

Jackson County, Michigan Hazard Mitigation Plan

Prepared by the Region 2 Planning Commission
for the Jackson County Board of Commissioners
and Local Units of Government within Jackson County

Approved by Jackson County Board of Commissioners: December 13, 2011
Approved by Federal Emergency Management Agency: December 27, 2011

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INTRODUCTION

Jackson County Hazard Mitigation Plan

Introduction

Purpose

In recent years with Hurricane Katrina, massive flooding, and powerful earthquakes, natural disasters have rocked our country and the world. In our own community we have experienced massive ice and snow storms, hazardous material threats on our highways, powerful electrical storms, tornadoes, and a broken gas pipeline. These natural disasters affect our economy and our quality of life. They are costly, disruptive, and they threaten health, welfare, and human life. 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 (MSP) Emergency Management and Homeland Security Division have partnered to encourage communities to plan for disasters, and to develop and implement mitigation strategies to reduce the likely severity of these types of disasters. They have provided grant funding for the preparation of this plan. They also provide incentives to communities through FEMA grant programs for hazard mitigation, to reduce the potential threat to life and property damage caused by natural hazards.

The Hazard Mitigation Plan is a community plan that anticipates natural, technological, and human related disasters, and identifies actions and activities to implement before disasters happen, 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 Jackson County Sheriff Department and the Jackson County Health Department.

Hazard Mitigation Plans have a pre-disaster focus, to develop strategies and actions to implement prior to the occurrence of disaster 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.

Introduction

Our community faces a wide range of potential hazards. They include the following:

<ul style="list-style-type: none">× Civil Disturbances× Earthquakes× Subsidence× Scrap Tire Fires× Structural Fires× Wildfires× Riverine Flooding× Dam Failures× Energy Emergencies× Significant Infrastructure Failures× Passenger Transportation Accidents× Hazardous Material Incidents× Nuclear Power Plant Accidents	<ul style="list-style-type: none">× Oil and Natural Gas Well Accidents× Oil and Natural Gas Pipeline Accidents× Nuclear Attacks× Sabotage/Terrorism/WMD× Public Health Emergencies× Drought× Extreme Temperatures× Hail× Lightning× Severe Wind Events and Tornadoes× Snowstorms× Ice and Sleet Storms
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The Hazard mitigation planning effort includes a review of these potential threats, and an analysis to determine which threats are most likely to occur in our community. The plan includes a set of strategies which address those hazards which are most likely to occur, affect a high percentage of population, have potential for severity, and have a potential for negative impacts on the economy. The preparation of a hazard mitigation plan requires the involvement of agencies and governmental departments which have responsibilities in emergency response, public utilities, elected officials of local units of government, planners, and citizens. The planning process offers opportunities for community collaboration in an attempt to maximize the effectiveness and efficiency of mitigation efforts. This

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maximization of efficiency and effectiveness helps to ensure the maximum community benefit, and to avoid expenditures for the mitigation of hazards which have low risk to the community.

This Hazard Mitigation Plan contains the following:

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 potentially face our community, there is a wide range of alternative approaches for mitigating these hazards.

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.

Introduction

5. Public education and awareness including public information, dissemination, public relations, public hearings, surveys, and public education.

Finally, it is important that hazard mitigation planning be fully incorporated into the community planning process. Many of the mitigation strategies which may be employed 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 benefit.

Jackson County Hazard Mitigation Plan

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PLAN PREPARATION

Jackson County Hazard Mitigation Plan

Plan Preparation and Local Unit Involvement and Participation

Staff Involvement

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

Jackson Community Planning Committee

Oversight and the preparation of the Jackson County Mitigation Plan was provided by the Jackson Community Planning Committee at regular meetings of the Committee on February 22, and April 26, 2007; and July 24, August 28, and October 23, 2008. Meeting topics included an introduction to hazard mitigation planning and the identification and ranking of hazards, a review of possible mitigation strategies, plan goals and objectives, development and approval of strategies, and approval of the draft plan.

The Community Planning Committee consists of the chief elected officials of the County of Jackson, the City of Jackson, and Jackson County's townships and villages. Each of the Community Planning Committee members, with the exception of the Jackson City Manager and the Jackson County Administrator, are elected officials who serve their local unit of government on a part-time basis. Each has a vocation and ability to view the hazard mitigation planning process from the perspective of an employer or employee in the private sector. In addition, input to the plan development was provided by representatives of the Jackson County Sheriff's Department, the Jackson County Health department, and the Office of Emergency Management and Homeland Security, Michigan State Police.

Meetings of the Community Planning Committee are public meetings. Annual meeting schedules are posted in the lobby of the Jackson County Tower building. In addition, meetings of the Committee are posted prior to each meeting 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,

Plan Preparation

and citizen input is desired and valued by Committee members. Citizen participation is viewed to be critical to successful plan implementation.

The draft Jackson County Hazard Mitigation Plan has been available for review on the Region 2 Planning Commission website continuously from its initial preparation. The plan has also been posted on occasion on the Jackson County website. No comments have been received as a result of these postings, however.

Citizen input was received on community goals as part of the process of preparing the Jackson Community Comprehensive Plan. Pertinent goals were incorporated into the Hazard Mitigation Plan. Four community meetings were held in the preparation of the Comprehensive Plan. An average of approximately ten citizens attended each of these meetings.

The Committee reviewed the plan, including goals and objectives and mitigation strategies, in July and October, 2008 and authorized the submission of the plan for review by the Emergency Management Division of the Michigan State Police and the Federal Emergency Management Agency.

Local Units of Government in Jackson County

In addition, local units of government in the county were contacted and requested to indicate their support for the hazard mitigation planning effort. In several cases, resolutions were adopted supporting the project.

On each occasion when the Hazard Mitigation Plan was discussed at a public meeting, citizens had the opportunity to comment on the preparation of the plan.

A listing of local units, their membership on the Community Planning Committee, and their interest in participating in the hazard mitigation program may be found on the table entitled "Local Unit Involvement and Participation". Local unit interest in the hazard mitigation plan, as described on the table, is based upon a unit's expression of interest or continuous involvement in meetings in which the draft plan was prepared.

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Opportunities for Participation of Neighboring Communities

Opportunities have been afforded to neighboring communities for participation in plan development. The Region 2 Planning Commission is involved in the production of plans in neighboring Hillsdale and Lenawee Counties. Each of these planning efforts included a series of meetings with planning commissions.

Opportunities for participation in hazard mitigation planning have been possible at these meetings.

At meetings of emergency managers involving neighboring jurisdictions, information has been distributed (at least quarterly) by MSP Coordinators about statewide local planning efforts. In addition, hazard mitigation planning efforts have been publicized statewide. Each of these opportunities has offered a means by which to inquire and comment upon the development of Jackson County's Plan (and for Jackson officials and citizens to comment on the plans of adjacent communities). Other than the flow of information between communities, a value in itself in the planning process, actual input from adjacent communities in plan preparation was limited.

Coordination with the Jackson Community Comprehensive Plan

The preparation of the Jackson County Hazard Mitigation Plan was coordinated with the Jackson Community Com-

Jackson County Hazard Mitigation Plan LOCAL UNIT INVOLVEMENT AND PARTICIPATION Prepared December, 2008			
Local Unit	Units of Governments with Zoning Ordinances	Member Community Planning Committee	Hazard Mitigation Plan Adoption
County of Jackson		X	
City of Jackson	X	X	
Blackman Township	X	X	
Columbia Township	X	X	
Concord Township	X	X	
Grass Lake Charter Township	X	X	
Hanover Township	X	X	
Henrietta Township	X	X	
Leoni Township	X	X	
Liberty Township	X	X	
Napoleon Township	X	X	
Norvell Township	X	X	
Parma Township	X	X	
Pulaski Township	X	X	
Rives Township	X	X	
Sandstone Charter Township	X	X	
Spring Arbor Township	X	X	
Springport Township	X	X	
Summit Township	X	X	
Tompkins Township	X	X	
Waterloo Township	X	X	
Village of Brooklyn	X	X	
Village of Concord	X		
Village of Grass Lake	X	X	
Village of Hanover	X	X	
Village of Parma	X	X	
Village of Springport	X	X	

Plan Preparation

prehensive Plan. The Community Planning Committee provided oversight in the preparation of both plans. Pertinent goals contained in the Jackson Community Comprehensive Plan were included as goals in the Hazard Mitigation Plan. The Community Planning Committee intends to incorporate hazard mitigation planning into the master planning process, with the 5-year update to the plan scheduled for 2010.

The following pages reprint meeting minutes from five of the Jackson Community Planning Committee meetings from a key period in the development of this hazard mitigation plan.

Local Zoning

Jackson County has no County Zoning Ordinance. Every village and township, and the City of Jackson, has a land use plan and zoning ordinance. Each local unit administers its zoning ordinance independently.

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Plan Preparation

**Thursday, February 22, 2007
 2nd Floor Commission Chambers
 Jackson County Tower Building
 4:00 p.m.**

I. CALL TO ORDER

The meeting was called to order at 4:05 p.m. by Chairman Tallis. A quorum was present.

ATTENDANCE			
Member	Alternate	Member	Alternate
Acker (P)		Kuzminski	Gaede (P)
Bamm (P)	Hawley (P)	Miltich	Spink
Day		Mitchell	
Childs		Siegart	Cryderman
DeGraaf		Snell (P)	Brockie
Dunn	Worden (P)	Stormont (P)	Harshbarger
Griffin		Surbrook (P)	Alyea
Hancock		Tallis (P)	Greiner
Herl	Reynolds	Tuttle (P)	Sterett
Huttenlocker (P)	Hannewald	Ulbin	Hagadorn
Jenkins		Walz	Nolte
Johnson (P)	Phelps	Ward	Webb

Others Present – Grant E. Bauman, R2PC and Kimberly Hines, R2PC.

II. PLEDGE OF ALLEGIANCE.

Those in attendance rose to offer the Pledge of Allegiance.

III. APPROVAL OF DECEMBER 21, 2006 MINUTES

Motion was made by Mr. Tuttle and supported by Mr. Snell to approve the minutes of the December 21, 2006 Community Planning Committee Meeting. Motion carried by unanimous voice vote.

IV. REVIEW AND PRESENTATION OF POTENTIAL DISASTER IN JACKSON COUNTY, BY GRANT E. BAUMAN, AICP, REGION 2 PLANNING COMMISSION.

Bauman spoke about the ongoing effort to develop a Hazard Mitigation Plan for Jackson County which will make participating local governments eligible to apply for hazard mitigation grants (when they become available in the State of Michigan). The first step in the process is to rank the following hazards accord-

Jackson County Hazard Mitigation Plan

ing to the risk they pose to county residents in terms of 1) how likely it is to occur, 2) the amount of people who will be affected, 3) the potential for causing death and injuries, 4) the potential for negative economic effects, and 5) public awareness of the hazard, as well as 6) any other related effects:

- **Civil Disturbances** (i.e., correctional facility uprisings; public demonstrations; and labor disputes);
- **Earthquakes and subsidence** (i.e., earthquakes and land subsidence);
- **Fire Hazards** (i.e., scrap tire fires; structural fires; and wildfires);
- **Flooding Hazards** (i.e., riparian and shoreline flooding and dam failures);
- **Energy and Utility/Infrastructure Failures** (i.e., energy emergencies, significant infrastructure failures, and transportation accidents);
- **Hazardous Materials Incidents** (i.e., fixed site and transportation-related hazardous materials incidents, nuclear power plant accidents, oil and gas well accidents, and pipeline accidents);
- **Homeland Security** (i.e., nuclear attacks, terrorism/sabotage/WMD, and public health emergencies); and
- **Extreme Weather** (i.e., drought, extreme temperatures, thunderstorm effects (i.e., hail, lightning, severe winds, and tornadoes), and severe winter weather (i.e., snowstorms and ice and sleet storms)).

Bauman reviewed a ranked listing of the hazards prepared by R2PC staff and requested any desired changes. The Committee came to a consensus on the following listing of the top seven hazards posing a risk to the residents and businesses of Jackson County:

TOP HAZARDS	
#1	ENERGY EMERGENCIES
#2	PUBLIC HEALTH EMERGENCIES
#3	SNOW STORMS
#3	ICE AND SLEET STORMS
#5	STRUCTURAL FIRES
#6	TORNADOES
#7	CIVIL DISTURBANCES

V. PUBLIC COMMENT.

No public comment was offered.

VI. OTHER BUSINESS.

1. Ray Snell offered an explanation of the overall job loss, created by the possibility of one of the prison facilities closing. It is estimated that there will approximately 50 jobs lost with another 150 relocating to other communities. It is also estimated that 20,000 prisoners will receive an early release.

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2. The next meeting of the Community Planning Committee is scheduled for Thursday, March 22, 2007.

VII. ADJOURNMENT.

Their being no further business, the meeting was adjourned at 4:55 p.m. by motion by Mr. Snell and supported by Mr. Tuttle.

Kimberly Hines
Recording Secretary

Jackson County Hazard Mitigation Plan

**Thursday,
Thursday, April 26, 2007
6th Floor Conference Room
Jackson County Tower Building
4:00 p.m.**

II. CALL TO ORDER

The meeting was called to order at 4:05 p.m. by Vice-Chairman Herl. A quorum was present.

ATTENDANCE			
Member	Alternate	Member	Alternate
Acker (P)		Kuzminski	Gaede (P)
Bamm	Hawley (P)	Miltich	Spink
Day		Mitchell (P)	
Childs		Siegart	Cryderman
DeGraaf		Snell (P)	Brockie
Dunn	Worden (P)	Stormont (P)	Harshbarger
Griffin		Surbrook	Alyea
Hancock		Tallis	Greiner
Herl (P)	Treacher	Tuttle	Sterett
Huttenlocker (P)	Hannewald	Ulbin	Hagadorn
Jenkins		Walz	Nolte
Johnson (P)	Phelps	Ward	Webb

Others Present – Grant E. Bauman, R2PC and Kimberly Hines, R2PC.

II. PLEDGE OF ALLEGIANCE.

Those in attendance rose to offer the Pledge of Allegiance.

III. APPROVAL OF FEBRUARY 22, 2007 MINUTES.

Motion was made by Mr. Snell and supported by Mr. Worden to approve the minutes of the February 22, 2007 Community Planning Committee Meeting. Motion carried by unanimous voice vote.

IV. HAZARD MITIGATION – POSSIBLE MITIGATION STRATEGIES.

A description of possible mitigation strategies was distributed with the agenda packet. Mr. Bauman briefly discussed the strategies, and they were reviewed and discussed by the Committee. The Committee found the proposed strategies to be appropriate with one exception: The Committee feels that fire sprinklers should not be required in new single-family residences located in distances greater than

Plan Preparation

a five-minute response time from fire stations. The Committee instead suggested that information on fire sprinklers be provided to developers as an educational strategy. Mr. Bauman was directed to proceed with the completion of the Hazard Mitigation Study using mitigation strategies as presented with the exception of residential sprinklers as a requirement outside areas with five miles of a fire station.

V. OTHER BUSINESS.

Motion was made by Mr. Snell and supported by Mr. Worden to cancel the scheduled May 24, 2007 meeting of the Jackson Community Planning Committee. Motion carried by unanimous voice vote.

VI. PUBLIC COMMENT.

No public comment was offered.

VII. ADJOURNMENT.

Their being no further business, the meeting was adjourned at 4:35 p.m.

Charles C. Reisdorf
Recording Secretary

Jackson County Hazard Mitigation Plan

**Thursday, July 24, 2008
2nd Floor Commission Chambers
Jackson County Tower Building
4:00 p.m.**

I. CALL TO ORDER

The meeting was called to order at 4:00 p.m. by Chairman Tallis. A quorum was present.

ATTENDANCE			
Member	A - Alternate	Member	Alternate
Acker		Kuzminski	Gaede (P)
Bamm	Hawley (P)	Miltich	Spink
Day (P)	Butler	Mitchell	
Childs		Cardenas (P)	Cryderman
Fortress	Gardner (P)	Snell	
Dunn (P)	Worden (P)	Stormont	Harshbarger
Griffin		Surbrook	Alyea
Hancock (P)		Tallis (P)	Greiner
Herl (P)	Treacher	Tuttle (P)	Sterett
Huttenlocher (P)	Hannewald	Ulbin	Hagadorn
Ludwig		Walz	Nolte (P)
Jenkins		Ward	Webb
Johnson (P)	Ballast		

Staff Present – Charles Reisdorf, R2PC

Others Present – Lt. Steve Rand, JSD; James Freeman, JC Health Dept; and Mike Sobocinski, MSP

II. PLEDGE OF ALLEGIANCE.

Those in attendance rose to offer the pledge of allegiance.

III. APPROVAL OF MARCH 27, 2008 MEETING MINUTES.

The Community Planning Committee reviewed the minutes of their meetings of March 27, 2008.

Motion was made by Ev Huttenlocher and supported by Shirley Johnson to approve the minutes of March 27, 2008 as printed. The motion carried by unanimous voice vote.

Plan Preparation

IV. HAZARD MITIGATION – PLANNING FOR SAFETY IN OUR COMMUNITY.

- A. Review of Plan progress. The Community Planning Committee received the presentation on hazard mitigation planning in Jackson County. The presentation included a definition of the term “hazard mitigation”, a description of the hazard mitigation planning process, a listing of possible hazards facing Jackson County and the prioritization of those hazards conducted in a previous meeting of the Jackson Community Planning Committee, and a discussion regarding goals and objects for the hazard mitigation plan.
- B. Approval of strategies to mitigate disasters. Those in attendance formed three groups to discuss the three highest priority hazards facing Jackson County – Energy emergencies, public health emergencies, and snow and ice storms. They reviewed possible strategies to mitigate the impact of these disasters on Jackson County. Each group made a brief presentation summarizing their discussions.

Mike Sobocinski, Lt. Steven Rand, and James Freeman set in on the group discussions for the energy, public health, and snow and ice emergencies.

V. PUBLIC COMMENT.

No public comment was offered.

VI. ADJOURNMENT.

Their being no further business, the meeting was adjourned at 5:15 p.m.

Charles C. Reisdorf
Recording Secretary

Jackson County Hazard Mitigation Plan

MINUTES
JACKSON COMMUNITY PLANNING COMMITTEE

Thursday, August 28, 2008
2nd Floor Commission Chambers
Jackson County Tower Building
4:00 p.m.

I. CALL TO ORDER

The meeting was called to order at 4:00 p.m. by Chairman Tallis. A quorum was not present.

ATTENDANCE			
Member	Alternate	Member	Alternate
Acker (P)		Kuzminski	Gaede (P)
Bamm	Hawley (P)	Miltich	Spink
Day (P)	Butler	Mitchell	
Childs		Cardenas (P)	Cryderman
Fortress	Gardner (P)	Snell	
Dunn	Worden (P)	Stormont	Harshbarger
Griffin		Surbrook	Alyea
Hancock (P)		Tallis (P)	Greiner
Herl (P)	Treacher	Tuttle	Sterett
Huttenlocher	Hannewald	Ulbin	Hagadorn
Ludwig		Walz	Nolte
Jenkins		Ward	Webb
Johnson (P)	Ballast		

Staff Present – Charles Reisdorf, R2PC

Others Present – Lt. Steve Rand, JSD; James Freeman, JC Health Dept; and Brad Piros, JCSD

II. PLEDGE OF ALLEGIANCE.

Those in attendance rose to offer the pledge of allegiance.

III. APPROVAL OF JULY 24, 2008 MEETING MINUTES.

The Community Planning Committee reviewed the minutes of their meetings of July 24, 2008.

Motion was made by Victor Cardenas and supported by Cliff Herl to approve the minutes of July 24, 2008 as printed. The motion carried by unanimous voice vote.

IV. HAZARD MITIGATION – PLANNING FOR SAFETY IN OUR COMMUNITY.

A. Review of Plan progress. The staff reported that the introduction, community profile, description of potential hazards, and the priority, risk, and vulnerability assessment sections of the plan had been completed. Staff is working on the goals and objectives and mitigation strategies sections of the plan.

B. The Community Planning Committee reviewed the proposed goals for the hazard mitigation plan including the following.

1. Guide development to assure a high quality environment.

Plan Preparation

MINUTES JACKSON COMMUNITY PLANNING COMMITTEE

2. Provide an urban environment that reflects cultural values and heritage, and is attractive and desirable.
3. Improve the transportation system to promote safety and efficiency.
4. Protect Jackson County's natural environment.
5. Strengthen and diversify Jackson's economy and promote high wage jobs.
6. Maintain a safe community and protect property.
7. Protect and preserve the housing stock of the community.

Staff is working on objective statements for each of these goals.

The Community Planning Committee was also provided a listing of possible mitigation strategies. The listing was organized in priority for the first 7 hazards identified as affecting Jackson County in their priority order. The balance of hazards which had the potential to affect the County follow in no particular order. In each case, for each hazard, a listing of at least one strategy is included. Members of the Community Planning Committee were asked to identify which strategies would help to mitigate disasters in Jackson County local units of government.

V. OTHER BUSINESS.

A question was asked regarding how township officials should handle calls regarding potential emergencies. If the threat is imminent, persons should call 911. If the call regards simply a question concerning how to handle a particular type of emergency Lt. Rand from the Jackson County Sheriff's office suggested contacting 211 for information.

VI. ADJOURNMENT.

There being no further business, the meeting was adjourned at 4:40 p.m.



Charles C. Reisdorf
Recording Secretary

Jackson County Hazard Mitigation Plan

**Thursday, October 23, 2008
2nd Floor Commission Chambers
Jackson County Tower Building
4:00 p.m.**

II. CALL TO ORDER

The meeting was called to order at 4:00 p.m. A quorum was present.

ATTENDANCE			
Member	Alternate	Member	Alternate
Acker (P)		Kuzminski	Gaede (P)
Bamm	Hawley	Miltich	Spink
Day (P)	Butler	Mitchell	
Childs		Cardenas (P)	Cryderman
Fortress	Gardner	Snell	
Dunn	Worden (P)	Stormont	Harshbarger
Griffin		Surbrook	Alyea
Hancock (P)		Tallis	Greiner
Herl (P)	Treacher	Tuttle	Sterett
Huttenlocher (P)	Hannewald	Ulbin	Hagadorn
Ludwig		Walz	Nolte
Jenkins		Ward	Webb
Johnson (P)	Ballast		

Staff Present – Charles Reisdorf, R2PC

Others Present – Lt. Steve Rand and Brad Piros, Jackson County Sheriff’s Department

II. PLEDGE OF ALLEGIANCE.

Those in attendance rose to offer the pledge of allegiance.

III. APPROVAL OF JULY 24, 2008 & AUGUST 28, 2008 MEETING MINUTES.

The Community Planning Committee reviewed the minutes of their meetings of July 24 and August 28, 2008.

Motion was made by Ev Huttenlocher and supported by Victor Cardenas to approve the minutes of the July 24, and August 28, 2008 meetings. The motion passed by unanimous voice vote.

IV. REVIEW AND APPROVAL OF “HAZARD MITIGATION PLAN & MITIGATION STRATEGIES” CHAPTER OF HAZARD MITIGATION PLAN.

The Committee was provided a presentation on the plan and mitigation strategies

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chapter of the Jackson County Hazard Mitigation Plan. The presentation included a set of mitigation strategies which applied generally, and mitigation strategies for each of the priority hazard areas identified by the Community Planning Committee. Following the presentation, the Committee agreed that the mitigation strategies proposed were appropriate and that the plan should be completed incorporating these strategies and submitted to the Federal Emergency Management Administration (FEMA) through the Michigan State Police Emergency Management Division for review and comment.

V. PUBLIC COMMENT.

There was no public comment; however, Committee members raised the following subjects for discussion at a future meeting of the Committee:

1. Wind Generation – Committee members discussed the ability of local units of government (due to State Pre-emption to adopt ordinances regarding wind generation. Such an ordinance exists for the City of Manistee. There's a need to study the impact on birds and bats, to address provisions for the sale of energy produced back to utilities, and to generally monitor the activities of the state and local units of government in addressing the wind generation issue.
2. The issue of pre-emption of local regulation of cell towers was discussed. There is a need for the Committee to look into the issue at a future meeting.
3. The Committee discussed financial problems affecting the Road Commission. It was suggested that we invite Ken Straub from the Jackson County Road Commission to a future meeting of the Community Planning Committee to discuss the manner. In a related matter, staff reported that the Michigan Department of Transportation has said that match funds necessary to match federal transportation planning monies would be insufficient by the year 2010.

VI. ADJOURNMENT.

Their being no further business, the meeting was adjourned at 4:40 p.m.

Charles C. Reisdorf
Recording Secretary

Jackson County Hazard Mitigation Plan

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COMMUNITY PROFILE

Jackson County Hazard Mitigation Plan

Community Profile

Regional Location

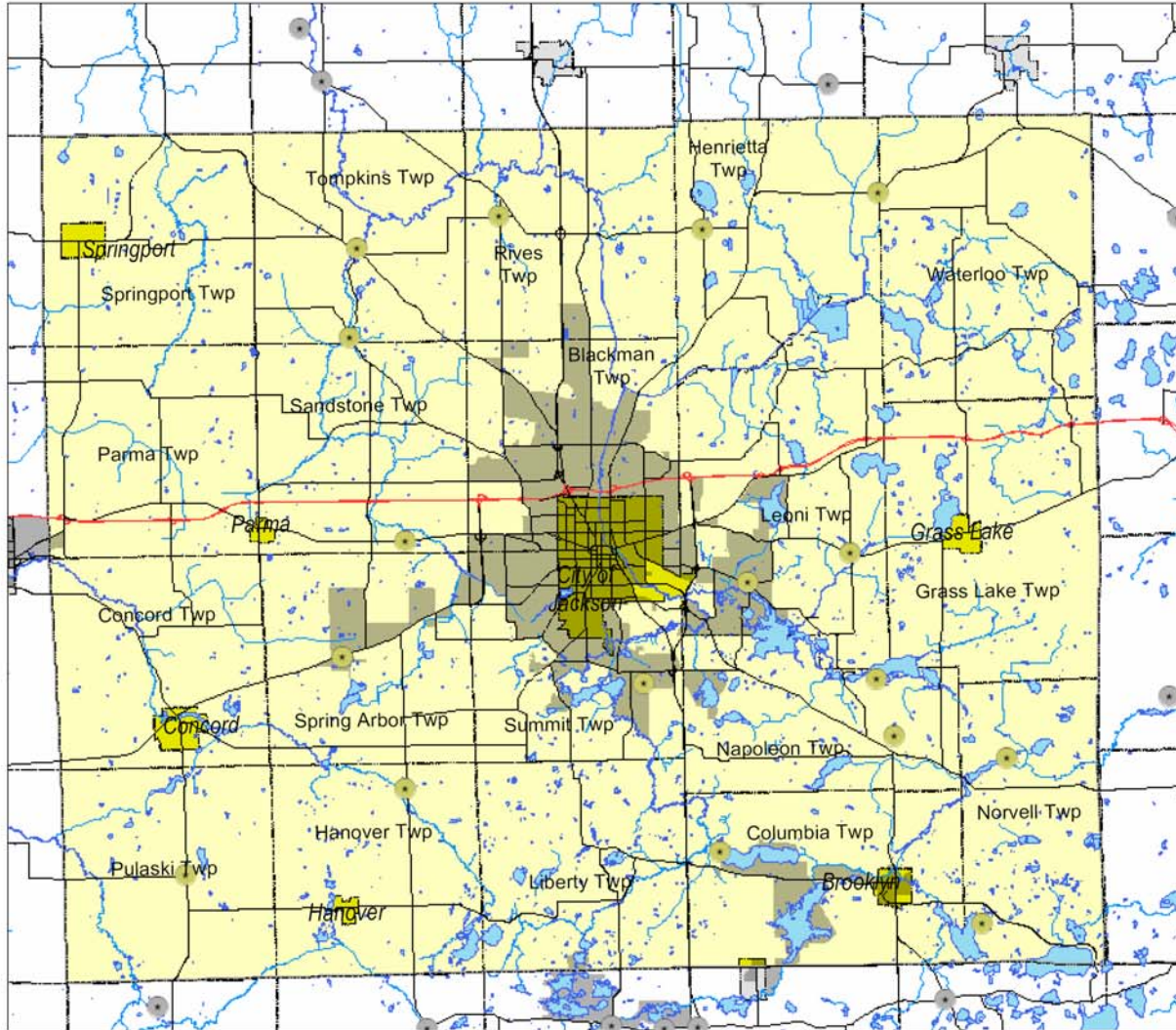
Jackson County is located in the south-central portion of the Lower Peninsula of Michigan, along the I-94 corridor and along US-127, which provides highway access to the north and south and bisects the county. Surrounding counties include Ingham to the north, Washtenaw to the east, Calhoun to the west, and Hillsdale and Lenawee to the south.

Political Jurisdictions

The county is composed of 19 townships, 6 villages, 1 city, and other small settlements. The townships and incorporated villages and the city are governed by elected boards and councils. County residents are also represented by the Jackson County Board of Commissioners. County residents are represented by 1 of the 12 commissioners serving on the governing body. The entire county is also part of Michigan District 7 of the US House of Representatives. The Townships of Parma, Sandstone, Spring Arbor, Pulaski, Hanover, Summit, and Napoleon; the City of Jackson, and the Villages of Parma, Concord, and Hanover are included in Michigan House District 64 and the rest of the county is included in District 65. The majority of the county is located in Michigan Senate District 19 although the Village of Grass Lake and the Townships of Summit, Leoni, Grass Lake, and Norvell are included in District 17.



Community Profile



Jackson County Communities

Municipalities

- Cities & Villages
- Townships
- ★ Unincorporated Settlements

Census Defined Geography

- Urbanized Areas

Transportation Facilities

- State Highways

Source:
Center for Geographic Information,
State of Michigan

Jackson County Hazard Mitigation

Jackson County Communities									
Community	County Comm. District	MI House District	MI Senate District	US House District	Community	County Comm. District	MI House District	MI Senate District	US House District
City					Townships (continued)				
Jackson	8, 9 & 10	64	19	7	Henrietta	2	65	19	7
Villages					Leoni	2 & 3	65	17	7
Brooklyn	4 & 5	65	19	7	Liberty	5	65	19	7
Cement City	5	65	19	7	Napoleon	4	64	19	7
Concord	6	64	19	7	Norvell	4	65	17	7
Grass Lake	2	65	17	7	Parma	1	64	19	7
Hanover	5	64	19	7	Pulaski	6	64	19	7
Parma	1 & 6	64	19	7	Rives	1	65	19	7
Springport	1	65	19	7	Sandstone	6 & 11	64	19	7
Townships					Spring Arbor	5 & 6	64	19	7
Blackman	10 & 12	65	19	7	Springport	1	65	19	7
Colombia	4	65	19	7	Summit	7	64	17	7
Concord	6	65	19	7	Tompkins	1	65	19	7
Grass Lake	2	65	17	7	Waterloo	2	65	19	7
Hanover	5	64	19	7					

Community Characteristics

Jackson County was home to 158,422 people in the year 2000, according to the US Census. The official estimate for the county in 2004 was 162,973 people, indicating slow but steady growth. Urbanized areas, which are based

Community Profile

upon population density, existed around Jackson (including portions of Blackman, Leoni, Napoleon, Summit, and Rives Townships); Spring Arbor (including Spring Arbor College and the M-60 corridor); and a portion of the Irish Hills Area (including Brooklyn and the areas surrounding Lake Columbia and Clark Lake in Columbia Township). It is also interesting to note that almost $\frac{3}{4}$ of the people lived in a township rather than a city or village in 2000. The following statistics about special groups of people also help to describe the population of Jackson County.

Population Density

The average density of population in the county was 224 people per square mile (ppsm) in the year 2000. However, population density varied significantly across the county from a high of 3,272 ppsm in the City of Jackson to a low of 42-170 ppsm in the rural townships. Population density within the urban townships surrounding the City of Jackson (i.e., Blackman, Leoni, Napoleon, Spring Arbor, and Summit Townships) ranged from 214-735 ppsm. It is important to note that areas within these urban townships that are also included within the urbanized area will have a greater population density than the surrounding township. It is also important to note that there are at least 17 unincorporated settlements within the county. Each of those settlements is likely to have a denser population than the surrounding township. Population density within the county's villages ranged from 502-1,525 ppsm.

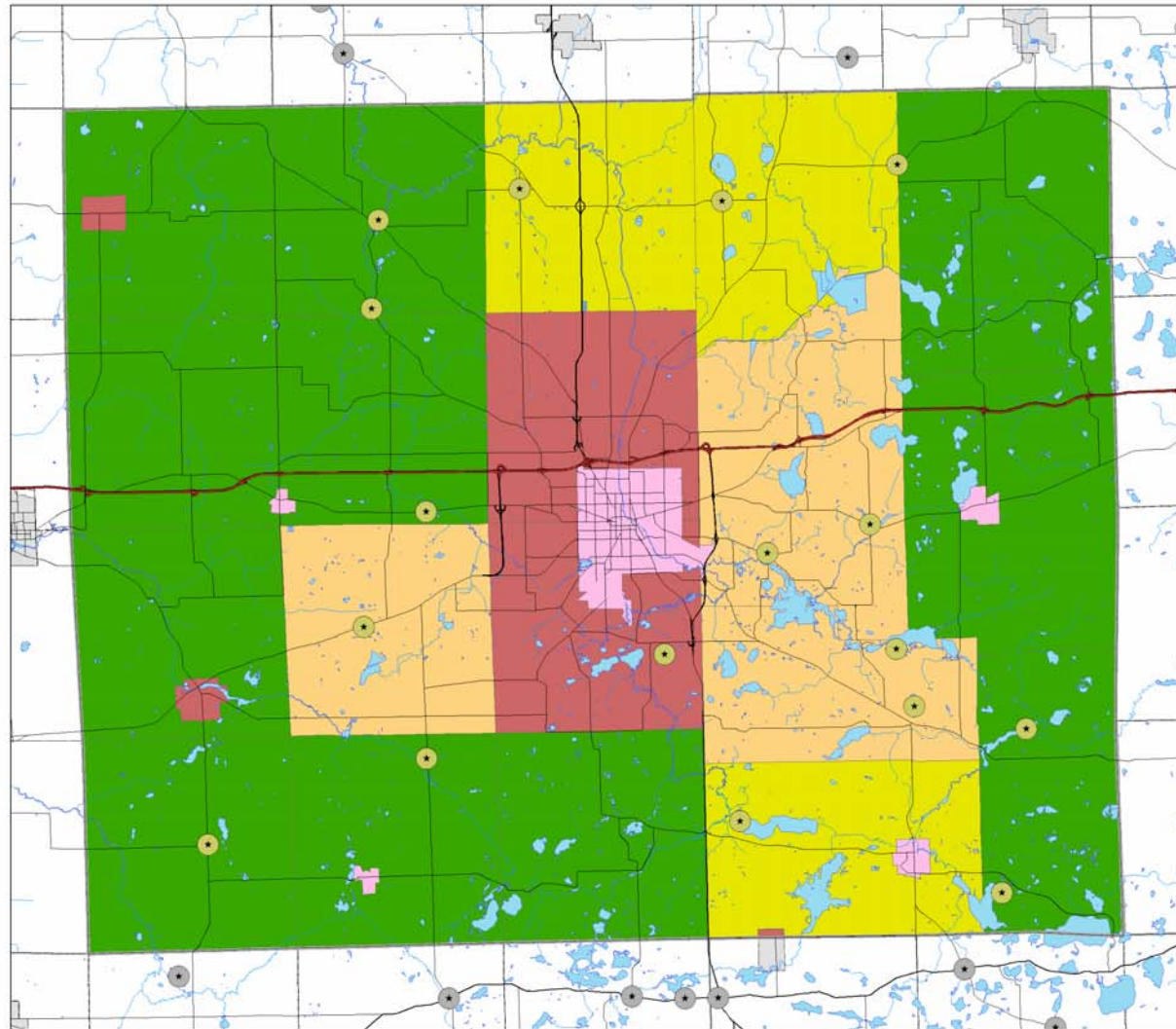
Populations with Special Needs

Several population groups within the county have special needs which must be given consideration in any serious analysis of the risks residents may have from hazards.

Elderly Residents

Fewer than 13% of Jackson County residents were at least 65 years old in the Year 2000, although this average varies widely. For example, the Village of Brooklyn (21.9%) and the Townships of Summit (17.8%) and Columbia (15.4%) had the highest ratios of elderly residents and the Village of Parma (8.7%) and the Townships of Rives (9.4%), Henrietta (9.5%), and Waterloo (9.5%) had the lowest ratios. There are at least 15 retirement/nursing homes in Jackson County, many of which are located within the Jackson Urbanized Area. The City of Jackson is also the location of Foote Health Systems, a regional hospital, and the Jackson County Medical Care Facility.

Jackson County Hazard Mitigation



Jackson County Population Density

People/Sq. Mile



Source:
Center for Geographic Information,
State of Michigan

Community Profile

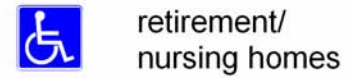
Jackson County Communities

Elderly Population

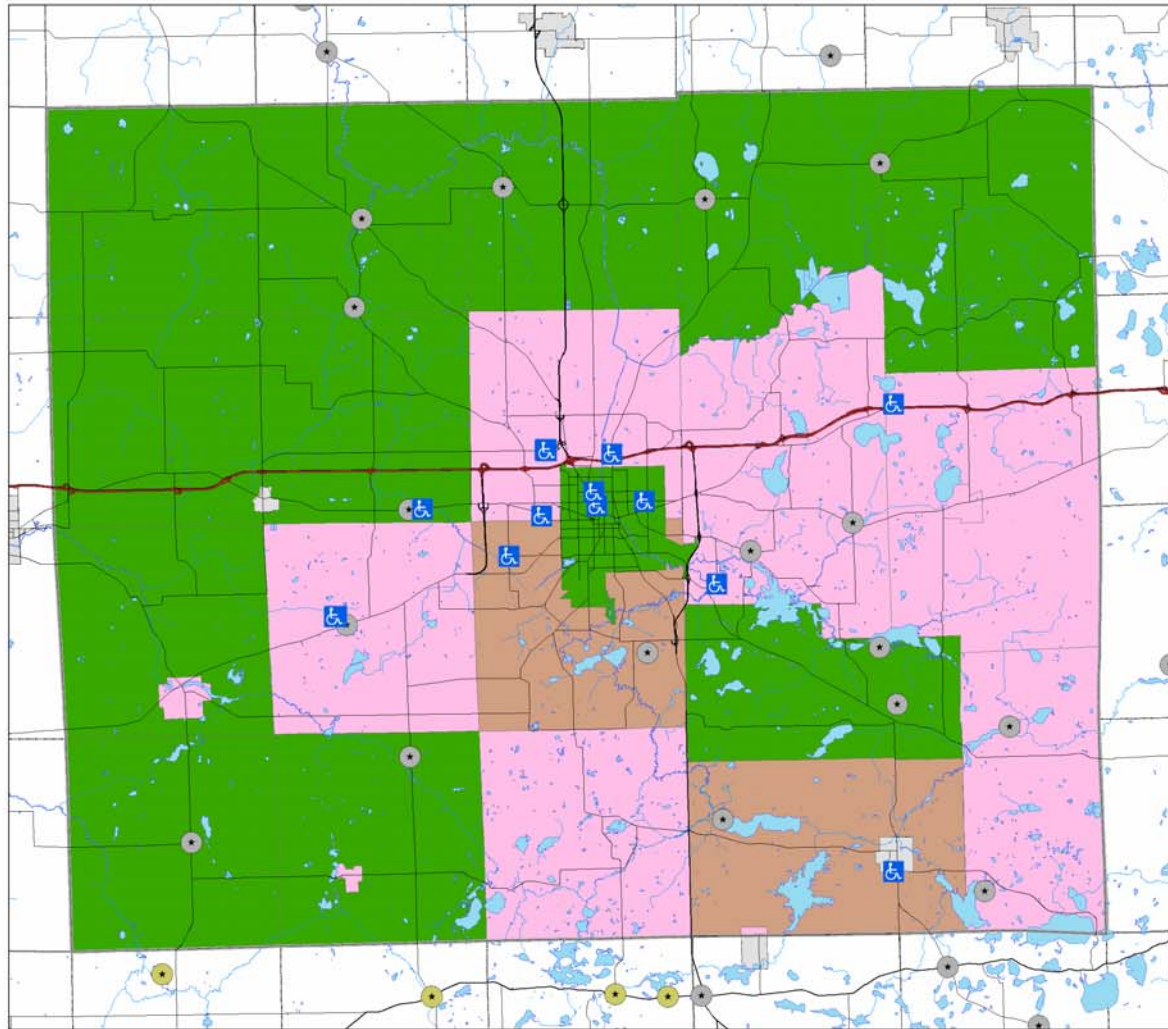
Population Over 64 Years of Age



Retirement/nursing homes



Source(s):
2000 US Census, Carepathways.com,
retirementhomes.com, and
doctordirectory.com



Jackson County Hazard Mitigation

Disabled Residents

The 2000 US Census surveyed the number of disabled people in two age groups:

- × **5-20 years of age.** Over 8% of residents between the ages of 5 and 20 were disabled in some way in the Year 2000, fairly representative of all the local governments which compose Jackson County. For example, the Townships of Parma (12.5%) and Pulaski (12.2%) had the highest ratios of disabled residents within the age group and the Village of Concord (3.5%) and the Township of Norvell (2.2%) had the lowest ratios.
- × **21-64 years of age:** Just over 19% of residents between the ages of 21 and 64 were disabled in some way in the year 2000, fairly representative of all local governments in the county. For example, Leoni Township (24.9%) and the City of Jackson (23.2%) had the highest ratios of disabled residents within the age group. The Villages of Concord (12.9%), Springport (13.1%), and Hanover (13.6%) had the lowest ratios of disabled residents in the age group.

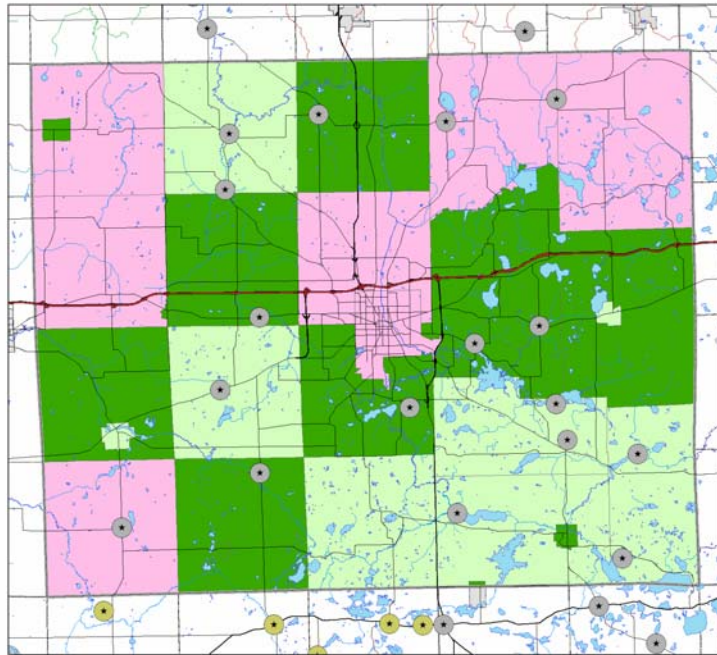
Impoverished Residents

The US Census considered 9% of Jackson County residents to have been poor in the Year 2000, although this varies greatly across the county. For example, the City of Jackson (19.6%) and the Village of Hanover (18.7%) had the highest ratios of poor residents. The Townships of Liberty (2.9%) and Grass Lake (2.3%) had the lowest ratios.

Foreign Language Speakers

Only 4% of Jackson County residents spoke a language other than English at home in the Year 2000, fairly representative of all the city villages, and townships which compose the county. For example, the Township of Blackman (6.1%) and the City of Jackson (5.7%) had the highest ratios. Pulaski Township (1.7%) and the Villages of Concord (1.7%) and Brooklyn (1.6%) had the lowest ratios.

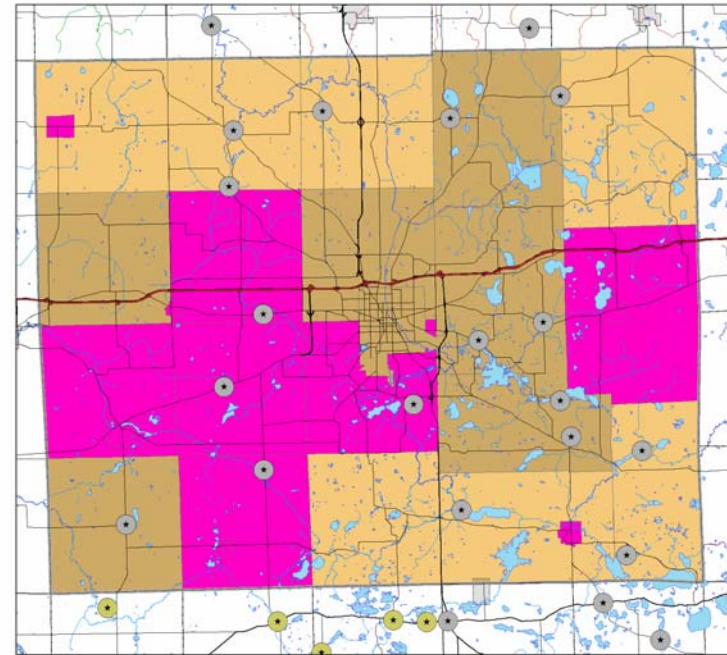
Community Profile



5-20 Years of Age

2.20% - 5.80%

5.81% - 8.40%



20-64 Years of Age

12.51% - 14.90%

14.91% - 17.50%

8.41% - 12.50%

17.51% - 24.90%

Jackson County Communities

Disabled Population

Source(s): 2000 US Census,
Center for Geographic Information,
Universal Maps, & R2PC

Jackson County Hazard Mitigation

School Populations

Children congregate daily within the school facilities located within Jackson County during the school year.

Public School Facilities

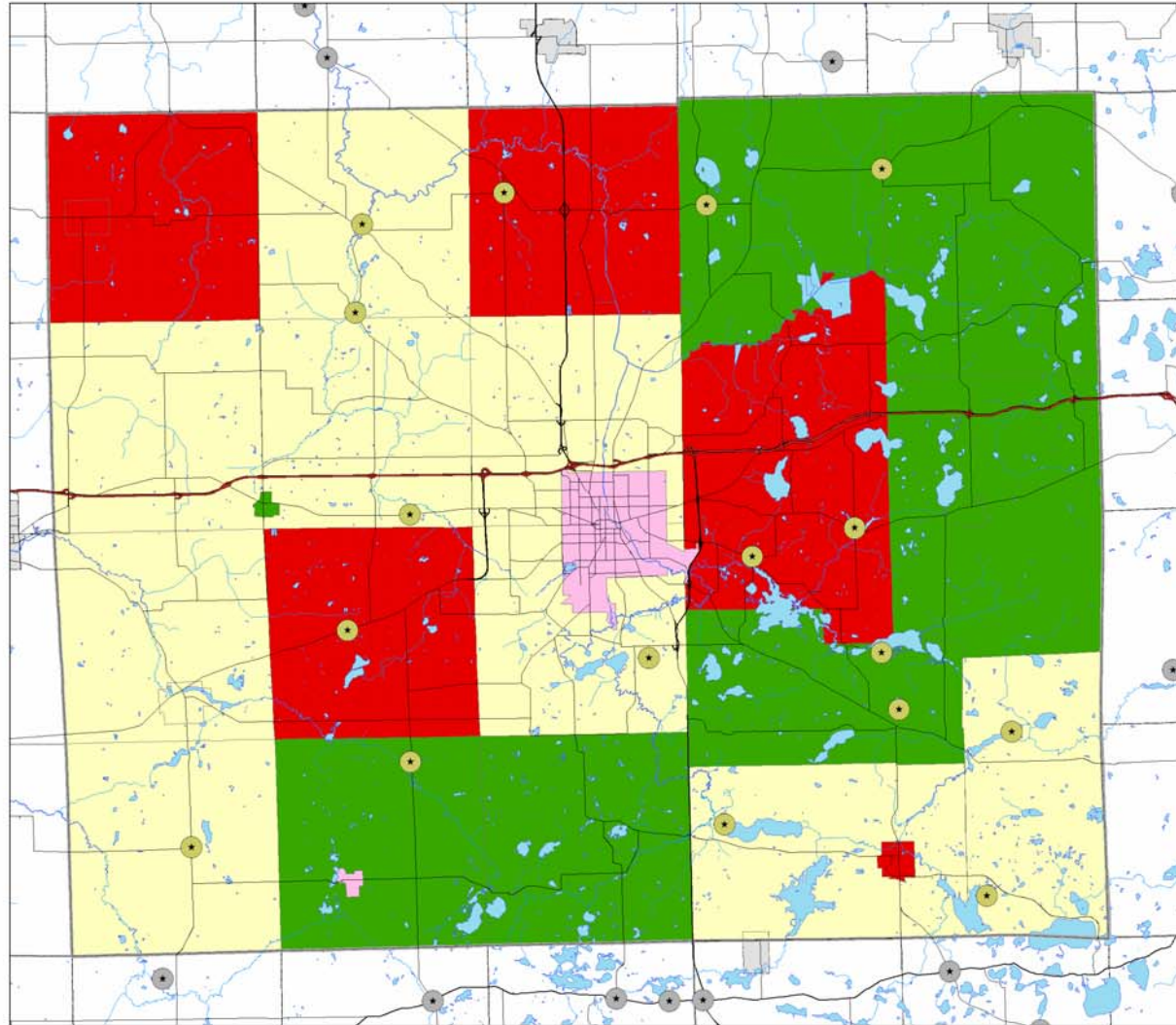
The public school facilities located within Jackson County are listed by school district:

Jackson Intermediate School District

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

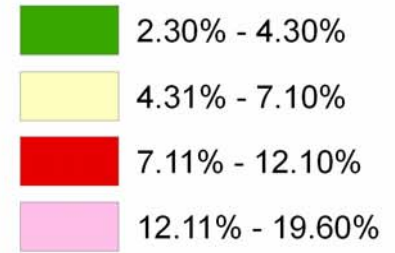
- × **Columbia School District.** Brooklyn (K-5) and Miller (K-5) elementary; Columbia Middle (6-8), Columbia Central High (9-12), and Columbia Community Education;
- × **Concord Community Schools.** Concord Elementary and Middle (K-8 located on a single campus) and Concord High (9-12);
- × **East Jackson Community Schools.** Bertha Robinson (K-5) and Memorial (K-5), East Jackson Middle (6-8), and East Jackson High (9-12);
- × **Grass Lake Community Schools.** George Long Elementary (K-6) and Grass Lake Junior/Senior High (7-12);
- × **Hanover-Horton Schools.** Hanover-Horton Elementary (K-5), Hanover-Horton Middle and High (6-12 located on a single campus);
- × **Jackson Public Schools.** Sharp Park (PK-1), TA Wilson (PK-4), Hunt (PK-6), Northeast (PK-6), Cascades (K-2), Bennett (K-5), Dibble (K-6), McCulloch (K-6), and Frost (2-6) elementary; Parkside (7-8) and Amy Firth Middle (7-9); and Jackson High (9-12);
- × **Michigan Center School District.** Arnold (PK-2), and Keicher (3-6) elementary, Michigan Center Junior and Senior High (7-12 on a single campus), and Clement School (9-12);
- × **Napoleon Community Schools.** Eby Elementary and Napoleon Middle and High Schools (K-12 on a single campus);

Community Profile



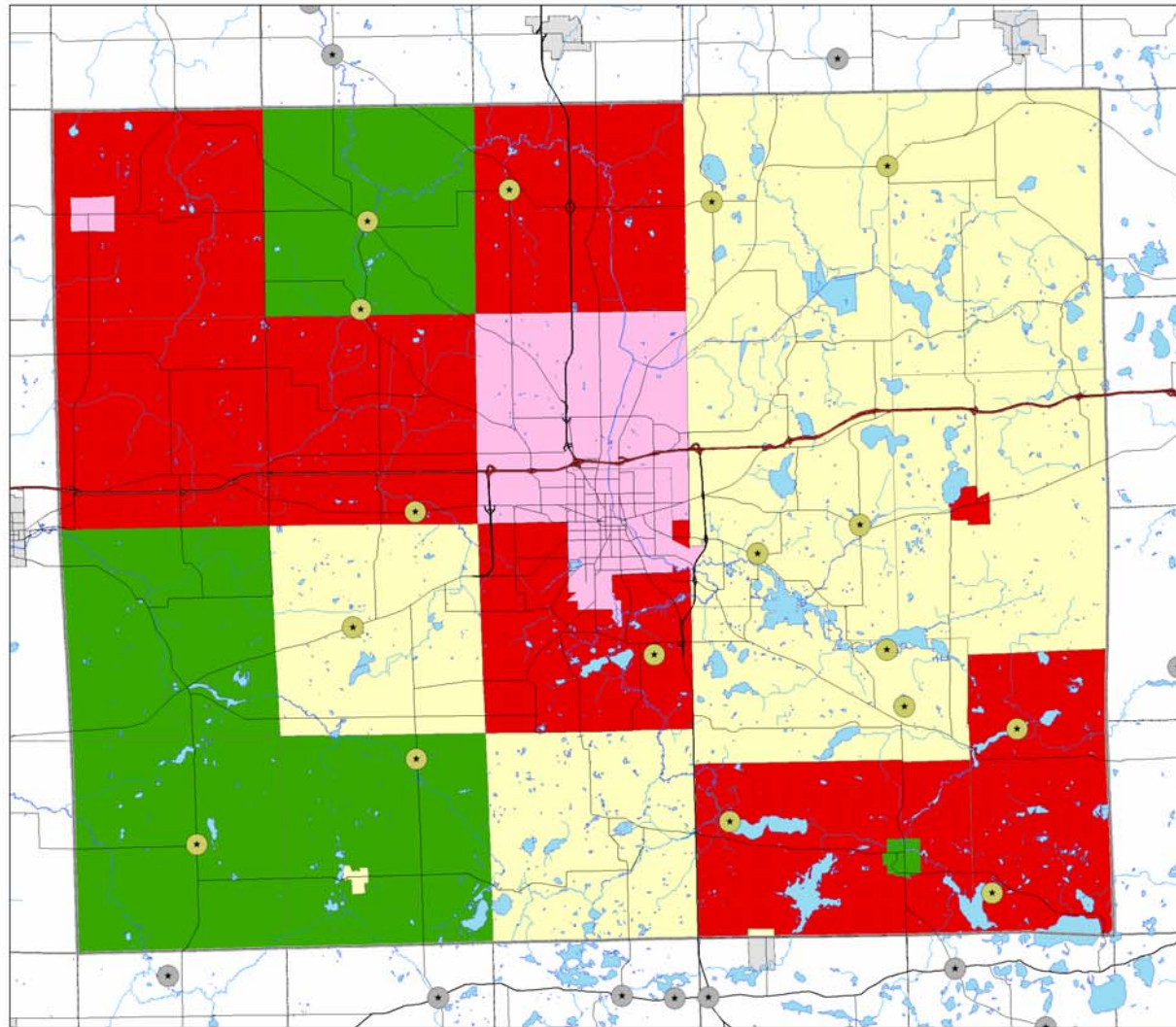
Jackson County Communities

People in Poverty

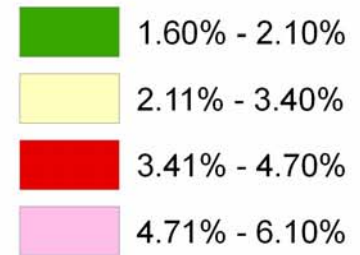


Source:
2000 US Census,
Universal Maps, & R2PC

Jackson County Hazard Mitigation

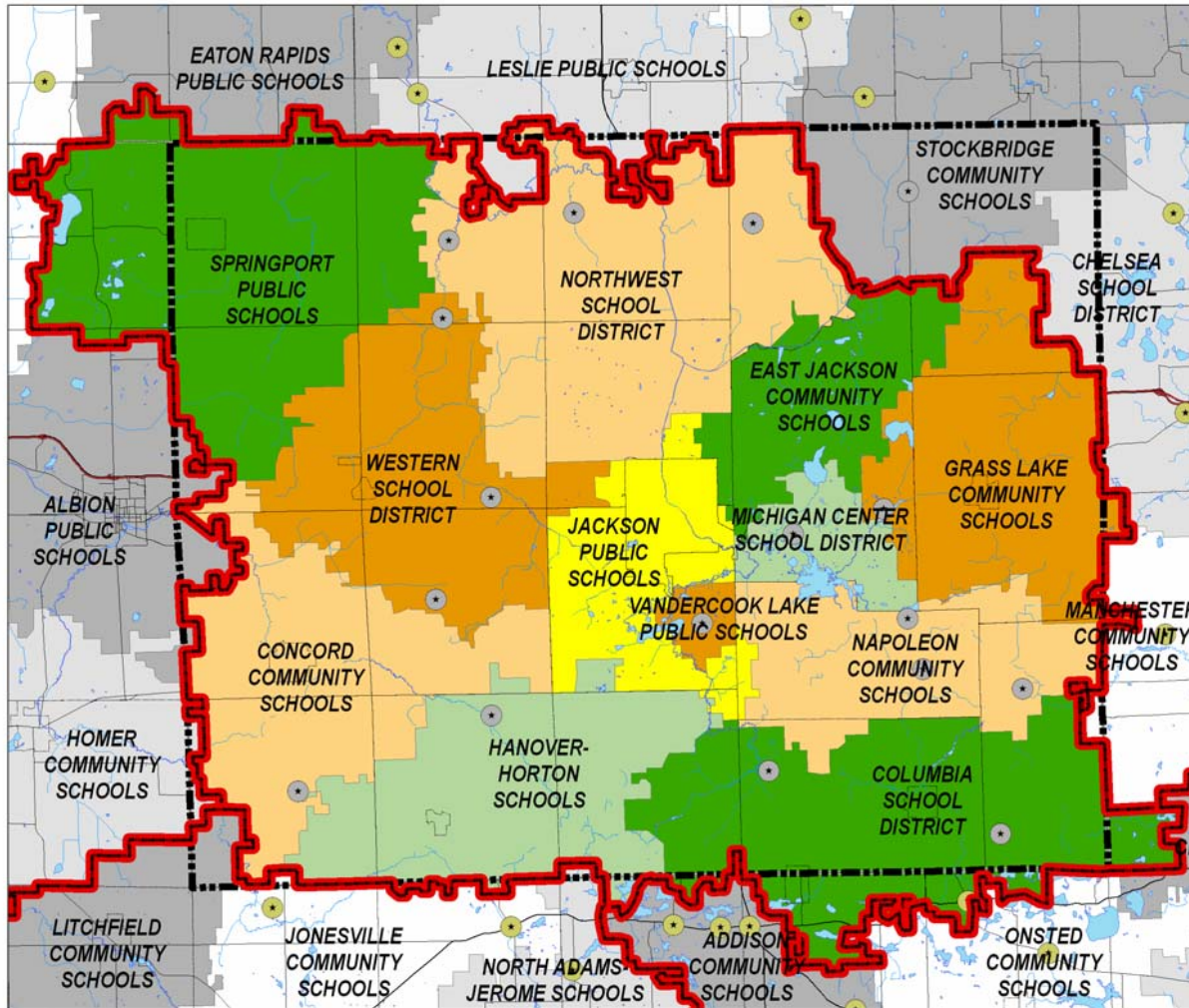


**Jackson County
Communities
Speaking a Language
Other Than
English at Home**










Source:
2000 US Census,
Universal Maps, & R2PC

Community Profile



Jackson County Communities

School Districts

-  Jackson County Boundary
-  Intermediate School District Boundaries
-  Local School Districts in the Jackson Intermediate School District
-  Intermediate School District
-  School District
-  Local School Districts in other Intermediate School Districts
-  School Districts

Source: www.greatschools.net & R2PC

Jackson County Hazard Mitigation

- × **Northwest School District.** Flora List (PK-1) and Northwestern and Parnall (1-5) elementary, RW Kidder Middle (6-8), and Northwest High (9-12);
- × **Springport Public Schools.** Springport Elementary, Middle, and High (PK-12 on a single campus);
- × **Vandercook Lake Public Schools.** Townsend Elementary (PK-5) and Vandercook Lake High (6-12);
- × **Western School District.** Bean, Parma and Warner Elementary (K-5), Western Middle (6-8), Western High (9-12), and Western Options Center (9-12);
- × **Charter Schools.** There are 2 charter schools in Jackson County: DaVinci Institute (K-12) and Paragon Charter Academy (K-8).

Other Local School Districts

Neighboring school districts also provide access to public schools for Jackson County residents. However, only 1 of those districts provides facilities within Jackson County.

- × **Stockbridge Community Schools.** Eldon Katz (1-2).

Other neighboring districts whose boundaries penetrate into Jackson County include Leslie Public Schools, Chelsea School District, Manchester Community Schools, Addison Community Schools, North Adams-Jerome Schools, Jonesville Community Schools, Litchfield Community Schools, Homer Community Schools, and Albion Public Schools

Private School Facilities

At least 14 private schools also operate in Jackson County: Jackson Christian High (PK-12), North Sharon Christian (PK-12), Westchester Christian (PK-3), St. Mary Star of the Sea (PK-6), Trinity Lutheran (PK-8), Happy Hearts Children's Ctr. (PK-K), Jackson SDA Elementary (1-8), Loomis Park Baptist Acad. (1-10), Jackson Christian Middle (7-8), Lumen Christi High (9-12), Faith Christian Acad. (K-12), Queen of Miraculous Medal (K-6), St. John's Elementary (K-6), and St. Joseph Elementary (K-8).

Community Profile

Public Safety Organizations

Organizations that protect citizens are found throughout Jackson County.

Fire Departments.

There are 16 fire departments serving county residents: Jackson FD, Grass Lake FD, Concord-Pulaski FD, Parma-Sandstone FD, Rives-Tompkins FD, Blackman Township FD, Columbia Township FD, Hanover Township FD, Henrietta Township FD, Leoni Township FD, Liberty Township FD, Napoleon Township FD, Pulaski Township FD, Spring Arbor FD, Springport Regional FD, and Summit Township FD. Most fire stations are located in or near settlements and serve those population centers and the surrounding countryside.

EMS

The Jackson Community Ambulance (JCA) operates 10 paramedic units in Jackson County. The JCA is headquartered in the City of Jackson and maintains a substation in Spring Arbor Township.

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 #17 is located in Blackman Township.
- × **Sheriffs Office.** The County Sheriffs Office is located in Downtown Jackson.
- × **Local Police Stations.** There are 6 local police departments in the county: Jackson PD, Parma PD, Columbia Twp. PD, Napoleon Twp. PD, Spring Arbor PD, and Springport Twp. PD.

Seasonal Housing

Only 3% of Jackson County housing units were used seasonally in the Year 2000 according to the US Census. The variability among the local units of government, however, is quite dramatic. For example, a large percentage of housing units in Norvell (24.6%), Waterloo (17.5%), and Columbia (15.4%) Townships are used seasonally. In comparison, none of the housing units the Village of Parma were used seasonally. It is also

Jackson County Hazard Mitigation

important to note that 1 resort, 9 organized camps, 9 campgrounds, and 3 college campuses are scattered across the county.

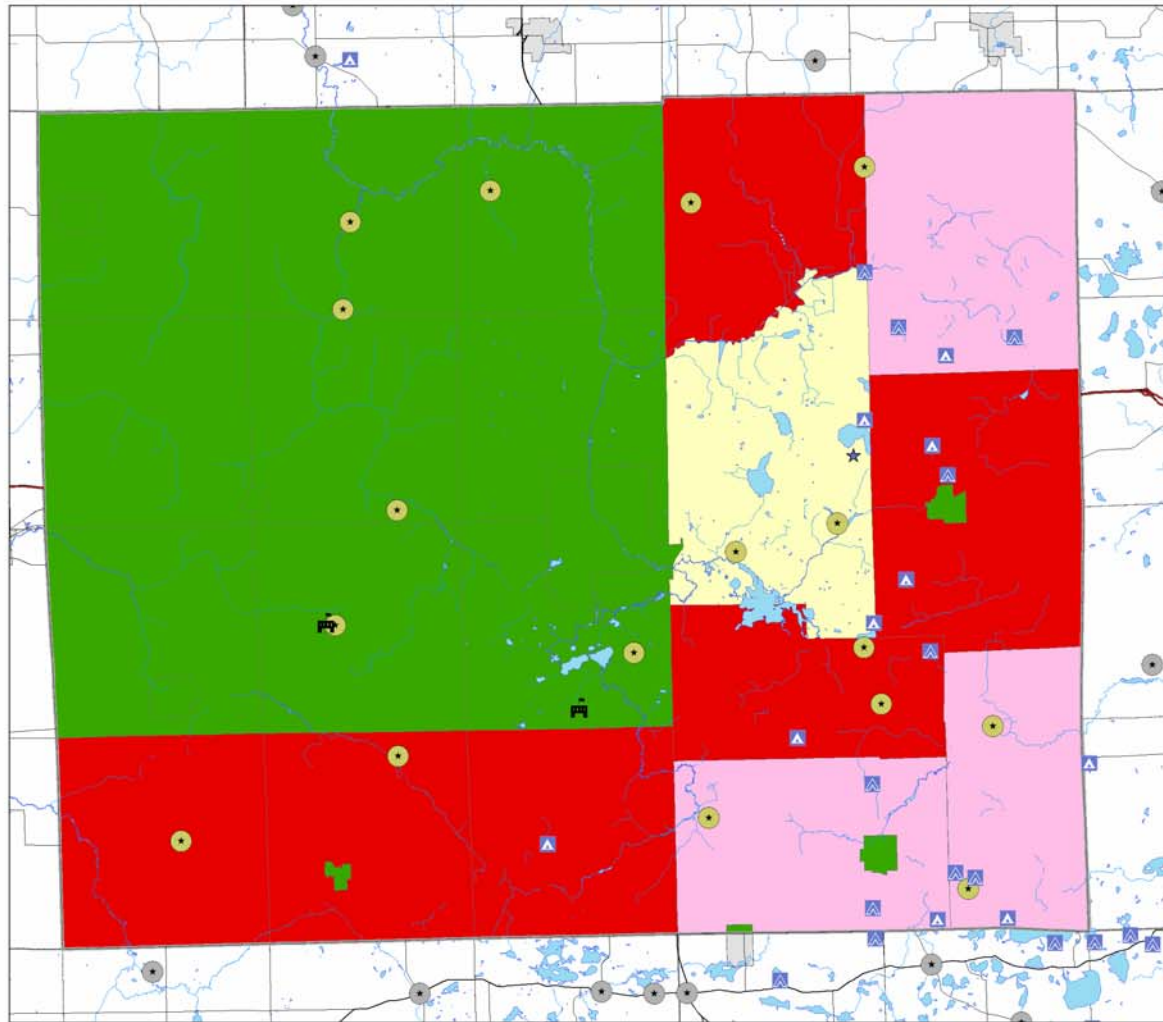
Median Home Values

The median home value in Jackson County was \$96,900 in the year 2000. Given the county's median home value and a total of 34,639 occupied housing units, the housing stock within Jackson County was valued at \$3.3 billion. The variability in housing values between the local units of government, however, was quite dramatic. For example, the median home values within Waterloo (\$151,200), Columbia (\$141,700), Liberty (\$137,500), Grass Lake (\$136,100), and Spring Arbor (\$128,500) Townships were all over \$125,000. In comparison, the median home values in the City of Jackson (\$64,300) and the Villages of Springport (\$67,600) and Hanover (\$73,800) were all under \$75,000. It is also interesting to note that the value of the occupied housing stock in Blackman, Leoni, and Summit Townships and the City of Jackson (\$1.8 billion) equals over half (53.9%) of the value of all occupied housing units in the county.

Future Land Use

Jackson County's future land use plan places concentrated residential, commercial, and industrial land uses around preexisting cities and villages, ponds and lakes, as well as some of the unincorporated settlements located along major roadways. However, scattered residential development already occurs along many of the roadways in the county—whether state highway, county primary road, or gravel lane—creating greatly dispersed ribbons of low density residential development.

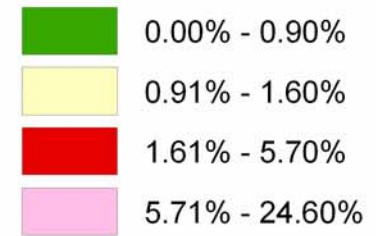
Community Profile







Jackson County Communities

Seasonal Housing

Housing Units Used Seasonally

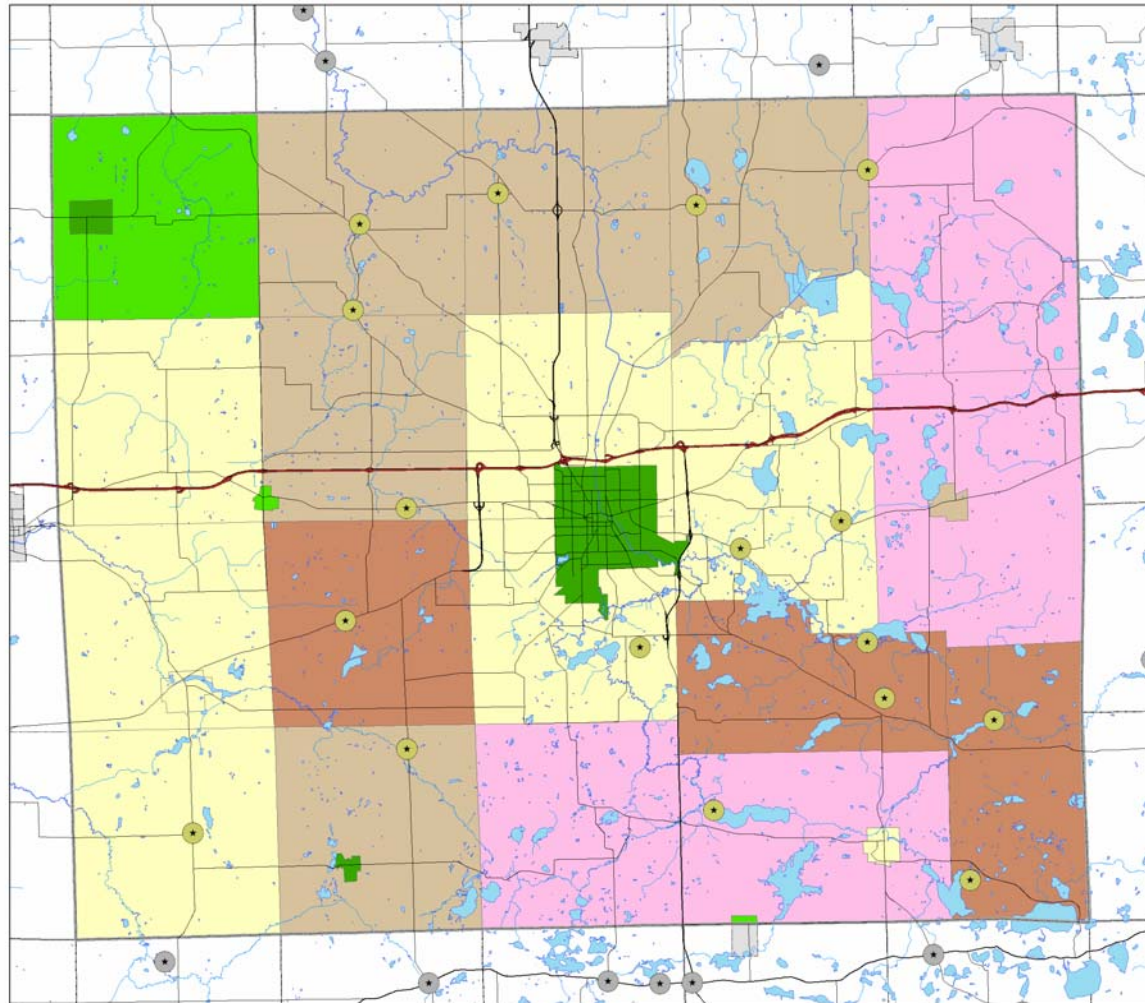


Seasonal Settlements

-  resort
-  campground
-  college
-  organized camp

Source:
2000 US Census,
Universal Maps, & R2PC

Jackson County Hazard Mitigation



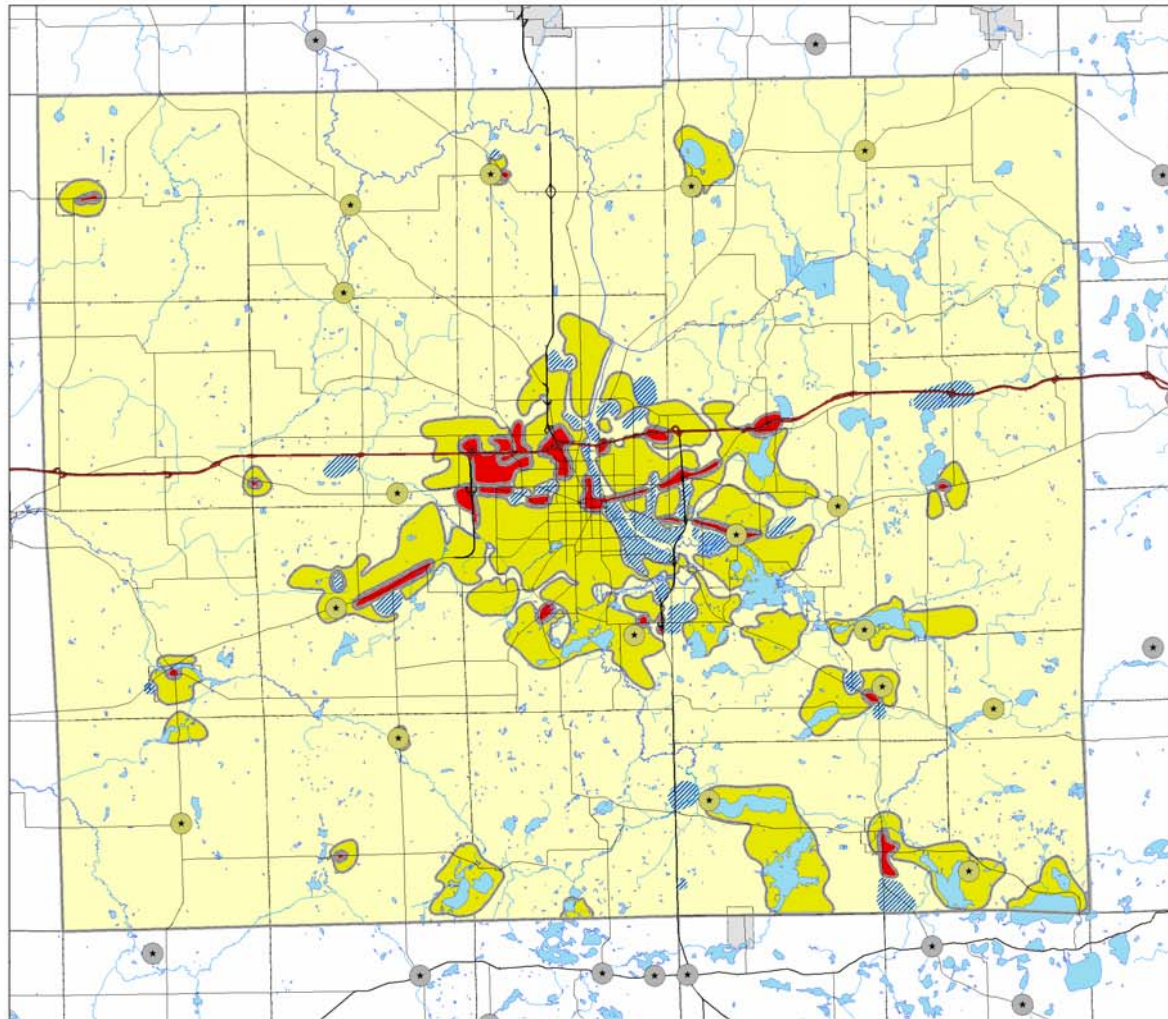
Jackson County Communities

Median Home Values



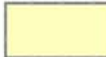




Source:
2000 US Census,
Universal Maps, & R2PC

Community Profile



Jackson County Communities

Future Land Use

-  Agricultural
-  Residential
-  Commercial
-  Industrial
-  Public

Source:
2000 US Census,
Universal Maps, & R2PC

Jackson County Hazard Mitigation

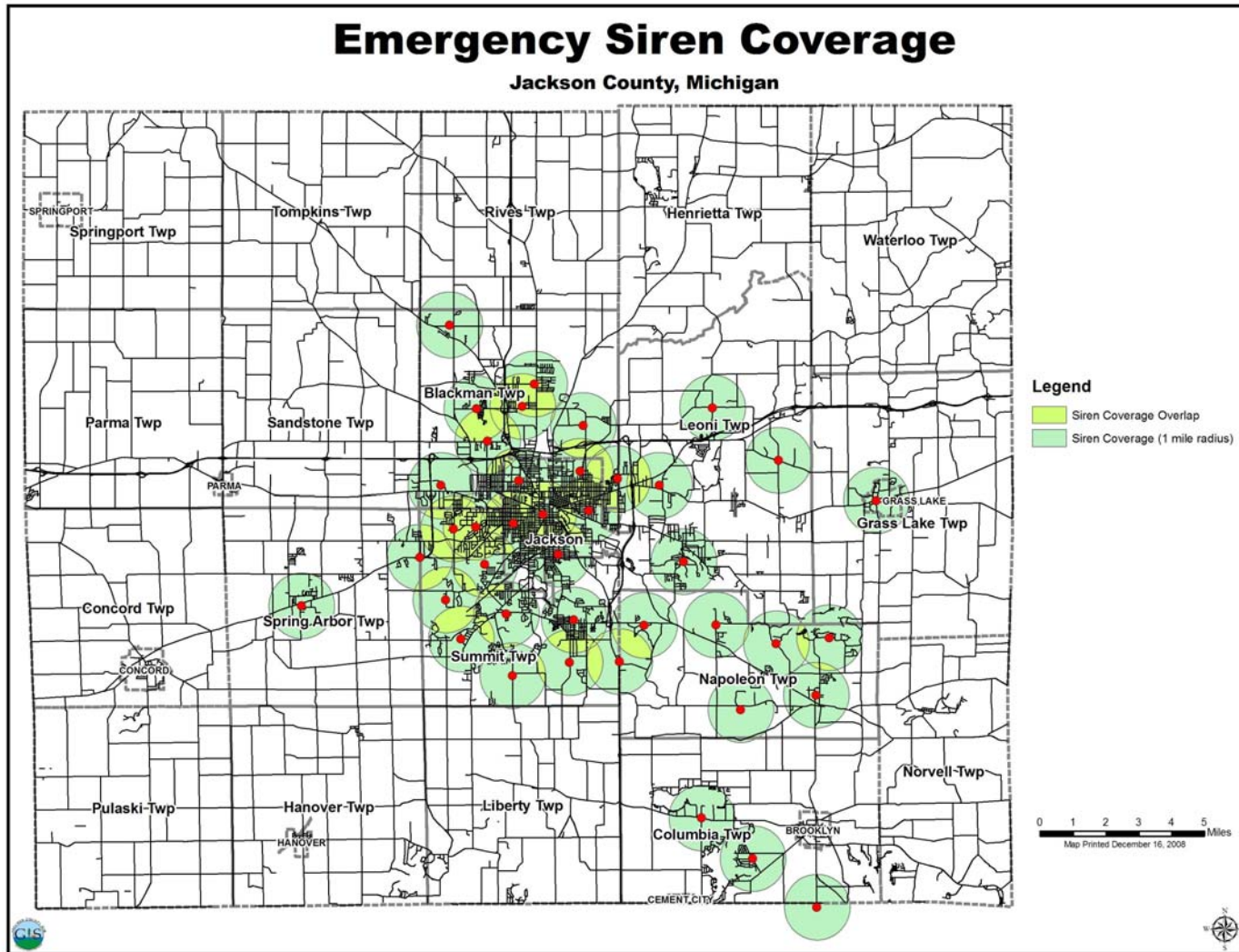
Emergency Warning Sirens

Jackson County has a system of emergency warning sirens to warn residents of the approach of tornadoes, nuclear attack, or other emergencies. A listing of these sirens and their locations are shown on a table entitled, “Jackson County Hazard Mitigation Plan – Emergency Warning Sirens”. Thirty-nine sirens are located primarily in the Jackson urbanized area and in population centers in Spring Arbor and Grass Lake Townships and in the lake areas in Columbia Township. While the urbanized area is well covered with sirens, several areas in the out-county area are not. These areas include the Villages of Brooklyn, Concord, Hanover, Parma, and Springport. In addition, areas of concentrated development which lack sirens include the lake areas of Round and Farwell Lakes, Pleasant Lake, Vineyard Lake, and Wamplers Lake. In addition, populated areas in Horton and Hanover Township and in Norvell Township do not have siren coverage. The location of sirens is mapped in a map entitled “Emergency Siren Coverage, Jackson County, Michigan”. The location of sirens are identified on the map and surrounded with a one-mile boundary.

The area of the City of Jackson, and Blackman and Summit Township have substantial siren coverage. Coverage in the areas of Leoni, Napoleon and Spring Arbor Townships are provided primarily in developed areas of these townships.

Jackson County Hazard Mitigation Plan EMERGENCY WARNING SIRENS 2008					
Siren Name	Street	Intersection	Siren Name	Street	Intersection
B-1	Rives Jct.	Van Horn Rd.	L-4	Portage Rd	Greenwood Rd
B-2	Lansing Ave	Cunningham Rd	N-2	Meridian Rd	Hart Rd
B-3	Doney Rd	Springport Rd	N-16	Rexford Rd	Fairmont St
B-4	Woodville Rd	Michigan Ave	N-17	Miles Rd	Napoleon Station 2
B-7	Parnall Rd	Township Hall	N-18	Lake St	Michigan Ave
B-8	Parnall Rd	Rod Mills Park	N-19	North St	West Ave (Napoleon H.S.)
B-9	Chanter Rd	Elm St	N-20	Stoney Lake Rd	Taylor Field
B-10	Dettman Rd	Osage Rd	N-21	Napoleon Rd	Olcott Dr.
Col-1	Jefferson Rd	Hayes Rd	N-22	Napoleon Rd	Anthony Dr
Col-2	Hewitt Rd	Turk Rd	S-1	Halstead Blvd	Morell St
Col-3	Brooklyn Rd	Taylor Rd	S-2	S. Jackson	Wickwire Rd
J-1	Jackson St	Wesley St	S-3	Maurice Ave	Cass Ave (Vandercook)
J-2	Bowen St	Morell St	S-4	Cobb Rd	Dead End
J-3	West Ave	North St	S-5	Arbor Hills Rd	Pioneer Dr
J-4	Fleming St	Floral Area	S-6	Hague Ave	Marion Rd
J-5	Pringle St	City Fire Station 3	S-7	Brookside Dr	Vrooman Rd
J-6	Milwaukee	Prospect	S-8	W. Mardee	S. Mardee
L-1	Fifth St	Township Hall	S-9	Robinson Rd	Morrell St
L-2	Sargent Rd	Brills Lake Rd	S-10	Dibble Rd	Dead End
L-3	Sutton Rd	Michigan Ave			

Community Profile



Jackson County Hazard Mitigation

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POTENTIAL HAZARDS

Jackson County Hazard Mitigation

Potential Hazards

A wide variety of hazards is known, or has the potential, to occur in Jackson County. These hazards include the following:

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. Significant 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. Sabotage/Terrorism/WMD
18. Public Health Emergencies

Potential Hazards

Extreme Weather

19. Drought
20. Extreme Temperatures
21. Hail
22. Lightning
23. Severe Wind Events and Tornados
24. Snowstorms
25. Ice and Sleet Storms

Jackson County Hazard Mitigation

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 within the county. These may stem from perceptions of unjust rules or living conditions, or from gang rivalries.

Jackson County Perspective

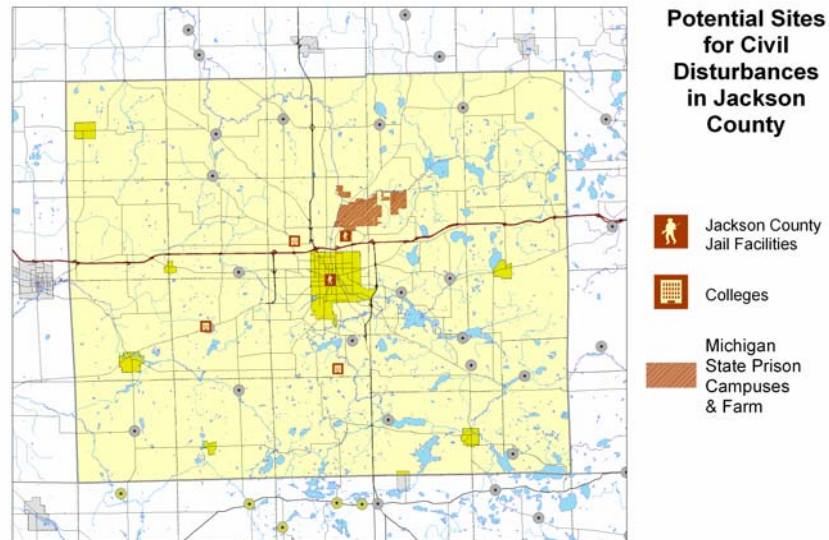
The adjacent table lists the correctional facilities currently located in Jackson County. Prison uprisings occurred at the Southern Michigan Prison (now closed) in 1952 and 1981. Based on these two occurrences during the period from 1952 to 2009, the probability of a correctional facility uprising in Jackson County is 4% in any given year.

Other Civil Disturbances

According to the Michigan Hazard Analysis, other civil disturbances rarely occur, but when they do they are usually an offshoot or result of one or more of the following events:

- ✘ labor disputes where there is a high degree of animosity between the participating parties
- ✘ high-profile/controversial judicial proceedings

Correctional Facilities	
Name	City/Twp
Charles Egeler Correctional Facility	Blackman
Cooper Street Correctional Facility	Blackman
G. Robert Cotton Correct. Facility	Blackman
Parnall Correctional Facility	Blackman
Jackson County Jail	Jackson



Potential Hazards

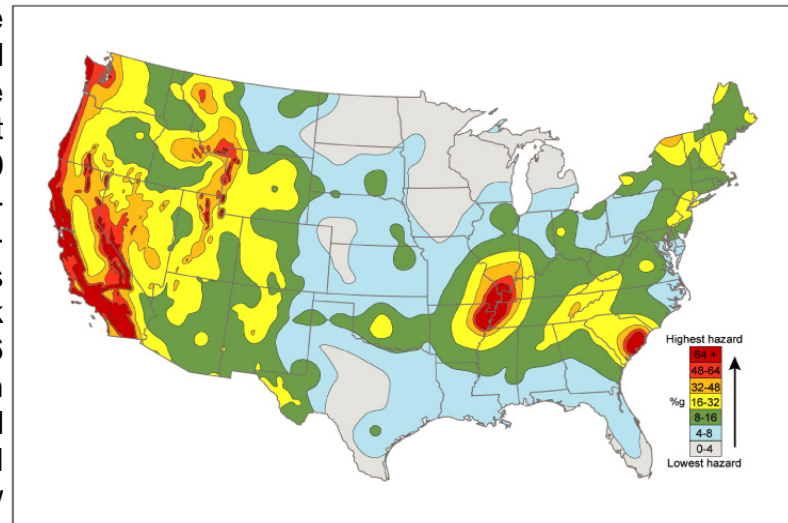
- ✗ the implementation of controversial laws or other governmental actions
- ✗ resource shortages caused by a catastrophic event
- ✗ disagreements between special interest groups over a particular issue or cause
- ✗ a perceived unjust death or injury to a person held in high esteem or regard

Jackson County Perspective

With the closure of a major prison facility in Jackson, the chance of occurrence has lessened considerably and therefore is difficult to estimate from historical trends. However, it seems plausible to give a rough estimate that there may be about a 10% chance of a significant civil disturbance during the next decade. This estimate may be changed upward or downward, as new information and techniques of analysis are eventually incorporated into this hazard analysis.

2. Earthquakes

Jackson 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 Jackson 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 Jackson 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 Jackson County. A Level II, according to the USGS, can be felt only by a few persons at rest, especially on upper floors of build-



Jackson County Hazard Mitigation

ings. 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.

Jackson County Perspective

According to the Jackson County Local Hazard Analysis (January, 2003), there have been no significant earthquake events in Jackson County. The largest earthquake in Michigan occurred in 1947 and was located southeast of Kalamazoo in the Bronson, Coldwater, Colon, Union City area. "Chimneys were damaged, windows and plaster were broken, and brick cornices were downed." The event registered 4.6 on the Richter Scale and had an intensity of VI. The event is reported at http://earthquake.usgs.gov/region/states/events/1947_09_10.php. The website references "Siesmicity of the United States, 1568-1989 (Revised)", by Carl W. Stover and Jerry L. Coffman, U.S. Geological Survey Professional Paper 1527, United States Government Printing Office, Washington, 1993.

It seems reasonable to estimate that one or two minor ground disturbances will be felt during the next decade, but that these will not cause any significant damage. There is some chance (not clearly defined) that a major earthquake may occur out-of-state during this timeframe and may cause some effects for Jackson County, such as energy disruptions or price increases, or the accomodation of refugees (in the case of a major New Madrid fault line event in the areas of Memphis, TN and St. Louis, MO, the most serious earthquake incident projected to be likely.

The greatest impact on Jackson County would probably come from the damage to natural gas and petroleum pipelines. If an earthquake occurs in the winter, the county could be severely impacted by fuel shortages. Damage would probably be negligible in well-designed and constructed buildings. However, poorly designed and constructed buildings could suffer considerable damage under the right circumstances.

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 dissolution of limestone or other soluble materials by

Potential Hazards

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 are salt mining, gypsum mining, and coal mining. Of these three causes the mining of coal is significant in Jackson County. Coal was discovered in 1835 and several small underground and surface mines were opened.

Jackson County Perspective

A subsidence incident occurred in October, 1984 when the abandoned Andrews Street Coal Mine in Jackson County partially collapsed, causing a detached garage, driveway and vehicle at a residence to collapse into a shallow sinkhole. A \$12,000 emergency reclamation project was instituted in that subsidence incident.

Since only one limited-scale event was noted in recent years, the probability of a similar event occurring again is difficult to estimate, but is certainly possible. The chance of occurrence might tentatively have been estimated as 5% within the next decade. However, as this plan was being developed, input was received regarding a class action lawsuit currently being taken, in which it is claimed that the groundwater depletion effects of the City of Jackson water pumping system has been causing a number of subsidence events impacting residential properties over the past 15 years. Damages have been described as the cracking and buckling of basement flooring and brick work, bedroom walls, yard depressions, slanting foundations, and other effects. The claim is that the southwestern area of the City of Jackson may have a great many structures at risk from subsidence effects, due to groundwater withdrawal. As the information and issues raised by this lawsuit are studied and analyzed, more definitive information can be included in the next update of this hazard mitigation plan and, if necessary, acted upon through appropriate means.

4. Scrap Tire Fires

Management of scrap tires has become a major economic and environmental issue. Scrap tires are breeding grounds for mosquitoes. From an emergency management perspective, the most serious problem that scrap tire disposal sites pose is that they can be a tremendous fire hazard if not properly designed and managed.

Jackson County Hazard Mitigation

Jackson County Perspective

There is one compliant registered scrap tire collection site and one registered hauler in Jackson County, according to the Michigan Department of Natural Resources and Environment (MDNRE). However, an MDEQ map entitled “Map of Regulated/Registered Outdoor Scrap Tire Collection Sites – November, 2009” indicates that the Jackson area had a site which was not compliant with registration requirements and thus suggests the possibility of a major fire risk. There is no real basis for estimating this probability, but it seems prudent to keep alert by suggesting the risk be treated as that similar to or greater than the subsidence hazard.

5. Structural Fires

Structural fires are often referred to as the universal hazard because they occur in virtually every community. They are by far the most common hazard facing most communities in Michigan and across the county. Over 1.7 million fires occurred in the State of Michigan during the period of 1975-2002, resulting in an average of over 63 thousand fires a year, with an annual average loss of \$360.7 million. Jackson County was in the bottom half of Michigan counties for the number of fires per 1,000 people in 1998.

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. As the above table illustrates, residential fires comprised 80% of the total number of fires and 86% of the monetary losses.

Potential Hazards

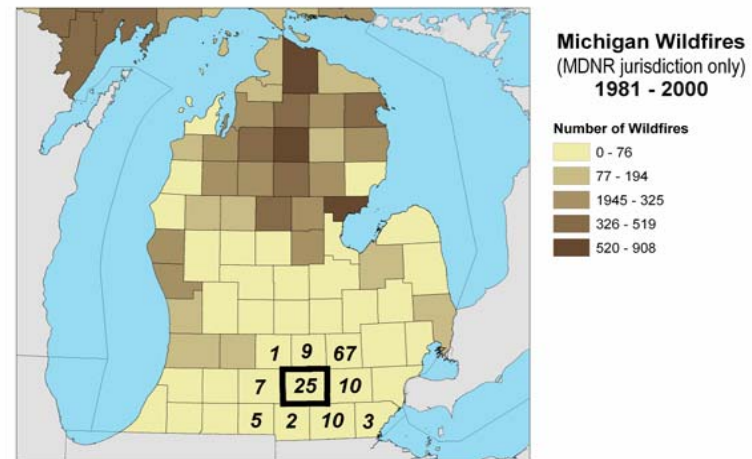
Fires in stores and other places of public assembly comprised 7% of the total number of fires and 10% of the monetary losses. Industrial fires comprised 13% of the total number of fires and 4% of the monetary losses.

Jackson County Perspective

It is expected that hundreds of fires will occur per year in a county the size of Jackson, but not all of these will be extremely serious events, on a community-wide scale. Approximately 775 separate fire events might be estimated (based on the history of past occurrences) to cause an average of \$5,725 damage per event, totaling about \$4.4 million in damage per year within the county.

6. Wildfires

Michigan has the 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. However, it also makes many areas of Michigan highly vulnerable to wildfires. Because Michigan's landscape has changed substantially over the last several decades, due to wild 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. Much of the recent development in Jackson County is also exurban in nature. The Irish Hills (i.e., Columbia and Norvell Townships) is an area of specific concern, for example, due to the exurban development which exists around its many lakes.



Jackson County Hazard Mitigation

Jackson County Perspective

There were 25 fires affecting 523 acres on Michigan Department of Natural Resources (MDNR) controlled land in Jackson County between 1981 and 2000. Based on the history from 1981 to 2000, an average of 1.25 wildfires per year occur involving MDNR lands. This should be taken as a conservative estimate of the expected annual number of wildfires, since information was not available or included regarding fire history on private, non-DNR lands.

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 even 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.

Jackson County Perspective

The Federal Emergency Management Agency (FEMA) recently prepared a revised draft Flood Insurance Study (FIS) for Jackson County, Michigan. Though undated and preliminary, the study was made available in digital form in a meeting held in Jackson County in the spring of 2009. The study included all communities in Jackson County – those that have FIRMs, those that were identified and for which a preliminary FIRM was prepared, and those for which no special flood hazard was identified. FIRM status for each community is shown in the table titled, “Flood Insurance Rate Map (FIRM) Status” which is found on the following page.

The FEMA study provides a history of major flood events in Jackson County including the following:

-The major flood of record for the Grand River occurred in March 1904. No flow estimate is available for this event. Another large flood event occurred in 1937. On June 20 and 21, 1937, 6.36” of rainfall was measured in the City of Jackson. An additional 1.72” of rain fell four days later. According to historical accounts,

Potential Hazards

the resulting flooding caused severe flooding of streets and basements. However, this flooding was largely localized flooding caused by clogged catch basins and overloaded storm sewers rather than high water on the Grand River.

-On June 23-26, 1968, 4.0" of rainfall was measured in the City of Jackson. While the maximum stream flow from this event was slightly less than that measured during the 1937 event, the observed water-surface elevation at the Jackson Waste Water Treatment Plant was abnormally high. The water-surface elevation was approximately a 1-percent-annual-chance flood elevation, while the stream flow was approximately equal to the 4-percent-annual-chance discharge. This high-water surface elevation was caused by debris blocking the channel downstream.

Jackson County Hazard Mitigation

This debris has since been removed. The water-surface elevation during this event was approximately 6.5 feet higher than the normal water-surface elevation for the time of year. This event caused some street and basement flooding. Other significant floods occurred in 1947 and 1950. However, at the time the 1980 City of Jackson Flood Insurance Study was published, no significant damage had occurred since a concrete conduit built as a Works Progress Administration project was constructed in the business district of the City of Jackson to improve low conditions. Localized flooding has been experienced in the areas surrounding the Grand River due to inadequate storm drainage. This is primarily due to a combination of snowmelt and rainfall on saturated or frozen ground during the late winter and early spring. Intense, localized rainfall during

Jackson County Hazard Mitigation Plan FLOOD INSURANCE MAP (FIRM) STATUS As of October, 2009				
	NFIP Participants	Preliminary FIRM	No Special Flood Area Specified	Not Included in Preliminary FIRMs
City of Jackson	Feb 8, 1980			
Blackman Township	Dec 18, 1984			
Columbia Township	May 3, 2010	X		
Concord Township	Jan 1, 1950			
Grass Lake Charter Township	May 3, 2010	X		
Hanover Township			X	
Henrietta Township		X		
Leoni Township	Jan 1, 1950			
Liberty Township		X		
Napoleon Township	May 3, 2010	X		
Norvell Township	Sep 30, 1988			
Parma Township		X		
Pulaski Township	May 3, 2010	X		
Rives Township		X		
Sandstone Charter Township	May 3, 2010	X		
Spring Arbor Township			X	
Springport Township		X		
Summit Township	Oct 15, 1982			
Tompkins Township		X		
Waterloo Township	May 3, 2010	X		
Village of Brooklyn	Jun 1, 1982			
Village of Cement City				X
Village of Concord	Mar 1, 1982			
Village of Grass Lake			X	
Village of Hanover			X	
Village of Parma			X	
Village of Springport			X	

Potential Hazards

the summer months can also result in such flooding.

It is important to note that the City of Jackson has made improvements in the downtown area through the removal of the Holton Dam which had been located immediately east of the intersection of the river and Francis St., and the removal of a cap which had separated the conduit from the overflow deck located immediately above the conduit. It is believed these two improvements have reduced the likelihood of flooding, and an assessment of these actions has been requested through the FEMA consultant assigned to prepare the flood insurance study.

The study also indicates that flooding in Summit Township is relatively minor as a result of its location near the upper reaches of the Grand River, though noting that the possibility of major flooding from a severe storm still exists.

In addition, the study indicates that little serious flooding has occurred in the Village of Brooklyn and that flooding in this area has been limited to undeveloped areas adjacent to the rivers.

The study also indicates that the flood season for the Kalamazoo River Watershed, located in the southwestern portion of the county, extends from late winter to early spring. It notes that frozen ground with large accumulations of ice and snow and accompanied by rapidly rising temperatures and high intensity rainfall has caused major floods during this time of year. Further, it notes that climate conditions in early summer are conducive to high intensity rain storms that can also cause flooding.

A preliminary review of the Proposed FIRMs maps has been conducted by R2PC staff. There are many areas in which 100-year flood plains have been identified which were not shown on previous FIRMs, or which are identified in previously un-mapped local units of government. These newly defined areas do not appear to contain substantial development where significant flood loss could be experienced, with one possible exception. The Northwest Mobile Home Park, located on the north side of Parnall Road in Section 17, falls within the 100 year flood boundary on the preliminary FIRM. Further study of these newly created maps is necessary to assess flood risk throughout the county. (See large format composite flood plain map attached as Appendix B.) However, each community which has been mapped intends to adopt and enforce the National Flood Insurance Program (NFIP) flood management requirements. Communities for which no flood

Jackson County Hazard Mitigation

hazard areas have been identified will monitor conditions and request further analysis of flood potential if it appears necessary to do so.

Those communities which have FIRMs will continue to monitor conditions in their communities, identify possible mitigation strategies, and work with FEMA to evaluate the impact of mitigation actions on their FIRMs and the flood hazard areas identified upon them.

Various areas, as illustrated on the official Flood Insurance Rate Maps, have been defined as having at least a 1% per year chance of being flooded. These areas are the designated floodplain areas shown on the maps. Sites located well within those floodplains may (depending on their locations and land elevations) have an even greater chance of experiencing flood events. This is particularly true of two structures located within Summit Township, which have officially been designated as “repetitive loss properties” by the NFIP, and thus prioritized for flood mitigation action. These two structures have recently tended to experience one or more damaging incidents per decade, costing thousands of dollars in damages to property at each location.

The following table provides information regarding other flood events from 1995-2009 in Jackson County. The table indicates that there were 15 floods within a period of 15 years, or an average of 1 event per year. Flash flood warnings were also issued on five other occasions. Property damage as a result of flooding during the period was \$472,000 with no injuries or fatalities. With few exceptions, floods occurred in the City of Jackson. ***On one occasion, flooding was sufficient to result in the issuance of disaster declaration from Governor Granholm for 24 counties in Michigan including Jackson County. President George Bush supported the governor's declaration for 19 of the 24 counties and federal disaster relief was made available to Jackson County***

Jackson County Flood Events, 1995-2009		
Date	Description	Location
8/2/1995	1630: Flood/flash Flood, \$2,000 property damage. 3.17 inches of rain fell over downtown Jackson in less than an hour, causing sewage overflow into the Grand River. A newly installed stone retaining wall at the New Tribes Bible Institute partially collapsed when loose soil became saturated and gave way. Low lying streets were flooded throughout the city.	Jackson

Potential Hazards

Jackson County Flood Events, 1995-2009		
Date	Description	Location
8/17/1995	1130: Flood/flash Flood, \$20,000 property damage. More than two inches of rain fell over the city of Jackson following similar amounts from the previous day, giving two day totals near six inches at some locations. The flash flooding that resulted left water two to three feet deep at many intersections and parking lots, with water entering many cars and buildings, including the Y Center downtown where a gymnasium and other recreation rooms were flooded.	Jackson
3/9/1998	08:00 AM: Flood. Minor flooding occurred along the Grand River in Jackson during the morning of March 9th. During the previous 24 hours, heavy rains of around an inch and a half had occurred in the Jackson area, resulting in significant runoff from the urban area and rapid rises in river levels. Jackson is located near the headwaters of the Grand River and the heavy rains caused the river to respond quickly and crest just above flood stage at 13.3 feet. The river was only at or above flood stage for 2 hours. Minor flooding occurred, but no property damage was reported.	Jackson
06/16/1998	06:00 PM: Flash Flood at Munith. Jackson County local law enforcement reported the flooding of several intersections along Michigan Highway 106 across northeastern Jackson County, in and around the Munith area. NWS Doppler Radar estimated two to three inch per hour rainfall, with storm totals in excess of five inches during a two hour period over this area. No injuries or significant damages were reported.	Henrietta Township – Munith
05/18/2000	07:00 AM: Flood.. Flood warnings were therefore issued in Jackson County on May 18 th and 19th.	Jackson County
05/26/2000	06:30 PM: Flood, \$450,000 property damage. Several severe thunderstorms produced flooding in multiple areas, and also caused the wall of a bowling alley to collapse (no injuries or fatalities). Law enforcement in the City of Jackson reported that part of a roof and a wall of a bowling alley collapsed at 6:30 pm. Further investigation into this event revealed that debris from the damaged building was found about 400 yards away near an airport runway. However, the damage did not appear to be caused by a tornado. The dome shape of the roof implies that water loading on the roof did not cause the collapse, although there were reports of flooding in the area. The most likely cause of the damage was deemed to be a “gustnado” or microburst. At 7:15 p.m., a trained spotter reported that Interstate 94 near the City of Jackson was flooded. (NOTE: Faults in the NCDC online database caused this information to also appear under an entry for 8/26/2000 as well as 5/26. In this plan, information for 8/26 was taken from the Law Enforcement Information Network instead of NCDC.)	Jackson, Blackman Township
2/9/01- 2/18/01	Rain, snowmelt, and flooding JACKSON, Flood warnings issued. 2/10/2001 JACKSON, at 1220, Flash report sent reporting flash flooding along the Grand River (measured at 12.2') in the county.	Jackson, Jackson County

Jackson County Hazard Mitigation

Jackson County Flood Events, 1995-2009		
Date	Description	Location
2/26/2001	JACKSON, Flash Flooding in Jackson	Jackson
10/16/2001	Flood Warning for the Grand River at Jackson (JACKSON), maximum, stage forecast at 13.3ft, flood stage is 13ft NWS in Grand Rapids issued a flood warning for the Grand River at Jackson in JACKSON County. The river was expected to go above flood stage of 13.0 feet that afternoon. The latest stage was 12.5 feet at 1200 on Tuesday. Flood stage is 13.0 feet. Minor flooding is forecasted. The river will go above flood stage this evening and is expected to fall back below flood stage this evening. At 13.0 feet expect minor flooding of low-lying areas.	Jackson
7/28/2002	Flood warning for Grand River at Jackson in JACKSON County. NWS in Grand Rapids has issued a flood warning for Grand River at Jackson. Moderate flooding is expected. Two to three inches of rain fell at Jackson in less than 2 hours. Moderate flooding with a stage of 14 feet measured. Flood stage is 13 feet.	Jackson
8/23/2002	05:30 PM, Flood at Jackson, \$50,000 property damage, \$5,000 crop damage. More than two inches of rain also fell in a short time in Jackson, causing an underpass to be flooded on Jackson Street north of Glick Highway, where several cars got stuck in up to three feet of standing water. Flash flood warning for JACKSON County: NWS indicated rainfall in the city of Jackson of almost two inches has resulted in widespread flooding. Flood warning for Grand River at Jackson in JACKSON County. The latest stage was 11.7 feet. Flood stage is 13 feet, which is 0.6 feet above flood stage. The river was forecast to rise above the flood stage of 13.0 feet this evening. The river is forecast to fall below the flood stage of 13.0 feet early Saturday morning. This crest compares to a previous crest of 13.5 feet on March 30, 1982. Local storm report for JACKSON County: Flash floods and several roads and I-94 had water over them. Several manhole covers were lifted off.	Jackson
8/24/2002	Hydrologic statement: The Grand River at Jackson. Flood stage is 13.0 feet. Forecast stage is 9.3.	Jackson
3/23/2003	Hydrologic statement: For the Grand River at Jackson in JACKSON County, the latest stage was 10.1 feet. Flood stage is 13.0 feet. No flooding is forecast. The maximum stage forecast is 10.1 feet.	Jackson
5/1/2003	Flood warning: The Grand River at Jackson in JACKSON County. The latest stage was 13.0 feet. The river is expected to rise to 13.8 feet and then recede slowly.	Jackson
5/21/2004	11:32 PM, Flood, \$2,500,000 property damage, \$4,600,000 crop damage. The biggest and longest duration flooding event in the past ten to twenty years occurred across southwestern and south cen-	Jackson County

Potential Hazards

Jackson County Flood Events, 1995-2009		
Date	Description	Location
	<p>tral lower Michigan from May 20th through the third of June. Flooding in mid May resulted in very high river levels and the ground was saturated on the 20th. Numerous thunderstorm complexes and areas of heavy rainfall developed repeatedly in the vicinity of a quasi stationary frontal boundary draped across southern lower Michigan. The heaviest rain fell on Saturday, May 22nd, when over two inches of rain fell over most of the area. Total rainfall over the Grand River basin from May 20th through June 3rd varied from four to as much as seven inches. The Grand Rapids office of the National Weather Service issued a Hazardous Weather Outlook as early as Wednesday morning, May 19th, to mention the threat of flooding. A hydrologic outlook was issued on May 20th to further address the potential for widespread flooding. A flood watch was issued for the entire area on Friday, May 21st. Flood warnings were issued for the southern half of our area at 12:10 a.m. EDT Saturday May 22nd, and for all of our area at 4:10 a.m. EDT Sunday May 23rd through 12 a.m. EDT May 24th. The following is a summary of peak river crests from across our Hydrological Service Area (HSA): Here are some daily flooding headlines from the period from May 22nd through June 4th: May 22nd: The Woodward Elementary School in Jackson county was flooded and damage there was estimated at \$200,000. June 4th: Governor Granholm issued a disaster declaration for 24 counties in Michigan. That list included Jackson County. President George Bush supported the governor's declaration for 19 of the 24 counties and federal disaster relief was made available to Jackson County. It was the wettest May on record in Lansing and Muskegon and the third wettest May on record in Grand Rapids. 9.29" of rain fell in Grand Rapids for the month, which is 5.94" above normal. 10.44" of rain fell in Lansing, which 7.73 inches above normal there. 9.59" of rain fell in Muskegon, which is 6.64 inches above normal. When it was all said and done with, approximately 500 homes were flooded, three dams were damaged, two schools were flooded, one state university building had flooding problems, and a zoo was flooded and closed for four days. The monetary estimate of flood damages incurred is in the millions of dollars. However, there was no loss of life due to all of the flooding.</p>	

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.

Repetitive loss properties are designated by FEMA. The properties are flood-insured properties located within participating NFIP communities that have filed damage claims reporting a significant amount of dam-

Jackson County Hazard Mitigation

age from flooding. FEMA wishes to prioritize flood mitigation activities for these properties. The repetitive loss properties include two ordinary residential structures. The first property has experienced five reported flood losses over the past two or three decades, totaling about \$34,000 in property damage (both to the structure and to contents within the structure). The other property has two reported flood losses over that same approximate time frame, totaling about \$6,500 in property damage (structure and contents). The vulnerability of these properties is thus estimated as an average of twice per decade and \$6,821 in damage for the first case and about once per 15 years or so in the second case, with an average of \$3,275 in damage per event.

8. Dam Failures

A dam failure can result in loss of life and extensive property or natural resource damage for miles downstream from the dam. Dam failures occur not only during flood events, which may cause overtopping of a dam, but also be a result of poor operation, lack of maintenance and repair, and vandalism. Such failures can be catastrophic when they occur unexpectedly providing no time for evacuation. Under state and federal legislation, certain dam owners are required to develop a survey of the downriver area, develop flood prone area maps, develop emergency action plans, and exercise these plans.

Environmental law in Michigan requires the Michigan Department of Environmental quality to rate each dam as either “high”, “significant”, or “low” hazard potential, according to the potential downstream impact if the dam were to fail. Dams over 6’ in height that create an impoundment with the surface area of more than 5 acres are regulated by statute. Dam owners are required to maintain an emergency action plan for “high” and “significant” hazard potential dams.

Jackson County Perspective

In Jackson County one dam has been rated high hazard potential, and four dams have been rated significant hazard potential. The location of these dams are known by the MDEQ and Emergency Management officials but are being withheld from this report for security reasons. It is estimated that there is a low probability of a significant dam failure, based on hydrologic conditions and the lack of historical events of this type.

Potential Hazards

The Jackson County local Hazard Analysis prepared by the Jackson County Sheriff's Department in January, 2003 notes with regard to dams that although there are dams that require maintenance or dams that have water seepage, there have been no outright dam failures in Jackson County.

9. Energy Emergencies

An adequate energy supply is critical to Jackson County'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 always dealt with short term energy disruptions caused by severe weather damage (i.e., downed power lines and poles), 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.

Jackson County Perspective

Jackson County has experienced numerous and severe electrical 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.

Jackson County Hazard Mitigation

The Planning Committee estimated the risk of this hazard as a common annual event, although the severity of each year's events may vary. Multiple energy emergencies of one type or another are therefore expected to occur each year (also see the significant infrastructure failure hazard, which overlaps in classification with this one).

10. Significant Infrastructure Failures

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

- x Water Distribution
- x Wastewater Collection/Treatment
- x Surface Drainage
- x Telecommunications

Jackson County Perspective

Jackson County has been spared the difficulties related to disastrous infrastructure failures. Such failures are possible, however. The Jackson Planning Committee estimated that disastrous infrastructure failures are similar in frequency to a significantly damaging earthquake, subsidence, or dam failure event. For planning purposes, this might be estimated as a 5 to 10 percent chance during the next decade.

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. There is a potential for harm or fatalities. Air crashes

Potential Hazards

may occur in flight (with equipment malfunction or sabotage), on landings and take-offs, and while vehicles are moving on the ground.

Jackson County Perspective

Jackson County Reynolds Field is located immediately southwest of the intersection of I-94 and Airport Road in Blackman Township. Brooklyn Shamrock Field is located south of M-124, just southeast of the Village of Brooklyn. Napoleon Airport, a basic utility airport, is located on the northeast corner of M-50 and Napoleon Road in Napoleon Township. In Jackson County, there are no commercial passenger flights. There are two general utility airports, and one basic utility airport. Jackson County is served by commercial buses (intercity, municipal and school) and train traffic. Jackson County has had no serious crashes involving commercial carriers. Disaster-level events of this type are quite rare in Michigan, but for planning purposes are tentatively estimated as having only about 3 to 5 percent chance of occurrence in Jackson County over the next decade.

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

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

Jackson County Hazard Mitigation

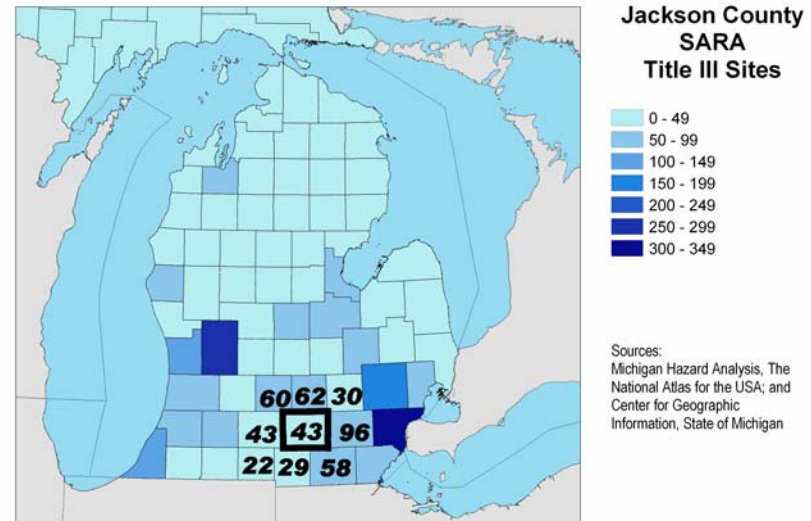
12. Hazardous Material Incidents: Fixed Site and Transportation

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. This definition includes industrial accidents. The SARA Title III program is committed to efficiently and effectively overseeing data collection and quality assurance of environmental information transmitted to the Department of Environmental Quality. 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.

Jackson County Perspective

Jackson County had 43 SARA Title III sites, as of September 2001. A Michigan Department of Environmental Quality (DEQ) list indicates that there were 45 sites as of July 2006. No recent industrial accidents of any significance in Jackson County were recorded in the Michigan Hazard Analysis, and no hazardous materials incidents of any significance have been reported since 1976, the first year such records were kept. For planning purposes, it is tentatively estimated that there is about a 20% chance of a major hazardous materials incident (either fixed site or transportation-related) in Jackson County over the next decade.



Potential Hazards

Transportation

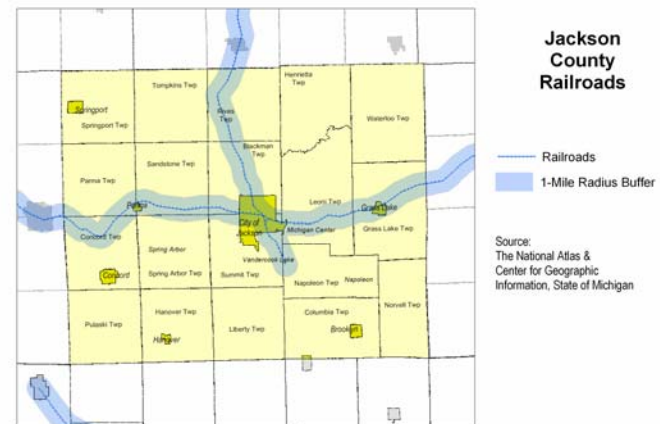
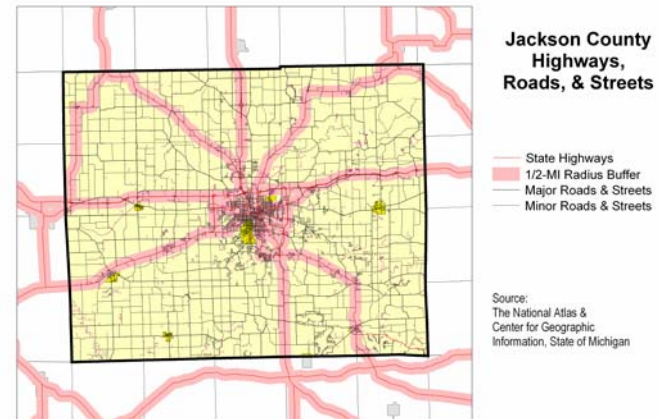
A transportation hazardous material incident is an uncontrolled release of hazardous materials during transport capable of posing a risk to life, health, safety, property or the environment. Several state highways traverse Jackson County (e.g., I-94; BL-94; US-127; M-50; M-52; M-60; M-99; & M-106). Highways—in addition to major local roads and streets—are the most likely thoroughfares 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. Several rail lines are located in the county.

Jackson County Perspective

No post-1978 (the first year of records) Jackson County hazardous material transportation incidents were recorded in the Michigan Hazard Analysis. For planning purposes, it is tentatively estimated that there is about a 20% chance of a major hazardous material incident (either fixed or transportation related) in Jackson County over the next decade.

13. Nuclear Power Plant Accidents

Even though the 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 ap-



Jackson County Hazard Mitigation

appropriate on-site and off-site emergency planning is conducted. The following significant world-wide nuclear power plant accidents have occurred (including an accident in Michigan):

1986 — Chernobyl, Ukraine

1979 — Three Mile Island, Harrisburg, Pennsylvania

1966 — Enrico Fermi-1, Monroe County, Michigan

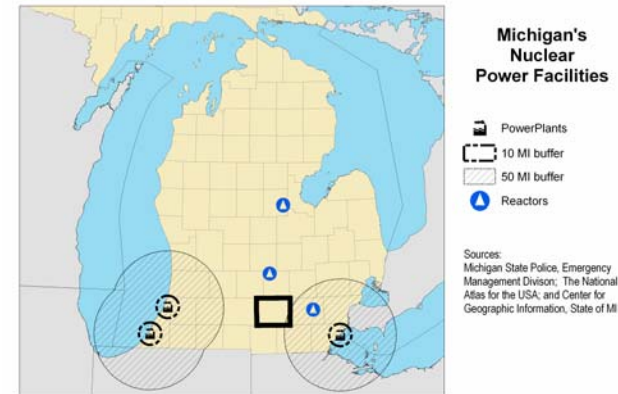
A primary emergency planning zone (EPZ) is established within a 10-mile radius of each nuclear power plant. Within this zone plans are developed to protect the public through in-place sheltering and evacuation in the event of an accident. A secondary emergency management zone is established within a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

Jackson County Perspective

There are no nuclear power plants in Jackson County. However, portions of Columbia, Grass Lake, and Norvell Townships are located within the 50-mile EPZ for the Enrico Fermi 2 Nuclear Power Plant. No such events are anticipated to affect Jackson County, although there is a slight possibility that one could happen. For planning purposes, a tentative estimate is offered that the probability is less than one percent over the next decade.

14. Oil and Natural Gas Well Accidents

Oil and natural gas are produced from fields scattered across 63 counties in the Lower Peninsula including Jackson County, which is the site of 685 oil and gas wells. Although the industry has a fine safety record, the threat of accidental releases, fires and explosions exists. In addition to these hazards, many of Michigan's oil and gas wells contain extremely poisonous hydrogen sulfide (H₂S) gas.



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The oil and gas industry is highly regulated in accordance with Michigan's Natural Resource and Environmental Act, PA 241 of 1994. The rules associated with PA 241 require classification of wells based upon a concept of radius of exposure. A formula is used to calculate the distance from the point of release at which hydrogen sulfide concentrations in the air reach 100 parts per million. Contingency plans for public protection are required for wells at which the 100 parts per million radius of exposure is greater than 100 feet. These plans require that procedures be implemented by company personnel in an emergency when hydrogen sulfide gas is released. These procedures include emergency contacts and their assigned duties and responsibilities, notification and evacuation procedures for the general public and procedures for igniting the well. In addition, site-specific information must be filed with the application for a drilling permit. These procedures are required to protect public safety. The Michigan Department of Natural Resources and the Environment regulations provide for buffer zones around wells and treatment in storage facilities. The following table summarizes the physiological responses likely to occur with exposure to H₂S:

Physiological Response to H₂S Exposure	
Parts per Million	Physiological Response
10 ppm	Beginning eye irritation.
50-100 ppm	Slight conjunctivitis & respiratory tract irritation with 1 hour of exposure.
100 – 200 ppm	Coughing, eye irritation, loss of sense of smell after 2-15 minutes. Altered respiration, pain in the eyes and drowsiness after 15-30 minutes followed by throat irritation after 1 hour. Several hours of exposure results in gradual increase in severity of these symptoms and death may occur within the next 48 hours.
200-300 ppm	Marked conjunctivitis & respiratory tract irritation after 1 hour of exposure.
500-700 ppm	Loss of consciousness & possibly death in 30 minutes to 1 hour.
700-1,000 ppm	Rapid unconsciousness, cessation of respiration & death.
1,000-2,000 ppm	Unconsciousness at once, with early cessation of respiration and death in a few minutes. Death may occur even if the individual is removed to fresh air at once.

Source: [Michigan Hazard Analysis](#)

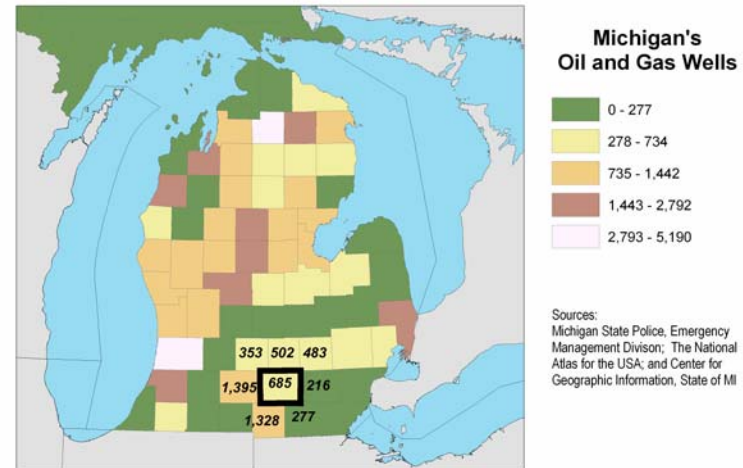
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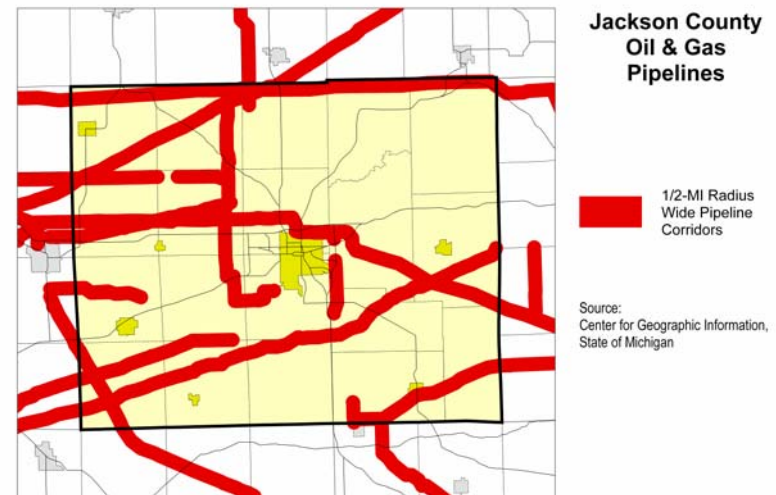
According to the Jackson County Local Hazard Analysis, it is impossible to ascertain how many oil and gas incidents have actually occurred in Jackson County. Although many wells are present in the county, not all are currently active, and probability of any producing a major effect is quite low. For planning purposes, it is tentatively estimated that there is only about a 5% chance of any such event over the next decade.

15. Oil and Natural Gas Pipeline Accidents

Though often overlooked, petroleum and natural gas pipelines pose a real threat in many Michigan communities, including Jackson County. 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 it is true that the petroleum and natural gas industries have had a fine safety record, and that pipelines are by far the safest form of transportation for these products, the threat of fires, exposure, ruptures, and spills nevertheless exists. In addition to these hazards, there is the danger of hydrogen sulfide (H₂S) release. The table in the previous section



communities, including Jackson County. Petroleum and



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summarizes the physiological responses likely to occur with exposure to H₂S.

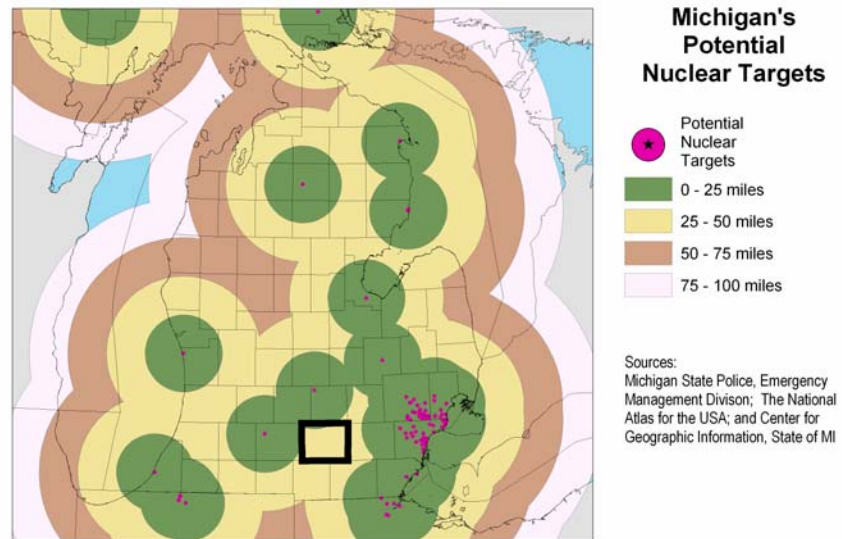
Jackson County Perspective

Pipelines traverse many parts of Jackson County. A section of pipeline ruptured in Blackman Township on June 7, 2000 releasing 75,000 gallons of gasoline into the environment and forcing the evacuation of more than 500 homes in a one square mile area around the spill. Wolverine Pipeline Company has expended in excess of \$10 million in response to this pipeline accident. A disruption in a strategic pipeline could also lead to an energy emergency in the county. Please note that the Jackson County Emergency Management Coordinator's office is also aware of a pipeline continuing through Blackman Township to the east, calling into question the accuracy of oil and gas pipeline map. For planning purposes, it is estimated that there is approximately a 10 to 15 percent chance of a major pipeline accident in Jackson County over the next 10 years.

16. Nuclear Attack

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 present-day Russia and throughout the rest of the world. Based upon the Nuclear Attack Planning Base 1990 (NAPB-90), the Federal Emergency Management Agency categorizes seven potential types of nuclear targets:

- x commercial power plants,
- x chemical facilities,



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- x counterforce military installations,
- x other military bases,
- x military support industries,
- x refineries, and
- x political targets.

Jackson County Perspective

Although there is no reason to suspect that Jackson County would be specifically targeted for nuclear attack in the current geopolitical environment, as an area with a significant industrialized urban center, it was reasonably calculated to have been a likely target during old Cold War planning scenarios, and therefore for hazard mitigation and preparedness planning purposes, the threat will not be underplayed, tentatively estimated instead as approximately a 3% chance during the next 10 years (see also the information about the Terrorism hazard).

17. Sabotage/Terrorism/WMD

In today's world, 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 now, in addition to bombings, include:

- x nuclear, chemical and biological weapons;
- x information warfare;
- x ethnic/religious/gender intimidation (hate crimes):
- x state and local militia groups that advocate the overthrow of the U.S. Government;
- x eco-extremism, designed to destroy or disrupt specific research or resource related activities;
- x pre-meditated attacks upon schools, workplaces, transportation systems or other places of public assembly; and
- x organized criminal enterprises and activities.

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There are no known organizations within Jackson County involved in any type of sabotage, terrorism, or the proliferation of weapons of mass destruction. The following are occurrences of sabotage/terrorism that affected Southern Lower Michigan:

- x October/November 2001 — Attempted bus hijackings at various locations across the country.
- x October 2001 – Anthrax attacks at various locations across the country.
- x 2000-2001 – Attempted bombing/bomb manufacturing on various dates and locations in the state.
- x December 31, 1999 – Arson Fire (eco-extremism) “to research offices at Michigan State University’s Agricultural Hall.
- x Various dates and locations — premeditated workplace violence.

There is little reason to suspect that Jackson County would be specifically targeted for terrorism, but given the seemingly random nature of some such attacks (such as the Oklahoma City bombing) the possibility must not be totally discounted. For planning purposes, a tentative estimated chance of about 2% over the next decade might be assigned, unless new information, trends, or prediction techniques suggest otherwise.

18. Public Health Emergencies

Public health emergencies can take many forms including the following possibilities:

- x disease epidemics,
- x large-scale incidents of food or water contamination,
- x extended periods without adequate water and sewer services,
- x harmful exposure to chemical, radiological or biological agents, and
- x 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. They also 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 biologi-

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cal 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.

Jackson County Perspective

No public health emergencies have ever been declared in Jackson County. However, at least 3 statewide emergencies may have affected local residents:

- x **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 conjunction with a shipment of a livestock feed supplement.
- x **Foodborne Contamination (Hepatitis A)** — Almost 300 cases of Hepatitis A in at least 4 school districts in the Spring of 1997 were caused by frozen strawberries.
- x **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.

For planning purposes there is a rough estimate that over the next decade, a 30 or 40 percent chance of a major public health emergency may affect Jackson County. This estimate may need to be quickly revised should a serious pandemic occur and markedly increase risks to the county’s population.

19. Drought

Drought is defined as a prolonged period of dryness as a result of a natural reduction in the amount of precipitation expected, over an extended period of time, usually a season or more in length. The entire state of Michigan is subject to the impacts of drought. Large urbanized areas are more vulnerable to water shortages and business disruptions due to the sheer 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

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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.

In rural agricultural areas drought brings on a host of other problems to address. The agricultural areas of 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 seriously impact local and regional income, which in turn has a rippling 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.

Jackson County Perspective

Jackson County receives approximately 32.5 inches of precipitation per year, except for a small area located on the northern border of the city which receives about 30.0 inches per year. As noted above, no measurement exists as to define a drought.

According to the Jackson County Local Hazard Analysis prepared by the Jackson County Sheriff's Department in 2003, a drought and heat wave affected Jackson County during the summer of 2001. It damaged or destroyed approximately one-third of the state's fruit and vegetable crops resulting in a U.S. Department of Agriculture Disaster Declaration for 82 of the state's 83 Counties. The drought/heat wave also caused water shortages in many areas in southeast Michigan, forcing officials to issue periodic water use restrictions.

Although Michigan documents have estimated that about 1 year in every 4 may qualify as a drought year in Michigan, over the long run (given that certain types of weather and hydrologic cycles cause adjacent years to be more similar to each other than a randomly selected year), it has been estimated that the chance of a serious drought event in Jackson County is not quite so frequent – perhaps only a 5% chance over the next decade of having a very serious effect on the county. The following table provides the recent history of droughts in Jackson County.

Jackson County Droughts, 2007-2009		
Date	Description	Location
4/22/2007	Red flag warnings issued for JACKSON	Jackson County

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Jackson County Droughts, 2007-2009		
Date	Description	Location
4/29/2007	Red flag warnings issued for JACKSON	Jackson County
8/1/2007 8/3/2007	Drought conditions persist across portions of southwest and west-central lower Michigan, with numerous locations receiving less than 2 inches of rainfall during the entire month of July. Precipitation deficits were increasing over the course of the summer months. Drought category 1 (D1: moderate drought) status affected JACKSON County and all points southwest of this line. It involves damage to vegetation and a high fire risk, with streams, reservoirs, and wells running low. 8/2/2007 drought category, precipitation deficits (inches below normal) since April 1. (Normal is 12.90" for Jackson County.) JACKSON: D1, -3.14" at Brooklyn. The Grand River at Jackson was low, its 8.55' being 63% of normal. On 8/3/2007, Red Flag Warnings were issued (just for the day) for JACKSON	Jackson County
8/17/2007	Red flag warnings had been issued for JACKSON A proclamation is issued by the Michigan DNR prohibiting the use of fire on forest lands and adjacent lands in JACKSON. This prohibits (except under specified conditions) the building of campfires, smoking, and the burning of materials within these counties.	Jackson County

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.

20. Extreme Temperatures

Prolonged periods of extreme temperatures can pose severe and life-threatening problems. Although they are radically different in terms of initiating conditions, extremes of heat and cold share a commonality in that they both primarily affect the most vulnerable segments of the population – the elderly, children, 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.

Jackson County Perspective

A 30-year (i.e., 1951-1980) compilation of temperature data from a weather station reporting to the Michigan State Climatologists Office located in the vicinity of Jackson indicates a daily average temperature range of 14.6°F – 82.9°F. Over the 30-year period, a maximum temperature greater than 90°F was only reached on

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14 days annually and less than 32°F on 57 days annually; a minimum temperature less than 32°F was reached on 143 days annually during that period and less than 0°F on 9 days annually. A low of -20°F was recorded in January, 1976 and a high of 103°F was recorded in July, 1977.

The National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC) recorded a temperature of 9°F (-35 to -30°F wind chill) during December, 1995 in 37 counties. The cold wave resulted in 3 deaths.

Several other significant heat waves listed in the Michigan Hazard Analysis:

- × Summer 1988 — 39 days with 90°F or more temperatures
- × July 1995 — 28 heat-related fatalities in the state
- × July 1999 — city residents were treated for heat-related problems statewide
- × June-August 2001 — heat stress index readings soared well above 100°F on many days
- × July 1936 — temperatures exceeded 100°F for several days, causing 570 deaths statewide

Jackson County Perspective

Extreme heat and cold are considered an annual occurrence within Jackson County, averaging 14 days per year with temperatures over 90 degrees Fahrenheit (which can have a greater impact in a dense urban environment such as the City of Jackson), and an average of 9 days per year with temperatures under zero degrees Fahrenheit.

As the following table indicates, extreme temperatures and extended periods of cold and heat do occur in Jackson County. The extreme temperatures listed in the table have resulted in statewide totals of three deaths. Due to the general nature of the data, the extent of the impact on Jackson County is impossible to assess. Extreme temperature events occurred two times in the 15-year period from 1995-2009 for a 13% probability of such an event in any given year.

Jackson County Extreme Temperature Events, 1995-2009	
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

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Jackson County Extreme Temperature Events, 1995-2009	
Date	Description
	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.
8/1/2001	Heat Advisory for JACKSON, index at 105 degrees

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 freezing level, where they remain suspended and continue to grow larger until their weight can no longer be supported by the winds. They finally fall to the ground, battering crops, denting autos, and injuring wildlife and people. 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.

Jackson County Perspective

Hail is considered an expected annual occurrence, although the size and impact of hail is difficult to predict since it tends to have only a localized impact. Jackson County experiences an average of between 40 and 60 thunderstorm days per year, and expects several severe thunderstorm events to occur each year that are capable of producing damaging hail. A total of 60 recorded incidents of hail storms occurred in Jackson County from 1958 through 2009 - a period of 51 years. Based on this, Jackson County sees an average of 1.2 hail storms per year. The following table provides the history of hail storms in the County from 1958 through 2009. These events have resulted in \$405,000 in property damage and \$225,000 in crop damage. All of the reports of damage have occurred since 1998 which suggests improved reporting rather than a re-

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cent increase in hail storm intensity. Eleven storms featured hail a minimum of 1.75” in size with 4.25” hail reported on one occasion in Rives Township in 2004.

Jackson County Hail Events, 1958-2009		
Date	Description	MCD's
08/03/1958	1400: Hail, 2.00 inch., LAT/LON: 42°17'N / 84°30'W	Sandstone
06/01/1961	1500: Hail, 2.00 inch., LAT/LON: 42°17'N / 84°30'W	Sandstone
05/31/1962	1443: Hail, 0.75 inch., LAT/LON: 42°12'N / 84°24'W	Summit
08/08/1962	1715: Hail, 0.75 inch., LAT/LON: 42°05'N / 84°11'W	Columbia
04/17/1963	1650: Hail, 1.25 inch., LAT/LON: 42°17'N / 84°30'W	Sandstone
08/27/1965	1730: Hail, 0.75 inch., LAT/LON: 42°05'N / 84°41'W	Pulaski
07/04/1977	0430: Hail, 1.00 inch., LAT/LON: 42°16'N / 84°28'W	Blackman
08/02/1980	0300: Hail, 1.25 inch., LAT/LON: 42°12'N / 84°21'W	Napoleon
04/28/1981	1345: Hail, 1.00 inch., LAT/LON: 42°11'N / 84°23'W	Summit
06/09/1985	0130: Hail, 0.75 inch., LAT/LON: 42°14'N / 84°24'W	Jackson
07/09/1985	2110: Hail, 1.50 inch., LAT/LON: 42°23'N / 84°41'W 2128: Hail, 1.50 inch., LAT/LON: 42°23'N / 84°41'W	Springport
07/25/1988	1810: Hail, 1.75 inch., LAT/LON: 42°15'N / 84°36'W	Parma
03/14/1989	1654: Hail, 1.00 inch., LAT/LON: 42°16'N / 84°28'W 1714: Hail, 0.75 inch., LAT/LON: 42°23'N / 84°11'W	Blackman Waterloo
05/30/1989	1830: Hail, 0.75 inch., LAT/LON: 42°15'N / 84°26'W	Jackson
05/31/1989	1700: Hail, 0.75 inch., LAT/LON: 42°15'N / 84°36'W	Parma
03/27/1991	1915: Hail, 2.75 inch., LAT/LON: 42°15'N / 84°26'W	Jackson
04/09/1991	1428: Hail, 2.75 inch., LAT/LON: 42°23'N / 84°41'W	Springport
07/04/1992	1830: Hail, 0.75 inch., LAT/LON: 42°19'N / 84°24'W	Blackman
10/08/1992	1940: Hail, 1.75 inch., LAT/LON: 42°14'N / 84°24'W	Jackson
06/13/1994	1621: Hail, 0.75 inch. Although a report was made by trained spotter, the exact location is unavailable.	Unavailable
07/24/1996	11:40 AM: Thunderstorm Wind/hail in Concord. Thunderstorm winds, combined with half-inch hail, knocked down numerous tree limbs.	Concord
09/11/1996	02:50 PM: Hail, LAT/LON: 42°14'N / 84°24'W, 0.88 inch. Several reports of dime-sized to nickel-sized hail were received from the city of Jackson.	Jackson
07/08/1997	05:55 PM: Hail, LAT/LON: 42°06'N / 84°33'W, 0.88 inch. Jackson Central Dispatch relayed	Hanover

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Jackson County Hail Events, 1958-2009		
Date	Description	MCD's
	<p>section of Lansing Ave. and Maple Grove Road in southern Rives Township, approximately 6 miles north of the city of Jackson. Scattered severe thunderstorms were characterized by several large hail reports, including golf-ball sized hail reports received from Jackson County and hail of 2 to 3 inches in diameter associated with a supercell thunderstorm as it tracked east-southeast across southern Ingham and northern Jackson County. This storm resulted in several wind damage and large hail reports, and an F1 tornado touched down in north central Jackson County near Layton Corners. No injuries were reported with the tornadoes, but damage was estimated at half a million dollars across Henrietta and Waterloo Townships in northern Jackson County. Hail was estimated to have reached 2 to 3 inches in diameter in association with this tornadic storm. The most significant damage was reported around the Pleasant Lake area, where several boats were overturned and several homes reported minor to moderate structural damage. Along North Meridian Road from near Layton Corners along the west end of Pleasant Lake, 2 homes reported destroyed garages. Pleasant Lake County Park was closed due to downed trees. The Waterloo State Recreation Area reported hundreds of trees uprooted, which resulted in the closing of some roads and horse trails. 5,800 were without power in the affected areas of Henrietta and Waterloo Townships. Damage was estimated at approximately \$500,000. At 05:25 PM: Hail 2 Miles North of Grass Lake, LAT/LON: 42°17'N / 84°13'W, 1.75 inch. Jackson County Emergency Management reported golf ball-sized hail on Morrissey Road in Grass Lake Township, 2 miles north of the city of Grass Lake.</p>	<p style="text-align: center;">Waterloo</p> <p style="text-align: center;">Grass Lake</p>
06/26/1998	<p>01:10 AM: Thunderstorm Wind at Jackson, LAT/LON: 42°14'N / 84°24'W, 52 knots. Scattered reports of wind damage and hail were received across west central, southwest, and south central Lower Michigan, as widespread thunderstorm activity moved across Michigan's Lower Peninsula during the late evening hours of Thursday, June 25th, and early morning hours of Friday, June 26th. No injuries were reported, but an estimated 22,000 people lost power across the southern third of Michigan's Lower Peninsula, due to downed trees and power lines.</p>	Unavailable
05/17/1999	<p>04:00 PM: Hail, 0.75 inch, \$50,000 property damage. 0.75" hail was reported in Parma, LAT/LON: 42°15'N / 84°36'W. There were also a few reports of hail 0.75" - 1.00" in diameter.</p>	Parma
06/09/1999	<p>04:22 AM: Hail, LAT/LON: 42°23'N / 84°27'W, 0.75 inch. Hail was observed in Rives Junction, where dime-sized hail covered the ground.</p>	Rives
09/28/1999	<p>06:28 PM: A thunderstorm became severe, producing pea-sized hail and wind gusts to 60</p>	Jackson

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Jackson County Hail Events, 1958-2009		
Date	Description	MCD's
	mph.	
03/15/2000	07:05 PM: Hail at Spring Arbor, LAT/LON: 42°12'N / 84°33'W, 1.50 inch. One thunderstorm produced hail (1.5" diameter) in Spring Arbor. There were also several reports of very small hail along the Interstate 94 corridor from Kalamazoo to Jackson.	Spring Arbor
07/14/2000	02:08 PM: Hail, LAT/LON: 42°23'N / 84°27'W, 0.88 inch., \$20,000 property damage, \$10,000 crop damage. Thunderstorms produced several reports of large hail during the afternoon hours. 0.88" diameter hail was reported in Rives Junction at 2:08 p.m. Severe thunderstorm warnings were issued. Marble to nickel-sized hail was reported in the Rives Junction and Pleasant Lake areas.	Rives Henrietta
08/02/2000	07:15 PM: Hail, 1.25 inch., LAT/LON: 42°23'N / 84°27'W, \$30,000 property damage, \$10,000 crop damage. Severe thunderstorms developed in the afternoon and evening. Hail of 1.25" was reported in Rives Junction and broke the windshield of a car. Wind damage included a 12-inch diameter tree limb that was blown down at 7:15 p.m. Severe thunderstorm warnings were issued.	Rives
07/29/2001	07:10 PM, Thunderstorm Wind, Parma to Spring Arbor, Begin LAT/LON: 42°15'N / 84°36'W, End LAT/LON: 42°12'N / 84°33'W, 53 Knots, 25,000 property damage. A large severe weather outbreak across southern and central lower Michigan during the late afternoon and evening hours resulted in numerous reports of downed trees and power lines, and a few reports of large hail. A 911 center in Spring Arbor (Jackson county) reported trees down in that area.	Unspecified
4/20/2003	03:25 PM, Hail, LAT/LON: 42°14'N / 84°24'W, 1.00 inch., \$10,000 property damage. One and three quarters inch hail was reported by Blackman township police and fire personnel 5 miles north of Jackson. A report of a large tree down was also received from Spring Arbor, and a one foot diameter pine tree was snapped in half 5 miles southwest of Spring Arbor.	Blackman Spring Arbor
4/30/2003	10:30 PM, Hail, LAT/LON: 42°14'N / 84°24'W, 1.00 inch., \$10,000 property damage. One inch diameter hail was reported one mile north of Jackson.	Blackman
5/1/2003	2330:, One inch hail in Jackson. (also listed as flooding and hail)	Jackson
5/9/2003	11:10 PM, Hail, LAT/LON: 42°07'N / 84°21'W, 1.00 inch., \$15,000 property damage, \$15,000 crop damage. One inch diameter hail was reported about one mile west of Brooklyn near Clark Lake.	Columbia
5/17/2004	01:15 PM: Hail, 1.75 inch., Rives Junction to Munith, Begin LAT/LON: 42°23'N / 84°27'W,	Northern Jackson

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Jackson County Hail Events, 1958-2009		
Date	Description	MCD's
	End LAT/LON: 42°23'N / 84°15'W, \$40,000 property damage, \$40,000 crop damage. The broadcast media reported one and three quarters inch diameter hail near I-127 in Rives Junction and a trained spotter reported one and three quarter inch diameter hail in Munith. Severe thunderstorm warning issued for JACKSON	County
5/21/2004	08:40 PM, Hail, 2.00 inch., LAT/LON: 42°14'N / 84°24'W, \$30,000 property damage, \$30,000 crop damage. Two inch diameter hail was reported by the public in Jackson.	Jackson
5/21/2004	12:42 PM, Hail, 0.88 inch., LAT/LON: 42°14'N / 84°24'W, \$40,000 property damage. Seven eighths inch diameter hail was reported 5 miles south of Jackson, and several power poles were blown down near Jackson as well.	Liberty
6/9/2004	12:35 PM, Hail, 4.25 inch., LAT/LON: 42°23'N / 84°27'W, \$50,000 property damage, \$50,000 crop damage. Four and one quarters inch diameter hail was reported at the intersection of Berry and US-127 roads. Several reports of smaller hail were also reported in and near Rives Junction.	Rives
6/5/2005	06:00 PM, Thunderstorm Wind, Parma to Springport, Begin LAT/LON: 42°15'N / 84°36'W, End LAT/LON: 42°23'N / 84°41'W, 52 Knots, \$10,000 property damage. A large severe weather outbreak occurred across our area resulting in numerous downed tree limbs and power lines, many reports of large hail and many reports of downed power lines. Several trees were blown down across area roads. There were several reports of three quarters to inch diameter hail and estimated wind gusts to 60 m.p.h.	Parma/Springport
6/30/2005	09:55 AM, Hail at Brooklyn, LAT/LON: 42°06'N / 84°15'W, 0.88 inch., \$10,000 property damage, \$10,000 crop damage.	Brooklyn
7/25/2005	10:04 PM, Thunderstorm Wind, 53 Knots, LAT/LON: 42°06'N / 84°33'W, \$25,000 property damage. A large severe weather outbreak occurred and produced numerous reports of wind damage, one tornado and one isolated hail report. As a result of severe thunderstorm wind gusts, there were numerous reports of wind damage including downed trees, limbs, and power lines across the area.	Hanover
9/22/2005	04:49 PM, Hail, 1.75 inch., LAT/LON: 42°15'N / 84°13'W, \$15,000 property damage, \$10,000 crop damage. The public reported one and three quarters inch diameter hail in Grass Lake.	Grass Lake
4/22/2006	06:31 PM, Hail, LAT/LON: 42°06'N / 84°33'W, 1.00 inch., \$10,000 property damage, \$5,000 crop damage. The public in Hanover reported one inch diameter hail.	Hanover

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Jackson County Hail Events, 1958-2009		
Date	Description	MCD's
	7:01 PM, Hail, LAT/LON: 42°10'N / 84°15'W, 1.00 inch., \$10,000 property damage, \$5,000 crop damage. Law enforcement three miles south of Napoleon reported one inch diameter hail.	Napoleon
6/19/2006	11:05 AM, Hail, 0.75 inch., LAT/LON: 42°11'N / 84°38'W, \$5,000 property damage, \$5,000 crop damage. Three quarters inch hail was reported in Concord. 12:00 PM, Hail, LAT/LON: 42°06'N / 84°15'W, 1.25 inch., \$20,000 property damage, \$15,000 crop damage. Hail ranging anywhere from one and a quarter to seven eighths inches in diameter was reported in Brooklyn.	Concord Brooklyn
06/28/2006	01:55 PM, Hail, LAT/LON: 42°06'N / 84°24'W, 0.75 inch., \$5,000 property damage, \$5,000 crop damage. A trained spotter reported three quarters inch hail in Liberty.	Liberty
5/15/2007	17:18 PM, Thunderstorm Wind 1 Mile North East of Pleasant Lake, LAT/LON: 42°24'N/84°19'W, 50 Knots, \$10,000 property damage. EVENT NARRATIVE: A combination of six trees and large limbs were blown down on a golf course one mile northeast of Pleasant Lake in Jackson county. EPISODE NARRATIVE: Severe storms produced several reports of large hail and high winds which brought down several trees and branches in Jackson County.	Henrietta
6/02/2007	18:15 PM, Thunderstorm Wind 3 Miles West North West of Pleasant Lake, LAT/LON: 42°25'N/84°23'W, 52 Knots, \$20,000 property damage. EVENT NARRATIVE: Multiple trees and power lines were blown down along the Jackson County line. EPISODE NARRATIVE: Severe storms affected much of southwestern lower Michigan, resulting in several reports of large and numerous reports of wind damage.	Henrietta
6/27/2007	JACKSON, at 1645, dime-sized hail (between 0.5" and 0.75" in diameter) was reported 5 miles north of Jackson.	Blackman
1/7/2008	21:54 PM, Thunderstorm Wind 2 Miles North, North East of Horton, LAT/LON: 42°10'N / 84°30'W, 52 Knots, \$2,000 property damage. EVENT NARRATIVE: One tree was blown down near the intersection of Reynolds and Horton roads three miles southeast of Spring Arbor. EPISODE NARRATIVE: A rare mid winter severe weather event occurred and resulted in several reports of high winds and large hail. There were few reports of damage associated with the severe weather. A tree was blown down just southeast of Spring Arbor.	Spring Arbor
4/11/2008	15:55 PM, Hail 1 Mile North of Parma, LAT/LON: 42°15'N / 84°36'W, 1.00 inch., \$10,000 property damage, \$5,000 crop damage. EVENT NARRATIVE: Hail briefly covered the	Parma

Potential Hazards

Jackson County Hail Events, 1958-2009		
Date	Description	MCD's
	ground in Parma and there were also several reports of broken windshields. EPISODE NARRATIVE: A round of severe thunderstorms resulted in numerous reports of large hail during the afternoon hours of April the eleventh. Hail briefly covered the ground at several locations and there were several reports of broken windshields from hail in Parma in Jackson County.	
6/6/2008	17:45 PM, Thunderstorm Wind 1 Mile North West of Spring Arbor, LAT/LON: 42°12'N / 84°33'W, 52 knots. EVENT NARRATIVE: Law enforcement reported that a couple of trees were blown down. EPISODE NARRATIVE: Severe thunderstorm wind gusts resulted in several reports of significant wind damage. Several reports of large hail were also received.	Spring Arbor
7/2/2008	17:35 PM, Hail 1 Mile West of Knollwood Park, LAT/LON: 42°15'N / 84°23'W, 0.88 inch. A severe weather outbreak on July 2 resulted in numerous reports of wind damage and large hail. Another area of large hail stretched from Allegan county east through Ingham county and south into Kalamazoo and Jackson counties. The hail was large enough to damage some crops.	Jackson
7/16/2008	20:53 PM, Thunderstorm Wind 1 Mile North West of Rives Junction, LAT/LON: 42°23'N / 84°27'W, 52 knots. EVENT NARRATIVE: Law enforcement in Jackson county reported that a couple of trees were blown down. One was blown down on Spring Court and another was blown down near Zion Road and East Berry Road. EPISODE NARRATIVE: Numerous severe thunderstorms across southwest Michigan resulted in wind damage and large hail.	Rives
4/25/2009	16:40 PM, Thunderstorm Wind 1 Mile East South East of Pleasant Lake to End Location: 7 Miles North of Waterloo, Begin LAT/LON: 42°24'N / 84°18'W, End LAT/LON: 42°27'N / 84°08'W, 53 knots. EVENT NARRATIVE: Scattered to widely scattered tree damage occurred including occasional uprooted trees along a 9 mile stretch from 2 miles west-southwest of Pleasant Lake to 2.5 miles southwest of Stockbridge. The damage swath was 4 to 6 miles wide. A measured 53 knot gust with pea sized hail occurred just north of Bateese Lake. The damage crossed into extreme southeast Ingham County at 42.4284 north latitude and 84.2094 west longitude. The damage continued east-northeast to at least the Livingston County line.	Henrietta
8/9/2009	19:20 PM, Hail 3 Miles South of Rives Junction, LAT/LON: 42°20'N / 84°27'W, 0.70 inch. EVENT NARRATIVE: No damage reported in association with the hail.	Rives

Jackson County Hazard Mitigation

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 thunderstorm’s tremendous energy. The perception of lightning as a minor hazard lingers despite the fact that it damages many structures and kills and injures more people on average in the United States per year 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, and those losses are expected to continue to grow as the use of computers and other lightning-sensitive electronic components becomes more prevalent. Unfortunately, lightning has [also] taken a tremendous toll on Michigan’s citizens in terms of injury and loss of life. Since 1959 , Michigan has incurred 101 lightning deaths, 711 lightning injuries, and 812 lightning casualties (deaths and injuries combined) – consistently ranking it near the top of the nation in all three categories. One major lightning event was reported in Jackson County, and a total of 244 statewide, between 1993 and 2004 to the National Climatic Data Center. One injury was attributed to lightning in Jackson County and 13 deaths and 124 injuries statewide. The lightning also accounted for \$20 million in property damage statewide.

Lightning related Deaths & Injuries in Michigan 1959 - July 2004			
	Deaths	Injuries	Casualties
Open fields & rec areas	38.4%	39.7%	39.5%
Unspecified locations	18.2%	36.1%	33.8%
Under a tree	26.3%	15.0%	16.4%
Comm. equip & heavy equipment/machinery	6.1%	5.5%	5.6%
Water related (boating, fishing, swimming, etc.)	11.1%	3.8%	4.7%
	99	693	792

Jackson County Perspective

Lightning is considered an expected annual occurrence in Jackson County, but with an impact that is difficult to predict and tends to be very localized unless it causes power failures or large fire events to occur. Jackson County experiences an average of between 40 and 60 thunderstorm days per year, any of which may

Potential Hazards

produce damaging lightning strikes. The county expects several severe thunderstorm events to occur each year that are characterized by the production of great amounts of lightning activity, some of which can be expected to produce damage or injuries. Based on the recent history of past lightning events within the county, the chance of a damaging lightning strike can be estimated at about 8% per year. The following lightning events in Jackson County are provided in the NCDC database:

Jackson County Lightning Events, 1994-2009		
Date	Description	MCD's
06/13/1994	1300: Lightning, 1 injury. A man cleaning out a storm drain during a thunderstorm was struck by lightning and thrown across the road. He was treated at a local hospital for minor injuries.	Unspecified
08/16/1997	02:45 PM: LAT/LON: 42°14'N / 84°24'W. Local utility companies reported approximately 55,000 power outages during the afternoon and evening across far southern Michigan, with most caused by lightning strikes, but some due to downed trees and utility poles (also listed under thunderstorm wind).	Jackson
07/21/1998	04:30 PM: LAT/LON: 42°14'N / 84°24'W. Jackson area law enforcement reported numerous trees and power lines downed in Blackman Township and the city of Jackson. The Jackson Citizen Patriot reported that a Jackson woman was trapped when the wind dropped a large branch and live power lines over her car on Sixth Street, just north of W. Morrell. Damage to the car was minor and the woman was not injured. Over 200 power lines were downed by the storm and transformers were damaged by lightning strikes. Approximately 5,000 residents lost power in Jackson County. Damage estimates were not available. (Also reported under thunderstorm wind).	Jackson Blackman 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.

Jackson County Hazard Mitigation

23. Severe Wind Events and Tornadoes

Severe Wind Events

Severe winds have, on occasion, 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.

Jackson County Perspective

A total of 141 severe wind events were reported in Jackson County between 1950 and 2004 according to the National Climatic Data Center. Recorded wind speeds for 66 of the events ranged from 42 knots to 87 knots. Severe winds accounted for \$7.5 million in property damages. Unfortunately, 1 death and 2 injuries were attributed to severe winds. The following table provides NCDC data on severe wind events in Jackson County from 1956 to 2009.

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
05/11/1956	1845: Thunderstorm Wind, LAT/LON: 42°17'N / 84°17'W	Leoni
05/30/1956	1435: Thunderstorm Wind, LAT/LON: 42°17'N / 84°30'W	Blackman
05/14/1957	2215: Thunderstorm Wind, 50 Knots, LAT/LON: 42°17'N / 84°30'W	Blackman
08/03/1958	1400: Thunderstorm Wind, LAT/LON: 42°17'N / 84°30'W	Blackman
08/26/1959	1925: Thunderstorm Wind, LAT/LON: 42°23'N / 84°41'W	Springport
07/22/1960	1600: Thunderstorm Wind, LAT/LON: 42°17'N / 84°30'W.	Blackman
06/01/1961	1329: Thunderstorm Wind, 50 Knots, LAT/LON: 42°17'N / 84°30'W.	Blackman
09/30/1961	1920: Thunderstorm Wind, 70 Knots, LAT/LON: 42°17'N / 84°30'W	Blackman
08/08/1962	1715: Thunderstorm Wind, LAT/LON: 42°05'N / 84°11'W.	Norvell
11/12/1965	2000: Thunderstorm Wind, 50 Knots, LAT/LON: 42°17'N / 84°24'W.	Jackson
04/02/1967	1556: Thunderstorm Wind, LAT/LON: 42°17'N / 84°24'W.	Jackson
06/16/1967	1700: Thunderstorm Wind, 50 Knots, LAT/LON: 42°17'N / 84°30'W.	Blackman
10/24/1967	2030: Thunderstorm Wind, LAT/LON: 42°17'N / 84°30'W.	Blackman
08/16/1968	1915: Thunderstorm Wind, LAT/LON: 42°17'N / 84°30'W.	Blackman
04/27/1969	1930: Thunderstorm Wind, LAT/LON: 42°17'N / 84°11'W.	Grass Lake
09/06/1969	1400: Thunderstorm Wind, LAT/LON: 42°05'N / 84°35'W	Hanover

Potential Hazards

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
07/02/1970	2020: Thunderstorm Wind, 50 Knots, LAT/LON: 42°17'N / 84°30'W.	Blackman
04/12/1971	0900: Thunderstorm Wind, LAT/LON: 42°12'N / 84°41'W	Concord
04/12/1971	0930: Thunderstorm Wind, LAT/LON: 42°12'N / 84°11'W.	Norvell
05/19/1971	1355: Thunderstorm Wind, LAT/LON: 42°17'N / 84°30'W.	Blackman
06/12/1973	1200: Thunderstorm Wind, LAT/LON: 42°06'N / 84°18'W.	Columbia
08/09/1973	1100: Thunderstorm Wind, 50 Knots, LAT/LON: 42°16'N / 84°28'W.	Blackman
05/25/1975	1515: Thunderstorm Wind, LAT/LON: 42°11'N / 84°38'W.	Concord
08/21/1975	1400: Thunderstorm Wind, LAT/LON: 42°23'N / 84°27'W.	Rives
05/05/1976	1830: Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W.	Jackson
05/17/1977	1750: Thunderstorm Wind, 65 Knots, LAT/LON: 42°16'N / 84°28'W.	Blackman
05/20/1978	1222: Thunderstorm Wind, LAT/LON: 42°24'N / 84°36'W.	Sandstone
05/13/1980	1455: Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W	Jackson
06/01/1980	2020: Thunderstorm Wind, 52 Knots, LAT/LON: 42°14'N / 84°24'W.	Jackson
07/16/1980	0607: Thunderstorm Wind, 55 Knots, LAT/LON: 42°16'N / 84°28'W.	Blackman
07/20/1980	2205: Thunderstorm Wind, 52 Knots, LAT/LON: 42°10'N / 84°15'W.	Napoleon
04/04/1981	0400: Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W.	Jackson
06/20/1982	1930: Thunderstorm Wind, LAT/LON: 42°14'N / 84°29'W.	Spring Arbor
06/27/1983	1445: Thunderstorm Wind, LAT/LON: 42°14'N / 84°29'W.	Spring Arbor
07/01/1983	1130: Thunderstorm Wind, LAT/LON: 42°14'N / 84°29'W.	Spring Arbor
07/17/1983	1020: Thunderstorm Wind, LAT/LON: 42°14'N / 84°29'W.	Spring Arbor
07/21/1983	1430: Thunderstorm Wind, LAT/LON: 42°14'N / 84°29'W.	Spring Arbor
07/21/1983	1624: Thunderstorm Wind, LAT/LON: 42°14'N / 84°29'W.	Spring Arbor
07/29/1983	1615: Thunderstorm Wind, LAT/LON: 42°14'N / 84°29'W.	Spring Arbor
07/29/1983	1715: Thunderstorm Wind, LAT/LON: 42°14'N / 84°29'W.	Spring Arbor
07/29/1983	1735: Thunderstorm Wind, LAT/LON: 42°09'N / 84°29'W.	Hanover
07/29/1983	1815: Thunderstorm Wind, LAT/LON: 42°14'N / 84°29'W.	Spring Arbor
05/18/1984	1830: Thunderstorm Wind, LAT/LON: 42°14'N / 84°29'W.	Spring Arbor
09/25/1984	1637: Thunderstorm Wind, LAT/LON: 42°05'N / 84°16'W.	Columbia
06/09/1985	0130: Thunderstorm Wind, 52 Knots, LAT/LON: 42°14'N / 84°24'W.	Jackson
07/05/1985	0130: Thunderstorm Wind, LAT/LON: 42°09'N / 84°29'W.	Hanover

Jackson County Hazard Mitigation

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
07/09/1985	2135: Thunderstorm Wind, LAT/LON: 42°14'N / 84°29'W.	Hanover
09/08/1985	1600: Thunderstorm Wind, LAT/LON: 42°14'N / 84°29'W.	Hanover
04/28/1986	1300: Thunderstorm Wind, LAT/LON: 42°15'N / 84°13'W	Grass Lake Village
05/17/1986	1945: Thunderstorm Wind, 52 Knots, LAT/LON: 42°14'N / 84°24'W.	Jackson
07/25/1986	1520: Thunderstorm Wind, LAT/LON: 42°15'N / 84°26'W.	Jackson
09/26/1986	1630: Thunderstorm Wind, LAT/LON: 42°06'N / 84°15'W.	Brooklyn
05/30/1987	1805: Thunderstorm Wind, LAT/LON: 42°15'N / 84°26'W.	Jackson
05/30/1987	1847: Thunderstorm Wind, 50 Knots, LAT/LON: 42°14'N / 84°24'W.	Jackson
06/29/1987	1615: Thunderstorm Wind, LAT/LON: 42°15'N / 84°26'W.	Jackson
07/20/1987	1805: Thunderstorm Wind, 52 Knots, 1 injury, LAT/LON: 42°15'N / 84°26'W.	Jackson
08/05/1988	1435: Thunderstorm Wind, LAT/LON: 42°15'N / 84°26'W.	Jackson
09/19/1988	2000: Thunderstorm Wind, LAT/LON: 42°15'N / 84°26'W.	Jackson
05/30/1989	1729: Thunderstorm Wind, LAT/LON: 42°15'N / 84°26'W.	Jackson
09/07/1990	0100: Thunderstorm Wind, LAT/LON: 42°15'N / 84°26'W.	Jackson
06/14/1991	1550: Thunderstorm Wind, 52 Knots, 1 injury, LAT/LON: 42°15'N / 84°25'W	Jackson
06/15/1991	1600: Thunderstorm Wind, LAT/LON: 42°12'N / 84°33'W.	Spring Arbor
07/07/1991	1805: Thunderstorm Wind, 62 Knots, LAT/LON: 42°12'N / 84°33'W.	Spring Arbor
07/07/1991	1820: Thunderstorm Wind, LAT/LON: 42°15'N / 84°26'W.	Jackson
06/17/1992	1805: Thunderstorm Wind, 56 Knots, LAT/LON: 42°12'N / 84°29'W.	Summit
06/17/1992	1838: Thunderstorm Wind, 52 Knots, LAT/LON: 42°14'N / 84°24'W.	Jackson
06/18/1992	1345: Thunderstorm Wind, 52 knots, LAT/LON: 42°10'N / 84°15'W.	Napoleon
06/28/1994	1900: Thunderstorm Winds, \$1,000 property damage. In addition to a tree falling on a house, additional tree and power line damage was reported.	Unspecified
07/06/1994	2115: Thunderstorm Winds, 13 Miles North East of Jackson. Numerous trees were reported down.	Waterloo
11/18/1994	1200: High Winds, 62 knots, \$1,000,000 property damage. High winds affected much of Michigan. Gusts of 40 to 50 mph were widespread throughout the state	Unspecified
07/04/1995	1535: Thunderstorm Winds, 52 Knots, \$1,000 property damage. Trees and power lines were blown down in the city of Jackson. Over 3,000 customers lost electric power around the county.	Jackson Jackson County

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Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
07/05/1995	1610: Thunderstorm Winds, 52 Knots, \$1,000 property damage. In the City of Jackson, large tree damage and damage to mobile homes was reported by a spotter.	Jackson
07/16/1995	1630: Thunderstorm Winds, 52 Knots, \$2,000 property damage. Trees and power lines were blown down in the city of Jackson. Several cars were damaged at a dealership, after one was flipped over by being pulled by the footings of a 20-foot promotional balloon that was caught in the wind and torn from its anchors.	Jackson
08/15/1995	1600: Thunderstorm Winds, 52 knots. 60 MPH wind and tree damage was reported in Grass Lake by amateur radio operators.	Grass Lake
07/23/1996	07:30 PM: Thunderstorm Wind at Jackson, 42°14'N / 84°24'W, 50 knots. Thunderstorm winds knocked down trees in the northern part of the city of Jackson.	Jackson
07/24/1996	11:25 AM: Thunderstorm Wind, Location: 8 Miles North of Jackson, LAT/LON: 42°21'N / 84°24'W, 50 knots. Thunderstorm winds blew trees down onto M-106 north of Jackson.	Rives
07/24/1996	11:40 AM: Thunderstorm Wind/hail in Concord. Thunderstorm winds, combined with half-inch hail, knocked down numerous tree limbs. (also listed in hail)	Concord
07/24/1996	11:55 AM: Thunderstorm Wind at Clark Lake, LAT/LON: 42°08'N / 84°21'W, 50 knots. Thunderstorm winds knocked down tree limbs.	Columbia
08/07/1996	09:00 PM: Thunderstorm Wind at Springport, LAT/LON: 42°23'N / 84°41'W, \$5,000 property damage. Power lines and several large trees were downed by the wind.	Springport
08/20/1996	01:15 PM: Thunderstorm Wind at Springport, LAT/LON: 42°23'N / 84°41'W, \$5,000 property damage. Numerous trees and limbs were blown down.	Springport
09/11/1996	02:25 PM: Thunderstorm Wind, \$3,000 property damage, LAT/LON: 42°15'N / 84°36'W. Several large trees were blocking roads in and around Parma.	Parma
04/06/1997	04:00 PM: High Winds, \$5,000,000 property damage statewide. Sustained wind speeds of 35 to 45 mph, along with frequent wind gusts of 50 to 70 mph, were common through midnight on April 6. Winds continued to gust to gale force through 5 PM EDT on April 7. Widespread wind damage was reported across the area, but no serious injuries were reported from the storm. The winds downed trees and power lines and resulted in roof damage to area homes and businesses. Between 180,000 and 200,000 Consumers Energy customers lost power across the state on Sunday evening. Nearly 70,000 customers were still without power Monday morning at 5 AM EDT.	Unspecified
07/08/1997	05:55 PM: Thunderstorm Winds, LAT/LON: 42°06'N / 84°33'W, \$5,000 property damage.	Hanover

Jackson County Hazard Mitigation

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
	Jackson Central Dispatch reported trees uprooted along Fowler Road in Hanover Township. Local fire officials estimated thunderstorm wind gusts up to 50 mph.	
07/14/1997	05:50 PM: Hail 4 Miles South East of Springport, LAT/LON: 42°21'N / 84°38'W, 0.88 inch. Strong to locally severe thunderstorms developed, with isolated reports received of up to nickel-sized hail and winds gusting to 70 mph. Downed trees and power lines cut power to approximately 48,000 Consumers Energy customers in southwest and south central Lower Michigan. No injuries were reported. Also listed under hail	Springport
07/14/1997	05:50 PM: Thunderstorm Wind 4 Miles South East of Springport, LAT/LON: 42°21'N / 84°38'W, 61 Knots, \$10,000 property damage. Jackson County officials reported a 70 mph wind gust and nickel-sized hail 4 miles southeast of Springport in Springport and Parma Townships. Numerous trees and power lines were knocked down in the mostly rural area. Also listed under hail	Springport
07/14/1997	05:59 PM: Thunderstorm Wind, LAT/LON: 42°23'N / 84°28'W, 52 Knots, \$5,000 property damage. Jackson County officials reported a 60 mph wind gust in Rives Junction in Rives Township in north central Jackson County, as well as downed trees.	Rives
08/16/1997	02:45 PM: Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W, 52 knots. Jackson County Central Dispatch relayed a report of a 60 mph wind gust in the city of Jackson. Thunderstorms produced heavy rainfall amounts of 2 to 5 inches, along with isolated reports of wind damage from 60 mph thunderstorm wind gusts. Local utility companies reported approximately 55,000 power outages during the afternoon and evening across far southern Michigan, with most caused by lightning strikes, but some due to downed trees and utility poles (also listed under lightning).	Jackson
08/16/1997	06:45 AM: Thunderstorm Wind, LAT/LON: 42°06'N / 84°33'W, \$5,000 property damage. Downed trees were reported in Hanover	Hanover
09/19/1997	04:10 PM: Thunderstorm Wind, LAT/LON: 42°15'N / 84°36'W, \$10,000 property damage. Jackson County Central Dispatch reported trees and power lines down in Parma Township, as a line of severe thunderstorms moved across southwest and south central Lower Michigan, producing wind gusts to 70 mph and small hail. Trees and power lines were downed in a line from Allegan County east-southeast through Jackson County. Around 10,000 customers in this swath lost power, nearly half of which occurred in Jackson County. At 04:20 PM: Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W, \$25,000 property damage. Jackson County Central Dispatch reported trees, power lines, and traffic lights were downed in and	Parma Jackson

Potential Hazards

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
	around the city of Jackson. A large tree limb fell across a van parked at the corner of N. Wisner and Norfolk Streets. A Consumers Energy spokesman reported that 5,000 customers had lost power across Jackson County because of the severe thunderstorms. Water was also knocked out briefly at the Jackson Water Department, which resulted in customers not having water or having reduced water pressure until backup systems could kick in. At 04:25 PM: Thunderstorm Wind, LAT/LON: 42°15'N / 84°16'W, \$5,000 property damage. Jackson County Central Dispatch reported trees and power lines were downed in Leoni Township. Thunderstorm Wind, LAT/LON: 42°23'N / 84°15'W, \$15,000 property damage. The Jackson County Sheriff's Department reported that trees and power lines were downed in Munith. One tree fell on the roof of a home and another across a vehicle in the area. At 04:30 PM: Thunderstorm Wind, LAT/LON: 42°15'N / 84°13'W, \$5,000 property damage. Jackson County Central Dispatch reported that trees and power lines were down across Grass Lake Township. At 04:35 PM: Thunderstorm Wind at Brooklyn, LAT/LON: 42°06'N / 84°15'W, \$15,000 property damage. A barn under construction on Cement City Highway near Hayes Road was severely damaged.	Leoni Waterloo Grass Lake Brooklyn Cement City
09/29/1997	12:00 PM: High Wind, 42 knots. Southwest, then west winds gusted between 40 and 50 mph through much of Monday afternoon and night. Gusts reached 46 mph at Jackson County Airport Monday evening. The winds caused some trees and power lines to come down, which resulted in 35,000 power outages across the region. Felled trees blocked a few isolated roads across the area for a brief time including Woodbridge and Union Streets in Jackson. No injuries were reported. Damage estimates were not available for the event.	Blackman Jackson
03/28/1998	11:00 AM: Thunderstorm Wind from 5 Miles East of Brooklyn to 5 Miles East South East of Brooklyn, Begin LAT/LON: 42°06'N / 84°09'W, End LAT/LON: 42°06'N / 84°09'W, \$5,000 property damage. Jackson County Central Dispatch reported that trees and power lines were downed in Norvell Township near the intersection of Michigan Highway 124 and Wellwood Road, approximately 5 miles east of Brooklyn. A large branch from a downed tree broke the front window of a home on Wellwood Road. No injuries were reported.	Norvell
05/31/1998	05:19 AM: Hail at Hanover, LAT/LON: 42°06'N / 84°33'W, 1.50 inches. Numerous sources indicated that the widespread and severe damages from a fast-moving line of thunderstorms during the early morning hours of Sunday, May 31st, were caused primarily by strong straight-line winds and isolated wet microburst winds. This derecho event produced widespread 60 to 90 mph wind gusts, which caused extensive tree and structural damage	Hanover

Jackson County Hazard Mitigation

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
	and left over 861,000 homes and businesses without electricity across Michigan's Lower Peninsula. Consumers Energy reported that the derecho event was the most destructive weather event in the company's history, leaving over 600,000 of its customers without power (Consumers Energy is the largest utility company in western and mid Lower Michigan). There were 4 storm-related fatalities reported in the state and 146 injuries (mostly minor). Statewide, approximately 250 homes were destroyed, 12,250 homes damaged, 34 businesses destroyed, and 829 businesses damaged. (This was subsequently denoted as federally-declared disaster number 1226.) Damage estimates across the above listed counties totaled over \$166 Million. Also listed under hail and thunderstorms.	
06/24/1998	This storm resulted in several wind damage and large hail reports, and an F1 tornado touched down in north central Jackson County near Layton Corners. No injuries were reported with the tornadoes, but damage was estimated at half a million dollars across Henrietta and Waterloo Townships in northern Jackson County. At 5:05 PM: Thunderstorm Wind at Rives Junction, LAT/LON: 42°23'N / 84°27'W, \$5,000 property damage. Jackson County Central Dispatch reported trees and power lines downed in the village of Rives Junction and scattered reports across Rives Township. The Waterloo State Recreation Area reported hundreds of trees uprooted, which resulted in the closing of some roads and horse trails. 5,800 were without power in the affected areas of Henrietta and Waterloo Townships. Damage was estimated at approximately \$500,000. At 05:25 PM: Hail 2 Miles North of Grass Lake, LAT/LON: 42°17'N / 84°13'W, 1.75 inch. Jackson County Emergency Management reported golf ball-sized hail on Morrissey Road in Grass Lake Township, 2 miles north of the city of Grass Lake. Also listed under hail	Henrietta Waterloo Rives
06/26/1998	01:10 AM: Thunderstorm Wind at Jackson, LAT/LON: 42°14'N / 84°24'W, 52 knots. Scattered reports of wind damage and hail were received across west central, southwest, and south central Lower Michigan, as widespread thunderstorm activity moved across Michigan's Lower Peninsula during the late evening hours of Thursday, June 25th, and early morning hours of Friday, June 26th. No injuries were reported, but an estimated 22,000 people lost power across the southern third of Michigan's Lower Peninsula, due to downed trees and power lines. At 01:20 AM: Thunderstorm Wind at Sandstone, LAT/LON: 42°15'N / 84°31'W, 52 knots. Jackson County Emergency Management reported wind gusts to 60 mph in Sandstone Township along with scattered reports of trees and power lines having been felled. At 12:58 AM, Thunderstorm Wind at Parma, LAT/LON: 42°15'N / 84°36'W, 52	Jackson Sandstone

Potential Hazards

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
	knots. Jackson County Emergency Management reported wind gusts to 60 mph in Parma Township along with scattered reports of trees and power lines having been felled. Also listed under hail	Parma
07/21/1998	04:30 PM: Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W. Jackson area law enforcement reported numerous trees and power lines downed in Blackman Township and the city of Jackson. The Jackson Citizen Patriot reported that a Jackson woman was trapped when the wind dropped a large branch and live power lines over her car on Sixth Street, just north of W. Morrell. Damage to the car was minor and the woman was not injured. Over 200 power lines were downed by the storm and transformers were damaged by lightning strikes. Approximately 5,000 residents lost power in Jackson County. Damage estimates were not available. Wind gusts of 60 to 80 mph occurred across portions of the county. No injuries were reported, but power outages across southwest and south central Lower Michigan peaked at approximately 110,000. At 06:30 AM, Thunderstorm Wind at Jackson, LAT/LON: 42°14'N / 84°24'W. The Jackson Citizen Patriot newspaper reported tree limbs and power lines down across the County. According to the Patriot, the Jackson County Road Commission reported tree limbs down on Pulaski, Lansing, Sargent, and County Farm Roads, with most of the damage north of the city of Jackson in the northern part of county. Approximately 1,500 homes lost power in the Jackson Area, including a section of N. West Avenue in the city (also listed under lightning).	Blackman Jackson Jackson County
09/07/1998	02:50 AM: Thunderstorm Wind at Napoleon, LAT/LON: 42°10'N / 84°15'W, 60 knots. Large trees were down near Napoleon at 0250 and 0315, and near Brooklyn at 0310.	Napoleon
11/10/1998	10:00 AM: High Wind, 87 Knots, 1 death. Winds exceeded 50 mph across the entire county, with gusts exceeding 60 mph. Over 167,000 Michigan homes were without power, and clean-up efforts were extensive.	Jackson County
12/06/1998	03:10 PM: Thunderstorm Wind at Spring Arbor, LAT/LON: 42°12'N / 84°33'W, \$2,000 property damage. A weather spotter reported 2 large trees down in Spring Arbor.	Spring Arbor
12/06/1998	03:15 PM: Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W, \$5,000 property damage. The Jackson County Sheriff's Department reported 5 trees down in the city of Jackson.	Jackson
05/17/1999	04:00 PM: Numerous trees and power lines were also brought down in the Napoleon and Clark Lake areas. A large severe weather outbreak featured numerous reports of wind gusts of 60 to 70 miles per hour that downed many trees and power lines. There were also a few reports of hail 0.75" - 1.00" in diameter. Also listed under hail	Parma

Jackson County Hazard Mitigation

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
07/23/1999	01:38 PM: Thunderstorm Wind, LAT/LON: 42°22'N / 84°32'W, 53 Knots, \$10,000 property damage. Several trees were downed in Tompkins, during numerous rounds of strong to severe thunderstorms. Many of the thunderstorms produced gusty winds of 50 to 60 mph. At 11:10 PM: Thunderstorm Wind at Jackson, LAT/LON: 42°14'N / 84°24'W, \$1,000 property damage. A large tree was downed on Comdon Road.	Tompkins Jackson
07/24/1999	10:28 PM: Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W, \$10,000 property damage. Trees and a few power lines were down in Jackson. Scattered strong to severe thunderstorms developed during the afternoon and continued through the evening.	Jackson
07/31/1999	01:05 PM: Thunderstorm Winds, Pleasant Lake to Grass Lake, Begin LAT/LON: 42°24'N / 84°20'W, End LAT/LON: 42°15'N / 84°13'W, 53 Knots, \$10,000 property damage. Several large trees were downed near Pleasant Lake and Grass Lake.	Henrietta Grass Lake
09/28/1999	06:28 PM: Thunderstorm Wind, LAT/LON: 42°15'N / 84°26'W, 53 Knots, \$10,000 property damage. Thunderstorm winds knocked down several trees, and one car drove into a tree that had fallen onto a road. The thunderstorm became severe, producing pea-sized hail and wind gusts to 60 mph. also listed under hail	Jackson
05/09/2000	06:50 PM: Thunderstorm Wind at Parma, LAT/LON: 42°15'N / 84°36'W, 53 Knots, \$50,000 property damage. Severe thunderstorms resulted in several trees being blown down in Parma. Severe thunderstorm warnings were issued.	Parma
06/21/2000	12:30 AM: Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W, 53 Knots, \$10,000 property damage. An isolated severe thunderstorm produced wind gusts estimated near 60 mph, blowing down several trees in Jackson during the early morning hours.	Jackson
07/28/2000	03:04 PM: Thunderstorm Wind, LAT/LON: 42°15'N / 84°36'W, 53 Knots, \$10,000 property damage. A tree was downed at the intersection of Erie and Little roads (1 mile southwest of Parma) at 3:04 p.m. Severe thunderstorm warnings were issued.	Parma
06/19/2001	08:30 PM, Thunderstorm Wind, LAT/LON: 42°10'N / 84°15'W, 53 Knots, \$25,000 property damage. A severe thunderstorm produced numerous reports of wind damage across Jackson county during the evening hours of the 19th. Trees were blown down in Napoleon township, and numerous trees and power lines were also blown down in the city of Jackson. Trees were also blown down in Leoni township. All of the reports of trees blown down came from Jackson county area law enforcement. 08:43 PM, Thunderstorm Wind, Jackson to Leoni, Begin LAT/LON: 42°14'N / 84°24'W, End	Jackson County Napoleon Jackson Leoni

Potential Hazards

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
	LAT/LON: 42°15'N / 84°16'W, 53 Knots, \$75,000 property damage. A severe thunderstorm produced numerous reports of wind damage across Jackson county during the evening hours of the 19th. Trees were blown down in Napoleon township, and numerous trees and power lines were also blown down in the city of Jackson. Trees were also blown down in Leoni township. All of the reports of trees blown down came from Jackson county area law enforcement.	
07/29/2001	07:10 PM, Thunderstorm Wind, Parma to Spring Arbor, Begin LAT/LON: 42°15'N / 84°36'W, End LAT/LON: 42°12'N / 84°33'W, 53 Knots, 25,000 property damage. A large severe weather outbreak across southern and central lower Michigan during the late afternoon and evening hours resulted in numerous reports of downed trees and power lines, and a few reports of large hail. A 911 center in Spring Arbor (Jackson county) reported trees down in that area. Also recorded as hail	Parma Spring Arbor
08/28/2001	12:28 AM, Thunderstorm Wind, LAT/LON: 42°12'N / 84°33'W, 53 Knots, 20,000 property damage. An isolated severe thunderstorm blew down numerous trees in Spring Arbor. Several trees fell on power lines, causing scattered power outages.	Spring Arbor
09/07/2001	07:05 PM, Thunderstorm Wind, LAT/LON: 42°06'N / 84°24'W, 53 Knots, \$10,000 in property damage. In Liberty, in Jackson county, several trees were also blown down.	Liberty
10/24/2001	06:05 PM, Thunderstorm Wind, LAT/LON: 42°15'N / 84°26'W, 53 Knots, 5,000 property damage. A major severe weather episode occurred across southern lower Michigan, highlighted by three supercell thunderstorms that caused extensive damage. It moved northeast between 50 and 55 m.p.h. across northwest Jackson. The storm blew down several trees and power lines but did not cause extensive damage in Jackson County.	Jackson
03/09/2002	12:54 PM, High Wind, 62 Knots, 485,000 property damage. A very strong area of low pressure produced numerous reports of wind gusts over 60 m.p.h. across southern lower Michigan, with sustained winds of 30 to 40 m.p.h. High wind damage across the area ranged from downed trees and power lines to property damage.	Unspecified
7/22/2002	05:40 PM, Thunderstorm Wind, LAT/LON: 42°07'N / 84°21'W, 53 Knots, 5,000 property damage. Numerous eight to ten inch diameter tree limbs were blown down and several fell down on and blocked roads in the Clark Lake area.	Columbia
7/26/2002	08:24 AM, Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W, 53 Knots, 20,000 property damage. An isolated severe thunderstorm during the morning in Jackson produced several	Jackson

Jackson County Hazard Mitigation

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
	<p>high wind gusts, causing several large trees and limbs to be blown down. One large tree was blown down on a home on the west side of Jackson, and another report of a tree blown down onto a home in Jackson was received as well. Another large tree limb was blown down and blocked a road.</p> <p>Storm report for JACKSON County. Wind damage and large trees blown down on a home in the west side of Jackson reported by law enforcement. Large limb knocked down by gusty winds blocking a road reported by law enforcement.</p>	
8/4/2002	<p>04:05 PM, Thunderstorm Wind, LAT/LON: 42°07'N / 84°38'W, 53 Knots, \$2,000 property damage. A tree was blown down in Pulaski by a severe thunderstorm wind gust, as reported by area law enforcement.</p> <p>04:30 PM, Thunderstorm Wind, LAT/LON: 42°10'N / 84°15'W, 53 Knots, \$2,000 property damage. Spotters two miles west of Napoleon reported that a thunderstorm wind gust blew down one tree.</p>	<p>Pulaski</p> <p>Napoleon</p>
9/10/2002	<p>04:16 PM, Thunderstorm Wind, Parma to Jackson, Begin LAT/LON: 42°15'N / 84°36'W, End LAT/LON: 42°14'N / 84°24'W, 53 Knots, \$20,000 property damage. Several trees were blown down in Parma and also in Jackson by thunderstorm wind gusts, as reported by local law enforcement.</p>	<p>Parma</p> <p>Jackson</p>
10/04/2002	<p>04:25 PM, Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W, 53 Knots, \$15,000 property damage. Several power lines and trees were blown down in Jackson and also about five miles south of Jackson.</p>	<p>Jackson</p> <p>Liberty</p>
3/28/2003	<p>432 PM, Thunderstorm Wind, Jackson to Brooklyn, Begin LAT/LON: 42°14'N / 84°24'W, End LAT/LON: 42°06'N / 84°15'W, 52 Knots, \$25,000 property damage. Numerous trees were blown down across Jackson county, and two large trees were uprooted two miles west of Brooklyn.</p>	<p>Brooklyn</p> <p>Columbia</p> <p>Jackson</p>
4/20/2003	<p>Storm report: JACKSON County has wind damage and trees and limbs down and some are one foot in diameter.</p> <p>NWS reported a number of trees and road signs downed as it passed through JACKSON County.</p>	<p>Unspecified location</p>
6/28/2003	<p>04:38 PM, Thunderstorm Wind, Pulaski to Jackson, LAT/LON: 42°07'N / 84°38'W, End LAT/LON: 42°14'N / 84°24'W, 53 Knots, \$15,000 property damage. Several trees were blown down in Pulaski, Spring Arbor, and Jackson.</p> <p>05:05 PM, Thunderstorm Wind, LAT/LON: 42°10'N / 84°15'W, 53 Knots, \$5,000 property damage. Severe thunderstorm</p>	<p>Pulaski</p> <p>Spring Arbor</p> <p>Jackson</p> <p>Napoleon</p>

Potential Hazards

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
	wind gusts blew down several trees in Napoleon.	
7/4/2003	11:04 AM: Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W, 53 Knots, \$30,000 property damage, \$10,000 crop damage. Numerous reports of blown down trees and power lines were received from across Jackson county.	Jackson Jackson Co.
7/8/2003	01:00 PM, Thunderstorm Wind, Brooklyn, LAT/LON: 42°06'N / 84°15'W, 53 Knots, \$15,000 property damage. Several trees were blown down and some fell across and blocked roads in Norvell township. 12:30 PM, Thunderstorm Wind, LAT/LON: 42°07'N / 84°38'W, 53 Knots, \$15,000 property damage. Numerous trees were blown down across Pulaski and Concord townships	Brooklyn Norvell Pulaski Concord
7/21/2003	01:50 AM, Thunderstorm Wind, 53 Knots, LAT/LON: 42°14'N / 84°24'W, \$30,000 property damage. Law enforcement in Jackson reported that several trees and power lines were blown down.	Jackson
8/1/2003	01:38 PM, Thunderstorm Wind, 67 Knots, \$20,000 property damage. A 77- m.p.h. wind gust was recorded in the city of Jackson.	Jackson
8/2/2003	Storm report: 77 mph wind gusts in JACKSON County.	Unspecified
11/12/2003- 11/13/2003	High wind warnings issued for JACKSON	Jackson
3/5/2004	High wind warning for JACKSON1121, High wind warning issued for JACKSON - West winds of 40 mph or greater, or gusts of 58 mph or stronger are likely.1530, High wind warning issued for JACKSON. West winds 25-35 mph with gusts to 60 mph.	Jackson
5/9/2004	06:30 PM: Thunderstorm Wind, Spring Arbor to Hanover, Begin LAT/LON: 42°12'N / 84°33'W, End LAT/LON: 42°06'N / 84°33'W, 53 Knots, 20,000 property damage, 5,000 crop damage. One tree was blown down in Spring Arbor, Brooklyn and Hanover.	Spring Arbor Hanover Brooklyn
6/14/2004	01:40 PM, Thunderstorm Wind, Jackson to Brooklyn, Begin LAT/LON: 42°14'N / 84°24'W, End LAT/LON: 42°06'N / 84°15'W, 53 Knots, \$10,000 property damage. The general public reported a couple of trees were blown down one mile east of Brooklyn and two miles south of Jackson.	Jackson Brooklyn
7/6/2004	10:45 PM, Thunderstorm Wind, LAT/LON: 42°11'N / 84°38'W, 53 Knots, \$5,000 property damage. A storm chaser in Jackson County reported that several trees were blown down along M-60 one mile east of Concord.	Concord
10/30/2004	11:00 AM, High Wind, 59 Knots, \$1,200,000 property damage. Law enforcement from all	

Jackson County Hazard Mitigation

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
	the counties in our area reported scattered downed trees and power lines due to gusty winds. Wind gusts of around 58 to 60 m.p.h. were estimated across our area based on all the reports. The wind knocked out power to about 100,000 people statewide.	Unspecified
5/13/2005	04:25 PM, Thunderstorm Wind, LAT/LON: 42°12'N / 84°33'W, 53 Knots, \$5,000 property damage. A severe thunderstorm produced an estimated wind gust to 60 m.p.h. in Spring Arbor which blew down numerous trees.	Spring Arbor
6/5/2005	06:00 PM, Thunderstorm Wind, Parma to Springport, Begin LAT/LON: 42°15'N / 84°36'W, End LAT/LON: 42°23'N / 84°41'W, 52 Knots, \$10,000 property damage. A large severe weather outbreak occurred across our area resulting in numerous downed tree limbs and power lines, many reports of large hail and many reports of downed power lines. Several trees were blown down across area roads. There were several reports of three quarters to inch diameter hail and estimated wind gusts to 60 m.p.h. also listed as hail	Parma Springport
6/30/2005	07:35 PM, Thunderstorm Wind at Parma, End LAT/LON: 42°15'N / 84°36'W, 52 Knots, \$10,000 property damage	Parma
6/30/2005	09:20 AM, Thunderstorm Wind, Parma to Jackson, Begin LAT/LON: 42°15'N / 84°36'W, End LAT/LON: 42°14'N / 84°24'W, 52 Knots, \$10,000 property damage. Twelve trees were blown down in and near Parma.	Parma Jackson
7/4/2005	05:15 PM, Thunderstorm Wind at Brooklyn, LAT/LON: 42°06'N / 84°15'W, 53 Knots, \$10,000 property damage. Three trees greater than one foot in diameter were uprooted in Brooklyn.	Brooklyn
7/25/2005	10:04 PM, Thunderstorm Wind, 53 Knots, LAT/LON: 42°06'N / 84°33'W, \$25,000 property damage. A large severe weather outbreak occurred and produced numerous reports of wind damage, one tornado and one isolated hail report. As a result of severe thunderstorm wind gusts, there were numerous reports of wind damage including downed trees, limbs, and power lines across the area. Also listed as hail	Hanover
5/30/2006	02:08 PM: Thunderstorm Wind, LAT/LON: 42°07'N / 84°38'W, 52 Knots, \$10,000 property damage, \$5,000 crop damage. The public reported numerous trees blown down one mile north of Pulaski in Jackson County.	Pulaski
06/21/2006	04:10 PM, Thunderstorm Wind, LAT/LON: 42°11'N / 84°38'W, 52 Knots, \$10,000 property damage. Law enforcement in Jackson reported several trees were blown down one mile south of Concord.	Concord

Potential Hazards

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
06/21/2006	05:30 PM, Thunderstorm Wind, Pulaski to Hanover, Begin LAT/LON: 42°07'N / 84°38'W, End LAT/LON: 42°06'N / 84°33'W, 52 Knots, \$20,000 property damage. Several trees were blown down in Pulaski and near Hanover.	Pulaski Hanover
06/21/2006	08:54 PM, Thunderstorm Wind, LAT/LON: 42°15'N / 84°36'W, 52 Knots, \$15,000 property damage. Several trees were blown down two miles east of Parma.	Parma
07/17/2006	10:00 PM: Thunderstorm Wind, LAT/LON: 42°14'N / 84°24'W, 53 Knots, \$25,000 property damage, \$5,000 crop damage. Numerous trees were blown down across the city of Jackson.	Jackson
5/15/2007	17:18 PM, Thunderstorm Wind 1 Mile North East of Pleasant Lake, LAT/LON: 42°24'N/84°19'W, 50 Knots, \$10,000 property damage. EVENT NARRATIVE: A combination of six trees and large limbs were blown down on a golf course one mile northeast of Pleasant Lake in Jackson county. EPISODE NARRATIVE: Severe storms produced several reports of large hail and high winds which brought down several trees and branches in Jackson County. Also listed under hail	Henrietta
6/02/2007	18:15 PM, Thunderstorm Wind 3 Miles West North West of Pleasant Lake, LAT/LON: 42°25'N/84°23'W, 52 Knots, \$20,000 property damage. EVENT NARRATIVE: Multiple trees and power lines were blown down along the Jackson County line. EPISODE NARRATIVE: Severe storms affected much of southwestern lower Michigan, resulting in several reports of large and numerous reports of wind damage. Also listed under hail JACKSON, at 1915, a thunderstorm wind gust of 60 mph was reported 3 miles southeast of Leslie, with multiple trees and limbs down along the Ingham/Jackson county line.	Henrietta
06/07/2007	11:10 AM, Strong Wind, 43 Knots, \$15,000 property damage. EVENT NARRATIVE: Non convective thunderstorm wind gusts brought down several trees and power lines. EPISODE NARRATIVE: High Winds not related to thunderstorms brought down several trees and power lines and also caused damage to some area buildings.	Unspecified

Jackson County Hazard Mitigation

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
08/7/2007	Severe Thunderstorm Warnings issued for JACKSON JACKSON, at 1919, thunderstorm wind damage was reported by county dispatch, with mature healthy large tree branches blown down near Pulaski and Howard. 18:19 PM, Thunderstorm Wind 1 Mile West of Pulaski, LAT/LON: 42°07'N / 84°38'W, 50 Knots, \$5,000 property damage. EVENT NARRATIVE: County dispatch reported that mature healthy large tree branches were blown down near the intersection of Pulaski and Howard. EPISODE NARRATIVE: An isolated severe thunderstorms brought down large tree limbs and branches in Jackson county.	Pulaski
8/23/2007	18:25 PM, Thunderstorm Wind 1 Mile North of Jackson, LAT/LON: 42°14'N / 84°24'W, 50 Knots, \$100,000 property damage. EVENT NARRATIVE: Numerous trees were blown down throughout the county. EPISODE NARRATIVE: A large severe weather event unfolded on August 23rd and resulted in numerous reports of wind damage.	Blackman
8/29/2007	16:28 PM, Thunderstorm Wind 1 Mile West of Springport to 2 Miles North, North West of Woodlawn Orchards, Begin LAT/LON: 42°22'N / 84°42'W, End LAT/LON: 42°16'N / 84°21'W, 50 Knots, \$15,000 property damage. EVENT NARRATIVE: Several trees were blown down in Springport. A couple of trees were also blown down near Jackson. EPISODE NARRATIVE: Severe thunderstorms produced widespread wind damage with numerous reports of downed trees and power lines across far southern lower Michigan. 16:48 PM, Thunderstorm Wind 1 Mile West of Springport, LAT/LON: 42°22'N / 84°42'W, 50 Knots, \$3,000 property damage. EVENT NARRATIVE: Two trees were blown down in Springport. EPISODE NARRATIVE: Severe thunderstorms produced widespread wind damage with numerous reports of downed trees and power lines across far southern lower Michigan.	Springport Jackson

Jackson County Hazard Mitigation

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
	<p>mph between Rives and Pleasant Lake.</p> <p>15:40 PM, Thunderstorm Wind 1 Mile South of Leoni, LAT/LON: 42°14'N / 84°16'W, 52 knots. EVENT NARRATIVE: The public reported that trees were blown down and that a tree and some debris were lifted up into the air.</p> <p>15:48 PM, Thunderstorm Wind, LAT/LON: 42°10'N / 84°15'W, 52 knots. EVENT NARRATIVE: Several trees were blown down around Napoleon.</p>	<p style="text-align: center;">Leoni</p> <p style="text-align: center;">Napoleon</p>
6/26/2008	<p>14:39 PM, Thunderstorm Wind 5 Miles North West of Concord, LAT/LON: 42°13'N / 84°42'W, 52 knots. EVENT NARRATIVE: One tree was blown down. EPISODE NARRATIVE: A round of severe thunderstorms resulted in several reports of strong to severe thunderstorm wind gusts which downed several trees.</p> <p>14:39 PM, Thunderstorm Wind 4 Miles South, South East of Devereaux, LAT/LON: 42°16'N / 84°40'W, 52 knots.</p> <p>14:39 PM, Thunderstorm Wind 1 Mile South West of South Jackson, LAT/LON: 42°09'N / 84°24'W, 52 knots.</p> <p>14:40 PM, Thunderstorm Wind 1 Mile North West of Minard, LAT/LON: 42°20'N / 84°33'W, 52 knots.</p> <p>14:40 PM, Thunderstorm Wind 2 Miles South West of South Jackson, LAT/LON: 42°09'N / 84°25'W, 52 knots.</p> <p>14:46 PM, Thunderstorm Wind 2 Miles South East of Tompkins Center, LAT/LON: 42°21'N / 84°30'W, 52 knots.</p> <p>14:48 PM, Thunderstorm Wind 1 Mile North of Parma, LAT/LON: 42°15'N / 84°36'W, 52 knots.</p> <p>18:04 PM, Thunderstorm Wind 1 Mile North of Brooklyn, LAT/LON: 42°06'N / 84°15'W, 52 knots. EVENT NARRATIVE: A trained spotter in Brooklyn reported that the entire village was without power due to blown down power lines.</p>	<p style="text-align: center;">Concord</p> <p style="text-align: center;">Parma</p> <p style="text-align: center;">Spring Arbor</p> <p style="text-align: center;">Spring Arbor</p> <p style="text-align: center;">Tompkins</p> <p style="text-align: center;">Columbia</p>
7/16/2008	<p>20:53 PM, Thunderstorm Wind 1 Mile North West of Rives Junction, LAT/LON: 42°23'N / 84°27'W, 52 knots. EVENT NARRATIVE: Law enforcement in Jackson county reported that a couple of trees were blown down. One was blown down on Spring Court and another was blown down near Zion Road and East Berry Road. EPISODE NARRATIVE: Numerous severe thunderstorms across southwest Michigan resulted in wind damage and large hail.</p> <p>Also listed under hail</p>	<p style="text-align: center;">Rives</p>
12/28/2008	<p>04:00 AM, High Wind, 52 knots. EVENT NARRATIVE: Wind gusts up to 60 mph brought</p>	<p style="text-align: center;">Unspecified</p>

Potential Hazards

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
	down several trees and power lines. EPISODE NARRATIVE: A strong low pressure system produced very windy conditions across southwestern lower Michigan on December the 28th. The highest wind gusts occurred mainly before sunrise, however very gusty conditions persisted well into the afternoon. Hundreds of thousands of people across the state lost power at least temporarily due to high winds.	
4/25/2009	<p>12:04 PM, Thunderstorm Wind, 53 knots. EVENT NARRATIVE: A wind gust of 61 mph was measured by the ASOS at the Jackson County Airport. An NWS storm survey team did not find any damage beyond a few small branches down in areas adjacent to the airport or in the city of Jackson itself. Severe storms developed ahead of a cold front that swept across Michigan during the afternoon and evening hours.</p> <p>16:30 PM, Thunderstorm Wind 1 Mile West of Munith, LAT/LON: 42°22'N / 84°16'W, 50 knots. EVENT NARRATIVE: Roughly a 1 by 2 mile area of widely scattered tree damage was observed about two miles west-northwest of Tompkins.</p> <p>16:30 PM, Thunderstorm Wind 1 Mile North West of Parma to 3 Miles South, South West of Munith, LAT/LON: 42°15'N / 84°36'W, End LAT/LON: 42°20'N / 84°16'W, 50 knots. EVENT NARRATIVE: Widely scattered tree damage was observed from about one mile west of Parma to 18 miles east-northeast of Parma. The swath was 2 to 3 miles wide. Other than tree damage a highway billboard was blown down on Interstate-94 just outside of Parma. Several eyewitnesses were interviewed to confirm that damage was from second storm.</p> <p>16:40 PM, Thunderstorm Wind 1 Mile East South East of Pleasant Lake to End Location: 7 Miles North of Waterloo, Begin LAT/LON: 42°24'N / 84°18'W, End LAT/LON: 42°27'N / 84°08'W, 53 knots. EVENT NARRATIVE: Scattered to widely scattered tree damage occurred including occasional uprooted trees along a 9 mile stretch from 2 miles west-southwest of Pleasant Lake to 2.5 miles southwest of Stockbridge. The damage swath was 4 to 6 miles wide. A measured 53 knot gust with pea sized hail occurred just north of Bateese Lake. The damage crossed into extreme southeast Ingham County at 42.4284 north latitude and 84.2094 west longitude. The damage continued east-northeast to at least the Livingston County line. Also listed under hail</p>	<p style="text-align: center;">Blackman</p> <p style="text-align: center;">Waterloo Tompkins</p> <p style="text-align: center;">Parma</p> <p style="text-align: center;">Henrietta</p>
8/9/2009	19:09 PM, Thunderstorm Wind, 5 Miles North, North West of Jackson Airport to 5 Miles North East of Jackson Airport, Begin LAT/LON: 42°20'N / 84°30'W, End LAT/LON: 42°19'N / 84°24'W, 55 knots. EVENT NARRATIVE: A roof section was partially peeled off of Kidder Middle School. Approximately three dozen trees were blown down. EPISODE NARRATIVE:	<p style="text-align: center;">Blackman</p> <p style="text-align: center;">Henrietta</p>

Jackson County Hazard Mitigation

Jackson County Severe/Strong/High Wind Events, 1962-2009		
Date	Description	MCD's
	Severe thunderstorms developed across west central lower Michigan ahead of a cold front during the late afternoon hours of August 9th. An area of thunderstorms developed south and east of Grand Rapids and produced wind damage in eastern Ingham county along Interstate-96 near Webberville and in central Jackson county. A severe storm just northwest of Jackson a few miles from the Interstate 94 and U.S. - 127 interchange produced 70 mph wind gusts that peeled part of the roof off of Kidder Middle School as well as damaging as many as 100 trees. The storm produced damaging wind gusts over a 5 mile long and up to 1.75 mile wide path.	Jackson

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.

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 the Polar Regions 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 storm's path. The violently rotating winds then carry debris aloft that can be blown through the air as dangerous missiles.

Jackson County Perspective

National Weather Service data indicates that there were 15 tornadoes resulting in 1 death in Jackson County between 1950 and July 2001. All of the tornado events occurring in Jackson County occurred during the months of March through August. The intensity of the tornadoes ranged from F0 - F3, with 27% at F0, 33% at F1, 33% at F2, and 7% at F3. F3 tornadoes are classified as "severe" with wind speeds of 18 to 206 mph resulting in severe damage. An F3 tornado can result in roofs and some walls torn off well constructed houses; trains overturned; and forests uprooted.

Severe winds are an annually expected occurrence in Jackson County because the county has an average of between 40 and 60 thunderstorm days per year, any of which may include strong wind gusts. Gusting

Potential Hazards

winds may also occur outside of storm events, or during winter storms, but the county expects several severe thunderstorm events to occur each year that are characterized by strong wind activity which can be expected to cause property or infrastructure damage and even some injuries.

Although less frequent than other sources of severe winds, a tornado touchdown tends to take place in the county at least once every 3 years, on average. This estimate is based on the history of touchdowns in the county over more than a half-century, with the probability of damage apparently greater now than it was 50 or 60 years ago, due to more extensive rural development and suburbanization patterns throughout the county. The following table provides a history of tornadoes in Jackson County from 1954-2009.

Jackson County Tornado Events, 1954-2009		
Date	Description	MCD's
06/19/1954	1600: Tornado, LAT/LON: 42°12'N / 84°21'W, F0, \$3,000 property damage.	Napoleon
08/06/1955	1700: Tornado, Begin LAT/LON: 42°06'N / 84°20'W, End LAT/LON: 42°09'N / 84°11'W, Length: 7.90 Miles, Width: 300 Yards, F2, \$3,000 property damage.	Begin: Columbia, End: Norvell
06/15/1960	1730: Tornado, Begin LAT/LON: 42°15'N / 84°20'W, End LAT/LON: 42°15'N / 84°13'W, Length: 5.60 Miles, Width: 33 Yards, Magnitude: F2, \$25,000 property damage.	Begin: Leoni, End: Grass Lake
07/04/1969	2310: Tornado, LAT/LON: 42°18'N / 84°20'W, Length: 0.30 Mile, Width: 27 Yards, Magnitude: F1, Injuries: 11, Property Damage: \$25,000.	Leoni
05/30/1972	1025: Tornado, LAT/LON: 42°15'N / 84°16'W, Length: 1.10 Miles, Width: 17 Yards, Magnitude: F1, \$2,500 property damage.	Grass Lake
04/03/1974	1900: Tornado, Begin LAT/LON: 42°05'N / 84°24'W, End LAT/LON: 42°07'N / 84°22'W, Length: 1.30 Miles, Width: 440 Yards, Magnitude: F2, Property Damage: \$25,000.	Columbia
03/12/1976	1645: Tornado, LAT/LON: 42°04'N / 84°30'W, End LAT/LON: 42°05'N / 84°28'W, Magnitude: F2, Property Damage: \$250,000.	Begin: Hanover, End: Liberty
03/12/1976	1650: Tornado, LAT/LON: 42°11'N / 84°15'W, Length: 2.00 Miles, Width: 90 Yards, Magnitude: F2, Property Damage: \$250,000.	Napoleon
05/20/1978	1215: Tornado, LAT/LON: 42°22'N / 84°31'W, Length: 0.70 Mile, Width: 70 Yards, Magnitude: F0, Property Damage: \$300.	Tompkins
07/28/1979	1800: Tornado, LAT/LON: 42°22'N / 84°20'W, Length: 0.20 Mile, Width: 17 Yards, Magni-	Henrietta

Jackson County Hazard Mitigation

Jackson County Tornado Events, 1954-2009		
Date	Description	MCD's
	tude: F0.	
05/30/1980	2125: Tornado, LAT/LON: 42°13'N / 84°36'W, Length: 1.90 Miles, Width: 17 Yards, Magnitude: F0, Property Damage: \$ 2,500.	Spring Arbor
06/15/1982	1457: Tornado, Begin LAT/LON: 42°21'N / 84°22'W, End LAT/LON: 42°24'N / 84°08'W, Length: 10.00 Miles, Width: 500 Yards, Magnitude: F3, Fatalities: 1, Injuries: 1, Property Damage: \$ 2,500,000.	Begin: Henrietta, End: Waterloo
06/02/1990	1930: Tornado, LAT/LON: 42°06'N / 84°33'W, Length: 0.50 Mile, Width: 20 Yards, Magnitude: F1, Property Damage: \$ 25,000.	Hanover
06/14/1991	1555: Tornado, LAT/LON: 42°25'N / 84°22'W, Length: 1.00 Mile, Width: 30 Yards, Magnitude: F1, Injuries: 1, Property Damage: \$25,000.	Henrietta
06/24/1998	05:04 PM: Funnel Cloud 6 Miles North of Jackson. Jackson County Emergency Management reported a funnel cloud near the intersection of Lansing Ave. and Maple Grove Road in southern Rives Township, approximately 6 miles north of the city of Jackson. Scattered severe thunderstorms were characterized by several large hail reports, including golf-ball sized hail reports received from Jackson County and hail of 2 to 3 inches in diameter associated with a supercell thunderstorm as it tracked east-southeast across southern Ingham and northern Jackson County. This supercell thunderstorm developed over eastern Barry County and tracked across Eaton County, southwest Ingham County, and northern Jackson County. This storm resulted in several wind damage and large hail reports, and an F1 tornado touched down in north central Jackson County near Layton Corners. No injuries were reported with the tornadoes, but damage was estimated at half a million dollars across Henrietta and Waterloo Townships in northern Jackson County. At 5:05 PM: Thunderstorm Wind at Rives Junction, LAT/LON: 42°23'N / 84°27'W, \$5,000 property damage. Jackson County Central Dispatch reported trees and power lines downed in the village of Rives Junction and scattered reports across Rives Township. At 05:06 PM: Tornado from 3 Miles East of Rives Junction to Waterloo, Begin LAT/LON: 42°23'N / 84°23'W, End LAT/LON: 42°21'N / 84°08'W, Length: 11.30 Miles, Width: 50 Yards, Magnitude: F1, \$500,000 property damage. The Jackson County Emergency Management Coordinator confirmed that a weak tornado had touched down just west of Layton Corners, in rural eastern Rives Township, and traveled east-southeast to near Waterloo, along the Washtenaw County line. The tornado was not on the ground for the entire 11.3 mile path, but due to the heavily wooded rural areas it traversed, exact path lengths could not be determined. Path width was narrow,	Rives Henrietta Waterloo

Potential Hazards

Jackson County Tornado Events, 1954-2009		
Date	Description	MCD's
	<p>estimated to be 50 yards at most. No injuries or deaths were associated with this F1 tornado. Damage consisted of downed trees and power lines, roof damage to approximately 12 homes, minor structural damage (broken windows, damaged siding, damaged vehicles and aluminum campers—mainly caused by large hail), fallen trees, and overturned boats on Pleasant Lake in Henrietta Township. Hail was estimated to have reached 2 to 3 inches in diameter in association with this tornadic storm. The most significant damage was reported around the Pleasant Lake area, where several boats were overturned and several homes reported minor to moderate structural damage. Along North Meridian Road from near Layton Corners along the west end of Pleasant Lake, 2 homes reported destroyed garages. Pleasant Lake County Park was closed due to downed trees. The Waterloo State Recreation Area reported hundreds of trees uprooted, which resulted in the closing of some roads and horse trails. 5,800 were without power in the affected areas of Henrietta and Waterloo Townships. Damage was estimated at approximately \$500,000. At 05:25 PM: Hail 2 Miles North of Grass Lake, LAT/LON: 42°17'N / 84°13'W, 1.75 inch. Jackson County Emergency Management reported golf ball-sized hail on Morrisey Road in Grass Lake Township, 2 miles north of the city of Grass Lake. Also listed under hail</p>	
3/31/2006	<p>06:05 PM, Tornado near Leoni, LAT/LON: 42°15'N / 84°16'W, Length: 7.00 Miles, Width: 65 Yards, Magnitude: F1, \$200,000 property damage, \$50,000 crop damage. The tornado began near Napoleon Road just north of Center Lake and moved northeast. Two small barns collapsed and a patio addition was blown away near the intersection of Page and Noon roads. Minor roof damage occurred at a house on Michigan avenue and a dozen large spruce trees were uprooted. The total damage path was 7 miles long and 200 feet wide and this F1 tornado was on the ground for approximately ten minutes. No injuries or fatalities occurred.</p>	Leoni
10/18/2007 10/19/2007	<p>Tornado warnings issued for JACKSON.</p>	Unspecified

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.

Jackson County Hazard Mitigation

24. Snowstorms

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

Several recent significant snowstorms of statewide significance, as reported in the Michigan Hazard Analysis, 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 Jackson County for the next several weeks. A Presidential Emergency Declaration was granted.

-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 Jackson 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.

Jackson County Perspective

A total of 52 snowstorm and winter storm events were reported in Jackson County from 1993 and 2009. This total yields an average annual snowstorm rate of 3.1. The snowstorms that have affected Jackson County have resulted in a total of \$5.13 million in damages statewide of which at least \$100,000 can be attributed directly to Jackson County. Two traffic fatalities occurred in Jackson County due to hazardous driving conditions as a result of snow storms.

Potential Hazards

The following table presents the history of snow storms in Jackson County from 1993-2009. Data regarding specific locations are generally lacking in the table. The effects of large snow storms are usually widespread and county-wide.

Jackson County Snow Storms, 1993-2009		
Date	Description	MCD's
01/12/1993	1200: Heavy Snow. Snowfall totals were probably about six inches, with winds gusting up to 30 mph at times, causing considerable drifting snow.	Unspecified location
01/23/1993	0400: Heavy Snow.	Unspecified location
04/11/1993	0700: Heavy Snow.	Unspecified location
04/15/1993	0700: Heavy Snow	Unspecified location
01/27/1994	0000: Heavy Snow/Freezing Rain. \$5,000,000 property damage statewide. Over the southern third of Lower Michigan, snow mixed with, then changed to, sleet and freezing rain. By late afternoon on the 27th, most of Lower Michigan had freezing rain or sleet. The freezing rain changed to rain by mid afternoon and continued, heavy at times after 7 pm. Overnight on the 27th and into the morning hours of the 28th, occasional rain continued. During the rest of the 28th, the area of freezing rain changed to snow. The snow, heavy at times, continued until around 2300 EST on the 28th. Light snow continued until mid afternoon on the 29th, but little additional accumulations occurred. During the freezing rain, around a quarter inch of ice had accumulated over the southern 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 Unspecified location 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 listed as ice 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, with Jackson 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	Unspecified location

Jackson County Hazard Mitigation

Jackson County Snow Storms, 1993-2009		
Date	Description	MCD's
	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. Considerable blowing and drifting of the falling snow resulted in near zero visibility and numerous multi-vehicle accidents on Interstate 94. As a result some sections of highway were closed for hours during the storm.	
12/06/1994	1800: Heavy Snow. Heavy snow fell from the evening on the 6th through the morning of the 7th. Snow amounts of 2 to 4 inches occurred, and some of the precipitation fell as freezing rain. Numerous traffic accidents were reported across the area, along with scattered power outages.	Unspecified location
01/01/1995	0000: Heavy Snow. Numerous traffic accidents were reported across the state.	Unspecified location
01/20/1995	0000: Heavy Snow. Accumulations ranged from 6 to 12 inches. Travel disruptions 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
02/03/1995	1800: Heavy Snow. Accumulations of six to eight inches were widespread, accompanied by strong winds and bitterly cold temperatures. Blowing and drifting snow through the 5 th resulted in numerous traffic accidents reported.	Unspecified location
02/11/1995	0000: Heavy Snow. Most areas had from 4 to 10 inches of snow, accompanied by strong winds. The combination of wind and snow created whiteout conditions on many roadways, making travel nearly impossible.	Unspecified location
02/25/1995	1500: Heavy Snow. Accumulations of three to six inches were common. Numerous traffic accidents were reported during the evening of the 25th, when temperatures fell quickly below freezing once the snow began, and caused sudden icing on roadways.	Unspecified location
03/19/1996	08:30 PM: Winter Storm. 4 to 8 inches of snow fell in a band that covered eastern Branch, Hillsdale, Jackson, and southeast Ingham Counties. Winds up to 45 mph caused drifts up to 2 feet, forcing the closing of many roads and schools. Power outages also affected nearly 5,000 customers.	Unspecified location
01/10/1997	02:00 AM: Heavy Snow. A lake-effect snow storm tied up all activities for over 3 days. Some schools closed early on Friday, the 10 th , and numerous shift workers were told not to report for 2nd and 3rd shifts. Heavy snow continued through Saturday and tapered off to flurries on Sunday morning. All areas reported new snowfall of 12 inches or more. Secondary roads across all of Central Lower and Southwest Lower Michigan were blocked from Friday night into Saturday, and	Unspecified location

Potential Hazards

Jackson County Snow Storms, 1993-2009		
Date	Description	MCD's
	interstates were also closed for a few hours late Friday into Saturday. Accidents occurred at the rate of 50 to 100 per day from the 10th through the 12th. Some secondary roads remained plugged on Sunday but were open by Monday morning.	
11/11/1997	09:00 PM: Lake Effect Snow. A lake-enhanced snow event began in the late evening on Tuesday, November 11th. In general, 1 to 5 inches of snow fell across western and southern Lower Michigan. The snow-covered and icy roads caught many overnight and early morning motorists by surprise. The snow initially melted on road surfaces overnight, then froze early Wednesday morning as temperatures fell below freezing. This resulted in extremely icy conditions and an unusually high number of minor accidents, which included many slide-offs into ditches.	Unspecified location
11/15/1997	07:00 AM: Snow. Snow accumulations of 3 to 4 inches occurred across Jackson during a 14 hour period.	Unspecified location
12/10/1997	01:00 AM: Winter Storm. Snow first moved in shortly after midnight on Wednesday, December 10 th and ended during the early afternoon hours. The heaviest snow fell between 6 and 10 am, when snowfall rates of 1 to 2 inches per hour were common. Snow accumulations totaled 10 to 12 inches in Jackson County. With the heaviest snow falling during the morning rush hour, numerous accidents were reported. A fatal accident claimed the life of a Spring Arbor man who was killed instantly when his automobile was struck by oncoming traffic, after he lost control when trying to pass a county snow plow on southbound U.S. Highway 127 around 3 pm in Jackson County. Several other injury and property damage accidents were reported throughout the storm. Many area schools along and north of Interstate 94 started classes for the day because snow had not yet started falling at the decision-making time of 4-5:30 am, even though Winter Storm Warnings had been posted the night before. However, snow became heavy at the onset, catching many school bus drivers off-guard. Many schools which had opened for the day sent students home early. The weight of the wet snow caused power outages, with up to 18,000 customers without power at the height of the storm due to arcing wires and downed branches. Flight delays and cancellations were common at airports across southern Michigan and local bus service was suspended for several hours of the day in Jackson.	Unspecified location
01/22/1998	07:00 PM: Winter Storm. A winter storm spread a large swath of moderate to occasionally heavy snow across most of western, central, and southern portions of Michigan's Lower Peninsula from Thursday evening through mid-morning Friday, January 22nd-23rd. Snow accumulations ranged from 3 to 6.5 inches, with 6-inch or greater amounts concentrated in Jackson County. Most major highways and roads became snow-covered during the storm and travel conditions were hazard-	Unspecified location

Jackson County Hazard Mitigation

Jackson County Snow Storms, 1993-2009		
Date	Description	MCD's
	ous from late Thursday evening through the Friday morning rush hour. Numerous weather-related minor accidents were reported across the region. Many local school districts were closed because of road conditions on Friday, January 23rd. Snowfall reports included 5.5 inches in Jackson.	
03/09/1998	07:00 AM: Winter Storm, \$100,000 property damage. Heavy snow and blizzard conditions occurred, as rain changed to freezing rain and sleet in the Jackson area and surrounding communities. This icy mix changed to snow during the mid to late morning hours, but a prolonged period of sleet across Jackson County cut down on the snowfall total in the area. Snowfall was heavy and was reported at rates around and slightly over 1 inch per hour. Occasional white-outs were reported. Snowfall totals of 2 to 5 inches were reported. Schools and businesses were closed by this winter storm, the most intense of the 1997-98 winter season. Saturated ground in Jackson from heavy rainfall Sunday night and early Monday morning weakened an old oak tree, which was blown over by winds gusting to 30 mph just before daybreak. This tree crashed through a home in the city of Jackson and caused an estimated \$100,000 in damage. No injuries were reported from residents inside the home. Also listed as snow.	Unspecified location City of Jackson
03/20/1998	04:00 PM: Winter Storm. A mixture of snow, sleet, and freezing rain fell across much of southwest and south central Lower Michigan. The precipitation started out as a mixture of sleet and freezing rain Friday afternoon, then turned to mostly snow Friday evening. The ice at the onset made travel conditions hazardous for the Friday afternoon rush hour, and several minor weather-related accidents were reported along and south of the Interstate-94 corridor. Snow accumulations ranged from 3 to 4 inches in Jackson County. Also included as snow.	Unspecified location
12/21/1998	01:00 PM: Lake Effect Snow. Snowfall totals ranged from 1 inch to several inches, but as is typically the case, the first snow of the season contributed to a dramatic increase in the reported number of traffic accidents. Most of the accidents were minor.	Unspecified location
01/02/1999	07:00 AM: Blizzard. Wind gusts of 45 to 60 mph were common across all of southern lower Michigan through the afternoon hours, causing blowing and drifting snow and whiteout conditions at times. By the late evening hours of the 2nd, 6 to 12 inches of snow had already fallen across all of southwest and west central lower Michigan.	Unspecified location
01/04/1999	12:00 AM: Snow. Snow showers continued from the previous day throughout a new day, accompanied by continued blowing and drifting of snow. Overall, this winter storm ended up being one of the strongest to affect western lower Michigan in 2 decades, and came to be known as the "Blizzard of '99". All of southern lower Michigan was affected by blizzard conditions at times on Janu-	Unspecified location

Potential Hazards

Jackson County Snow Storms, 1993-2009		
Date	Description	MCD's
	ary 2nd. Snow began in the morning and continued through the afternoon, making travel difficult to impossible. By the evening hours of the 2nd, 6 to 12 inches of snow had already fallen across southwest and west central lower Michigan, with both Van Buren and Kalamazoo counties reporting up to a foot of new snow by 10 pm. The snow continued through the 3rd and 4th, and even lingered into the early morning hours of the 5th before finally tapering to flurries. Travel through the period ranged from difficult to impossible, due to all the blowing and drifting of snow, and occasional whiteout conditions. Some snow drifts measured to 5 to 6 feet in open rural areas. Roads became impassable and many highways and rural roads were closed through the 4th. There were several car accidents through the period. Most schools were closed, some for over a week in rural areas. Most colleges and universities, as well as quite a few area businesses, were closed on the 4th and 5th as well. Final snow storm total snowfalls for the 2nd through the 5 th included 16 inches in the city of Jackson.	City of Jackson
01/11/1999	04:00 AM: Snow. 2 to 4 inches of snow fell across Jackson county.	Unspecified location
03/04/1999	10:00 PM: Snow. 8 inches across Jackson County.	Unspecified location
03/08/1999	10:00 PM: Snow. 5 to 6 inches across Jackson County.	Unspecified location
12/11/2000	06:00 AM: Winter Storm. A significant winter storm affected southern lower Michigan with very heavy snow and strong winds. Anywhere from 6 to as much as 15 inches of snow fell across the area. Strong winds caused blowing and drifting snow. The combination of the heavy snow and winds that gusted to 40 m.p.h. created blizzard conditions at times, causing virtually every school and many businesses to close for a day. In fact many area schools, particularly in outlying and rural areas, were closed for several days and even a week in some instances. Numerous accidents were reported in blowing and drifting snow. Many counties reported upwards of 100 accidents occurring between 7 a.m. on the 11th and 7 a.m. on the 12th.	Unspecified location
12/13/2000	02:00 PM: Heavy Snow. Jackson saw 5-6 inches of snowfall.	Unspecified location
01/30/2002	04:00 AM, Winter Storm. A stationary front set up to the south of lower Michigan, setting the stage for a prolonged overrunning precipitation event for southern lower Michigan on the 30th and 31st. Anywhere from eight to as much as thirteen inches of snow fell across the area, and freezing rain fell in Jackson County as low pressure moved into lower Michigan. Winter Storm warning for JACKSON, snow up to 7" with a quarter inch of ice. Also listed as freezing rain.	Unspecified location
2/1/2002	School Closings in JACKSON	Unspecified location

Jackson County Hazard Mitigation

Jackson County Snow Storms, 1993-2009		
Date	Description	MCD's
	1149, Winter storm warning was issued for JACKSON	
2/25 to 2/26/2002	Winter storm warnings were issued for JACKSON	Unspecified location
2/25/2002	07:00 PM, Winter Storm. Moderate to heavy snow developed across much of southern lower Michigan on the 25th and continued on the 27th. There were two phases to the snowfall. During the first phase of this event, the heaviest snow fell across Ingham and Jackson counties, where six to eight inches of snow fell during the late evening hours of the 25th into the morning hours of the 26th. The second phase of this event occurred during the late evening hours of the 26th through the 27th as lake effect snow bands set up across west central lower Michigan.	Unspecified location
12/24/2002	09:00 PM, Heavy Snow. A winter storm caused snow to begin to fall along the I-94 corridor of southern lower Michigan at around 9 p.m. on Christmas Eve. It spread north to near I-96 by mid-night. The maximum snowfall report of 9 inches was received from Jackson (Jackson County).	Unspecified location
3/4/2003	06:00 PM, Heavy Snow. Low pressure moved from the panhandle of Texas northeast to Nebraska and eventually to near Toledo Ohio, producing heavy snow across central and southern lower Michigan. Most of the area between I-96 and I-94 generally received anywhere from 6 to 7 inches of snow in less than 12 hours. Winter storm warnings were issued for JACKSON	Unspecified location
3/5/2003	Winter storm warning was issued for JACKSON	Unspecified location
4/6/2003	Winter storm warning issued for JACKSON	Unspecified location
4/7/2003	04:00 AM, Heavy Snow. A late season snow event produced an isolated report of heavy snow in Jackson where seven inches of snow fell.	Unspecified location
1/27/2004	07:00 AM, Winter Storm. A low pressure system developed over the gulf coast states and moved northeast to southern Lake Huron, bringing a combination of moderate to heavy snow and strong gusty winds that caused blowing and drifting of snow across the area. The snow developed around sunrise on the 27th across extreme southwest lower Michigan and expanded northeast to cover most of central and southern lower Michigan by 10 a.m. This was the heaviest general snowfall across our area for the 2003-2004 winter season. A general six to ten inch snowfall occurred across the area.	Unspecified location
11/24/2004	12:00 PM, Winter Storm A potent winter storm brought heavy snow and wind across southern and south central lower Michigan on November the 24th on the day before Thanksgiving. Low pressure developed over eastern Texas late on the 23rd and intensified rapidly as it moved northeast to western Ohio on Wednesday evening. Precipitation began as rain along the I-94 corridor but	Unspecified location

Potential Hazards

Jackson County Snow Storms, 1993-2009		
Date	Description	MCD's
	changed to snow by around noon. Snow become moderate to heavy during the early to mid afternoon hours, when snowfall rates of two to three inches an hour were reported at times. Moderate to heavy snow continued into the early evening hours before gradually diminishing overnight. Reports of six to nine inches of snow were received from Kent, Allegan, Calhoun, Jackson, Clinton and Eaton counties.	
12/22/2004	09:00 PM, Heavy Snow. Heavy snow was reported in Jackson County, where up to 7 inches of snow fell in Brooklyn in southern Jackson County. The remainder of Jackson county received an average of 5 to 6 inches of snow.	Unspecified location Brooklyn
1/4/2005	07:00 PM, Heavy Snow. An initial burst of snow occurred during the late evening hours of the 4th into the early morning hours of the 5th. The main low pressure system moved northeast from Texas and brought the most substantial snow during the daytime hours of the 5th. Six to nine inches of snow fell in less than 24 hours across much of the rest of the area.	Unspecified location
1/21/2005	11:00 PM, Heavy Snow. A potent Alberta clipper system in combination with a strong upper air system produced heavy snow across central and southern lower Michigan. 10 to 12 inches of snow was reported across most of the area across central and southern lower Michigan from Interstate 96 south.	Unspecified location
12/8/2005	04:00 PM, Heavy Snow. A synoptic snow event resulted in total snow accumulations of six to eight inches across much of southern lower Michigan.	Unspecified location
2/13/2007	02:00 AM, Heavy Snow. EVENT NARRATIVE: Six inches of snow fell in about a 9 hour period in Jackson County by late in the day on Tuesday February 13th. EPISODE NARRATIVE: A low pressure system moved northeast along a stationary front well south of our region and this produced a band of snow which clipped southern lower Michigan. Six inches of snow fell in about a 9 hour period in Jackson County by late in the day on Tuesday February 13th.	Unspecified location
12/31/2007	22:30 PM, Winter Storm. EVENT NARRATIVE: This heavy snow event continued into the early morning hours on New Year's Day. EPISODE NARRATIVE: Heavy snow moved into southern lower Michigan during the early evening hours of New Year's Eve, impacting New Year's travel plans by creating very hazardous travel conditions in heavy snow and snow covered roads. Many locations across southern Michigan reported total snowfall of 7 to 10 inches, with as much as 11.5 inches reported three miles south southeast of Jackson.	Unspecified location Napoleon Township
2/1/2008	02:00 AM, Winter Storm. EPISODE NARRATIVE: A low pressure system tracked northeast between Toledo and Cleveland and brought significant snowfall to most of southern lower Michigan	Unspecified location

Jackson County Hazard Mitigation

Jackson County Snow Storms, 1993-2009		
Date	Description	MCD's
	on the first of February. The heaviest snow occurred between midnight and daybreak before gradually diminishing during the mid to late morning hours. Snow continued to taper off to flurries in the afternoon before ending. Approximately five to seven inches of snow fell south of a line from Muskegon to Clare.	
3/21/2008	13:20 PM, Winter Storm. EPISODE NARRATIVE: A low pressure system brought heavy snow to much of southwestern lower Michigan from the 21st through the 22nd. Snow began during the morning hours of the 21st and continued into the early morning hours of the 22nd before gradually diminishing. The heaviest snow fell during the afternoon and early evening hours of the 21st, when snowfall rates of two inches per hour were reported at some locations. Eight to fourteen inches of snow fell south of a line from Holland to Jackson.	Unspecified location
12/19/2008	04:00 AM, Winter Storm. EVENT NARRATIVE: A total of eight to twelve inches of snow was reported. EPISODE NARRATIVE: An area of low pressure moved from Kansas City, Missouri to north of Pittsburgh, Pennsylvania. Snow spread into southwest lower Michigan out ahead of the low, starting in South Haven at around 2:00 a.m. on the nineteenth. Heavy Snow occurred across most of the area between 5:00 a.m. and 1:00 pm, with snowfall rates reaching 1 to 2 inches per hour at times. Thundersnow was even reported at locations across southern lower Michigan, evidence to the instability in place with this system. Some sleet and freezing rain mixed in along the Interstate 94 corridor. A maximum of snow was found across south central lower Michigan from Bellevue in Eaton county southeast to Vandercook Lake in Jackson county.	Unspecified location Summit Township
1/9/2009	12:00 PM, Winter Storm. EVENT NARRATIVE: Four to eight inches of snow fell. EPISODE NARRATIVE: Six to twelve inches of snow fell south of the I-96 corridor over south and southwest Michigan on the ninth and tenth. The snow began during the morning of the ninth and continued through the early evening hours. The mainly light snow combined with fog to produce visibilities between one quarter and one half of a mile along the I-94 corridor. Many locations saw a break in the falling snow during the late evening hours of the ninth, before a second period of heavier snow began during the early morning hours of the tenth. Snow fell throughout the day on the tenth before tapering to flurries in the evening.	Unspecified location
4/5/2009	22:30 PM, Winter Storm. EVENT NARRATIVE: Six to seven and a half inches of snow was reported across Jackson county, resulting in downed trees, branches and power lines, 34 property damage accidents and two accidents with injuries. Scattered power outages were also reported. EPISODE NARRATIVE: A spring snowstorm brought 4 to 8 inches of heavy wet snow to the south and southeast part of the county warning area on the evening of April 5th through the morning of	Unspecified location

Potential Hazards

Jackson County Snow Storms, 1993-2009		
Date	Description	MCD's
	April 6th. The snowfall resulted in numerous traffic accidents with at least one known fatality. The wet snow also brought down some trees and numerous tree limbs resulting in sporadic power outages that affected between 25,000 and 50,000 persons during the storm. Rain spread into the region between 5:00 and 8:00 pm and then changed to snow between 10:00 and 11:00 pm. Accumulating snow fell with temperatures near freezing through Monday morning. Temperatures rose just above freezing Monday morning with the snow ending from west to east by midday.	Southeast Jackson County
2/9/2010	05:00 AM, Heavy Snow. A low pressure system formed over the Tennessee Valley region and moved to the north northeast to just east of Toledo Ohio, bringing heavy snow to southern lower Michigan. The snow fell from the morning hours of February 9th through the mid morning hours of February 10th. The snow was heaviest during the late afternoon and evening hours of the 9th. Most of the area south of a line from Muskegon to St. John's had between 6 and 10 inches of snow. The storm coincided with Michigan's winter 'Count Day' used to determine base funding for local public school systems. Many school systems closed due to the snowstorm. Several significant accidents occurred on the regions primary arteries. I-94 was closed for several times due to jackknifed trucks.	Unspecified location
2/21/2010	21:00 PM, Heavy Snow. Four to eight inches of snow fell south of a Muskegon to St. John's line over southwest lower Michigan during the morning hours of Monday, February 22nd. The highest amounts fell over Eaton, Ingham, Calhoun, and Jackson counties. The highest observed snow accumulation rates, between 0.5 and 1.0 inch per hour, occurred during the morning commute on the 22nd.	Unspecified location

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.

Jackson County Hazard Mitigation

25. Ice and Sleet Storms

Ice storms are sometimes incorrectly referred to as 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, including the following three significant events:

03/13/1997 Ice Storm affecting the southern third of Michigan. Detroit Edison and Consumers Energy outages affected 514,000 customers, including those in Jackson County. Shelters were also opened in many communities. **01/01/1985 Ice Storm affecting Jackson 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 than 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.

03/02-07/1976 Ice Storm with accompanying high winds and tornadoes struck Jackson and 28 other counties in Central Lower Michigan. The storm, 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.

Jackson County Perspective

A total of 8 winter storm events were reported in Jackson County between 1993 and 2004 to the National Climatic Data Center, which is maintained by the National Oceanic and Atmospheric Administration. No information on winter storms was available on the NCDC database for the 1950-1992 time periods. The most significant event was a heavy snowstorm that mixed with freezing rain causing more than \$5 million in property damage over most of Michigan (including Jackson County) January of 1994. No deaths or injuries were attributed to these winter storm events.

Potential Hazards

A total of 13 ice storm/freezing rain events were reported in Jackson County between 1993 and 2009 as indicated in the following table. Based on these data, the annual probability of an ice or sleet storm in Jackson County is 0.75. These storms resulted in property damage estimated at \$5,100,000 million statewide including \$100,000 directly attributable to Jackson County. It is very likely that additional property damage occurred in Jackson County but additional amounts are included in statewide data. Several injuries and traffic fatalities resulted statewide from these storms, but none are traced directly to Jackson County. Unfortunately, in both cases where damage estimates are provided, the hazard events are also listed as snowstorms or otherwise identified as winter storms. Sufficient data are not available to identify whether damages resulted from the ice storm or the snowstorm. Therefore, it can only be stated that winter storms, including ice storms and snowstorms, have resulted in \$5.1 million in damages in the State of Michigan.

Jackson County Ice Storms/Freezing Rain Events, 1993-2009		
Date	Description	MCD's
01/27/1994	0000: Heavy Snow/Freezing Rain. \$5,000,000 property damage statewide. Over the southern third of Lower Michigan, snow mixed with, then changed to, sleet and freezing rain. By late afternoon on the 27th, most of Lower Michigan had freezing rain or sleet. The freezing rain changed to rain by mid afternoon and continued, heavy at times after 7 pm. Overnight on the 27th and into the morning hours of the 28th, occasional rain continued. During the rest of the 28th, the area of freezing rain changed to snow. The snow, heavy at times, continued until around 2300 EST on the 28th. Light snow continued until mid afternoon on the 29th, but little additional accumulations occurred. During the freezing rain, around a quarter inch of ice had accumulated over the southern 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 added as snow storm.	Unspecified location

Jackson County Hazard Mitigation

Jackson County Ice Storms/Freezing Rain Events, 1993-2009		
Date	Description	MCD's
02/27/1995	0100: Ice Storm. Freezing rain developed 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 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 and sleet occurred 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 traffic accidents were reported.	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. 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
03/14/1997	01:30 AM: Ice Storm. An Ice Storm lasting slightly more than 12 hours blanketed much of West Central Lower Michigan and all of Southwest Lower Michigan. The worst hit areas included the county of Jackson. Ice accumulations were near 1 inch. Power was out for up to 24 hours in Jackson County (affecting 38,000 customers). Trees and power lines were downed, and automobile accidents occurred continually throughout the storm. Emergency Management and Road Department budgets were heavily affected.	Unspecified location
01/04/1998	12:00 AM: Freezing Rain. A strong cold front moved in during the early morning hours of Sunday, January 4th. Temperatures behind the cold front fell into the upper 20's and lower 30's, changing light rain to freezing rain. One period of light freezing rain fell from after midnight to around 10:00 AM EST, resulting in light ice accumulations of around one-tenth of an inch. No serious problems were reported, other than icy spots on secondary roads and bridges/overpasses.	Unspecified location

Jackson County Hazard Mitigation

Jackson County Ice Storms/Freezing Rain Events, 1993-2009		
Date	Description	MCD's
	Winter Storm warning for JACKSON, snow up to 7" with a quarter inch of ice. Also listed as snow.	
1/31/2002	Ice storm warning was issued this day for the following Michigan counties: JACKSON Flash Report for JACKSON County. Road conditions icy and slippery. 25 businesses damaged. Power wires, phones, cable TV lines down due to accumulation of ice and falling trees. Flash Report from JACKSON County, weather related power outages. Winter Storm Warnings for JACKSON Ice Storm Warning for BARRY, CALHOUN, EATON, INGHAM, JACKSON Counties, ice accumulation up to half inch. School Closings in JACKSON	Unspecified location
12/1/2006	JACKSON, at 0600, an ice storm was reported at Jackson, with some trees and wires down. 05:00 AM, Ice Storm , 30,000 property damage. EVENT NARRATIVE: A third of an inch of ice was reported across most of Jackson county. EPISODE NARRATIVE: A strong early winter season low pressure system brought snow and freezing rain to southwestern and west central lower Michigan. The heaviest ice accumulations occurred over southern lower Michigan south of I-96 where many locations reported at least three tenths of an inch of ice.	City of Jackson Unspecified location

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.

Potential Hazards

Intra-County Summary of Hazards

A table, entitled “Actual and Potential Hazard Experience by Local Unit of Government”, provides a geographic analysis of hazards among local units of government and may be found on page 85. The table documents the location of actual experiences and identifies local units of government in which there is a potential for each of the various hazards described in the plan.

Jackson County Hazard Mitigation Plan

Actual and Potential Hazard Experience by Local Unit of Government

Local Unit	Civil Disturbances	Earthquakes	Subsidence	Scrap Tire Fires	Structural Fires	Wildfires	Riverine Flooding	Dam Failures	Energy Emergencies	Sig. Infrastructure Failures	Transportation Accidents	Haz. Mat. Incidents – Fixed Site	Haz. Mat. Incidents – Transportation	Nuclear Power Plant Accidents	Oil & Nat. Gas Well Accidents	Oil & Natural Gas Pipeline Accidents	Nuclear Attacks	Sabotage/Terrorism	Public Health Emergencies	Drought	Extreme Temperatures	Hail	Lightning	Severe Wind Events	Snowstorms	Ice & Sleet Storms
County of Jackson	P	A	A	P	A	A	P	P	A	P	P	A	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
City of Jackson	P	A	A		A		P		A	P	P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Blackman Twp.	A	A	P		A	A	P		A	P	P	A	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Columbia Twp.		A			A	A	P	P	A	P	P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Concord Twp.		A			A	A	P		A		P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Grass Lake Twp		A			A	A	P		A		P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Hanover Twp.		A			A	A			A			P		P	N/A	P	P	P	P	A	A	A	A	A	A	A
Henrietta Twp.		A			A	A	P		A	P	P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Leoni Twp.		A		P	A	A	P	P	A		P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Liberty Twp.		A			A	A	P		A		P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Napoleon Twp.		A			A	A	P		A		P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Norvell Twp.		A			A	A	P		A		P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Parma Twp.		A			A	A	P		A		P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Pulaski Twp.		A			A	A	P		A			P		P	N/A	P	P	P	P	A	A	A	A	A	A	A
Rives Twp.		A			A	A	P		A		P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Sandstone Twp.		A	P		A	A	P		A	P		P		P	N/A	P	P	P	P	A	A	A	A	A	A	A
Spring Arbor Twp.	P	A			A	A			A	P	P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Springport Twp.		A			A	A	P		A		P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Summit Twp.	P	A			A	A	P		A	P	P	P	P	P	N/A	P	P	P	P		A	A	A	A	A	A
Tompkins Twp.		A			A	A	P		A		P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Waterloo Twp.		A			A	A	P		A		P	P	P	P	N/A	P	P	P	P	A	A	A	A	A	A	A
Vil. of Brooklyn		A			A	A	P	P	A	P	P	P	P	P	N/A	P	P	P	P		A	A	A	A	A	A
Vil. of Cement City		A			A	A			A	P		P		P	N/A	P	P	P	P		A	A	A	A	A	A
Vil. of Concord		A			A	A		P	A	P	P	P	P	P	N/A	P	P	P	P		A	A	A	A	A	A
Vil. of Grass Lake		A			A	A			A	P	P	P	P	P	N/A	P	P	P	P		A	A	A	A	A	A
Vil. of Hanover		A			A	A		P	A	P	P	P	P	P	N/A	P	P	P	P		A	A	A	A	A	A
Vil. of Parma		A			A	A			A	P	P	P	P	P	N/A	P	P	P	P		A	A	A	A	A	A
Vil. of Springport		A			A	A			A	P	P	P	P	P	N/A	P	P	P	P		A	A	A	A	A	A

A = Actual Experiences P = Potential Experiences N/A = Not Available

Priority, Risk and Vulnerability Assessment

Jackson County Hazard Mitigation

Priority, Risk, and Vulnerability Assessment

The previous chapter of this plan identified a wide range of potential hazards facing Jackson County. However, each of these hazards does not pose the same degree of risk to the community. The purpose of this chapter is to identify those hazards which are likely to have the greatest impact on Jackson County in terms of property damage and public safety. Hazards will be reviewed in terms of their likelihood of occurrence, percentage of the population affected, severity of the hazard, and potential for negative impacts on the local economy. A review of these hazards in terms of their risk, and the vulnerability they pose to the community, will help guide the community in its development of mitigation strategies and actions. This type of analysis is critical. Jackson County, like other communities in Michigan, currently faces severe governmental revenue shortages. It is imperative that funds be allocated among projects and programs to deliver the greatest benefit to the community.

The hazard mitigation planning process included a means of community participation and involvement to identify hazards which pose the greatest threat to the community.

Hazards which pose the greatest threat to the community were identified through a rating process. The staff of the Region 2 Planning Commission reviewed identified potential hazards from the perspective of six characteristics. These characteristics include: likelihood of occurrence, percent of population affected, potential for causing casualties, negative economic affects, public awareness of the hazard, and the potential for corollary affects. Each of the potential hazards identified was rated for each of the six characteristics of hazards. This rating ranged from 0 to 10, with 0 being a rating of no significance and 10 being a rating of complete significance. In addition, the characteristics were weighted to reflect perceptions of community values based upon discussion with local officials at meetings of the Jackson Community Planning Committee. The weightings were endorsed by staff, the emergency management coordinator, and local officials who participation through the Community Planning Committee. The **likelihood of occurrence** received 30% of the total weighting. The **percentage of population affected** and the **potential for causing casualties** each received 20% of the weighting. The potential for **negative economic effects** received 15%. **Public awareness** of the hazard received 5%, and the **occurrence of any corollary events** received 10%. The rating of each hazard for each of the six characteristics, and the application of weighting of the characteristics resulted in a total rate 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

Priority, Risk, and Vulnerability Assessment

are found in the following table. The total rating for each individual hazard was established by multiplying the individual rating by the weight assigned to each characteristic. The sums of each of these individual ratings composed the total rating for each hazard.

Hazard Ratings and Vulnerability														
Hazard		Likelihood of Occurrence		Percent of Population Affected		Potential for				Public Awareness of Hazard		Corollary Effects		Total
		Rating	(Weighted)	Rating	(Weighted)	Causing Casualties	Negative Economic Effects	Rating	(Weighted)	Rating	(Weighted)	Rating	(Weighted)	
2.3	Civil Disturbances	4	1.20	3	0.60	8	1.60	6	0.90	6	0.30	2	0.20	4.80
2.4	Earthquakes & Subsidence													
2.4.1	Earthquakes	2	0.60	10	2.00	1	0.20	1	0.15	10	0.50	1	0.10	3.55
2.4.2	Subsidence	2	0.60	0	0.00	1	0.20	0	0.00	10	0.50	0	0.00	1.30
2.5	Fire Hazards													
2.5.1	Scrap Tire Fires	2	0.60	1	0.20	1	0.20	0	0.00	10	0.50	1	0.10	1.60
2.5.2	Structural Fires	10	3.00	5	1.00	5	1.00	2	0.30	0	0.00	0	0.00	5.30
2.5.3	Wildfires	8	2.40	2	0.40	1	0.20	1	0.15	9	0.45	2	0.20	3.80
2.6	Flooding Hazards													
2.6.1	Riverine Flooding	9	2.70	1	0.20	1	0.20	4	0.60	5	0.25	5	0.50	4.45
2.6.2	Shoreline Flooding	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
2.6.3	Dam Failures	2	0.60	3	0.60	1	0.20	3	0.45	10	0.50	5	0.50	2.85
2.7	Energy & Utility/Infrastructure Failures													
2.7.1	Energy Emergencies	10	3.00	10	2.00	2	0.40	3	0.45	0	0.00	2	0.20	6.05
2.7.2	Significant Infrastructure Failures	2	0.60	8	1.60	2	0.40	8	1.20	8	0.40	2	0.20	4.40
2.7.3	Transportation Accidents	1	0.30	0	0.00	8	1.60	0	0.00	0	0.00	1	0.10	2.00

Jackson County Hazard Mitigation

2.8	Hazardous Materials Incidents													
2.8.1	Fixed Site HazMat Incident	5	1.50	1	0.20	4	0.80	2	0.30	9	0.45	1	0.10	3.35
2.8.2	HazMat Transportation Incident	5	1.50	3	0.60	1	0.20	1	0.15	5	0.25	1	0.10	2.80
2.8.3	Nuclear Power Plant Accidents	1	0.30	1	0.20	1	0.20	1	0.15	10	0.50	1	0.10	1.45
2.8.4	Oil & Gas Well Accidents	2	0.60	1	0.20	1	0.20	0	0.00	9	0.45	0	0.00	1.45
2.8.5	Pipeline Accidents	4	1.20	3	0.60	1	0.20	1	0.15	5	0.25	1	0.10	2.50
2.9	Homeland Security													
2.9.1	Nuclear Attacks	2	0.60	5	1.00	5	1.00	5	0.75	0	0.00	5	0.50	3.85
2.9.2	Terrorism/Sabotage/WMD	1	0.30	1	0.20	1	0.20	0	0.00	10	0.50	0	0.00	1.20
2.9.3	Public Health Emergencies	6	1.80	5	1.00	5	1.00	5	0.75	10	0.50	5	0.50	5.55
2.10	Extreme Weather													
2.10.1	Drought	2	0.60	10	2.00	1	0.20	1	0.15	9	0.45	2	0.20	3.60
2.10.2	Extreme Temperature	10	3.00	3	0.60	1	0.20	1	0.15	10	0.50	0	0.00	4.45
2.10.3	Thunderstorms													
2.10.3.1	Hail	10	3.00	4	0.80	1	0.20	1	0.15	0	0.00	2	0.20	4.35
2.10.3.2	Lightning	10	3.00	4	0.80	3	0.60	1	0.15	0	0.00	2	0.20	4.75
2.10.3.3	Severe Winds	10	3.00	4	0.80	1	0.20	1	0.15	0	0.00	2	0.20	4.35
2.10.3.4	Tornadoes	8	2.40	4	0.80	5	1.00	5	0.75	0	0.00	2	0.20	5.15
2.10.4	Severe Winter Weather													
2.10.4.1	Snow Storms	10	3.00	10	2.00	1	0.20	0	0.00	0	0.00	2	0.20	5.40
2.10.4.2	Ice and Sleet Storms	10	3.00	10	2.00	1	0.20	0	0.00	0	0.00	2	0.20	5.40
Percent of Points		30%		20%		20%		15%		5%		10%		100%

Priority, Risk, and Vulnerability Assessment

Hazard Risk and Vulnerability

Priority determinations for various hazards facing the Jackson Community were submitted to, and reviewed by the Jackson Community Planning Committee. The Jackson Community Planning Committee met, and continues to meet monthly at advertised meetings open to the public. An agenda item offers public comment, and public comment is welcome at the time of discussion as agenda items are considered.

In addition, area agencies, businesses, non-profit corporations and organizations, academic institutions, and other interested parties were provided opportunities to be involved in the hazard mitigation planning process at these meetings.

The Community Planning Committee is composed of the township supervisors of each of Jackson County's 19 townships, the village presidents of Jackson's 6 villages, the City of Jackson and representatives of the Jackson County Board of Commissioners. The priority ranking has also been reviewed by the Jackson County Commissioners County Affairs Committee, at a public meeting; and the department heads of the City of Jackson departments. Concurrence in these rankings was expressed in each case. Particular vulnerability is apparent for seven hazards, presented in priority order. Hazards presented in priority order include: energy emergencies, public health emergencies, ice storms, snow storms, structural fires, tornadoes, and civil disturbances.

Top Hazards	
#1	Energy Emergencies
#2	Public Health Emergencies
#3	Ice Storms
#4	Snow Storms
#5	Structural Fires
#6	Tornadoes
#7	Civil Disturbances

Jackson County Hazard Mitigation

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GOALS AND OBJECTIVES

Jackson County Hazard Mitigation

Goals and Objectives

The establishment of goals and objectives is a critical component of any community master plan. Goals provide general direction for the community and serve as the basis for the formation of policy and decision making. Goals help to explain what the community intends to achieve as a result of the planning process. Goals are long-term and generally represent broad visions for the community. Objectives are benchmarks which may be used to determine whether goals are met. Objectives are specific, measurable and have a defined completion date. Goals and objectives have been established for the Jackson Community Hazard Mitigation Plan. The development of these goals and objectives was based in part upon the goals included in the Jackson Community Comprehensive Plan, and in discussions with the Jackson Community Planning Committee. Goals and objectives for the Jackson Community Hazard Mitigation Plan are as follows. Goals are numbered from 1-7, and objectives have been established for each of the goals. These goals and objectives were reviewed by the Community Planning Committee and approved.

1. Guide future growth and development to assure a high quality, safe environment.

- A. Development should occur in a manner consistent with existing local community master plans for the County, City of Jackson, and Jackson County Townships and Villages. These plans must be reviewed when land use decisions and governmental expenditures are considered, and such decisions and expenditures should be consistent with the plans at the time of their implementation.
- B. Local units of government should promote high-density compact development which offers an ease in service delivery and the provision of infrastructure, and avoids an over-consumption of land.
- C. As components of the natural system, wetlands, rivers and floodplains, and wooded areas should be used to define development and channel growth into appropriate areas, and maintain natural systems for flood prevention.
- D. Municipal services should be extended only in accordance with adopted community plans as a means of channeling development to a manageable area.

2. Improve the transportation system to promote safety and efficiency.

- A. High crash, dangerous intersections should be identified, analyzed, and improved for safety.
- B. Transportation improvements should promote safety and ease of movement of people and freight.

3. Protect Jackson County's natural environment.

- A. Development should be strongly discouraged in floodplains.
- B. Jackson Communities should preserve their wetlands.
- C. Jackson County's lakes and streams should be protected and the quality of surface water maintained.
- D. Best management practices should be applied for storm water management throughout the County.

4. Strengthen and diversify Jackson's economy safely and efficiently.

- A. New industrial parks should be located in areas which are accessible to I-94 and major state arterial routes to promote Jackson's economic growth, and promote safety in the production and movement of goods.
- B. Jackson Communities should make use of Brownfields within urban areas for redevelopment to reduce urban sprawl and address contamination hazards.
- C. Areas which are contaminated should be scheduled for clean-up based upon a prioritized schedule consistent with available resources.

Jackson County Hazard Mitigation

5. Maintain a safe community and protect property.

- A. Local units of government should continue to promote regional fire protection agreements to improve safety and efficiency, and enable the collective purchase of specialized equipment to address potential hazards.
- B. Inter-governmental cooperation should be promoted in the area of police protection services.
- C. A feasibility study should be conducted to determine if a centralized public safety building which would house both the City of Jackson Police Department and the Jackson County Sheriff's Department should be constructed to enhance public safety.
- D. Hazard mitigation planning should be incorporated as a fundamental element in the local master planning process for the Region, County, City of Jackson, and Jackson County Townships and Villages with their next update according to state law.

6. Protect and preserve the housing stock of the community.

- A. Local building codes should be enforced for compliance for all new construction.
- B. Local units of government should consider the adoption of housing codes for older residential areas.
- C. A sprinkler system ordinance should be considered for application for multiple family structures.

HAZARD MITIGATION PLAN & STRATEGIES

Jackson County Hazard Mitigation

Hazard Mitigation Plan and Mitigation Strategies

Research conducted as a part of the preparation of this plan on various natural, technological, and man-made hazards reveals that, relative to other areas of the United States, Jackson County is a relatively safe place to live, one where loss of life and damage to property from these hazards is relatively low. The Jackson Community is not plagued with threats from recurrent hurricanes, riverine flooding common to other areas of the Midwest, earthquakes of the potential evident in the western United States, or the types of wildfires common in dry climates on the US west coast. The community does, however, face significant threat to life and property associated with electrical power failures, environmental health threats, severe winter snow and ice storms, and tornadoes. The purpose of this plan is to anticipate the potential consequences of these events upon the community and to take measures, and implement strategies, to minimize the impact of the severity of these hazards on our community. The plan is intended to protect the health, safety, and economic interests of residents by reducing the impacts of these natural, technological, and man-made hazards through hazard mitigation planning, awareness, and implementation. Action taken to eliminate or reduce the long-term risk to human life and property will not only help to minimize the impacts of disasters, but will enable a rapid recovery and restoration of community normalcy in the event of such an occurrence. As such, the Hazard Mitigation Plan is an essential element of emergency planning, in addition to the emergency services offered by Jackson County's law enforcement, fire protection, public health, and emergency medical services, and their activities and planning for preparedness, response, and recovery.

Local governmental units in Jackson County, in common with local units of government throughout the state, face increasingly difficult challenges in terms of revenues to fund local governmental operations, activities, and programs. Planning for natural disasters and implementing measures to mitigate those disasters, can, in the long run, save tax dollars. FEMA has noted that every dollar spent on hazard mitigation results in a savings of four dollars. While the responsibilities of local government extend well beyond addressing the potential hazards local communities face, the wise use of expenditures to mitigate such hazards will benefit the community in terms of the need of funding for all local governmental operations. Simply put, limited dollars should be expended where they generate the greatest amount of effectiveness in terms of the delivery of public services. It should also be noted that the collective efforts of local government in developing hazard mitigation strategies and actions will result in savings nationally, and will contribute to the well being of our nation.

Plan and Strategies

A set of mitigation strategies have been developed for Jackson County by the Jackson Community Planning Committee, a committee composed of representatives from the Jackson County Board of Commissioners and County Administration, the Jackson City Council and the City Administration, and the chief elected officials from Jackson County Townships and Villages. Nearly all of Jackson County's local units of government are represented and participate on the Community Planning Committee. In addition to the work of the Committee, each local unit of government was provided with a summary of the potential hazards facing Jackson County. These local units of government were requested to review these hazards and to propose mitigation strategies which could be applied within their community to reduce the potential impact. In each case, the issue of hazard mitigation planning was discussed at a public meeting where citizens, area agencies, businesses, non-profits, academic institutions and other interested parties, had the opportunity to participate in the hazard mitigation planning process. Comments were received, or documentation regarding the review by the local unit was received, for over half the local units of government in Jackson County. Reviews were conducted at regularly scheduled and advertised meetings of the Jackson City Council, and village and township boards in Jackson County.

The result of the efforts by the Jackson Community Planning Committee with input from citizens were a set of mitigation strategies which could be applied to address the hazards the community faces. These strategies could be categorized in two ways. First a set of strategies were proposed which could apply generally to address all of the hazards which face the Jackson Community. Second, strategies were identified to address each of the priority hazards identified by the Community Planning Committee. These two sets of strategies are outlined below.

Mitigation Strategies to Address All Hazards

The following mitigation strategies are intended to be implemented to address any hazard facing the Jackson Community.

1. **Implement an enhanced public information and education program, aimed at Jackson County citizens, 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

Jackson County Hazard Mitigation

- inform citizens about the potential hazards facing the Jackson Community. 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 facing the Jackson Community, there is a need to incorporate hazard mitigation planning into the Community master planning process. The protection of the public, health, safety and welfare is central to governmental planning. The incorporation of hazard mitigation planning as an elemental part of the community planning process will assure a review of the hazard mitigation plan at least once every five years when the Community Master Plan is reviewed and updated.
 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. **Enhance fire department communication, cooperation, and consolidation.** The City of Jackson, and the surrounding three townships of Blackman, Leoni, and Summit have, in recent years, enhanced fire protection services through improved cooperation and communication. The four units of government have implemented an automatic aid system whereby multiple units respond to structure fires within the boundaries of these four units of government. This arrangement assures that adequate equipment and personnel are available to address structure fires. The arrangement is viewed favorably by the local units of government, the firefighters, and the public. In addition, these local units of government have expanded cooperation in the area of training and the purchase of equipment. This has resulted in efficiencies and more effective service to the community. In addition, each of these steps has moved the departments closer to some type of consolidation arrangement. A study was prepared by the Region 2 Planning Commission at the request of the four units of government to determine the feasibility of establishing an authority for fire protection in the four units of government. While it is not likely that such an authority will be established in the near future, the study did result in a number of recommendations to improve safety and efficiency, and to move the local units of government closer to some type of cooperative system. These recommendations are now

Plan and Strategies

under review for possible implementation and are incorporated as a part of this plan (See Appendix A).

In addition, the fire departments of local units of government in the rural areas of the county have a history of working together. In some cases, local units of government have joined to construct the station and provide fire protection services.

5. **Determine the feasibility of constructing of a County Sheriffs/City Police Department building to enhance communication and cooperation in police services.** Jackson County and the City of Jackson are currently studying the feasibility of constructing a single building to house both the County Sheriff Department and the City Police Department. This arrangement would result in better communication between the two departments, and could lead to further cooperation and, perhaps, consolidation at some point in the future.
6. **Jackson County's Emergency Management Center should be reviewed to determine adequacy.** If the review justifies the construction of a new emergency management center to facilitate emergency warning and response, local officials must determine where the center could be located and how construction and necessary equipment could be financed.

Jackson County Hazard Mitigation

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. Energy Emergencies
2. Public Health Emergencies
3. Ice Storms
4. Snow Storms
5. Structural Fires
6. Tornadoes
7. Flooding

Each of these emergencies is addressed below. In addition, other hazards, which have not been identified as a particular hazard to county residents as a whole, but which, because of their severity, prevalence, or their impact on smaller numbers of residents within particular units of local government; or for which a mitigation strategy may be particularly effective in addressing a hazard, are also addressed. In each case 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 the chapter (page 112).

Energy Emergencies

The top hazard facing the Jackson Community is the interruption of electrical energy to the community’s industry, business, institutions, and residences. Interruptions are frequently caused by storm events. The following mitigation strategies are proposed:

1. Critical facilities; hospitals, schools, jails and prisons, nursing homes, emergency communication facilities, care facilities and similar institutions require the use of backup generators for electrical power in the event of a power failure. Effective in 2010 a listing of such critical facilities will be prepared and

Plan and Strategies

- an inventory of backup generating equipment, including its capacity and condition, will be prepared to develop an estimate of equipment and facility needs. Based upon the inventory, a prioritized listing of equipment needs and costs can be assembled so that the purchase, update or repair of equipment can be scheduled based on resources available.
2. Where possible, to resist damage from severe winds and the accumulation of ice, electrical and telephone lines will be buried where the costs associated with the activity can be justified based upon the costs of service disruption, the likelihood of recurrence, or the public health and safety risk to the community. This determination will be implemented in 2010 through a joint effort of the Community Planning Committee, and representatives of Consumers Energy, the supplier of electrical energy to the Jackson Community. The cost of such action will be determined, and lines will be buried where justified.
 3. A community forestry program will be established with the purpose of creating and maintaining a disaster-resistant landscape and public rights-of-way. The purpose of the program will be to protect utility wires from encroaching or falling branches. Various utility service providers, including Consumers Energy, telephone companies, and cable television services, have programs to minimize tree damage to utility lines. These maintenance programs, and the development of a policy regarding the types of vegetation to be located within utility corridors to minimize potential service outage, should be coordinated. In 2010 representatives of each utility and the City of Jackson will be assembled to discuss the coordination of these activities and the development of a vegetation policy.
 4. Redundancies in utility and communication systems, especially those associated with critical community, safety, health and employment, will be implemented where feasible. Priority will be assigned to facilities based upon criteria to be established by the Community Planning Committee and the Emergency Management Coordinator. This activity will be initiated in 2010.

Public Health Emergencies

Public health emergencies were ranked the 2nd highest priority hazard facing Jackson Communities. Local leaders have expressed concern about the threats infectious diseases pose to residents. In particular, older

Jackson County Hazard Mitigation

residents are at risk, and Jackson County has and will continue to have, over the 20-year planning horizon, a comparatively large proportion of older persons in its population.

The responsibility for addressing public health emergencies rests with the Jackson County Health Department. The Health Department has an emergency preparedness coordinator. The emergency preparedness coordinator has the responsibility to assess community health emergencies and to implement appropriate measures to address these emergencies. The following mitigation strategies have been recommended and will be implemented with the assistance and participation of the health department emergency preparedness coordinator.

1. Residents are encouraged to receive immunizations against communicable diseases. The health department has a program to provide residents with immunizations against communicable diseases. Flu shots are issued at clinics held at the start of the flu season, usually in early October. Vaccines are available at these clinics. It is particularly important that immunization promotion be targeted to residents who are the most vulnerable to disease. Older residents and residents with conditions affecting immunity should be offered immunizations. It may be necessary to offer incentives to these vulnerable populations to boost the number of immunizations to a level which minimizes the spread of disease.

In addition, immunizations may result in a reduction in the amount of sick time taken by employees for Jackson area businesses. Savings in productivity may likely substantially exceed the cost of immunization program. The Jackson County Health Department is encouraged to continue its immunization program and to seek grant resources where necessary to assist in program implementation.

2. Vacant condemned structures should be demolished, and properties cleared of debris, to prevent rodent infestation.

The City of Jackson has a program to demolish condemned vacant structures. The program is operated in conjunction with neighborhood revitalization efforts to remove trash, rubbish, and debris from City of Jackson neighborhoods. It is imperative that this effort continue to operate at a level necessary to check rodent infestation and minimize the potential for fire.

Plan and Strategies

3. A program is in place in the community to increase public awareness of the causes, symptoms, and protective actions for disease outbreaks and other potential health emergencies. Low cost measures are available to individuals to protect themselves from infectious diseases. A campaign is necessary to enhance current public information and awareness programs regarding the causes, symptoms, and protective actions to address disease.
4. There is a need to assess the potential for diseases affecting livestock, and in particular diseases which may affect wildlife and cross over into farm animals and human populations. Currently, the MSU Cooperative Extension service offers information regarding the prevention of disease for farm animals and wildlife.

In addition, a program to cull the deer herd in the Ella Sharp Park area has been implemented. This program is undertaken in cooperation with the Michigan Department of Natural Resources. Herd management may be necessary in an on-going process to control population levels and maintain the health of deer herds to avoid the spread of disease. A continuation of the program is recommended, subject to a review and approval by the Michigan Department of Natural Resources.

Ice and Snowstorm Emergencies

The Jackson Community has experienced ice and snow storm emergencies in the past. These emergencies are associated with large amounts of snowfall, or ice storms in which the accumulation of ice results in slips and falls, transportation hazards due to impassable or slippery conditions, downed trees and tree limbs, and energy failures associated with fallen tree limbs and the sheer weight of ice on powerlines and poles. Mitigation strategies for ice and snow storms are as follows.

1. 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.

Jackson County Hazard Mitigation

2. Identify local schools and other public buildings throughout the county which could be designated as warming shelters where vulnerable residents could go to escape the effects of loss of heat in their homes due to power outages. Once identified, a public awareness campaign should be initiated to inform citizens of the availability of these shelters. The identification of potential shelters will be completed in 2010.

Structural Fires

Structural fires pose a threat to human life and are a leading cause of property damage and destruction in the Jackson Community. In addition to these losses, the cost of fire protection services is perhaps 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. Expand the use of fire protection sprinkler systems, particularly in existing older buildings in downtown areas, and in other areas of the community. Fire protection sprinkler systems are effective in extinguishing structure fires. Sprinkler systems are especially important in high rise buildings in the Jackson downtown area, where, due to the number of persons working in buildings, evacuation of large numbers of people is cumbersome. It is suggested that a committee be established to consist of the emergency management coordinator for the county, the fire inspector for the City of Jackson, and building owners in the downtown area, to discuss and address this issue.
2. The Jackson Community has a good system of fire protection provided by its local units of government, the City of Jackson and Jackson County townships and villages. An effective mutual aid system exists. In addition, automatic aid exists between the City of Jackson and the townships of Blackman and Summit. While the community has made much progress in the development of intergovernmental cooperation in responding to fire emergencies, and in the areas of equipment purchases and training, more can and should be done to promote cooperation among and between units, and to reduce fire protection costs. The goal of such efforts should be the enhancement of fire protection services at a reduced cost. The responsibility for the implementation of these measures rests with the collective fire departments and their local units of government in the community.

Plan and Strategies

Tornadoes

Jackson County has experienced deaths and substantial property damage from tornadoes in the past. While no serious tornado damage has been experienced over the past several years, tornado events are possible 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. Public early warning systems will be assessed to determine their function, adequacy, and coverage. Sirens will be installed where warranted, and those in operation will be repaired or replaced where necessary.
2. There is a need to ensure that anchoring required in building codes and the HUD manufacturing code for manufactured housing is provided and properly installed. The responsibility for this review rests with local units of government.
3. Shelter areas – certain areas should have tornado shelters that are accessible to nearby residents and the public. Local officials will meet with mobile home park owners to determine the feasibility of installing tornado shelters for park residents where none currently exist. Where there is a need for such shelters funding alternatives should be determined and park operators should be encouraged to construct the shelter.

Flooding

As noted in this plan, flooding in Jackson County has not resulted in extreme citizen hardship or financial loss. In addition, flooding has not received a high priority for action by the public or community leaders. Still, there is a potential for flooding which could result in a serious public health and safety emergency and high cost to the community. The following mitigation strategies are established:

1. Newly prepared, preliminary Flood Insurance Rate Maps will be reviewed to determine whether the designated 100 year flood plains could result in substantial flood losses. In the event such losses are determined possible, flood prevention measures will be identified and implemented to the extent of financial feasibility. Map revisions may be sought, where necessary.

Jackson County Hazard Mitigation

2. Floodplain regulations to promote floodplain management will be developed or updated in each community which has an identified flood hazard in the Flood Insurance Study for Jackson County.
3. Local units will maintain catch basins and storm sewers to reduce the potential for flooding due to clogged systems.
4. Four bridges crossing the North Branch of the Kalamazoo River in the Village of Concord have the potential to cause constriction. These include the Spring Arbor Road, Spring Street, Main Street, and railroad bridges. At the time these are replaced, their replacement will include consideration to reduce their potential constrictive character in a cost effective manner.
5. 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.

Mitigation Strategy Prioritization and Implementation

Strategy Prioritization

The mitigation strategies proposed to address potential hazards in Jackson 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 initial determination for benefit, cost, and implementation potential was made by the Region 2 Planning staff, and confirmed with organizations or entities charged with 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 Jackson 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 (as in, for example, the need for a manufactured housing park to construct a shelter).

Plan and Strategies

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.

Jackson County Hazard Mitigation

Jackson County Hazard Mitigation Plan HAZARD MITIGATION STRATEGY PRIORITIZATION					
Hazard	Strategy	Estimates of Benefits and Costs		Implementation Potential	Priority
		Potential Impact (Benefit)	Cost		
Energy	1. Generators	Medium	Medium	Medium	Medium Priority
	2. Buried Lines	High	High	Low	
	3. Tree Pruning	Medium	High	Medium	
	4. Redundancy	Medium	High	Medium	
Public Health	1. Immunization	High	Medium	Medium	Medium Priority
	2. Demolition of Condemned Structure	Low	Medium	Medium	
	3. Public Awareness	High	Low	High	Top Priority
	4. Disease Crossover	Low	Low	Medium	
Ice and Snow	1. Debris Management	Low	Low	High	Medium Priority
	2. Warming Shelters	Medium	Low	Medium	Medium Priority
Structural Fires	1. Sprinkler Older Bldgs	High	High	Low	
	2. Cooperation Among Fire Departments	High	Low	Medium	High Priority
Tornadoes	1. Public Warning System	High	Medium	High	High Priority
	2. Manufactured Housing Anchoring	Low	High	High	
	3. Shelters	Medium	Medium	Low	
Flooding	1. Review FIRM's	High	Low	High	Top Priority
	2. Floodplain Regulations	High	Low	High	Top Priority
	3. Catch Basin Management	Medium	Medium	Medium	Medium Priority
	4. Bridge Replacement	Low	High	Low	
	5. Wetland Protection in Local Planning	High	Low	Medium	High Priority

Plan and Strategies

The results of this analytical process are shown on the table entitled, “Hazard Mitigation Strategy Prioritization. Top priority strategies were identified to 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.

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 Jackson 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 implementation of a public awareness campaign for infectious disease, the review of proposed Flood Insurance Rate Maps, and preparation and adoption of local flood plain regulations, should be under way or implemented immediately upon plan adoption. “High” priority strategies, including cooperation among fire departments, assessment and enforcement of public warning systems, and wetland protection in local planning, will be implemented upon adoption of the Jackson County Hazard Mitigation Plan. The implementation of “medium priority” strategies will be initiated in 2011.

Jackson County Hazard Mitigation

Jackson County Hazard Mitigation Plan RESPONSIBLE AND POTENTIAL LEAD AGENCIES AND POSSIBLE FUNDING SERVICES																						
Hazard	Strategy	Responsible and Potential Lead Organizations												Possible Funding Sources								
		R2PC	JCS D	R2CAA	JCH D	JCDA	Local Units of Gov't	Utilities	Private	CJPW, JCRC	CJCD	MSUCE	MIDOT	FEMA	County Funds	CDBG	R2CAA	Private	Foundation	Local Units of Gov't	MIDOT / FHWA	
Energy	1. Generators		P				R	P	R					X	X	X	X	X	X			
	2. Buried Lines							R						X				X				
	3. Tree Pruning							R		R				X		X		X	X			
	4. Redundancy		P					R	R					X	X	X	X	X				
Public Health	1. Immunization				R	P								X	X	X	X		X			
	2. Demolition of Condemned Structure			P			R				P			X		X						
	3. Public Awareness				R	P								X		X	X		X			
	4. Disease Crossover				P							R		X				X	X			
Ice and Snow	1. Debris Management						R			R				X	X	X				X		
	2. Warming Shelters				P	P	R							X	X	X	X			X		
Structural Fires	1. Sprinkler Older Bldgs						R		P										X			
	2. Cooperation Among Fire Departments						R														X	
Tornadoes	1. Public Warning System		R											X		X	X	X		X		
	2. Manufactured Housing Anchoring						R	P						X				X		X		
	3. Shelters		R				R	P						X	X	X	X	X		X		
Flooding	1. Review FIRM's	P					R														X	
	2. Floodplain Regulations	P					R														X	
	3. Catch Basin Management						R			R			R	X		X		X			X	
	4. Bridge Replacement									R			R								X	X
	5. Wetland Protection in Local Planning	P					R														X	
R + Responsible Organization P + Potentially Responsible Organization																						
R2PC = Region 2 Planning Commission; JCS D = Jackson County Sheriffs Dept; R2CAA = Region 2 Community Action Agency; JCH D = Jackson County Health Dept; FEMA = Federal Emergency Management Agency; CDB6 = Community Development Block Grant; CJPW = City of Jackson Public Works Dept.; CJCD = City of Jackson Community Development; MIDOT = Michigan Department of Transportation; JCDA = Jackson County Department on Aging; JCRC = Jackson County Road Commission																						

Plan and Strategies

Implementation of Strategies by Local Units of Government

Each of Jackson County's local units of government has at 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, are shown on the table entitled "Strategy Implementation by Local Unit of Government." The reference to Jackson County includes involvement and participation by the Jackson County Health Department; and the independent agency, the Jackson County Road Commission. Each of Jackson County's townships and villages are shown on the table, as are the city of Jackson and Jackson County.

JACKSON COUNTY HAZARD MITIGATION PLAN
Strategy Implementation by Local Unit of Government

		Jackson County	City of Jackson	Blackman Twp	Columbia Twp	Concord Twp	Grass Lake Twp	Hanover Twp	Henrietta Twp	Leoni Twp	Liberty Twp	Napoleon Twp	Norvell Township	Parma Twp	Pulaski Twp	Rives Twp	Sandstone Twp	Spring Arbor Twp	Springport Twp	Summit Twp	Tompkins Twp	Waterloo Twp	Vil of Brooklyn	Vil of Cement City	Vil of Concord	Vil of Grass Lake	Vil of Hanover	Vil of Parma	Vil of Springport
Energy	1. Generators	X																											
	2. Buried Lines																												
	3. Tree Pruning																												
	4. Redundancy																												
Public Health	1. Immunization	X																											
	2. Demolition of Condemned Structure		X	X						X										X									
	3. Public Awareness																												
	4. Disease Crossover																												
Ice and Snow	1. Debris Management	X	X																										
	2. Warning Shelters	X																											
Structural Fires	1. Sprinkler- Older Buildings		X																										
	2. Cooperation Among Fire Departments		X	X						X										X									
Tornadoes	1. Public Warning System	X																											
	2. Manufactured Housing 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
	3. Shelters	X																											
Flooding	1. Review FIRM's		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. Floodplain Regulations				X		X		X		X	X		X	X	X	X		X		X	X							
	3. Catch Basin Management		X	X						X								X		X									
	4. Bridge Replacement	X																											
	5. Wetland Protection in Local Planning			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						

PLAN MAINTENANCE & IMPLEMENTATION

Jackson County Hazard Mitigation

Plan Maintenance and Implementation

Implementation

The implementation of the Jackson County Hazard Mitigation Plan will depend upon the cooperative efforts of the Jackson Community Planning Committee, the Emergency Management Coordinator within the Jackson County Sheriff's Department, and local units of government. Upon plan adoption, the Community Planning Committee will begin the implementation of the strategies established in the Hazard Mitigation Plan. 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. A sub-committee may be established 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 Community Planning Committee will work with 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 Jackson Community Planning Committee. The Committee 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 Committee will oversee implementation activities by local units of government, agencies, and private sector entities. The plan will be amended when deemed necessary by the Committee or upon the request of the State of Michigan or Federal government.

In its evaluation of the Hazard Mitigation Plan, the Community Planning Committee will use the following criteria:

1. Has there been a potential or actual change in the hazards facing Jackson County?
2. Has new development in the Community resulted in a change in circumstances or conditions which necessitates a review or revision of strategies?

Plan Maintenance and Implementation

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 the Jackson Community?
5. Are there changes in laws, regulations, techniques or practices that warrant an amendment to the plan?

Plan Update

The Jackson 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 Jackson County Hazard Mitigation Plan will also be incorporated into the community master planning processes. The Jackson Community Master Plan was adopted in 2005, and will be reviewed and updated, as required by the Michigan Planning Act, PA 110 of 2006, in 2010.

In addition, local units of government, including the City of Jackson, and Jackson County townships and villages, 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. In addition, the 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 Community Planning Committee for their use in the preparation of the update to the Jackson 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:

Jackson County Hazard Mitigation

1. **Public hearings** – public hearings will be held before each unit of government which considers adoption of the Jackson County Hazard Mitigation Plan.
2. **Public discussion** – public discussion has, and will continue to be encouraged and received in open forums at Community Planning Committee meetings, meetings of the City of Jackson, Jackson County township and village planning commission meetings, and the meetings of the Jackson City Council, the Jackson County Board of Commissioners, township boards, and village councils.
3. **Web based opportunities** – Web based opportunities for citizen participation in the implementation and subsequent updates to the Jackson County Hazard Mitigation Plan will be continued on an ongoing basis as the Plan is approved, reviewed and updated in the future. The draft Jackson County Hazard Mitigation Plan has been available for public review on the Region 2 Planning Commission and Jackson County websites.

APPENDIX A

Jackson County Hazard Mitigation

APPENDIX A

In September, 2008 the Region 2 Planning Commission released a “Study of a Metropolitan Fire Authority”. This study was prepared for, and with the involvement of, the City of Jackson and the Townships of Blackman, Leoni, and Summit. The purpose of the study was to determine if the establishment of a metropolitan fire authority composed of the four units of local government was advisable. The study concluded that a metropolitan fire authority is not feasible at the present time. The study did, however recommend continued efforts toward mutual cooperation and participation in various aspects of fire protection services which lead toward a metropolitan approach. These recommendations are as follows:

1. Establishment of a Cooperative Capital Apparatus, Equipment, and Supplies Policy.

- Proposal:** The establishment of a cooperative apparatus, equipment, and supplies policy is proposed. The purpose of the policy is to reduce the cost and achieve standardization over the long term in vehicles, equipment, and supplies throughout the Jackson metropolitan area.
- Advantages:** Standardization of apparatus and equipment would allow the transfer of vehicles and equipment among departments or to a future metropolitan department, the facilitation of maintenance, reductions in costs, equipment compatibility, and fire-fighter familiarity system-wide.
- Obstacles:** Some departments may have preferences for specific brands of vehicles, equipment, or supplies.

Appendices

Means of

Implementation: Two committees composed of one representative of each department are recommended to be established for capital purchases, and for the purchase of equipment and supplies. These committees will inventory apparatus and equipment, develop replacement and replenishment schedules, and come to agreement on the purchase of vehicles, equipment and supplies.

The Jackson Community Ambulance (JCA) has been contacted and has indicated a willingness to discuss department participation in purchasing with the ambulance companies who currently have a joint purchasing arrangement. The departments may participate with purchases under the same pricing policy as those which exist for the ambulance companies.

Recommendation:

The Steering Committee recommends the immediate implementation of this suggestion through the appointment of the two committees, and believes each department would benefit individually and collectively.

2. Establishment of an Area-Wide Maintenance Program.

Proposal:

Currently, each of the four departments outsources the repair of vehicles. Repairs are completed in various locations and involve transportation costs. It may be possible to contract with a single provider for repair and maintenance services. Each of the four departments could be billed for work performed on their vehicles. Work could take place within the City's central station because of available space and lift equipment currently in place, or in another agreed upon location.

Jackson County Hazard Mitigation

Advantages:

1. Maintenance work could be scheduled on the basis of system-wide priority.
2. Efficiencies could be realized due to the consolidation of maintenance work in one location.
3. Maintenance work could be scheduled on the basis of system-wide priority.
4. The question of liability with the possible use of the City's central station has been addressed and is not an obstacle to implementation.

Obstacles:

Blackman Township's ladder could not be serviced at the City's central station because of the weight and length of the vehicle.

Means of Implementation:

1. The City's main station on N. Jackson Street, a centrally located facility, has lift equipment capable of handling fire vehicles, and space available to conduct such work.
2. The departments will contract with a single provider for vehicle maintenance and repair services.

Recommendation:

It is recommended that a single provider be engaged. Each of the three townships and the city would benefit under this arrangement.

3. Automatic Mutual-Aid for Rescue Responses.

Proposal:

The four departments could agree upon automatic mutual-aid for emergency rescue responses based upon a protocol designed to achieve rapid response and efficiency.

Appendices

Advantages:

1. Emergency rescue services could be provided by adjacent departments in locations where the service cannot be provided efficiently by the department of jurisdiction.
2. Automatic mutual-aid rescue responses could facilitate situations involving multiple emergency rescue requests.
3. An automatic mutual-aid arrangement for rescue may be very beneficial between the City and Summit Township.

Obstacles:

1. Automatic rescue response for Blackman Township would probably not work because the township has such a rapid response time. Their vehicles usually arrive at scenes prior to fire department vehicles.
2. Leoni cannot respond to areas within the City of Jackson faster than the City can respond.

Means of

Implementation:

An agreement for automatic mutual-aid for fire department rescue may be achieved using the model that successfully resulted in automatic mutual aid for structure fires. However, the concept appears only to be feasible for implementation between the City of Jackson and Summit Township.

Recommendation:

The involvement of the fire unions is recommended prior to attempting further study of this measure.

Jackson County Hazard Mitigation

4. Sharing of Reserved Apparatus.

Proposal: The four fire departments collectively could reduce apparatus requirements through the sharing of equipment in reserve.

Advantages: The sharing of reserve apparatus may result in a savings to each department by a reduction of apparatus necessary to meet reserve needs, and a reduction in the space required to house these vehicles. Such an arrangement would also allow for “cherry picking” system-wide to keep the best equipment for reserve purposes and allow the sales of remaining apparatus. Superfluous equipment could be sold.

Obstacles:

1. Insurance may be a problem because each of the four departments uses different insurance agencies.
2. Some vehicles are equipped with a capacity for only two personnel within the cab.
3. Because of variability and equipment, there is a lack of familiarity with vehicles which could create operational problems during fire emergencies.
4. The vehicles would have to be equipped with appropriate equipment.
5. There is not a need for such an arrangement because of the availability of such apparatus.

Means of

Implementation: A committee composed of representatives from each department may be established to review the reserve equipment needs and available vehicles. Available reserve vehicles could be housed at the City’s central fire station.

Appendices

Recommendation:

The Steering Committee advises further exploration of this measure as equipment ages. There is no immediate need for the sharing of reserve apparatus. One concern is the safety of firefighters as they operate equipment with which they are unfamiliar.

5. Refinement of Automatic Mutual-Aid System:

Proposal:

The operational characteristics of the automatic mutual-aid system could be reviewed to determine whether the response to a structure fire by all departments is necessary on all occasions. If it can be determined that response is not necessary by all departments for structure fires in certain locations without a reduction in efficiency or safety to firefighters, then such a reduction should be implemented.

Advantages:

Reducing the number of responses system-wide could result in a savings in cost, reduction of wear and tear on fire apparatus, and a reduction in the risk associated with emergency vehicles responding under lights and siren.

Obstacles:

1. Insurance may be a problem because each of the four departments uses different insurance agencies.
2. Generally there is a preference to not reduce man-power at fires.
3. The implementation of the proposal may be of concern to the fire department unions.

Jackson County Hazard Mitigation

Means of

Implementation: Central Dispatch issues the alarm and provides the location of structure fires. The individual departments determine who will go to the fire. To effectuate the change a simple change in protocol, and a corresponding adjustment to the mutual-aid agreement, would be necessary.

Recommendation:

Involvement of the fire unions is recommended to study and, perhaps, facilitate implementation.

6. Expansion of Centralized Training and Testing.

Proposal: Departments may enhance and expand their centralized training and testing programs to achieve greater efficiency, and pre-qualify potential employees.

Advantages:

1. More firefighters and public safety officers could be trained more efficiently.
2. Fire personnel would become more familiar with the personnel of other departments, which would facilitate their operations at fire scenes.

Obstacles: There are no known obstacles.

Means of

Implementation: A committee could be established to work out a curriculum to do training and testing in areas such as the pulmonary/respiratory fit test, hazmat training, and the expansion of the use of technology within departments.

Appendices

Recommendation:

The measure is recommended for immediate implementation.

7. Continuation of Meetings to Consider Cooperation Improvements.

Proposal:

It is recommended that elected officials from the townships, the Jackson City Manager, and the fire and public safety departments' leadership continue to meet on a regular basis to assess progress and propose additional means of cooperation, leading toward a metropolitan approach to the provision of fire protection services.

Advantages:

The City and townships can continue to focus on service consolidation for improvements in safe, effective, and economical fire protection services.

Obstacles:

None.

Means of

Implementation:

The Committee shall agree to continue to meet and establish meeting schedules, agendas, and minutes of meetings.

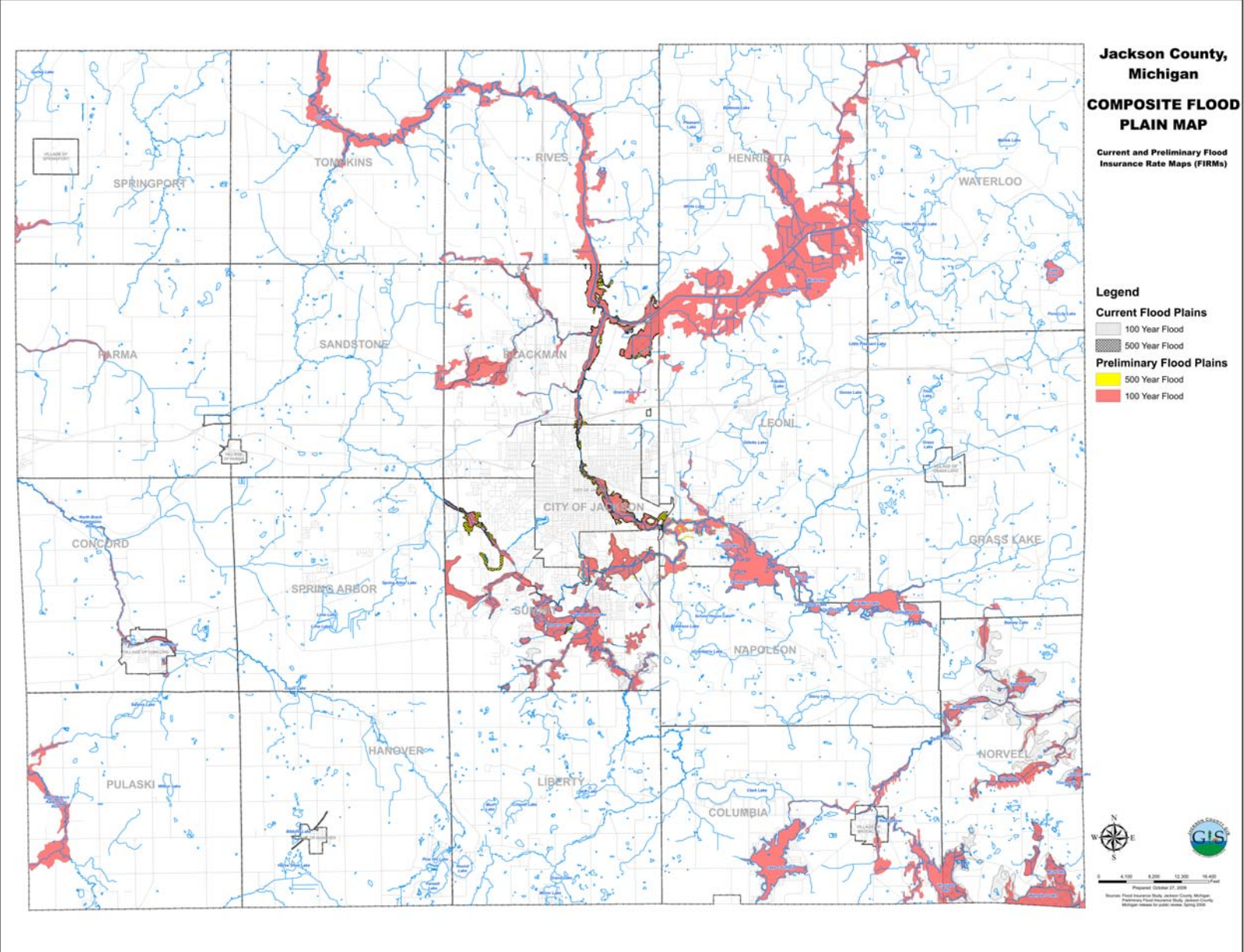
Recommendation:

The measure is recommended for immediate implementation.

Jackson County Hazard Mitigation

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APPENDIX B



**Jackson County,
Michigan**
**COMPOSITE FLOOD
PLAIN MAP**

Current and Preliminary Flood
Insurance Rate Maps (FIRMs)

Legend

Current Flood Plains

- 100 Year Flood
- 500 Year Flood

Preliminary Flood Plains

- 500 Year Flood
- 100 Year Flood



0 4,100 8,200 12,300 16,400 Feet

Prepared October 27, 2018
Source: Flood Insurance Rate Map, October 2015
Preliminary Flood Data and Study by the Jackson County
Michigan Office for water issues, Spring 2018