner | Tributary to Wolf Creek | Adrian Township |
| Daub Dam | | Low | Individually owned | Tributary to Childs Drain | Rollin Township |
| No Name #2 Dam | | Low | Individually owned | Tributary to Childs Drain | |
| Posey Lake Level Control Structure | Posey Lake | Low | Lenawee County Drain Commissioner | Posey Lake Drain | Hudson |
| Sand Lake Inlet/Outlet Con-trol Structure | | Low | Lenawee County Drain Commissioner | N/A | Franklin |
| McCoy's Pond Dam | McCoy's Pond | Low | Individually owned | Tributary to River Raisin | |
| Horseshoe Lake Level Control Structure | Horseshoe Lake | Low | Lenawee County Drain Commissioner | Tributary to Bean Creek | Rollin Township |
| River Raisin | | Low | Harbortowne Village Asso-ciation | River Raisin | Rollin |

Source: Michigan Department of Environmental Quality

## 9. Energy Emergencies

An adequate energy supply is critical to Michigan's economic and social well being. The American economy and lifestyle are dependent on a non-interrupted, reliable, and relatively inexpensive supply of energy that includes gasoline to fuel our vehicles, and electricity, natural gas, fuel oil, and propane to operate our homes, businesses and public buildings. To date, Americans have been able to deal with short term energy disruptions caused by severe weather damage, broken natural gas and fuel pipelines, and shortages caused by the inability of the energy market to adequately respond to consumer demand and meet required production. However, the 1973/74 Oil Embargo and the 1991 Gulf War highlight our continued vulnerability. There are three types of energy emergencies:

- the physical destruction to energy production or distribution facilities caused by severe storms, tornadoes, floods, earthquakes, or sabotage;
- a sharp sudden escalation in energy prices, usually resulting from a curtailment of oil supplies; and
- a sudden surge in energy demand caused by a national security emergency involving mobilization of U.S. defense forces.

**Lenawee County Perspective**

Lenawee County has been spared direct difficulties related to disastrous energy emergencies. Such emergencies are likely to affect Lenawee County in the future, but these effects are likely to be shared by other communities in the region, state, and nation. The probability that energy emergencies will affect Lenawee County in any given year is based on one event in the 36-year period since the Oil Embargo in 1973/74 which equates to a 3% chance.

## 10. Infrastructure Failure

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

vulnerable members of society (i.e., the elderly, children, impoverished individuals, and people in poor health) who are the most heavily impacted by an infrastructure failure. If the failure involves more than one system, or is large enough in scope and magnitude, whole communities and possibly even regions can be severely impacted.

The following listing describes the various types of infrastructure systems (all of which can fail):

- Water Distribution
- Wastewater Collection/Treatment
- Surface Drainage
- Telecommunications
- Digital, Internet Connections

Many forms of infrastructure are relied upon by the public, to provide the essential components of a productive modern lifestyle. The supply of fresh water (for drinking, cleaning, washing, cooking, and other uses) may sometimes be interrupted by pipe freezes, breaks, or water main failures. In addition to the need for citizens to find alternative sources of water, there is the potential for certain types of water system failures to allow contaminated water to be delivered and consumed, causing negative public health impacts. Pipe or water main failures may also cause localized damage, erosion, and flooding.

A failure of electric power systems may cause severe problems for persons who rely on medical equipment for their very survival, or for the maintenance of good health. A properly functioning power supply is also essential to maintain the safety of citizens who are working, traveling, attending to domestic matters, or involved in certain types of recreational activities. A sudden power failure may cause (1) traffic lights to stop functioning, (2) traffic patterns to slow dramatically (resulting in traffic jams and delays in emergency response capabilities), (3) interference with important communication networks and needed machinery (including other important infrastructure, such as sewer lift stations and hospital equipment), or (4) sudden darkness when vital operations are taking place or dangerous activities are being performed as a part of people's ordinary occupations and activities. Food storage and safety relies heavily on an ongoing supply of electrical power. A great many community events, business operations, and tourist attractions are similarly reliant upon electrical infrastructure.

Communication systems are vital for emergency response and operations, as well as a great many business functions and personal matters. Failure of communication systems may include (1) an area's mass media (conveying important emergency, health, public awareness, educational, recreational, and economic information), (2) its emergency 9-1-1 systems (allowing residents to quickly call for emergency assistance or to report hazardous conditions), (3) its land-based and/or cellular telephone systems (inhibiting a great number of valuable

communications), (4) the internet (an increasingly important means of communicating and running business operations), or (5) specialized radio communication systems (such as those used by police, EMS, and other vital service networks). The impacts include great inconvenience, lost personal and business opportunities, and various degrees of added risk throughout citizens' lives.

Drainage infrastructure failures may cause normally safe areas to become flood-prone, causing all the impacts of that hazard (described previously), but in locations beyond those that are recognized as floodplain and wetland areas. Often, "urban flooding" is the result, in which the drainage capacities of a built-up area are exceeded, and polluted waters back up into streets, basements, yards, parking areas, etc. This causes transportation and access problems, property damages, potential injuries and ill-health, cleaning costs and inconvenience, and the loss of irreplaceable records, artwork, photos and historic documents, and other personal articles. Another type of potential impact is environmental, when sewage processing capabilities cannot be adequately maintained and result in the deposition of untreated sewage into some part of the local environment, such as an area river. The impacts of transportation infrastructure failures are dealt with in separate subsections elsewhere in this document, under categories such as transportation accidents, pipeline accidents, and hazardous material releases.

Public and private utility infrastructure failures can negatively impact the environment, from wastewater collection and treatment facilities discharging various pollutants, contamination and raw sewage into the natural environment. Surface water and ground water discharge facilities can negatively harm the environment with suspended soil sediments, dissolved chemical substances, or biological material, for example. Sewage disposal systems can back up or overflow, causing basement flooding. When sewage processing capabilities cannot be adequately maintained, it may result in the deposition of untreated sewage into some part of the local environment, such as an area river. This pollution flows into rivers and streams, affecting the natural environment. Pollutants can lead to the poisoning of aquatic wildlife or the creation of vast dead zones, in receiving lakes and waters, where there isn't enough oxygen for marine life to survive.

County and watershed drainage systems, and water conveyance and treatment systems, range from small agricultural drains to massive urban storm and sanitary sewer systems. These can contaminate the environment in the event of an infrastructure failure. Detention and retention basins, dams, flood pumps, irrigation diversions, and erosion control structures are also part of the infrastructure. These facilities vary from rural open channels, with drainage areas of several hundred acres, to large river systems with drainage areas of several hundred square miles. In the event of an infrastructure failure, all may be environmentally impacted. Electric power and telecommunication facilities and systems can have environmental impacts because the infrastructure requires tree

trimming and clearance, to install and maintain overhead lines in the natural environment, or when placing new distribution systems underground.

**Lenawee County Perspective**

Lenawee County has experienced numerous power outages, caused mostly by severe weather such as windstorms or ice and sleet storms. Fortunately, most of those occurred in months where severe cold temperatures were not a problem. If they had occurred during the cold winter months, there certainly would have been a potential for loss of life, especially among the elderly and other more vulnerable members of society. Power outages are expected to occur at least once each year. The duration and severity of each event vary, but can potentially affect all of the county's residents for multiple days.

In August, 2003, Michigan experienced the nation's worst power blackout in history. Because of an overworked, outdated power grid system, cities from Toronto, Ontario to Cleveland, Ohio to New York City were in the dark. Eight states were affected by the blackout. Public water customers were advised to boil water or use bottled water until the water emergency ended. A state of emergency was declared for fourteen Michigan counties, but Lenawee County was not among those included in the emergency order.

The presence of multiple electrical facilities such as substations and transformers brings with it a degree of vulnerability. However, efforts by utility companies are underway to create redundant electrical systems and the vulnerability is not unique to Lenawee County.

## 11. Passenger Transportation Accidents

A passenger transportation accident is defined as a crash or accident involving an air, land or water-based commercial passenger carrier. While the safety record of passenger commercial transportation is very good for aircraft buses, and trains, crashes are possible.

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

- suppressing fires;

**Lenawee CountyAirports/Helipads**

| Name | Ownership | Type | Community |
|---|---|---|---|
| Al Myers Airport | private | basic utility | Tecumseh |
| Betz Airport | private | basic utility | Blissfield Twp. |
| Honey Acres Airport | private | basic utility | Clinton Twp. |
| Merillat Field | private | basic utility | Raisin Twp. |
| Van Camps Heliport | private | Heliport | Tecumseh |
| Lenawee Co. Airport | public | general utility | Madison Twp. |

- rescuing and providing emergency first aid for survivors;
- establishing mortuary facilities for victims;
- detecting the presence of explosive or radioactive materials; and
- providing crash site security, crowd and traffic control, and protection of evidence.

**Lenawee County Perspective**

Lenawee County has had no serious crashes involving commercial carriers. However, the potential exists for passenger transportation accidents as there are five airports and one heliport located in various locations in the County. In addition, Lenawee County is served by commercial and school buses, and train traffic.

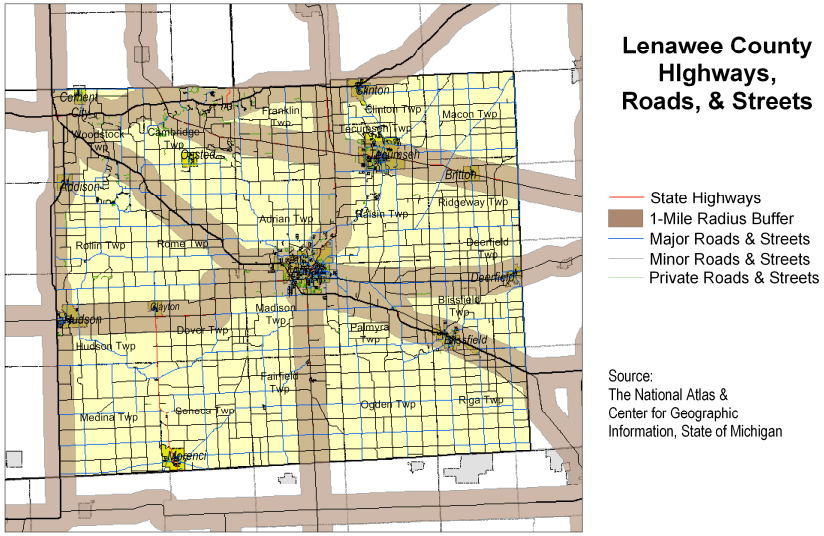
The fact that Lenawee County is on the flight paths of both Detroit Metropolitan Airport and Willow Run Airport brings with it an element of risk. Though a commercial airplane crash with origin or destination at either of those airports has not occurred in Lenawee County, the potential for disaster exists. However, based on the lack of a history of passenger transportation accidents, the probability of such an event occurring in a given year is negligible.

## 12. Hazardous Material Incidents: Fixed Site and Transportation

Hazardous materials mitigation is much different from natural hazard mitigation. The consequences are more insidious and more likely to have long-term environmental effects as well as widespread health consequences. Research indicates that people tend to have a much harder time recovering from man-made disasters such as hazardous materials incidents than from a natural disaster. Hazardous materials incidents are classified in two categories – fixed site and transportation.

### Fixed Site

A fixed site hazardous material incident is an uncontrolled release of hazardous materials from a fixed site capable of posing a risk to life, health, safety, property or the environment. The SARA Title III program, administered by the U.S. Environmental Protection Agency, is committed to efficiently and effectively overseeing data collection and quality assurance of environmental information transmitted to the MDNRE. This includes providing support to the Michigan Emergency Planning and Community Right-to-Know Commission (SERC) on coordination of hazardous materials enforcement, response, and planning in the State of Michigan. Lenawee County had 58 SARA Title III sites, as of August, 2010.




### Lenawee County Perspective

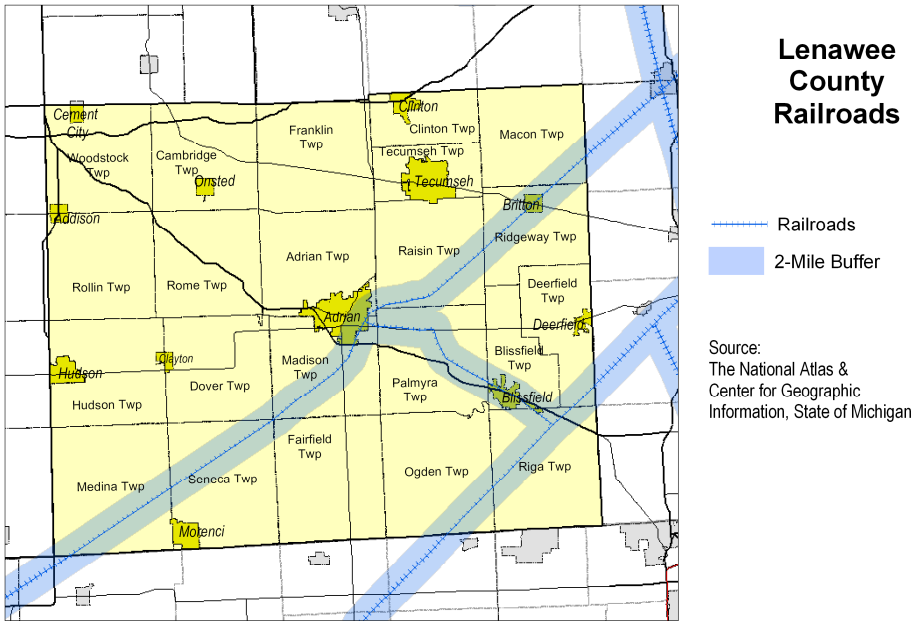
A fire at an Adrian Area plastics plant on March 5, 1984 involving polystyrene forced the evacuation of 1,000 people from nearby mobile home parks and a subdivision. On May 3, 1979, Curene 442 (a chlorinated hydrocarbon) leaked from a plant into nearby sewers in a five block area, affecting the Raisin River. Two events in the 30-year period from 1979-2009 equates to a 7% probability of a fixed site hazardous material incident in a given year.

## Transportation

A transportation hazardous material incident is an uncontrolled release of hazardous materials during transport capable of posing a risk to life, health, safety, property or the environment.

## Lenawee County Perspective

Several state highways traverse Lenawee County (e.g., US-12; US-127; US-223; M-50; M-52; M124: and M-156 and several rail lines traverse southeastern Lenawee County (e.g., Norfolk and Western; Lenawee County; Detroit, Toledo, and Ironton; and Conrail). Highways and railroads – in addition to major local roads and streets – are the most likely routes/facilities utilized for the transport of hazardous materials. However, it is important to note that parts of many hazardous material transport trips will occur on minor local roads and streets. Railroads are also utilized for the transport of hazardous materials.



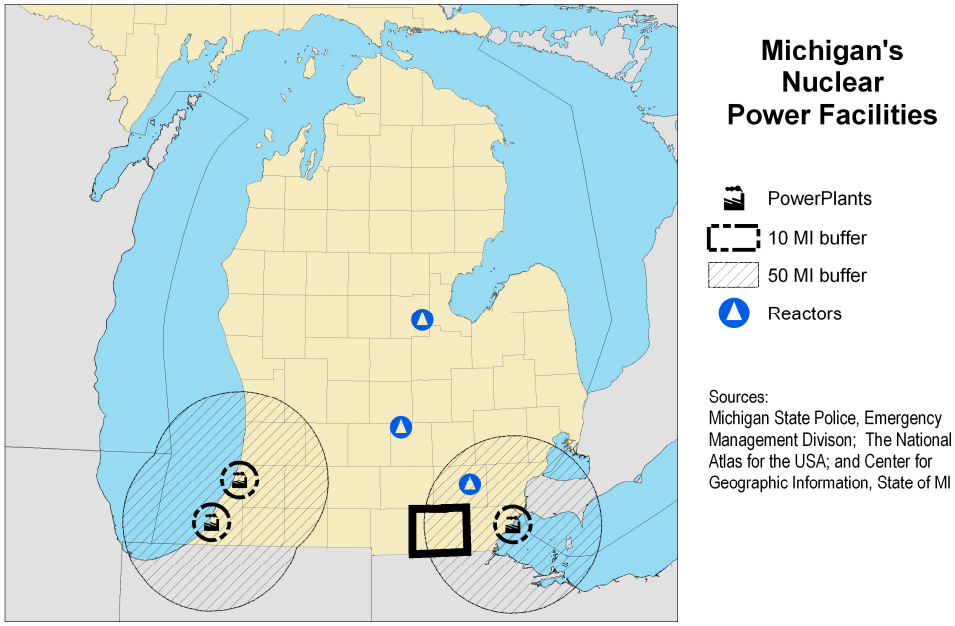

Due to the intersection of several types of transportation routes in Adrian, Blissfield, and Britton, those communities would appear to have a higher-potential for transportation-related hazardous material incident. However, the safety record among transportation agents has been good. Based on a lack of history of transportation-related hazardous materials incidents, the probability of an event in any given year is negligible. However, the presence of several state trunklines and rail transportation routes enhances the possibility of future incidents.

Many of the County's SARA Title III sites tend to be located in lower income areas. Attention needs to be paid to residents in these areas that may be more vulnerable than the rest of the population.

## 13. Nuclear Power Plant Accidents

Though construction and operation of nuclear power plants are closely monitored and regulated by the Nuclear Regulatory Commission (NRC), accidents at these plants are considered a possibility and appropriate on-site and off-site emergency planning is conducted. The following list records significant nuclear power plant accidents (including an accident in Michigan):

1986 — Chernobyl, Ukraine
1979 — Three Mile Island, Harrisburg, Pennsylvania
1966 — Enrico Fermi-1, Monroe County, Michigan




The Enrico Fermi-1 event was a malfunction causing an interruption of coolant reaching the space surrounding the reactor core. The melting of a portion of the core resulted in a radiation leak into the containment building. No off-site release of radiation occurred. The plant was repaired and operated for a short time before it was permanently shut down in 1972. The fuel and related materials were removed and sent to a Federal government facility in the mid-1970's. The Enrico Fermi-2 nuclear power plant opened next door in 1988.

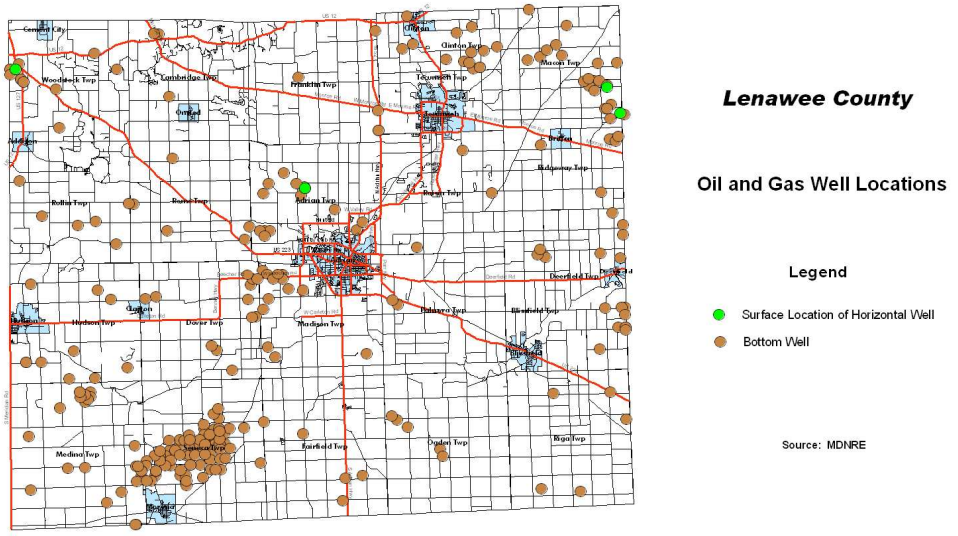
A primary emergency planning zone (EPZ) is established within a 10-mile radius of each nuclear power plant. Within this zone, plans are developed to protect the public through in-place sheltering and evacuation. A secondary emergency management zone is established within a 50-mile radius around most plants. The zones are created for planning considerations with the intention to prevent the introduction of radioactive contamination into the food chain.

**Lenawee County Perspective**

There are no nuclear power plants in Lenawee County. However, a majority of the County is located within the 50-mile EPZ for the Enrico Fermi-2 Nuclear Power Plant. The secondary buffer refers to the area where contamination has the potential to infiltrate the food chain. This hazard is not seen as posing a high risk to Lenawee County. Given that the Fermi I incident did not affect Lenawee County, nuclear power plant accidents have never affected Lenawee County and the probability of such an event occurring in any given year is negligible.

## 14. Oil and Natural Gas Well Accidents

Oil and natural gas are produced from fields scattered across 63 counties in the Lower Peninsula, including Lenawee County, which hosts 274 oil and gas wells. Although the industry has a fine safety record, the threat of accidental releases, fires and explosions still exists. In addition to these hazards, many of Michigan's oil and gas wells contain extremely poisonous hydrogen sulfide ($H_2S$) gas.



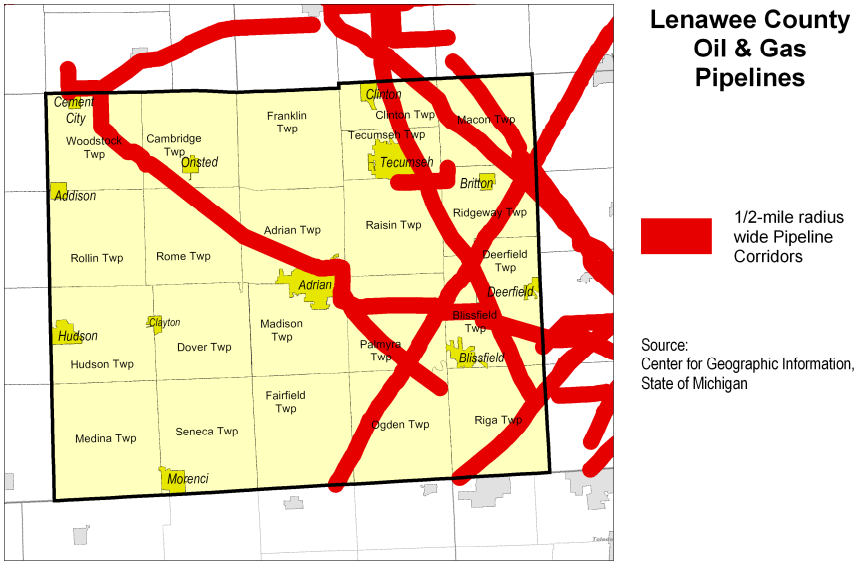

**Lenawee County Perspective**

Though there have been no oil or natural gas well incidents in Lenawee County, the potential exists given the number of wells. As the oil and gas well location map indicates, most wells are located in areas with low population densities. Based on that fact, and the fact that an oil and natural gas well accident has not been recorded in Lenawee County, the probability of such an event occurring in the future is negligible.

## 15. Oil and Natural Gas Pipeline Accidents

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

While petroleum and natural gas industries have had a fine safety record, the threat of fires, exposure, ruptures, and spills nevertheless exists. In addition to these hazards, there is the danger of hydrogen Sulfide ($H_2S$) release.



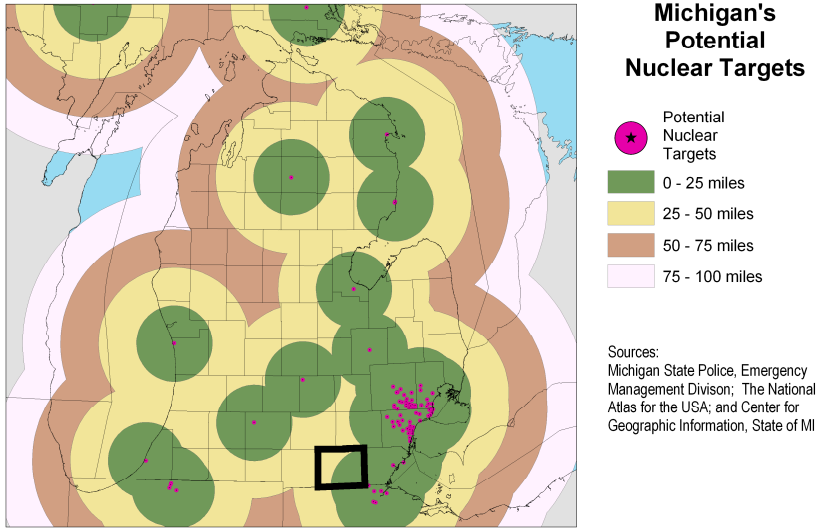

Severe events may cause shortages of, and higher prices for, petroleum and other fuels. Some residents with low incomes or fixed budgets may find higher prices to be unaffordable, and may face problems involving heating and other energy needs being used to maintain their homes and health. Transportation and fuel costs may become too expensive to allow business profits to be maintained, when such businesses rely on fuel-driven transportation or functions. Those in the vicinity of the pipeline break itself may suffer from health problems, unpleasant odors, and damage/contamination of their property. Some pipeline accidents result in explosions that cause extensive damage, injury and even loss of life. Gas leaks in particular can cause surprising amounts of damage from sudden explosions, without any advance warning to those nearby.

Petroleum and natural gas pipelines pose a real threat because they can lead to leaks, fractures, fires, explosions, ruptures, and spills that cause environmental contamination. The vast majority of pipeline accidents are caused by third party damage to the pipeline, often due to construction or some other activity that involves trenching or digging operations. The danger of hydrogen sulfide (H2S) release can occur where the gas or oil has a high sulfur content. Hydrogen sulfide is not only an extremely poisonous gas, but is also explosive when mixed with air at

temperatures of 500 degrees Fahrenheit or above. Atmospheric concentrations of greenhouse gases, especially carbon dioxide, methane, and nitrous oxide, can contribute to climate change, both regionally and globally. Adverse local consequences to ecological and socioeconomic systems can result from a major petroleum or natural gas pipeline accident. Particulate pollutants may consist of metals, soot, or various similar small substances. Soft sloping ground near waterway crossings can be susceptible to erosion or lateral spreading which may cause significant pipe displacement or rupture.

**Lenawee County Perspective**

Pipelines traverse eastern Lenawee County as well as the US 223 corridor. To date, no casualties are known to have resulted in the County as a result of a pipeline accident. However, the presence of these lines create the potential for accidents or terrorist attack.




The Hazard Mitigation Planning Committee identified a natural gas pipeline explosion at some point during the 1990's. Contact was made by the EMC with the Ridgeway Township Fire Chief who verified that a pipeline explosion occurred in Ridgeway Township in February of 1996 with no known casualties. The Committee also identified a natural gas pipeline explosion that occurred on Beecher Street in Madison Township during the mid-1990's. No additional information is available regarding that incident. Based on those two incidents that have occurred from approximately 1995 through 2009, the annual probability of a pipeline accident in Lenawee County is approximately 14%.

## 16. Nuclear Attacks

World events in recent years have greatly changed the nature of the nuclear attack threat against the United States. However, while the threat of attack is diminished, it is still a possibility due to the large number of nuclear

weapons still in existence in Russia and throughout the rest of the world. Based upon the Nuclear Attack Planning Base 1990 (NAPB-90), the Federal Emergency Management Agency categorizes 7 potential types of nuclear targets:

- commercial power plants,
- chemical facilities,
- counterforce military installations,
- other military bases,
- military support industries,
- refineries, and
- political targets.

**Lenawee County Perspective**

No potential nuclear targets are located in Lenawee County. However, the southeastern half of the county is located within 25 miles of at least one potential nuclear target. The majority of the remainder of the county is located between 25-50 miles of at least one target. Given the fact that such an attack has never occurred in the United States, the probability of such a catastrophe is negligible.

## 17. Sabotage/Terrorism/WMD

Sabotage/terrorism can take on many forms, although civilian bombings, assassination and extortion are probably the methods with which we are most familiar. Unfortunately, with advances in transportation and technology, sabotage/terrorism has now crossed the oceans into the United States. Equally alarming is the rapid increase in the scope and magnitude of sabotage/terrorism methods and threats which include:

- Nuclear, chemical and biological weapons;
- Information warfare;
- Ethnic/religious/gender intimidation;
- State and local militia groups that advocate the overthrow of the U.S. Government;
- Eco-extremism, designed to destroy or disrupt specific research or resource related activities;
- Pre-meditated attacks upon schools, workplaces, transportation systems or other places of public assembly; and
- Organized criminal enterprises and activities.

The following are notable occurrences of sabotage/terrorism that affected Southern Lower Michigan:

- March 2010 – Hutaree Militia Plot in which nine Lenawee residents were charged. Nine members of the Hutaree militia organization were arrested and charged with plotting attacks against Michigan law enforcement personnel. The planned attacks were alleged to have involved the firearms ambush of law enforcement officers, followed by improvised explosive device attacks at the victims' funeral services.
- December 2009 –The attempted bombing of a commercial passenger plane flying in to Romulus. On Christmas Day, a man was arrested for the attempted bombing of Northwest Airlines Flight 253 approaching Detroit Metropolitan Airport. He was accused of being a terrorist operating under the orders of the Al-Qaeda in Yemen terrorist group. He is specifically accused of attempting to destroy the plane by detonating explosive powder concealed in his underwear. The explosive failed to detonate properly, who was then subdued by the plane's passengers and crew. The Flight had 290 passengers and crew on board at the time.
- October/November, 2001 — Attempted bus hijackings at various locations across the country.
- October, 2001 – Anthrax attacks at various locations across the country.
- September 11, 2001 – Plane hijackings, destruction of World Trade Center, damage to Pentagon.
- 2000-2001 – Attempted bombing/bomb manufacturing on various dates and locations in the state.
- December 31, 1999 – Arson Fire (eco-extremism) at Michigan State University's Agricultural Hall."
- Various dates and locations — premeditated workplace violence.

**Lenawee County Perspective**

Though the likelihood of a successful terrorist attack from a terrorist group is small, extremist groups exist in Michigan. Absent information from law enforcement officials regarding confidential investigations, the extent of these threats is difficult to estimate, and outside the scope of this Hazard Mitigation Plan.

The Hazard Mitigation Committee identified two incidents involving exploded improvised explosive devices (IEDs) in Lenawee County. The incidents were not documented but several members of the Committee recalled two incidents, both of which occurred in the late 1990's. One event occurred at the Adrian Cinemas on M-52 in Adrian Township, and the other occurred in an unspecified location in Dover Township. IED's are listed as WMDs by the federal government. In spite of the events that have occurred within the past decades, the probability of a large-scale event in the county is very low.

## 18. Public Health Emergencies

Public health emergencies can take many forms, among them being:

- Disease epidemics,
- Large-scale incidents of food or water contamination,
- Extended periods without adequate water and sewer services,
- Harmful exposure to chemical, radiological or biological agents, and
- Large-scale infestations of disease-carrying insects or rodents

Public health emergencies can occur as primary events by themselves, or they may be secondary events to another disaster and have the potential to adversely impact a large number of people. Perhaps the greatest emerging public health threat would be the intentional release of a radiological, chemical or biological agent. Fortunately, to date Michigan has not experienced such a release aimed at mass destruction. However, Michigan has experienced hoaxes and it is probably only a matter of time before an actual incident of that nature and magnitude does occur.

**Lenawee County Perspective**

No public health emergencies have ever been declared in Lenawee County. However, at least three statewide emergencies may have affected local residents:

- **Chemical Contamination (Polybrominated Biphenyl) —** Thousands of cattle and other animals died in 1973 from poisoning after a chemical company accidentally sent bags of a fire retardant in conjunct tion with a shipment of a livestock feed supplement.
- **Foodborne Contamination (Hepatitis A) —** Almost 300 cases of Hepatitis A in at least four school districts in the Spring of 1997 were caused by frozen strawberries.
- **West Nile Virus (Encephalitis Virus) —** West Nile arrived in Michigan in August 2001 and is transmitted to humans by the bite of an infected mosquito. The virus was typically found in Africa, West and Central Asia, and the Middle East. It peaked in Michigan in 2002 with 644 reported cases, including 51 deaths.
- **Communicable Disease Epidemic (Influenza Pandemic) —** Influenza is an example of a potential public health emergency of a very large proportion. Flu pandemics caused widespread deaths nationally in 1957-1958 and 1968-1969. People suffer from the flu in the county every year.

The Hazard Mitigation Committee reported that there have been no incidents of epidemics or public health emergencies in Lenawee County. While H1N1 was declared an epidemic in some areas of the United States, that did not occur in Lenawee County. Given the lack of recent public health emergencies in Lenawee County, the probability of future occurrences is very low.

## 19. Drought

The entire state is subject to the impacts of drought. Large urbanized areas are more vulnerable to water shortages and business disruptions due to the number of water users that are competing for the limited water resources. In those areas, water management strategies typically have to be implemented to deal with the water shortage problems. Public health and safety concerns are also numerous, everything from maintaining adequate water supply for firefighting to addressing the needs of the elderly, children, ill or impoverished individuals suffering from heat-related stress and illness.

Rural counties in southern Lower Michigan are highly vulnerable to drought conditions that impact the quantity or quality of crops, livestock, and other agricultural activities. A prolonged drought can have serious impacts upon local and regional incomes having a ripple effect on the other components of the economy. Drought can also cause long-term problems that can affect the viability of some agricultural operations, and increase the threat of wildfire.

**Lenawee County Perspective**
Lenawee County averages 32.5 inches of precipitation per year. The County is in the middle range for precipitation when compared with the western half of the nation (29.9 inches or less rainfall a year) and the southeastern U.S. (40.0 or more inches a year).

Droughts occur in Michigan and Lenawee County is no exception. Table 19-1 indicates the two droughts that occurred in a two-year span in the recent past. The 2001 drought caused $150 million in crop damage over 17 counties including Lenawee County. County-specific data are not available to indicate the level of crop damage in Lenawee County, but given the County's strong agricultural base, it is likely that it was significant.

All areas of Lenawee County are at equal risk for drought. However, the Marshal Aquifer, which covers the northwestern part of the county, and the Silurian-Devonian Aquifers, which is located in the Deerfield area, may provide some relief to those areas in the event of a drought.
Table 19-1 provides additional information on the two droughts that have affected Lenawee County. The two droughts occurred in consecutive years, but only the two occurrences are listed within the time frame. While the effects of drought in Lenawee County can be great, and the potential for crop devastation is large, the likelihood of occurrence is relatively low. Including the 1988 drought, three droughts have occurred in Lenawee County in the past 21 years. Therefore, based on this history, the probability of a drought in any year is 14%.

Several members of the Hazard Mitigation Committee recalled a drought that occurred in the summer of 1988. During that summer, the temperature reached 90°F for an extended period and there were many days without rain.

**Table 19-1, Lenawee County Droughts, 1998-2009**

| Date | Description |
|---|---|
| **07/01/2001** | 12:00 AM: Drought, $150.0 million property damage statewide. Beginning in late June and continuing through the month of July, weather patterns prevented the development of widespread thunderstorms, and prevented rainfall from moving into the region from the west. While there was occasional isolated thunderstorms, much of the region suffered a pronounced dry spell. The lack of rainfall put a hardship on the area's water supply and measures were taken to curb usage. During the five week period ending July 28th, Detroit Metro Airport officially reported only 0.32 inches of rainfall. This became Detroit's 11th driest month on record. In contrast to July, April through early June had seen slightly above normal precipitation levels. That wet spring had delayed the planting of crops and resulted in shallower than normal rooting systems for crops that had already been established. By mid summer, however, the upper air pattern changed and rainfall waned. In terms of timing, the drought impacted many summer crops during moisture-sensitive growth stages of greatest water need, leading to moisture stress which peaked by mid August. It was estimated that yields of corn, dry beans and soybeans were 1/3 off from normal. Rains returned to the region in mid and late August—too late to reverse the negative effects from mid summer. |
| **09/01/2002** | 12:00 AM: Drought. The month of September turned out to be like much of the summer of 2002 was, hot and dry. Flint, Saginaw and Detroit metro airport received less than .05 inches of precipitation during the first half of the month. The dryness was only worsened by the heat. Several record highs were set throughout eastern Michigan during the month of September. After an extremely hot and dry July and August, the weather of September 2002 only exasperated drought conditions. During the first half of the month, hundreds of communities across the area were under water restrictions. Hardest hit from the drought was the agricultural industry. September yields across most of the area were estimated at under 50 percent |

| Table 19-1, Lenawee County Droughts, 1998-2009 | |
|---|---|
| **Date** | **Description** |
| | and many counties across eastern Michigan were declared agricultural disaster areas. |

Sources: Michigan Hazard Analysis, the National Climatic Data Center (NCDC) storm events database, reports from the Law Enforcement Information Network (LEIN), and local input from plan participants.

## 20. Extreme Temperatures

Prolonged periods of extreme temperatures, whether summer heat or winter cold, pose severe and often life-threatening problems. The two hazards both primarily affect the most vulnerable segments of the population – the elderly, children and infants, impoverished individuals, and people in poor health. Extreme summer heat can result in heatstroke, heat exhaustion, heat syncope, and heat cramps. Extreme winter cold can result in hypothermia and frostbite.

Extreme Summer Heat is characterized by a combination of very high temperatures and humid conditions. The major threats of extreme summer heat are heat exhaustion and heatstroke. Heat exhaustion is a less severe condition than heatstroke, but it causes problems involving dizziness, weakness and fatigue. Heat exhaustion is often the result of fluid imbalance due to increased perspiration in response to the intense heat. Treatment generally consists of restoring fluids and staying indoors in a cooler environment until the body returns to normal. If heat exhaustion is not addressed and treated, it can advance to heatstroke, so medical attention should be sought immediately.

Heatstroke symptoms include a high body temperature, dry skin, inadequate perspiration, paleness or reddening, confusion or irritability, and seizures and the victim may become delirious, stuporous, unconscious, or comatose. Cooling is essential to preventing permanent neurological damage or death. Other, less serious risks associated with extreme summer heat are often exercise-related and include heat cramps (an imbalance of fluids that occurs when people unaccustomed to heat exercise outdoors) and heat syncope (a loss of consciousness by persons not acclimated to hot weather). Periods of hot weather also entail risks of dehydration, even for those who are not engaged in demanding physical activities. Extreme heat poses the greatest danger to urban residents, especially the elderly, children, outdoor laborers, people with poor health, and people residing in homes without air conditioning.

In Michigan, heat advisories will tend to be announced when the heat index is calculated to exceed 105 degrees in an area for a period of at least 3 hours in duration. It should be noted, however, that the temperature inside of vehicles without air conditioning can be dozens of degrees hotter than the outdoor temperature—an outdoor temperature might be “only” 100 degrees Fahrenheit, but people may then get into a car that exceeds 130 degrees. People vary in the conditions in which they operate (and in their capacity to tolerate extreme temperatures), and can find themselves in circumstances that threaten their health even if no official temperature advisory has been issued. Extreme heat is also hazardous to livestock and agricultural crops, and it can cause water shortages, exacerbate fire hazards, and prompt excessive demands for energy. Roads, bridges, railroad tracks and other infrastructure are susceptible to damage from extreme heat (due to the effects of thermal expansion of materials).

Extreme winter cold periods can, like heat waves, result in a significant number of temperature-related deaths. Each year in the United States, approximately 700 people die as a result of severe cold temperature-related causes. This is substantially higher than the average of 175 heat-related deaths each year. It should be noted that a significant number of cold-related deaths are not the direct result of “freezing” conditions. Rather, many deaths are the result of illnesses and diseases that are negatively impacted by severe cold weather, such as stroke, heart disease and pneumonia.

Hypothermia (the unintentional lowering of core body temperature), and frostbite (damage from tissue being frozen) are probably the two conditions most closely associated with cold temperature-related injury and death. Hypothermia is usually the result of over-exposure to the cold, and is generally thought to be clinically significant when core body temperature reaches 95 degrees or less. As body temperature drops, the victim may slip in and out of consciousness, and appear confused or disoriented. Treatment normally involves the warming the victim (preferably performed by trained medical personnel) but frostbitten areas should not be rubbed. Although frostbite damage itself rarely results in death, in extreme cases it can result in the amputation of the affected body tissue.

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

**Lenawee County Perspective**

Under normal circumstances, Lenawee County has a relatively mild climate and is not subject to extreme heat or cold temperatures. For example, Adrian average temperatures in January, the coldest month, are 23°F while in July, the warmest month, the temperature averages 72°F. The average temperature low in January is 15°F in January and the average high temperature is 84°F in July. The highest temperature ever recorded in Adrian was 104°F in June, 1988, and the lowest temperature ever recorded was -22°F in January, 1994.

Still, as Table 20-1 indicates, extreme temperatures and extended periods of cold and heat do occur in Lenawee County. The extreme temperatures listed in the table have resulted in statewide totals of 10 deaths, 606 injuries, and $1.75 million in property damage. The impact on Lenawee County can be estimated as involving various heat-related illnesses occur with each event of extreme heat, occasional effects upon the area's infrastructure operations during both heat and freeze events, and various cases of cold-related injuries or health effects upon vulnerable or exposed persons during extreme cold temperature periods. Extreme temperature events occurred 17 times in the period from 1995-2009 for an annual average rate of 1.1 events.

As discussed in the drought section, the Hazard Mitigation Committee identified the summer of 1988 as a standout in terms of temperature extremes. However, NCDC data regarding extreme temperatures does not extend back to that point in time.

**Table 20-1, Lenawee County Extreme Temperature Events, 1995-2011**

| Date | Description |
|---|---|
| **12/09/1995** | 0400: Cold Wave, 3 deaths statewide. Low temperatures ranged from three above zero at Detroit to one below zero at WSFO White Lake during the period from the early morning on the 9th through the morning on the 10th. On the 9th, winds averaging 20 to 25 mph combined with afternoon temperatures in the single digits to produce wind chills of 30 to 35 below zero. |
| **02/01/1996** | 12:00 AM: Extreme Cold, 1 death statewide. The coldest weather of the winter season occurred across southeast Michigan during the first week of February. At Flint, the low temperature was zero or lower every day from January 31st through February 6th, reaching a low of -11 on the 3rd. At Detroit, the lowest temperature was -7, also on the 3rd. An elderly man died of hypothermia on the 2d after wandering away from a nursing home in Detroit. |
| **01/17/1997** | 12:00 AM: Extreme cold, 2 deaths statewide. The coldest weather of the winter occurred from the 17th through the 19th. During that period, lows reached as low as -6 at Detroit's metro airport. Several cases of hypothermia were reported. |

| Table 20-1, Lenawee County Extreme Temperature Events, 1995-2011 | |
|---|---|
| **Date** | **Description** |
| **01/04/1999** | 01:00 AM: Extreme cold, 3 deaths, 29 injuries statewide. Arctic air invaded Michigan behind the massive snowstorm. As usual, the Great Lakes offered some protection, as air was warmed as it crossed the lakes, but far southeast Michigan did not receive the benefit of the lakes, as arctic air coming from the northwest curled around the southern tip of Lake Michigan and turned northeast into the southeast corner of the state. After a high of around 10 degrees on the 4th, temperatures nose-dived that night. The mercury plunged to -10 at Adrian, and Ypsilanti, and -13 at Tecumseh. It was not until late afternoon on the 5th before temperatures rose to above zero. The bitter cold caused numerous cases of frostbite. |
| **01/11/1999** | 01:00 AM: Extreme cold, $1.3 million property damage. Temperatures plunged below zero in far southeast Michigan during the early morning hours of the 11th. At Detroit Metro Airport, the morning low was -4 degrees. The cold resulted in over 120 water main breaks in the city of Detroit. A very large water main ruptured in downtown Adrian, causing a water shortage for its 22,000 residents. |
| **07/04/1999** | 11:00 AM: Excessive heat, 52 injuries. Hot and extremely humid weather rolled into southeast Michigan for the Fourth of July holiday weekend. High temperatures climbed into the 90s across the area, with dew points well into the 70s. This resulted in triple-digit heat indices across southeast Michigan on both the 4th and 5th. The heat index exceeded 105 in and near Detroit. This resulted in numerous heat-related illnesses, as people overdid outdoor activities during the holiday weekend. Numerous hospitals in metro Detroit reported cases of heat stroke, heat exhaustion, dehydration, and severe sunburn. However, unlike many other parts of the country, no fatalities were reported. |
| **03/08/2000** | 12:00 PM: Record warmth. An unusual late-winter warm spell began February 22, and continued through March 9. Normal high temperatures during this time are in the 35 to 40 degree range. However, during this 17-day stretch, Detroit failed to reach 50 degrees just once, and Flint only three times. There were six days in the 60s or higher in both Flint and Detroit, and five such days in Saginaw. The warm weather produced five new record highs in Flint, and three in Detroit. The heat wave culminated on March 8th, with both Flint and Detroit reaching 80 degrees. This was the earliest 80 degree day ever for both cities. Previously, the earliest 80 degree in Detroit was March 22 1938, while in Flint it was April 2 1965. The 80 degrees at Flint was the warmest March day ever, beating several 79 degree days, most recently March 30 1998. The weather was not only warm, but dry. This contributed to several brush fires toward the end of the warm spell. Genesee, Saginaw, St Clair, and Washtenaw Counties, each saw fires burn up to 10 acres of land. |
| **12/21/2000** | 06:00 PM: Extreme cold, $475,000 property damage. Though the worst of the snow was over, the worst of the cold was just beginning. Temperatures never got out of single digits on the 22nd, with Detroit seeing a high of only 4 degrees, after a morning low of 3 below zero. That would prove to be the coldest daytime temperatures of the month - but some colder nights were still in store. End result: the 4th coldest December of all time in Detroit. Combined with the high snowfall totals, and it's |

| Table 20-1, Lenawee County Extreme Temperature Events, 1995-2011 | |
|---|---|
| **Date** | **Description** |
| | safe to say: if you don't like cold and snow, then December of 2000 was the most miserable December in southeast Michigan history. No other December on record comes close to its combination of heavy snow and brutal cold. |
| **08/06/2001** | 12:00 PM: Excessive heat, 1 death, 200 injuries statewide. High temperatures soared well into the 90s across southeast Michigan. Detroit broke a record on the 8th when a high of 99 degrees was reached. In addition to the heat, humidity levels rose significantly during this time. The high heat and humidity allowed daytime heat indices to exceed 100 degrees four days in a row. Heat advisories were in effect for all of southeast Michigan for the afternoons and evenings of the 7th, 8th, and 9th. During this time period, heat indices ranged from 105 to 110 degrees. The heat caused several people to seek emergency care for heat stroke and heat exhaustion. The hot weather only aggravated the dry conditions already in place across southeast Lower Michigan (see July 1 entry for more details). This led to tremendous worries among area farmers that they would lose entire crops. Thousands of power outages also occurred throughout the region as demand surpassed supply. |
| **08/08/2001** | A Heat Advisory was issued for Lenawee County (for heat indices reaching 110 degrees). |
| **01/10/2003** | 08:00 AM: Extreme cold/wind-chill. Temperatures averaged well below normal across the Great Lakes region for much of January. In fact, for a three week period, the temperature never rose above freezing. Temperatures fell below zero for several nights during this period. Frozen pipes and water main breaks occurred in many areas of Detroit and its suburbs. Several area schools had to cancel classes due to frozen pipes. Many area homeless shelters were filled to capacity and area hospitals reported dozens of cases of frostbite. Three deaths were also attributed to this cold spell, statewide. |
| **05/29/2006** | 12:00 PM: Heat, 75 injuries statewide. An early season heat wave, leading to an unusually hot Memorial Day, resulted in dozens of people suffering from heat related illnesses. Near record to record setting high temperatures, in the low to mid 90's, sent some people to the hospital. The official high temperatures for the day ranged from 88 to 93 degrees. Of the 52 cooperative observer reports received for that day, including at least one report from each of the 17 counties in southeast lower Michigan, 50 of them reported a high above 90. They ranged from 89 (along the lakeshore) to 98 (at Midland), and averaged out at 94 degrees. Most of the month of May, leading up to this weekend, was well below normal. Combining this factor with temperatures at 20 to 30 degrees above the seasonal norms created very uncomfortable conditions. Conditions were further exacerbated by the combination of high humidity, light winds, and mostly clear skies. Nearly all of southeast lower Michigan reached 90 degrees by Noon EST. Heat indices were in the mid 90's throughout most of the day. The relief from the heat did not come until after 1800 EST...when temperatures finally dropped back into the 80s. |
| **07/29/2006** | 12:00 PM: Heat, 25 injuries statewide. This 2006 heat wave delivered the hottest weather the re- |

| Table 20-1, Lenawee County Extreme Temperature Events, 1995-2011 | |
|---|---|
| **Date** | **Description** |
| | gion had experienced in at least 4 years. A 5 day stretch of maximum temperatures at or above 90 degrees began on July 29th. A blanket of especially high heat and oppressive humidity settled over the area on July 31st, and remained relentless through August 2nd. Temperatures on the 31st soared above 90 by noon with heat indices over 100 degrees. Heat indices averaged between 105 and 110 degrees through the entire afternoon. Detroit topped out at 96 and set a new high temperature record for July 31st. Little relief was felt Monday evening with temperatures not dropping below 90 until 1900 EST. Most significantly, Detroit Metro tied the all time record for the warmest minimum temperature, for any date, when it failed to record a temperature below 80 degrees on July 31st. This had happened only 3 other times in the previous 136 years of record keeping, and this was the first time in 64 years that it had happened again. The major power companies in the area reported an all-time record customer demand for power from 1500 to 1600 EDT on the 31st. Remarkably, very few heat related illnesses occurred during the event. Newspaper articles revealed an extremely high level of awareness and preparedness from the communities across southeast lower Michigan. A large number of cooling centers were made available to those in need as folks reportedly heeded the warnings and took extra precaution. Although area hospitals reported some increase due to heat related illnesses, most were mild and due to heat exhaustion and dehydration. No heat related deaths were reported. |
| **08/01/2006** | Continuation of heat wave - 215 injuries statewide. |
| **02/03/2007** | 16:00 PM: Cold/wind-chill, 10 injuries, $25,000 property damage. A bitter cold airmass blasted into the region on Saturday, February the 3rd and persisted through Tuesday, February the 6th. Temperatures through this period were 20 to 25 degrees below normal. Daytime temps struggled to reach 10 degrees while subzero temperatures occurred all 3 nights. Winds of 15 to 25 MPH gusted as high as 35 MPH at times. After factoring in the winds, apparent temperatures ranged from 15 below to 25 below through nearly the entire event. Almost every school district in Southeast Michigan canceled school on Monday and most did the same on Tuesday, citing conditions too dangerous for the kids either walking to school or waiting outside for the bus. Area hospitals reported numerous cases of patients suffering from cold related illnesses. Most of the cases involved frostbite. At least one fatality was blamed on the cold weather. AAA Michigan reported over 20,000 vehicle service calls due to the cold air, the most in nearly 10 years. Total damages were roughly estimated at $425K statewide, including electrical and mechanical damages to vehicles and property damages caused by flooding. |
| **12/21/2008** | 20:00 PM: Cold/wind-chill. Wind chills around 25 below zero were noted. |
| **01/14/2009 - 01/18/2009** | 20:00 PM: Extreme Cold/wind-chill. An arctic air mass become firmly established over the Great Lakes region on January 14th and persisted through the 18th. Temperatures fell below zero all four days, with wind chill values in the 5 to 30 below range during the majority of the time. Detroit's low temperatures for January 14-18th were -3, -3, -15, and -11. |
| **07/04/2010 – 07/08/2010** | A five day heat wave occurred from July 4th-July 8th. High temperatures climbed into the lower 90s |

| Table 20-1, Lenawee County Extreme Temperature Events, 1995-2011 | |
|---|---|
| **Date** | **Description** |
| | across most areas, producing heat indices in the mid 90s to around 100 degrees. Little relief occurred during the overnight hours as lows hovered at or above 70 degrees. Two heat related fatalities were reported. Here are the recorded high temperatures at Detroit Metro over the 5 day stretch: 91, 93, 92, 94, 93. |
| **07/17/2011 – 07/22/2011** | A mid July heat wave helped cap off the warmest month on record at Detroit. Three direct deaths were reported due to the heat wave, as heat indices were above 100 degrees. Here are the high temperatures recorded for Detroit and Flint during the period of July 17th-22nd: Flint, 95, 94, 94, 95, 99, 84. Detroit, 92, 96, 94, 96, 100, 95. |

Sources: Michigan Hazard Analysis, the National Climatic Data Center (NCDC) storm events database, reports from the Law Enforcement Information Network (LEIN), and local input from plan participants.

## 21. Hail

Hail is a product of the strong thunderstorms that frequently move across the state. As one of these thunderstorms passes over, hail usually falls near the center of the storm, along with the heaviest rain. Most hailstones range in size from a pea to a golf ball, but hailstones larger than baseballs have occurred with the most severe thunderstorms. Hail is formed when strong updrafts within the storm carry water droplets above the freeze level, where they remain suspended and continue to grow larger until their weight can no longer be supported by the winds. They finally fall to the ground, battering crops, denting autos, and injuring wildlife and people. Large hail is a characteristic of severe thunderstorms, and it may precede the occurrence of a tornado. The National Weather Service began recording hail activity in Michigan in 1967. Statistics since that time indicated that approximately 50% of the severe thunderstorms that produce hail have occurred during the months of June and July and nearly 80% have occurred during the prime growing season of May through August.

### Lenawee County Perspective

A total of 109 recorded incidents of hail storms have occurred in Lenawee County from 1963 through 2009 - a period of 47 years. Therefore, Lenawee County sees an average of 2.3 hail storms per year. Table 21-1 provides the history of hail storms in the County from 1963 through 2009. While all hail storms are cause for concern, four hail storms have caused significant injury, and property and/or crop damage in Lenawee County. Total damage from the impact of these four storms includes 1 injury, $3.15 million in property damage (one storm on April 12, 1996

contributed $3 million in property damage), and $50,000 in crop damages. Twenty-one hail storms featured hail a minimum of 1.75” in size with 2” hail on one occasion with a storm in Deerfield in 1994.

| Table 21-1, Lenawee County Hail Events, 1963-2011 | | |
|---|---|---|
| **Date** | **Description** | **MCD’s** |
| **04/17/1963** | 2120: 1.5 inch hail, LAT/LON: 41°53'N / 84°00'W. | Palmyra Township |
| **06/15/1974** | 0925: 1.50 inch hail, LAT/LON: 42°04'N / 84°05'W. | Franklin Township |
| **07/16/1975** | 1630: 0.75 inch hail, LAT/LON: 41°59'N / 84°21'W. | Addison |
| **09/02/1984** | 1710: 1.75 inch hail, LAT/LON: 41°54'N / 84°02'W. | Adrian |
| **06/09/1985** | 0230: 1.75 inch hail, LAT/LON: 41°43'N / 84°13'W. | Morenci |
| **07/05/1985** | 1350: 1.75 inch hail, LAT/LON: 41°50'N / 83°45'W | East of Deerfield |
| **05/06/1986** | 1321: 1.75 inch hail, LAT/LON: 41°54'N / 84°01'W.<br>1512: 1 inch hail, LAT/LON: 41°49'N / 84°02'W. | Adrian<br>Fairfield Township |
| **05/17/1986** | 1225: 1 inch hail, LAT/LON: 41°57'N / 84°16'W.<br>1245: 1 inch hail, LAT/LON: 41°54'N / 84°04'W | Rollin Township<br>Adrian |
| **07/11/1987** | 1214: 0.75 inch hail, LAT/LON: 41°51'N / 84°21'W | Hudson |
| **04/23/1988** | 2100: 1.75 inch hail, LAT/LON: 41°51'N / 84°25'W | West of Hudson |
| **05/15/1988** | 1520: 0.75 inch hail, LAT/LON: 41°54'N / 84°04'W | Adrian |
| **08/28/1990** | 1615: 0.75 inch hail, LAT/LON: 41°54'N / 84°04'W | Onsted |
| **04/09/1991** | 1417: 0.75 inch hail, LAT/LON: 42°00'N / 84°11'W | Medina Township |
| **07/03/1991** | 1330: 0.88 inch hail, LAT/LON: 41°43'N / 84°16'W<br>1420: 1.75 inch hail, LAT/LON: 42°00'N / 83°56'W | Adrian<br>Tecumseh |
| **04/23/1992** | 1600: 1.00 inch hail, LAT/LON: 41°53'N / 83°47'W | Deerfield |
| **06/13/1994** | 1805: 1.75 inch hail, 3 miles southeast of Adrian, $50,000 crop damage. Hail damaged fruit and vegetable crops in Palmyra Township. Winds blew down a large tree in Blissfield that crushed a garage. Thunderstorm winds toppled trees and power lines across the county. | Palmyra Township<br><br>Blissfield |
| **07/06/1994** | 1615: 0.75 inch hail near Clinton. Dime-size hail reported at intersection of U.S. 12 and M-52. | Clinton |
| **09/25/1994** | 1415: 2.00 inch hail at Deerfield. | Deerfield |
| **07/15/1995** | 1655: 1.00 inch hail, Onsted. A ham radio operator reported that one-inch diameter hail fell for 15 minutes.<br>1711: 0.75 inch hail at Adrian. | Onsted<br>Adrian |
| **04/12/1996** | 03:19 PM: 1.00 inch hail at Adrian, LAT/LON: 41°54' N / 84°02'W, $1.0 million property damage.<br>03:22 PM: 1.50 inch hail at Clayton, LAT/LON: 41°52 'N / 84°14'W, 1 injury, $1.0 million property damage.<br>05:04 PM: 0.75 inch hail at Morenci, LAT/LON: 41°43 'N / 84°13'W.<br>06:44 PM: 0.75 inch hail at Deerfield, LAT/LON: 41°53'N / 83°47'W | Adrian<br>Clayton<br>Morenci<br>Deerfield |
| **04/19/1996** | 09:35 PM: 0.75 inch hail at Cadmus, LAT/LON: 41°52' N / 84°10'W.<br>09:40 PM: 0.75 inch hail at Clayton, LAT/LON: 41°52 'N / 84°14'W. | Dover Township<br>Clayton |

| Table 21-1, Lenawee County Hail Events, 1963-2011 | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **05/09/1996** | 05:15 PM and 05:19 PM: 0.75 inch hail at Onsted, LAT/LON: 42°00'N / 84°11'W | Onsted |
| **07/24/1996** | 04:25 PM: 1.00 inch hail at Blissfield, LAT/LON: 41°50'N / 83°52'W. | Blissfield |
| **06/20/1997** | 09:54 PM: 1.75 inch hail 8 miles northwest of Adrian, LAT/LON: 41°59'N / 84°09'W. | Rome Township |
| **08/03/1997** | 08:50 PM: 1.00 inch diameter hail in Blissfield, LAT/LON: 41°50'N / 83°52'W. | Blissfield |
| **05/31/1998** | 01:05 PM: 0.75 inch hail at Jasper, LAT/LON: 41°47' N / 84°02'W. A thunderstorm complex crossed southeast Michigan during the afternoon. A third distinct severe weather episode in the past 12 hours for southeast Michigan was confined to the far southeast corner of the state. Scattered thunderstorms developed and some produced large hail. | Fairfield Township |
| **06/12/1998** | 04:35 PM: 0.75 inch hail at Cambridge Junction, LAT/LON: 42°03'N / 84°13'W. Severe thunderstorms developed in southern Michigan. Most of damage was only marginally severe. | Cambridge Township |
| **06/27/1998** | 02:55 PM: 0.88 inch hail at Medina, LAT/LON: 41°48' N / 84°16'W. A number of severe thunderstorms developed in Indiana and Ohio, but only one severe cell developed in southeast Michigan. A citizen reported nickel sized hail with this thunderstorm in southwest Lenawee County. | Medina Township |
| **07/21/1998** | 05:12 PM: 1.75 inch hail at Britton, LAT/LON: 41°59 'N / 83°50'W. | Britton |
| **07/28/1999** | 07:17 PM: 1.00 inch hail at Hudson, LAT/LON: 41°51' N / 84°21'W. Severe thunderstorms developed, produced hail up to golf ball size, and brought wind gusts that toppled trees and power lines.<br>07:30 PM: 1.75 inch hail at Adrian, LAT/LON: 41°54' N / 84°02'W. | Hudson<br><br>Adrian |
| **10/13/1999** | 10:40 AM: 0.75 inch hail at Tecumseh, LAT/LON: 42°0 0'N / 83°56'W. A band of thunderstorms developed and produced marginally severe hail. | Tecumseh |
| **04/20/2000** | 07:45 AM: 0.75 inch hail from 1 Mile East of Britton, LAT/LON: 41°59'N / 83°49'W, to 1 Mile East South East of Britton, LAT/LON: 41°59'N / 83°49'W.<br>01:59 PM: 0.75 inch hail 3 Miles North East of Hudson, LAT/LON: 41°53'N / 84°19'W. Thunderstorms formed, some of which produced marginally severe hail. The storms were also unusually prolific lightning producers for so early in severe weather season. During the mid to late afternoon hours, some of the storms moved repeatedly over the same areas. | Britton<br><br>Hudson Township |
| **05/09/2000** | 06:40 PM: 1-inch hail from 5 Miles West of Adrian, LAT/LON: 41°54'N / 84°08'W, to 3 Miles East South East of Onsted, LAT/LON: 42°00'N / 84°07'W.<br>07:00 PM: 1.75 inch hail at Tecumseh, LAT/LON: 42°0 0'N / 83°56'W. 74 knot thunderstorm winds from Tecumseh, LAT/LON: 42°00'N / 83°56'W, to Clint on, LAT/LON 42°04'N / 83°58'W, $125,000 property damage. | Rome Township<br><br>Tecumseh to Clinton |
| **07/14/2000** | 03:00 PM: 1-inch hail at Clinton, LAT/LON: 42°04'N / 83°58'W. Severe thunderstorm warnings were issued for Lenawee. Thunderstorms developed explosively early in the afternoon, and many became severe. Large hail was the predominant severe weather type on this day. Dime, nickel, and quarter sized hail was quite common. Wind damage was not as widespread, though a few very strong gusts occurred. | Clinton |

| Table 21-1, Lenawee County Hail Events, 1963-2011 | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **07/28/2000** | 04:20 PM: 1-inch hail at Clinton, LAT/LON: 42°04'N / 83°58'W. Thunderstorms developed in the heat of the day, evolving into a squall line that crossed southeast Michigan in the late afternoon and early evening hours. Several of the thunderstorms became severe. Only a couple of storms produced damaging wind; large hail was the most common type of severe weather, composed of dime to quarter sized hail events. Severe thunderstorm warnings were issued.<br>05:20 PM: Quarter-sized hail was reported in Clinton. | Clinton<br><br>Clinton |
| **08/02/2000** | 06:23 PM: 0.75 inch hail at Adrian, LAT/LON: 41°54' N / 84°02'W. A batch of severe thunderstorms produced marginally severe events. The majority of these were hail, but a few damaging wind gusts occurred as well. Severe thunderstorm warnings were issued.<br>06:40 PM: 0.75 inch hail at Adrian, LAT/LON: 41°54' N / 84°02'W.<br>07:23 PM: Dime-sized hail was reported in Adrian. | Adrian<br><br>Adrian<br>Adrian |
| **04/09/2001** | 09:05 AM: 1.25 inch hail from 4 Miles North of Adrian, LAT/LON: 41°57'N / 84°02'W, to Adrian, LAT/LON: 41°54'N / 84°02'W. A cluster of showers and thunderstorms strengthened as it moved east into southeast Michigan during the morning. A number of these produced large hail, making for an unusually chilly severe weather episode. | Adrian Township |
| **04/10/2001** | 02:30 AM: 0.75 inch hail at 2 Miles West of Rome Center, LAT/LON: 41°57'N / 84°13'W. A storm developed in Hillsdale County, toward 3 am EDT. The storm tended to weaken as it moved into Lenawee County, but not before producing dime sized hail in the western part of the county. | Rome Township |
| **07/29/2001** | 08:04 PM: 1-inch hail at Tecumseh, LAT/LON: 42°00'N / 83°56'W. Numerous thunderstorms caused many power outages.<br>08:05 PM: 0.75 inch hail from 4 Miles South of Tecumseh, LAT/LON: 41°57'N / 83°56'W, to 4 Miles South West of Tecumseh, LAT/LON: 41°57'N / 83°56'W. | Tecumseh<br><br>Raisin Township |
| **09/21/2001** | 02:05 PM: 0.88 inch hail at Hudson, LAT/LON: 41°51' N / 84°21'W. A few thunderstorms produced large hail.<br>02:12 PM: 1-inch hail at Hudson, LAT/LON: 41°51'N / 84°21'W.<br>Severe Thunderstorm Warnings issued for Lenawee County, with hail up to 1" diameter. | Hudson<br>Hudson |
| **07/22/2002** | 09:52 AM: 0.75 inch hail at Adrian, LAT/LON: 41°54' N / 84°02'W. Thunderstorms developed during the late morning hours around Adrian and then quickly moved northeast. However storms redeveloped by mid afternoon. The storms continued through the afternoon and much of the evening hours. Severe wind gusts were associated with many of these storms. Thousands of power outages were reported throughout eastern Michigan (note: also logged as a thunderstorm). | Adrian |
| **08/12/2002** | 03:55 PM: 0.75 inch hail at Adrian, LAT/LON: 41°54' N / 84°02'W. Scattered thunderstorms developed and one of these storms in Lenawee county produced severe wind gusts and large hail.<br>04:02 PM: 0.75 inch hail at Adrian, LAT/LON: 41°54' N / 84°02'W, 55 knot thunderstorm winds at Adrian, LAT/LON: 41°54'N / 84°02'W. Trained spotters and law enforcement reported that a thunderstorm produced severe hail and damaging winds, blowing down several trees and power lines. | Adrian<br><br>Adrian<br>Adrian |
| **03/20/2003** | 04:57 PM: 1-inch hail at Adrian, LAT/LON: 41°54'N / 84°02'W. | Adrian |

| Table 21-1, Lenawee County Hail Events, 1963-2011 | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | 05:00 PM: 1-inch hail from 1 Mile East of Adrian, LAT/LON: 41°54'N / 84°01'W, to 1 Mile East South East of Adrian, LAT/LON: 41°54'N / 84°01'W.<br>05:10 PM: 0.88 inch hail at Britton, LAT/LON: 41°59 'N / 83°50'W.<br>05:17 PM: 1.00 inch hail from 5 Miles South of Tecumseh, LAT/LON: 41°56'N / 83°56'W, to 5 Miles South West of Tecumseh, LAT/LON: 41°56'N / 83°56'W. | Palmyra Township<br><br>Britton<br>Raisin Township |
| **05/10/2003** | 01:41 AM: 0.75 inch hail at Addison, LAT/LON: 41°59 'N / 84°21'W. Thunderstorms developed and moved across southern Lower Michigan late in the evening on the 9th through the early morning hours of the 10th. Large hail was associated with the stronger storms.<br>02:04 AM: 1.75 inch hail 9 Miles South of Adrian, LAT/LON: 41°46'N / 84°02'W. | Addison<br><br>Fairfield Township |
| **07/21/2003** | 04:36 PM: 0.75 inch hail from 5 Miles East of Clinton, LAT/LON: 42°04'N / 83°52'W, to 5 Miles East South East of Clinton, LAT/LON: 42°04'N / 83°52'W. Storms were moving east along the Ohio border. The most intense storm of the night formed into a supercell right on the Lenawee/Monroe county line, producing damaging winds, large hail and very heavy rainfall. A number of reports of wind damage came in. All significant thunderstorm activity exited the region by around 7 pm. | Macon Township |
| **08/01/2003** | 04:58 PM: 1-inch hail at Adrian, LAT/LON: 41°54'N / 84°02'W. | Adrian |
| **08/25/2003** | 10:50 PM: 1.25 inch hail at Devils Lake, LAT/LON: 42°00'N / 84°18'W. | Woodstock Township |
| **05/06/2004** | 10:52 PM: A spotter reported golf ball sized hail in Adrian.<br>11:03 PM: Weather spotters report golf ball sized hail in Adrian, Tecumseh, and Deerfield.<br>09:50 PM: 1-inch hail 5 Miles South West of Tecumseh, LAT/LON: 41°57'N / 84°00'W. Thunderstorms rapidly developed late in the evening and continued through the early morning on the 7th. Many of these storms produced large hail.<br>09:51 PM: 1.75 inch hail at Tecumseh, LAT/LON: 42°0 0'N / 83°56'W.<br>10:01 PM: 1.75 inch hail at Deerfield, LAT/LON: 41°53'N / 83°47'W. | Adrian<br>Adrian, Tecumseh, Deerfield<br><br>Tecumseh<br>Tecumseh<br>Deerfield |
| **05/07/2004** | 01:30 AM: 0.75 inch hail 5 Miles North of Morenci, LAT/LON: 41°47'N / 84°13'W. | Seneca Township |
| **05/09/2004** | 05:15 PM: 0.75 inch hail 4 Miles North East of Onsted, LAT/LON: 42°02'N / 84°08'W. Some thunderstorms produced damaging winds. | Cambridge Township |
| **05/10/2004** | 05:00 PM: 0.88 inch hail 5 Miles North East of Tecumseh, LAT/LON: 42°03'N / 83°52'W. A few severe storms moved through the area. Severe thunderstorm warnings were issued for Lenawee. | Macon Township |
| **05/21/2004** | 12:45 PM: 1-inch hail at Cambridge Junction, LAT/LON: 42°03'N / 84°13'W.<br>12:50 PM: 1.75 inch hail from 2 Miles East of Addison, LAT/LON: 41°59'N / 84°19'W, to 2 Miles East South East of Addison, LAT/LON: 41°59'N / 84°1 9'W.<br>01:00 PM: 0.75 inch hail at Adrian, LAT/LON: 41°54' N / 84°02'W.<br>01:05 PM: 1-inch hail at Adrian, LAT/LON: 41°54'N / 84°02'W. | Cambridge Township<br>Rollin Township<br><br>Adrian<br>Adrian |
| **06/29/2005** | 05:12 PM: 0.75 inch hail at Adrian, LAT/LON: 41°54' N / 84°02'W. | Adrian |
| **06/30/2005** | 07:15 PM: 1-inch hail 3 Miles North North West of Morenci, LAT/LON: 41°45'N / 84°14'W. | Medina Township |
| **04/22/2006** | 08:21 PM: 0.75 inch hail 4 Miles South West of Jasper, LAT/LON: 41°45'N / 84°05'W. | Fairfield Township |

| Table 21-1, Lenawee County Hail Events, 1963-2011 | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | 08:30 PM: 0.75 inch hail at Blissfield, LAT/LON: 41°50'N / 83°52'W. | Blissfield |
| **06/19/2006** | 12:00 PM: 0.75 inch hail at Cambridge Junction, LAT/LON: 42°03'N / 84°13'W. A decent number of severe weather events were noted, mainly hail of 3/4 to 1 inch in diameter, but also spotty wind damage. Storms were multi-cellular in nature. Several short-lived supercells managed to produce hail up to the size of golf balls, winds up to 70 MPH.<br>12:35 PM: 1-inch hail 1 Mile South West of Onsted, LAT/LON: 41°59'N / 84°12'W. | Cambridge Township<br><br><br><br>Rome Township |
| **06/21/2006** | 05:13 PM: 1.75 inch hail 4 Miles North of Adrian, LAT/LON: 41°57'N / 84°02'W.<br>05:20 PM: 0.88 inch hail at Tecumseh, LAT/LON: 42°0 0'N / 83°56'W.<br>05:23 PM: 1-inch hail at Adrian, LAT/LON: 41°54'N / 84°02'W.<br>05:28 PM: 1.25 inch hail 1 Mile North of Tecumseh, LAT/LON: 42°01'N / 83°56'W.<br>05:32 PM: 1.50 inch hail at Tecumseh, LAT/LON: 42°0 0'N / 83°56'W.<br>05:52 PM: 1.00 inch hail at Fairfield, LAT/LON: 41°49'N / 84°02'W.<br>07:50 PM: 0.75 inch hail 4 Miles North West of Adrian, LAT/LON: 41°56'N / 84°05'W. | Adrian Township<br>Tecumseh<br>Adrian<br>Tecumseh Township<br>Tecumseh<br>Fairfield Township<br>Adrian Township |
| **09/05/2006** | 05:10 PM: 0.88 inch hail 2 Miles South East of Clinton, LAT/LON: 42°03'N / 83°56'W. | Clinton Township |
| **05/01/2007** | 15:10 PM: 0.75 inch hail at Hudson, LAT/LON: 41°51' N / 84°21'W. A few thunderstorms became severe from Detroit southwest to the Ohio border during the afternoon, including large hail. The strongest storm clipped Lenawee County, producing hail up to the size of ping pong balls.<br>15:10 PM: 1.50 inch hail 4 Miles South East of Hudson, LAT/LON: 41°48'N / 84°18'W.<br>15:26 PM: 1.00 inch hail 3 Miles West of Sand Creek, LAT/LON: 41°49'N / 84°09'W.<br>15:28 PM: 1-inch hail 2 Miles South of Clayton, LAT/LON: 41°50'N / 84°13'W. | Hudson<br><br><br>Medina Township<br>Dover Township<br>Dover Township |
| **07/26/2007** | 19:34 PM: 0.75 inch hail 2 Miles West of Adrian, LAT/LON: 41°54'N / 84°04'W. This event will be remembered for the extreme intensity of large hail it generated. Large hail caused significant damage to cars in and around the Adrian area. Most reports received involved hail, but there were also a few wind damage reports from thunderstorm downbursts.<br>19:34 PM: 1.50 inch hail 2 Miles North West of Adrian, LAT/LON: 41°55'N / 84°03'W.<br>19:39 PM: 1.75 inch hail 2 Miles North West of Adrian, LAT/LON: 41°55'N / 84°03'W, $75,000 property damage. Hail the size of golf balls pelted the area, denting many vehicles. Total property damages were estimated at roughly $75K.<br>19:42 PM: 1.75 inch hail at Adrian, LAT/LON: 41°54' N / 84°01'W, $75,000 property damage. A local newspaper reported hail damages to sheriff's department patrol cars at the Lenawee County Fair. Total property damages, including other vehicles parked in the fairgrounds parking lot, were estimated at roughly $75K.<br>20:23 PM: 0.88 inch hail 1 Mile North of Deerfield, LAT/LON: 41°53'N / 83°46'W. | Adrian Township<br><br><br><br>Adrian Township<br>Adrian Township<br><br><br>Adrian<br><br><br>Deerfield Township |
| **06/21/2008** | 12:41 PM: 0.75 inch hail at Morenci, LAT/LON: 41°43 'N / 84°13'W. Scattered severe thunderstorms occurred along and near an Adrian to Port Huron line.<br>12:53 PM: 1.75 inch hail at Morenci, LAT/LON: 41°43 'N / 84°13'W.<br>13:26 PM: 0.88 inch hail 1 Mile South of Adrian, LAT/LON: 41°53'N / 84°01'W. | Morenci<br><br>Morenci<br>Madison Township |

| Table 21-1, Lenawee County Hail Events, 1963-2011 | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **07/18/2010** | 16:30 PM: 0.75 inch hail at Adrian, LAT/LON: 41°55' N / 84°05'W. A warm front lifted north of southeast Michigan, as a strong low tracked in from Wisconsin. A few severe thunderstorms developed, one of which produced a tornado in Huron County.<br>16:50 PM: 1.75 inch hail at Tecumseh, LAT/LON: 42°0 0'N / 83°56'W. | Adrian<br>Tecumseh |
| **05/10/2011** | 05:48 AM: 1.00 inch hail at Munson, LAT/LON: 41°45' N / 84°19'W. A thunderstorm just southwest of Medina produced 1 inch hail.<br>05:53 AM: 0.75 inch hail at Medina, LAT/LON: 41°46' N / 84°18'W. | Munson<br>Medina |
| **05/23/2011** | 17:19 PM: 1.50 inch hail at Birdsall, LAT/LON: 41°58'N / 84°02'W. Numerous severe thunderstorms impacted areas south of M-59.<br>17:25 PM: 0.75 inch hail at Tecumseh, LAT/LON: 42°00'N / 83°56'W. | Birdsall<br>Tecumseh |
| **08/01/2011** | 13:45 PM: 0.88 inch hail at Weston, LAT/LON: 41°43'N / 84°04'W. An isolated marginally severe thunderstorm impacted Saginaw during the early morning hours. A thunderstorm then popped up during the afternoon hours and produced nickel size hail in Lenawee county. | Weston |

Sources: Michigan Hazard Analysis, the National Climatic Data Center (NCDC) storm events database, reports from the Law Enforcement Information Network (LEIN), and local input from plan participants.

## 22. Lightning

Lightning is a random and unpredictable product of a tremendous energy. The perception of lightning as a minor hazard lingers despite the fact that lightning damages many structures and kills and injures more people in the United States per year on average than tornadoes or hurricanes.

In terms of property losses from lightning statistics vary widely according to source. However, annual lightning-related property damages are conservatively estimated at several billion dollars per year. Those losses are expected to continue to grow as the use of computers and other lightning-sensitive electronic components become more prevalent. Unfortunately, lightning has taken a tremendous toll on Michigan's citizens in terms of injury and loss of life. From 1993-2009, Michigan incurred 17 lightning deaths, 146 injuries, and $26 million in property damage, ranking it near the top of the nation in all three categories.

Lightning deaths are usually caused by the electrical force shocking the heart into cardiac arrest or throwing the heartbeat out of its usual rhythm. Lightning can also cut off breathing by paralyzing the chest muscles or damaging

the respiratory center in the brain stem. Lightning can also cause severe skin burns that can lead to death if complications from infection set in.

**Lenawee County Perspective**

Table 22-1 provides an inventory of lightning events in Lenawee County from 1995 to 2009. Also included are several warnings that were issued in the County during that period. A total of 17 lightning storms were reported in Lenawee County from 1995 to 2007. These storms resulted in one death when a woman in Adrian was struck by lightning in her yard in Adrian in 2003. No other casualties are known, but $935,000 in property damages have been recorded. With 17 storms occurring in the 15-year period from 1995-2009, lightning storms occur at a rate of 1.1 lightning storms per year in Lenawee County. Lightning strikes do not appear to follow a geographic pattern of occurrence.

**Table 22-1, Lenawee County Lightning Events, 1995-2009**

| Date | Description | MCD's |
|---|---|---|
| **06/24/1995** | 1500: Lightning near Hudson, $40,000 property damage. A 60- by 60-foot pole barn was destroyed by a fire caused by lightning, along with a car that had been parked inside the barn. | Hudson |
| **07/15/1995** | 1700: Lightning at Blissfield, $15,000 property damage. Lightning started a fire that severely burned a two car garage and destroyed the car that was parked inside. | Blissfield |
| **10/29/1996** | 11:32 PM: A strong low pressure area moving northeast across the central Plains triggered strong to severe thunderstorms across southeast Michigan during the evening of the 29th. A severe thunderstorm downed trees in Lenawee county at 2232 EST. | Unspecified location |
| **06/21/1997** | 12:00 AM: Lightning at Adrian, $15,000 property damage. Lightning struck a house, igniting a fire that destroyed most of the upstairs portion of the house. A dog and kitten were killed in the fire. | Adrian |
| **06/26/1998** | 05:45 AM: Lightning 3 miles southwest of Rome Center, $6,000 property damage. Lightning struck a home on Plank Road, causing significant electrical damage. | Rome Township |
| **01/17/1999** | 06:00 PM: Thunderstorm. A line of thunderstorms crossed southeast Michigan from west to east after sunset on the 17th. The visual effect of almost continuous cloud-to-ground lightning, at night, reflecting off of a roughly two-foot snowpack, was quite extraordinary. Although no severe weather occurred, the storms produced a half inch of rain, which fell onto the deep snowpack. The heavy rain, runoff, and snowmelt put a lot of water on area roads. That water froze overnight, leaving many highways a solid sheet of ice. Classes were cancelled in numerous school districts due to the icy roads. | Lenawee County |
| **04/10/1999** | 11:30 PM: Lightning at Morenci, $7,000 property damage. A lightning strike in a residential area damaged electrical appliances, blew out windows, and caused tires on two nearby vehicles to explode. One car suffered extensive electrical damage. | Morenci |
| **06/20/2000** | Severe thunderstorm warnings were issued for Lenawee. | Lenawee County |
| **06/29/2000** | Severe thunderstorm warnings were issued for Lenawee. | Lenawee County |

| Table 22-1, Lenawee County Lightning Events, 1995-2009 | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **08/09/2001** | 12:35 PM: Lightning at Morenci, $150,000 property damage. Lightning ignited a barn. The fire completely destroyed the barn and the contents inside it; including a truck, a tractor, a grain truck, a travel trailer, lawn mowers and tools. Firefighters managed to save the house next to the barn. The house sustained only minor damage. | Morenci |
| **06/21/2002** | 01:00 PM: Lightning 5 Miles South East of Adrian. Lightning struck a home in Palmyra Township. No damage was reported. Scattered thunderstorms produced hail and very heavy rainfall. Slow storm movement and the intense rainfall led to flooding in some locations. The most persistent heavy rainfall occurred from Adrian to Monroe to the southern suburbs of Detroit, where rainfall rates of 2 inches per hour were reported.<br>Severe thunderstorm warnings were issued, along with flash flood warnings issued. Reports came in of stranded cars and 3 to 4 feet of water covering low lying areas.<br>3 Miles South of Tecumseh, lightning caused $150,000 of property damage, striking a home and setting it on fire. The home sustained serious damage from the fire. | Palmyra Township<br><br>Raisin Township |
| **07/22/2002** | 10:30 AM: Lightning 3 Miles North of Britton, $100,000 property damage. A newspaper reported that lightning struck a home in Macon Township and set it on fire, causing considerable damage.<br>11:00 AM: Lightning 1 Mile North of Adrian, $50,000 property damage. A newspaper reported that lightning struck a home and set it on fire. | Macon Township<br><br>Adrian Township |
| **07/28/2002** | Severe thunderstorm warnings were issued for Lenawee. | Lenawee County |
| **03/27/2003** | Thunderstorm warnings were issued for Lenawee. | Lenawee County |
| **05/09/2003** | Severe thunderstorm warnings were issued for Lenawee. | Lenawee County |
| **06/28/2003** | Severe thunderstorm warnings were issued for Lenawee. | Lenawee County |
| **08/01/2003** | 05:00 PM: Lightning at Adrian, 1 death. A woman was struck by lightning and killed standing in her backyard.<br>Severe thunderstorm warnings and tornado warnings were issued for Lenawee. | Adrian<br>Lenawee County |
| **08/15/2003** | 03:00 PM: Lightning at Addison, $12,000 property damage. Lightning was the suspected cause of a fire that destroyed a garage and damaged a home on Quaker Road. | Addison |
| **08/16/2003** | Severe thunderstorm warnings were issued for Lenawee. | Lenawee County |
| **08/26/2003** | Severe thunderstorm warnings issued for LENAWEE. | Lenawee County |
| **04/21/2004** | Severe thunderstorm warnings were issued for Lenawee. | Lenawee County |
| **11/15/2005** | 05:49 PM: Lightning at Tecumseh. Lightning struck the northwest corner of a home located at 509 Maple Drive in Tecumseh. The strike damaged the exterior and drywall of a bedroom. This was the third powerful storm to hit the area in a week and a half, leading to yet another round of strong winds. Intense cloud to ground lightning was observed. | Tecumseh |
| **03/12/2006** | 01:39 AM: Lightning at Adrian, $50,000 property damage. A lightning strike sparked a house fire leading to smoke and water damage estimated at 35K to the structure and 15K to the contents. | Adrian |

| Table 22-1, Lenawee County Lightning Events, 1995-2009 | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **05/31/2006** | 05:00 PM: Lightning at Fairfield, $2,000 property damage. Lightning struck a Consumers Energy substation in Fairfield, knocking out power to 4400 people in Adrian. | Fairfield Township |
| **06/21/2006** | 04:54 PM: Lightning at Clayton, $10,000 property damage. Lightning struck a home on M-34 near Posey Lake. No injuries were reported. The details of the damages are unknown and the value assigned is a rough estimate. On the evening of Wednesday, June 21st, rapid thunderstorm development occurred across the southern two tiers of counties in southeast Michigan. One tornado, rated at F0 intensity, touched down near Addison in Lenawee County. The severe thunderstorms resulted in a mix of high wind and large hail, with several reports of hail the size of golf balls. In addition, flash flooding was reported across Lenawee and Monroe counties.<br>04:54 PM: Lightning at Clayton, $10,000 property damage. Lightning struck a home on South Street in Clayton. No injuries were reported. The details of the damages are unknown and the value assigned is a rough estimate. | Clayton<br><br>Clayton |
| **05/01/2007** | Severe thunderstorm warnings issued for Lenawee. | Lenawee County |
| **07/26/2007** | Severe thunderstorm warnings were issued for Lenawee.<br>19:42 PM: Lightning at Adrian, LAT/LON: 41°54'N / 8 4°01'W, $250,000 property damage. A local newspaper reported $250K in lightning damages to computer, radio and telephone equipment at county buildings in downtown Adrian.<br>19:50 PM: Lightning 1 Mile South East of Adrian, LAT/LON: 41°53'N / 84°00'W, $50,000 property damage. A local newspaper reported lightning damage to electrical systems at Delphi Automotive Systems. Total property damages were estimated at roughly $50K. | Lenawee County<br>Adrian<br><br>Madison Township |

Sources: Michigan Hazard Analysis, the National Climatic Data Center (NCDC) storm events database, reports from the Law Enforcement Information Network (LEIN), and local input from plan participants.

## 23. Tornadoes

Tornadoes in Michigan are most frequent in the spring and early summer when warm, moist air from the Gulf of Mexico collides with cold air from Canada to generate severe thunderstorms. These thunderstorms often produce the violently rotating columns of wind that are called tornadoes. Most of a tornado's destructive force is exerted by the powerful winds that knock down walls and lift roofs from buildings in the path of the storm. The violently rotating winds then carry debris aloft that can be blown through the air as dangerous missiles. Michigan is located along the northeastern edge of the "tornado belt". The tornado belt extends from Texas and Oklahoma through Missouri and Illinois, into Indiana, Ohio, and Michigan. A tornado may have winds up to 300 miles per hour and interior air pressure that is 10-20% below that of the surrounding environment. After reaching the ground, the aver-

age length of a tornado path is 16 miles, but tracks much longer than that have been reported. Tornado path widths are generally less than one-quarter mile in width.

Tornado intensity is measured on the Fujita Scale which examines the damage caused by a tornado on homes, commercial buildings, and man-made structures. The Fujita Scale rates the intensity of a tornado based on the potential to cause damage, not by its size, which is not necessarily an indication of storm intensity. It is very difficult to judge the intensity of a tornado while it is occurring. Generally, that can be done after the tornado has passed using the Fujita Scale as a measuring stick. According to the National Weather Service, the majority of tornadoes that have occurred since 1950 were classified as weak (F0 or F1). Table 23-1 provides a description of the six Fujita Scale ratings. Fujita Scale ratings for tornadoes in Lenawee County also provided in Table 23-2.

**Table 23-1, Fujita Tornado Scale**

| Magnitude | Description | Wind Speeds |
|---|---|---|
| F0 | Gale Tornado | 42-72 mph |
| F1 | Moderate Tornado | 73-112 mph |
| F2 | Significant Tornado | 113-157 mph |
| | | |
| F3 | Severe Tornado | 158-206 mph |
| F4 | Devastating Tornado | 207-260 mph |
| F5 | Incredible Tornado | 261-318 mph |

**Lenawee County Perspective**

A total of 31 tornadoes were reported in Lenawee County between 1950 and 2009. According to the Michigan Hazard Analysis, Lenawee County ranked only second to Genesee County in the period from 1950 to 2001 in terms of Michigan County tornado event rankings. This rate equates to a probability of 0.5 tornadoes per annum.

The "Palm Sunday Tornado" which occurred on April 11, 1965 was particularly noteworthy. On that dreadful day, 23 tornadoes touched down in 14 southern central Michigan counties, resulting in 53 fatalities. 798 injuries, and $51 million in damage to public and private property. Many of the tornadoes were rated F3 and F4 in intensity. Two F4 tornadoes touched down in Lenawee County in the area of Devils and Round Lakes and proceeded on their deadly track in the direction of Tecumseh. The Palm Sunday Tornado resulted in 9 deaths, 83 injuries, and roughly $25 million in property damage in Lenawee County, ***and resulted in Lenawee County being declared a Disaster Area by President Lyndon Johnson along with 15 other Michigan counties.***

While most tornadoes that occur in Lenawee County are relatively docile, a few have resulted in property damage and injury. Table 23-2 provides an inventory of tornado events in Lenawee County from 1954-2009. Of the 31 tornadoes listed in the Table, 21 were rated F0 or F1, six were rated F2 (including three in the same storm), one rated F3, and two F4 (both on Palm Sunday). On one occasion, a tornado was spotted but no Fujita Scale rating

was provided. While Michigan is at the northern edge of the Tornado Belt, no evidence exists that the geographic pattern of tornado distribution exists in Lenawee County.

Damage estimates dating back to 1954 are sketchy at best. Inflation over time and uncertainty regarding the data make the available information somewhat unreliable. From the information available, tornadoes in Lenawee County have resulted in a loss of nine lives, 89 injuries, and $25,950,000 in property damage. Tornado impacts, then, have included disaster-level property damage, downed trees, blocked roads and other infrastructure damage.

| Table 23-2, Lenawee County Tornado Events, 1954-2010 (Disaster Declarations indicated in shaded Red entries) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **06/12/1954** | 1630: F0 Tornado, $3000 property damage, Begin LAT/LON: 42°03'N / 84°16'W. Length: 0.10 Mile, Width:7 Yards. | Cambridge Township |
| **04/14/1956** | 1800: F1 Tornado, LAT/LON: 41°43'N / 84°13'W, $2500 property damage. | Morenci |
| **08/03/1958** | 1730: F0 Tornado, LAT/LON: 42°00'N / 83°57'W | Tecumseh |
| **08/26/1962** | 1625: F1 Tornado, Length: 0.50 Mile, Width: 33 Yards, LAT/LON: 41°55'N / 84°20'W, $25,000 property damage. | Rollin Township |
| **08/22/1964** | 1335: F3 Tornado, 2 injuries, LAT/LON: 42°00'N / 84 °10'W, $25,000 property damage.<br>1340: F1 Tornado, LAT/LON: 41°59'N / 83°52'W, $25,0 00 property damage. | Cambridge Township<br>Ridgeway Township |
| **04/11/1965** | 1850: F4 Tornado, 5 killed, 42 injured, Begin LAT/LON: 41°57'N / 84°22'W, End LAT/LON: 42°00'N / 83°55'W, Length: 23.20 Miles, Width: 1760 Yards, $2 5 million property damage.<br>1930: F4 Tornado, 4 killed, 41 injured, Begin LAT/LON: 41°57'N / 84°22'W, End Location: Not Known, End LAT/LON: 42°00'N / 83°55'W, Length: 23.2 0 Miles, Width: 33 Yards. | Begin: Rollin Township<br>End: Tecumseh |
| **08/18/1972** | 2145: F0 Tornado, $25,000 property damage, Length: 0.10 Mile, Width: 10 Yards, LAT/LON: 42°02'N / 84°13'W. | Cambridge Township |
| **6/16/1973** | 1805: F1 Tornado, $25,000 property damage, Length: 2.50 Miles, Width: 50 Yards, LAT/LON: 42°01'N / 83°56'W. | Tecumseh |
| **06/26/1973** | 1425: F0 Tornado, LAT/LON: 41°57'N / 83°59'W. | Raisin Township |
| **04/03/1974** | 1925: F2 Tornado, 3 injured, $25,000 property damage, Begin LAT/LON: 41°50'N / 84°23'W, End LAT/LON: 41°51'N / 84°22'W.<br>1930: F2 Tornado, Length: 4.30 Miles, Width: 33 Yards, Begin LAT/LON: 41°47'N / 84°20'W, End LAT/LON: 41°50'N / 84°16'W. | Begin/End: Pittsford Township (Hillsdale Co.)<br>Begin/End: Medina Township |
| **03/12/1976** | 1610: F2 Tornado, $250,000 property damage, Begin LAT/LON: 41°49'N / 84°22'W, End LAT/LON: 41°50'N / 84°21'W. | Begin: Pittsford Twp.<br>End: Hudson Township |
| **06/24/1976** | 1725: F1 Tornado, $25,000 property damage, Length: 1.00 Mile, Width: 50 Yards, LAT/LON: 41°54'N / 83°47'W. | Deerfield Township |

| Table 23-2, Lenawee County Tornado Events, 1954-2010 (Disaster Declarations indicated in shaded Red entries) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **6/20/1979** | 1641: F2 Tornado, $250,000 property damage, Length: 0.60 Mile, Width: 27 Yards, LAT/LON: 41°44'N / 83°50'W. | Riga Township |
| **08/29/1979** | 1648: F1 Tornado, $25,000 property damage, LAT/LON: 42°01'N / 83°45'W, Length: 0.30 Mile, Width: 50 Yards. | Eastern Lenawee (nearest Macon Twp.) |
| **04/12/1982** | 2326: F0 Tornado, $3,000 property damage, LAT/LON: 41°49'N / 83°56'W, Length: 0.10 Mile, Width: 13 Yards. | Palmyra Township |
| **05/01/1983** | 2335: F2 Tornado, $25,000 property damage, LAT/LON: 42°00'N / 84°11'W, Length: 1.90 Miles, Width: 400 Yards.<br>2337: F2 Tornado, $25,000 property damage, Begin LAT/LON: 41°59'N / 84°06'W, End LAT/LON: 42°02'N / 84°00'W, Length: 5.90 Miles, Width: 500 Y ards.<br>2340: F2 Tornado, $25,000 property damage, LAT/LON: 41°58'N / 83°58'W, Length: 2.00 Miles, Width: 100 Yards. | Onsted<br>Begin: Franklin Twp<br>End: Tecumseh Twp.<br>Raisin Township |
| **05/27/1985** | 0005: F1 Tornado, $3,000 property damage, Begin LAT/LON: 42°00'N / 83°56'W, End LAT/LON: 42°00'N / 83°52'W, Length: 4.90 Miles, Width: 80 Ya rds. | Begin: Tecumseh<br>End: Macon Town-ship |
| **07/15/1986** | 2123: F0 Tornado, LAT/LON: 42°00'N / 84°11'W, Lengt h: 0.20 Mile, Width: 13 Yards | Cambridge Township |
| **06/29/1987** | 1720: F1 Tornado, $2,500 property damage, LAT/LON: 41°55'N / 84°22'W, Length: 0.80 Mile, Width: 147 Yards. | Rollin Township |
| **07/31/1987** | 1430: F0 Tornado, $3,000 property damage, Begin LAT/LON: 41°54'N / 83°57'W, End LAT/LON: 41°56'N / 83°55'W, Length: 3.50 Miles, Width: 20 Ya rds. | Raisin Township |
| **04/03/1988** | 1244: F0 Tornado, $25,000 property damage, LAT/LON: 41°54'N / 84°14'W, Length: 1.00 Mile, Width: 30 Yards. | Rome Township |
| **5/15/1988** | 1719: F0 Tornado, 1 injury, $3,000 property damage, LAT/LON: 41°53'N / 83°47'W, Length: 0.20 Mile, Width: 10 Yards. | Deerfield |
| **06/20/1994** | 1440: F0 Tornado, $50,000 property damage, Location: 3 Miles South West of Blissfield, LAT/LON: 41°48'N / 83°55'W, Length: 0.50 Mile, Width: 20 Yar ds. Two witnesses confirmed sighting of tornado touchdown, preceded by a brief hail storm that destroyed a 75 x 100 foot cattle barn, a 30 x 70 foot pig barn, and an antique windmill. Another 50 x 70 foot barn was damaged, and a fallen tree dam-aged the wall of a home. | Ogden Township |
| **03/28/1998** | 10:58 AM: F1 Tornado, $25,000 property damage 2 Miles North West of Tipton, LAT/LON: 42°02'N / 84°06'W. A line of fast-moving showers with embedde d thunderstorms raced across far southeast Michigan during the late morning and early afternoon hours. A brief tornado occurred in northern Lenawee County, destroying a farmhouse and a barn, damaging another barn, and moving two grain silos off of their foundations. | Franklin Township |
| **05/23/1999** | 02:50 PM: F1 Tornado from 2 Miles South West of Rome Center, LAT/LON: 41°56'N / 84°12'W, to 3 Miles North East of Rome Center, LAT/LON: 41°59'N / 84°08'W, $15,000 property damage, Length: | Begin: Rome Town-ship |

| Table 23-2, Lenawee County Tornado Events, 1954-2010 (Disaster Declarations indicated in shaded Red entries) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | 4.90 Miles, Width: 35 Yards, Magnitude: F1. A tornado moved northeast across Rome Township. This tornado produced F0 damage along most of its path, but briefly reached F1 intensity about 2 miles northeast of Rome Center. At this point, the tornado destroyed a large metal shed, blowing debris up to a quarter mile away. The tornado also damaged an antique gas pump at the same site. Along the rest of its path, the tornado snapped off a number of trees, and damaged siding and rain gutters to a farmhouse. Just before it lifted, the tornado shifted a barn off its foundation, and partially de-roofed two barns. As an historical note, the path of this tornado coincided almost exactly with a segment of the paths of the Palm Sunday tornadoes of April 11 1965 - which were the strongest tornadoes in Lenawee County since 1950. In fact, local property owners commented that the structures that were damaged by the 1999 tornado were also damaged (much more heavily) back in 1965! | End: Franklin Township |
| **5/9/2000** | 07:52 PM: Severe thunderstorm warnings, tornado warnings. At 1952 a tornado was reported near Hudson, moving northeast at 45 mph. At 2007 a trained weather spotter reported a tornado 3 miles northwest of Blissfield, or 7 miles east of Adrian, moving northeast at 50 mph. | Hudson, Blissfield |
| **08/25/2003** | Tornado warnings were issued for Lenawee. | Lenawee County |
| **6/21/2006** | 05:10 PM: F0 Tornado from 4 Miles South South East of Addison, LAT/LON: 41°56'N / 84°19'W, to 4 Miles South East of Addison, LAT/LON: 41°57'N / 84° 18'W, $40,000 property damage. An F0 intensity tornado with winds of 60 to 70 MPH touched down approximately 4 miles south of Addison in Rollin Township on Wednesday, June 21st. The damage path was concentrated in a 100 yard wide path for a length of approximately 2 miles, extending from Rollin Highway just south of Burton Road eastward along Burton Road to the intersection of Burton Road and Shierson Highway. The most extensive damage along the path was to large trees near the Burton Road and Townley Highway intersection. Several homes received minor structural damage from falling trees associated with this tornado. Total property damages were roughly estimated at $40K. Average path width was 25 yards. | Rollin Township |
| **6/6/2010** | 12:48 AM: F1 Tornado 2 Miles West North West of Rome Center, LAT/LON: 41°57'N / 84°13'W, to 1 Mile East North East of Rome Center, LAT/LON: 41°57 'N / 84°10'W, $500,000 property damage. An F1 tornado touched down at 148 AM at Southard Highway and Woerner Road in Lenawee County. The tornado then tracked 2.5 miles east southeast to Springville Highway before lifting at 152 AM. The path width was 250 yards with maximum winds of 90 mph as it crossed US 223, which is classified at an EF1. Several buildings were destroyed and numerous trees were downed by this tornado. | Rome Center |

Sources: Michigan Hazard Analysis, the National Climatic Data Center (NCDC) storm events database, reports from the Law Enforcement Information Network (LEIN), and local input from plan participants.

## 24. Severe Winds

Severe winds spawned by thunderstorms or other storm events have had devastating effects on Michigan. Severe wind events are characterized by wind velocities of 58 miles per hour or greater with gusts sometimes exceeding 74 miles per hour.

**Lenawee County Perspective**

A total of 216 wind events were reported in Lenawee County between 1962 and 2009. These events were associated with thunderstorms on 201 occasions; high wind events on 14 occasions; and a strong wind event on a single occasion. Recorded wind speeds for 203 of the events ranged from 40 knots to 69 knots while the remaining 13 ranged from 61 to 78 knots. On 24 occasions, wind speeds reached the "severe" level with speeds greater than or equal to 58 knots.

The impact of severe wind events upon Lenawee County has been estimated in the tens of millions of dollars from 1962 to 2009, although the precise cost for Lenawee County can't be verified from available data. No deaths have resulted from these events, but eight injuries were attributed to severe wind in Lenawee County. The impacts have included power failures, as lines are pulled down or damaged by winds, or by wind-blown trees and limbs.

Table 24-1 provides an inventory of wind events that have affected Lenawee County from 1962-2009. Dates and locations of reporting stations are also provided. Data from the Table show that no pattern exists regarding location of severe wind events. Location is more a function of reporting station position than any pattern that may exist. Obstructions such as trees and buildings help to provide shelter from the effects of severe winds. Wind erosion can be limited to some extent using best practices in agriculture and development.

While windy days are quite common, severe winds at 58 knots and above are not frequent in Lenawee County. In the 48 years covered by Table 24-1, 20 days with severe wind events were recorded. This produces an average of 0.42 severe wind events per year. While severe winds tend to be county-wide, the winds tend to be more sustained in rural treeless areas in the southern half of Lenawee County. However, this is not reflected in Table 24-1 as the locations of severe wind events are somewhat random.

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **07/26/1962** | 1730: Strong thunderstorm winds, LAT/LON: 42°00'N / 83°47'W. | Macon Township |
| **03/19/1963** | 0920: Strong thunderstorm winds, LAT/LON: 41°47'N / 83°54'W. | Ogden Township |
| **08/27/1965** | 1800: Strong thunderstorm winds, LAT/LON: 41°53'N / 84°00'W. | Palmyra Township |
| **11/28/1968** | 1630: Strong thunderstorm winds, LAT/LON: 41°53'N / 84°00'W | Palmyra Township |
| **07/04/1969** | 1640: Strong thunderstorm winds, LAT/LON: 41°53'N / 84°11'W. | Ogden Township |
| **07/04/1974** | 1250: Strong thunderstorm winds, LAT/LON: 41°54'N / 84°02'W. | Adrian |
| **05/25/1975** | 1650: Strong thunderstorm winds, LAT/LON: 42°00'N / 83°56'W.<br>1700: Strong thunderstorm winds, LAT/LON: 41°43'N / 84°13'W. | Tecumseh<br>Outside Lenawee Co. |
| **07/16/1975** | 1630: Strong thunderstorm winds, LAT/LON: 41°59'N / 84°21'W. | Addison |
| **05/31/1977** | 1300: Strong thunderstorm winds, LAT/LON: 41°53'N / 83°47'W. | Deerfield |
| **06/10/1979** | 1205: Strong thunderstorm winds, LAT/LON: 41°51'N / 84°21'W. | Hudson |
| **06/20/1979** | 1625: Strong thunderstorm winds, LAT/LON: 41°44'N / 84°12'W | Morenci |
| **08/23/1979** | 1300: 65 knot thunderstorm winds, LAT/LON: 41°51'N / 84°21'W | Hudson |
| **04/08/1980** | 1700: Strong thunderstorm winds, LAT/LON: 41°49'N / 84°02'W. | Madison Township |
| **06/07/1980** | 1710: Strong thunderstorm winds, LAT/LON: 42°00'N / 83°56'W. | Tecumseh |
| **07/16/1980** | 0620: Strong thunderstorm winds, LAT/LON: 41°54'N / 84°04'W. | Adrian |
| **09/22/1980** | 1742: Strong thunderstorm winds, LAT/LON: 42°54'N / 84°02'W. | Outside Lenawee Co. |
| **06/16/1981** | 0000: Strong thunderstorm winds, LAT/LON: 41°51'N / 84°21'W. | Hudson |
| **05/01/1983** | 2335: Strong thunderstorm winds, LAT/LON: 42°00'N / 84°11'W. | Onsted |
| **07/17/1983** | 1040: Strong thunderstorm winds, LAT/LON: 41°52'N / 84°07'W. | Madison Township |
| **06/02/1984** | 1910: Strong thunderstorm winds, LAT/LON: 41°52'N / 84°07'W. | Madison Township |
| **06/13/1984** | 1550: Strong thunderstorm winds, LAT/LON: 41°52'N / 84°07'W | Madison Township |
| **08/18/1984** | 1510: Strong thunderstorm winds, LAT/LON: 41°53'N / 83°47'W. | Deerfield |
| **09/02/1984** | 1720: Strong thunderstorm winds, LAT/LON: 41°54'N / 84°02'W. | Adrian |
| **07/09/1985** | 2315: Strong thunderstorm winds, LAT/LON: 41°52'N / 84°07'W.<br>2345: Strong thunderstorm winds, LAT/LON: 41°52'N / 84°07'W. | Madison Township |
| **09/08/1985** | 1715: Strong thunderstorm winds, LAT/LON: 41°52'N / 84°07'W. | Madison Township |
| **07/25/1986** | 1549: Strong thunderstorm winds, LAT/LON: 41°54'N / 84°04'W. | Adrian |
| **08/15/1986** | 1415: Strong thunderstorm winds, LAT/LON: 41°55'N / 83°57'W. | Raisin Township |
| **08/26/1986** | 1130: Strong thunderstorm winds, LAT/LON: 42°03'N / 84°13'W. | Cambridge Township |
| **09/26/1986** | 1700: Strong thunderstorm winds, 2 injuries, LAT/LON: 41°54'N / 84°04'W. | Adrian |
| **06/02/1987** | 1245: Strong thunderstorm winds, LAT/LON: 42°04'N / 83°52'W. | Macon Township |
| **05/15/1988** | 1705: Strong thunderstorm winds, LAT/LON: 41°43'N / 84°13'W. | Morenci |
| **07/25/1988** | 1815: 61 knot thunderstorm winds, LAT/LON: 41°51'N / 84°21'W. | Hudson |
| **08/15/1988** | 1040: Strong thunderstorm winds, LAT/LON: 41°54'N / 84°02'W. | Adrian |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **09/19/1988** | 2030: Strong thunderstorm winds, LAT/LON: 41°54'N / 84°04'W. | Adrian |
| **09/22/1988** | 2220: Strong thunderstorm winds, LAT/LON: 42°00'N / 83°56'W. | Tecumseh |
| **05/30/1989** | 1817: Strong thunderstorm winds, LAT/LON: 41°54'N / 84°04'W. | Adrian |
| **01/25/1990** | 1134: Strong thunderstorm winds, LAT/LON: 41°54'N / 84°04'W. | Adrian |
| **06/02/1990** | 1915: Strong thunderstorm winds, LAT/LON: 41°54'N / 84°04'W | Adrian |
| **08/28/1990** | 1545: Strong thunderstorm winds, LAT/LON: 41°54'N / 84°02'W.<br>1645: 52 knot thunderstorm winds, LAT/LON: 41°54'N / 84°04'W. | Adrian |
| **03/27/1991** | 2000: 52 knot thunderstorm winds, LAT/LON: 41°54'N / 84°04'W. | Adrian |
| **05/13/1991** | 1415: 52 knot thunderstorm winds, LAT/LON: 41°54'N / 84°02'W. | Adrian |
| **07/03/1991** | 1400: 61 knot thunderstorm winds, 1 injury, LAT/LON: 41°54'N / 84°02'W. | Adrian |
| **07/07/1991** | 1900: 52 knot thunderstorm winds, LAT/LON: 42°00'N / 83°56'W.<br>1920: 52 knot thunderstorm winds, LAT/LON: 41°50'N / 83°52'W. | Tecumseh<br>Blissfield |
| **04/20/1992** | 1738: Strong thunderstorm winds, LAT/LON: 41°54'N / 84°18'W. | Rollin Township |
| **07/07/1991** | 1900: 52 knot thunderstorm winds, LAT/LON: 42°00'N / 83°56'W.<br>1920: 52 knot thunderstorm winds, LAT/LON: 41°50'N / 83°52'W. | Tecumseh<br>Blissfield |
| **04/20/1992** | 1738: Strong thunderstorm winds, LAT/LON: 41°54'N / 84°18'W. | Rollin Township |
| **05/17/1992** | 1345: 56 knot thunderstorm winds, LAT/LON: 41°54'N / 84°02'W.<br>1350: 56 knot thunderstorm winds, LAT/LON: 41°53'N / 83°47'W. | Adrian<br>Deerfield |
| **06/13/1994** | 1815: Strong thunderstorm winds, $5,000 property damage. Hail damaged fruit and vegetable crops in Palmyra Township. Winds blew down a large tree in Blissfield that crushed a garage. Thunder-storm winds toppled trees and power lines across the county. | Palmyra, Blissfield |
| **06/28/1994** | 1851: Strong thunderstorm winds. Large trees blown down by thunderstorm winds. | Unknown |
| **07/20/1994** | 1910: Strong thunderstorm winds 5 miles southeast of Hudson, $500 property damage. Spotters reported widespread wind damage with large branches down and work sheds blown over.<br>1950: Strong thunderstorm winds at Rome Center. Spotters reported numerous trees blown down. | Hudson<br><br>Rome Township |
| **11/18/1994** | 1200: 62 knot high winds, $1.0 million property damage statewide. High winds affected much of Michigan. Gusts of 40 to 50 mph were widespread throughout the state. | Unspecified location |
| **06/26/1995** | 1400: Strong thunderstorm winds and lightning, Addison To Raisin Township, $23,000 property damage. A severe thunderstorm tracking across central Lenawee County downed trees. In addition, lightning struck a large storage shed in a lumber yard, burning it to the ground. | Addison to Raisin Township |
| **06/27/1995** | 1335: Strong thunderstorm winds, near Addison. Strong thunderstorm winds caused a mobile home to shift, and uprooted trees. | Addison |
| **07/09/1995** | 2010: Strong thunderstorm winds at Adrian. Several trees were blown over. | Adrian |
| **07/13/1995** | 1810: Strong thunderstorm winds at Sand Creek, $5,000 property damage. | Madison Township |
| **08/01/1995** | 1340: Strong thunderstorm winds at Adrian, $5,000 property damage. Trees and power lines were | Adrian |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | blown down. About 1,200 customers were without power.<br>1415: Strong thunderstorm winds at Adrian, $10,000 property damage. Trees and power lines were blown down. A horse was killed.<br>1500: Strong thunderstorm winds at Morenci, $80,000 property damage. Strong straight-line winds associated with a thunderstorm destroyed five mobile homes in a campground. Extensive damage was done to the roof of a house when a large tree fell on the roof. | Adrian<br><br>Morenci |
| **08/03/1995** | 1615: Strong thunderstorm winds and lightning at Adrian, $20,000 property damage. A severe thunderstorm produced strong winds that downed trees and power lines. In addition, four houses were struck by lightning. | Adrian |
| **08/13/1995** | 1820: Strong thunderstorm winds and lightning at Rome Center, $10,000 property damage, $5,000 crop damage. Trees and power lines were blown down. In Adrian, 4,400 customers were without power after the storm. Lightning ignited a fire that damaged the roof of an apartment building in Adrian. A spotter reported large amounts of corn crop damage. The roof was blown off of a silo in Blissfield. | Rome Township<br><br>Adrian, Blissfield |
| **08/15/1995** | 1630: Strong thunderstorm winds near Hudson. Several large trees were downed near the town of Hudson. | Hudson |
| **08/16/1995** | 1942: Strong thunderstorm winds at Clayton. Several trees ranging in diameter from two to 3.5 feet were blown down. | Clayton |
| **01/18/1996** | 06:38 PM: 50 knot thunderstorm winds at Morenci, LAT/LON: 41°43'N / 84°13'W. | Morenci |
| **03/25/1996** | 12:00 PM: 50 knot high winds, $65,000 property damage. Strong winds downed power lines and resulted in outages to about 10000 Detroit Edison customers throughout southeast Michigan. The peak wind gust at Detroit's Metro Airport was 54 mph. | Unspecified location |
| **04/12/1996** | 03:05 PM: 52 knot thunderstorm winds/hail at Hudson, $1.0 million property damage.<br>03:50 PM: 60 knot thunderstorm winds at Adrian, LAT/LON: 41°54'N / 84°02'W, $1.0 million property damage.<br>04:04 PM: 78 knot thunderstorm winds at Riga, LAT/LON: 41°49'N / 83°50'W, $8,000 property damage. | Hudson<br>Adrian<br><br>Riga Township |
| **09/11/1996** | 04:30 PM: 50 knot thunderstorm winds at Tecumseh, LAT/LON: 42°00'N / 83°56'W. | Tecumseh |
| **10/29/1996** | 11:32 PM: 55 knot thunderstorm winds 3 Miles southwest of Rome Center, LAT/LON: 41°55'N / 84°13'W. | Rome Township |
| **10/30/1996** | 12:00 AM: 60 knot high winds, $90,000 property damage. High winds did widespread damage. Through the day, high winds downed trees and power lines, causing outages throughout southeast Michigan. Detroit Edison reported outages to 70,000 customers. | Unspecified location |
| **02/27/1997** | 08:00 AM: 55 knot high winds, $20,000 property damage. Peak winds reached 59 mph at Detroit's metro airport. | Unspecified location |
| **04/06/1997** | 03:00 PM: 70 knot high wind, 1 injury, $1.2 million property damage statewide. Gusts to 70 mph were estimated in a few spots during the late afternoon. The wind damaged trees and power lines | Unspecified location |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | throughout southeast Michigan, resulting in a power loss to 125,000 customers. | |
| **08/03/1997** | 08:35 PM: 50 knot thunderstorm winds at Adrian, LAT/LON: 41°54'N / 84°02'W. Severe thunderstorms developed over Lenawee county late in the day on the 3rd. Trees and power lines were blown down in Adrian. | Adrian |
| **08/16/1997** | 06:56 AM: 75 knot thunderstorm winds at Cement City, LAT/LON: 42°04'N / 84°20'W, $50,000 property damage. Severe thunderstorms did $50,000 worth of damage to a campground near route 12 outside of Cement City. Campgrounds in the area were full that morning, since a race was scheduled for later in the day at the Michigan International Speedway, just across the county-line in Brooklyn.<br>03:19 PM: 50 knot thunderstorm winds, beginning 5 Miles West of Adrian, LAT/LON: 41°54'N / 84°08'W, Ending 5 Miles West North West of Adrian, LAT/LON: 41°54'N / 84°08'W. A cold front spawned severe thunderstorms late in the afternoon over an area that reported severe storms earlier that morning. A severe thunderstorm downed large limbs 5 miles west of Adrian. | Cement City<br><br>Dover Township |
| **09/19/1997** | 05:10 PM: 60 knot thunderstorm winds at Clinton, LAT/LON: 42°04'N / 83°58'W. Severe thunderstorms downed trees and power lines at Chelsea, Howell, Farmington Hills, Detroit, Clinton and Dundee. About 20,000 people were left without power. | Clinton |
| **06/24/1998** | 06:25 PM: 52 knot thunderstorm winds at Macon, LAT/LON: 42°04'N / 83°52'W, $2,000 property damage. Thunderstorms developed across central lower Michigan and became severe. Although the storms caused much damage elsewhere, only the northeast corner of Lenawee County was grazed, as trees were downed near Macon. | Macon Township |
| **06/26/1998** | 01:19 AM: 52 knot thunderstorm winds at Addison, LAT/LON: 41°59'N / 84°21'W, $5,000 property damage. Scattered thunderstorms developed in the evening hours and sporadically produced large hail and damaging winds. A weakening area of thunderstorms moved southeast into Washtenaw and Lenawee Counties after midnight. These storms were still potent enough to generate severe wind gusts in the western parts of these counties. Trees were downed in Dexter, Addison, north of Chelsea, and just west of Ann Arbor. | Addison |
| **07/21/1998** | 07:05 AM: 52 knot thunderstorm winds 4 miles southwest of Tecumseh, LAT/LON: 41°57'N / 83°56'W, $2,000 property damage. A tornadic supercell developed in Jackson County at around sunrise. This storm lost supercell characteristics as it moved into southeast Michigan, but the windows were blown out of a residence as it passed.<br>04:39 PM: 58 knot thunderstorm winds from Addison, LAT/LON: 41°59'N / 84°21'W to 1 Mile North West of Cambridge Junction, LAT/LON: 42°04'N / 84°14'W, 1 injury, $65,000 property damage. July 21st was one of the hottest days of the summer in southeast Michigan, as temperatures soared into the middle to upper 90s. Thunderstorms developed and rapidly became severe. The storms were prodigious producers of damaging wind gusts. The Lenawee injury in the event was due to an awning collapse - in the northwest of the county. Severe winds struck a campground near Michigan | Raisin Township<br><br>Addison |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | Speedway, where a major auto race would take place during the upcoming weekend. The awning of a camper was blown down, injuring a bystander. The damage was almost exclusively confined to the southern three tiers of counties in southeast Michigan. The first county in southeast Michigan to be affected by severe weather was Lenawee. Trees were downed in Ridgeway, Britton, Addison, and Deerfield. Britton also received the largest hail during the entire severe weather episode. In Tecumseh, two vehicles were damaged by fallen trees. Roof damage at Tecumseh City Hall led to computer systems inside being destroyed by exposure to the elements. Adrian was hit hard as well. Numerous homes were damaged by fallen trees, and a radio tower at the sheriff department was knocked out of service. Trees were downed just northeast of town. Many trees, limbs, and power lines were downed in Hudson, with numerous cars hit by debris, and the roof of a business de-stroyed. Amateur radio operators north of Addison and northeast of Adrian both estimated 65 mph winds.<br>04:46 PM: 65 knot thunderstorm winds at Hudson, LAT/LON: 41°51'N / 84°21'W, $100,000 property damage. (see description above)<br>04:50 PM: 58 knot thunderstorm winds from Adrian, LAT/LON: 41°54'N / 84°02'W to Tecumseh, LAT/LON: 42°00'N / 83°56'W, $145,000 property damag e.<br>05:03 PM: 55 knot thunderstorm winds from Ridgeway, LAT/LON: 42°00'N / 83°52'W, to Deerfield, LAT/LON: 41°53'N / 83°47'W, $40,000 property damage . | Cambridge Township<br>Ridgeway Township<br>Britton<br>Addison<br>Deerfield<br>Tecumseh<br>Hudson<br>Adrian |
| **08/24/1998** | 04:25 AM: 55 knot thunderstorm winds 3 Miles South Southeast of Addison, LAT/LON: 41°57'N / 84°20'W, $8,000 property damage. A cluster of thund erstorms occurred in southwest lower Michi-gan just after 3 am EDT. These storms raced to the east, affecting the southernmost tier of Michi-gan counties. Numerous trees were downed in western and central Lenawee County, while large limbs and power lines came down in southern Monroe County.<br>04:45 AM: 55 knot thunderstorm winds from 3 Miles North of Adrian, LAT/LON: 41°57'N / 84°02'W to Adrian, LAT/LON: 41°54'N / 84°02'W, $10,000 prop erty damage. | Addison<br><br>Adrian Township |
| **11/10/1998** | 12:00 PM: 61 knot high winds, $1.1 million property damage statewide. A very intense storm sys-tem moved north across the western Great Lakes on the 10th. This storm occurred on the 23rd an-niversary of the sinking of the Edmund Fitzgerald in Lake Superior, and was actually very compara-ble to that storm, both in regards to storm intensity and storm track. The big story with both systems were the extremely strong winds that occurred. Thankfully, this storm - as opposed to the Fitzgerald storm - was forecast days in advance, and the huge majority of marine traffic on the Great Lakes sought safe harbor before wind speeds became excessive. The highest winds during the entire event occurred within a couple of hours of midnight. Trees, limbs, and power lines were downed across all of southeast Michigan. The falling trees and limbs caused damage to some homes and vehicles. An automated weather observing station in Adrian was disabled.<br>12:53 PM: 52 knot thunderstorm winds from 1 Mile West of Morenci, LAT/LON: 41°43'N / 84°14'W to 1 Mile West North West of Morenci, LAT/LON: 41°4 3'N / 84°14'W, $5,000 property damage. | Unspecified location<br><br>Morenci |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | 01:10 PM: 52 knot thunderstorm winds from Adrian, LAT/LON: 41°54'N / 84°02'W to Tecumseh, LAT/LON: 42°00'N / 83°56'W, $8,000 property damage. In the middle of the period of high winds, and just ahead of the cold front, a thin line of rain showers raced across southeast Michigan. Very little lightning or thunder was reported with this line. However, the line did act to give a brief in-crease to local wind speeds. All of the above reports involved trees and lines being downed.<br>01:12 PM: 52 knot thunderstorm winds at Onsted, LAT/LON: 42°00'N / 84°11'W, $8,000 property damage. | Adrian<br><br>Onsted |
| **12/06/1998** | 11:10 PM: 52 knot thunderstorm winds at Devils Lake (Manitou Beach), LAT/LON: 42°00'N / 84°18'W, $20,000 property damage. A December severe weather episode - a rather uncommon event for Michigan – caused wind damage, and the majority of the damage involved the downing of trees, large limbs, and power lines. Damage was isolated in the southernmost tier of counties. A tree fell on a home in Devils Lake. | Rollin Township |
| **05/06/1999** | 12:00 PM: Wind, $92,000 property damage. Sustained winds of 20 to 30 mph were common, with occasional gusts in excess of 40 mph. The gusts were sufficient to down trees in Blissfield and Adrian. | Blissfield, Adrian |
| **06/12/1999** | 05:10 PM: 52 knot thunderstorm winds 5 Miles South West of Adrian, Begin LAT/LON: 41°51'N / 84°06'W, $5,000 property damage. Most of the severe thunderstorms produced either marginally severe hail, or damaging wind gusts that downed trees and power lines. About three inches of rain fell during the severe thunderstorm, with over five inches of rain for the event as a whole. | Madison Township |
| **07/23/1999** | 05:00 PM: 52 knot thunderstorm winds from Rome Center, LAT/LON: 41°57'N / 84°11'W, to 1 Mile South West of Tipton, LAT/LON: 42°00'N / 84°04'W, $ 16,000 property damage. Thunderstorms moved into Michigan, and a large number of them became severe. | Rome Township |
| **07/24/1999** | 10:56 PM: 52 knot thunderstorm winds from 5 Miles North of Adrian, LAT/LON: 41°58'N / 84°02'W, to Adrian, LAT/LON: 41°54'N / 84°02'W, $6,000 prope rty damage. Far southern Michigan avoided the line of severe thunderstorms on the afternoon of the 24th. However, additional thunderstorms developed near Jackson late in the evening. One of these evolved into a supercell as it moved southeast, producing a swath of wind damage from Manchester to the Ohio border, south of Adrian. A number of trees and power lines were downed.<br>11:10 PM: 52 knot thunderstorm winds at Devils Lake, LAT/LON: 42°00'N / 84°18'W, $8,000 prop-erty damage. 52 knot thunderstorm winds at Fairfield, LAT/LON: 41°49'N / 84°02'W, $7,000 prop-erty damage.<br>11:20 PM: 55 knot thunderstorm winds from 3 Miles South of Weston, LAT/LON: 41°43'N / 84°06'W, to 2 Miles South West of Ogden Center, LAT /LON: 41°45'N / 84°00'W, $16,000 property damage | Adrian Township<br><br>Woodstock Township<br><br>Fairfield Township |
| **07/31/1999** | 02:00 PM: 54 knot thunderstorm winds at Addison, LAT/LON: 41°59'N / 84°21'W, $8,000 property damage. Numerous severe thunderstorms developed, and damaging wind gusts were reported by | Addison |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | spotters. As is usually the case, the main result of these severe gusts was to down trees, tree limbs, and power lines. The number of severe thunderstorms from the 23rd through the 31st was unusually high. Insurance companies stated that there were more damage claims from these late July storms than for any other single weather event since 1983. Area power companies came under some "heat" during this time period. Severe weather, combined with high electric demand due to hot and humid weather, produced frequent and lengthy power outages in some locations. In particular, Detroit Edison received quite a bit of negative press, with over 400,000 customers losing power at some point during the last 10 days of July.<br>02:45 PM: 52 knot thunderstorm winds from 3 Miles South of Cement City, LAT/LON: 42°01'N / 84°20'W, to 2 Miles North of Onsted, 42°02'N / 84°1 1'W, $15,000 property damage.<br>02:45 PM: 52 knot thunderstorm winds at Clinton, LAT/LON: 42°04'N / 83°58'W, $6,000 property damage. | Woodstock Township<br><br>Clinton |
| **05/09/2000** | 06:30 PM: 52 knot thunderstorm winds at Hudson, LAT/LON: 41°51'N / 84°21'W, $16,000 property damage. 55 knot thunderstorm winds at Morenci, LAT/LON: 41°43'N / 84°13'W, $35,000 property damage. Some sporadic wind damage also occurred with these storms, downing trees and power lines. A barn was destroyed in Hudson. Several vehicles were damaged by fallen trees in Morenci and Adrian. Blissfield experienced some of the worst damage: a mobile home was flipped, injuring the two occupants (one of whom had broken ribs and a punctured lung); another man suffered electrical injuries when a falling power line struck him; an RV was overturned; store signs were destroyed; a garage collapsed; several homes were damaged by fallen trees, including one landmark home heavily damaged; at a local ball field, a scoreboard was destroyed, a dugout de-roofed, and metal bleachers tossed; and large steel grain bins were destroyed. A hangar at nearby Betz Airport collapsed, crushing an airplane. Two other hangars were damaged. In Sand Creek, a hay barn and a corral were blown down. Tecumseh was also hard hit: a storage structure at a lumber yard was destroyed; part of an inn was de-roofed; and numerous homes and vehicles were damaged by fallen trees. All told, over 200,000 people statewide lost power at some point, and thousands of insurance claims were filed over the coming weeks. Many schools were closed the next day due to damage or power outages; some schools and businesses did not reopen for several days.<br>06:46 PM: 70 knot thunderstorm winds from Adrian, LAT/LON: 41°54'N / 84°02'W, to Blissfield, LAT/LON: 41°50'N / 83°52'W, 3 injuries, $960,000 pr operty damage.<br>06:48 PM: 52 knot thunderstorm winds from Onsted, LAT/LON: 42°00'N / 84°11'W, to 2 Miles North of Tipton, LAT/LON: 42°03'N / 84°04'W, $20,000 prop erty damage. | Hudson, Adrian, Madison Township, Blissfield, Tecumseh<br><br>Adrian, Blissfield<br><br>Onsted, Franklin Township |
| **06/14/2000** | 02:35 PM: 52 knot thunderstorm winds at Britton, LAT/LON: 41°59'N / 83°50'W. Thunderstorms developed in the afternoon, and several of them became severe. Reports elsewhere consisted of a few trees, limbs, and/or power lines downed by wind.<br>02:53 PM: 50 knot thunderstorm winds 5 Miles North of Adrian, LAT/LON: 41°58'N / 84°02'W, $2,000 property damage. Severe thunderstorm warnings were issued. | Britton<br><br>Adrian Township |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **08/26/2000** | 08:47 PM: 52 knot thunderstorm winds from 3 Miles West of Morenci, LAT/LON: 41°43'N / 84°16'W, to Morenci, LAT/LON: 41°43'N / 84°13'W, $10,000 pro perty damage. Thunderstorms moved east in far southern Michigan. One of these became briefly severe, downing trees in the Morenci area. Severe thunderstorm warnings were issued. | Medina Township, Seneca Township, Morenci |
| **04/12/2001** | 04:00 AM: Wind, 1 injury, $1.0 million property damage. Strong winds were observed across much of the area. In a few spots, the winds reached high wind criteria. Most of the damage comprised of isolated trees, large limbs, and power lines being downed, as winds gusted around 50 mph at times. | Unspecified location |
| **06/15/2001** | 04:18 PM: 52 knot thunderstorm winds 3 Miles North West of Tecumseh, LAT/LON: 42°02'N / 83°58'W, $4,000 property damage. Several trees were blown down. Some thunderstorms managed to reach severe levels, producing a few spots of wind damage. | Tecumseh Township |
| **09/08/2001** | 03:57 PM: 50 knot thunderstorm winds 2 Miles North of Adrian, LAT/LON: 41°56'N / 84°02'W. Large tree limbs blew down on power lines and knocked the power lines down. Most of the thunderstorms that developed over a three day period produced severe wind gusts. The most common type of damage from these storms was trees being blown down or broken. Some of the storms also produced torrential rainfall. However, the rainfall did not last long enough to produce widespread or serious flooding. | Adrian Township |
| **10/16/2001** | 04:00 PM: 40 knot high winds. Although wind speeds did not reach high wind warning criteria, numerous small tree branches were blown down across metro Detroit and Ann Arbor. Some of these tree branches knocked down power lines in the aforementioned locations, causing thousands of residence and business locations to lose power. Maximum wind gusts were estimated around 45 MPH. | Unspecified location |
| **10/24/2001** | 06:30 PM: 55 knot thunderstorm winds 5 Miles South West of Onsted, LAT/LON: 41°57'N / 84°15'W. Several large trees were uprooted. Thunder storms extended from the Great Lakes all the way to the deep south. Strong winds just off the surface allowed some of the thunderstorms that developed across southern Michigan to become severe. Most of the severe storms caused damaging winds gusts associated with strait line microburst winds. However, increased low level directional shear via a surface warm front that extended across southeast Michigan allowed some of the thunderstorms to develop rotation, a few of which produced tornadoes (outside of Lenawee County). This is considered an unusual event since tornadoes in late October in Southeast Michigan are extremely rare. Following the passage of the cold front early on the morning of the 25th, winds gusting as high as 45 MPH affected the region and dropped temperatures 20 to 30 degrees. | Rollin Township |
| **02/01/2002** | 09:00 AM: 40 knot high winds, 1 injury, $30,000 property damage. Maximum wind gusts were around 45 miles an hour. The winds only exacerbated the widespread power outages due to the heavy snow and freezing rain that had occurred on January 30-31. Ice Storm Warnings were issued for Lenawee County, with ice accumulation up to one quarter inch. | Unspecified location |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **03/09/2002** | 03:00 PM: 61 knot high winds, 2 injuries, $780,000 property damage. During the late afternoon hours of the 9th, a line of showers developed. Very strong winds and brief heavy rain were associated with these showers. Behind the line of showers were powerful winds, which continued into the early morning hours of the 10th. Wind gusts measured between 60 and 70 MPH. Winds as high as 50 to 60 MPH continued into the night. Hundreds of trees, power lines and utility poles were blown down across southeast Michigan. Falling trees caused damage to several homes throughout the region. High winds also tore roofing material and siding off of many homes and businesses. A few cars were also struck by falling trees and branches. An estimated 180,000 homes and businesses across southeast Michigan lost power due many powers lines being blown down. In Lenawee, at least two barns on the South County Line Highway were blown down. High winds also blew down part of the frame of a new professional building under construction on the west side of Blissfield. An Adrian woman escaped injury as she was driving westbound on US 223 near Humphrey Highway in Palmyra Township when a tree fell onto the road and struck her car. High wind warnings were issued. | Blissfield, southern Lenawee County, Palmyra Township |
| **07/22/2002** | 10:00 AM: 50 knot thunderstorm winds at Adrian, LAT/LON: 41°54'N / 84°02'W. The city of Adrian parks and recreation reported 6 to 12 inch diameter tree limbs blown down in thunderstorm winds.<br>12:15 PM: 52 knot thunderstorm winds from 2 Miles East of Fairfield, LAT/LON: 41°49'N / 84°00'W, to 2 Miles East South East of Fairfield, LAT/LON: 41°49'N / 84°00'W. Law enforcement reported numerous large trees down. | Adrian<br><br>Palmyra Township |
| **8/4/2002** | 04:05 PM: 56 knot thunderstorm winds 1 Mile South East of Clinton, LAT/LON: 42°03'N / 83°57'W. The storms developed along and south of Interstate 94. Some produced damaging winds. They also produced torrential rainfall and frequent lightning. Thousands of residents from I-94 south to the state line were left without power. Thunderstorm warnings were issued for Lenawee County.<br>04:10 PM: 52 knot thunderstorm winds at Tecumseh, LAT/LON: 42°00'N / 83°56'W. Law enforcement reported that thunderstorm winds blew several 6 inch diameter tree limbs and several power lines down.<br>04:30 PM: 52 knot thunderstorm winds at Tecumseh, LAT/LON: 42°00'N / 83°56'W. A ham radio operator reported that thunderstorm winds blew an 18 inch diameter tree down.<br>04:35 PM: 55 knot thunderstorm winds 1 Mile South East of Rollin, LAT/LON: 41°54'N / 84°18'W, $50,000 property damage. The newspaper reported that thunderstorm winds blew over several large trees near Posey Lake. One of the trees fell onto a sport utility vehicle and crushed it. Another tree fell onto a garage and damaged the siding and another one fell onto the roof of a home. | Clinton Township<br><br>Tecumseh<br><br>Tecumseh<br><br>Rollin Township |
| **08/12/2002** | 03:55 PM: 60 knot thunderstorm winds at Adrian, LAT/LON: 41°54'N / 84°02'W.<br>04:02 PM: 55 knot thunderstorm winds at Adrian, LAT/LON: 41°54'N / 84°02'W. Trained spotters and law enforcement reported that a thunderstorm produced severe hail and damaging winds, blowing down several trees and power lines. | Adrian<br>Adrian |
| **09/19/2002** | 05:15 PM: 50 knot thunderstorm winds from 3 Miles South of Adrian, LAT/LON: 41°51'N / 84°02'W, | Madison Township |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | to 3 Miles South West of Adrian, LAT/LON: 41°51'N / 84°02'W. Spotters reported several large tree limbs blown down in thunderstorm winds. Some of the day's thunderstorms had been severe, with damaging wind gusts. | |
| **03/28/2003** | 05:30 PM: 50 knot thunderstorm winds from 1 Mile East of Addison, LAT/LON: 41°59'N / 84°20'W, to 1 Mile East South East of Addison, LAT/LON: 41°5 9'N / 84°20'W. Spotters reported that a very large tree was blown over in thunderstorm winds. Strong southwest winds, gusting as high as 40 MPH, developed with thunderstorms late in the afternoon over southwest Lower Michigan. These storms then moved across Eastern Michigan during the evening hours. Some of these storms produced wind gusts of 50 to 60 MPH.<br>05:30 PM: 50 knot thunderstorm winds from 2 Miles South of Hudson, LAT/LON: 41°49'N / 84°21'W, to 2 Miles South West of Hudson, LAT/LON: 41°49'N / 84°21'W. It was reported by spotters that a couple 4 inch diameter trees were blown down in thunderstorm winds. | Addison<br><br>Hudson Township |
| **07/04/2003** | 11:37 AM: 50 knot thunderstorm winds at Adrian, LAT/LON: 41°54'N / 84°02'W. Law enforcement reported trees blown down. Developing during the overnight hours of July 3rd, a thunderstorm complex moved through Lower Michigan during the late morning hours of the 4th. Severe wind reports occurred from I-69 and points south. The entire event lasted around two hours, leaving 170,000 customers in southeast Michigan without power. | Adrian |
| **07/07/2003** | 12:30 PM: 50 knot thunderstorm winds at Morenci, LAT/LON: 41°43'N / 84°13'W. Local law enforcement reported a wire blown down. | Morenci |
| **07/08/2003** | 02:42 AM: 54 knot thunderstorm winds 2 Miles North East of Springville, LAT/LON: 42°03'N / 84°08'W. A trained spotter estimated winds of 60 to 65 mph on Sand Lake. | Cambridge Township |
| **08/01/2003** | 04:40 PM: 56 knot thunderstorm winds from 3 Miles West of Rome Center, LAT/LON: 41°57'N / 84°15'W, to 3 Miles West North West of Rome Center, LAT/LON: 41°57'N / 84°15'W. Local law enforcement reported power lines down. Numerous slow moving thunderstorms developed during the afternoon, producing hail and wind damage.<br>04:43 PM: 56 knot thunderstorm winds at Hudson, LAT/LON: 41°51'N / 84°21'W. Spotters reported several large tree limbs down.<br>05:08 PM: 58 knot thunderstorm winds at Adrian, LAT/LON: 41°54'N / 84°02'W. Spotters reported several trees and power lines blown down. | Rollin Township, Rome Township<br><br>Hudson<br><br>Adrian |
| **08/25/2003** | 10:50 PM: 56 knot thunderstorm winds at Addison, LAT/LON: 41°59'N / 84°21'W. Local law enforcement reported numerous trees down.<br>10:50 PM: 60 knot thunderstorm winds at Devils Lake, LAT/LON: 42°00'N / 84°18'W. Large tree limbs were blown down.<br>10:50 PM: 56 knot thunderstorm winds at Manitou Beach, LAT/LON: 41°59'N / 84°18'W. Local law enforcement reported numerous trees down. | Addison<br><br>Woodstock Township<br><br>Rollin Township |
| **09/24/2003** | 06:35 PM: 54 knot thunderstorm winds from 4 Miles East of Addison, LAT/LON: 41°59'N / 84°16'W, | Rollin Township |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | to 4 Miles East South East of Addison, LAT/LON: 41°59'N / 84°16'W. A trained weather spotter reported 16 inch diameter tree limbs down.<br>06:35 PM: 52 knot thunderstorm winds 3 Miles North West of Onsted, LAT/LON: 42°02'N / 84°13'W. A trained weather spotter estimated 60 mph thunderstorm wind gusts.<br>06:55 PM: 56 knot thunderstorm winds at Addison, LAT/LON: 41°59'N / 84°21'W. Spotters reported trees blown down.<br>06:55 PM: 56 knot thunderstorm winds at Onsted, LAT/LON: 42°00'N / 84°11'W. A trained weather spotter reported trees blown down.<br>07:55 PM A trained weather spotter reported trees down in Addison and Onsted. | Cambridge Township<br>Addison<br>Onsted<br>Addison, Onsted |
| **11/12/2003** | 05:00 PM: 76 knot high winds, $21.0 million property damage. Wind gusts between 50 and 60 MPH occurred across all of Southeast Michigan. In addition, there were even a few wind gusts reported between 60 and 88 mph. An estimated 250,000 customers lost power in southeast Michigan, as widespread trees and power lines were blown down. High wind warnings were issued for Lenawee, along with severe thunderstorm warnings. | Unspecified location |
| **03/05/2004** | 11:18 AM: High wind warnings were issued for Lenawee. Winds of 40 mph with gusts to 60 mph were expected. | Lenawee County |
| **05/21/2004** | 12:45 PM: 52 knot thunderstorm winds at Cambridge Junction, LAT/LON: 42°03'N / 84°13'W.<br>01:00 PM: 55 knot thunderstorm winds occurred at Adrian, LAT/LON: 41°54'N / 84°02'W, 1 injury. Trees and wires were blown down. A large tree landed on a house. A tree also fell on a woman. She was treated for minor injuries at Bixby Medical Center. Severe thunderstorms rolled through during the late-night hours of Thursday, May 20th into the early morning hours of Friday, May 21st, and delivered strong winds, hail and heavy rain. Much of the rainfall fell in saturated areas that had experienced well-above average precipitation for the month of May.<br>12:50 PM: 61 knot thunderstorm winds from 2 Miles East of Addison, LAT/LON: 41°59'N / 84°19'W, to 2 Miles East South East of Addison, LAT/LON: 41°59'N / 84°19'W.<br>12:59 PM: 52 knot thunderstorm winds 1 Mile North West of Tecumseh, LAT/LON: 42°01'N / 83°57'W. | Cambridge Township<br>Adrian<br>Addison<br>Tecumseh |
| **06/14/2004** | 02:25 PM: 52 knot thunderstorm winds at Deerfield, LAT/LON: 41°53'N / 83°47'W. A trained weather spotter reported 6 inch diameter tree limbs down. A storm produced both hail and wind damage during the afternoon hours of the 14th across southeast Michigan. | Deerfield |
| **10/30/2004** | 11:30 AM: 54 knot high winds, $3.5 million property damage. Wind gusts of 60 mph led to widespread power outages, downed trees and wires, along with some minor property damage throughout all of southeast Michigan. Utility companies reported power outages to 283,000 customers across lower Michigan, with at least half that total coming from southeast Michigan, where damage was estimated to be 3.5 million dollars. Unofficial wind gust reports from spotters indicated winds approaching 70 mph. There were no reported injuries with this event. | Unspecified location |
| **06/05/2005** | 06:30 PM: 60 knot thunderstorm winds at Addison, LAT/LON: 41°59'N / 84°21'W. A trained spotter | Addison |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | reported a tree blown down. High winds took down tree limbs and knocked out power to about 107,000 DTE Energy customers throughout Southeast Michigan. | |
| **06/30/2005** | 06:38 PM: 54 knot thunderstorm winds at Hudson, LAT/LON: 41°51'N / 84°21'W. Trees were reported blown down.<br>07:00 PM: 54 knot thunderstorm winds 3 Miles South of Hudson, LAT/LON: 41°48'N / 84°21'W, to 3 Miles South West of Hudson, LAT/LON: 41°48'N / 84°2 1'W. Trees were reported blown down.<br>10:20 AM: 54 knot thunderstorm winds at Sand Creek, LAT/LON: 41°50'N / 84°06'W. Local law enforcement reported trees blown down. | Hudson<br>Hudson Township<br><br>Madison Township |
| **07/26/2005** | 01:54 PM: 54 knot thunderstorm winds at Clayton, LAT/LON: 41°52'N / 84°14'W. Three trees were reported blown down. | Clayton |
| **11/15/2005** | 05:49 PM: Lightning at Tecumseh. Lightning struck the northwest corner of a home located at 509 Maple Drive in Tecumseh. The strike damaged the exterior and drywall of a bedroom. This was the third powerful storm to hit the area in a week and a half, leading to yet another round of strong winds. Intense cloud to ground lightning was observed. Southwest winds were sustained at 25 to 35 mph, gusting to around 50 mph. Heavy rains also occurred across the region, and the combination of winds and rain led to property damage estimated at 7.2 million dollars statewide.<br>09:00 PM: 48 knot strong winds, $7.2 million property damage | Tecumseh |
| **03/13/2006** | 02:00 PM: 52 knot high winds, 1 death and 2 injuries statewide. Sustained damaging winds (from 30 to 40 MPH, with frequent gusts over 50 MPH) began during the late afternoon of the 13th and continued until 0300 EST on the 14th. The combination of the strong winds and water-saturated ground led to large trees being uprooted across the entire area. Many homes and other structures received wind damage to the roofs and windows. The highest wind gusts recorded at an official weather stations in Lenawee was 48 MPH at Adrian. Note: Estimates from spotters, in combination with the amount of damage, suggested wind speeds approaching 60 MPH at times. | Adrian |
| **03/31/2006** | 07:02 PM: 55 knot thunderstorm winds 4 Miles South East of Adrian, LAT/LON: 41°52'N / 83°59'W. The fire department reported 20 trees down. An early season severe weather episode broke out in the form of mini-supercells. Several reports of funnel clouds, none of which touched down, were received when the supercells peaked. Most reports were hail up to 1 inch, and reports of hail that accumulated in spots.<br>07:12 PM: 50 knot thunderstorm winds from 2 Miles East of Adrian, LAT/LON: 41°54'N / 84°00'W, 2 Miles East South East of Adrian, LAT/LON: 41°54'N / 84°00'W. Trees were damaged and power poles down.<br>07:15 PM: 50 knot thunderstorm winds from 1 Mile East of Seneca, LAT/LON: 41°47'N / 84°10'W, to 1 Mile East South East of Seneca, LAT/LON: 41°47 'N / 84°10'W. Dispatch reported power poles and wires down.<br>07:22 PM: 50 knot thunderstorm winds from 2 Miles South of Jasper, LAT/LON: 41°45'N / 84°02'W, | Palmyra Township<br><br>Palmyra Township<br><br>Seneca Township<br><br>Fairfield Township |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | to 2 Miles South West of Jasper, LAT/LON: 41°45'N / 84°02'W. Power poles and wires down. | |
| **05/25/2006** | 05:20 PM: 50 knot thunderstorm winds at Adrian, LAT/LON: 41°54'N / 84°02'W, $3,000 property damage. Thunderstorm winds downed several wires and large tree limbs in Adrian. Several Telephone poles were leaning halfway across East Maumee Street in Adrian. Strong storms developed across the rest of the area with severe weather occurring in 11 of the 17 Counties in southeast lower Michigan. The nature of the severe storms was a mixture of large hail and strong winds. Numerous trees were reported down with most of the wind estimates at around 60 MPH. Numerous quarter sized hail reports were received with at least one report of hail the size of ping pong balls. | Adrian |
| **06/19/2006** | 12:25 PM: 50 knot thunderstorm winds 1 Mile North of Adrian, LAT/LON: 41°55'N / 84°02'W. A local newspaper included a picture of a large tree branch down across North Scott Street in Adrian. | Adrian Township |
| **06/21/2006** | 04:54 PM: 55 knot thunderstorm winds at Clayton, LAT/LON: 41°52'N / 84°14'W, $25,000 property damage. A local newspaper included a picture of a collapsed section of the rear wall of a 125 year old two-story brick building located at Clayton Crossing. The damage to the building was roughly estimated at $40K. The fire chief said the building was a safety hazard and would need to be demolished.<br>05:23 PM: 54 knot thunderstorm winds at Britton, LAT/LON: 41°59'N / 83°50'W. Trained spotter reported a tree 4 feet in diameter blown down.<br>05:55 PM: 51 knot thunderstorm winds 1 Mile North of Adrian, LAT/LON: 41°55'N / 84°02'W, $2,000 property damage. Law enforcement reported a power pole blown down.<br>05:58 PM: 50 knot thunderstorm winds 2 Miles North of Adrian, LAT/LON: 41°56'N / 84°02'W. Law enforcement reported tree limbs blown down.<br>06:00 PM: 55 knot thunderstorm winds at Adrian, LAT/LON: 41°54'N / 84°02'W, $5,000 property damage. A local newspaper included a picture of a giant pine tree at least 5 feet in diameter blown down in West Park in Adrian.<br>06:00 PM: 55 knot thunderstorm winds at Adrian, LAT/LON: 41°54'N / 84°02'W, $30,000 property damage. A local newspaper reported that a roof was blown off a house in Adrian. Property damage was roughly estimated at $30K.<br>06:03 PM: 52 knot thunderstorm winds 4 Miles North East of Onsted, LAT/LON: 42°02'N / 84°08'W, $5,000 property damage. Law enforcement reported a tree blown down on a vacant trailer.<br>06:04 PM: 52 knot thunderstorm winds at Tecumseh, LAT/LON: 42°00'N / 83°56'W, $3,000 property damage. Law enforcement reported power lines and trees down.<br>06:06 PM: 52 knot thunderstorm winds 2 Miles North of Adrian, LAT/LON: 41°56'N / 84°02'W. Law enforcement reported a tree blown down onto the highway.<br>06:11 PM: 52 knot thunderstorm winds 2 Miles North North East of Adrian, LAT/LON: 41°56'N / 84°01'W. Law enforcement reported a tree blown down .<br>06:16 PM: 52 knot thunderstorm winds at Palmyra, LAT/LON: 41°52'N / 83°56'W. NWS storm survey reported trees down. | Clayton<br>Britton<br>Adrian Township<br>Adrian Township<br>Adrian<br>Adrian<br>Cambridge Township<br>Tecumseh<br>Adrian Township<br>Adrian Township<br>Palmyra Township |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **06/28/2006** | 03:01 PM: 52 knot thunderstorm winds 5 Miles South East of Tecumseh, LAT/LON: 41°57'N / 83°52'W, $1,000 property damage. Central Dispatcher reported a tree blown down and covering both lanes of a highway. | Ridgeway Township |
| **07/17/2006** | 10:30 PM: 53 knot thunderstorm winds at Tecumseh, LAT/LON: 42°00'N / 83°56'W. Central dispatch reported several trees blown down. This July 17th severe weather event would eventually go down as the largest and most destructive of the 2006 severe weather season. Intense thunderstorms affected many counties, primarily to the north of Lenawee. There were several reports of trees blown down in areas south of M-59, although the damage was minimal when compared to the destruction across the northern parts of the area. Very few reports of hail were received.<br>10:35 PM: 53 knot thunderstorm winds at Rollin, LAT/LON: 41°55'N / 84°19'W. | Tecumseh<br><br>Rollin Township |
| **05/15/2007** | 14:20 PM: 56 knot thunderstorm winds at Addison, LAT/LON: 41°58'N / 84°21'W. A trained spotter reported trees down. The first major severe weather event of the season resulted in widespread reports of wind damage and large hail.<br>14:40 PM: 56 knot thunderstorm winds 3 Miles North East of Tipton, LAT/LON: 42°03'N / 84°01'W. An amateur radio operator reported trees down.<br>14:50 PM: 55 knot thunderstorm winds 4 Miles North of Adrian, LAT/LON: 41°57'N / 84°01'W, $8,000 property damage. A trained spotter reported large tree branches down and shingles blown from a roof.<br>14:55 PM: 52 knot thunderstorm winds 4 Miles East South East of Onsted, LAT/LON: 41°58'N / 84°06'W, $1,000 property damage. A trained spotter reported power lines down.<br>15:05 PM: 52 knot thunderstorm winds 3 Miles North East of Ridgeway, LAT/LON: 42°01'N / 83°49'W. A trained spotter reported power lines down.<br>15:10 PM: 56 knot thunderstorm winds at Palmyra, LAT/LON: 41°52'N / 83°55'W. Law enforcement reported trees down.<br>15:10 PM: 52 knot thunderstorm winds 4 Miles North East of Tecumseh, LAT/LON: 42°02'N / 83°52'W, $1,000 property damage. A trained spotter reported power lines down. | Addison<br><br>Franklin Township<br><br>Adrian Township<br><br>Adrian Township<br><br>Macon Township<br><br>Palmyra Township<br><br>Macon Township |
| **06/02/2007** | 15:35 PM: 52 knot thunderstorm winds 3 Miles South East of Clayton, LAT/LON: 41°50'N / 84°11'W. Law enforcement reported a large tree down , when an area of storms formed, leading to several reports of wind damage. | Dover Township |
| **06/21/2007** | 12:38 PM: 50 knot thunderstorm winds 1 Mile East of Southland, LAT/LON: 41°43'N / 83°45'W. A trained spotter reported large tree branches down on the Lenawee/Monroe County line. A storm produced severe wind gusts along the Michigan/Ohio border, resulting in tree damage. Severe thunderstorm warnings were issued for Lenawee. | East Lenawee County line |
| **08/07/2007** | 17:47 PM: 56 knot thunderstorm winds 3 Miles West of Onsted, LAT/LON: 42°00'N / 84°14'W. A trained spotter reported trees down, from a couple of severe thunderstorms over Washtenaw and Lenawee Counties. This was an all wind event with the most tree damage occurring in the Chelsea | Cambridge Township |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | area. Severe Thunderstorm Warnings were issued for Lenawee. | |
| **08/24/2007** | 17:05 PM: 56 knot thunderstorm winds at Sand Creek, LAT/LON: 41°49'N / 84°06'W. A trained spotter reported many trees down. There were widespread reports of severe thunderstorm wind gusts producing downed trees, limbs, and power lines.<br>17:13 PM: 56 knot thunderstorm winds 3 Miles South of Adrian, LAT/LON: 41°51'N / 84°01'W. A trained spotter reported trees down.<br>17:15 PM: 56 knot thunderstorm winds at Palmyra, LAT/LON: 41°52'N / 83°55'W, $3,000 property damage. A trained spotter reported numerous trees and power lines down. | Madison Township<br>Madison Township<br>Palmyra Township |
| **12/23/2007** | High wind warnings were issued for Lenawee. | Lenawee County |
| **06/06/2008** | 20:34 PM: 56 knot thunderstorm winds 1 Mile South West of Palmyra, LAT/LON: 41°51'N / 83°56'W, $5,000 property damage. Numerous trees and wires reported down. Numerous severe thunderstorms produced damaging winds.<br>20:37 PM: 52 knot thunderstorm winds at Blissfield, LAT/LON: 41°49'N / 83°52'W. Numerous large tree limbs reported down. | Palmyra Township<br>Blissfield |
| **06/08/2008** | 16:15 PM: 61 knot thunderstorm winds 1 Mile North of Cambridge Junction, LAT/LON: 42°03'N / 84°13'W, $25,000 property damage. Trees and wires w ere reported down. A derecho brought wide-spread wind damage and localized large hail to the region. This was the most widespread damage to occur over southeast Michigan in over a decade, as over 300,000 residents lost power. State-wide, over 10,000 residents were without power for a week or more, indicative of the extent of dam-age, which was estimated to be 100 million dollars.<br>16:30 PM: 56 knot thunderstorm winds at Morenci, LAT/LON: 41°43'N / 84°13'W, $60,000 property damage. Local media reported trees and wires. A garage and car were also damaged. | Cambridge Township<br>Morenci |
| **06/09/2008** | 18:37 PM: 53 knot thunderstorm winds 1 Mile West of Adrian, LAT/LON: 41°54'N / 84°02'W. A tree and power line were reported down over a road at 159 North Makinzee. A few severe thunder-storms had occurred during the early evening hours of June 9th.<br>18:40 PM: 52 knot thunderstorm winds 2 Miles West South West of Deerfield, LAT/LON: 41°52'N / 83°48'W. Two power line polls broke off, along with 6 inch diameter tree limbs reported down. | Adrian<br>Blissfield Township |
| **06/10/2008** | 02:25 AM: 54 knot thunderstorm winds 1 Mile North of Deerfield, LAT/LON: 41°53'N / 83°46'W. A large oak tree fell onto a house. An isolated severe thunderstorm had popped up over Lenawee and Monroe counties during the early morning hours of June 10th. | Deerfield Township |
| **06/15/2008** | 17:30 PM: 56 knot thunderstorm winds 4 Miles South West of Medina, LAT/LON: 41°46'N / 84°19'W, $5,000 property damage. Trees were reporte d down.<br>17:35 PM: 56 knot thunderstorm winds 4 Miles South West of Medina, LAT/LON: 41°46'N / 84°19'W, $25,000 property damage. A roof was report ed blown off a house on Lime Creek Road.<br>17:39 PM: 54 knot thunderstorm winds at Morenci, LAT/LON: 41°43'N / 84°13'W, $30,000 property damage. Numerous trees and power lines reported down. | Medina Township<br>Medina Township<br>Morenci |
| **06/21/2008** | 13:31 PM: 54 knot thunderstorm winds 1 Mile West of Adrian, LAT/LON: 41°54'N / 84°02'W, $5,000 | Adrian |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | property damage. Law enforcement reported trees down. | |
| **07/02/2008** | 17:55 PM: 57 knot thunderstorm winds 1 Mile North West of Onsted, LAT/LON: 42°00'N / 84°11'W. Scattered severe thunderstorms had occurred during the early evening hours.<br>17:58 PM: 52 knot thunderstorm winds 1 Mile North West of Onsted, LAT/LON: 42°00'N / 84°11'W, $20,000 property damage. Trees were reported down.<br>17:59 PM: 52 knot thunderstorm winds 3 Miles West of Tipton, LAT/LON: 42°01'N / 84°07'W, $5,000 property damage. Trees were reported down.<br>18:03 PM: 52 knot thunderstorm winds 3 Miles East South East of Tipton, LAT/LON: 42°00'N / 84°01'W. Large tree limbs were reported down.<br>18:10 PM: 52 knot thunderstorm winds 1 Mile East of Ridgeway, LAT/LON: 42°00'N / 83°51'W, $15,000 property damage. Trees were reported down.<br>18:12 PM: 52 knot thunderstorm winds 2 Miles North North West of Adrian Lenawee Airport, LAT/LON: 41°54'N / 84°04'W, $30,000 property damage . Wires and power poles reported down.<br>18:16 PM: 52 knot thunderstorm winds 2 Miles East North East of Birdsall, LAT/LON: 41°57'N / 83°57'W, $5,000 property damage. Trees were reporte d down.<br>18:18 PM: 52 knot thunderstorm winds 1 Mile West of Adrian, LAT/LON: 41°54'N / 84°02'W, $5,000 property damage. A tree fell onto a house.<br>18:26 PM: 54 knot thunderstorm winds 1 Mile North of Addison, LAT/LON: 41°59'N / 84°21'W, $25,000 property damage. Many large trees were reported down, shutting down US-127.<br>19:20 PM: 52 knot thunderstorm winds 1 Mile East of Birdsall, LAT/LON: 41°57'N / 83°58'W, $10,000 property damage. Trees were reported down. | Cambridge Township<br>Onsted<br>Franklin Township<br>Franklin Township<br>Macon Township<br>Adrian<br>Raisin Township<br>Adrian Township<br>Addison<br>Raisin Township |
| **07/08/2008** | 13:10 PM: 50 knot thunderstorm winds 1 Mile East of Lenawee Junction, LAT/LON: 41°52'N / 83°55'W. Two large tree limbs reported down, from a few severe thunderstorms that had developed during the afternoon hours near the Ohio border.<br>13:26 PM: 52 knot thunderstorm winds 2 Miles South South East of Riga, LAT/LON: 41°47'N / 83°49'W, $5,000 property damage. Two utility poles were reported down. | Palmyra Township<br>Riga Township |
| **12/28/2008** | 04:00 AM: 56 knot high winds. Winds gusts of 50 to 65 mph led to widespread tree branches and trees downed, along with extensive power outages, as more than 400,000 Michigan homes and businesses lost power. The majority of those customers who lost power were located in the Detroit Metro Area. | Unspecified location |
| **06/08/2009** | 20:37 PM: 52 knot thunderstorm winds 1 Mile West of Adrian, LAT/LON: 41°54'N / 84°02'W. A trained spotter estimated a 60 mph thunderstorm wind gust. Isolated severe storms had occurred during the late afternoon hours.<br>20:39 PM: 52 knot thunderstorm winds 2 Miles South East of Adrian, LAT/LON: 41°52'N / 84°00'W, $3,000 property damage. Local media reported tree limbs blown down, along with a barn. | Adrian<br>Palmyra Township |
| **12/09/2009** | 12:00 PM: 52 knot high winds, $250,000 property damage. A cold front passed through southeast | Unspecified location |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | Michigan. Wind gusts to 60 mph occurred south of M-59, which lead to downed tree branches along with a few trees and power lines. About 40,000 customers lost power, most concentrated in Wayne County. | |
| **05/07/2010** | 17:50 PM: 52 knot thunderstorm winds 1 Mile West of Adrian, LAT/LON: 41°54'N / 84°02'W. Two large oak trees reported down on Broad and Chestnut streets. A few strong to severe thunderstorms impacted locations along and south of M-59.<br>17:52 PM: 52 knot high winds 1 Mile West of Adrian, LAT/LON: 41°54'N / 84°02'W., $25,000 property damage, a tree fell onto a pickup truck on South Main street. A large branch also blocked one southbound lane of Main Street.<br>17:55 PM: 52 knot thunderstorm winds 2 Miles East of Birdsall, LAT/LON: 41°57'N / 83°58'W., $50,000 property damage, numerous trees, large branches, and power lines reported down. | Adrian<br>Birdsall |
| **05/31/2010** | 11:17 AM: 52 knot thunderstorm winds 1 Mile North West of Onsted, LAT/LON: 42°00'N / 84°11'W. Five trees were reported blown down across Cambridge Township. A few thunderstorms developed ahead of a cold front. Thunderstorms also produced heavy rain, which lead to flash flooding.<br>11:20 AM: 52 knot thunderstorm winds 2 Miles East South East of Oak Shade Park, LAT/LON: 42°03'N / 84°07'W. A trained spotter estimated a 60 mph thunderstorm wind gust. | Onsted<br>Cambridge Township |
| **06/18/2010** | 20:08 PM: 51 knot thunderstorm winds 1 Mile West of Adrian, LAT/LON: 41°54'N / 84°02'W. A long lived line of severe thunderstorms tracked east, impacting areas generally along and south of M-59. | Adrian |
| **06/22/2010** | 01:56 AM: 52 knot thunderstorm winds 1 Mile West of Adrian, LAT/LON: 41°54'N / 84°02'W. Four inch diameter trees were reported down. An isolated marginally severe thunderstorm impacted Adrian. | Adrian |
| **06/23/2010** | 20:40 PM: 50 knot thunderstorm winds, LAT/LON: 42°04'N / 83°58'W. Large tree limbs were blown down. A few tornadic producing severe thunderstorms tracked along and south of the I-94 corridor during the early evening hours.<br>21:00 PM: 52 knot thunderstorm winds 2 Miles East of Adrian, LAT/LON: 42°04'N / 83°49'W. A large tree and several additional large tree limbs were reported blown down. | Clinton<br>Macon |
| **07/18/2010** | 16:25 PM: 54 knot thunderstorm winds 1 mile north of Addison, LAT/LON: 41°59'N / 84°21'W., $20,000 property damage. Trees and power lines were reported down. A warm front lifted north of southeast Michigan and a few thunderstorms developed.<br>16:30 PM: 53 knot thunderstorm winds 4 miles North West of Adrian, LAT/LON: 41°56'N / 84°04'W. Trees were uprooted.<br>16:50 PM: 54 knot thunderstorm winds 1 mile North West Tecumseh, LAT/LON: 42°00'N / 83°56'W., $20,000 property damage. Multiple trees and power lines down. | Addison<br>Adrian<br>Tecumseh |
| **07/23/2010** | 17:38 PM: 56 knot thunderstorm winds 1 Mile Southwest of Tecumseh, LAT/LON: 41°59'N / 83°56'W., $20,000 property damage. Trees and power lines reported down. A tropical air mass and a frontal boundary lifted into southeast Michigan, which produced severe storms south of Eight Mile Road. | Tecumseh<br>Irish Hills |

| Table 24-1, Lenawee County Severe/Strong/High Wind Events, 1962-2011 (Severe Wind Events blocked in Green) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | 18:50 PM: 56 knot thunderstorm winds 1 Mile South East of Irish Hills, LAT/LON: 42°02'N / 84°08'W., $15,000 property damage. Trees and power lines reported down. | |
| **07/28/2010** | 14:30 PM: 52 knot thunderstorm winds 1 Mile West of Adrian, LAT/LON: 41°54'N / 84°02'W. A trained spotter estimated a 60 mph thunderstorm wind gust. Scattered severe thunderstorms tracked along the south of the M-59 corridor. | Adrian |

Sources: Michigan Hazard Analysis, the National Climatic Data Center (NCDC) storm events database, reports from the Law Enforcement Information Network (LEIN), and local input from plan participants.

## 25. Snowstorms

Blizzards are the most dramatic and perilous of snowstorms, characterized by low temperatures and strong winds (35+ miles per hour) bearing enormous amounts of snow. Most of the snow accompanying a blizzard is in the form of fine, powdery particles that are wind-blown in such great quantities that visibility is reduced to a few feet. Blizzards have the potential to result in property damage and loss of life. The cost of clearing snow can be enormous loss and disruption of essential services in affected communities, not to mention the risk of health concerns.

Most of the severe winter weather events that occur in Michigan have their origin as Canadian and Arctic cold fronts that move across the state from the west or northwest. Michigan is susceptible to moderate snowfall and extreme cold, averaging 90-180 days per year below freezing in the Lower Peninsula. Two significant recent snowstorms of statewide significance are worth mentioning:

- **12/11-31/2000 Snowstorm affecting 39 counties in central and southern Lower Michigan.** A series of snowstorms caused a host of public health and safety concerns and problems across the region including Lenawee County. A Presidential Emergency Declaration was granted for 39 Michigan counties, but the declaration did not include Lenawee County.
- **1/2-3/1999 Snowstorm affecting 31 counties in Southern Lower Michigan.** A severe winter storm moved across the western and southern portions of Michigan including Lenawee County. Subsequent storms followed. Combined, these winter storms produced the worst winter conditions to hit Michigan since the statewide blizzard that occurred in January 1978. Various winter weather related traffic accidents during December and January can be indirectly related to this snowstorm. ***A presidential emergency declaration was granted for this storm.***
- **1/26-27/1978 State wide snow blizzard affecting all counties in Michigan.** On January 26-27, 1978 a severe snowstorm struck the Midwest, and Michigan was at the center of the storm. Dubbed a “white hurricane” by some meteorologists, the storm measured 2,000 miles by 800 miles and produced winds with the same strength of a small hurricane and tremendous amounts of snow. In Michigan, up to 34 inches of snow fell in some areas, and winds of 50-70 miles per hour piled the snow into huge drifts. At the height of the storm, it was estimated that over 50,000 miles of roadway were blocked, 104,000 vehicles were abandoned on the highways, 15,000 people were being cared for in mass care shelters, and over 390,000 homes were without electric power. In addition, 38 buildings suffered partial or total roof collapse. Two days after the storm, over 90% of the state's road system was still blocked with snow, 8,000 people were still being cared for in shelters, 70,000 vehicles were stranded, and 52,000 homes were still without electricity. ***A presidential emergency declaration was granted for this storm.***

**Lenawee County Perspective**

A total of 43 snowstorm and winter storm events were reported in Lenawee County from 1993 and 2009 as listed in Table 25-1. Therefore, an average of 2.5 snowstorms occurred in Lenawee County during this period. Snowstorm impacts upon Lenawee County included at least a $500,000 share of the $7.35 million in damages statewide from these events, transportation accidents, clearance costs, and power failure effects. Although shoveling heavy snow burdens the heart, no fatalities or injuries were recorded in Lenawee County.

Data regarding specific snowfall location are lacking in the table. The effects of large snow storms are usually widespread and county-wide.

| Table 25-1, Lenawee County Snow Storms, 1993-2011 (Presidential Emergency Declarations Indicated in Red) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **01/12/1993** | 1200: Heavy Snow. | Unspecified location |
| **04/15/1993** | 0700: Heavy Snow. | Unspecified location |
| **01/27/1994** | 0000: Heavy Snow/freezing Rain, $5.0 million property damage statewide. Snow developed over southwest Lower Michigan just after Midnight on the 27th. This snow area spread rapidly northeast. By 0700 EST on the 27th, the snow area had merged with a lake induced snow area over northeast Lower Michigan, resulting in snowfall over all of Lower Michigan by that time. By 0400 to 0500 EST on the 27th, over the southern third of Lower Michigan, the snow mixed with, then changed to, sleet and freezing rain. The area of freezing rain then raced northward across the rest of Lower Michigan. By late afternoon on the 27th, most of Lower Michigan had freezing rain or sleet. The freezing rain changed to rain over the southern third of Lower Michigan by mid afternoon. After 1900 EST on the 27th, freezing rain continued north of a South Haven to Flint line, while rain continued, heavy at times, south of that line. Overnight on the 27th and into the morning hours of the 28th, occasional rain continued over the southern half of Lower Michigan while occasional freezing rain continued over the north half of Lower Michigan. During the 28th, the area of freezing rain changed to snow across Lower Michigan. As for ice accumulations over Lower Michigan during the freezing rain, around a quarter inch accumulated over the south third of lower Michigan. This resulted in numer-ous outages. Detroit Edison reported 50,000 people affected by power outages. Consumers Power County reported 2,000 customers without power. Most of the power loss problems were over the southeastern part of Michigan even though this was not the area of heaviest ice accumulation or of the strongest winds. Most of the power loss occurred on Thursday, January 27th, during the ice accumulation phase of the storm. More than 150 schools canceled classes across the state. Across Michigan, there were numerous reports of cars skidding off the road and minor fender-bender type accidents. ALSO RECORDED AS ICE STORM/FREEZING RAIN | Unspecified location |

| Table 25-1, Lenawee County Snow Storms, 1993-2011 (Presidential Emergency Declarations Indicated in Red) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **02/07/1994** | 1800: Snow. Warm, moist, air overran a stationary front across the Tennessee Valley, resulted in snowfalls of four to seven inches across much of Southern Lower Michigan. The heaviest snow fell in a 50-mile wide arc that extended from the Holland area in the southwest, to just north of the Lansing area in central lower Michigan, to Flint in east-central lower Michigan, to the Dundee area in Southeast Lower Michigan. No major motor vehicle accidents were reported with this storm. | Unspecified location |
| **02/25/1994** | 1100: Heavy Snow. An intense snow burst caused five to eight inches of snow to fall across most of the southern third of lower Michigan. The heaviest snowfalls, seven to eight inches, fell over a 50-mile wide area across southern lower Michigan. On the north side of the area were the cities of Grand Rapids, Lansing and Flint. Detroit, Jackson and Kalamazoo were on the southern edge of the heaviest snowfall area. Snowfall rates of one to two inches an hour, for a period to two to three hours, were common. Northeast to east winds at 15 to 25 mph with frequent gusts to 35 mph combined with temperatures around 20F resulted in wind chill values of 10 to 20 degrees below zero. The combination of strong winds and heavy snow caused near blizzard conditions for a period of about six hours. Scores of people were stranded as the storm hit during the middle of the day. A drive that normally would take half an hour was taking from an hour and a half to three hours in the Detroit area. The main characteristic of this storm was the intensity of the snowfall. | Unspecified location |
| **12/06/1994** | 1800: Heavy snow fell across the southern half of lower Michigan from the evening on the 6th through the morning of the 7th. The snow began in southwest lower Michigan during the afternoon on the 6th, then quickly spread northeast to cover all of southern lower Michigan by early evening. Accumulations of 6 to 11 inches occurred in a band from near Holland and Muskegon in western lower Michigan, east through Grand Rapids, Battle Creek, Lansing, Flint, and the Detroit Metropolitan area. Snow amounts of 2 to 4 inches occurred over extreme southern lower Michigan, where some of the precipitation fell as freezing rain. Numerous traffic accidents were reported across the area, along with scattered power outages. | Unspecified location |
| **01/06/1995** | 0000: Heavy snow fell across a small portion of southeast lower Michigan on the 6th. The heaviest accumulation was reported at Saline, in Washtenaw County, where six inches fell. Most of lower Michigan received from one to three inches of snow during the storm. Numerous traffic accidents were reported. | Unspecified location |
| **01/20/1995** | 0000: Heavy snow fell across large areas of southern lower Michigan. Accumulations ranged from 6 to 12 inches across most of the southern half of lower Michigan during the period. Travel disruptions across southern lower Michigan were not as severe as what would normally be expected with such large snow amounts, since much of the snow fell during the weekend, and the snow fell over a several day period. Still, many serious traffic accidents were reported, along with scattered power outages. | Unspecified location |
| **02/25/1995** | 1500: Heavy snow fell in a band from near Muskegon southeast to near Detroit during the period from late afternoon on the 25th through the early morning hours of the 26th. Accumulations of three to six inches were common in that area. Numerous traffic accidents were reported during the eve- | Unspecified location |

| Table 25-1, Lenawee County Snow Storms, 1993-2011 (Presidential Emergency Declarations Indicated in Red) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | ning on the 25th, as temperatures fell quickly below freezing once the snow began, causing sudden icing on roadways. | |
| **03/19/1996** | 10:00 PM: Heavy Snow. The biggest snowstorm of the season for much of the area hit on the first day of spring. Rain changed to snow before midnight, then snow continued into the afternoon on the 20th. An accumulation of 8.4 inches were measured at Flint, with 6.9 inches Ann Arbor and 5.8 inches at Detroit. Strong winds created drifts as high as 3 feet in some areas. The combination of strong winds and heavy wet snow resulted in power outages to 173,000 homes and businesses in southeast Michigan. | Unspecified location |
| **12/16/1996** | 12:00 PM: Heavy Snow. Snow spread northeast from Indiana across southeast lower Michigan on the 16th, and lasted until around noon on the 17th. A narrow band of 6 inch accumulations occurred from western Lenawee county northeast to northwest Oakland county—2 to 5 inch amounts were common. | Western Lenawee County |
| **12/10/1997** | 07:00 AM: Heavy snow. A broad area of 3 to 8 inches of snow was left across Southeast Lower Michigan. The heaviest snow fell from Livingston county to St. Clair county, south to the Ohio border. Some of the heaviest snow accumulations included 7.0 inches at Dover in Lenawee county. Numerous accidents were reported as a result of the snow. | Lenawee County, Dover Township |
| **01/02/1999** | 09:00 AM: Heavy snow, $50,000 property damage.<br>01:00 PM: Blizzard. A combination of snow, blowing snow, and wind produced blizzard conditions in the early afternoon. The winds subsided slightly as the snow intensified, but near-blizzard conditions were the rule into the overnight hours. The strong wind throughout the storm made it very difficult to measure snowfall accurately. Snowfall amounts were 16" in Tecumseh; 14" in Clinton; 12" in Hudson and Morenci; and 10" in Adrian. Drifts up to seven feet high were reported. President Clinton would eventually declare Lenawee, Macomb, Oakland, Washtenaw, and Wayne Counties as federal disaster areas. All told, this was one of the worst snowstorms of the past 25 years, and the effects were far-reaching. The storm was well advertised, and a run on grocery stores occurred early in the day. Many stores ran out of staples like bread and milk. Most businesses closed their doors early on the 2nd, to allow employees to get home while they still could. After the snow, the run was on snow removal equipment, with snowblowers, shovels, and salt all very hard to find. Most schools closed the Monday and Tuesday after the storm (January 2nd was a Saturday), and some schools stayed closed for Wednesday as well**. Presidential Emergency Declaration #3137.)** | Lenawee County<br><br>Tecumseh, Clinton, Hudson, Morenci, Adrian |
| **01/12/1999** | 05:00 PM: Snow, 3 injuries, $1.8 million property damage. By the middle of the month, snowfall was nearing historic proportions, with January of 1999 already among one of the snowiest months ever in southeast Michigan. Compounding the problem was a sustained cold spell during the first half of the month, which prevented any of the snow from melting. As the snowpack grew toward two feet deep across southeast Michigan, it became more and more difficult to find places to put additional snowfall. On the 14th, a roof covering an outdoor pool collapsed in Hudson. Ice dams on roofs were | Lenawee County<br><br>Hudson |

| Table 25-1, Lenawee County Snow Storms, 1993-2011 (Presidential Emergency Declarations Indicated in Red) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | another widespread problem. Heat escaping from homes melted some of the snow on the roof, and as the meltwater ran down to the eaves, it refroze, as the eaves were not heated from underneath. Ice buildup on the eaves of roofs created ice dams; further meltwater had nowhere to go, and found its way through shingles and into ceilings. Tens of thousands of buildings statewide suffered leaks, resulting in a barrage of calls to both roofers and insurance agents. **(Presidential Emergency Declaration #3137.)** | |
| **03/05/1999** | 06:00 PM: Heavy snow. The snow was heavy across much of southeast Michigan. In addition, wind gusts to 35 mph caused considerable blowing and drifting, along with wind chills as low as fifteen below zero. The snowfall amount was 7" in Britton, 6.5" in Hudson and Tecumseh, and 6" in Adrian. | Lenawee County<br>Britton, Hudson, Tecumseh, Adrian |
| **03/09/1999** | 02:00 AM: Heavy snow, $50,000 property damage. Six and a half inches of snow fell near Adrian, with amounts dwindling quickly to the north and east. The area had seen about 6 inches of snow a few days previous. Thus, gusty east winds produced a tremendous amount of blowing and drifting snow, especially in Lenawee County. County officials reported that many of the rural back roads were drifted shut. The weight of accumulated snow caused the roof of a skating rink - damaged after heavy snow in January - to collapse in Adrian. | Lenawee County<br><br>Adrian |
| **01/20/2000** | 10:15 AM: Snow. A low pressure system produced up to 5 inches of snow across much of lower Michigan. An auto accident on US 223 in northwest Lenawee County claimed the life of a 37-year-old woman, who lost control of her vehicle on the slushy highway and crashed into a truck. | Northwest Lenawee County |
| **10/07/2000** | 01:00 AM: Snow. An unusual early October cold blast brought one of the earliest snowfalls on record to southeast Michigan. | Unspecified location |
| **12/05/2000** | 01:00 AM: Snowfall amounts were only around an inch or less. However, the snow and blowing snow quickly melted and then refroze on area roads, producing unusually dangerous driving conditions. This would prove to be just the opening act in a month-long onslaught of winter weather. | Unspecified location |
| **12/07/2000** | 09:00 AM: Snow. Reports of 4 to 5 inches of snowfall were common across Lenawee County. The highest amount, 5.5 inches, was in Hudson. Many auto accidents resulted, though most were minor. | Lenawee County<br>Hudson |
| **12/11/2000** | 12:00 PM: Winter Storm, $50,000 property damage. A powerful storm system moved east just south of Michigan, dumping heavy snow across all of the area, with some freezing rain and sleet near the Ohio border. Near blizzard conditions were found across all of the area. Many schools were closed for two to four days after the storm. Mail delivery the next day was spotty at best, and many businesses and government offices were closed. In Lenawee County, 5.7" of snowfall was measured in Adrian along with some freezing rain; 5.8" was measured in Tipton; Hudson had 2.5" and freezing rain, and missed its mail delivery for the first time since the blizzard of 1978. This storm resulted in a Presidential Emergency Declaration (Federal Emergency Declaration #3160) for 39 Michigan counties, but the declaration did not include Lenawee County. ALSO RECORDED AS FREEZING RAIN | Lenawee County<br><br>Franklin Township<br>Adrian<br>Hudson |
| **12/13/2000** | 02:00 PM: Heavy Snow. The heaviest snow was near the Ohio border, with 6.5 inches of snow in Adrian. Most of the rest of the area picked up 3 to 6 inches. | Lenawee County<br>Adrian |

| Table 25-1, Lenawee County Snow Storms, 1993-2011 (Presidential Emergency Declarations Indicated in Red) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **12/17/2000** | 01:00 AM: More snow, $400,000 property damage. Much of southeast Michigan saw 2 to 4 inches of snow. A furniture/appliance/electronics store in Tecumseh saw its roof collapse under the snow. This storm would be the last big one of the month, though another few inches would fall here and there. A low pressure system would drop 2 to 4 inches of snow on the night of the 18th into the morning of the 19th. The snow would cause problems across southeast Michigan for weeks to come. The sheer volume of it was difficult to handle, and the process of moving it out of the way became difficult (and expensive), as there was almost no place to put it. Many communities used the majority of their snow removal budget, and their road salt supply, during December. There were fears that both would run out if the winter did not calm down. In Lenawee County, snow removal expenditures were greater in December 2000 than for all of the previous winter. Ice dams and water seepage confounded thousands of businesses and homeowners well into January. Several house fires erupted when meltwater seeped into electric meter boxes. | Lenawee County<br><br>Tecumseh |
| **12/24/2002** | 10:00 PM: Winter storm. On Christmas Eve, a storm system caused several inches of accumulation across much of the area. The snowfall began near the Ohio border late in the evening on Christmas eve, then slowly lifted northward across eastern Michigan on Christmas morning. The heaviest snowfall amounts occurred across Lenawee, Monroe, Washtenaw and Wayne counties, where 5 to 7.5 inches of accumulation were reported. Snowfall totals were 6 inches in Adrian. Given the large amount of holiday travelers, dozens of traffic accidents were reported across the region. No injuries or deaths were reported. | Lenawee County<br><br>Adrian |
| **02/22/2003** | 12:00 PM: Winter storm. A mix of snow, sleet and rain affected locations along and south of I-94 during the afternoon of the 22nd. The precipitation then turned over to all snow by evening. Snowfall continued through much of the night across eastern Michigan and came to an end early in the morning on the 23rd. Winds gusting as high as 40 MPH created considerable blowing and drifting snow with this storm. The Lenawee area generally received from 6 to 8 inches of snow accumulation. Due to the winds, drifts as high as 2 to 3 feet were reported. Dozens of traffic accidents were reported during the storm, with no major injury reports received. Several tree limbs and power lines were blown down in the wind. This led to an estimated 9,000 homes and businesses statewide without power. | Lenawee County |
| **04/06/2003** | A winter storm warning was issued for Lenawee. | Lenawee County |
| **12/23/2004** | 12:00 AM: Winter storm. A strong storm system produced snow which tapered off by early afternoon, with most locations receiving between 6 to 10 inches. Strong northerly winds to 30 mph also caused significant blowing and drifting of snow. At Deerfield, 9.0 inches of snow was recorded. | Lenawee County<br><br>Deerfield |
| **01/11/2005** | 03:00 AM: Heavy snow. Five to Seven inches of snow fell across Lenawee County. | Lenawee County |
| **01/22/2005** | 03:00 AM: Winter storm. Snow fell across southeast Michigan, with 9.0 inches measured at Deerfield. | Lenawee County, Deerfield |
| **12/09/2005** | 02:00 AM: Heavy snow. The first snowstorm of the winter season dropped a widespread 6 to 9 | Lenawee County |

| Table 25-1, Lenawee County Snow Storms, 1993-2011 (Presidential Emergency Declarations Indicated in Red) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | inches of snow across most of southeast lower Michigan. This was a quick hitting snowstorm. The snow began around 1900 EST on the 8th and reached 6 inches at 0300 EST on the 9th. At the height of the storm, during the early morning hours, snow fell at a rate of 1 to 2 inches per hour and several reports of thunder snow were received. A band of heavier snow, 6 to 8 inches, stretched from Adrian to Detroit. The snow tapered off to flurries by 0600 EST. The highest snowfall report was received from Hudson, at 8.9 inches. | Hudson |
| **12/15/2005** | 06:00 PM: Heavy snow. Snowfall rates of one inch per hour were common across the area into the afternoon hours. By 1800 EST, most of southeast lower Michigan had received 6 inches or more of snow. Accumulating snow ended by 2200 EST. Adrian reported 6.0 inches of snow. | Unspecified location |
| **02/13/2007** | 13:00 PM: Winter storm. A trained spotter reported 9 inches of snow in 12 hours in Lenawee. North-easterly winds frequently gusted to 30 MPH and created extensive blowing and drifting snow. In addition, temperatures were in the single digits with wind chill values around 15 below zero. The snow began Tuesday afternoon of the 13th and became heavy at times through the evening and into the early morning hours of the 14th. The winds made it extremely difficult to measure the snow, but trained spotters estimated 6 to 9 inches of snow fell on areas along and east of a line from Port Huron to Adrian. Snow drifts from 3 to 5 feet were reported across this same area. A number of county roads were impassable, prompting officials to close some roads. Several motorists had to be rescued when their vehicles became stuck in snow drifts in Lenawee County. Nearly all schools along and south of M-59 closed on Valentine's Day due to the very poor road conditions. The snow ended by sunrise on the 14th, but poor visibilities persisted for several more hours as the wind con-tinued to blow the snow around. One of the highest Lenawee snowfall totals was at Morenci, with 5.8 inches. | Lenawee County<br><br>Morenci |
| **12/16/2007** | 00:00 AM: Blizzard. Trained spotters reported blizzard and white-out conditions, especially along M-25. Widespread snow, heavy at times, moved into the region during the early morning hours and persisted throughout much of the day. Snowfall ranged from generally 6 to 10 inches throughout much of Southeast Lower Michigan. Strong gusty winds of 35 to 45 mph created 1 to 3 foot drifts with near blizzard conditions across much of Southeast Lower Michigan. Numerous accidents were reported during the storm and schools were closed on Monday.<br>00:00 AM: Winter Storm. Trained spotters reported 8.5 inches of snowfall in 12 hours. | Unspecified location |
| **01/01/2008** | 00:00 AM: Winter Storm. Trained spotters reported 5 inches of snowfall in Lenawee. Cement City registered 9.5 inches. | Lenawee County, Cement City |
| **02/01/2008** | 01:00 AM: Heavy Snow. A heavy burst of snow during the early morning hours lead to accumula-tions of 4 to 5.5 inches within a 6 hour period across parts of southeast Michigan, with 1 to 4 inches elsewhere. | Unspecified location |
| **02/12/2008** | 14:00 PM: Heavy Snow. Snow intensified during the evening commute, causing very poor driving conditions. Widespread snow accumulations ranged from 2 to 5 inches with locally higher amounts, occurring in less than 9 hours. | Unspecified location |

| Table 25-1, Lenawee County Snow Storms, 1993-2011 (Presidential Emergency Declarations Indicated in Red) | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **02/25/2008** | 09:00 AM: Heavy Snow. Total snowfall amounts up to 6 inches occurred near the Ohio Border. | Unspecified location |
| **02/29/2008** | 05:00 AM: Heavy Snow. Widespread snowfall of around 3 to 5 inches occurred in a short 6 to 8 hour time frame over Washtenaw and Lenawee counties. | Lenawee County |
| **03/04/2008** | 16:00 PM: Heavy Snow. The majority of snow fell in a 9 hour period with mostly 4-7 inches reported south of M-59. | Unspecified location |
| **03/21/2008** | 08:00 AM: Heavy Snow. The average snowfall range across Lenawee was 7-10 inches. | Lenawee County |
| **12/19/2008** | 04:00 AM: Winter Storm. A general 6 to 12 inch snowfall took place across southeast Michigan, which fell in a ten hour period. | Unspecified location |
| **01/09/2009** | 16:00 PM: Winter storm. 6 to 9 inches of snow along and south of M-59. | Unspecified location |
| **04/05/2009** | 10:00 AM: Winter Storm. Snowfall totals averaged 1 to 4 inches south of I-94. Cement City reported 6.0 inches. | Lenawee County, Cement City |
| **02/09/2010** | 16:00 PM: Heavy Snow. A strong low pressure system passing through the Ohio River Valley dropped the largest snowfall totals of the season across southeast Michigan. Most locations received between 5-10 inches with the highest amounts observed along the Ohio border. Strong winds, gusting between 20 and 30 mph at the tail end of the storm produced blowing snow which caused some large drifts to form. Adrian received 8.6 inches. | Lenawee County |
| **02/22/2010** | 00:00 AM: Heavy Snow. Low pressure moved out of the Central Plains and tracked northeast through the Ohio River Valley, moving through northwest Ohio. Snowfall totals were generally in the 2 to 8 inch range, with the higher totals occurring along and south of I-69. | Lenawee County |
| **02/01/2011** | 19:00 PM: Winter Storm. A major winter storm impacted southeast Michigan, with snowfall accumulations generally ranging from 6 to 12 inches. Northeast winds gusting between 25 to 35 mph caused some blowing and drifting of snow. Frequent wind gusts to 35 mph came off Lake Huron and Saginaw Bay, leading to blizzard conditions north of the I-69 corridor. | Lenawee County |
| **02/20/2011** | 13:30 PM: Heavy Snow. A big winter storm impacted southeast Michigan, with 5 to 10 inches of snow falling across the majority of the area. Snow turned to ice near the Ohio border, where a major ice storm occurred. Downed trees and power lines occurred over Lenawee and Monroe counties due to ice accumulations half an inch to one inch. Power outages lasted 4 to 5 days. | Lenawee County |

Sources: Michigan Hazard Analysis, the National Climatic Data Center (NCDC) storm events database, reports from the Law Enforcement Information Network (LEIN), and local input from plan participants.

## 26. Ice and Sleet Storms

Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage. When electric lines are

downed, households may be without power for several days, resulting in significant economic loss and disruption of essential services in affected communities.

Several recent significant ice and sleet storms of statewide significance are worth mentioning:

- **03/13/1997 Ice Storm affecting the southern third of Michigan.** Detroit Edison and Consumers Energy outages affected 514,000 customers, including Lenawee County. Shelters were also opened in many communities.
- **01/15/1985 Ice Storm affecting Lenawee and 12 other counties in Southern Lower Michigan.** Up to 1 inch of freezing rain downed tree limbs, trees, and power lines, blocked roads, and caused widespread power outages. More that 430 thousand electric customers were without power for up to 10 days. An estimated $50 million in public and private damages, 3 deaths, and 8 injuries are attributed to this event. A Governor's Disaster Declaration was issued, but the declaration did not include Lenawee County.
- **03/02-07/1976 Ice Storm with accompanying high winds and tornadoes struck Lenawee and 28 other counties in Central Lower Michigan.** The storms, considered to be one of the worst to hit the state, caused over $56 million in damage and widespread power outages. A Presidential Major Disaster was granted, but the declaration did not include Lenawee County.

**Lenawee County Perspective**

A total of 13 ice storm/freezing rain events were reported in Lenawee County between 1993 and 2009 as indicated in Table 26-1. Based on these data, the annual probability of an ice or sleet storm in Lenawee County is 0.75. Storm impacts included Lenawee's estimated $440,000 share of property damage estimated at $25 million statewide, the likelihood of additional property damage in Lenawee County not included in statewide data, and various infrastructure failures and transportation accidents. Several injuries and traffic fatalities resulted statewide from these storms, but none are traced directly to Lenawee County. The following timeline is in addition to the above-mentioned presidential and gubernatorial disaster declarations.

**Table 26-1, Lenawee County Ice Storms/Freezing Rain Events, 1993-2011**

| Date | Description | MCD's |
|---|---|---|
| **01/21/1993** | 0000: Ice Storm. Freezing rain began shortly after midnight on the 12th across far southwest Lower Michigan and spread across all of Lower Michigan by 7 am. Between 0.3 and 0.4 inches of ice accumulated on exposed surfaces across northwest Lower Michigan and Upper Michigan with lesser amounts of ice across southern and far eastern Lower Michigan. | Unspecified location |
| **01/27/1994** | 0000: Heavy Snow/freezing Rain, $5.0 million property damage statewide. Snow developed over southwest Lower Michigan just after Midnight on the 27th. This snow area spread rapidly northeast. By 0700 | Unspecified location |

| Table 26-1, Lenawee County Ice Storms/Freezing Rain Events, 1993-2011 | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| | EST on the 27th, the snow area had merged with a lake induced snow area over northeast Lower Michigan, resulting in snowfall over all of Lower Michigan by that time. By 0400 to 0500 EST on the 27th, over the southern third of Lower Michigan, the snow mixed with, then changed to, sleet and freezing rain. The area of freezing rain then raced northward across the rest of Lower Michigan. By late afternoon on the 27th, most of Lower Michigan had freezing rain or sleet. The freezing rain changed to rain over the southern third of Lower Michigan by mid afternoon. After 1900 EST on the 27th, freezing rain continued north of a South Haven to Flint line, while rain continued, heavy at times, south of that line. Overnight on the 27th and into the morning hours of the 28th, occasional rain continued over the southern half of Lower Michigan while occasional freezing rain continued over the north half of Lower Michigan. During the 28th, the area of freezing rain changed to snow across Lower Michigan. As for ice accumulations over Lower Michigan during the freezing rain, around a quarter inch accumulated over the south third of lower Michigan. This resulted in numerous outages. Detroit Edison reported 50,000 people affected by power outages. Consumers Power County reported 2,000 customers without power. Most of the power loss problems were over the southeastern part of Michigan even though this was not the area of heaviest ice accumulation or of the strongest winds. Most of the power loss occurred on Thursday, January 27th, during the ice accumulation phase of the storm. More than 150 schools canceled classes across the state. Across Michigan, there were numerous reports of cars skidding off the road and minor fender-bender type accidents. ALSO RECORDED AS SNOW STORM | |
| **02/27/1995** | 0100: Ice Storm. Freezing rain developed across southern lower Michigan late on the 26th, then continued through the morning hours on the 27th. Several hours of sleet preceded the freezing rain in many places. Ice accumulations of one-quarter inch were common throughout southern Michigan by late morning on the 27th. Numerous traffic accidents were reported, and most schools were closed. Despite the heavy icing, only widely scattered power outages occurred, since the storm was accompanied by very little wind. | Unspecified location |
| **03/06/1995** | 0000: Ice Storm. Freezing rain occurred across much of southern Michigan during the early morning on the 6th, but the heaviest accumulation of ice occurred early on the 7th, when many areas reported accumulations of one-quarter inch. Most schools were closed for at least one day, and many schools were closed on both the 6th and the 7th. A brief thaw occurred across the far south during the afternoon on the 7th, followed by a sharp temperature drop and a light accumulation of snow, making roads extremely hazardous once again during the evening on the 7th. Scattered power outages occurred, but the outages were not as widespread as what might have occurred had the storm been accompanied by strong winds. Many serious traffic accidents were reported throughout the state, with several fatalities. | Unspecified location |
| **12/13/1995** | 1800: Ice Storm. Snow developed across southeast Michigan late in the afternoon on the 13th, then quickly changed to freezing rain and sleet during the evening. The precipitation ended as light rain during the early morning on the 14th. Snow accumulations were generally two inches or less, but 1/4 inch ice accumulations occurred in many places. At least 230 school districts throughout southern Michigan cancelled school on the 14th, as roads became icy and hazardous. Scattered power outages were also reported. | Unspecified location |

| Table 26-1, Lenawee County Ice Storms/Freezing Rain Events, 1993-2011 | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **03/13/1997** | 09:00 PM: Ice storm, $19.0 million property damage. A storm brought widespread precipitation to south-east Michigan from late on the 13th through midday on the 14th. From Detroit and Ann Arbor south to the state-line, freezing rain changed to rain, but not before heavy ice accumulations occurred. Total precipitation amounts ranged from 1.5 to nearly 2.5 inches from Detroit and Ann Arbor south to the Ohio state-line. In the Detroit Metropolitan area, the ice storm resulted in power outages to over 425,000 homes and businesses; the 3rd largest outage in history, and the worst ever for an ice storm. Several thousand residents were without power for as long as 4 days. In addition to power lines, falling trees damaged dozens of cars and houses throughout the area. Most schools were closed, and there were numerous auto accidents. | Unspecified location |
| **12/11/2000** | 12:00 PM: Winter Storm, $50,000 property damage. A powerful storm system moved east just south of Michigan, dumping heavy snow across all of the area, with some freezing rain and sleet near the Ohio border. Near blizzard conditions were found across all of the area. Many schools were closed for two to four days after the storm. Mail delivery the next day was spotty at best, and many businesses and government offices were closed. In Lenawee County, 5.7" of snowfall was measured in Adrian along with some freezing rain; 5.8" was measured in Tipton; Hudson had 2.5" and freezing rain, and missed its mail delivery for the first time since the blizzard of 1978. ALSO RECORDED AS SNOW STORM. | Adrian<br>Franklin Township<br>Hudson |
| **01/29/2001** | 05:00 AM: Freezing rain. Freezing rain broke out across far southeast Michigan early in the morning, and accumulated up to two-tenths of an inch. Hundreds of auto accidents occurred, and school closings were widespread across the area. Icy roads would be found the very next morning across all of southeast Michigan, as rain that would fall later on the 29th froze that night. Many school districts had to close. | Unspecified location |
| **01/30/2002** | 08:00 PM: Ice storm, 2 injuries, $820,000 property damage. A prolonged period of winter weather occurred across southeast Michigan from January 30th to February 1st. Precipitation began as snow, and then changed over to freezing rain south of I-96. The heaviest freezing rain fell along and south of a line from Ann Arbor to Detroit. Precipitation gradually tapered to light freezing rain and freezing drizzle late in the morning of the 31st across all of southeast Michigan. Freezing rain redeveloped during the evening of the 31st across all of southeast Michigan, and again was heaviest along and south of a Detroit to Ann Arbor line. The precipitation changed to all rain shortly after midnight on the 1st. High winds developed later in the morning of the 1st. Snowfall amounted to only 2 to 4 inches across Lenawee before changing over to freezing rain. Around a half an inch of ice accumulated onto trees, power lines, and untreated surfaces by the afternoon of the 31st. The weight of the snow and ice on trees caused hundreds of tree limbs to break and even uprooted a few large trees. This did damage to dozens of homes and automobiles. The accumulation of snow and ice on the roads and highways led to dozens of accidents across southeast Michigan. Falling tree branches and the weight of the ice downed hundreds of power lines and left an estimated 290 thousand residents and businesses without power, some of which had to wait several days for power to be restored. Most of the power outages occurred in the metro Detroit area, as well as across Washtenaw, Lenawee, and Monroe counties. The heavy snowfall closed almost all school districts. A Winter Storm Warning was issued for Lenawee, with mix of snow and ice producing over 4" of snow and a quarter inch of ice | Lenawee County |
| **01/31/2002** | Winter storm warnings and Ice storm warnings issued for Lenawee, with ice accumulations of ¼ inch. | Lenawee County |

| Table 26-1, Lenawee County Ice Storms/Freezing Rain Events, 1993-2011 | | |
|---|---|---|
| **Date** | **Description** | **MCD's** |
| **01/14/2007** | 07:00 AM: Winter Weather. Light freezing rain led to numerous traffic accidents. A relatively minor ice event proved to be a precursor to the more significant icing that would take place the following morning. Around a tenth of an inch of ice was reported across the southern counties. A mixture of light freezing rain, sleet, and snow fell along the M59 corridor with up to a tenth of an inch of ice and minor sleet and snow accumulations. Elsewhere in Southeast Michigan, mainly light snow fell (1 to 2 inches). No power outages or tree damages were reported. But with temperatures hovering around 30 degrees, bridges and over-passes froze over and led to numerous car accidents. No fatalities were reported.<br>21:00 PM: Ice storm, $350,000 property damage. By 0300 EST on the 15th, spotters were reporting up to 1/2 inch of ice on vegetative and elevated surfaces across the central and northern sections of the county. Numerous tree branches and power lines were downed across the area due to the extra weight of the ice. Approximately 30,000 customers lost power and area hotels reported a substantial increase in bookings from those who remained without power Monday night. Total property damage was roughly estimated at $350K, mostly caused by ice weighted trees and live power lines falling on homes and businesses. Numerous car accidents occurred across the affected areas. Most injuries (all indirect) were minor. Total property damage was roughly estimated in excess of $2M statewide, including damage to vehicles, homes, businesses, and electrical poles and transformers. In addition, many businesses in the hardest hit areas reported losses due to the extended power outages.<br>21:00 PM: Winter weather, $40,000 property damage. A local newspaper included pictures of trees down in Hudson, crushing at least one vehicle. Ice accumulations up to 2/10 of an inch were reported. | Unspecified location<br><br>Hudson |
| **12/09/2007** | 08:00 AM: Ice Storm. A trained spotter observed .25 inch of ice accumulation over a 6 hour period. Significant amounts of freezing rain and icing occurred near the Ohio border, where ice accumulated to around a quarter inch across Lenawee and Monroe Counties. A double dose of freezing rain and below freezing temperatures Sunday left the region looking like an ice skating rink. Nearly all schools were closed on Monday due to icy back roads and parking lots that were a sheet of ice. Several people were treated for falls on the ice and other weather related injuries (all indirect). Numerous tree branches popped under the weight of the ice but no damage was reported. | Lenawee County |
| **12/11/2007** | 09:00 AM: Winter weather. A combination of light snow and freezing rain occurred over the area, with generally light amounts of mixed precipitation falling. Icing amounts ranged from a trace to two tenths of an inch, leading to numerous accidents across all of Southeast Lower Michigan. Some school districts sent students home early when roads began to deteriorate. | Unspecified location |
| **02/20/2011** | 13:30 PM: Ice Storm, $1.5 million property damage. A big winter storm impacted southeast Michigan, with 5 to 10 inches of snow falling across the majority of the area. Snow turned to ice near the Ohio border, where a major ice storm occurred. Downed trees and power lines occurred over Lenawee and Monroe counties due to ice accumulations half an inch to one inch. Power outages lasted 4 to 5 days. ALSO RECORDED AS SNOW STORM. | Lenawee County |

Sources: Michigan Hazard Analysis, the National Climatic Data Center (NCDC) storm events database, Law Enforcement Information Network (LEIN), and local input from plan participants.

# Priority, Risk and Vulnerability Assessment

## Hazard Assessment

The purpose of this section is to identify hazards that are likely to have the greatest impact on Lenawee County, in terms of property damage and public safety. This helps to identify where focus should be placed for mitigation purposes, with the top actions providing concerned agencies with the ability to realize cost-effective results. Like many other counties in Michigan, Lenawee County faces severe governmental revenue shortages. It is imperative that funds be allocated among projects and programs to deliver the greatest benefit to the community.

Lenawee County's most significant hazards were identified using a two-stage screening process. The first stage involved the ranking of hazards in terms of six criteria resulting in hazard ratings and rankings. The second stage involved the elimination of certain hazards based on the application of a "common sense" review.

*Stage 1 Review*

In the initial stage, all 27 hazards (including shoreline flooding) were reviewed in terms of their likelihood of occurrence, percentage of the population affected, potential for causing casualties, potential for negative impacts on the local economy, public awareness of the hazard, and potential for corollary effects. Six criteria were used to rate and rank hazards each of which was assigned a weighting factor. The **likelihood of occurrence** received 30% of the total weighting. The **percentage of population affected** received 20% as did the **potential for causing casualties.** The **potential for negative economic effects** received 15% of the weighting while **public awareness** of the hazard received 5% and the **occurrence of any corollary events** received 10% of the total. The rating of each hazard for each of the six characteristics, and the application of weighting of the characteristics resulted in a total ranking score for each hazard. The higher the score, the more important the need to develop mitigation strategies and projects to reduce the severity of the event. The results of this analysis are found in the table on the following page. The sum of the ratings for each individual hazard was established by multiplying the individual rate by the weight assigned to each characteristic. The sums of each of these individual ratings comprised the total rating for each hazard. The hazards were ranked according to the rating totals that they received.

| Lenawee County Hazard Ratings and Rankings | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Likelihood of Occurrence | | Percent of Population Affected | | Potential for Causing Casualties | | Potential for Negative Economic Effects | | Public Awareness of Hazard | | Corollary Effects | | Total |
| **Hazard** | **Rating** | **Pts.** | **Rating** | **Pts.** | **Rating** | **Pts.** | **Rating** | **Pts.** | **Rating** | **Pts.** | **Rating** | **Pts.** | **Rate[3]** |
| Civil Disturbances | 2 | 0.60 | 2 | 0.40 | 5 | 1.00 | 5 | 0.75 | 8 | 0.40 | 2 | 0.20 | 3.35 |
| Earthquakes & Subsidence | | | | | | | | | | | | | |
| Earthquakes | 1 | 0.30 | 5 | 1.00 | 1 | 0.20 | 1 | 0.15 | 10 | 0.50 | 10 | 1.00 | 3.15 |
| Subsidence | 1 | 0.30 | 1 | 0.20 | 1 | 0.20 | 1 | 0.15 | 5 | 0.25 | 5 | 0.50 | 1.60 |
| Fire Hazards | | | | | | | | | | | | | |
| Scrap Tire Fires | 1 | 0.30 | 1 | 0.20 | 1 | 0.20 | 5 | 0.75 | 5 | 0.25 | 5 | 0.50 | 2.20 |
| Structural Fires | 10 | 3.00 | 1 | 0.20 | 5 | 1.00 | 5 | 0.75 | 5 | 0.25 | 2 | 0.20 | 5.40 |
| Wildfires | 3 | 0.90 | 1 | 0.20 | 1 | 0.20 | 2 | 0.30 | 5 | 0.25 | 5 | 0.50 | 2.35 |
| Flooding Hazards | | | | | | | | | | | | | |
| Riverine Flooding | 9 | 2.70 | 4 | 0.80 | 1 | 0.20 | 5 | 0.75 | 5 | 0.25 | 6 | 0.60 | 5.30 |
| Shoreline Flooding | 1 | 0.30 | 1 | 0.20 | 1 | 0.20 | 1 | 0.15 | 5 | 0.25 | 2 | 0.20 | 1.30 |
| Dam Failures | 1 | 0.30 | 3 | 0.60 | 5 | 1.00 | 7 | 1.05 | 8 | 0.40 | 10 | 1.00 | 4.35 |
| Energy and Utility/Infrastructure Failures | | | | | | | | | | | | | |
| Energy Emergencies | 5 | 1.50 | 5 | 1.00 | 1 | 0.20 | 5 | 0.75 | 5 | 0.25 | 1 | 0.10 | 3.80 |
| Significant Infrastructure Failures | 1 | 0.30 | 10 | 2.00 | 5 | 1.00 | 10 | 1.50 | 5 | 0.25 | 8 | 0.80 | 5.85 |
| Transportation Accidents | 1 | 0.30 | 1 | 0.20 | 6 | 1.20 | 2 | 0.30 | 10 | 0.50 | 2 | 0.20 | 2.70 |
| Hazardous Materials Incidents | | | | | | | | | | | | | |
| Fixed Site HazMat Incident | 3 | 0.90 | 2 | 0.40 | 3 | 0.60 | 3 | 0.45 | 9 | 0.45 | 3 | 0.30 | 3.10 |
| HazMat Transportation Incident | 4 | 1.20 | 2 | 0.40 | 3 | 0.60 | 5 | 0.75 | 10 | 0.50 | 10 | 1.00 | 4.45 |
| Nuclear Power Plant Accidents | 1 | 0.30 | 2 | 0.40 | 1 | 0.20 | 3 | 0.45 | 2 | 0.10 | 5 | 0.50 | 1.95 |
| Oil & Gas Well Accidents | 1 | 0.30 | 2 | 0.40 | 5 | 1.00 | 3 | 0.45 | 10 | 0.50 | 2 | 0.20 | 2.85 |
| Pipeline Accidents | 2 | 0.60 | 8 | 1.60 | 1 | 0.20 | 7 | 1.05 | 10 | 0.50 | 10 | 1.00 | 4.95 |
| Homeland Security | | | | | | | | | | | | | |
| Nuclear Attacks | 1 | 0.30 | 1 | 0.20 | 1 | 0.20 | 1 | 0.15 | 1 | 0.05 | 10 | 1.00 | 1.90 |
| Terrorism/Sabotage/WMD | 1 | 0.30 | 3 | 0.60 | 8 | 1.60 | 5 | 0.75 | 5 | 0.25 | 5 | 0.50 | 4.00 |
| Public Health Emergencies | 2 | 0.60 | 3 | 0.60 | 8 | 1.60 | 7 | 1.05 | 5 | 0.25 | 2 | 0.20 | 4.30 |
| Extreme Weather | | | | | | | | | | | | | |
| Drought | 3 | 0.90 | 8 | 1.60 | 2 | 0.40 | 8 | 1.20 | 8 | 0.40 | 7 | 0.70 | 5.20 |

| Lenawee County Hazard Ratings and Rankings | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Likelihood of Occurrence | | Percent of Population Affected | | Potential for Causing Casualties | | Potential for Negative Eco-nomic Effects | | Public Aware-ness of Haz-ard | | Corollary Effects | | Total |
| Extreme Temperature | 5 | 1.50 | 5 | 1.00 | 8 | 1.60 | 5 | 0.75 | 5 | 0.25 | 10 | 1.00 | 6.10 |
| Hail | 10 | 3.00 | 4 | 0.80 | 1 | 0.20 | 5 | 0.75 | 5 | 0.25 | 5 | 0.50 | 5.50 |
| Lightning | 10 | 3.00 | 4 | 0.80 | 2 | 0.40 | 5 | 0.75 | 5 | 0.25 | 5 | 0.50 | 5.70 |
| Severe Winds | 7 | 2.10 | 9 | 1.80 | 1 | 0.20 | 4 | 0.60 | 5 | 0.25 | 5 | 0.50 | 5.45 |
| Tornadoes | 1 | 0.30 | 4 | 0.80 | 6 | 1.20 | 9 | 1.35 | 8 | 0.40 | 10 | 1.00 | 5.05 |
| Snow Storms | 5 | 1.50 | 10 | 2.00 | 2 | 0.40 | 5 | 0.75 | 6 | 0.30 | 10 | 1.00 | 5.95 |
| Ice and Sleet Storms | 3 | 0.90 | 10 | 2.00 | 2 | 0.40 | 7 | 1.05 | 9 | 0.45 | 10 | 1.00 | 5.80 |
| Percent of Points | | **30%** | | **20%** | | **20%** | | **15%** | | **5%** | | **10%** | **100%** |

The hazard rankings that emerged from the scoring system were as follows:

| Lenawee County Hazard Rankings | |
|---|---|
| 1. Extreme Temperature | 15. Public Health Emergencies |
| 2. Snow Storms | 16. Terrorism/Sabotage/WMD |
| 3. Significant Infrastructure Failures | 17. Energy Emergencies |
| 4. Ice and Sleet Storms | 18. Civil Disturbances |
| 5. Lightning | 19. Earthquakes |
| 6. Hail | 20. Oil & Gas Well Accidents |
| 7. Severe Winds | 21. Transportation Accidents |
| 8. Structural Fires | 22. Wildfires |
| 9. Riverine Flooding | 23. Scrap Tire Fires |
| 10. Drought | 24. Nuclear Power Plant Accidents |
| 11. Tornadoes | 25. Nuclear Attacks |
| 12. Pipeline Accidents | 26. Subsidence |
| 13. HazMat Incidents | 27. Shoreline Flooding |
| 14. Dam Failures | |

*Stage 2 Review*

Each of the 27 of the man-made and natural hazards listed in the table above were reviewed for the potential to affect the people and property of Lenawee County. As a result of this review, hazards 15-27 from the table were removed from further consideration based on several factors including: 1) the hazard received a low rating in Stage 1, 2) the hazard was man-made, 3) mitigation measures were not practical, practicable, or beyond the scope of this plan, and/or 4) the hazard was already mitigated by existing infrastructure. Thus, the Hazard Mitigation Planning Committee, composed of a cross-section of county agencies with knowledge of the hazards that Lenawee County faces, applied a common sense approach to eliminate hazards that pose a minimal threat to Lenawee County.

Hazard Analysis by Community

The following table identifies hazards significant to each Lenawee County community:

| Implementation Measure | Addison Vil | Adrian City | Adrian Twp | Blissfield T | Blissfield V | Britton Vill | Cambridge | Cement Cit | Clayton Vil | Clinton Twp | Clinton Vil | Deerfield T | Deerfield V | Dover Twp | Fairfield T | Franklin Tp | Hudson Cit | Hudson Tp | Macon Twp | Madison T | Medina Twp | Morenci Cit | Ogden Twp | Onsted Vil | Palmyra T | Raisin Twp | Ridgeway T | Riga Twp | Rollin Twp | Rome Twp | Seneca Tp | Tecum City | Tecum Twp | Woodstock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Extreme Temps. | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Snowstorms | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Infrastructure Failur. | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Ice/Sleet Storms | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Lightning | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Hail | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Severe Winds | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Structural Fires | L | S | L | L | S | S | L | L | L | L | S | L | S | L | L | L | S | L | L | L | L | S | L | S | L | L | L | L | L | L | L | S | L | L |
| Riverine Flooding | L | S | S | S | S | L | L | L | L | S | S | S | S | L | L | L | S | S | L | L | L | L | L | L | S | L | L | L | L | L | L | S | S | L |
| Drought | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| STornadoes | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Pipeline Accidents | S | S | S | S | S | S | N | N | N | S | S | S | S | N | N | N | N | N | S | L | N | N | S | N | S | S | S | S | S | S | N | S | S | L |
| Hazardous Mater. | L | S | S | S | S | S | L | L | S | S | S | S | S | S | L | S | S | S | L | S | L | S | L | L | S | L | S | S | L | L | S | S | S | L |
| Dam Failures | S | S | S | L | L | L | S | L | L | S | S | L | L | L | L | L | L | L | L | L | L | L | L | N | L | L | L | L | L | L | L | S | S | L |
| Public Health Emer. | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Terrorism/Sabotage | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Energy Emergency | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Civil Disturbances | L | S | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | S | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Earthquakes | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Oil & Gas Well Acc. | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | S | L | L | L | L | L | L | L | L | L | S | L | L | L |
| Transport. Accident | L | S | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Wildfires | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Scrap Tire Fires | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Nuclear Plant Acc. | N | L | L | L | L | L | L | N | L | L | L | L | L | L | L | L | N | L | L | L | N | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Nuclear Attacks | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Subsidence | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Great Lakes | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |

S = Significant hazard; L = Lower-level of local risk; N = risk too low to be given priority treatment in this plan

# GOALS AND OBJECTIVES

## Goals and Objectives

The mission of the Lenawee County Hazard Mitigation Plan is to

***"Provide for the health, safety, and welfare of the public and to preserve its property by taking action to permanently eliminate or reduce the long-term risk to human life and property from all types of hazards."***

In order to accomplish this mission, goals and objectives were established. These goals and objectives were based on the hazard analysis as well as input from the public and local agencies.

Goals are general guidelines that describe a future vision that the community would like to achieve. They are usually long-term and represent global visions such as "to protect public health and safety." Objectives, on the other hand, define strategies to reach the identified goals. Objectives tend to be specific and address the details of who will do what and when to reach the goals. Communities need to identify clear goals and objectives, which can then be used as a guide for the plans and actions that will help meet the community needs. The following goals and objectives were outlined by the Lenawee County Hazard Mitigation Planning Committee, and adopted by the Lenawee County Planning Commission:

Goals:

1. Prevent the loss of life and property damage as a result of the hazards that affect Lenawee County.
2. Improve response and recovery for man-made and natural disasters.
3. Enhance early warning systems.
4. Maintain essential public services.

5. Enhance public awareness.
6. Protect public health, safety, and welfare.
7. Reduce losses from man-made and natural disasters.
8. Protect the environment.
9. Make hazard mitigation a part of day-to-day community activities.
10. Develop a collaborative to manage resources and secure additional resources in the event of an emergency.

Objectives:

1. Amend zoning ordinances to incorporate hazard mitigation measures into site plan review, special land use procedures, and supplemental provisions sections of the zoning ordinance.
2. Enhance coordination between response agencies.
3. Increase warning siren coverage and weather radio.
4. Provide resources to ensure provision of essential services.
5. Provide opportunities for public education including web sites, alerts, and social networking sites.
6. Provide additional storm shelters.
7. Enhance early warning systems and education of all hazards.
8. Enhance warning systems and notifications for special populations.
9. Support the continuing implementation of the MEMAC (Michigan Emergency Management Assis tance Compact), and MABAS-MI (Mutual Aid Box Alarm System) programs.
10. Encourage and promote continued and expanded compliance with the NFIP, through map use and consideration in the regulation of new construction, and seeking to implement flood mitigation measures (especially through the application for FEMA flood mitigation funding).

# HAZARD MITIGATION PLAN & STRATEGIES

## Hazard Mitigation Plan and Mitigation Strategies

The hazard inventory revealed that, relative to many other areas of the United States, Lenawee County is a safe place to live. Lenawee County is not plagued with threats from recurrent hurricanes, earthquakes of the potential evident in the Western United States, or the types of wildfires common in dry climates on the West Coast of the United States. The County does, however, face significant threat to life and property associated with several other types of hazards such as extreme temperatures, severe winter snow and ice storms, tornadoes, hail, lightning, and severe winds.

The purpose of this Plan is to protect the health, safety, and economic interests of residents by reducing the impacts of identified natural and man-made hazards through planning, awareness, and implementation. Actions taken to eliminate or reduce risk to human life and property damage will not only help to minimize the impacts of disasters, but will enable a rapid recovery and restoration of community normality in the event of such an occurrence.

Two sets of strategies were developed. First, strategies were developed that are intended to apply generally to all of the hazards which face Lenawee County. Strategies were also identified to address each of the priority hazards identified by the Hazard Mitigation Committee in the previous section. These two sets of strategies are outlined below.

## Mitigation Strategies to Address All Hazards

In the Vulnerability Analysis, a list of potential hazards were divided into those that would be focused upon for implementation purposes and those that would not be given special emphasis. However, it is not the intent of this plan to ignore any hazard that has the potential to occur in Lenawee County. Unusual events have been known to occur and the purpose of this plan is to be prepared. Some strategies have universal value regardless of the hazard. For these reasons, the following general mitigation strategies are provided.

1. ***Implement an enhanced public information and education program, aimed at the citizens of Lenawee County, regarding potential emergencies and how to prepare and respond.*** As result of the preparation of this Plan and the comprehensive view of hazards facing the community, it was determined that there is a need to develop an enhanced public information and education program to inform citizens about the potential hazards facing Lenawee County. A knowledgeable citizen base can do much to minimize the potential for damage and threat to human life.

2. ***Incorporate hazard mitigation planning in community master planning***. As a means of mitigating the hazards that Lenawee County faces, there is a need to incorporate hazard mitigation planning into the community planning process. This will assure a review of the hazard mitigation plan at least once every five years when community plans are reviewed and updated. Other opportunities include development of model ordinance language as part of site plan review, special land uses, and special zoning regulations. There are several publications that deal with this matter including a recent Planning Advisory Service report entitled *Hazard Mitigation: Integrating Best Practices into Planning*, published in 2010 by the American Planning Association.

3. ***Update the hazard mitigation plan every five years, or as deemed necessary.*** An update of the hazard mitigation plan every five years will offer an opportunity to reassess the hazards facing the community and adjust mitigation strategies as necessary. This review and adjustment will result in a maximization of the use of limited resources, and a reduction of the impacts of the hazards.

4. ***Best management practices***. Stay informed regarding the latest trends in best management practices. Subscribe to FEMA's list server regarding hazards that affect Lenawee County.

5. ***Maintain hazard incident database.*** As part of development of this Plan, a hazard database was developed. Maintenance of this database will allow for continual review of the hazards to which Lenawee County is susceptible. Continue to improve the database and update at least on an annual basis. This will also assist the Lenawee County Emergency Management Coordinator in review of the County's Hazard Analysis.

6. ***Public awareness***. Use all available media including NOAA Weather Radio, sirens, radio and television stations, county web sites, etc. to inform residents about the impending hazards and the availability of shelters and other sources of help.

7. ***Disaster planning***. Encourage residents, businesses, institutional uses, and manufacturers to develop disaster plans.

8. ***Debris management***. Several hazard responses involve the cleaning of debris including tree limbs, building materials, and other waste. Pre-plan for debris management staging and storage areas. In anticipation of downed trees, tree limbs, and snow accumulation, strategies must be in place to predetermine locations for the collection and processing of snow in urban areas, and tree limbs. The establishment of such staging areas will facilitate the clearing of roads and handling of debris and snow.

9. ***Mutual aid.*** Promotion of mutual aid agreements. Mutual aid agreements avoid duplication of services and provide the flexibility to allow assistance to be provided in the event that equipment or manpower are lacking.

## Mitigation Strategies for Specifically Identified Hazards

As noted in the "Hazard Risk and Vulnerability" chapter of this report, priorities have been established for the following hazards:

1. Extreme Temperatures
2. Snowstorms
3. Significant Infrastructure Failures
4. Ice and Sleet Storms
5. Lightning
6. Hail
7. Severe Winds
8. Structural Fires
9. Riverine Flooding
10. Drought

11. Tornadoes
12. Pipeline Accidents
13. Hazardous Materials Incidents – Fixed Site and Transportation

Mitigation measures for each of these hazards is addressed below. In each instance, strategies are proposed for implementation to minimize potential damages from these catastrophic events. A table identifying potential lead agencies and funding sources is located at the conclusion of this chapter.

## Extreme Temperatures

Lenawee County is not generally subject to extremes in temperature, either hot or cold. Therefore, the residents of the County are not acclimated to such extremes. As indicated in the hazard analysis, Lenawee County experienced over one extreme temperature event per year from 1995-2009. When extreme temperature events occur, the affect the entire County leaving the elderly, poverty-stricken, disabled, and adolescent populations somewhat vulnerable. Several mitigation measures were identified by the Hazard Mitigation Planning Committee including:

1. Development of an outreach program intended specifically to connect with vulnerable populations during periods of extreme temperatures. Establish and construct accessible heating and cooling centers in the county.

2. Inform vulnerable residents of help available for payment of utility bills.

## Snowstorms

Lenawee County has experienced snow emergencies in the past. These emergencies are associated with large amounts of snowfall resulting in transportation hazards, health concerns due to shoveling snow, ice dams on roofs resulting from accumulations of snow and ice. Mitigation strategies for snowstorms are as follows:

1. Identification of local schools and other public buildings throughout the County which could be designated as shelters for stranded motorists and others. Once identified, a public awareness campaign should be initiated to inform citizens of the availability of these shelters.

2. Maintain adequate road clearing capabilities.

3. Identification of roads that are subject to snow drifts. Use of vegetation to limit blowing and drifting of snow over critical road segments.

## Significant Infrastructure Failures

As noted in the hazard analysis, Lenawee County has experienced numerous power outages, caused mostly by severe weather such as windstorms or ice and sleet storms. Fortunately, most of those occurred in months where severe cold temperatures were not a problem. If they had occurred during the cold winter months, there certainly would have been a potential for loss of life, especially among the elderly and other more vulnerable members of society. Power outages are expected to occur at least once each year. The duration and severity of each event are the variables at play. The mitigation measures identified to address this hazard are:

1. Availability of emergency generators, especially when needed for critical emergency services.
2. Burying electrical and phone lines to resist damage.
3. Redundancies in utility and communication systems, especially lifeline systems.
4. Programs/networks for contacting elderly or homebound persons during periods of infrastructure failure, to assess whether they have unmet needs.
5. Regular infrastructure maintenance and equipment checks.
6. Tree-trimming programs to protect utility wires.
7. Increasing public awareness and widespread use of the Miss Dig utility damage prevention service (1-800- 482-7171).

## Ice and Sleet Storms

The hazard analysis indicated that Lenawee County saw 13 ice and sleet storms from 1993 to 2009. Though the rate of occurrence is less than once per year, the effects of these storms can be significant, and can result in corollary effects. Fallen power lines and tree limbs, power outages, riverine flooding, ice dams on roofs are common sources of property damage and casualties. The following mitigation measures for ice and sleet storms were identified:

1. Building maintenance to prevent roof and wall damage from ice dams.
2. Burying electrical and phone lines to resist damage.

## Lightning

Lightning strikes causing property damage and/or casualties occur approximately once per year in Lenawee County. They follow no known geographic pattern in the County. Among the mitigation measures identified to address lightning area:

1. Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines.
2. Buried and protected power and utility lines.
3. Install lightning protection devices on the community's communications infrastructure.

## Hail

Hail storms occur often in Lenawee County occasionally causing damage. There exists no geographic pattern of occurrence and are associated with thunderstorms. Mitigation measures for hail include:

1. Use of structural bracing, window shutters, laminated glass in window panes, and hail-resistant roof shingles to minimize damage to structures.

## Severe Winds

Severe winds occur more often in Lenawee County than any other hazard. Winds of 58 miles per hour or greater create the potential to rip shingles and siding off of homes, fell trees and limbs, cause soil erosion and snow drifts, and down power lines. The following mitigation measures were recommended for severe wind events that occur in Lenawee County:

1. Use of appropriate wind engineering measures and construction techniques.
2. Proper anchoring of manufactured homes and exterior structures such as carports and porches.
3. Securing loose materials, yard, and patio items indoors or where the winds cannot blow them about.
4. Construction of concrete safe rooms in homes and shelter areas in mobile home parks, fairgrounds, shopping malls, or other vulnerable public areas.

## Structural Fires

Structural fires pose a threat to human life and are a leading cause of property damage and destruction in Lenawee County. In addition to these losses, the cost of fire protection services is often among the highest budgeted item for most local units of government. Mitigation strategies to both reduce the incidence of structural fires and reduce the cost of fire protection services are as follows:

1. Local building, heating, and mechanical code enforcement.
2. Installation and maintenance of smoke detectors and fire extinguishers.
3. Improved and continuous training for emergency responders, and provision of equipment for them.
4. Retrofit older buildings with sprinkler systems.

## Riverine Flooding

As the hazard analysis indicated, riverine flooding has occurred on many occasions in Lenawee County. In order to reduce the hazard potential of riverine flooding, the following mitigation strategies are established:

1. Accurate identification and mapping of flood-prone areas.
2. Identify all structures in the floodplain.
3. Adopt and enforce local regulations to prevent development within a floodplain.
4. Retrofit existing structures within a floodplain.
5. Encourage additional communities to consider joining the National Flood Insurance Program.
6. Encourage current NFIP member communities in their continued compliance with the NFIP, through the use and application of map information in the regulation of floodplain developments, and through the seeking of FEMA grant funds for flood mitigation projects, to address properties that may currently be vulnerable to flooding in identifiable risk areas.
7. Wetlands and lakes act as natural retention basins, temporarily storing runoff and releasing it slowly. Local units of government will consider the importance of wetlands and lakes in this process as they prepare and implement local land use plans.

## Drought

Lenawee County is a highly agricultural area. While droughts do not occur often, they can cause severe crop damages. The following mitigation measures are suggested:

1. Storage of water for use in drought events, especially for human needs during extreme temperatures.
2. Water rationing if necessary to control water use, especially when needed to fight fires.
3. Agricultural insurance.

## Tornadoes

Lenawee County has experienced casualties and substantial property damage from tornadoes in the past. While no serious tornado damage has been experienced in the past several years, tornadoes are likely and could result in loss to human life and substantial property damage in the community. Mitigation strategies to address the potential effects from tornadoes are as follows:

1. Use of appropriate wind engineering measures and construction techniques.
2. Proper anchoring of manufactured homes and exterior structures such as carports and porches.
3. Securing loose materials, yard, and patio items indoors or where the winds cannot blow them about.
4. Construction of concrete safe rooms in homes and shelter areas in mobile home parks, fairgrounds, shop ping malls, or other vulnerable public areas.

## Pipeline Accidents

Lenawee County has several natural gas pipelines. As discussed in the hazard analysis, explosions are believed to have occurred in at least two occasions. Mitigation measures regarding pipeline accidents are as follows:

1. Continued training for police and fire personnel and first responders.
2. Locating pipelines away from dense development, critical facilities, special needs population, and environmentally vulnerable areas whenever possible.

## Hazardous Materials Incidents – Fixed Site and Transportation

Lenawee County has seen hazardous waste incidents in the past, sometimes in populated areas. Because mitigation measures are identical, fixed site and transportation incidents are combined for the following measures:

1. A mutual aid/memorandum of understanding (MOU) in place to provide mitigation of hazardous materials incidents.

2. Continued training for police and fire personnel and first responders.

3. Local adoption of hazardous spills expense recovery ordinances.

4. Update hazardous materials inventory.

## Mitigation Strategy Prioritization and Implementation

### Strategy Prioritization

The mitigation strategies proposed to address potential hazards in Lenawee County were analyzed to determine their benefit, cost, and implementation potential. Though in each case, the analysis was subjective, the process resulted in a defensible priority determination for strategy implementation. The benefit of each strategy was determined to be of "High", "Medium", or "Low" value relative to the range of strategies suggested, though in actuality, even those strategies labeled low in benefit would represent true progress in the mitigation of hazards facing Lenawee County. Costs were similarly estimated with consideration to both capital and on-going, long-term operational costs. Implementation potential represents the ease of implementation, given political considerations, instances where the cost would not necessarily benefit the implementing organization, and the need to convince third party organizations of the value of the implementation of the strategy.

Actual priority determination involved a mathematical process whereby benefits, costs, and implementation potential were assigned either one, two, or three points, with high benefit, low cost, and high implementation potential receiving three points. Points were then summed, placed on a histogram, and ranges for the "Top", "High", and "Medium" priority strategies were selected. The results of this analytical process are shown on the table entitled, "Hazard Mitigation Strategy Prioritization. Top priority strategies were identified address public health and flooding hazards. "High" priority strategies address energy, public health, and tornado hazards. "Medium" priority strategies address ice and snow and flooding.

| HAZARD MITIGATION STRATEGY PRIORITIZATION | | | | | |
|---|---|---|---|---|---|
| **Hazard** | **Strategy** | **Estimates of Benefits and Costs** | | **Implementation Potential** | **Priority** |
| | | **Potential Impact (Benefit)** | **Cost** | | |
| **Extreme Temperatures** | 1. Cooling centers | High | High | Low | |
| | 2. Utility bills | Low | Low | Medium | |
| **Snowstorms** | 1. Shelter identification | High | Medium | Medium | Medium Priority |
| | 2. Road clearance | High | High | Low | |
| | 3. Snow drifting | Low | Medium | Low | |
| **Infrastructure Failures** | 1. Generators | Medium | High | Medium | |
| | 2. Burying utility lines | High | High | Low | |
| | 3. Redundancies | Medium | High | Medium | |
| | 4. Elderly alerts | Medium | Low | Medium | |
| | 5. Infrastructure maintenance | High | High | Medium | |
| | 6. Tree trimming | Medium | High | Medium | |
| | 7. Public awareness of MISS DIG | Medium | Low | Medium | Medium Priority |
| **Ice and Sleet Storms** | 1. Building maintenance | High | High | Medium | |
| **Lightning** | 1. Tree trimming | Medium | High | Medium | |
| | 2. Buried utility lines | High | High | Low | |
| | 3. Lightning protection devices | Medium | Medium | High | Medium Priority |
| **Hail** | 1. Preventive building materials | Low | High | Low | |
| **Severe Winds** | 1.Wind engineering | Medium | High | Medium | |
| | 2. MH anchoring | Medium | High | High | |
| | 3. Securing loose items | Low | Low | Medium | |
| | 4. Safe rooms | Medium | High | Low | |
| **Structural Fires** | 1. Code enforcement | Medium | Medium | High | Medium Priority |
| | 2. Smoke detectors | High | Low | High | Top Priority |

| | | | | | |
|---|---|---|---|---|---|
| | 3. Training | Low | Medium | Medium | |
| | 4. Sprinkler older buildings | High | High | Low | |
| **Riverine Flooding** | 1. Floodplain identification | High | Low | High | Top Priority |
| | 2. Structures in floodplain | Medium | Low | Medium | Medium Priority |
| | 3. Adopt local regulations | Medium | Medium | Medium | |
| | 4. Retrofit existing structures | Medium | High | Low | |
| | 5. Join NFIP | Medium | Low | Medium | Medium Priority |
| | 6. Continued NFIP compliance | Medium | Medium | Medium | Medium Priority |
| | 7. Wetland protection | High | Medium | Medium | Medium Priority |
| **Drought** | 1. Water storage | High | High | Low | |
| | 2. Water rationing | High | Medium | Medium | Medium Priority |
| | 3. Agricultural insurance | Low | Medium | Medium | |
| **Tornadoes** | 1. Construction techniques | Medium | High | Medium | |
| | 2. MH anchoring | Medium | Medium | High | |
| | 3. Securing loose items | Low | Low | Medium | |
| | 4. Safe rooms and shelters | High | Medium | Medium | |
| **Pipeline Accidents** | 1. Continued training | Medium | Medium | Medium | Medium Priority |
| | 2. Pipeline location | High | High | Medium | |
| **Hazardous Materials Incidents – Fixed Site and Transportation** | 1. Continued training | Medium | Medium | High | Medium Priority |
| | 2. Local ordinances | Medium | Low | High | Top Priority |
| | 3. Hazardous materials inventory | Medium | Low | High | Top Priority |

## Responsible Lead Organization, Funding, and Time-Frame for Implementation

The table entitled "Responsible and Potential Lead Agencies" identifies the agency or agencies responsible for strategy implementation. More than one agency is identified as responsible for the implementation of a particular strategy if there is a logical reason for such designation. For example, bridge replacement may be the responsibility of the Lenawee County Road Commission or the Michigan Department of Transportation, depending on its location. Other agencies are identified as potential lead organizations if they could assume some or all of the responsibility for implementation of the strategy.

"Top" priority strategies, including the provision of smoke detectors, the review of proposed Flood Insurance Rate Maps, local ordinances regarding hazardous materials, and hazardous materials inventory, should be under way or implemented as soon as possible upon plan adoption. Medium priority strategies will be initiated in 2011.

**Lenawee County Hazard Mitigation Plan**

**RESPONSIBLE AND POTENTIAL LEAD AGENCIES AND POSSIBLE FUNDING SOURCES**

| Hazard | Strategy | Responsible and Potential Lead Organizations | | | | | | | | | | | | Possible Funding Sources | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R2PC | LCSD | CAA | LCHD | Businesses | Local Units | Utilities | Private | Local DPW, LCRC | MDOT | LCDC | LEMC | FEMA | County Funds | Utilities | CAA | Private | Foundation | Local Units | MDOT/ FHWA |
| **Extreme Temperatures** | 1. Cooling centers | | | | P | | P | | P | | | | P | X | X | X | X | X | X | | |
| | 2. Utility bills | | | P | | | | R | P | | | | P | X | | X | X | X | X | | |
| **Snow-storms** | 1. Shelter identification | | | P | | | P | | P | | | | | X | X | | X | X | X | X | |
| | 2. Road clearance | | | | | | P | | | R | R | | | X | X | | | | | X | X |
| | 3. Snow drifting | | | | | | P | | | R | R | | | X | X | | | X | X | X | X |
| **Infrastructure Failures** | 1. Generators | | P | P | | | | P | P | P | | | | X | | X | | X | X | | |
| | 2. Burying utility lines | | | | | | | R | | P | | | | X | | X | | X | | X | |
| | 3. Redundancies | | | | | | | R | R | | | | | | | X | | X | | | |
| | 4. Elderly alerts | | P | P | P | | P | | P | | | | P | X | X | X | | | | X | |

| Lenawee County Hazard Mitigation Plan<br>RESPONSIBLE AND POTENTIAL LEAD AGENCIES AND POSSIBLE FUNDING SOURCES | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Hazard** | **Strat-egy** | **Responsible and Potential Lead Organizations** | | | | | | | | | | | **Possible Funding Sources** | | | | | | | |
| | | **R2PC** | **LCSD** | **CAA** | **LCHD** | **Businesses** | **Local Units** | **Utilities** | **Private** | **Local DPW, LCRC** | **MDOT** | **LCDC** | **LEMC** | **FEMA** | **County Funds** | **Utilities** | **CAA** | **Private** | **Foundation** | **Local Units** | **MDOT/ FHWA** |
| | 5. Infra-structure mainte-nance | | | | | | P | R | R | R | R | R | | X | X | | | X | | X | X |
| | 6. Tree trimming | | | | | | | R | | R | | | | X | X | | | X | X | | |
| | 7. Public awareness of Miss Dig | | | | | | P | R | R | P | | | | | | | | X | | X | |
| **Ice and Sleet Storms** | 1. Building mainte-nance | | | | | | R | | R | | | | | X | | X | | X | X | X | |
| **Lightning** | 1. Tree trimming | | | | | | | R | | R | | | | X | X | | | X | X | | |
| | 2. Buried utility lines | | | | | | | R | | P | | | | X | | X | | X | | X | |
| | 3. Lightning protection devices | | | | | P | | P | P | | | | P | X | X | | | X | X | X | |
| **Hail** | 1. Preven-tive build-ing materi-als | | | | | | R | | R | | | | | X | | | | X | X | X | |
| **Severe Winds** | 1. Wind engineer-ing | | | | | P | P | | P | | | | | X | X | | | X | X | | |
| | 2. MH anchoring | | | | | | R | P | | | | | | X | | | | X | | X | |
| | 3. Securing loose items | | | | | | | | R | | | | | | | | | X | | | |
| | 4. Safe rooms | | | | | P | P | | P | | | | | X | X | | X | X | | | |
| **Structural Fires** | 1. Code enforce-ment | | | | | | R | | | | | | | | | | | X | | X | |

| Lenawee County Hazard Mitigation Plan<br>RESPONSIBLE AND POTENTIAL LEAD AGENCIES AND POSSIBLE FUNDING SOURCES | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Hazard** | **Strat-egy** | **Responsible and Potential Lead Organizations** | | | | | | | | | | | **Possible Funding Sources** | | | | | | | |
| | | **R2PC** | **LCSD** | **CAA** | **LCHD** | **Businesses** | **Local Units** | **Utilities** | **Private** | **Local DPW, LCRC** | **MDOT** | **LCDC** | **LEMC** | **FEMA** | **County Funds** | **Utilities** | **CAA** | **Private** | **Foundation** | **Local Units** | **MDOT/ FHWA** |
| | 2. Smoke detectors | | | P | | P | R | | P | | | | | X | | | X | X | X | | |
| | 3. Training | | R | | | | R | | P | | | | P | X | X | | | X | | X | |
| | 4. Sprinkler older buildings | | | | | R | R | | R | | | | | | | | | X | | | |
| **Riverine Flooding** | 1. Flood-plain identifica-tion | P | | | | | R | | | | | P | | | | | | | | X | |
| | 2. Struc-tures in floodplain | P | | | | | R | | | | | P | | | | | | | | X | |
| | 3. Adopt local regulations | P | | | | | R | | | | | P | | | | | | | | X | |
| | 4. Retrofit existing structures | | | | | P | | | P | | | | | X | | | | X | | | |
| | 5. Join NFIP | | | | | | R | | | | | | | | | | | | | X | |
| | 6. Contin-ued NFIP compliance | P | | | | | R | | | | | P | P | X | X | | | | | X | |
| | 7. Wetland protection | P | | | | | R | | | | | P | | | | | | | | X | |
| **Drought** | 1. Water storage | | | | | | P | P | P | P | | | | X | | | | X | | X | |
| | 2. Water rationing | | | | | | P | | | P | | | | | | | | | | X | |
| | 3. Agricul-tural insurance | | | | | | | | R | | | | | | | | | X | | | |
| **Tornadoes** | 1. Con-struction techniques | | | | | P | R | P | P | | | | | X | | | | X | | X | |

**Lenawee County Hazard Mitigation Plan**

**RESPONSIBLE AND POTENTIAL LEAD AGENCIES AND POSSIBLE FUNDING SOURCES**

| Hazard | Strategy | Responsible and Potential Lead Organizations | | | | | | | | | | | | Possible Funding Sources | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R2PC | LCSD | CAA | LCHD | Businesses | Local Units | Utilities | Private | Local DPW, LCRC | MDOT | LCDC | LEMC | FEMA | County Funds | Utilities | CAA | Private | Foundation | Local Units | MDOT/ FHWA |
| | 2. MH anchoring | | | | | | R | P | | | | | | X | | | | X | | X | |
| | 3. Securing loose items | | | | | | | | R | | | | | | | | | X | | | |
| | 4. Safe rooms and shelters | | | | | P | P | | P | | | | P | X | X | | | X | X | | |
| **Pipeline Accidents** | 1. Continued training | | P | | | | R | | | P | | | | X | X | | | | | X | |
| | 2. Pipeline location | | | | | | R | | | | | | P | | | | | | | X | |
| **Hazardous Materials Incidents – Fixed Site and Transportation** | 1. Continued training | | P | | | | R | | | | | | P | X | X | | | | | X | |
| | 2. Local ordinances | | | | | | R | | | | | | P | | | | | | | X | |
| | 3. Hazardous materials inventory | | | | | | | | | | | | R | | X | | | | | | |

R-Responsible Agent, P-Potentially Responsible Agent

**R2PC**=Region 2 Planning Commission; **LCSD**=Lenawee Co. Sheriffs Dept.; **CAA**=Community Action Agency; **LCHD**=Lenawee County Health Dept.; **FEMA**=Federal Emergency Management Agency**; CDBG**=Community Development Block Grant; **MDOT**=Michigan Department of Transportation; **FHWA**=Federal Highways Administration; **LCDC**=Lenawee County Drain Commissioner; **LEMC**=Lenawee County Emergency Management Coordinator; LEPC=Lenawee Emergency Planning Committee

## Implementation of Strategies by Local Units of Government

Each of Lenawee County's local units of government has as least one action that may be taken as a means of mitigation of a disaster. These actions, or the implementation of a strategy contained within the plan, is shown on the table entitled "Strategy Implementation by Local Unit of Government." Each of Lenawee County's townships, villages, and cities are shown on the table.

| Implementation Measure | Addison V | Adrian C | Adrian T | Blissfield T | Blissfield V | Britton V | Cambridge | Cement C | Clayton V | Clinton T | Clinton V | Deerfield T | Deerfield V | Dover T | Fairfield T | Franklin T | Hudson C | Hudson T | Macon T | Madison T | Medina T | Morenci C | Ogden T | Onsted V | Palmyra T | Raisin T | Ridgeway T | Riga T | Rollin T | Rome T | Seneca T | TecumsehC | TecumsehT | Woodstock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Extreme Temperatures*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Cooling centers | X | X | | | X | X | | X | X | | X | | X | | | | X | | | | | X | | | | | | | | | | X | | |
| 2. Utility bills | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Snow Storms*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Shelter identification | X | X | | | X | X | | X | X | | X | | X | | | | X | | | | | X | | X | | | | | | | | X | | |
| 2. Road clearance | X | X | | | X | X | | X | X | | X | | X | | | | X | | | | | X | | X | | | | | | | | X | | |
| 3. Snow drifting | X | X | | | X | X | | X | X | | X | | X | | | | X | | | | | X | | X | | | | | | | | X | | |
| ***Infrastructure Failures*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Generators | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Burying utility lines | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Redundancies | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Elderly alerts | X | X | | | X | X | | X | X | | X | | X | | | | X | | | | | X | | X | | | | | | | | X | | |
| 5. Infrastructure maintenance | | X | | | X | | | | | | X | | X | | | | X | | | | | X | | | | | | | | | | X | | |
| 6. Tree trimming | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. Public awareness of Miss Dig | X | X | X | X | X | X | X | X | X | X | X | | X | | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| ***Ice and Sleet Storms*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Building maintenance | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| ***Lightning*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Tree trimming | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Buried utility lines | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Lighting protection devices | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Hail*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Preventive building materials | X | X | X | X | X | X | X | X | X | X | X | | X | | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| ***Severe Winds*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Wind engineering | | X | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| 2. MH anchoring | X | X | X | X | X | X | X | X | X | X | X | | X | | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| 3. Securing loose items | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Safe rooms | X | X | | | X | X | | X | X | | X | | X | | | | X | | | | | X | | X | | | | | | | | X | | |
| ***Structural Fires*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Code enforcement | X | X | X | X | X | X | X | X | X | X | X | | X | | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |

| Implementation Measure | Addison V | Adrian C | Adrian T | Blissfield T | Blissfield V | Britton V | Cambridge | Cement C | Clayton V | Clinton T | Clinton V | Deerfield T | Deerfield V | Dover T | Fairfield T | Franklin T | Hudson C | Hudson T | Macon T | Madison T | Medina T | Morenci C | Ogden T | Onsted V | Palmyra T | Raisin T | Ridgeway T | Riga T | Rollin T | Rome T | Seneca T | TecumsehC | TecumsehT | Woodstock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2. Smoke detectors | X | X | X | X | X | X | X | X | X X | X | X | | X | | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| 3. Training | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 4. Sprinkler older buildings | X | X | | | X | X | | X | X | | X | | X | | | | X | | | | | X | | X | | | | | | | | X | | |
| ***Riverine Flooding*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Floodplain identification | X | | | X | | X | X | X | X | X | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X |
| 2. Structures in floodplain | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 3. Adopt local regulations | X | | | X | | X | X | X | X | X | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X |
| 4. Retrofit existing structures | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Join NFIP | X | | | X | | X | X | X | X | X | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X |
| 6. Continue NFIP compliance | | X | X | | X | | | | | | X | | X | | | | X | | | | | | | | | | | | | | | X | | |
| 7. Wetland protection | X | X | X | X | X | X | X | X | X | X | X | | X | | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| ***Drought*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Water storage | X | X | | | X | X | | | X | | X | | X | | | | X | | | X | | X | | X | | | | | | | | X | | |
| 2. Water rationing | X | X | | | X | X | | | X | | X | | X | | | | X | | | X | | X | | X | | | | | | | | X | | |
| 3. Agricultural insurance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Tornadoes*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Construction techniques | X | X | X | X | X | X | X | X | X | X | X | | X | | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| 2. MH anchoring | X | X | X | X | X | X | X | X | X | X | X | | X | | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| 3. Securing loose items | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Safe rooms and shelters | X | X | | | X | X | | X | X | | X | | X | | | | X | | | | | X | | X | | | | | | | | X | | |
| ***Pipeline Accidents*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Continued training | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2. Pipeline location | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| ***Hazardous Materials Incidents*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Training | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2. Local ordinances | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 3. Hazardous materials inventory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

# PLAN MAINTENANCE & IMPLEMENTATION

# Plan Maintenance and Implementation

## Implementation

The implementation of the Lenawee County Hazard Mitigation Plan will depend upon the cooperative efforts of several public and private entities, as well as the residents of Lenawee County. Implementation will focus first on strategies identified as "Top Priority". Where opportunities become apparent that enable implementation of a strategy due to a temporary or immediate change in perceived benefit, cost opportunity, or implementation potential, strategies may be implemented to take advantage of such opportunities. The Hazard Mitigation Planning Committee may be reconvened to address the details of specific mitigation strategies within local units of government which might be affected by specific hazards in the Plan. Where capital improvements are necessary, or where significant outlays of community funds are required, the Lenawee County Planning Commission will work with the Emergency Management Coordinator and local units of government to identify, in detail, the improvement or project necessary, and to locate appropriate funding.

## The Monitoring of Progress

The implementation of the policies and strategies contained with this plan will be monitored by the Lenawee County Planning Commission. The LCPC meets on a regular basis and will review hazardous events, their effect upon the Community, and the degree to which hazard mitigation strategies were effective in protecting human life and minimizing property damage. The LCPC will oversee implementation activities by local units of government, agencies, and private sector entities. The plan will be amended when deemed necessary or upon the request of the State of Michigan or Federal government.

In its evaluation of the Hazard Mitigation Plan, the LCPC will use the following criteria:

1. Has there been a potential or actual change in the hazards facing Lenawee County County?
2. Has new development in the Community resulted in a change in circumstances or conditions which necessitates a review or revision of strategies?
3. Have actions been taken, or strategies applied that reduce or eliminate the hazard's impact on the community?
4. Are there new programs or funding available to address specific hazards facing Lenawee County?
5. Are there changes in laws, regulations, techniques or practices that warrant an amendment to the plan?

## Plan Update

The Lenawee County Hazard Mitigation Plan will be reviewed and updated by amendment in 2015 or as deemed necessary prior to 2015. A review will take place within every five years, following plan approval. The Hazard Mitigation Plan will be incorporated into the Lenawee County Comprehensive Land Use Plan at its next update.

In addition, local units of government in Lenawee County will be encouraged to incorporate the hazard mitigation planning process into their local master plans. At the time of update, the community will be advised of the contents of the Hazard Mitigation Plan so that they may incorporate relevant provisions of the plan into their local master plan. Local units will be encouraged to review potential hazards facing their unit of government and to develop mitigation strategies which can be applied. The strategies resulting from this effort will be provided to the County Planning Commission for use in the preparation of the update to the Lenawee County Hazard Mitigation Plan.

## Public Participation

Public participation is viewed to be an important component in the planning process, in the development of the goals, objectives, and strategies contained within the plan, and also to facilitate the implementation of strategies.

The public, including area agencies, businesses, non-profits, academic institutions, and other invested parties, has and will continue to be offered opportunities for participation in the hazard mitigation planning process through the following:

1. **Public hearings** – public hearings will be held before each unit of government which considers adoption of the Lenawee County Hazard Mitigation Plan.
2. **Public discussion** – public discussion has, and will continue to be encouraged and received in open forums at Lenawee County Planning Commission meetings and the meetings of local planning and legislative bodies in Lenawee County.
3. **Web based opportunities** – Web based opportunities for citizen participation in the implementation and subsequent updates to the Lenawee County Hazard Mitigation Plan will be continued on an ongoing basis as the Plan is approved, reviewed and updated in the future. The draft Lenawee County Hazard Mitigation Plan has been available or public review.

# APPENDICES

Appendix A – Documents Pertaining to the Activities of the Hazard Mitigation Planning Committee

Appendix B – Minutes from the Lenawee County Planning Commission meeting of August 19, 2010

Appendix C – Summary of Community Survey Results

# Appendix A

## Documents Pertaining to the Activities of the Hazard Mitigation Planning Committee

**Contents**

1. **Meeting minutes from July 20, July 28, and August 4, 2010 meetings**
2. **Meeting announcements distributed to newspapers throughout Lenawee County**
3. **Correspondence received**

## MEETING MINUTES

M I N U T E S
LENAWEE COUNTY HAZARD MITIGATION PLANNING COMMITTEE
2nd Floor Conference Room
Lenawee County Courthouse
Adrian, Michigan
Tuesday, July 20, 2010

| | |
|---|---|
| Members Present: | Al Boggs, Rome Township Supervisor<br>Karol Bolton, Lenawee County Board of Commissioners<br>Susie Dice, Lenawee County Health Department<br>Howard Keller, Lenawee Intermediate School District<br>Steven May, Lenawee County Drain Commissioner<br>Curtis Parsons, Lenawee County Emergency Management Coordinator<br>Rick Renard, Raisin Charter Township Fire Chief |
| Staff Present: | Timothy Anderson, Region 2 Planning Commission |
| Others Present: | Joel Hess, GIS intern at Curtis Parson=s office<br>No members of the public were present. |

The meeting was called to order by Tim Anderson at 10:00 a.m

Item 1 Introductions

Members of the committee introduced themselves.

Item 2 Background on Hazard Mitigation Planning

The Committee discussed the purpose of the plan and the purpose of the meeting today. Mr. Anderson indicated that there would likely need to be three meetings of this committee. The first meeting to focus on hazard analysis; second meeting regarding goals and objectives; and third to discuss implementation. The draft of the plan would be taken to the Lenawee County Planning Commission for approval at the August 19 meeting, and then to be send on to Mike Sobocinski at Michigan State Police Emergency Management Division for his review prior to submittal to FEMA for approval

The plan would serve several purposes including identification of actors in mitigation planning, tie in with Curtis Parsons in development of his hazard analysis update, and make Lenawee County eligible for hazard mitigation grants from FEMA.Item 3 Review of Lenawee County Hazard History

The committee reviewed the hazard history. Mr. Anderson pointed out that the data on hazards were from various sources but the most important source was the committee members. The following summarizes the discussion:

*Civil Disturbances*

The draft indicates that there are no instances of civil disturbances or correctional facility uprisings. In fact, an incident occurred at the Gus Harrison facility in the late 1990's. No further documentation exists regarding casualties.

*Earthquakes*

No additional information provided as a result of the discussion.

*Subsidence*

No additional information provided as a result of the discussion.

*Scrap Tire Fires*

Tim Anderson contacted MDNRe regarding scrap tire facilities in Lenawee County. They are unaware of any registered or non-registered facilities in the County.

*Structural Fires*

Lengthy discussion regarding NFIRS as a data source. Rick Renard indicated that the source is good as long as local agencies report in. Mr. Anderson will take another look at the NFIRS web site for additional information regarding a breakout by fire type, property losses.

Discussion on Table 5-2 regarding pre-1960 housing units. It was decided to retain the table though it was pointed out that there are many sources of structural fires, mostly human error (e.g. space heaters, smoking, stove fires). Older houses tend to hold up to fire better than the newer ones so the table is of limited utility.

Rick Renard will also look into this.

*Wildfires*

Tim Anderson said that data specific to wildfires was difficult to find. They do occur in Lenawee County on occasion according to the Michigan Hazard Analysis. Rick suggested that NFIRS would have this information available.

*Riverine Flooding*

No additional information provided as a result of the discussion.

*Dam Failures*

Tim indicated that a FOIA request was needed for the MDNRe to release dam information. Steve may suggest several changes to the table regarding ownership of dams. He also provided information regarding location of some impoundments. Al Boggs suggested that the dam at Manchester should also be included among those that would effect Lenawee County in the event of failure.

*Energy Emergencies*

No additional information provided as a result of the discussion.

*Infrastructure Failures*

Susie Dice suggested that the internet and digital sources of information should be added to the list of examples. The fact that there are several transformers and substations located in the county was discussed. Rick pointed out that an effort is underway to reduce risk of infrastructure failure by adding electrical facilities.

*Passenger Transportation Accidents*

Loar=s Field was removed from the list of public use airports. A brief discussion regarding the location of Lenawee County on Detroit Metropolitan Airport and Willow Run flight paths.

*Hazardous Material Incidents: Fixed Site and Transportation*

Updated information from the LEPC indicates that there are 63 SARA Title III sites in Lenawee County. Rick will get NFIRS data regarding background and past incidents record.

*Nuclear Power Plant Accidents*

Considerable discussion regarding the vulnerability of Lenawee County in the event of an incident at Fermi II reactor in Monroe.

*Oil and Natural Gas Well Accidents*

Tim presented a map showing oil and gas well locations in Lenawee County. Though there are many well locations, they are not located in areas with high concentrations of population.

*Oil and Natural Gas Pipeline Accidents*

The draft incorrectly indicated that there is no history of pipeline explosions in the County. In fact, a natural gas pipeline did explode in Britton during the 1990's. (Note: upon subsequent telephone contact by Curt, Ridgeway Township Fire Chief Frayer indicated that the explosion occurred in February, 1996. No record of casualties or property damage though it can be assumed that some property damage occurred.).

*Nuclear Attacks*

No additional information provided as a result of the discussion.

*Sabotage/Terrorism/WMD*

Draft generally indicates that groups are active in Michigan. However, Curt reports that incidents regarding exploded improvised explosive devices have occurred in Lenawee County. Incidents are memory-based and specifics are somewhat lacking but there are no known casualties occurred as a result of the two incidents, both of which occurred in the late 1990's. One event occurred at the Adrian Cinemas on M-52 in Adrian Township, and the other occurred in an unspecified location in Dover Township. IEDs are classified as WMD=s by Homeland Security.

*Public Health Emergencies*

Susie Dice reported that there are no incidents of public health emergencies in Lenawee County. H1N1 epidemics were declared in some areas but not in Lenawee County.

*Drought*

Two incidents were reported in the NCDC database. However, the most severe drought in memory occurred in 1988, and should be mentioned in the text, if not the table. The years listed in the heading of the table should be changed to 1998-2009.

*Extreme Temperatures*

No additional information provided as a result of the discussion.
*Hail*

No additional information provided as a result of the discussion.

*Lightning*

No additional information provided as a result of the discussion.

*Tornadoes*

One typo noted. It was pointed out that there were two tornadoes on Palm Sunday in 1965. Other than that, no additional information provided as a result of the discussion.

*Severe Winds*

Given that there were 217 events listed under severe winds, Tim suggested that he would like to cut down on the number of reported severe wind events to those that equal or exceed 58 mph, but having noted that some of the incidents with lesser winds caused property damage, backed off that idea. The committee was of the opinion that the information was good and worth including.

*Snowstorms*

The most severe snowstorm in many people=s memory is the one that occurred in the late 1970's but is not within the NCDC timeline from 1993-2009. Mention should be made of that storm in the text.

*Ice and Sleet Storms*

No additional information provided as a result of the discussion.

Item 4 Vulnerability Assessment

The committee began to fill in the scoring matrix based based on a scoring system devised by Tim. It was clear that this was going to take a considerable amount of time and it was decided that Tim would email the spreadsheet to members who would fill it out. The average of the individual scores would be taken and the priorities would be taken from that.

Item 5 Call to the Public

Though the meeting was advertised, no members of the public were present.

Next meeting to be held at the same location on July 28 at 10:00 a.m. Meeting to be noticed in the newspapers. Topic of next meeting: results from hazard scoring, goals and objectives, mitigation.

Tim Anderson, Secretary

M I N U T E S
LENAWEE COUNTY HAZARD MITIGATION PLANNING COMMITTEE
2nd Floor Conference Room
Lenawee County Courthouse
Adrian, Michigan
Tuesday, July 28, 2010

| | |
|---|---|
| Members Present: | Al Boggs, Rome Township Supervisor<br>Karol Bolton, Lenawee County Board of Commissioners<br>Susie Dice, Lenawee County Health Department<br>Howard Keller, Lenawee Intermediate School District<br>Steven May, Lenawee County Drain Commissioner<br>Curtis Parsons, Lenawee County Emergency Management Coordinator<br>Rick Renard, Raisin Charter Township Fire Chief |
| Staff Present: | Timothy Anderson, Region 2 Planning Commission |
| Others Present: | Joel Hess, Intern at Curtis Parsons= office<br>Susan Richardson, Region 2 Planning Commission<br>Three members of the public were present. |

The meeting was called to order by Tim Anderson at 10:00 a.m

Item 1 Introduction

With the presence of members of the public, Tim Anderson summarized the purpose of the hazard mitigation planning effort and the work done at the previous meeting.

Item 2 Vulnerability Assessment

Tim Anderson summarized the results of the responses from the hazard scoring sheets that were returned by six members of the Committee. The preliminary results indicated that the top 10 hazards were 1. extreme temperatures; 2. Snowstorms; 3. Nuclear attacks; 4. Significant infrastructure failures; 5. Ice and sleet storms; 6. Lightning; 7. Severe winds; 8. Hail; 9. Drought; 10. Structural fires.

Mr. Anderson asked the committee to review the list and added that nuclear attacks as hazard #3 indicated that adjustments were needed to the weighting system. This hazard ranked highly due to the weighting giving Alikelihood of occurrence@ 30% of the total hazard score. There is very little that can be done by a county regarding nuclear attacks and mitigation measures for this hazard are not likely to receive a great deal of support.

Mr. Anderson presented a modified system with likelihood of occurrence receiving 40% of total score. This yielded the following top 10 hazard list: 1. Extreme temperatures; 2. Snowstorms; 3. Significant infrastructure failures; 4. Ice and sleet storms; 5. Lightning; 6. Hail; 7. Severe winds; 8. Nuclear attacks; 9. Structural fires; 10. Riverine flooding. KZ Bolton noted that the next five were 11. Drought; 12. Tornadoes; 13. Energy emergencies; 14. Wildfires; and 15. Public health emergencies.

Mr. Anderson asked the committee to review the modified list and comment. There was general agreement on the modified list but it was felt that some hazards should be ranked higher and some lower. In general, the list was consistent with the hazards that Lenawee County faces as long as mitigation measures are identified for all pertinent hazards. It was felt that nuclear attacks was not a pertinent hazard so it was removed from the list that are eligible from mitigation measures.

More adjustments were likely needed and no further action was taken on the hazard list at this time.

Item 3 Goals and Objectives

Mr. Anderson presented some goals and objectives as a starting point for further discussion. The goals included the following:

1. Prevent the loss of life and property damage as a result of the hazards that affect Lenawee County.
2. Improve response and recovery for man-made and natural disasters.
3. Enhance early warning systems.
4. Maintain essential public services.
5. Enhance public awareness.
6. Protect public health, safety, and welfare.
7. Reduce losses from man-made and natural disasters.
8. Protect the environment.
9. Make hazard mitigation a part of day-to-day community activities.
10. Develop a collaborative to manage resources and secure additional resources in the event of an emergency.

Objectives:

1. Amend zoning ordinances to incorporate hazard mitigation measures into site plan review, special land use procedures, and supplemental provision sections of the zoning ordinance.
2. Enhance coordination between response agencies.
3. Increase warning siren coverage and weather radio.
4. Provide resources to ensure provision of essential services.
5. Provide opportunities for public education including web sites, alerts, and social networking sites.
6. Provide additional storm shelters.
7. Enhance early warning systems and education of all hazards.
8. Enhance warning systems and notifications for identified special populations (e.g. non-English speakers, elderly residents, handicapped).
9. Support the continued implementation of MEMAC and MABAS systems.

Further review of the goals and objectives would be done during the first half-hour of the next meeting.

Item 4 Call to the Public

Three members of the public were present in response to public notice in the Daily Telegram. Two members of the public attended the meeting from interest in the topic. The other member of the public, Jim Martin, provided the attached correspondence subsequent to the meeting.

Next meeting to be held at the same location on August 4th at 9:30 a.m. if room is available. Meeting to be noticed in the newspapers. Topic of next meeting: completion of goals and objectives, and hazard mitigation implementation element.

Tim Anderson, Secretary

M I N U T E S
LENAWEE COUNTY HAZARD MITIGATION PLANNING COMMITTEE
2nd Floor Conference Room
Lenawee County Courthouse
Adrian, Michigan
Wednesday, August 4, 2010

| | |
|---|---|
| Members Present: | Al Boggs, Rome Township Supervisor<br>Howard Keller, Lenawee Intermediate School District<br>Steven May, Lenawee County Drain Commissioner<br>Curtis Parsons, Lenawee County Emergency Management Coordinator<br>Rick Renard, Raisin Charter Township Fire Chief |
| Members Absent: | Karol Bolton, Lenawee County Board of Commissioners<br>Susie Dice, Lenawee County Health Department |
| Staff Present: | Timothy Anderson, Region 2 Planning Commission |
| Others Present: | Joel Hess, Intern at Curtis Parsons= office |

The meeting was called to order by Tim Anderson at 9:30 a.m

Item 1 Hazard Rankings

After reviewing the hazard rankings, the committee considered a list of hazards that have affected Lenawee County in the past based on the hazard history. There was agreement that the following hazards were to be considered:

1. Extreme temperature
2. Snow storm
3. Infrastructure failure
4. Ice and sleet storm
5. Lightning
6. Hail
7. Severe wind
8. Structural fire
9. Riverine flooding
10. Drought
11. Tornado
12. Pipeline accident
13. Hazardous materials incidents - fixed site and transportation

any of the remaining hazards are possible in the county, but their score does not register highly in the hazard scoring spreadsheet.

Item 2 Goals and Objectives

In light of the final hazard rankings, the goals and objectives discussed at the previous meeting remained the same:

Goals:
1. Prevent the loss of life and property damage as a result of the hazards that affect Lenawee County.
2. Improve response and recovery for man-made and natural disasters.
3. Enhance early warning systems.

4. Maintain essential public services.
5. Enhance public awareness.
6. Protect public health, safety, and welfare.
7. Reduce losses from man-made and natural disasters.
8. Protect the environment.
9. Make hazard mitigation a part of day-to-day community activities.
10. Develop a collaborative to manage resources and secure additional resources in the event of an emergency.

Objectives:
1. Amend zoning ordinances to incorporate hazard mitigation measures into site plan review, special land use procedures, and supplemental provisions sections of the zoning ordinance.
2. Enhance coordination between response agencies.
3. Increase warning siren coverage and weather radio.
4. Provide resources to ensure provision of essential services.
5. Provide opportunities for public education including web sites, alerts, and social networking sites.
6. Provide additional storm shelters.
7. Enhance early warning systems and education of all hazards.
8. Enhance warning systems and notifications for special populations.
9. Support the continuing implementation of the MEMAC (Michigan Emergency Management Assistance Compact), and MABAS-MI (Mutual Aid Box Alarm System) programs.

Item 3 Mitigation Measures

The committee discussed possible hazard mitigation measures for the list of top hazards. The hazard mitigation workbook was used as a resource and supplemented by the committee members. Measures were to be carried out by identified agencies and priorities were to be set according to hazard ranking.

Item 4 Call to the Public

No members of the public were present.

Mr. Anderson thanked the committee members for their efforts and indicated that he would probably not need another meeting. If the members were willing, he would request a meeting the next week.

Tim Anderson, Secretary

# MEETING ANNOUNCEMENTS

First Meeting Announcement

The Lenawee County Hazard Mitigation Committee will be holding a meeting on Tuesday, July 20th at 10:00 a.m. The meeting will be held in the 2nd Floor Committee Room at the Lenawee County Courthouse, 301 North Main Street, in Adrian.

The purpose of the meeting will be to discuss hazards that affect Lenawee County and mitigation actions that can be taken to reduce the effects of those hazards. Goals and objectives will also be discussed. The public is invited to attend the meeting.

For further information, please contact Timothy Anderson, Region 2 Planning Commission at (517) 786-6703 or email at tanderso@co.jackson.mi.us.

Date: July 12, 2010

Second Meeting Announcement

The Lenawee County Hazard Mitigation Committee will be holding a meeting on Wednesday, July 28th at 10:00 a.m. The meeting will be held in the 2nd Floor Committee Room at the Lenawee County Courthouse, 301 North Main Street, in Adrian.

The purpose of the meeting will be to discuss hazards that affect Lenawee County and mitigation actions that can be taken to reduce the effects of those hazards. Goals and objectives will also be discussed. The public is invited to attend the meeting.

For further information, please contact Timothy Anderson, Region 2 Planning Commission at (517) 786-6703 or email at tanderso@co.jackson.mi.us.

Date: July 21, 2010

Third Meeting Announcement

The Lenawee County Hazard Mitigation Committee will be holding a meeting on Wednesday, August 4th at 9:30 a.m. The meeting will be held in the 2nd Floor Committee Room at the Lenawee County Courthouse, 301 North Main Street, in Adrian.

The purpose of the meeting will be to discuss hazards that affect Lenawee County and mitigation actions that can be taken to reduce the effects of those hazards. Goals and objectives will also be discussed. The public is invited to attend the meeting.

For further information, please contact Timothy Anderson, Region 2 Planning Commission at (517) 786-6703 or email at tanderso@co.jackson.mi.us.

Date: July 30, 2010

# CORRESPONDENCE

## Memo

**To:** Timothy Anderson (Region 2 Planning Commission)
**From:** Jim Martin (Adrian College Associate Professor, Biology & RRWC Adopt-A-Stream Director)
**CC:** Stephen May (Lenawee Co. Drain Commissioner), Karol Bolton (Lenawee Co. Commissioner, District 5)
**Date:** 7/28/2010
**Re:** Hazard Assessment in Lenawee County

I attended, with interest, the Lenawee County Mitigation Committee's meeting of July 28 and have some comments I would like to relate. As the likelihood that a given hazard will be given attention is directly related to how high it ranks on the priority sheet (page 2, from the Priority, Risk and Vulnerability Assessment handout) it is very important that the various categories be scrutinized carefully. Further, it occurred to me that mitigation falls under a limited number of categories: 1) early warning systems (which were much discussed during this meeting), 2) structural alterations to landscapes or buildings that lessen the effects of a given hazard, and 3) preparedness of response teams or public agencies to a given hazard. Where similar mitigation strategies for a set of hazards overlap it would seem to be reasonable to combine them.

Severe weather dominates the 'top ten' list for Lenawee County; mitigation for these various emergencies (extreme temperatures, snowstorms, ice storms, lighting, hail, severe winds and drought or tornado) has both common and unique themes for each of these. Early warning is always helpful, despite the unique characteristics of each of these dangers. However, I think that many of these types of hazards are related in solution: while a lighting strike damages a structure in a different manner than severe winds do, and different construction elements are used to limit the destructive effects of either hazard, the mitigation remedy for both of them fall under zoning ordinance and building inspection. So I submit that many of these particular hazards are subcategories that can be combined.

Some of these hazards can be extremely dangerous yet occur over very short time periods (tornadoes, for example) others can be over much longer time scales and can trigger other disasters in a chain of reactions (an extensive drought could trigger a wildfire, for instance). This last problem is an important phenomenon often associated with disasters: one disaster triggering or concurrent with another (the example of power failure coupled with high temperatures and how that would put at risk populations in danger was discussed at today's meeting).

Riverine flooding barely made it on to the top ten list (though with the removal of nuclear attack as a threat to Lenawee County it edged up from ten to nine). Southeast Michigan is a soggy portion of the state and much of it has drainage canals so that the land can be exploited. These canals (there are about 3,000 miles of them in the River Raisin system; approximately 1000 miles of them overseen by the Lenawee County Drain Commission) speed water removal off the lands to keep them relatively dry. In large rain events, however, these channels rapidly move water down river and inundate floodplain all the way to Monroe, exporting nutrients, sediment, and pathogens into the western basin of Lake Erie and through all the communities it flows along the way.

Flood damage to property in particular regions of the flood plain due to a particular event may affect relatively small numbers of home owners (hence the relatively low rating that riverine flooding received in the metric). However, when floods come (and they can be frequent in a wet year) significant infrastructure failures, particularly at WWTPs, occur. When these happen, they release large quantities of untreated or semi-treated sewage directly into the waters (this last occurred May 21st of this year in the city of Adrian, but some years have seen these failures occur up to eight or nine times county wide). Large quantities of soil and fertilizers wash off the agricultural lands in these events as well. So riverine flooding is, in addition to being destructive to property, also a conservation problem and a public health issue.

Riverine flooding as a unique and complex hazard is appropriately addressed by the Lenawee County Mitigation Committee; there are actions this body could do that would lessen the effects of floods. The problem is, indeed, a bigger one than just our county however; the river's geography is larger than the jurisdiction of the county.

I appreciate the committee's time and effort on this serious issue. As the Boy Scout motto goes: Be Prepared. This is a much better place to be than the alternative.

# Appendix B

# Meeting Minutes of the Lenawee County Planning Commission Meeting of August 19, 2010

M I N U T E S
LENAWEE COUNTY PLANNING COMMISSION
Lenawee County Courthouse - Committee Room
Adrian, Michigan
Thursday, August 19, 2010

| | |
|---|---|
| Members Present: | Karol Bolton, Lenawee County Commission<br>Keith Dersham, City of Adrian<br>Becky Liedel, Madison Charter Township<br>Bill Saunders, Dover Township<br>Ralph Tillotson, Lenawee County Commission<br>Jim Tipton, Blissfield Township |
| Members Absent: | Howard Keller, Lenawee ISD |
| Others Present: | Tim Anderson, Secretary |

The meeting was called to order at 7:00 p.m. by Chairman Tipton.

**ITEM 1 APPROVAL OF MINUTES**

A motion was made by Comr. Liedel and seconded by Comr. Dersham to approve the minutes of the July 15, 2010 meeting. The motion passed unanimously.

**ITEM 2 APPROVAL OF AGENDA**

Mr. Anderson asked that two items be added: Item 5a regarding a farmland agreement application in Ogden Township. Also, under other business, request to change the date of the meeting to September 15.

Comr. Tillotson made the motion to approve the agenda as amended. Comr. Liedel seconded the motion which passed unanimously.

**ITEM 3 APPROVAL OF LENAWEE COUNTY HAZARD MITIGATION PLAN**

Mr. Anderson presented a draft of the Lenawee County Hazard Mitigation Plan for the review and approval of the LCPC. A six-page executive summary of the Plan was provided.

Mr. Anderson summarized the meetings of the Hazard Mitigation Planning Committee. At the first meeting, the Committee reviewed the hazard database and analysis and began the process of rating and ranking the hazards. Several hazard events were also added by the Committee.

The hazard rating and ranking systems were discussed. The top 13 hazards were identified. Goals and objectives as recommended by the Committee were described. Mitigation measures for all hazards and specific hazards were presented as well as incorporation of the Hazard Mitigation Plan into the Lenawee County Comprehensive Land Use Plan at the next update. Comr. Tillotson said that he disagreed with that notion because it is the surest way to stall progress on implementation of the plan.

Comr. Tipton commended the Committee for their work. Others agreed.

Comr. Saunders said that he would vote against the Plan because it represented an added layer of bureaucracy.

The motion was made by Comr. Liedel and seconded by Comr. Bolton to approve the Lenawee County Hazard Mitigation Plan with the following conditions:

1. That the plan be submitted to the Michigan State Police Emergency Management Division for their review and recommendations,
2. That the plan be forwarded to FEMA upon clearance from the MSP-EMD,
3. That the FEMA-approved plan be submitted to the Lenawee County Board of Commissioners for their approval, and
4. That the plan be incorporated into the Lenawee County Comprehensive Land Use Plan as part of its next update.

The motion passed by the following roll call vote: Yeas - Bolton, Liedel, Dersham, and Tipton; Nays - Saunders and Tillotson; Absent - Keller.

**ITEM 4 CONSIDERATION OF A LAND USE PLAN UPDATE FROM FRANKLIN TOWNSHIP**

Mr. Anderson presented a staff recommendation to find the five-year update to the Franklin Township Land Use Plan consistent with the plans of surrounding communities and the Lenawee County Comprehensive Land Use Plan. Mr. Anderson presented the land use plan map and a composite land use plan map of the county. No communities have responded as a result of distribution of the plan draft.

Comr. Dersham made the motion to find the Franklin Township Land Use Plan update consistent with the Lenawee County Comprehensive Land Use Plan. Comr. Saunders seconded the motion which passed unanimously.

**ITEM 5 CONSIDERATION OF P.A. 116 FARMLAND AGREEMENTS**

a. Beaverson (Medina Township)

The Commission reviewed an agreement for the submittal of 43 acres on the south side of Morenci Road in sections 3 and 10 of Medina Township for a 15-year term. The application was submitted by Daryl E. and Joni M. Beaverson, 13431 Morenci Road in Morenci. The application indicated that three buildings, including a home, were included in the application.

Considerable discussion ensued regarding the inclusion of buildings in the application. The Commission was concerned that the house could be removed from the agreement at some later date if the property were to be sold. If that were to happen, the property could fall below 40 acres and a demonstration would have to be made that the property can provide $200 per acre. Consideration should be given to not including the house in the application because on many occasions the members have seen a home removed from an agreement. However, a favorable motion was made.

Comr. Saunders made the motion to recommend that the agreement be approved. Comr. Tillotson seconded the motion which passed with one member voting in opposition.

b. Strouse (Ogden Township)

The members considered an application to enroll 40 acres for property on the north side of Mull Road between Crocket and Loar highways in Section 26 of Ogden Township for a period of 10 years. The application was submitted by William C. and Nancy J. Crouse, 7747 Riga Highway in Ogden Township.

Comr. Saunders made the motion to recommend that the agreement be approved. Comr. Bolton seconded the motion which passed unanimously.

**ITEM 6 DISCUSSION ON SOLID WASTE ACTIVITIES**

The members discussed the best location for a recycling drop-off center.

**ITEM 7 OTHER BUSINESS**

Mr. Anderson asked that the date of the September meeting be changed to Wednesday the 15th due to vacation and schedule conflict. The members agreed to the change.

There being no other business, the meeting adjourned at 8:15 p.m.

Timothy Anderson, Secretary

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# Appendix C

## Summary of

## Community Survey Results

# Lenawee County Hazard Mitigation Survey

## Introduction

In order to solicit local participation in the planning process, a survey was distributed by mail to the 34 local units of government in Lenawee County. These local units consist of 22 townships, eight villages and four cities. Initial response was somewhat limited so several rounds of follow-up phone calls were conducted.

The purposes of the survey was to identify hazards that are perceived to have the greatest effect on local units of government in Lenawee County, and understand whether any actions are being taken on the local level to address those concerns. In this way, gaps in preparation for hazards could be identified and responded to.

Surveys were delivered by mail to representatives from each community. Included in the mailing was a cover letter, the survey, and a sheet providing definitions of hazards.

## Survey Questions

The survey contained four questions. The first question asked respondents to choose the top five hazards from a list of 26 hazards listed in the hazard mitigation plan. A space was also provided for respondents to list any other hazards that the given community faces.

The second question was a follow up to Question 1. Respondents was asked whether any mitigation measures are taken to address identified hazards. Question 2 was open-ended.

The Hazard Mitigation Planning Committee identified hazards that they believe pose the greatest risk to Lenawee County. In Question 3, survey respondents were asked to review that list of hazards and signify their community's level of preparedness regarding the committee's list of top hazards.

Question 4 asked respondents to identify actions that can be taken to reduce the effects of hazards that can affect their community. The question was open-ended.

An open-ended general comments section was provided at the end of the survey as well as an optional request for contact information.

Response

Survey responses were received from 18 communities for a response rate of 53%. The following communities responded to the mailed survey:

- Adrian city
- Blissfield village
- Cement City village
- Clinton Township
- Clinton village
- Fairfield Township
- Franklin Township
- Hudson city
- Hudson Township
- Macon Township
- Madison Charter Township
- Medina Township
- Ogden Township
- Raisin Charter Township
- Rollin Township
- Rome Township
- Tecumseh city
- Tecumseh Township

Results

The responses from the survey are summarized in this section.

***Question 1 – Please the top five hazard categories that your community is most vulnerable to (Note: table listing hazards attached to survey).***

Results from Question 1 are provided in the following table.

| Community | Addison V | Adrian C | Adrian T | Blissfield T | Blissfield V | Britton V | Cambridge | Cement C | Clayton V | Clinton T | Clinton V | Deerfield T | Deerfield V | Dover T | Fairfield T | Franklin T | Hudson C | Hudson T | Macon T | Madison T | Medina T | Morenci C | Ogden T | Onsted V | Palmyra T | Raisin T | Ridgeway T | Riga T | Rollin T | Rome T | Seneca T | Tecumseh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Civil disturbance*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Earthquakes*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Subsidence*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Scrap Tire fires*** | | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | | | |
| ***Structural fires*** | | | | | 4 | | | | | | 4 | | | | 4 | 1 | | | | 3 | | | | | | | | | | 5 | | |
| ***Wildfires*** | | | | | | | | | | | | | | | | | | 1 | | | | | 3 | | | | | | | | | |
| ***Riverine flooding*** | | | | | 1 | | | | | | | | | | | | 1 | | | | | | 1 | | | | | | | | | |
| ***Dam failures*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 |
| ***Energy emergencies*** | | | | | | | | | | | | | | | | 5 | 2 | | | | | | | | | | | | 3 | | | |
| ***Infrastructure failures*** | | 5 | | | | | | | | | | | | | | | | | 3 | | | | | | | 3 | | | 5 | 3 | | |
| ***Passenger tranport accidents*** | | | | | | | | | | | | | | | 3 | | | | | | | | | | | | | | | | | |
| ***Hazardous material incidents*** | | 4 | | | 5 | | | | | | 5 | | | | | 2 | | 3 | | | 4 | | | | | | | | | | | |
| ***Nuclear power plant accidents*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 5 |
| ***Oil/natural gas well accidents*** | | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | | | |
| ***Oil/natural gas pipeline acci-*** | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | 3 |

| Community | Addison V | Adrian C | Adrian T | Blissfield T | Blissfield V | Britton V | Cambridge | Cement C | Clayton V | Clinton T | Clinton V | Deerfield T | Deerfield V | Dover T | Fairfield T | Franklin T | Hudson C | Hudson T | Macon T | Madison T | Medina T | Morenci C | Ogden T | Onsted V | Palmyra T | Raisin T | Ridgeway T | Riga T | Rollin T | Rome T | Seneca T | Tecumseh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***dents*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Nuclear attacks*** | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | |
| ***Sabotage/Terrorism/ WMD*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Public health emergencies*** | | | | | | | | | | | | | | | | | 3 | 4 | | | | | | | | | | | 4 | | | |
| ***Drought*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Extreme temperatures*** | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | 1 | | |
| ***Hail*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ***Lightning*** | | | | | | | | 5 | | | | | | | | | | | | | 3 | | | | | 5 | | | | | | |
| ***Severe wind*** | | 3 | | | 2 | | | 2 | | 1 | 1 | | | | 5 | | | | | 2 | | | 4 | | | | | | | | | 2 |
| ***Tornados*** | | | | | | | | 1 | | 2 | 2 | | | | 2 | 3 | 4 | | 2 | 1 | 5 | | 2 | | | | | | 1 | | | 1 |
| ***Snowstorms*** | | 2 | | | 3 | | | 3 | | 3 | | | | | | 4 | 5 | | 4 | 4 | 2 | | | | | 2 | | | | 2 | | |
| ***Ice and sleet storms*** | | 1 | | | | | | 4 | | 4 | 3 | | | | | | | | 5 | 5 | 1 | | 5 | | | 4 | | | 2 | 4 | | |

Reviewing the responses to Question 1, it was observed that the top hazards facing communities were natural hazards. Tornadoes, ice/sleet storms, snow storms, and severe winds made the top 5 lists in a majority of communities. Other natural hazards receiving votes included wildfires, riverine flooding, extreme temperatures, and lightning.

Among man-made hazard categories, structural fires, infrastructure failures, and hazardous material incidents, were each identified by five communities as being a top 5 hazard. Other man-made hazards identified were pipeline accidents, nuclear attacks, scrap tire fires, energy emergencies, passenger transportation accidents, public health emergencies, dam failures, and nuclear plant incidents. No community named civil disturbances, earthquakes, subsidence, oil/natural gas well accidents, sabotage/terrorism/WMD's, drought, or hail as a top 5 hazard.

Communities were given the opportunity to list any other hazards that have the potential to affect their community. Rollin Township was the only respondent here identifying long-term lake eutrophication as a hazard.

***Question 2 – Is your community currently taking any actions to prevent or reduce the impact of hazards that have the potential to have an impact on your community? If so, please describe these actions.***

The purpose of Question 2 was to discover current actions taken by communities to mitigate hazards identified in the previous question. Responses were open-ended and are presented in the following table:

| Community | Current Hazard Mitigation Measures |
|---|---|
| *City of Hudson* | -Electrical infrastructure improvements.<br>-Memo of agreement with Lenawee County EMA on public health cooperation.<br>-Test program for infrared surveillance camera for tornado/weather monitoring. |
| *Cement City Village* | Only normal maintenance (after the fact) |
| *City of Adrian* | -Bridge and dam inspection.<br>-Water valve exercising.<br>-City plan development.<br>-Joint training.<br>-Water source from well rather than lakes.<br>-Mutual aid agreements. |
| *Hudson Township* | Education on wildfires. |
| *Fairfield Township* | -Member of Lenawee County Emergency Action Guidelines.<br>-Fire prevention.<br>-Joint training with chemical plant and grain elevator. |
| *City of Tecumseh* | -Looking into "Code Red" automated phone notification system.<br>-Reviewing emergency preparation plans.<br>-Looking at early warning notification systems. |
| *Raisin Township* | -Working on additional planning as time allows.<br>-Looking at the installation of additional early warning sirens. |
| *Rollin Township* | -Severe weather alert siren<br>-Fire fighting/EMT services |
| *Tecumseh Township* | None |
| *Village of Blissfield* | -Working with MDNRE and FEMA in floodplain management<br>-We are considering the state MEMAC agreement |
| *Rome Township* | Building code |
| *Village of Clinton* | -Preventive maintenance<br>-Training<br>-Mutual aid |
| *Franklin Township* | We have a good fire department at two locations. |

As can be seen from the table, actions being taken to mitigate the hazards that communities face were somewhat varied. Several communities identified mutual aid agreements as a mitigating action. Early warning notification, training, and planning were also seen as important preventative measures.

***Question 3 - From the list of hazards on the previous page, the Hazard Mitigation Planning Committee prepared a list of hazards that they believe will have the greatest potential impact on Lenawee County. To the extent that these hazards apply to your community, please indicate your level of preparedness, if known:***

Results from Question 3 are provided in the following table:

| Community | Addison | Adrian C | Adrian T | Blissfield T | Blissfield V | Britton | Cambridge | Cement C | Clayton | Clinton T | Clinton V | Deerfield T | Deerfield V | Dover | Fairfield | Franklin | Hudson C | Hudson T | Macon | Madison | Medina | Morenci | Ogden | Onsted | Palmyra | Raisin | Ridgeway | Riga | Rollin | Rome | Seneca | Tecumseh | Tecumseh | Woodstock |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Structural fires*** | | V | | | V | | | U | | S | V | | | | V | V | S | V | V | V | S | | | | | V | | | V | S | | V | S | |
| ***Riverine flooding*** | | S | | | S | | | U | | U | S | | | | U | U | S | U | N | U | U | | U | | | U | | | N | | | U | S | |
| ***Dam failures*** | | S | | | S | | | U | | U | S | | | | U | U | U | U | U | U | U | | | | | U | | | N | | | U | U | |
| ***Infrastructure failures*** | | S | | | S | | | U | | U | S | | | | U | S | S | S | V | S | U | | | | | U | | | S | N | | U | S | |
| ***Hazardous material incidents*** | | V | | | S | | | U | | U | S | | | | U | S | S | V | S | S | U | | | | | S | | | S | S | | U | S | |
| ***Pipeline accidents*** | | N | | | S | | | U | | | U | | | | S | U | U | U | | S | U | | | | | S | | | U | N | | U | U | |
| ***Drought*** | | V | | | V | | | U | | U | N | | | | S | U | V | U | N | U | U | | S | | | U | | | U | | | S | U | |
| ***Extreme temperatures*** | | S | | | S | | | U | | S | N | | | | S | V | V | U | V | S | U | | | | | U | | | U | S | | V | U | |
| ***Hail*** | | U | | | S | | | U | | S | N | | | | S | S | U | U | S | S | U | | | | | U | | | U | | | N | S | |
| ***Lightning*** | | N | | | V | | | U | | | N | | | | S | S | S | S | S | S | U | | | | | U | | | U | | | N | S | |
| ***Severe wind*** | | V | | | S | | | U | | S | S | | | | S | S | S | S | S | S | U | | U | | | U | | | U | S | | U | S | |
| ***Tornados*** | | S | | | U | | | U | | S | S | | | | S | S | S | S | S | S | U | | U | | | S | | | S | S | | U | S | |
| ***Snow-storms*** | | V | | | V | | | S | | S | V | | | | S | S | V | S | V | U | S | | | | | S | | | S | S | | S | S | |
| ***Ice and sleet storms*** | | V | | | S | | | S | | S | S | | | | S | S | V | S | V | U | S | | U | | | S | | | U | S | | S | S | |

**Key: V – Very prepared S – Somewhat prepared U – Unprepared N – Unknown/Does not apply Blank – No response**

The purpose of Question 3 was to determine the level of preparedness to deal with the top hazards as identified by the Hazard Mitigation Planning Committee. The findings are presented in the following table:

| Hazard | Level of Preparedness | | | |
|---|---|---|---|---|
| | Very Prepared | Somewhat Prepared | Unprepared | Unknown/ Does Not Apply |
| *Structure fires* | 11 | 5 | 1 | 0 |
| *Riverine flooding* | 0 | 5 | 10 | 2 |
| *Dam failures* | 0 | 3 | 12 | 1 |
| *Infrastructure failures* | 1 | 9 | 6 | 1 |
| *Hazard materials incidents* | 2 | 10 | 5 | 0 |
| *Pipeline accidents* | 0 | 4 | 9 | 2 |
| *Drought* | 3 | 3 | 9 | 2 |
| *Extreme temperatures* | 4 | 6 | 6 | 1 |
| *Hail* | 0 | 7 | 7 | 2 |
| *Lightning* | 1 | 7 | 4 | 3 |
| *Severe winds* | 1 | 11 | 6 | 0 |
| *Tornadoes* | 0 | 13 | 5 | 0 |
| *Snowstorms* | 5 | 11 | 1 | 0 |
| *Ice/sleet storms* | 3 | 12 | 3 | 0 |

The response indicates that there are significant variances in the levels of preparedness for the hazards that can affect Lenawee County.

According to the survey responses, the highest levels of preparedness are found in relation to structural fires where 14 communities rated their preparation as either very prepared or somewhat prepared. Other high preparedness levels are found in the categories of ice/sleet storms and snow storms where state and county road agencies, utilities, and private companies bear the highest levels of responsibility.

Judging by the survey response, local units of government are relatively unprepared to deal other hazards. A weighted average of the hazard responses indicates that riverine flooding, dam failures, pipeline accidents, and hail score the low-est in terms of local preparedness.

***Question 4 – Are there any actions that can be taken to lessen the effects of the hazards which can affect your community?***

The purpose of Question 4 was to discover any other potential actions that could be taken by communities to mitigate hazards. Responses were open-ended and are presented in the following table:

| Community | Current Hazard Mitigation Measures |
|---|---|
| *City of Tecumseh* | -Local TV programs that cover emergency preparedness prior to emergencies happening.<br>-Government access TV.<br>-Code Red phone notification system.<br>-Review of emergency preparedness plans. |
| *Village of Cement City* | -Emergency shelters<br>-Emergency generators<br>-Evacuation plan<br>-Larger equipment (tractors, snow blowers) |
| *Fairfield Township* | More in-depth training |
| *Madison Township* | Not without additional training and resources |
| *City of Adrian* | -Helpful to have siren system city wide.<br>-Continue training<br>-Regional HAZMAT team.<br>-Table top exercise for dam failure.<br>-Additional notification systems via phone, text, radio. |
| *Ogden Township* | River Raisin cleaning |
| *Raisin Township* | Additional planning |
| *Rollin Township* | -Send safety tips with tax bills.<br>-Designate emergency shelters if available.<br>-Generator for township offices. |
| *Tecumseh Township* | None |
| *Village of Blissfield* | -Join MEMAC<br>-Coordinate planning with county emergency management coordinator. |
| *Rome Township* | More communication with residents and warning system. |
| *Village of Clinton* | Work on actions related to Question 2. |

## General Comments

Respondents were given the opportunity to provide comments regarding hazard mitigation. Results provided in the following table:

| Community | Current Hazard Mitigation Measures |
|---|---|
| *Hudson Township* | Better funding for fire departments would help greatly. |
| *Ogden Township* | I would like to have someone from Region 2 attend our local township meetings to explain some options we may have to meet these goals. There might also be |

| | |
|---|---|
| | some other concerns residents or other board members might have. |
| *Medina Township* | We tend to rely on our county emergency management. |
| *Fairfield Township* | More government funding for training. |
| *Tecumseh Township* | We purchase all our services from other municipalities and Lenawee County. |
| *Rome Township* | The best prevention is education of the people of the dangers they could endure under the different weather conditions. Also, they need to have a supply of food and water available that will sustain them for a few days. |