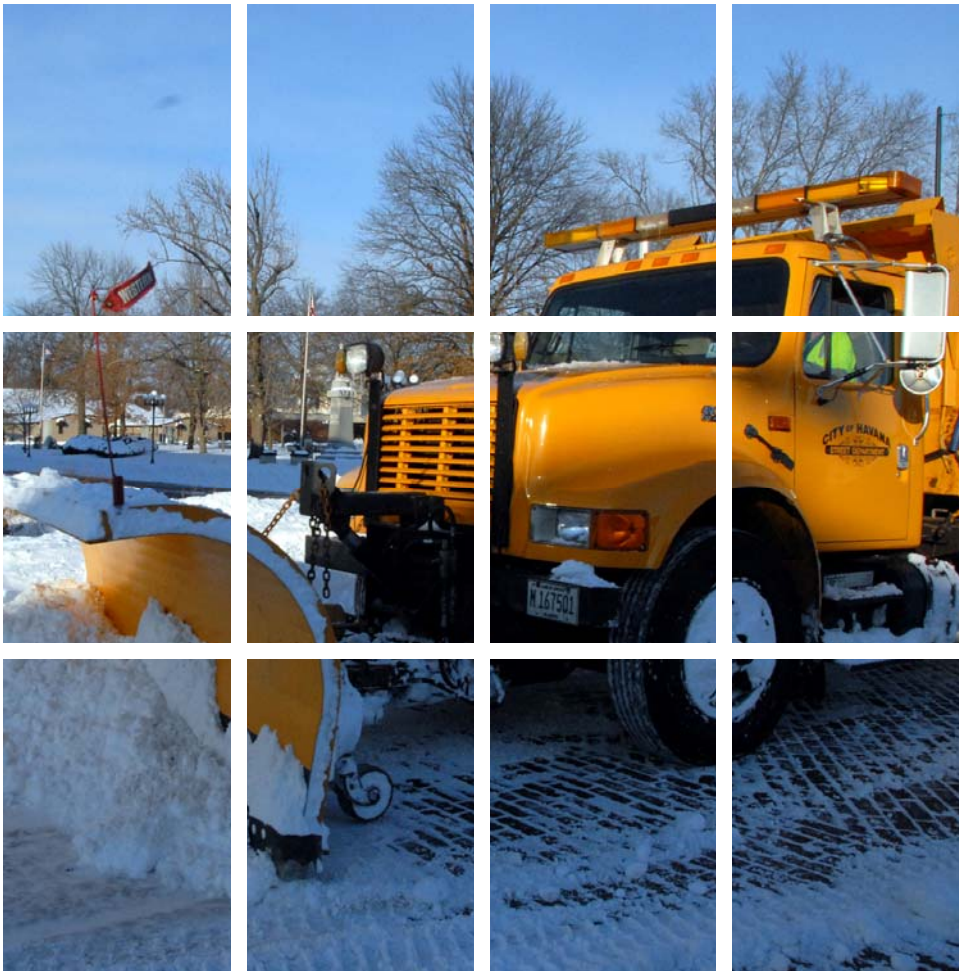

Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan

PARTICIPANTS

Bath, Village of
Easton, Village of
Forest City, Village of
Havana, City of
Havana Rural FPD
Kilbourne, Village of
Manito, Village of
Mason, County of
Mason City, City of
Mason District Hospital
San Jose, Village of
Topeka, Village of

JANUARY 2015

The five year update of this Plan must be completed on or before August 3, 2020.

ACKNOWLEDGEMENTS

This Plan is the first attempt to assemble a single source of information on severe weather in Mason County. Developing the first Natural Hazards Mitigation Plan for Mason County and the participating municipalities involved many people. All of their contributions have helped to make this Plan the definitive source of information on natural hazards, impacts on human health and property, and specific options to eliminate or reduce these impacts on current and future generations.

The Mason County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee was organized to represent the various jurisdictions and interests throughout the County. The Planning Committee's efforts produced a document which will be a valuable resource to all who use it.

Identifying, verifying, and gathering information about severe weather events involves research into various files and discussions with individuals. Gaps exist in weather records. Information from government sources has been supplemented by photographs and weather data from personal collections. Verifying the date, time, and location of a severe weather event is seldom accompanied by any information about property damages. Chris Miller at the National Weather Service in Lincoln graciously responded to all requests for information.

Photographs depicting storms and storm damages are often difficult to find. Wendy Martin (Mason County Democrat Newspaper), Joe Ragle and Greg Griffin (Mason County ESDA), and Chris Miller (National Weather Service) provided photographs and news stories. Many important details associated with extreme weather events in Mason County were illustrated in the information they provided.

As this Plan is updated, we hope that future generations will continue to build on this document with more information and photographs.

Cover photographs were provided courtesy of The Mason County Democrat and the Mason County Emergency Services and Disaster Agency.

From top to bottom:

- *February 2, 2011 blizzard – Havana*
- *April 15, 2011 tornado – unincorporated Mason County near Poplar City*
- *1993 flooding – emergence of Sand Lake near Havana*

MASON COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

MASON COUNTY, ILLINOIS

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Researched and written for the Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee
by Andrea J. Bostwick and Greg R. Michaud
Johnson, Depp & Quisenberry

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1.0 INTRODUCTION

1.0 INTRODUCTION

Each year natural hazards (i.e., severe thunderstorms, tornadoes, severe winter storms, flooding, etc.) cause damage to property and threaten the lives and health of the residents of Mason County. Since 1965, Mason County has had 13 federally-declared disasters. **Figure 1** identifies each declaration including the year the disaster was declared and the type of natural hazard(s) covered by the declaration.

Figure 1
Federal Disaster Declarations: Mason County

Declaration #	Year	Natural Hazard(s) Covered by Declaration
242	1968	flooding; severe storms and tornadoes
373	1973	flooding and severe storms
438	1974	flooding and severe storms
583	1979	flooding and severe storms
674	1982	flooding; severe storms; torrential rains; severe winds and tornadoes
735	1985	flooding; severe storms; excessive rainfall and ice jams
997	1993	flooding
1025	1994	flash flooding; thunderstorms and torrential rains
1053	1995	flash flooding; severe storms; thunderstorms; torrential rains; severe winds and tornadoes
1416	2002	flooding; excessive rainfall; severe storms and tornadoes
1469	2003	flooding; severe storms and tornadoes
1960	2011	severe winter storms
4116	2013	flooding; severe storms and severe winds

Sources: Illinois Emergency Management Agency.
Federal Emergency Management Agency.

In addition, in the past decade alone, there have been 83 heavy rain events producing at least 1.50 inches of rain, 32 thunderstorms with damaging winds, 20 severe winter storms, 8 general flood and flash flood events, 5 extreme heat events, 4 severe storms with hail one inch in diameter or greater, 2 tornadoes, 2 droughts, 1 lightning strike event, 1 extreme cold event, and 1 earthquake felt by residents in the County.

While natural hazards cannot be avoided, their impacts can be reduced through effective hazard mitigation planning. This prevention-related concept of emergency management often receives the least amount of attention, yet it is one of the most important steps in creating a hazard-resistant community.

What is hazard mitigation planning?

Hazard mitigation planning is the process of determining how to reduce or eliminate the loss of life and property damage resulting from natural hazards. This process helps the County and participating jurisdictions reduce their risk from natural hazards by identifying vulnerabilities

and developing mitigation actions to lessen and sometimes even eliminate the effects of a hazard. The results of this process are documented in a natural hazards mitigation plan.

Why prepare a natural hazards mitigation plan?

By preparing and adopting a natural hazards mitigation plan, participating jurisdictions become eligible to apply for and receive federal hazard mitigation funds to implement mitigation actions identified in the plan. These funds can help provide local government entities with the opportunity to complete mitigation projects that would not otherwise be financially possible.

The federal hazard mitigation funds are made available through the Disaster Mitigation Act of 2000, an amendment to the Robert T. Stafford Disaster Relief and Emergency Assistance Act, which provides federal aid for mitigation projects, but only if the local government entity has a Federal Emergency Management Agency (FEMA) approved hazard mitigation plan.

How is this plan different from other emergency plans?

A natural hazards mitigation plan is aimed at identifying projects and activities that can be conducted prior to a natural disaster, unlike other emergency plans which provide direction on how to respond to a disaster after it occurs. This is the first time that Mason County has prepared a plan that describes actions that can be taken to help reduce or eliminate damages caused by specific types of natural hazards.

1.1 PARTICIPATING JURISDICTIONS

Recognizing the benefits that could be gained from preparing a natural hazards mitigation plan, the Mason County Board passed a resolution on February 14, 2012 authorizing the development of the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan (hereto referred to as the Plan). **Appendix A** contains a copy of the resolution. The County then invited all the local government entities within Mason County to participate. **Figure 2** identifies the participating jurisdictions that are represented in the Plan. The Plan development was administered by the Mason County Emergency Services and Disaster Agency (ESDA).

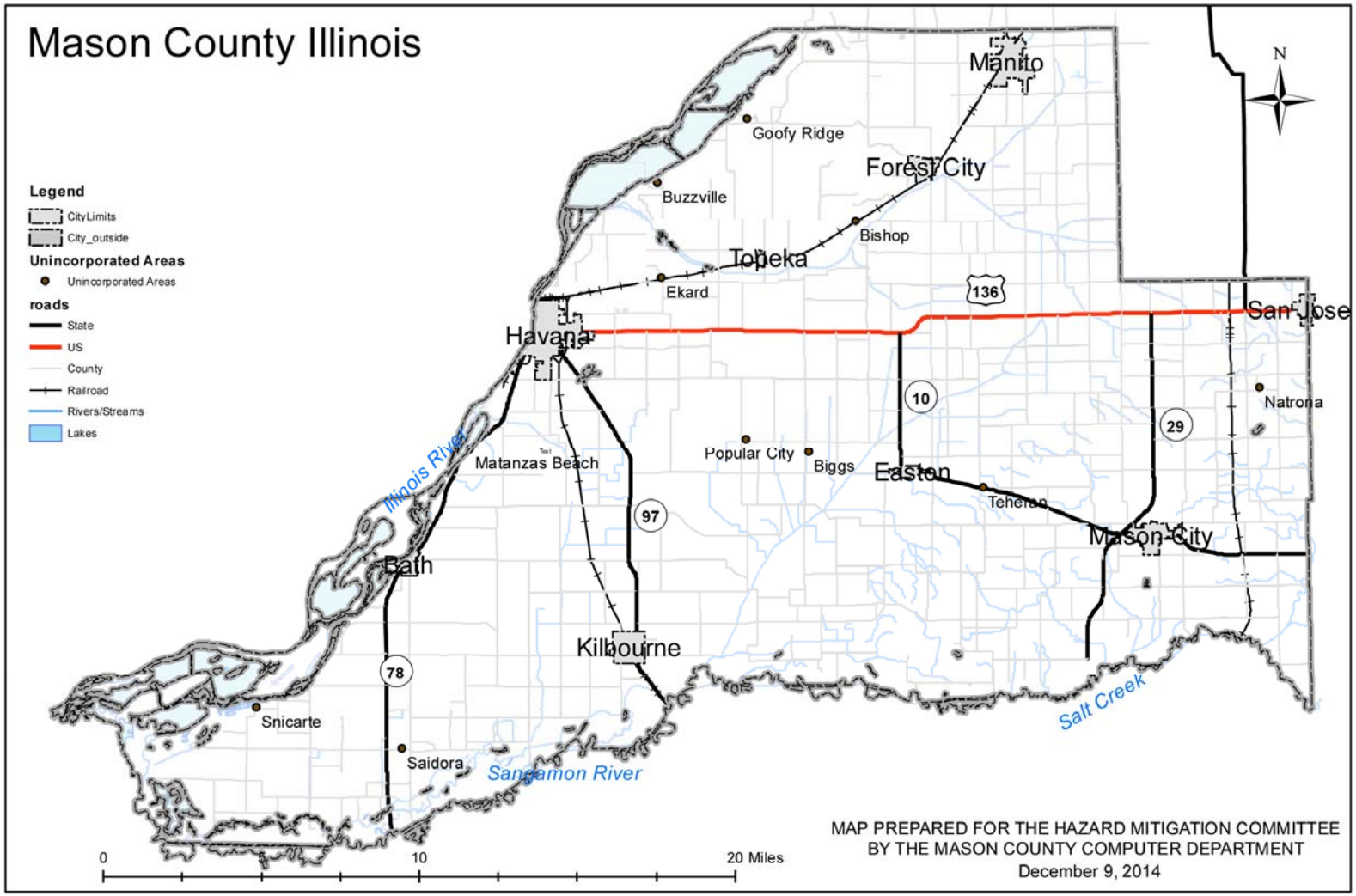
Figure 2
Participating Jurisdictions Represented in the Plan

- Bath, Village of
- Easton, Village of
- Forest City, Village of
- Havana, City of
- Havana Rural FPD
- Kilbourne, Village of
- Manito, Village of
- Mason City, City of
- Mason District Hospital
- San Jose, Village of
- Topeka, Village of

1.2 DEMOGRAPHICS

Mason County is located in west-central Illinois and covers approximately 563 square miles. **Figure 3** provides a location map of Mason County and the participating municipalities. The topography of the County is generally flat to gently sloping. The County is bounded to the north

Figure 3
Location Map



by Tazewell County, to the east by Tazewell and Logan Counties, to the south by Menard and Cass Counties and to the west by the Illinois River. The county seat is located in Havana.

Agriculture is a major economic enterprise in the County. According to the 2012 Census of Agriculture, there are 490 farms in Mason County occupying approximately 84% (289,841 acres) of the total land acreage in the County. The County produces a wide variety of crops because of its sandy soils and the wide use of irrigation. The major crops include corn, soybeans and wheat. The County is also a leading producer of watermelons, pumpkins and cantaloupes. Also grown in the County are sorghum, oats, sunflowers, popcorn, tomatoes, strawberries, sweet corn, cucumbers and Christmas trees. Hogs and cattle are the main livestock raised in the County.

The County ranks first in the State for production in the following categories: popcorn; vegetables harvested, all; and beans, snap. The County ranks second in the State in terms of value of sales by commodity group in the following categories: vegetables, melons, potatoes, and sweet potatoes; and aquaculture. In terms of major crops the County ranks 34th in the State for corn production and 44th for production of hogs and pigs. Mason County ranks in the top 30 Illinois counties for crop cash receipts and in the top 50 for livestock cash receipts.

Figure 4 provides demographic data on the County and each of the participating municipalities along with information on housing units and assessed values. The assessed values are for all residential structures and associated buildings (including farm homes and buildings associated with the main residence.) The assessed value of a residence in Mason County is approximately one-third of the market value.

Figure 4
Demographic Data by Participating Jurisdiction

Participating Jurisdiction	Population (2010)	Projected Population (2030)	Land Area (Sq. Miles) (2010)	Number of Housing Units (2010)	Housing Unit Density (Units/Sq. Mile) (Rounded Up)	Total Assessed Value of Housing Units (2013)
Mason County (unincorporated)	5,460	6,384	531.388	2,844	6	$156,238,660
Bath	333	389	0.365	161	---	$1,667,816
Easton	321	375	0.240	165	---	$2,485,320
Forest City	246	288	0.523	111	---	$1,404,961
Havana	3,301	3,859	2.741	1,535	561	$23,430,196
Kilbourne	302	353	0.889	143	---	$1,734,668
Manito	1,642	1,920	1.441	710	493	$17,137,739
Mason City	2,343	2,739	1.014	1,108	1,093	$17,381,967
San Jose	642	751	0.500	255	---	$2,773,512
Topeka	76	89	0.137	45	---	$487,326

Sources: Poler, Kristi J., Mason County Supervisor of Assessments.
Illinois Department of Commerce and Economic Opportunity, Projection Summary by County.
U. S. Census Bureau, 2010 Census U.S. Gazetteer Files.
U.S. Census Bureau, American FactFinder.

1.3 LAND USE AND DEVELOPMENT TRENDS

Population growth and economic development are two major factors that trigger changes in land use. Mason County is largely rural with a population that experienced a decrease of 8.6% between 2000 and 2010. Between 1980 and 2010, the population of Mason County decreased by approximately 24.8% from 19,492 to 14,666. However, between 1960 and 1980 the population of the County increased by 28.3% from 15,193 to 19,492. With the exception of Bath, all of the municipalities in Mason County have experienced modest to substantial declines in their populations since 2000.

Land use in Mason County is primarily agricultural. As discussed in the previous section, approximately 84% of the land within the County is used for farming practices. Agriculture is and will continue to be a major employment sector within the County for residents and a vital part of the County's economy.

There are no other large-scale economic development initiatives underway in the County. Substantial changes in land use (from forested and agricultural land to residential, commercial and industrial) are not anticipated within the County in the immediate future. No sizeable increases in residential or commercial/industrial developments are expected within the next five years.

2.0 PLANNING PROCESS

2.0 PLANNING PROCESS

The planning process utilized to prepare the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan (the Plan) involved the implementation of eight tasks. **Figure 5** provides a brief description of each task. These tasks were designed to ensure that the Plan complies with the requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act and Title 44 CFR §201.6.

Figure 5
Description of Planning Process

Tasks	Description
Task One: Organization	The Planning Committee was formed with broad representation and specific expertise to assist the County and the Consultant in preparing the Plan.
Task Two: Public Involvement	Early and ongoing public involvement activities were conducted throughout the Plan's development to ensure the public was given every opportunity to participate and provide input.
Task Three: Coordination	Agencies and organizations were contacted to identify plans and activities currently being implemented that impact or might potentially impact hazard mitigation activities.
Task Four: Risk Assessment	The Consultant identified and profiled the natural hazards that have impacted the County and conducted a vulnerability assessment to evaluate the risk to each participating jurisdiction.
Task Five: Goal Setting	After reviewing existing plans and completing the risk assessment, the Consultant assisted the Planning Committee in establishing goals and objectives for the Plan.
Task Six: Mitigation Activities	The participating jurisdictions were asked to identify mitigation actions based on the results of the risk assessment. These actions were then analyzed, categorized and prioritized.
Task Seven: Draft Plan	The draft Plan summarized the results of Tasks One through Six. In addition, a section was added that describes the responsibilities to monitor, evaluate and update the Plan. The draft Plan was reviewed by the participants and a public forum was held to give the public an additional opportunity to provide input. Comments received were incorporated into the draft Plan submitted to the Illinois Emergency Management Agency (IEMA) and FEMA for review and approval.
Task Eight: Final Plan	Comments received from IEMA and FEMA were incorporated in to the final Plan. The final Plan was then submitted to the County and participating jurisdictions for adoption. The Plan will be reviewed periodically and updated every five years.

The Plan was developed through the Mason County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee (Planning Committee) and was led at the staff level by Gregory Griffin, Director of the Mason County Emergency Services and Disaster Agency (ESDA). Johnson, Depp & Quisenberry, an environmental and engineering consulting firm, with experience in hazard mitigation, risk assessment and public involvement, was employed to guide the County and participating jurisdictions through the planning process.

Participation in the planning process, especially by the County and local government representatives was crucial to the development of the Plan. To ensure that all participating jurisdictions took part in the planning process, participation requirements were established. Each participating jurisdiction agreed to satisfy the following requirements in order to be included in the Plan. All of the participating jurisdictions met the participation requirements.

- Attend at least two Planning Committee meetings.
- Submit a list of documents (i.e., plans, studies, reports, maps, etc.) relevant to the natural hazard mitigation planning process.
- Identify and submit a list of critical infrastructure and facilities.
- Review the risk assessment and provide information on additional events and damages.
- Participate in the development of mitigation goals.
- Submit a list of mitigation actions.
- Review and comment on the draft Plan.
- Formally adopt the Plan.
- Where applicable, incorporate the Plan into existing planning efforts.
- Participate in the Plan maintenance.

2.1 PLANNING COMMITTEE

As previously mentioned, at the start of the planning process, the Mason County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee was formed. The Planning Committee included representatives from each participating jurisdiction, as well as agriculture, emergency services (Red Cross, fire, and law enforcement), insurance, healthcare and GIS.

Figure 6 details the entities represented on the Planning Committee and the individuals who attended on their behalf. The Planning Committee was chaired by Mason County ESDA.

Additional technical expertise was provided by the staff at the Illinois Emergency Management Agency Hazard Mitigation Unit; the Illinois Department of Natural Resources Office of Water Resources; the Illinois Environmental Protection Agency; and the University of Illinois.

Mission Statement

Over the course of the first two meetings, the Planning Committee developed a mission statement they felt best described their objectives for the Plan.

"The mission of the Mason County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee is to develop a mitigation plan that can reduce the negative impacts of natural hazards on citizens, infrastructure, private property and critical facilities."

Figure 6
Mason County Planning Committee Member Attendance Record

Representing	Name	Title	11/14/2013	3/13/2014	6/24/2014	10/9/2014	1/13/2015
American Red Cross	Coker, John	Government Operations Liaison	X	X	X	X	
American Red Cross	Potts, John	Regional Parternship Lead	X				
Bath, Village of	Cox, Gregory	Village Manager	X	X	X	X	X
Bath, Village of	Foutch, Floyd	President	X	X	X	X	X
Easton, Village of	Fangmeier, Charlene	Trustee		X		X	X
Easton, Village of	Lowers, Mindy	Village President					X
Easton, Village of	Lynn, Jerry	Former Village President	X				
Easton, Village of	Riegel, Dixie	Trustee		X			
Easton, Village of	Stout, Steven	Appointed Representative	X				
Forest City, Village of	Lacer, Norm	Trustee	X			X	X
Forest City, Village of	Uhle, John	Trustee					X
Forest City, Village of	Wooding, Devin	Trustee					X
Forman Ambulance	Herrman, Doug	EMS Chief		X			
Forman Fire Protection District	Moore, Julie	Trustee					X
Havana, City of	Kachanuk, John	Fire Chief	X	X	X		X
Havana, City of	McDowell, Ross	Alderman					X
Havana, City of	Noble, Kevin	Police Chief	X	X	X		X
Havana, City of	Stadsholt, Brenda	Mayor	X	X		X	X
Havana Rural Fire Protection District	Ragle, Joe	Lieutenant	X	X	X	X	X
Havana Rural Fire Protection District	Williams, Scott	Assistant Chief		X	X		X
Johnson, Depp & Quisenberry	Bostwick, Andrea	Environemntal Specialist	X	X	X	X	X
Johnson, Depp & Quisenberry	Michaud, Greg	Environmental Services Manager	X	X	X	X	X
Kilbourne, Village of	Lascelles-Troxell, Sharon	Board Member	X	X	X	X	
Logan, Mason & Menard Counties Regional Office of Education	McDowell, Terri	Assistant Regional Superintendent					X
Manito, Village of	Kraft, Dan	ESDA Director		X			
Manito, Village of	Sanders, Cliff	Public Works Supervisor					X
Manito, Village of	Moore, Julie	ESDA Representative					X
Mason City, City of	Bowers, Charles "Pete"	Mayor	X				X
Mason City, City of	Burris, Mike	City Engineer		X	X	X	X
Mason City, City of	Combs, Marion	Alderman		X			
Mason City, City of	Dixon, Wayne	Superintendent	X		X	X	X
Mason County - Administrator	Blessman, Bill	Administrator	X	X	X	X	
Mason County - Board	Garlisch, Eldon	Board Member	X	X	X		X
Mason County - Board	Walker, Ken	Chairman	X		X		X
Mason County - Clerk's Office	Brown, Summer	Clerk	X	X	X	X	X
Mason County - Coroner's Office	Hurley, Michael	Coroner	X		X		
Mason County - ESDA	Griffin, Greg	Director	X	X	X	X	X
Mason County - GIS	Roper, Robb	Data Processing Manager	X	X	X	X	X
Mason County - Health Department/Housing	Jibben, Curt	Director	X	X	X		
Mason County - Health Department/Housing	Krueger, Nina	Director of Nurses					X
Mason County - Highway Department	Pedigo, Mike	County Engineer	X	X	X		X
Mason County - Sheriff's Office	Burgett, Steve	Sergent		X			
Mason County - Sheriff's Office	Gann, Paul	Sheriff	X				X
Mason County - Sheriff's Office	Pedigo, Holly	911 Coordinator	X	X			
Mason County - Supervisor of Assessments Office	Poler, Kristi	Assessor	X	X	X	X	X
Mason County Democrat	Martin, Wendy	Editor	X	X	X		X
Mason County Farm Bureau	Deuth, Renee	Manager	X	X		X	
Mason District Hospital	Kosier, Doug	Safety Officer	X	X	X	X	
Mason District Hospital	Troxell, Chris	Director of Emergency Services		X	X	X	
San Jose, Village of	Coon, Ralph E. Jr.	Trustee			X		X
San Jose, Village of	Cupi, Maria	Police Chief			X		X
Topeka, Village of	Marshall, Gloria	Clerk		X			
Topeka, Village of	Rangle, Joe	Public Representative				X	X
Weather Reporter	Acker, Larry	Climatologist		X	X	X	X
Williams Insurance Agency	Williams, Scott	Owner		X	X		X

Planning Committee Meetings

The Planning Committee met five times between November, 2013 and January 2015. **Figure 6** identifies the representatives present at each meeting. **Appendices B** and **C** contain copies of the attendance sheets and meeting minutes for each meeting. The purpose of each meeting, including the topics discussed, is summarized below.

First Planning Committee Meeting – November 14, 2013

The purpose of this meeting was to explain the planning process to the Planning Committee members and give them a brief overview on what a natural hazards mitigation plan is and why one should be prepared. Drafts of the mission statement and mitigation goals were presented. Representatives for the County and the participating jurisdictions were asked to complete the forms entitled "List of Existing Planning Documents", "Critical Facilities" and "Severe Weather Shelters" and return them at the next meeting. Copies of a hazard events questionnaire and citizen questionnaire were also distributed.

Second Planning Committee Meeting – March 13, 2014

At the second Planning Committee meeting the natural hazard risk assessment section was presented for review. Committee members were asked to think about whether any critical facilities have been damaged by a natural hazard event within their jurisdiction. The Planning Committee continued their discussions on the mission statement and mitigation goals and finalized both. Ideas for potential mitigation projects were presented. Representatives for the County and the participating jurisdictions were asked to complete the forms entitled "Critical Facilities Damaged by Natural Hazard Events" and "Hazard Mitigation Projects" and return them at the next meeting.

Third Planning Committee Meeting – June 26, 2014

The purpose of the third Planning Committee meeting was to review the mitigation actions identified by the participating jurisdictions and discuss the mitigation strategy. The mitigation strategy discussion focused on the project prioritization methodology and categories of mitigation actions. Portions of the vulnerability assessment were presented for review. All representatives were asked to complete a compensation questionnaire for use in administering the grant.

Fourth Planning Committee Meeting – October 9, 2014

At the fourth meeting the sections of each Plan focusing on the mitigation strategy, plan maintenance and dam failures were presented for review. In addition, the mitigation action tables were completed for each participating jurisdiction and distributed for review. The tables listed all of the mitigations actions identified and prioritized them using the approved project prioritization methodology. Information on mitigation project funding was also discussed.

Fifth Planning Committee Meeting – January 13, 2015
The purpose of the fifth Planning Committee meeting was to provide the public an opportunity to provide comments on the draft Plan.

2.2 PUBLIC INVOLVEMENT

To engage the public in the planning process, a comprehensive public involvement strategy was developed. The strategy was structured to engage the public in a two-way dialogue, encouraging the exchange of information throughout the planning process. A mix of public involvement techniques and practices were utilized to:

- disseminate information;
- identify additional useful information about natural hazard occurrences and impacts;
- assure that interested residents would be involved throughout the Plan's development; and
- nurture ownership of the Plan, thus increasing the likelihood of adoption by the participating jurisdictions.

The dialogue with the public followed proven risk communication principles to help assure clarity and avoid overstating or understating the impacts posed by the natural hazards identified in the Plan. The following public involvement techniques and practices were applied to give the public an opportunity to access information and participate in the dialogue at their level of interest and availability.

Citizen Questionnaire
A citizen questionnaire was created to gather facts and gauge public perceptions about natural hazards. The questionnaire was made available at the offices of participating jurisdictions. A copy of the questionnaire is contained in **Appendix D**.

A total of 25 questionnaires were completed and returned to the Planning Committee. The questionnaires were filled out by residents of most of the participating municipalities. While fewer questionnaires were returned than has been experienced using similar techniques with virtually the same survey in other counties, the responses should provide useful information to decision makers as they deliberate how best to disseminate information about natural hazards and how residents can protect themselves and their property.

Additionally, these results provide an indication as to the types of projects that are most likely to receive public support. A review of the questionnaires revealed the following:

- Severe storms (thunderstorms, hail, lightning and heavy rain), severe winter storms and floods were identified as the most frequently encountered natural hazards in Mason County by respondents. This is consistent with the weather records compiled for the County and as described in this Plan.
- Electronic media (internet and television) were identified as the most effective means of disseminating information about natural hazards. Of the electronic media choices, the internet was recognized as the most favored means of dissemination followed closely by

television. Newspapers and mailings distributed via government agencies and fire/law enforcement departments also received strong support among respondents.

- Five (5) categories of mitigation projects and activities were felt to be most needed. The following identifies each category and provides the percentage of support received:
  - maintain roadway passages during snow storms and heavy rains (78.3%);
  - maintain power during storms by burying power lines, trimming trees and/or purchasing backup generators (69.6%);
  - retrofit critical infrastructure (public water supplies, schools, sewage treatment facilities, bridges, hospitals and other important services) to reduce potential damages (56.5%);
  - identify residents with special needs in order to provide assistance during a natural hazard event (56.5%); and
  - provide flood and drainage protection (47.8%) – the respondents who selected this category felt culverts and drainage ditch maintenance was the most needed activity.

FAQ Fact Sheet

A "Frequently Asked Questions" fact sheet was created to explain what a natural hazard mitigation plan is and briefly explain the planning process. The fact sheet was made available at the government offices of participating jurisdictions. A copy of the fact sheet is contained in **Appendix E**.

News Releases

News releases were prepared and submitted to local print media prior to each Planning Committee meeting. The releases announced the purpose of the meetings and how the public could become involved in the development each Plan. **Appendix F** contains a list of the print media that received the news releases and copies of the news articles published. No newspaper articles were published for the March 13, 2014 or October 9, 2014 meetings even though a news release was issued. A copy of the official news release is included in place of an article for these meetings.

Planning Committee Meetings

All of the meetings conducted by the Planning Committee were open to the public and publicized in advance to encourage public participation. At the end of each meeting, time was set aside for public comment. In addition, Committee members were available throughout the planning process to talk with residents and local government officials and were responsible for relaying any concerns and questions voiced by the public to the Planning Committee.

Public Forum

The final meeting of the Planning Committee, held on January 13, 2015, was conducted as an open-house public forum. The open-house format was chosen for this forum instead of a hearing to provide greater convenience for residents who wished to participate. Residents were able to come and go at any time during the forum, reducing conflicts with business, family, and social obligations.

At the forum, residents could review the draft Plan; meet with representatives from the County, the participating local government entities and the Consultant; ask any questions; and provide comments on the draft Plan. Individuals attending the public forum were provided with a two-page handout summarizing the planning process and a separate comment sheet that could be used to provide feedback on the draft Plan. **Appendices G** and **H** contain copies of these materials.

Public Comment Period

After the public forum, the Mason County draft Plan was made available for public review and comment through January 27, 2015 at the Mason County Clerk's Office. Residents were encouraged to submit their comments electronically, by mail or through representatives of the Planning Committee.

Results of Public Involvement

The public involvement strategy implemented during the planning process created a dialogue among participants and interested residents which resulted in many benefits, a few of which are highlighted below.

- *Discovered previously unidentified documentation about natural hazards*. Verifiable hazard event and damage information was obtained from participants that presents a clearer assessment of the extent and magnitude of natural hazards that have impacted the County. This information included details about severe storms, lightning, floods, severe winter storms, tornadoes and drought not available in state and federal databases.
- *Obtained critical facilities damage information*. Data collection surveys soliciting information about critical facilities damaged by severe storms and other natural hazards were used to supplement information obtained from government databases. This was the first time this information had been collected and was vital to the preparation of the vulnerability assessment.
- *Increased awareness of the impacts associated with natural hazard events within the County*. Understanding how mitigation actions can reduce risk to life and property helped generate over 100 potential mitigation projects and activities at the local level that had not been identified in any other planning process.

2.3 PARTICIPATION OPPORTUNITIES FOR INTERESTED PARTIES

Businesses, schools, not-for-profit organizations, neighboring counties, and other interested parties were provided multiple opportunities to participate in the planning process. Wide-reaching applications were combined with direct, person-to-person contacts to reach anyone who might have an interest or possess information which could be helpful in developing the Plan.

Business Community

Representatives from those segments of the business community who had the most interest in natural hazard mitigation were invited to serve on the Planning Committee. Agriculture and agribusiness are major economic enterprises in the County. Virtually every aspect of life in each County is affected by agriculture. Consequently, input was sought from the agricultural community which responded positively to being involved.

Input from the insurance industry also provided balance and context for discussions on property damages, both residential and agricultural. An experienced and well respected local insurance agent represented the insurance industry (as well as the Havana Rural Fire Protection District) and his perspectives on storm damages were valuable in the development of the Plan.

Not-For-Profit Organizations

The American Red Cross served on the Planning Committee as well. A Government Operations liaison with the Central Illinois Chapter, which serves Mason County, participated and provided input into the planning process.

Neighboring Counties

An announcement was sent to EMA/ESDA offices in all of the neighboring counties inviting participation in the mitigation planning process. **Appendix I** contains a copy of the invitation memo.

2.4 INCORPORATING EXISTING PLANNING DOCUMENTS

As part of the planning process, each participating jurisdiction was asked to identify and provide existing documents (plans, studies, reports and technical information) relevant to the Plan. **Figure 7** summarizes the availability of existing planning documents by participating jurisdiction. These documents were reviewed and incorporated into the Plan whenever applicable.

Figure 7
Existing Planning Documents by Participating Jurisdiction

Existing Planning Documents	Participating Jurisdiction									
	Mason County	Bath	Easton	Forest City	Havana	Kilbourne	Manito	Mason City	San Jose	Topeka
Plans										
Comprehensive Plan					X		X			
Emergency Management Plan	X				X		X	X		
Land Use Plan					X		X			
Codes & Ordinances										
Building Codes					X		X	X	X	
Drainage Ordinances					X		X			
Historic Preservation Ordinance							X			
Subdivision Ordinance(s)					X		X		X	
Zoning Ordinances	X	X			X		X	X	X	
Maps										
Existing Land Use Map	X						X		X	
Infrastructure Map					X		X			
Zoning Map	X	X			X		X		X	
Flood-Related										
Flood Ordinance(s)	X	X			X		X	X		
Flood Insurance Rate Maps	X	X			X		X	X		
Repetitive Flood Loss List					X					
Elevation Certificates for Buildings	X				X					

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3.0 RISK ASSESSMENT

3.0 RISK ASSESSMENT

Risk assessment is the process of evaluating the vulnerability of people, buildings and infrastructure to natural hazards in order to estimate the potential loss of life, personal injury, economic injury and property damage resulting from natural hazards. This section summarizes the results of the risk assessment conducted on the natural hazards that pose a threat to Mason County. The information contained in this section was gathered by evaluating local, state and federal records from the last 60 years.

This risk assessment identifies the natural hazards that pose a threat to the County and includes a profile of each which identifies past occurrences, the severity or extent of the hazard, and the likelihood of future occurrences. It also provides a vulnerability assessment which identifies the impacts to public health and property, evaluates the assets of the participating jurisdictions (i.e., residential buildings, critical facilities and infrastructure) and estimates the potential impacts each natural hazard would have on the health and safety of the residents as well as the buildings, critical facilities and infrastructure located within the County. Where applicable, the differences in vulnerability between participating jurisdictions are described.

One of the responsibilities of the Planning Committee was to decide which natural hazards to include in the Plan. Over the course of the first two Planning Committee meetings, the Planning Committee members discussed their experiences with natural hazard events and reviewed information about various natural hazards. After much discussion, they chose to include the following natural hazards in this Plan:

- severe storms (thunderstorms, hail, lighting & heavy rain)
- severe winter storms (snow, ice & extreme cold)
- floods
- tornadoes
- extreme heat
- drought
- earthquakes
- dams
- levees

The subsequent sections provide detailed information on each of the selected natural hazards. The sections are color coded and ordered by the frequency with which the natural hazard has previously occurred within the County, starting with severe storms. Each natural hazard section contains three subsections: identifying the hazard, profiling the hazard and assessing vulnerability.

3.1 SEVERE STORMS (THUNDERSTORMS, HAIL, LIGHTNING & HEAVY RAIN)

IDENTIFYING THE HAZARD

What is the definition of a severe storm?

The National Oceanic and Atmospheric Administration's National Weather Service (NWS) defines a "severe storm" as any thunderstorm that produces one or more of the following:

- winds with gust of 50 knots (58 mph) or greater;
- hail that is at least one inch in diameter (quarter size) or larger; and/or
- a tornado.

While severe storms are capable of producing deadly lightning and excessive rainfall that may lead to flash flooding, the NWS does not use either to define a severe storm. However, a discussion of both lightning and heavy rain is included in this section because they both capable of causing extensive damage. For the purposes of this report, tornadoes and flooding are categorized as separate hazards and are not discussed under severe storms.

What is a thunderstorm?

A thunderstorm is a rain shower accompanied by lightning and thunder. An average thunderstorm is approximately 15 miles in diameter, affecting a relatively small area when compared to winter storms or hurricanes, and lasts an average of 30 minutes. Thunderstorms can bring heavy rain, damaging winds, hail, lightning and tornadoes.

There are four basic types of thunderstorms: single-cell, multi-cell, squall line, and supercell. The following provides a brief description of each.

Single-cell Thunderstorm

Single cell storms are small, weak storms that only last about ½ hour to an hour and are not usually considered severe. They are typically driven by heating on a summer afternoon. Occasionally a single cell storm will become severe, but only briefly. When this happens, it is called a pulse severe storm.

Multi-cell Thunderstorm

Multi-cell storms are the most common type of thunderstorms. A multi-cell storm is organized in clusters of at least two to four short-lived cells. Each cell usually lasts 30 to 60 minutes while the system as whole may persist for many hours. Multi-cell storms may produce hail, strong winds, brief tornadoes, and/or flooding.

Squall Line

A Squall line is a group of storms arranged in a line, often accompanied by "squalls" of high wind and heavy rain. The line of storms can be continuous or there can be gaps and breaks in the line. Squall lines tend to pass quickly and can be hundreds of miles long but are typically only 10 to 20 miles wide. A "bow echo" is a radar signature of a squall line that "bows out" as winds fall behind the line and circulation develops on either end.

Supercell Thunderstorm

Supercell storms are long-lived (greater than one hour) and highly organized storms that feed off a rising current of air (an updraft). The main characteristic that sets a supercell storm apart from other thunderstorm types is the presence of rotation in the updraft. The rotating updraft of a supercell (called a mesocyclone when visible on radar) helps a supercell storm produce extreme weather events. Supercell storms are potentially the most danagerous storm type and have been observed to generate the vast majority of large and violet tornadoes, as well as downburst winds and large hail.

Despite their size, all thunderstorms are dangerous and capable of threatening life and property. Of the estimated 100,000 thunderstorms that occur each year in the United States, roughly 10% are classified as severe.

What kinds of damaging winds are produced by a thunderstorm?

Aside from tornadoes, thunderstorms can produce straight-line winds. A straight-line wind is defined as any wind produced by a thunderstorm that is not associated with rotation. There are several types of straight-line winds including downdrafts, downbursts, microbursts, gust fronts and derechos.

Damage from straight-line winds is more common than damage from tornadoes and accounts for most thunderstorm wind damage. Straight-line wind speeds can exceed 87 knots (100 mph), produce a damage pathway extending for hundreds of miles and can cause damage equivalent to a strong tornado.

The NWS measures a storm's wind speed in knots or nautical miles. A wind speed of one knot is equal to approximately 1.15 miles per hour. **Figure 8** shows conversions from knots to miles per hour for various wind speeds.

Figure 8
Wind Speed Conversions

Knots (kts)	Miles Per Hour (mph)	Knots (kts)	Miles Per Hour (mph)
50 kts	58 mph	60 kts	69 mph
52 kts	60 mph	65 kts	75 mph
55 kts	63 mph	70 kts	81 mph
58 kts	67 mph	80 kts	92 mph

What is hail?

Hail is precipitation in the form of spherical or irregular-shaped pellets of ice that occur within a thunderstorm when strong rising currents of air (updrafts) carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. Hailstones grow by colliding with supercooled water drops. The supercooled water drops freeze on contact with ice crystals, frozen rain drops, dust, etc. Thunderstorms with strong updrafts continue lifting the hailstones to the top of the cloud where it would encounter more supercooled water and continue to grow. Eventually the hail becomes too heavy to be supported by the updraft and falls to the ground.

In the United States, hail causes more than $1 billion in damages to property and crops annually. Hail has been known to cause injuries, although it rarely causes death or serious injury.

How is the severity of a hail event measured?

The severity or magnitude of a hail event is measured in terms of the size (diameter) of the hailstones. The hail size is estimated by comparing it to known objects. **Figure 9** provides descriptions for various hail sizes.

Figure 9
Hail Size Descriptions

Hail Diameter (inches)	Description	Hail Diameter (inches)	Description
0.25 in.	pea	1.75 in.	golf ball
0.50 in.	marble/mothball	2.50 in.	tennis ball
0.75 in.	penny	2.75 in.	baseball
0.88 in.	nickel	3.00 in.	tea cup
1.00 in.	quarter	4.00 in.	grapefruit
1.50 in.	ping pong ball	4.50 in.	softball

Source: NOAA, National Severe Storm Laboratory.

Hail size can vary widely. Hailstones may be as small as 0.25 inches in diameter (pea-sized) or, under extreme circumstances, as large as 4.50 inches in diameter (softball-sized). Typically hail that is 1 inch in diameter (quarter-sized) or larger is considered severe.

The severity of a hail event can also be measured or rated using the TORRO Hailstorm Intensity Scale. This scale was developed in 1986 by the Tornado and Storm Research Organisation of the United Kingdom. It measures the intensity or damage potential of a hail event based on several factors including: maximum hailstone size, distribution, shape and texture, numbers, fall speed and strength of the accompanying winds.

The Hailstorm Intensity Scale identifies ten different categories of hail intensity, H0 through H10. **Figure 10** gives a brief description of each category. This scale is unique because it recognizes that, while the maximum hailstone size is the most important parameter relating to structural damage, size alone is insufficient to accurately categorize the intensity and damage potential of a hail event.

It should be noted that the typical damage impacts associated with each intensity category reflect the building materials predominately used in the United Kingdom. These descriptions may need to be modified for use in other countries to take into account the differences in building materials typically used (i.e., whether roofing materials are predominately shingle, slate or concrete, etc.).

What is lightning?

Lightning, a component of all thunderstorms, is a visible electrical discharge that results from the buildup of charged particles within storm clouds. It can occur from cloud-to-ground, cloud-to-cloud, within a cloud or cloud-to-air. The air near a lightning strike is heated to approximately

50,000°F (hotter than the surface of the sun). The rapid heating and cooling of the air near the lightning strike causes a shock wave that produces thunder.

Figure 10
TORRO Hailstorm Intensity Scale

Intensity Category		Typical Hail Diameter		Description	Typical Damage Impacts
		millimeters (approx.)*	inches (approx.)*		
H0	Hard Hail	5 mm	0.2”	pea	no damage
H1	Potentially Damaging	5-15 mm	0.2” – 0.6”	pea / mothball	slight general damage to plants, crops
H2	Significant	10-20 mm	0.4” – 0.8”	dime / penny	significant damage to fruit, crops, vegetation
H3	Severe	20-30 mm	0.8” – 1.2”	nickel / quarter	severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-40 mm	1.0” – 1.6”	half dollar / ping pong ball	widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50 mm	1.2” – 2.0”	golf ball	wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60 mm	1.6” – 2.4”	golf ball / egg	bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-75 mm	2.0” – 3.0”	egg / tennis ball	severe roof damage, risk of serious injuries
H8	Destructive	60-90 mm	2.4” – 3.5”	tennis ball / tea cup	severe damage to aircraft bodywork
H9	Super Hailstorms	75-100 mm	3.0” – 4.0”	tea cup / grapefruit	extensive structural damage, risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	> 100 mm	> 4.0”	softball	extensive structural damage, risk of severe or even fatal injuries to persons caught in the open

* Approximate range since other factors (i.e., number and density of hailstones, hail fall speed and surface wind speed) affect severity.

Source: Tornado and Storm Research Organisation, TORRO Hailstorm Intensity Scale Table.

Lightning on average causes 60 fatalities and 300 injuries annually in the United States. Most fatalities and injuries occur when people are caught outdoors in the summer months. In addition, lightning can cause structure and forest fires. Many of the wildfires in the western United States and Alaska are started by lightning. According to the NWS lightning strikes cost more than $1 billion in insured losses each year.

Are alerts issued for severe storms?

Yes. The National Weather Service Weather Forecast Office in Lincoln, Illinois is responsible for issuing ***severe thunderstorm watches*** and ***warnings*** for Mason County depending on the weather conditions. The following provides a brief description of each type of alert.

- **Watch.** A severe thunderstorm watch is issued when conditions are possible in or near the watch area. Individuals should stay alert for the latest weather information and be prepared to take shelter.

- **Warning.** A severe thunderstorm warning is issued when a severe thunderstorm is approaching or is occurring. Warnings indicate imminent danger to life and property for those who are in the path of the storm.

PROFILING THE HAZARD

When have severe storms occurred previously? What is the extent of these previous severe storms?

Figures 11, **12**, **13**, and **14**, located at the end of this section, summarize the previous occurrences as well as the extent or magnitude of severe storm events recorded in Mason County. The severe storm events are separated into four categories: thunderstorms with damaging winds, hail, lightning and heavy rain. Severe storms are the most frequently occurring natural hazard in Mason County.

Thunderstorms with Damaging Winds

NOAA's Storm Events Database has documented 91 reported occurrences of thunderstorms with damaging winds in Mason County between 1964 and 2013. Of the 91 occurrences, 51 had reported wind speeds of 50 knots or greater. There were 40 occurrences, however, where the wind speed was not recorded.

The highest wind speed recorded in Mason County occurred in Havana and Bath on August 12, 1999 when winds reached 70 knots (81 mph) during a thunderstorm event. Thunderstorms with damaging winds have occurred in every participating municipality within the County on multiple occasions.

Severe Storms Fast Facts – Occurrences

Number of Thunderstorms with Damaging Winds (1964 – 2013): ***91***

Number of Severe Hail Events (1966 – 2013): ***28***

Number of Lightning Strikes (2006 – 2013): ***2***

Number of Heavy Rain Events (1950 – 2013): ***416***

Highest Recorded Wind Speed: ***70 knots (Aug. 12 1999)***

Largest Hail Recorded: ***2.75 inches in diameter (Dec. 8, 1991 & Aug. 18, 2001)***

Most Likely Month for Thunderstorms with Damaging Winds to Occur: ***June***

Most Likely Month for Severe Hail to Occur: ***May***

Most Likely Month for Heavy Rain to Occur: ***July***

Most Likely Time for Thunderstorms with Damaging Winds to Occur: ***Afternoon/Early Evening***

Most Likely Time for Severe Hail to Occur: ***Early Afternoon***

Most Likely Time for Heavy Rain to Occur: ***Early Morning***

Figure 15 charts the reported occurrences of thunderstorms with damaging winds in Mason County by month. Of the 91 events, 62 (68%) took place in May, June and July making this the peak period for thunderstorms with damaging winds in Mason County. Of those 62 events, 23 (37%) occurred during June, making this the peak month for thunderstorms with damaging winds.

Figure 16 charts the reported occurrences of thunderstorms with damaging winds by hour. Approximately 81% of all thunderstorms with damaging winds occurred during the p.m. hours, with 50 of the events (55%) taking place between 2 p.m. and 7 p.m.

Hail

NOAA's Storm Events Database has documented 28 reported occurrences of severe storms with hail 1.00 inch in diameter or greater in Mason County between 1966 and 2013. Of the

28 occurrences, 19 produced hailstones 1.50 inches or larger in diameter. The largest hail documented in Mason County measured 2.75 inches in diameter (baseball-sized) and fell on two separate occasions in Manito on December 8, 1991 and again on August 18, 2001. Hail 1.00 inch in diameter or greater has been *recorded* at least once in every participating municipality, with the exception of Forest City and Topeka.

Figure 15
Thunderstorms with Damaging Winds by Month
1964 – 2013

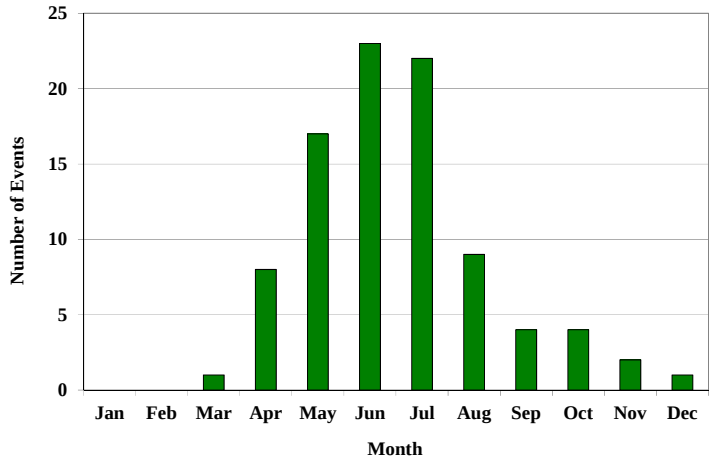


Figure 16
Thunderstorms with Damaging Winds by Hour
1964 – 2013

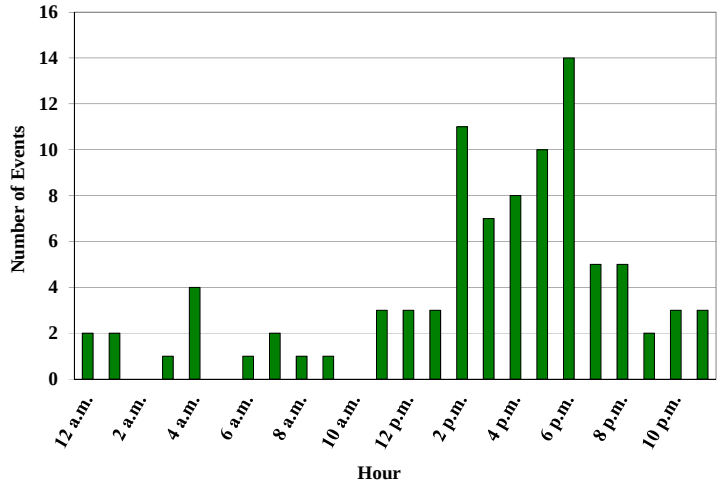


Figure 17 charts the reported occurrences of hail by month. Of the 28 occurrences, 19 (68%) took place in April and May making this the peak period for hail in Mason County. Of the 19 events, 13 (68%) occurred during May, making this the peak month for hail events.

Figure 17
Hail Events by Month
1966 – 2013

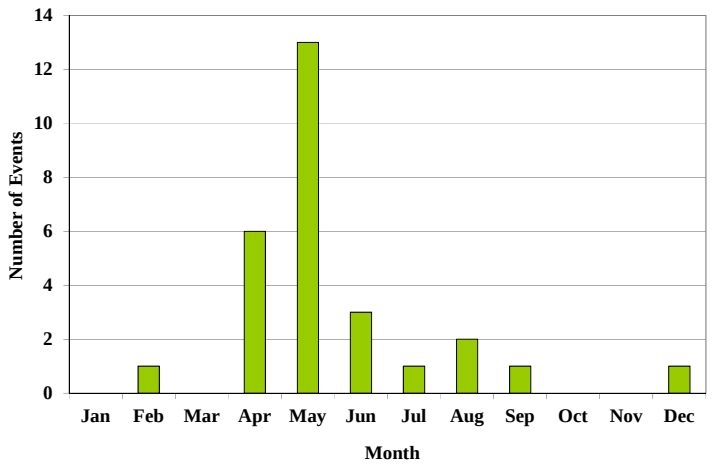
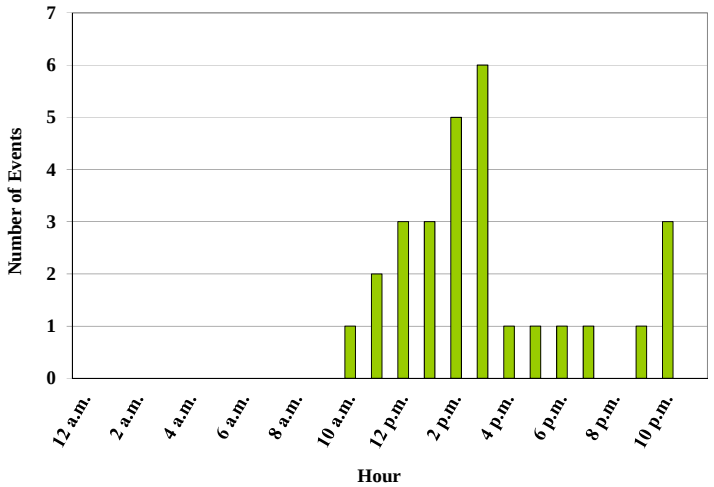


Figure 18 charts the reported occurrences of hail by hour. Approximately 89% of all the hail events occurred during the p.m. hours, with 17 of the events (61%) taking place between 12 p.m. and 4 p.m.

Figure 18
Hail Events by Hour
1966 – 2013



Lightning

While lightning strike events occur regularly across central Illinois, NOAA's Storm Events Database has only two documented occurrences of a lightning strike in Mason County between 2006 and 2013. This is almost certainly due to the rural nature of the County. One of the event took place in May and the other took place in August.

Heavy Rain

NWS's COOP data records have documented 416 reported occurrences of heavy rain in Mason County between 1950 and 2013. Of the 416 occurrences, 67 events (16%) produced three inches or more of rain. Between 1993 and 2013, records indicate that flooding and/or flash flooding resulted from 14 of the 151 heavy rain events (9%).

Figure 19 charts the reported occurrences of heavy rain by month. Of the 416 events, 225 (54%) took place in May, June, July and August making this the peak period for heavy rain in Mason County. Of the 225 events, 64 (28%) occurred during July, making this the peak month for heavy rains. There were 14 events that spanned two months; however, for illustration purposes only the month the event began in is graphed.

Figure 19
Heavy Rain Events by Month
1950 – 2013

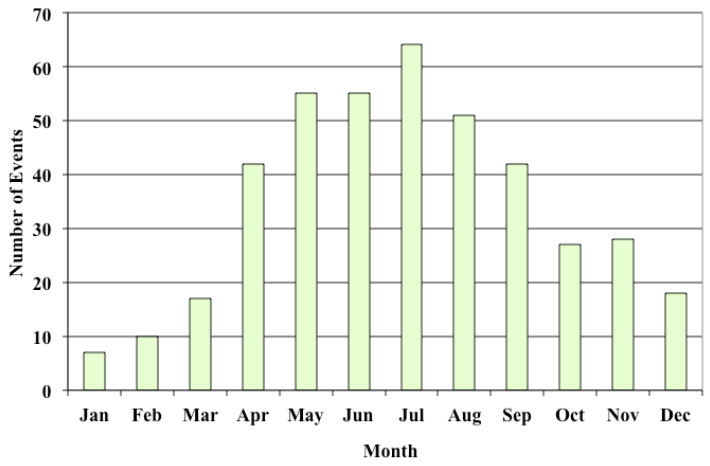
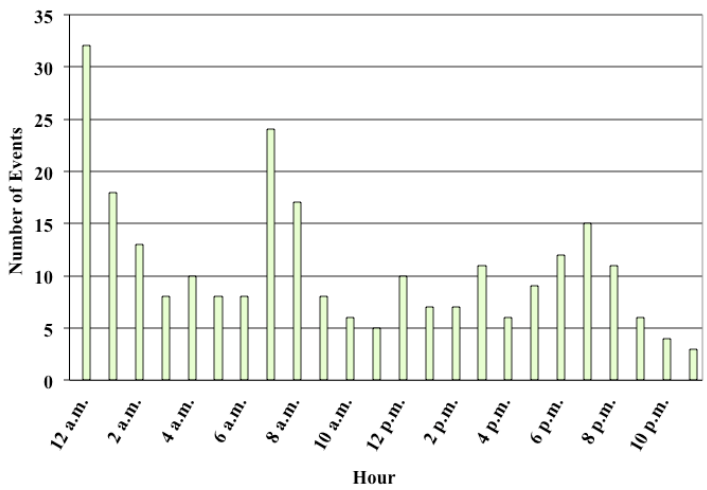


Figure 20 charts the reported occurrences of heavy rain by hour. Of the 416 occurrences, start times were unavailable for 158 events. Of the remaining 258 events with recorded times, approximately 61% occurred during the a.m. hours. Eighty-nine (89) of the events (57%) took place between 12 a.m. and 6 a.m.

Figure 20
Heavy Rain Events by Hour
1950 – 2013



What locations are affected by severe storms?

Severe storms affect the entire County. A single severe storm event will generally extend across the entire County and affect multiple locations. The *2013 Illinois Natural Hazard Mitigation Plan* prepared by the Illinois Emergency Management Agency (IEMA) classifies Mason County's hazard rating for severe storms as "high." (IEMA's hazard rating system has five levels: low, guarded, elevated, high and severe.)

What is the probability of future severe storm events occurring?

Thunderstorms with Damaging Winds

Mason County has had 91 verified occurrences of thunderstorms with damaging winds between 1964 and November 30, 2013. With 91 occurrences over the past 50 years, Mason County should expect to experience at least two thunderstorms with damaging winds each year. There were 15 years over the last 50 years where multiple (three or more) thunderstorms with damaging winds occurred. This indicates that the probability that multiple thunderstorms with damaging winds may occur during any given year within the County is 30%.

Hail

There have been 28 verified occurrences of hail one inch in diameter or greater between 1966 and November 30, 2013. With 28 occurrences over the past 48 years, the probability or likelihood of a severe hail event occurring in Mason County in any given year is 58%. There were 8 years over the last 48 years where two or more hail events occurred. This indicates that the probability that more than one severe storm with hail may occur during any given year within the County is 17%.

Heavy Rain

The County has experienced 416 heavy rain events producing at least 1.50 inches of rain between 1950 and 2013. With 416 occurrences over the past 64 years, the County should expect

to experience at least six heavy rain events each year. There were 55 years where three or more heavy rain events occurred. This indicates that the probability that multiple heavy rain events may occur during any given year within the County is 86%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to severe storms?

Yes. All of Mason County is vulnerable to the dangers presented by severe storms due to the topography of the region and its location in relation to the movement of weather fronts across southwestern Illinois. Since 2004, Mason County has experienced 32 thunderstorms with damaging winds, 4 severe storms with hail one inch in diameter or greater, 83 heavy rain events producing at least 1.50 inches of rain and one lightning strike.

Figure 21 details the number thunderstorms with damaging winds, hail events and lightning strikes that were recorded in or near each participating municipality. Aside from the NWS COOP observer locations (Havana and Mason City), area specific information was unavailable for the heavy rain events.

Figure 21
Verified Severe Storm Events by Participating Municipality

Participating Municipality	Number of Events		
	Thunderstorm & High Wind	Severe Hail	Lightning
Bath	6	3	1
Easton	11	2	0
Forest City	12	0*	0
Havana	26	11	1
Kilbourne	8	3	0
Manito	17	6	0
Mason City	15	3	0
San Jose	5	3	0
Topeka	4	1	0

* While no verified hail events were recorded for Forest City, there have been multiple verified severe hail events in the area that almost certainly impacted the Village.

Of the participating municipalities, Havana and Manito have had more recorded occurrences of hail and thunderstorms with damaging winds. The difference in the number of recorded events may be due in part to the fact that these municipalities are among the largest in the County. In addition, one of the two COOP observers for the National Weather Service in Mason County is located in the Havana area.

Figure 22 details the number of thunderstorms with damaging winds and hail events that were recorded in or near unincorporated areas of Mason County. No data was available on lightning strikes in the unincorporated area and area specific information was unavailable for most of the heavy rain events.

Figure 22
Verified Severe Storm Events in Unincorporated Mason County

Unincorporated Area	Number of Events		Unincorporated Area	Number of Events	
	Thunderstorm & High Wind	Severe Hail		Thunderstorm & High Wind	Severe Hail
Biggs	5	0	Saidora	0	2
Eckard	4	0	Snicarte	2	0
Goofy Ridge	2	0	Teheran	6	1
Matanzas Beach	1	0	Sand Ridge State Park	2	0
Poplar City	6	0			

What impacts resulted from the recorded severe storms?

Severe storms as a whole have caused an estimated $812,550 in property damages and $12.3 million in crop damages. The following provides a breakdown of impacts by category.

While severe summer storms frequently occur in Mason County, the number of injuries and fatalities is very low. The hospital in Havana, as well as hospitals in the Peoria area (Tazewell and Peoria Counties), Lincoln (Logan County) and Canton (Fulton County), are equipped to provide care to persons injured during a severe storm. Consequently, the risk or vulnerability to public health and safety from severe storms is low.

Severe Storms Fast Facts – Impacts/Risk

Thunderstorms with Damaging Winds Impacts
- Total Property Damage: ***$654,550***
- Infrastructure/Critical Facilities Damage*: ***n/a***
- Total Crop Damage: ***$12.3 million***
- Injuries: ***0***
- Fatalities: ***0***

Severe Hail Impacts
- Total Property Damage: ***n/a***
- Infrastructure/Critical Facilities Damage*: ***n/a***
- Total Crop Damage: ***n/a***

Lightning Strike Impacts
- Total Property Damage: ***$158,000***
- Infrastructure/Critical Facilities Damage*: ***$8,000***
- Toal Crop Damage: ***n/a***
- Injuries: ***0***
- Fatalities: ***0***

Heavy Rain Impacts
- Total Property Damage: ***n/a***
- Infrastructure/Critical Facilities Damage*: ***n/a***
- Total Crop Damage: ***$50.8 million***

Severe Storms Risk/Vulnerability to:
- Public Health & Safety: ***Low***
- Buildings/Infrastructure/Critical Facilities: ***Medium/High***

* Infrastructure/Critical Facilities Damage totals are included in the Total Property Damage amounts.

Thunderstorms with Damaging Winds

Data obtained from NOAA's Storm Events Database and Planning Committee member records indicates that between 1964 and 2013, 22 of the 91 thunderstorms with damaging winds caused $654,550 in property damage and $12.3 million in crop damage. Damage information was either unavailable or none was recorded for the remaining 69 reported occurrences. No injuries or fatalities were reported as a result of any of the thunderstorm events.

Hail

Damage information was either unavailable or none was recorded for any of the reported occurrences of hail. In addition, no injuries or fatalities were reported as a result of any these events.

Lightning

Data obtained from NOAA's Storm Events Database and Planning Committee member records indicates that between 2006 and 2013, the two recorded lightning strikes caused $158,000 in property damage. No injuries or fatalities were reported as result of either of these lightning strike events.

Included in the property damage figure provided above is $8,000 in verified infrastructure and critical facilities damage sustained in Bath when lightning struck and damaged a sewer lift station on May 29, 2006.

Heavy Rain

Damage information was either unavailable or none was recorded for any of the reported occurrences of heavy rain. In addition, no injuries or fatalities were reported as a result of any these events.

According to the Mason County Farm Bureau Manager, a total of $50.8 million in crop damages/losses resulted from heavy rains that fell during the planting and growing seasons of 2010 and 2011. The following provides a brief description of the damages for each year. These figures are not included in **Figure 14** because they are not tied to a single event.

- Between April and August, 2010 approximately 24 to 30 inches of rain fell on an already high water table. This excessive rain led to an inability by many farmers to plant and destroyed crops that had already been planted. The damages and value of crops lost totaled $26.3 million.
- In 2011, approximately 15 inches of rain fell between April and June again leading to an inability by many farmers to plant and destroying crops that had already been planted. Approximately $24.5 million in damages and losses were sustained as a result of the heavy rains.

While damage information was unavailable, Planning Committee member records identified two separate events that led to property damage in Mason City. During the Fall of 1994 and Spring of 1999 heavy rains and poor drainage led to water infiltration in basements and sewer problems in the Hillcrest subdivision on the east end of the City. These events are not included in **Figure 14** because they are not tied to a single event.

What other impacts can result from severe storms?

In Mason County, the greatest risk to health and safety from severe storms is vehicle accidents. Hazardous driving conditions resulting from severe storms (i.e., wet pavement, poor visibility, high winds, etc.) can contribute to accidents that result in injury and death. Traffic accident data assembled by the Illinois Department of Transportation between 2008 and 2012 indicates that

wet road surface conditions were present for 8.2% to 11.4% of all crashes recorded annually in the County.

While other circumstances cause wet road surface conditions (i.e., melting snow, condensation, light showers, etc.), law enforcement officials agree that hazardous driving conditions caused by severe storms add to the number of crashes. **Figure 23** provides a breakdown by year of the number of crashes and corresponding injuries and fatalities that occurred when wet road surface conditions were present.

Figure 23
Severe Weather Crash Data for Mason County

Year	Total # of Crashes	Presence of Wet Road Surface Conditions		
		# of Crashes	# of Injuries	# of Fatalities
2008	380	38	6	1
2009	332	38	10	0
2010	263	26	7	0
2011	245	22	4	0
2012	255	21	6	0
Total:	**1,475**	**145**	**33**	**1**

Source: Illinois Department of Transportation.

Are existing buildings, infrastructure and critical facilities vulnerable to severe storms?

Yes. All existing buildings, infrastructure and critical facilities located in Mason County and the participating municipalities are vulnerable to damage from severe storms. Structural damage to buildings is a relatively common occurrence with severe storms. Damage to roofs, siding, awnings and windows can occur from hail, flying and falling debris and high winds. Lightning strikes can damage electrical components and equipment (i.e., appliances, computers etc.) and can cause fires that consume buildings. If the roof is compromised or windows are broken, rain can cause additional damage to the structure and contents of a building.

Infrastructure and critical facilities tend to be just as vulnerable to severe storm damage as buildings. The infrastructure and critical facilities that are the most vulnerable to severe storms are related to power distribution and communications. High winds, lightning and flying and falling debris have the potential to cause damage to communication and power lines; power substations; transformers and poles; and communication antennas and towers.

The damage inflicted by severe storms often leads to disruptions in communication and creates power outages. Depending on the damage, it can take anywhere from several hours to several days to restore service. Power outages and disruptions in communications can impair vital services, particularly when backup power generators are not available. Most of the participating municipalities acknowledged the need for emergency backup generators to allow continued operation of critical facilities such as municipal buildings, police and fire stations, storm shelters and lift stations.

In addition to affecting power distribution and communications, debris and flooding from severe storms can block state and local roads hampering travel. When transportation is disrupted,

emergency and medical services are delayed, rescue efforts are hindered and government services can be affected.

Based on the frequency with which severe storms occur in Mason County, the amount of property damage previously reported and the potential for disruptions to power distribution and communication; the risk or vulnerability to buildings, infrastructure and critical facilities from severe storms is medium to high.

Are future buildings, infrastructure and critical facilities vulnerable to severe storms?

Yes and No. While four of the participating municipalities have building codes in place that will likely help lessen the vulnerability of new buildings and critical facilities to damage from severe storms, the County and five other municipalities do not. In addition, infrastructure such as new communication and power lines will continue to be vulnerable to severe storms as long as they are located above ground. High winds, lightning and flying and falling debris can disrupt power and communication. Steps to bury all new lines would eliminate the vulnerability, but this action would be cost prohibitive in most areas.

What are the potential dollar losses to vulnerable structures from severe storms?

Unlike other natural hazards, such as tornadoes, there are no standard loss estimation models or methodologies for severe storms. With only 24 of the 537 recorded events listing property damage numbers for all categories of severe storms, there is no way to accurately estimate future potential dollar losses. Since all existing structures within Mason County are vulnerable to damage, it is highly probable that there will be future dollar losses from severe storms.

Figure 11
(Sheet 1 of 11)
Severe Storms – Thunderstorms with Damaging Winds Reported in Mason County
1964 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Deaths	Property Damage	Crop Damage	Description
6/20/1964	7:50 a.m.	Kilbourne^	n/a	n/a	n/a	n/a	n/a	
5/30/1974	3:00 p.m.	Easton	n/a	n/a	n/a	n/a	n/a	
6/19/1974	6:30 p.m.	Easton	n/a	n/a	n/a	n/a	n/a	
6/20/1974	8:54 p.m.	Easton^ Teheran^	n/a	n/a	n/a	n/a	n/a	
7/14/1974	8:45 p.m.	Havana	n/a	n/a	n/a	n/a	n/a	
7/15/1976	3:10 p.m.	Forest City	n/a	n/a	n/a	n/a	n/a	
6/16/1977	2:45 p.m.	Easton Snicarte	n/a	n/a	n/a	n/a	n/a	
7/16/1977	11:35 a.m.	Manito	n/a	n/a	n/a	n/a	n/a	
7/5/1980	1:48 a.m.	Kilbourne	n/a	n/a	n/a	n/a	n/a	
4/13/1981	6:10 p.m.	Topeka^ Eckard^ Mason City San Jose	n/a	n/a	n/a	n/a	n/a	
5/30/1982	3:55 p.m.	Mason City	n/a	n/a	n/a	n/a	n/a	
5/21/1987	9:00 p.m.	Poplar City^	n/a	n/a	n/a	n/a	n/a	
5/8/1988	4:00 p.m.	Manito	n/a	n/a	n/a	n/a	n/a	
6/19/1990	11:30 p.m.	Havana	61 kts	n/a	n/a	n/a	n/a	
5/17/1991	8:30 p.m.	Biggs	n/a	n/a	n/a	n/a	n/a	
10/4/1991	4:50 p.m.	Manito	n/a	n/a	n/a	n/a	n/a	
Subtotal:				**0**	**0**	**$0**	**$0**	

^ Thunderstorm with damaging winds verified in the vicinity of this location(s).

Figure 11
(Sheet 2 of 11)
Severe Storms – Thunderstorms with Damaging Winds Reported in Mason County
1964 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Deaths	Property Damage	Crop Damage	Description
7/2/1992	2:20 p.m.	Mason City	n/a	n/a	n/a	n/a	n/a	
7/2/1992	4:05 p.m.	Havana	n/a	n/a	n/a	n/a	n/a	
7/2/1992	8:20 p.m.	Havana	n/a	n/a	n/a	n/a	n/a	
7/2/1992	8:32 p.m.	Manito	n/a	n/a	n/a	n/a	n/a	
9/9/1992	12:00 p.m.	Poplar City[A]	n/a	n/a	n/a	n/a	n/a	
8/23/1993	5:12 p.m.	Bath[A]	n/a	n/a	n/a	$500	n/a	winds blew down large trees 4 miles south of the Village
5/24/1994	5:32 p.m.	Forest City	n/a	n/a	n/a	n/a	n/a	winds uprooted 2 foot diameter trees
6/26/1994	6:09 p.m.	Manito	52 kts	n/a	n/a	n/a	n/a	
6/26/1994	6:34 p.m.	Havana	n/a	n/a	n/a	$5,000	n/a	winds blew down power lines
7/20/1994	5:20 p.m.	Forest City	n/a	n/a	n/a	$50	n/a	winds blew down power lines
6/21/1995	7:40 p.m.	Mason City	n/a	n/a	n/a	n/a	n/a	winds blew down numerous trees and power lines
7/24/1996	11:55 a.m.	Snicarte	52 kts	n/a	n/a	n/a	n/a	
10/29/1996	4:11 p.m.	Havana[A]	n/a	n/a	n/a	n/a	n/a	winds blew down several power lines 1 mile north of the City
4/5/1997	2:50 p.m.	Havana	n/a	0	0	n/a	n/a	winds blew down numerous trees, tree limbs and power lines across the area
4/30/1997	2:10 p.m.	Mason City	n/a	n/a	n/a	n/a	n/a	winds destroyed a shed and blew down several power lines in the City
6/12/1997	12:40 p.m.	Mason City	n/a	0	0	n/a	n/a	winds blew down a large tree
Subtotal:				**0**	**0**	**$5,550**	**$0**	

[A] Thunderstorm with damaging winds verified in the vicinity of this location(s).

Figure 11
(Sheet 3 of 11)
Severe Storms – Thunderstorms with Damaging Winds Reported in Mason County
1964 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Deaths	Property Damage	Crop Damage	Description
7/19/1997	5:09 p.m.	Havana	n/a	0	0	n/a	n/a	- winds blew down numerous trees across the area - one tree fell onto the roof of a house 2 miles south of the City - some minor street flooding was reported due to the heavy amounts of rain in a short period of time
3/27/1998	6:45 p.m.	San Jose^	n/a	0	0	n/a	n/a	wind blew down numerous trees and power lines
5/15/1998	7:52 p.m.	Easton^ Teheran^ Mason City^	n/a	0	0	n/a	n/a	winds blew down several large trees
5/24/1998	12:50 a.m.	Kilbourne	n/a	0	0	n/a	n/a	winds blew down a large tree as well as numerous tree limbs
6/11/1998	3:15 a.m.	Manito San Jose	n/a	0	0	n/a	n/a	- winds blew down several trees and power lines in both villages - in San Jose, a tree fell onto a house causing minor damage and another fell onto a truck
6/18/1998	5:55 p.m.	countywide	n/a	n/a	n/a	n/a	n/a	wind blew down numerous trees, tree limbs and power lines across the county
6/28/1998	6:43 p.m.	Forest City	n/a	n/a	n/a	n/a	n/a	winds blew down several power lines
6/29/1998	3:37 p.m.	countywide	52 kts	n/a	n/a	n/a	n/a	winds caused widespread damage to trees, tree limbs, power poles, power lines and structures
Subtotal:				**0**	**0**	**$0**	**$0**	

^ Thunderstorm with damaging winds verified in the vicinity of this location(s).

Figure 11
(Sheet 4 of 11)
Severe Storms – Thunderstorms with Damaging Winds Reported in Mason County
1964 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Deaths	Property Damage	Crop Damage	Description
7/22/1998	8:00 a.m.	Havana Bath	n/a	0	0	n/a	n/a	- winds blew down trees and power lines in Bath, along IL Rte. 78 between Bath & Havana, and in Havana - a grain wagon was blown across the road in Havana - the shed doors were blown in at the Havana sewage plant
11/10/1998	4:27 a.m.	Havana Poplar City Biggs Easton Teheran Mason City	52 kts	0	0	n/a	n/a	- in Mason City, a steel roofing system was blown off of an IDOT garage and numerous trees were blown down - 5 miles north of Mason City a tandem truck was blown off of US Rte. 136, the driver was not injured - in rural Mason City, a 2x4 was blown through a bathroom window of a farm house and the roof was blown off of a machine shed
5/12/1999	2:50 p.m.	Easton^	n/a	0	0	n/a	n/a	winds blew 2 semis off the road at the intersection of US Rte. 126 and IL Rte. 10, neither of the drivers sustained any injuries
Subtotal:				**0**	**0**	**$0**	**$0**	

^ Thunderstorm with damaging winds verified in the vicinity of this location(s).

Figure 11
(Sheet 5 of 11)
Severe Storms – Thunderstorms with Damaging Winds Reported in Mason County
1964 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Deaths	Property Damage	Crop Damage	Description
6/1/1999	5:10 p.m.	Bath Havana^ Eckard Topeka Forest City Manito	52 kts	n/a	n/a	$200,000	n/a	- winds blew down numerous trees, with some causing minor structural damage - a roof was lifted off of a house and an old drive-in movie screen was blown over - 5 miles west of Manito several power lines and trees were blown down in the Woodland Estates Subdivision, several homes sustained minor damage
6/4/1999	3:24 p.m.	countywide	n/a	n/a	n/a	n/a	n/a	winds blew down numerous power poles
8/12/1999	6:38 p.m.	Bath Mason City	70 kts	0	0	$100,000	$12,300,000	- winds blew down numerous trees, tree limbs and power lines - winds blew down 1,000 acres of corn - a tree was blown over onto a van trapping its occupants at the intersection of IL Rte. 97 and the Bath Blacktop, rescue crews freed the occupants, who were uninjured - in the Sanganois Conservation Area another car was trapped by a fallen tree, but no injuries were reported
Subtotal:				**0**	**0**	**$300,000**	**$12,300,000**	

^ Thunderstorm with damaging winds verified in the vicinity of this location(s).

Figure 11
(Sheet 6 of 11)
Severe Storms – Thunderstorms with Damaging Winds Reported in Mason County
1964 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Deaths	Property Damage	Crop Damage	Description
4/20/2000	4:30 a.m.	countywide	52 kts	n/a	n/a	$20,000	n/a	- winds blew down numerous power lines and trees across the county - in Mason City the wall of a large storage building was blown off - in the Mason City area a few homes lost sections of siding, a few sheds were demolished and some trees were uprooted
8/26/2000	7:20 p.m.	Matanzas Beach	n/a	n/a	n/a	n/a	n/a	winds blew down several large trees
4/10/2001	11:55 p.m.	Havana Eckard Topeka Forest City	50 kts	n/a	n/a	n/a	n/a	winds blew down tree limbs and power lines across the area
6/14/2001	5:50 p.m.	Bath Havana[^] Eckard Topeka Forest City Manito	50 kts	n/a	n/a	n/a	n/a	winds blew down several large trees
7/17/1001	2:58 p.m.	Bath[^]	50 kts	n/a	n/a	n/a	n/a	winds blew down 6 to 8 power poles
7/18/2001	6:45 a.m.	Kilbourne[^]	50 kts	n/a	n/a	n/a	n/a	winds blew down several power poles southeast of the Village
Subtotal:				**0**	**0**	**$20,000**	**$0**	

[^] Thunderstorm with damaging winds verified in the vicinity of this location(s).

Figure 11
(Sheet 7 of 11)
Severe Storms – Thunderstorms with Damaging Winds Reported in Mason County
1964 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Deaths	Property Damage	Crop Damage	Description
8/2/2001	5:00 p.m.	Havana Poplar City Biggs Easton Teheran Mason City	50 kts	n/a	n/a	n/a	n/a	winds blew down several trees, tree limbs and power lines
8/9/2001	7:30 p.m.	Forest City^ Sand Ridge State Forest	52 kts	n/a	n/a	n/a	n/a	winds blew down a large tree in Sand Ridge State Forest
8/22/2001	6:40 p.m.	Havana Poplar City Biggs Easton	50 kts	n/a	n/a	n/a	n/a	winds blew down trees and power lines in Havana as well as on the southern end of Easton
6/13/2002	12:20 a.m.	San Jose^	50 kts	n/a	n/a	n/a	n/a	winds blew down 2 power poles across US Rte. 136
4/4/2003	2:30 p.m.	Kilbourne	55 kts	n/a	n/a	n/a	n/a	winds blew down several trees onto IL Rte. 97
6/25/2003	6:30 p.m.	Forest City Sand Ridge State Forest	55 kts	n/a	n/a	n/a	n/a	winds blew down several trees in Sand Ridge State Forest
7/8/2003	2:55 p.m.	Manito	50 kts	n/a	n/a	n/a	n/a	winds blew down several power lines
Subtotal:				**0**	**0**	**$0**	**$0**	

^ Thunderstorm with damaging winds verified in the vicinity of this location(s).

Figure 11
(Sheet 8 of 11)
Severe Storms – Thunderstorms with Damaging Winds Reported in Mason County
1964 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Deaths	Property Damage	Crop Damage	Description
5/24/2004	10:39 p.m.	Manito Mason City	60 kts	n/a	n/a	n/a	n/a	- winds blew down numerous tree limbs between Manito and Mason City - near Manito winds flipped over an irrigation system
5/30/2004	4:21 p.m.	Havana	50 kts	n/a	n/a	n/a	n/a	winds blew down several trees and a road sign
5/30/2004	4:41 p.m.	Mason City	52 kts	n/a	n/a	n/a	n/a	
10/29/2004	10:25 p.m.	Forest City	50 kts	n/a	n/a	n/a	n/a	winds blew down a large tree
7/26/2005	4:00 p.m.	Manito	50 kts	n/a	n/a	n/a	n/a	winds blew down several trees and power lines
8/18/2005	11:50 p.m.	countywide	50 kts	n/a	n/a	n/a	n/a	winds blew down tree limbs across the county
11/5/2005	9:09 p.m.	Mason City	50 kts	n/a	n/a	n/a	n/a	winds blew down power lines
4/2/2006	5:18 p.m.	Mason City[^] San Jose	65 kts	n/a	n/a	n/a	n/a	- winds blew down numerous trees and large tree limbs - significant damage was sustained by several barns and outbuildings
5/24/2006	2:00 p.m.	Manito	55 kts	n/a	n/a	n/a	n/a	- winds blew down numerous trees, power lines and power poles - winds blew over an irrigation system - a few outbuildings sustained some minor structural damage
Subtotal:				**0**	**0**	**$0**	**$0**	

[^] Thunderstorm with damaging winds verified in the vicinity of this location(s).

Figure 11
(Sheet 9 of 11)
Severe Storms – Thunderstorms with Damaging Winds Reported in Mason County
1964 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Deaths	Property Damage	Crop Damage	Description
7/2/2006	6:52 p.m.	Manito	56 kts	n/a	n/a	n/a	n/a	winds blew down a few trees and power lines
7/3/2006	5:17 p.m.	Teheran^	52 kts	n/a	n/a	n/a	n/a	winds blew down power lines
719/2006	3:29 p.m.	Havana	56 kts	n/a	n/a	n/a	n/a	winds blew down numerous trees and power lines
9/11/2006	6:05 p.m.	Havana	52 kts	n/a	n/a	n/a	n/a	
9/11/2006	6:30 p.m.	Havana^	50 kts	n/a	n/a	n/a	n/a	winds blew down tree limbs and corn
5/15/2007	12:27 p.m.	Forest City	52 kts	n/a	n/a	$2,000	n/a	- winds blew down tree limbs and power lines - several road construction signs were pulled out of the ground
9/25/2007	1:45 p.m.	Goofy Ridge^	56 kts	n/a	n/a	$8,000	n/a	winds blew down a few large trees and numerous tree limbs
5/13/2008	1:00 p.m.	Kilbourne^ Havana Regional Airport	61 kts	n/a	n/a	$25,000	n/a	- winds blew down several trees - a portion of the roof was blown off an airplane hanger
6/3/2008	9:00 a.m.	Havana Poplar City Biggs Easton Teheran Mason City	61 kts	n/a	n/a	$25,000	n/a	winds blew down numerous trees and power lines in Havana and across much of the County
Subtotal:				**0**	**0**	**$60,000**	**$0**	

^ Thunderstorm with damaging winds verified in the vicinity of this location(s).

Figure 11
(Sheet 10 of 11)
Severe Storms – Thunderstorms with Damaging Winds Reported in Mason County
1964 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Deaths	Property Damage	Crop Damage	Description
6/15/2008	1:55 p.m.	Manito	56 kts	n/a	n/a	$8,000	n/a	winds blew down a few trees
7/8/2008	3:10 p.m.	Mason City^	52 kts	n/a	n/a	$3,000	n/a	winds blew down 2 trees just south of the City
12/27/2008	11:30 a.m.	Kilbourne	61 kts	n/a	n/a	$35,000	n/a	winds blew down 30 utility poles on 600 North near the Village
6/27/2009	7:21 p.m.	Havana	52 kts	n/a	n/a	$20,000	n/a	winds uprooted several trees
7/24/2009	10:30 p.m.	Havana	52 kts	n/a	n/a	$10,000	n/a	winds blew down numerous trees
8/4/2009	7:05 a.m.	Havana	61 kts	n/a	n/a	$50,000	n/a	- winds blew down several power lines and large tree limbs - Planning Committee members indicated that the winds damaged the Havana Jr. High School and a communications tower and that a tree limb fell onto a power line causing a fire that damaged the Hurley Funeral Home
8/19/2009	2:50 p.m.	Manito	52 kts	n/a	n/a	$22,000	n/a	winds blew down a 12 inch diameter tree damaging a porch
4/4/2010	6:35 p.m.	Goofy Ridge	52 kts	n/a	n/a	$15,000	n/a	winds blew down numerous 6 inch diameter branches near Goofy Ridge
6/23/2010	6:26 p.m.	Havana	52 kts	n/a	n/a	$20,000	n/a	winds blew down power lines
7/24/2010	2:10 p.m.	Havana^	52 kts	n/a	n/a	$6,000	n/a	winds blew down 2 trees
10/26/2010	4:02 a.m.	Manito	52 kts	n/a	n/a	n/a	n/a	winds blew over an irrigation system in a field near the Village
Subtotal:				**0**	**0**	**$189,000**	**$0**	

^ Thunderstorm with damaging winds verified in the vicinity of this location(s).

Figure 11
(Sheet 11 of 11)
Severe Storms – Thunderstorms with Damaging Winds Reported in Mason County
1964 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Deaths	Property Damage	Crop Damage	Description
5/25/2011	4:30 a.m.	Kilbourne	52 kts	n/a	n/a	$20,000	n/a	winds uprooted several trees and blew down a few power lines
5/25/2011	4:25 p.m.	Forest City	52 kts	n/a	n/a	n/a	n/a	- winds blew down several trees - a popcorn factory south of the Village sustained structural damage
6/27/2011	1:55 a.m.	Easton	52 kts	n/a	n/a	$60,000	n/a	- winds blew down several trees - a tree sliced through a mobile home
Subtotal:				**0**	**0**	**$80,000**	**$0**	
GRAND TOTAL:				**0**	**0**	**$654,550**	**$12,300,000**	

^ Thunderstorm with damaging winds verified in the vicinity of this location(s).

Source: Mason County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee group discussion on November 14, 2013.
Mason County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Member responses to Mason County Natural Hazard Events Questionnaire.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

Figure 12
(Sheet 1 of 2)
Severe Storms – Hail Events Reported in Mason County
1966 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Diameter)	Injuries	Deaths	Property Damage	Crop Damage	Description
5/17/1966	10:50 p.m.	Havana	1.00 in.	n/a	n/a	n/a	n/a	
6/17/1977	6:40 p.m.	Manito	1.00 in.	n/a	n/a	n/a	n/a	
6/2/1985	5:25 p.m.	San Jose	1.75 in.	n/a	n/a	n/a	n/a	
5/6/1986	1:12 p.m.	Topeka^	1.75 in.	n/a	n/a	n/a	n/a	
5/6/1986	2:45 p.m.	Bath	1.00 in.	n/a	n/a	n/a	n/a	
5/6/1986	3:55 p.m.	Bath	1.75 in.	n/a	n/a	n/a	n/a	
5/17/1991	10:35 p.m.	Havana	1.00 in.	n/a	n/a	n/a	n/a	
12/8/1991	2:15 p.m.	Manito	2.75 in.	n/a	n/a	n/a	n/a	
5/18/1995	10:12 a.m.	Havana	1.75 in.	n/a	n/a	n/a	n/a	
4/7/1998	3:25 p.m.	Bath	1.75 in.	n/a	n/a	n/a	n/a	
4/7/1998	3:47 p.m.	Havana	1.75 in.	n/a	n/a	n/a	n/a	
4/7/1998	4:22 p.m.	Manito	1.00 in.	n/a	n/a	n/a	n/a	
5/12/1998	7:27 p.m.	Kilbourne Mason City	1.50 in.	n/a	n/a	n/a	n/a	
5/12/1999	2:40 p.m.	Easton	1.00 in.	n/a	n/a	n/a	n/a	
6/4/1999	3:23 p.m.	Kilbourne Havana^	1.75 in.	n/a	n/a	n/a	n/a	
4/19/2000	10:18 p.m.	Havana	1.00 in.	n/a	n/a	n/a	n/a	
5/12/2000	2:11 p.m.	Easton Teheran Mason City	1.00 in.	n/a	n/a	n/a	n/a	
8/18/2001	11:16 a.m.	Manito San Jose^	2.75 in.	n/a	n/a	n/a	n/a	
Subtotal:				**0**	**0**	**$0**	**$0**	

^ Hail event verified in the vicinity of this location(s).

Figure 12
(Sheet 2 of 2)
Severe Storms – Hail Events Reported in Mason County
1966 – 2013

Date(s)	Start Time	Location(s)	Magnitude (Diameter)	Injuries	Deaths	Property Damage	Crop Damage	Description
5/1/2002	1:00 p.m.	Saidora^	1.75 in.	n/a	n/a	n/a	n/a	
4/4/2003	2:20 p.m.	Saidora^ Kilbourne^ Mason City^	2.00 in.	n/a	n/a	n/a	n/a	
5/8/2003	9:03 p.m.	Havana	1.75 in.	n/a	n/a	n/a	n/a	
8/2/2003	12:40 p.m.	Havana^	1.75 in.	n/a	n/a	n/a	n/a	
4/20/2004	3:45 p.m.	Havana	1.75 in.	n/a	n/a	n/a	n/a	
5/2/2004	11:12 a.m.	Havana^	1.50 in.	n/a	n/a	n/a	n/a	
7/19/2006	3:29 p.m.	Havana	1.50 in.	n/a	n/a	n/a	n/a	
5/22/2011	12:22 p.m.	Manito	1.50 in.	n/a	n/a	n/a	n/a	
2/22/2011	12:27 p.m.	Manito	1.75 in.	n/a	n/a	n/a	n/a	
9/12/2012	1:45 p.m.	San Jose	1.00 in.	n/a	n/a	n/a	n/a	
Subtotal:				**0**	**0**	**$0**	**$0**	
GRAND TOTAL:				**0**	**0**	**$0**	**$0**	

^ Hail event verified in the vicinity of this location(s).

Source: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

Figure 13
Severe Storms – Lightning Events Reported in Mason County
2006 – 2013

Date(s)	Start Time	Location(s)	Injuries	Deaths	Property Damage	Crop Damage	Description
5/29/2006	n/a	Bath	0	0	$8,000	n/a	lightning struck a sewer lift station
8/28/2008	6:56 p.m.	Havana	0	0	$150,000	n/a	lightning struck a house setting the roof and attic ablaze, the residents were able to escape uninjured
GRAND TOTAL:			**0**	**0**	**$158,000**	**$0**	

Sources: Mason County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Member responses to Critical Facilities Damaged by Natural Hazard Events Questionnaire.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

Figure 14
(Sheet 1 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
4/3/1950	11:00 a.m.	- Havana - Mason City	1.55 – 1.10 in.	n/a	n/a	n/a	- COOP observers measured: • 1.55 inches at Mason City • 1.26 inches at Havana • 1.10 inches at Havana Power Station
4/24/1950	2:00 a.m.	- Havana - Mason City	1.86 – 1.51 in.	n/a	n/a	n/a	- COOP observers measured: • 1.86 inches at Havana Power Station • 1.78 inches at Mason City • 1.51 inches at Havana
6/14/1950	1:00 a.m.	- Havana - Mason City	2.00 – 1.75 in.	n/a	n/a	n/a	- COOP observers measured: • 2.00 inches at Havana Power Station • 1.75 inches at Mason City
6/18/1950 thru 6/19/1950	7:30 a.m.	- Havana - Mason City	1.95 – 2.55 in.	n/a	n/a	n/a	- COOP observers measured: • 2.55 inches at Havana Power Station • 2.52 inches at Havana • 1.95 inches at Mason City
7/16/1950 thru 7/17/1950	n/a	Havana	1.88 – 196 in.	n/a	n/a	n/a	- COOP observers measured: • 1.96 inches at Havana Power Station • 1.88 inches at Havana
6/7/1951	10:15 a.m.	Havana	1.42 – 1.50 in.	n/a	n/a	n/a	- COOP observers measured: • 1.50 inches at Havana • 1.42 inches at Havana Power Plant
6/26/1951 thru 6/27/1951	8:10 a.m.	Havana	3.53 – 4.22 in.	n/a	n/a	n/a	- COOP observers measured: • 4.22 inches at Havana • 3.53 inches at Havana Power Plant
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 2 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
5/16/1952 thru 5/17/1952	5:30 a.m.	Havana	1.75 – 1.94 in.	n/a	n/a	n/a	- COOP observers measured: • 1.75 inches at Havana Power Station • 1.94 inches at Havana
6/13/1952 thru 6/14/1952	8:00 p.m.	Havana	1.70 – 1.85 in.	n/a	n/a	n/a	- COOP observers measured: • 1.85 inches at Havana • 1.70 inches at Havana Power Station
6/20/1952 thru 6/22/1952	10:00 a.m.	Havana	1.68 – 2.23 in.	n/a	n/a	n/a	- COOP observers measured: • 2.23 inches at Havana Power Station • 1.68 inches at Mason City
8/15/1952 thru 8/16/1952	2:30 p.m.	Havana	2.34 – 2.44 in.	n/a	n/a	n/a	- COOP observers measured: • 2.44 inches at Havana • 2.34 inches at Havana Power Station
11/24/1952 thru 11/25/1952	4:45 a.m.	Havana	1.49 – 1.66 in.	n/a	n/a	n/a	- COOP observers measured: • 1.66 inches at Havana Power Station • 1.49 inches at Havana
7/16/1953 thru 7/17/1953	1:00 p.m.	Havana	2.13 – 2.31 in.	n/a	n/a	n/a	- COOP observers measured: • 2.31 inches at Havana • 2.13 inches at Havana Power Plant
2/15/1954 thru 2/16/1954	7:30 p.m.	Havana	1.59 – 1.60 in.	n/a	n/a	n/a	- COOP observers measured: • 1.60 inches at Havana • 1.59 inches at Havana Power Plant
4/10/1954 thru 4/11/1954	9:00 a.m.	Havana	1.59 – 1.62 in				- COOP observers measured: • 1.62 inches at Havana Power Station • 1.59 inches at Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 3 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
4/21/1954 thru 4/22/1954	12:45 p.m.	- Havana - Mason City	2.29 – 3.60 in.	n/a	n/a	n/a	- COOP observers measured: • 3.60 inches at Mason City • 2.43 inches at Havana • 2.29 inches at Havana Power Station
5/31/1954 thru 6/1/1954	2:00 p.m.	Havana	1.88 in.	n/a	n/a	n/a	- COOP observers measured1.88 inches at Havana Power Station
10/4/1954 thru 10/5/1954	6:45 p.m.	Havana	1.08 – 1.70 in.	n/a	n/a	n/a	- COOP observers measured: • 1.70 inches at Havana Power Station • 1.08 inches at Havana
11/18/1954 thru 11/19/1954	3:45 p.m.	Havana	1.37 – 1.58 in.	n/a	n/a	n/a	- COOP observers measured: • 1.58 inches at Havana • 1.37 inches at Havana Power Station
2/19/1954 thru 2/20/1954	4:30 a.m.	Havana	1.44 – 1.70 in.	n/a	n/a	n/a	- COOP observers measured: • 1.70 inches at Havana Power Station • 1.44 inches at Havana
5/12/1955 thru 5/13/1955	2:30 a.m.	Havana	2.05 – 2.08 in.	n/a	n/a	n/a	- COOP observers measured: • 2.08 inches at Havana Power Plant • 2.05 inches at Havana
7/23/1955	11:30 a.m.	Havana	2.08 – 2.10 in.	n/a	n/a	n/a	- COOP observers measured: • 2.10 inches at Havana Power Plant • 2.08 inches at Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 4 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
8/29/1955 thru 8/30/1955	1:00 p.m.	Havana	3.55 – 3.65 in.	n/a	n/a	n/a	- COOP observers measured: • 3.65 inches at Havana • 3.55 inches at Havana Power Plant
10/4/1955 thru 10/5/1955	6:00 a.m.	Havana	2.52 – 2.55 in.	n/a	n/a	n/a	- COOP observers measured: • 2.55 inches at Havana • 2.52 inches at Havana Power Station
4/28/1956 thru 4/29/1956	5:00 a.m.	Havana	2.85 – 2.95 in.	n/a	n/a	n/a	- COOP observers measured: • 2.95 inches at Havana • 2.85 inches at Havana Power Station
7/3/1956	n/a	Havana	1.44 – 1.86 in.	n/a	n/a	n/a	- COOP observers measured: • 1.86 inches at Havana Power Station • 1.44 inches at Havana
7/31/1956 thru 8/1/1956	7:30 p.m.	Havana	2.35 – 2.40 in.	n/a	n/a	n/a	- COOP observers measured: • 2.40 inches at Havana Power Station • 2.35 inches at Havana
11/5/1956	3:00 p.m.	Havana	1.80 – 1.82 in.	n/a	n/a	n/a	- COOP observers measured: • 1.82 inches at Havana • 1.80 inches at Havana Power Plant
4/26/1957 thru 4/28/1957	11:30 a.m.	Havana	2.02 – 2.74 in.	n/a	n/a	n/a	- COOP observers measured: • 2.74 inches at Havana • 2.02 inches at Havana Power Plant
5/10/1957	12:30 a.m.	Havana	1.40 – 1.52 in.	n/a	n/a	n/a	- COOP observers measured: • 1.52 inches at Havana Power Plant • 1.40 inches at Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 5 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
5/18/1957 thru 5/19/1957	7:00 p.m.	Havana	1.75 – 1.83 in.	n/a	n/a	n/a	- COOP observers measured: • 1.83 inches at Havana • 1.75 inches at Havana Power Plant
10/22/1957 thru 10/23/1957	8:00 a.m.	Havana	3.60 – 3.85 in.	n/a	n/a	n/a	- COOP observers measured: • 3.85 inches at Havana • 3.60 inches at Havana Power Station
5/31/1958 thru 6/1/1958	7:00 p.m.	Havana	1.50 – 2.10 in.	n/a	n/a	n/a	- COOP observers measured: • 2.10 inches at Havana • 1.50 inches at Havana Power Station
7/2/1958	7:00 p.m.	Havana	1.42 – 1.50 in.	n/a	n/a	n/a	- COOP observers measured: • 1.50 inches at Havana • 1.42 inches at Havana Power Station
7/14/1958 thru 7/15/1958	6:30 p.m.	Havana	1.52 – 1.55 in.	n/a	n/a	n/a	- COOP observers measured: • 1.55 inches at Havana Power Station • 1.52 inches at Havana
8/5/1959 thru 8/6/1959	7:30 a.m.	Havana	2.10 – 2.15 in.	n/a	n/a	n/a	- COOP observers measured: • 2.15 inches at Havana • 2.10 inches at Havana Power Plant
3/29/1960 thru 3/30/1960	8:00 p.m.	Havana	2.17 – 2.58 in.	n/a	n/a	n/a	- COOP observers measured: • 2.58 inches at Havana Power Plant • 2.17 inches at Havana
4/16/1960 thru 4/17/1960	9:30 a.m.	Havana	1.33 – 1.88 in.	n/a	n/a	n/a	- COOP observers measured: • 1.88 inches at Havana • 1.33 inches at Havana Power Plant
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 6 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
5/24/1960 thru 5/25/1960	3:00 p.m.	Havana	1.60 – 1.81 in.	n/a	n/a	n/a	- COOP observers measured: • 1.81 inches at Havana Power Plant • 1.60 inches at Havana
6/11/1960 thru 6/13/1960	7:00 p.m.	Havana	1.48 – 1.79 in.	n/a	n/a	n/a	- COOP observers measured: • 1.79 inches at Havana Power Station • 1.48 inches at Havana
6/23/1960	1:30 a.m.	Havana	1.45 – 1.65 in.	n/a	n/a	n/a	- COOP observers measured: • 1.65 inches at Havana Power Station • 1.45 inches at Havana
7/12/1960 thru 7/13/1960	5:30 p.m.	Havana	1.60 – 1.65 in.	n/a	n/a	n/a	- COOP observers measured: • 1.65 inches at Havana • 1.60 inches at Havana Power Station
7/25/1960	12:00 p.m.	Havana	1.45 – 1.46 in.	n/a	n/a	n/a	- COOP observers measured: • 1.46 inches at Havana Power Station • 1.45 inches at Havana
8/4/1960	1:30 a.m.	Havana	4.10 – 4.20 in.	n/a	n/a	n/a	- COOP observers measured: • 4.20 inches at Havana • 4.10 inches at Havana Power Plant
4/22/1961	12:00 a.m.	Havana	2.62 – 3.10 in.	n/a	n/a	n/a	- COOP observers measured: • 3.10 inches at Havana • 2.62 inches at Havana Power Plant
5/7/1961 thru 5/8/1961	2:00 p.m.	Havana	1.62 – 1.65 in.	n/a	n/a	n/a	- COOP observers measured: • 1.65 inches at Havana • 1.62 inches at Havana Power Plant
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 7 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
5/14/1961	4:00 p.m.	Havana	1.78 – 1.93 in.	n/a	n/a	n/a	- COOP observers measured: • 1.93 inches at Havana • 1.78 inches at Havana Power Plant
6/17/1961	12:30 p.m.	Havana	1.50 – 1.55 in.	n/a	n/a	n/a	- COOP observers measured: • 1.55 inches at Havana • 1.50 inches at Havana Power Station
6/30/1961	6:00 a.m.	Havana	3.16 – 3.53 in.	n/a	n/a	n/a	- COOP observers measured: • 3.53 inches at Havana • 3.16 inches at Havana Power Station
7/12/1961 thru 7/13/1961	11:00 p.m.	Havana	1.43 – 1.46 in.	n/a	n/a	n/a	- COOP observers measured: • 1.46 inches at Havana • 1.43 inches at Havana Power Station
7/21/1961	8:00 a.m.	Havana	1.73 in.	n/a	n/a	n/a	- COOP observers measured 1.73 inches at Havana & Havana Power Station
7/27/1961 thru 7/28/1961	8:00 a.m.	Havana	1.65 – 1.66 in.	n/a	n/a	n/a	- COOP observers measured: • 1.66 inches at Havana • 1.65 inches at Havana Power Plant
9/11/1961 thru 9/12/1961	8:00 p.m.	Havana	2.30 – 2.90 in.	n/a	n/a	n/a	- COOP observers measured: • 2.90 inches at Havana • 2.30 inches at Havana Power Plant
9/13/1961 thru 914/1961	3:00 p.m.	Havana	3.90 in.	n/a	n/a	n/a	- COOP observers measured 3.90 inches at Havana & Havana Power Plant
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 8 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
9/22/1961 thru 9/25/1961	8:00 p.m.	Havana	3.47 – 3.66 in.	n/a	n/a	n/a	- COOP observers measured: • 3.66 inches at Havana Power Plant • 3.47 inches at Havana
3/20/1962 thru 3/21/1962	3:30 p.m.	Havana	1.98 in.	n/a	n/a	n/a	- COOP observers measured 1.98 inches at Havana
7/14/1962 thru 7/15/1962	5:00 p.m.	Havana	1.51 – 1.53 in.	n/a	n/a	n/a	- COOP observers measured: • 1.53 inches at Havana Power Station • 1.51 inches at Havana
9/30/1962 thru 10/2/1962	8:00 a.m.	- Havana - Mason City	4.07 – 4.54 in.	n/a	n/a	n/a	- COOP observers measured: • 4.54 inches at Mason City • 4.19 inches at Havana • 4.07 inches at Havana Power Station
10/19/1962 thru 10/20/1962	5:00 p.m.	- Havana - Mason City	1.42 – 1.75 in.	n/a	n/a	n/a	- COOP observers measured: • 1.75 inches at Havana • 1.63 inches at Havana Power Station • 1.42 inches at Mason City
3/3/1963 thru 3/5/1963	9:00 p.m.	Havana	2.08 – 2.20 in.	n/a	n/a	n/a	- COOP observers measured: • 2.20 inches at Havana Power Plant • 2.08 inches at Havana
5/27/1963	n/a	Mason City[^]	1.50 in.	n/a	n/a	n/a	- COOP observer measured 1.50 inches 1 mile east of Mason City
Subtotal:				**0**	**0**	**$0**	

[^] Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 9 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
7/6/1963	8:00 a.m.	- Havana - Mason City	1.35 – 1.66 in.	n/a	n/a	n/a	- COOP observers measured: • 1.66 inches at Havana • 1.57 inches at Havana Power Plant • 1.35 inches 1 mile east of Mason City
4/18/1964 thru 4/21/1964	8:00 a.m.	- Havana - Mason City	3.05 – 4.34 in.	n/a	n/a	n/a	- COOP observers measured: • 4.34 inches at Mason City • 3.17 inches at Havana • 3.05 inches at Havana Power Station
6/20/1964 thru 6/21/1964	8:00 a.m.	- Havana - Mason City	2.59 – 3.41 in.	n/a	n/a	n/a	- COOP observers measured: • 3.41 inches at Mason City • 2.86 inches at Havana • 2.59 inches at Havana Power Station
8/20/1964 thru 8/21/1964	7:00 p.m.	- Havana - Mason City	1.71 – 2.90 in.	n/a	n/a	n/a	- COOP observers measured: • 2.90 inches at Havana Power Station • 2.53 inches at Havana • 1.71 inches at Mason City
11/15/1964 thru 11/16/1964	7:00 a.m.	- Havana - Mason City	1.50 – 1.53 in.	n/a	n/a	n/a	- COOP observers measured: • 1.53 inches at Mason City • 1.50 inches at Havana
12/31/1964 thru 1/1/1965	6:00 p.m.	- Havana - Mason City	2.57 – 3.40 in.	n/a	n/a	n/a	- COOP observers measured: • 3.40 inches at Havana Power Plant • 3.33 inches at Havana • 2.57 inches at Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 10 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
3/16/1965 thru 3/17/1965	10:00 p.m.	- Havana - Mason City	1.08 – 1.64 in.	n/a	n/a	n/a	- COOP observers measured: • 1.64 inches at Havana • 1.38 inches at Havana Power Plant • 1.08 inches at Mason City
3/22/1965	n/a	Mason City	2.00 in.	n/a	n/a	n/a	- COOP observer measured 2.00 inches at Mason City
4/5/1965	7:00 a.m.	- Havana - Mason City	2.45 – 2.78 in.	n/a	n/a	n/a	- COOP observers measured: • 2.78 inches at Havana • 2.65 inches at Havana Power Plant • 2.45 inches at Mason City
4/14/1965 thru 4/15/1964	8:00 a.m.	- Havana - Mason City	1.12 – 2.03 in.	n/a	n/a	n/a	- COOP observers measured: • 2.03 inches at Havana • 1.74 inches at Havana Power Plant • 1.12 inches at Mason City
8/22/1965	1:30 a.m.	- Havana - Mason City^	1.50 – 2.32 in.	n/a	n/a	n/a	- COOP observers measured: • 2.33 inches at Havana • 2.30 inches at Havana Power Plant • 1.50 inches 4 miles north-northwest of Mason City
8/29/1965 thru 8/31/1965	3:00 p.m.	- Havana - Mason City^	1.75 – 1.88 in.	n/a	n/a	n/a	- COOP observers measured: • 1.88 inches at Havana • 1.85 inches 4 miles north-northwest of Mason City • 1.75 inches at Havana Power Plant
9/15/1965 thru 9/16/1965	10:00 p.m.	- Havana - Mason City^	2.22 – 4.03 in.	n/a	n/a	n/a	- COOP observers measured: • 4.03 inches 4 miles north-northwest of Mason City • 2.35 inches at Havana Power Plant • 2.22 inches at Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 11 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
2/8/1966 thru 2/10/1966	12:30 p.m.	Havana	1.68 – 2.06 in.	n/a	n/a	n/a	- COOP observers measured: • 2.06 inches at Havana • 1.68 inches at Havana Power Plant
5/17/1966 thru 5/18/1966	6:30 a.m.	Havana	1.71 – 2.15 in.	n/a	n/a	n/a	- COOP observers measured: • 2.15 inches at Havana Power Plant • 1.71 inches at Havana
6/8/1966	12:00 p.m.	- Havana - Mason City	1.62 – 2.35 in	n/a	n/a	n/a	- COOP observers measured: • 2.35 inches at Mason City • 1.69 inches at Havana • 1.62 inches at Havana Power Plant
6/12/1966 thru 6/13/1966	9:40 p.m.	- Havana - Mason City	1.37 – 3.23 in.	n/a	n/a	n/a	- COOP observers measured: • 3.23 inches at Havana Power Plant • 2.82 inches at Havana • 1.37 inches at Mason City
6/15/1966	7:30 a.m.	- Havana - Mason City	1.01 – 1.66 in.	n/a	n/a	n/a	- COOP observers measured: • 1.66 inches at Havana Power Plant • 1.28 inches at Havana • 1.01 inches at Mason City
8/9/1966 thru 8/10/1966	9:00 p.m.	- Havana - Mason City	1.77 – 1.89 in.	n/a	n/a	n/a	- COOP observers measured: • 1.89 inches at Mason City • 1.80 inches at Havana • 1.77 inches at Havana Power Plant
9/3/1966	1:15 p.m.	Havana	1.00 – 1.52 in.	n/a	n/a	n/a	- COOP observers measured: • 1.52 inches at Havana Power Plant • 1.00 inches at Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 12 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
9/14/1966	7:30 a.m.	- Havana - Mason City	1.00 – 1.54 in.	n/a	n/a	n/a	- COOP observers measured: • 1.54 inches at Mason City • 1.08 inches at Havana • 1.00 inches at Havana Power Plant
9/18/1966 thru 9/19/1966	6:00 p.m.	- Havana - Mason City	1.46 – 1.67 in.	n/a	n/a	n/a	- COOP observers measured: • 1.67 inches at Havana • 1.57 inches at Havana Power Plant • 1.46 inches at Mason City
10/12/1966 thru 10/13/1966	1:15 p.m.	Havana	1.47 in.	n/a	n/a	n/a	- COOP observer measured 1.47 inches at Havana Power Plant
11/26/1966 thru 11/27/1966	4:00 p.m.	Mason City	1.73 in.	n/a	n/a	n/a	- COOP observer measured 1.73 inches at Mason City
12/6/1966 thru 12/7/1966	4:00 p.m.	- Havana - Mason City	1.95 – 2.48	n/a	n/a	n/a	- COOP observers measured: • 2.48 inches at Havana Power Plant • 1.93 inches at Mason City
4/1/1967	1:00 a.m.	Havana	1.95 in.	n/a	n/a	n/a	- COOP observer measured 1.95 inches at Havana Power Plant
5/5/1967 thru 5/6/1967	6:00 a.m.	- Havana - Mason City	1.72 – 2.00 in.	n/a	n/a	n/a	- COOP observers measured: • 2.00 inches at Havana Power Plant • 1.72 inches at Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 13 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
5/30/1967 thru 5/31/1967	1:00 a.m.	- Havana - Mason City	1.97 – 2.04 in.	n/a	n/a	n/a	- COOP observers measured: • 2.04 inches at Havana Power Plant • 1.97 inches at Mason City
7/18/1967 thru 7/19/1967	11:30 p.m.	- Havana - Mason City	1.45 – 1.74 in.	n/a	n/a	n/a	- COOP observers measured: • 1.74 inches at Mason City • 1.45 inches at Havana Power Plant
7/23/1967	8:30 p.m.	- Havana - Mason City	1.20 – 2.94 in.	n/a	n/a	n/a	- COOP observers measured: • 2.94 inches at Havana Power Plant • 1.20 inches at Mason City
9/15/1967 thru 9/17/1967	7:00 a.m.	- Havana - Mason City	1.21 – 2.48 in.	n/a	n/a	n/a	- COOP observers measured: • 2.48 inches at Havana Power Plant • 1.21 inches at Mason City
9/19/1967 thru 9/20/1967	5:00 p.m.	- Havana - Mason City	1.38 – 1.68 in.	n/a	n/a	n/a	- COOP observers measured: • 1.68 inches at Mason City • 1.38 inches at Havana Power Plant
10/15/1967 thru 10/16/1967	5:00 a.m.	- Havana - Mason City	2.32 – 3.39 in.	n/a	n/a	n/a	- COOP observers measured: • 3.39 inches at Mason City • 2.32 inches at Havana Power Plant
5/22/1968 thru 5/23/1968	12:30 p.m.	- Havana - Mason City	1.43 – 1.83 in.	n/a	n/a	n/a	- COOP observers measured: • 1.83 inches at Mason City • 1.43 inches at Havana Power Plant
6/25/1968 thru 6/26/1968	12:30 p.m.	- Havana - Mason City	1.19 – 3.16 in.	n/a	n/a	n/a	- COOP observers measured: • 3.16 inches at Havana Power Plant • 1.19 inches at Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 14 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
7/7/1968	3:00 p.m.	Mason City	1.52 in.	n/a	n/a	n/a	- COOP observer measured 1.52 inches at Mason City and noted that they received that amount of rain in 30 minutes
9/18/1968 thru 9/19/1968	12:00 p.m.	- Havana - Mason City	2.27 – 2.32 in.	n/a	n/a	n/a	- COOP observers measured: • 2.32 inches at Mason City • 2.27 inches at Havana Power Plant
12/27/1968 thru 12/28/1968	2:00 a.m.	Havana	2.43 in.	n/a	n/a	n/a	- COOP observer measured 2.43 inches at Havana Power Plant
6/30/1969	7:00 a.m.	- Havana - Mason City^	1.44 – 2.83 in.	n/a	n/a	n/a	- COOP observers measured: • 2.83 inches 3 miles south of Mason City • 1.44 inches at Havana Power Plant
7/6/1969 thru 7/7/1969	12:00 a.m.	- Havana - Mason City^	2.46 – 3.13 in.	n/a	n/a	n/a	- COOP observers measured: • 3.13 inches at Havana Power Plant • 2.46 inches south of Mason City
7/19/1969 thru 7/20/1969	n/a	Mason City^	1.64 in.	n/a	n/a	n/a	- COOP observer measured 1.64 inches 3 miles south of Mason City
8/9/1969	12:00 a.m.	Havana Mason City^	1.72 – 2.09 in.	n/a	n/a	n/a	- COOP observers measured: • 2.09 inches at Havana Power Plant • 1.72 inches 3 miles south of Mason City
10/10/1969 thru 10/13/1969	4:30 a.m.	- Havana - Mason City^	6.16 – 7.32 in.	n/a	n/a	n/a	- COOP observers measured: • 7.32 inches 3 miles south of Mason City • 6.16 inches at Havana Power Plant
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 15 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
11/28/1969	n/a	Mason City^	1.55 in.	n/a	n/a	n/a	- COOP observer measured 1.55 inches 3 miles south of Mason City
4/1/1970	12:00 a.m.	Mason City^	1.47 in.	n/a	n/a	n/a	- COOP observer measured 1.47 inches 3 miles south of Mason City
4/18/1970 thru 4/19/1970	9:00 a.m.	- Havana - Mason City^	2.43 – 3.00 in.	n/a	n/a	n/a	- COOP observers measured: • 3.00 inches at Havana Power Plant • 2.43 inches 1 mile northwest of Mason City
4/30/1970 thru 5/1/1970	12:00 a.m.	- Havana - Mason City^	4.05 – 4.10 in.	n/a	n/a	n/a	- COOP observers measured: • 4.10 inches 1 mile northwest of Mason City • 4.05 inches at Havana Power Plant
5/11/1970	9:30 a.m.	Mason City^	2.76 in.	n/a	n/a	n/a	- COOP observer measured 2.76 inches at Mason City
5/15/1970	12:00 a.m.	- Havana - Mason City^	1.38 – 1.68 in.	n/a	n/a	n/a	- COOP observers measured: • 1.68 inches at Havana Power Plant • 1.31 inches 1 mile northwest of Mason City
5/31/1970 thru 6/2/1970	5:30 p.m.	- Havana - Mason City^	1.45 – 2.30 in.	n/a	n/a	n/a	- COOP observers measured: • 2.30 inches at Havana Power Plant • 1.45 inches 1 mile northwest of Mason City
8/4/1970 thru 8/5/1970	4:00 a.m.	- Havana - Mason City^	1.76 – 2.07 in.	n/a	n/a	n/a	- COOP observers measured: • 2.07 inches at Havana Power Plant • 1.76 inches 1 mile northwest of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 16 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
9/12/1970 thru 9/13/1970	7:30 p.m.	- Havana - Mason City^	2.48 – 3.30 in.	n/a	n/a	n/a	- COOP observers measured: • 3.30 inches at Havana Power Plant • 2.48 inches 1 mile northwest of Mason City
9/21/1970 thru 9/23/1970	10:00 p.m.	- Havana - Mason City^	2.85 – 4.72 in.	n/a	n/a	n/a	- COOP observers measured: • 4.72 inches at Havana Power Plant • 2.85 inches 1 mile northwest of Mason City
7/9/1971 thru 7/10/1971	7:00 a.m.	- Havana - Mason City^	1.62 – 3.83 in.	n/a	n/a	n/a	- COOP observers measured: • 3.83 inches at Havana Power Plant • 1.62 inches 1 mile northwest of Mason City
9/5/1971 thru 9/6/1971	3:00 p.m.	- Havana - Mason City^	1.70 in.	n/a	n/a	n/a	- COOP observer measured 1.70 inches 1 mile northwest of Mason City
9/25/1971	4:00 a.m.	- Havana - Mason City^	1.73 – 1.88 in.	n/a	n/a	n/a	- COOP observers measured: • 1.88 inches at Havana Power Plant • 1.73 inches 1 mile northwest of Mason City
10/3/1971	12:00 a.m.	- Havana - Mason City^	2.02 in.	n/a	n/a	n/a	- COOP observer measured 2.02 inches at Havana Power Plant
12/10/1971	12:00 a.m.	- Havana - Mason City^	1.55 – 1.73 in.	n/a	n/a	n/a	- COOP observers measured: • 1.73 inches at Havana Power Plant • 1.55 inches 1 mile northwest of Mason City
12/14/1971 thru 12/15/1971	12:30 a.m.	- Havana - Mason City^	1.12 – 2.12 in.	n/a	n/a	n/a	- COOP observers measured: • 2.12 inches at Havana Power Plant • 1.12 inches 1 mile northwest of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 17 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
3/12/1972 thru 3/13/1972	6:00 p.m.	- Havana - Mason City^	1.61 – 2.01 in.	n/a	n/a	n/a	- COOP observers measured: • 2.01 inches 1 mile northwest of Mason City • 1.61 inches at Havana Power Plant
6/28/1972	n/a	- Havana - Mason City^	2.22 in.	n/a	n/a	n/a	- COOP observer measured 2.22 inches northwest of Mason City
7/9/1972	8:00 a.m.	- Havana - Mason City^	1.10 – 1.45 in.	n/a	n/a	n/a	- COOP observers measured: • 1.45 inches at Havana Power Plant • 1.10 inches 1 mile northwest of Mason City
8/22/1972	n/a	- Havana - Mason City^	1.77 in.	n/a	n/a	n/a	- COOP observer measured 1.77 inches 1 mile northwest of Mason City
8/23/1972	8:00 a.m.	- Havana - Mason City^	1.86 – 2.15 in.	n/a	n/a	n/a	- COOP observers measured: • 2.15 inches 1 mile northwest of Mason City • 1.86 inches at Havana Power Plant
9/28/1972	8:30 p.m.	- Havana - Mason City^	1.28 – 1.96 in.	n/a	n/a	n/a	- COOP observers measured: • 1.96 inches at Havana Power Plant • 1.28 inches 1 mile northwest of Mason City
3/6/1973 thru 3/7/1973	9:00 a.m.	- Havana - Mason City^	1.31 – 1.45 in.	n/a	n/a	n/a	- COOP observers measured: • 1.45 inches 1 mile northwest of Mason City • 1.31 inches at Havana Power Plant
3/28/1973 thru 3/29/1973	7:00 a.m.	- Havana - Mason City^	1.64 – 1.69 in.	n/a	n/a	n/a	- COOP observers measured: • 1.69 inches 1 mile northwest of Mason City • 1.64 inches at Havana Power Plant
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 18 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
4/21/1973 thru 4/22/1973	12:00 a.m.	- Havana - Mason City^	1.76 – 2.50 in.	n/a	n/a	n/a	- COOP observers measured: • 2.50 inches 1 mile northwest of Mason City • 1.76 inches at Havana Power Plant
5/4/1973	1:00 a.m.	- Havana - Mason City^	1.70 – 1.76 in.	n/a	n/a	n/a	- COOP observers measured: • 1.76 inches 1 mile northwest of Mason City • 1.70 inches at Havana Power Plant
6/2/1973 thru 6/4/1973	4:00 p.m.	- Havana - Mason City^	2.01 – 3.37 in.	n/a	n/a	n/a	- COOP observers measured: • 3.37 inches at Havana Power Plant • 2.01 inches 1 mile northwest of Mason City
6/26/1973	5:00 a.m.	- Havana - Mason City^	2.14 – 2.49 in.	n/a	n/a	n/a	- COOP observers measured: • 2.49 inches 1 mile northwest of Mason City • 2.14 inches at Havana Power Plant
7/19/1973 thru 7/21/1973	5:30 p.m.	- Havana - Mason City^	1.44 – 2.52 in.	n/a	n/a	n/a	- COOP observers measured: • 2.52 inches 1 mile northwest of Mason City • 1.44 inches at Havana Power Plant
8/11/1973 thru 8/12/1973	11:00 p.m.	- Havana - Mason City^	1.68 – 4.22 in.	n/a	n/a	n/a	- COOP observers measured: • 4.22 inches at Havana Power Plant • 1.68 inches 1 mile northwest of Mason City
9/3/1973	8:30 a.m.	Havana	2.68 in.	n/a	n/a	n/a	- COOP observer measured 2.68 inches at Havana Power Plant
9/30/1973 thru 10/1/1973	8:00 p.m.	Havana	2.49 in.	n/a	n/a	n/a	- COOP observer measured 2.49 inches at Havana Power Plant
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 19 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
10/3/1973	1:30 a.m.	- Havana - Mason City^	1.26 – 2.63 in.	n/a	n/a	n/a	- COOP observers measured: • 2.63 inches at Havana Power Plant • 1.26 inches 1 mile northwest of Mason City
10/12/1973 thru 10/13/1973	7:30 p.m.	- Havana - Mason City^	2.56 – 3.01 in.	n/a	n/a	n/a	- COOP observers measured: • 3.01 inches 1 mile northwest of Mason City • 2.56 inches at Havana Power Plant
12/4/1973 thru 12/5/1973	12:30 a.m.	- Havana - Mason City^	1.48 – 1.62 in.	n/a	n/a	n/a	- COOP observers measured: • 1.62 inches at Havana Power Plant • 1.48 inches 1 mile northwest of Mason City
5/19/1973	4:000 a.m.	- Havana - Mason City^	1.70 – 1.86 in.	n/a	n/a	n/a	- COOP observers measured: • 1.86 inches at Havana Power Plant • 1.70 inches 1 mile northwest of Mason City
5/30/1973	2:30 p.m.	- Havana - Mason City^	2.16 – 3.25 in.	n/a	n/a	n/a	- COOP observers measured: • 3.25 inches 1 mile northwest of Mason City • 2.16 inches at Havana Power Plant
6/22/1973	6:00 a.m.	- Havana - Mason City^	2.44 – 2.50 in.	n/a	n/a	n/a	- COOP observers measured: • 2.50 inches 1 mile northwest of Mason City • 2.44 inches at Havana Power Plant
1/10/1975	n/a	Mason City^	1.54 in.	n/a	n/a	n/a	- COOP observer measured 1.54 inches 1 mile northwest of Mason City
4/18/1975	n/a	- Havana - Mason City^	1.02 – 2.30 in.	n/a	n/a	n/a	- COOP observers measured: • 2.30 inches at Havana Power Plant • 1.02 inches 1 mile northwest of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 20 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
5/24/1975 thru 5/26/1975	6:00 p.m.	- Havana - Mason City^	1.16 – 1.67 in.	n/a	n/a	n/a	- COOP observers measured: • 1.67 inches 1 mile northwest of Mason City • 1.16 inches at Havana Power Plant
7/6/1975	3:00 a.m.	Havana	1.60 in.	n/a	n/a	n/a	- COOP observer measured 1.60 inches at Havana Power Plant
7/23/1975 thru 7/24/1975	7:00 a.m.	- Havana - Mason City^	1.69 – 2.28 in.	n/a	n/a	n/a	- COOP observers measured: • 2.28 inches at Havana Power Plant • 1.69 inches 1 mile northwest of Mason City
8/13/1975 thru 8/14/1975	7:00 a.m.	- Havana - Mason City^	1.26 – 1.60 in.	n/a	n/a	n/a	- COOP observers measured: • 1.60 inches 1 mile northwest of Mason City • 1.26 inches at Havana Power Plant
8/29/1975 thru 8/30/1975	n/a	Mason City^	1.50 in.	n/a	n/a	n/a	- COOP observer measured 1.50 inches 1 mile northwest of Mason City
9/18/1975 thru 9/19/1975	6:00 p.m.	- Havana - Mason City^	1.34 – 2.68 in.	n/a	n/a	n/a	- COOP observers measured: • 2.68 inches at Havana Power Plant • 1.34 inches 1 mile northwest of Mason City
3/4/1976	12:00 a.m.	- Havana - Mason City^	1.77 – 2.00 in.	n/a	n/a	n/a	- COOP observers measured: • 2.00 inches at Havana Power Plant • 1.77 inches 1 mile northwest of Mason City
5/5/1976 thru 5/6/1976	7:30 p.m.	- Havana - Mason City^	1.62 – 1.93 in.	n/a	n/a	n/a	- COOP observers measured: • 1.93 inches at Havana Power Plant • 1.62 inches 1 mile northwest of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 21 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
7/21/1976 thru 7/22/1976	12:00 p.m.	- Havana - Mason City^	1.84 – 2.40 in.	n/a	n/a	n/a	- COOP observers measured: • 2.40 inches 1 mile northwest of Mason City • 1.84 inches at Havana Power Plant
7/27/1976	2:30 a.m.	- Havana - Mason City^	2.01 – 2.46 in.	n/a	n/a	n/a	- COOP observers measured: • 2.46 inches at Havana Power Plant • 2.01 inches 1 mile northwest of Mason City
8/14/1976 thru 8/15/1976	8:00 p.m.	- Havana - Mason City^	1.50 in.	n/a	n/a	n/a	- COOP observer measured 1.50 inches at Havana Power Plant
9/25/1976 thru 9/26/1976	7:30 a.m.	- Havana - Mason City^	1.59 – 2.08 in.	n/a	n/a	n/a	- COOP observers measured: • 2.08 inches at Havana Power Plant - 1.59 inches 1 mile northwest of Mason City
3/11/1977 thru 3/12/1977	9:30 a.m.	- Havana - Mason City^	1.79 – 2.53 in.	n/a	n/a	n/a	- COOP observers measured: • 2.53 inches at Havana Power Plant • 1.79 inches northwest of Mason City
5/4/1977 thru 5/6/1977	5:30 p.m.	- Havana - Mason City^	3.44 – 3.47 in.	n/a	n/a	n/a	- COOP observers measured: • 2.47 inches 1 mile northwest of Mason City • 2.44 inches at Havana Power Plant
7/31/1977	12:00 a.m.	- Havana^ - Mason City^	1.26 – 2.00 in.	n/a	n/a	n/a	- COOP observers measured: • 2.00 inches 4 miles north-northwest of Havana • 1.26 inches 1 mile northwest of Mason City
8/5/1977 thru 8/6/1977	n/a	- Havana^ - Mason City^	2.58 – 3.00 in.	n/a	n/a	n/a	- COOP observers measured: • 3.00 inches 4 miles north-northwest of Havana • 2.58 inches 1 mile northwest of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 22 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
8/7/1977 thru 8/8/1977	n/a	- Havana^ - Mason City^	1.05 – 2.43 in.	n/a	n/a	n/a	- COOP observers measured: • 2.43 inches 4 miles north-northwest of Havana • 1.05 inches 1 mile northwest of Mason City
9/12/1977 thru 9/13/1977	n/a	- Havana^ - Mason City^	1.85 – 2.80 in.	n/a	n/a	n/a	- COOP observers measured: • 2.80 inches 1 mile northwest of Mason City • 1.85 inches 4 miles north-northwest of Havana
10/1/1977	n/a	- Havana^ - Mason City^	1.68 – 1.73 in.	n/a	n/a	n/a	- COOP observers measured: • 1.73 inches 4 miles north-northwest of Havana • 1.68 inches 1 mile northwest of Mason City
10/23/1977 thru 10/25/1977	n/a	- Havana^ - Mason City^	1.85 – 2.41 in.	n/a	n/a	n/a	- COOP observers measured: • 2.41 inches 1 mile northwest of Mason City • 1.85 inches 4 miles north-northwest of Havana
11/1/1977 thru 11/2/1977	n/a	Havana^	2.55 in.	n/a	n/a	n/a	- COOP observer measured 2.55 inches 4 miles north-northwest of Havana
5/7/1978 thru 5/8/1978	12:00 a.m.	- Havana^ - Mason City^	1.42 – 1.79 in.	n/a	n/a	n/a	- COOP observers measured: • 1.79 inches 1 mile northwest of Mason City • 1.42 inches 4 miles north-northwest of Havana
5/12/1978 thru 5/13/1978	3:00 a.m.	- Havana^ - Mason City^	1.99 – 2.07 in.	n/a	n/a	n/a	- COOP observers measured: • 2.07 inches 1 mile northwest of Mason City • 1.99 inches 4 miles north-northwest of Havana
7/2/1978	4:30 a.m.	- Havana^ - Mason City^	1.74 – 1.80 in.	n/a	n/a	n/a	- COOP observers measured: • 1.80 inches 4 miles north-northwest of Havana • 1.74 inches 1 mile northwest of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 23 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
8/25/1978 thru 8/26/1978	n/a	- Havana^ - Mason City^	1.23 3.53 in.	n/a	n/a	n/a	- COOP observers measured: • 3.53 inches 4 miles north-northwest of Havana • 1.23 inches 1 mile northwest of Mason City
3/19/1979	12:00 a.m.	- Havana^ - Mason City^	1.52 – 1.92 in.	n/a	n/a	n/a	- COOP observers measured: • 1.92 inches 1 mile northwest of Mason City • 1.52 inches 4 miles north-northwest of Havana
4/11/1979 thru 4/12/1979	2:30 a.m.	- Havana^ - Mason City^	2.31 – 2.96 in.	n/a	n/a	n/a	- COOP observers measured: • 2.96 inches 1 mile northwest of Mason City • 2.31 inches 4 miles north-northwest of Havana
7/14/1979	5:30 a.m.	Havana^	1.51 in.	n/a	n/a	n/a	- COOP observer measured 1.51 inches 4 miles north-northwest of Havana
7/24/1979 thru 7/25/1979	6:00 p.m.	- Havana^ - Mason City^	2.00 – 2.87 in.	n/a	n/a	n/a	- COOP observers measured: • 2.78 inches 4 miles north-northwest of Havana • 2.00 inches 1 mile northwest of Mason City
11/21/1979	12:00 a.m.	Havana^	1.51 in.	n/a	n/a	n/a	• COOP observer measured 1.51 inches 4 miles north-northwest of Havana
12/23/1979 thru 12/25/1979	8:30 p.m.	- Havana^ - Mason City^	1.90 – 2.07 in.	n/a	n/a	n/a	- COOP observers measured: • 2.07 inches 1 mile northwest of Mason City • 1.90 inches 4 miles north-northwest of Havana
4/8/1980 thru 4/9/1980	8:00 a.m.	- Havana^ - Mason City^	1.15 – 2.07 in.	n/a	n/a	n/a	- COOP observers measured: • 2.07 inches 1 mile northwest of Mason City • 1.15 inches 4 miles north-northwest of Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 24 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
6/1/1980 thru 6/3/1980	n/a	- Havana^ - Mason City^	3.20 – 3.39 in.	n/a	n/a	n/a	- COOP observers measured: • 3.39 inches 1 mile northwest of Mason City • 3.20 inches 4 miles north-northwest of Havana
8/5/1980 thru 8/6/1980	2:30 a.m.	- Havana^ - Mason City^	1.10 – 2.14 in.	n/a	n/a	n/a	- COOP observers measured: • 2.14 inches 4 miles north-northwest of Havana • 1.10 inches 1 mile northwest of Mason City
8/14/1980 thru 8/16/1980	7:00 a.m.	- Havana^ - Mason City^	2.43 – 2.78 in.	n/a	n/a	n/a	- COOP observers measured: • 2.78 inches 1 mile northwest of Mason City • 2.43 inches 4 miles north-northwest of Havana
8/31/1980 thru 9/2/1980	12:00 a.m.	- Havana^ - Mason City^	1.86 – 2.52 in.	n/a	n/a	n/a	- COOP observers measured: • 2.52 inches 4 miles north-northwest of Havana • 1.86 inches 1 mile northwest of Mason City
9/16/1980 thru 9/17/1980	1:00 a.m.	- Havana^ - Mason City^	2.52 – 2.57 in.	n/a	n/a	n/a	- COOP observers measured: • 2.57 inches 1 mile northwest of Mason City • 2.52 inches 4 miles north-northwest of Havana
10/17/1980	2:30 p.m.	Havana^	1.90 in.	n/a	n/a	n/a	- COOP observer measured 1.90 inches 4 miles north-northwest of Havana
12/7/1980 thru 12/8/1980	12:00 a.m.	- Havana^ - Mason City^	1.72 – 2.05 in.	n/a	n/a	n/a	- COOP observers measured: • 2.05 inches 4 miles north-northwest of Havana • 1.78 inches 1 mile northwest of Mason City
5/10/1981 thru 5/11/1981	12:00 a.m.	- Havana^ - Mason City^	1.39 – 2.18 in.	n/a	n/a	n/a	- COOP observers measured: • 2.18 inches 1 mile northwest of Mason City • 1.39 inches 4 miles north-northwest of Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 25 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
5/18/1981 thru 5/19/1981	1:00 a.m.	- Havana^ - Mason City^	1.58 – 2.21 in.	n/a	n/a	n/a	- COOP observers measured: • 2.21 inches 4 miles north-northwest of Havana • 1.58 inches 1 mile northwest of Mason City
6/21/1981 thru 6/22/1981	1:30 a.m.	- Havana^ - Mason City^	1.20 – 2.66 in.	n/a	n/a	n/a	- COOP observers measured: • 2.66 inches 4 miles north-northwest of Havana • 1.20 inches 1 mile northwest of Mason City
7/4/1981 thru 7/5/1981	12:00 a.m.	- Havana^ - Mason City^	3.36 – 3.88 in.	n/a	n/a	n/a	- COOP observers measured: • 3.88 inches 1 mile northwest of Mason City • 3.36 inches 4 miles north-northwest of Havana
7/19/1981	n/a	Mason City^	1.60 in.	n/a	n/a	n/a	- COOP observer measured 1.60 inches 1 mile northwest of Mason City
7/26/1981 thru 7/28/1981	n/a	- Havana^ - Mason City^	2.07 – 2.53 in.	n/a	n/a	n/a	- COOP observers measured: • 2.53 inches 4 miles north-northwest of Havana • 2.07 inches 1 mile northwest of Mason City
8/3/1981	n/a	Mason City^	2.70 in.	n/a	n/a	n/a	- COOP observer measured 2.70 inches 1 mile northwest of Mason City
8/5/1981 thru 8/6/1981	n/a	- Havana^ - Mason City^	1.10 – 1.59 in.	n/a	n/a	n/a	- COOP observers measured: • 1.59 inches 1 mile northwest of Mason City • 1.10 inches 4 miles north-northwest of Havana
8/15/1981	12:30 a.m.	- Havana^ - Mason City^	1.17 – 1.90 in.	n/a	n/a	n/a	- COOP observers measured: • 1.90 inches 4 miles north-northwest of Havana • 1.17 inches 1 mile northwest of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 26 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
4/16/1982 thru 4/17/1982	4:00 p.m.	- Havana^ - Mason City^	2.35 – 3.27 in.	n/a	n/a	n/a	- COOP observers measured: • 3.27 inches 1 mile northwest of Mason City • 2.35 inches 4 miles north-northwest of Havana
9/17/1982	n/a	- Havana^ - Mason City^	1.34 – 1.75 in.	n/a	n/a	n/a	- COOP observers measured: • 1.75 inches 4 miles north-northwest of Havana • 1.34 inches 1 mile northwest of Mason City
11/11/1982 thru 11/12/1982	3:30 a.m.	- Havana^ - Mason City^	1.55 – 1.67 in.	n/a	n/a	n/a	- COOP observers measured: • 1.67 inches 1 mile northwest of Mason City • 1.55 inches 4 miles north-northwest of Havana
12/2/1982 thru 12/6/1982	n/a	- Havana^ - Mason City^	3.40 – 5.31 in.	n/a	n/a	n/a	- COOP observers measured: • 5.31 inches 1 mile northwest of Mason City • 3.40 inches 4 miles north-northwest of Havana - Heavy rains between the 2nd and the 6th coupled with already saturated soils produced record or near record flooding along most Illinois rivers, streams and creeks. Many roads and bridges were washed away and major property damage occurred. Mason County was among the declared disaster areas for flooding `and included in Federal Disaster Declaration #674.
12/24/1982 thru 12/25/1982	n/a	- Havana^ - Mason City^	1.43 – 2.36 in.	n/a	n/a	n/a	- COOP observers measured: • 2.36 inches 4 miles north-northwest of Havana • 1.43 inches 1 mile northwest of Mason City
4/2/1983	12:00 a.m.	Havana^	2.45 in.	n/a	n/a	n/a	- COOP observer measured 2.45 inches 4 miles north-northwest of Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 27 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
5/1/1983	n/a	- Havana^ - Mason City^	1.44 – 1.85 in.	n/a	n/a	n/a	- COOP observers measured: • 1.85 inches 4 miles north-northwest of Havana • 1.44 inches 1 mile northwest of Mason City
5/13/1983 thru 5/14/1983	n/a	- Havana^ - Mason City^	1.15 – 1.75 in.	n/a	n/a	n/a	- COOP observers measured: • 1.75 inches 4 miles north-northwest of Havana • 1.15 inches 1 mile northwest of Mason City
8/22/1983 thru 8/23/1983	n/a	Mason City^	1.87 in.	n/a	n/a	n/a	- COOP observer measured 1.87 inches 1 mile northwest of Mason City
10/20/1983 thru 10/22/1983	6:00 a.m.	Havana^	2.26 in.	n/a	n/a	n/a	- COOP observer measured 2.26 inches 4 miles north-northwest of Havana
11/23/1983	12:30 a.m.	- Havana^ - Mason City^	1.41 – 2.00 in.	n/a	n/a	n/a	- COOP observers measured: • 2.00 inches 4 miles north-northwest of Havana • 1.41 inches 1 mile northwest of Mason City
11/28/1983 thru 11/29/1983	n/a	Havana^	1.53 in.	n/a	n/a	n/a	- COOP observer measured 1.53 inches 4 miles north-northwest of Havana
4/21/1984 thru 4/22/1984	1:00 a.m.	- Havana^ - Mason City^	1.81 – 2.03 in.	n/a	n/a	n/a	- COOP observers measured: • 2.03 inches 4 miles north-northwest of Havana • 1.81 inches 1 mile northwest of Mason City
5/20/1984	12:30 a.m.	- Havana^ - Mason City^	3.20 – 4.35 in.	n/a	n/a	n/a	- COOP observers measured: • 4.35 inches 4 miles north-northwest of Havana • 3.20 inches 1 mile northwest of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 28 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
6/9/1984	n/a	Havana^	1.50 in.	n/a	n/a	n/a	- COOP observer measured 1.50 inches 4 miles north-northwest of Havana
6/23/1984	n/a	Mason City^	1.45 in.	n/a	n/a	n/a	- COOP observer measured 1.45 inches 1 mile northwest of Mason City
7/24/1984	n/a	- Havana^ - Mason City^	1.38 – 1.77 in.	n/a	n/a	n/a	- COOP observers measured: • 1.77 inches 1 mile northwest of Mason City • 1.38 inches 4 miles north-northwest of Havana
10/31/1984 thru 11/1/1984	5:00 a.m.	- Havana^ - Mason City^	2.51 – 3.00 in.	n/a	n/a	n/a	- COOP observers measured: • 3.00 inches 4 miles north-northwest of Havana • 2.51 inches 1 mile northwest of Mason City
11/11/1984	9:00 a.m.	Havana^	1.70 in.	n/a	n/a	n/a	- COOP observer measured 1.70 inches 4 miles north-northwest of Havana
2/21/1985 thru 2/23/1985	n/a	- Havana^ - Mason City^	2.10 – 2.19 in.	n/a	n/a	n/a	- COOP observers measured: • 2.19 inches 1 mile northwest of Mason City • 2.10 inches 4 miles north-northwest of Havana - Unusually heavy rains on February 21st through the 23rd coupled with significant snow accumulations and warm temperatures resulted in flooding on most Illinois rivers by February 24th. The major event was the near-record flooding on the Illinois River. From Havana to Meredosia the flood levels observed were the worst since the record flood of 1943. Mason County was among the declared disaster areas and included in Federal Disaster Declaration #735.
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 29 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
3/3/1985 thru 3/4/1985	n/a	- Havana^ - Mason City^	1.42 – 2.04 in.	n/a	n/a	n/a	- COOP observers measured: • 2.04 inches 4 miles north-northwest of Havana • 1.42 inches 1 mile northwest of Mason City
3/11/1985	n/a	- Havana^ - Mason City^	1.50 – 1.65 in.	n/a	n/a	n/a	- COOP observers measured: • 1.65 inches 4 miles north-northwest of Havana • 1.50 inches 1 mile northwest of Mason City
4/27/1985	n/a	Havana^	1.80 in.	n/a	n/a	n/a	- COOP observer measured 1.80 inches 4 miles north-northwest of Havana
9/23/1985	8:00 a.m.	Havana^	1.85 in.	n/a	n/a	n/a	- COOP observer measured 1.85 inches 4 miles north-northwest of Havana
10/31/1985 thru 11/2/1985	n/a	- Havana^ - Mason City^	1.46 – 2.10 in.	n/a	n/a	n/a	- COOP observers measured: • 2.10 inches 4 miles north-northwest of Havana • 1.46 inches 1 mile northwest of Mason City
11/10/1985	7:30 a.m.	- Havana^ - Mason City^	1.42 – 1.50 in.	n/a	n/a	n/a	- COOP observers measured: • 1.50 inches 4 miles north-northwest of Havana • 1.42 inches 1 mile northwest of Mason City
11/14/1985 thru 11/16/1985	2:30 p.m.	- Havana^ - Mason City^	2.13 – 2.70 in.	n/a	n/a	n/a	- COOP observers measured: • 2.70 inches 4 miles north-northwest of Havana • 2.13 inches 1 mile northwest of Mason City
11/18/1985 thru 11/19/1985	n/a	- Havana^ - Mason City^	2.86 – 2.87 in.	n/a	n/a	n/a	- COOP observers measured: • 2.87 inches 4 miles north-northwest of Havana • 2.86 inches 1 mile northwest of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 30 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
5/1/1986	1:00 p.m.	Havana^	1.90 in.	n/a	n/a	n/a	- COOP observer measured 1.90 inches 4 miles north-northwest of Havana
6/5/1986 thru 6/6/1986	7:00 p.m.	- Havana^ - Mason City^	1.65 – 1.99	n/a	n/a	n/a	- COOP observers measured: • 1.99 inches 1 mile northwest of Mason City • 1.65 inches 4 miles north-northwest of Havana
6/10/1986	n/a	Havana^	1.68 in.	n/a	n/a	n/a	- COOP observers measured 1.68 inches 4 miles north-northwest of Havana
7/10/1986 thru 7/12/1986	n/a	- Havana^ - Mason City^	2.00 – 2.92 in.	n/a	n/a	n/a	- COOP observers measured: • 2.92 inches 1 mile northwest of Mason City • 2.00 inches 4 miles north-northwest of Havana
9/11/1986	4:00 a.m.	- Havana^ - Mason City^	1.63 – 2.33 in.	n/a	n/a	n/a	- COOP observers measured: • 2.33 inches 1 mile northwest of Mason City • 1.63 inches 4 miles north-northwest of Havana
9/23/1986 thru 9/24/1986	n/a	- Havana^ - Mason City^	1.41 – 1.80 in.	n/a	n/a	n/a	- COOP observers measured: • 1.80 inches 4 miles north-northwest of Havana • 1.41 inches 1 mile northwest of Mason City
9/26/1986 thru 9/27/1986	n/a	- Havana^ - Mason City^	1.21 – 2.28 in.	n/a	n/a	n/a	- COOP observers measured: • 2.28 inches 4 miles north-northwest of Havana • 1.21 inches 1 mile northwest of Mason City
10/3/1986	12:00 a.m.	- Havana^ - Mason City^	1.95 – 3.70 in.	`	n/a	n/a	- COOP observers measured: • 3.70 inches 4 miles north-northwest of Havana • 1.95 inches 1 mile northwest of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 31 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
10/24/1986 thru 10/25/1986	n/a	- Havana^ - Mason City^	1.42 – 1.58 in.	n/a	n/a	n/a	- COOP observers measured: • 1.58 inches 4 miles north-northwest of Havana • 1.42 inches 1 mile northwest of Mason City
11/26/1986	n/a	- Havana^ - Mason City^	1.06 – 1.79 in.	n/a	n/a	n/a	- COOP observers measured: • 1.79 inches 1 mile northwest of Mason City • 1.06 inches 4 miles north-northwest of Havana
4/13/1987 thru 4/14/1987	n/a	- Havana^ - Mason City^	1.43 – 1.55 in.	n/a	n/a	n/a	- COOP observers measured: • 1.55 inches 4 miles north-northwest of Havana • 1.43 inches 1 mile northwest of Mason City
6/20/1987	1:00 p.m.	Havana^	1.63 in.	n/a	n/a	n/a	- COOP observer measured 1.63 inches 4 miles north-northwest of Havana
8/4/1987	n/a	Havana^	2.30 in.	n/a	n/a	n/a	- COOP observer measured 2.30 inches 4 miles north-northwest of Havana
3/28/1988 thru 3/29/1988	n/a	- Havana^ - Mason City^	1.20 – 1.85 in.	n/a	n/a	n/a	- COOP observers measured: • 1.85 inches 1 mile northwest of Mason City • 1.20 inches 4 miles north-northwest of Havana
11/10/1988	5:00 a.m.	- Havana^ - Mason City^	1.60 – 3.10 in.	n/a	n/a	n/a	- COOP observers measured: • 3.10 inches 1 mile northwest of Mason City • 1.60 inches 4 miles north-northwest of Havana
4/23/1989	10:00 a.m.	- Havana^ - Mason City^	1.42 – 1.75 in.	n/a	n/a	n/a	- COOP observers measured: • 1.75 inches 1 mile northwest of Mason City • 1.42 inches 4 miles north-northwest of Havana
5/25/1989	n/a	Mason City^	1.78 in.	n/a	n/a	n/a	- COOP observer measured 1.78 inches 1 mile northwest of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 32 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
7/20/1989 thru 7/21/1989	n/a	Mason City^	1.74 in.	n/a	n/a	n/a	- COOP observer measured 1.74 inches 1 mile northwest of Mason City
8/24/1989	7:00 a.m.	Havana^	1.67 in.	n/a	n/a	n/a	- COOP observer measured 1.67 inches 4 miles north-northwest of Havana
9/8/1989 thru 9/9/1989	n/a	- Havana^ - Mason City^	1.18 – 1.62 in.	n/a	n/a	n/a	- COOP observers measured: • 1.62 inches 1 mile northwest of Mason City • 1.18 inches 4 miles north-northwest of Havana
2/22/1990 thru 2/23/1990	n/a	- Havana^ - Mason City^	2.11 – 2.21 in.	n/a	n/a	n/a	- COOP observers measured: • 2.21 inches 1 mile northwest of Mason City • 2.11 inches 4 miles north-northwest of Havana
5/3/1990 thru 5/4/1990	n/a	- Havana^ - Mason City^	1.44 – 1.53 in.	n/a	n/a	n/a	- COOP observers measured: • 1.53 inches 1 mile west of Mason City • 1.44 inches 4 miles north-northwest of Havana
6/6/1990 thru 6/8/1990	n/a	- Havana^ - Mason City^	1.14 – 1.89 in.	n/a	n/a	n/a	- COOP observers measured: • 1.89 inches 4 miles north-northwest of Havana • 1.14 inches 1 mile west of Mason City
6/14/1990	n/a	- Havana^ - Mason City^	2.00 – 3.33 in.	n/a	n/a	n/a	- COOP observers measured: • 3.33 inches 1 mile west of Mason City • 2.00 inches 4 miles north-northwest of Havana
6/20/1990	11:00 a.m.	- Havana^ - Mason City^	2.86 – 2.88 in.	n/a	n/a	n/a	- COOP observers measured: • 2.88 inches 4 miles north-northwest of Havana • 2.86 inches 1 mile west of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 33 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
6/29/1990 thru 6/30/1990	n/a	- Havana^ - Mason City^	1.74 – 3.50 in.	n/a	n/a	n/a	- COOP observers measured: • 3.50 inches 4 miles north-northwest of Havana • 1.74 inches 1 mile west of Mason City
7/10/1990 thru 7/11/1990	n/a	- Havana^ - Mason City^	1.19 – 2.02 in.	n/a	n/a	n/a	- COOP observers measured: • 2.02 inches 4 miles north-northwest of Havana • 1.19 inches 1 mile west of Mason City
8/20/1990	n/a	Mason City^	2.29 in.	n/a	n/a	n/a	- COOP observer measured 2.29 inches 1 mile west of Mason City
11/4/1990 thru 11/5/1990	6:00 a.m.	- Havana^ - Mason City^	1.96 – 2.80 in.	n/a	n/a	n/a	- COOP observers measured: • 2.80 inches 4 miles north-northwest of Havana • 1.96 inches 1 mile west of Mason City
11/27/1990 thru 11/28/1990	n/a	- Havana^ - Mason City^	1.80 – 1.88 in.	n/a	n/a	n/a	- COOP observers measured: • 1.88 inches 4 miles north-northwest of Havana • 1.80 inches 1 mile west of Mason City
12/29/1990	n/a	- Havana^ - Mason City^	1.10 – 2.32 in.	n/a	n/a	n/a	- COOP observers measured: • 2.32 inches 1 mile west of Mason City • 1.10 inches 4 miles north-northwest of Havana
4/14/1991 thru 4/15/1991	2:00 a.m.	- Havana^ - Mason City^	1.73 – 1.81 in.	n/a	n/a	n/a	- COOP observers measured: • 1.81 inches 1 mile west of Mason City • 1.73 inches 4 miles north-northwest of Havana
5/4/1991 thru 5/5/1991	1:00 p.m.	- Havana^ - Mason City^	1.98 – 2.69 in.	n/a	n/a	n/a	- COOP observers measured: • 2.69 inches 4 miles north-northwest of Havana • 1.98 inches 1 mile west of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 34 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
8/6/1991	n/a	- Havana^ - Mason City^	2.00 – 3.26 in.	n/a	n/a	n/a	- COOP observers measured: • 3.26 inches 1 mile west of Mason City • 2.00 inches 4 miles north-northwest of Havana
8/8/1991	9:30 a.m.	Havana^	1.62 in.	n/a	n/a	n/a	- COOP observer measured 1.62 inches 4 miles north-northwest of Havana
9/10/1991	11:00 a.m.	- Havana^ - Mason City^	1.77 – 1.90 in.	n/a	n/a	n/a	- COOP observers measured: • 1.90 inches 4 miles north-northwest of Havana • 1.77 inches 1 mile west of Mason City
10/3/1991 thru 10/5/1991	9:30 p.m.	- Havana^ - Mason City^	5.45 – 5.76 in.	n/a	n/a	n/a	- COOP observers measured: • 5.76 inches 1 mile west of Mason City • 5.45 inches 4 miles north-northwest of Havana
6/15/1992	n/a	Mason City^	2.15 in.	n/a	n/a	n/a	- COOP observer measured 2.15 inches 1 mile west of Mason City
7/2/1992	n/a	Mason City^	1.90 in.	n/a	n/a	n/a	- COOP observer measured 1.90 inches 1 mile west of Mason City
7/3/1992	3:00 p.m.	- Havana^ - Mason City^	1.25 – 1.76 in.	n/a	n/a	n/a	- COOP observers measured: • 1.76 inches 4 miles north-northwest of Havana • 1.25 inches 1 mile west of Mason City
7/26/1992	7:00 a.m.	- Havana^ - Mason City^	2.73 – 3.55 in.	n/a	n/a	n/a	- COOP observers measured: • 3.55 inches 4 miles north-northwest of Havana • 2.73 inches 1 mile west of Mason City
7/30/1992	n/a	- Havana^ - Mason City^	1.53 – 2.18 in.	n/a	n/a	n/a	- COOP observers measured: • 2.18 inches 1 mile west of Mason City • 1.53 inches 4 miles north-northwest of Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 35 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
9/8/1992 thru 9/10/1992	10:00 p.m.	- Havana^ - Mason City^	1.79 – 2.85 in.	n/a	n/a	n/a	- COOP observers measured: • 2.85 inches 4 miles north-northwest of Havana • 1.79 inches 1 mile west of Mason City
10/15/1992	n/a	Havana^	2.10 in.	n/a	n/a	n/a	- COOP observer measured 2.10 inches 4 miles north-northwest of Havana
11/1/1992	n/a	- Havana^ - Mason City^	1.40 – 1.84 in.	n/a	n/a	n/a	- COOP observers measured: • 1.84 inches 1 mile west of Mason City • 1.40 inches 4 miles north-northwest of Havana
1/4/1993	n/a	- Havana^ - Mason City^	1.48 – 1.92 in.	n/a	n/a	n/a	- COOP observers measured: • 1.92 inches 1 mile west of Mason City • 1.48 inches 4 miles north-northwest of Havana
4/14/1993 thru 4/15/1993	n/a	- Havana^ - Mason City^	1.72 – 3.59 in.	n/a	n/a	n/a	- COOP observers measured: • 3.59 inches 1 mile west of Mason City • 1.72 inches 4 miles north-northwest of Havana
6/25/1993	3:00 a.m.	- Havana^ - Mason City^	1.02 – 2.10 in.	n/a	n/a	n/a	- COOP observers measured: • 2.10 inches 4 miles north-northwest of Havana • 1.02 inches 1 mile west of Mason City
6/29/1993 thru 7/1/1993	n/a	- Havana^ - Mason City^	4.42 – 4.58 in.	n/a	n/a	n/a	- COOP observers measured: • 4.58 inches 4 miles north-northwest of Havana • 4.42 inches 1 mile west of Mason City
7/10/1993 thru 7/11/1993	n/a	- Havana^ - Mason City^	1.35 – 1.72 in.	n/a	n/a	n/a	- COOP observers measured: • 1.72 inches 1 mile west of Mason City • 1.35 inches 4 miles north-northwest of Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 36 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
7/13/1993 thru 7/14/1993	n/a	- Havana^ - Mason City^	1.03 – 1.58 in.	n/a	n/a	n/a	- COOP observers measured: • 1.58 inches 4 miles north-northwest of Havana • 1.03 inches 1 mile west of Mason City
7/22/1993 thru 7/24/1993	7:00 a.m.	- Havana^ - Mason City^	2.46 – 3.32 in.	n/a	n/a	n/a	- COOP observers measured: • 3.32 inches 4 miles north-northwest of Havana • 2.46 inches 1 mile west of Mason City
8/24/1993	5:00 p.m.	Havana^	1.64 in.	n/a	n/a	n/a	- COOP observer measured 1.64 inches 4 miles north-northwest of Havana
9/2/1993 thru 9/3/1993	3:00 a.m.	- Havana^ - Mason City^	2.52 – 2.72 in.	n/a	n/a	n/a	- COOP observers measured: • 2.72 inches 4 miles north-northwest of Havana • 2.52 inches 1 mile west of Mason City - Heavy rains fell on already saturated soils causing the already high water table in the area to rise to a level that created lakes in depressed areas around Havana.
9/14/1993 thru 9/15/1993	n/a	- Havana^ - Mason City^	3.81 – 4.87 in.	n/a	n/a	n/a	- COOP observers measured: • 4.87 inches 1 mile west of Mason City • 3.81 inches 4 miles north-northwest of Havana - The additional heavy rain in the Havana area on the 14th and 15th led to major aquifer flooding.
10/16/1993 thru 10/17/1993	2:00 a.m.	- Havana^ - Mason City^	1.39 – 2.01 in.	n/a	n/a	n/a	- COOP observers measured: • 2.01 inches 4 miles north-northwest of Havana • 1.39 inches 1 mile west of Mason City
4/11/1994 thru 4/13/1994	n/a	- Havana^ - Mason City^	1.89 – 2.36 in.	n/a	n/a	n/a	- COOP observers measured: • 2.36 inches 1 mile west of Mason City • 1.89 inches 4 miles north-northwest of Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 37 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
11/5/1994 thru 11/6/1994	7:00 a.m.	- Havana^ - Mason City^	1.53 in.	n/a	n/a	n/a	- COOP observer measured 1.53 inches 4 miles north-northwest of Havana
12/6/1994 thru 12/7/1994	n/a	- Havana^ - Mason City^	1.49 – 1.85 in.	n/a	n/a	n/a	- COOP observers measured: • 1.85 inches 4 miles north-northwest of Havana • 1.49 inches 1 mile west of Mason City
1/13/1995 thru 1/14/1995	3:30 a.m.	- Havana^ - Mason City^	1.67 – 1.97 in.	n/a	n/a	n/a	- COOP observers measured: • 1.97 inches 1 mile west of Mason City • 1.67 inches 4 miles north-northwest of Havana
4/8/1995 thru 4/9/1995	n/a	Havana^	2.10 in.	n/a	n/a	n/a	- COOP observer measured 2.10 inches 4 miles north-northwest of Havana
5/8/1995 thru 5/9/1995	12:00 a.m.	- Havana^ - Mason City^	1.58 – 2.24 in.	n/a	n/a	n/a	- COOP observers measured: • 2.24 inches 4 miles north-northwest of Havana • 1.58 inches 1 mile west of Mason City
5/17/1995 thru 5/18/1995	5:00 a.m.	- Havana^ - Mason City^ - Countywide	2.91 – 5.22 in.	n/a	n/a	n/a	- COOP observers measured: • 5.22 inches 1 mile west of Mason City • 2.91 inches 4 miles north-northwest of Havana - Heavy rains fell within a short amount of time causing flash flooding of small streams and closures of flooded roads countywide.
5/23/1995 thru 5/25/1995	n/a	- Havana^ - Mason City^	2.78 – 3.07 in.	n/a	n/a	n/a	- COOP observers measured: • 3.07 inches 4 miles north-northwest of Havana • 2.78 inches 1 mile west of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 38 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
10/20/1995	n/a	- Havana^ - Mason City^	1.15 – 1.60 in.	n/a	n/a	n/a	- COOP observers measured: • 1.60 inches 1 mile west of Mason City • 1.15 inches 4 miles north-northwest of Havana
5/26/1996 thru 5/27/1996	7:00 p.m.	- Havana^ - Mason City^	1.83 – 2.08 in.	n/a	n/a	n/a	- COOP observers measured: • 2.08 inches 1 mile west of Mason City • 1.83 inches 4 miles north-northwest of Havana
2/21/1997 thru 2/22/1997	1:00 a.m.	Havana^	3.20 in.	n/a	n/a	n/a	- COOP observer measured 3.20 inches 4 miles north-northwest of Havana - Heavy rain fell on already frozen ground along the Illinois River basin causing numerous tributaries of the Illinois River to flood which, in turn, caused the Illinois River to rise. The River rose above flood stage at Havana on the 21st.
2/26/1997 thru 2/27/1997	n/a	Havana^	1.47 in.	n/a	n/a	n/a	- COOP observer measured 1.47 inches 4 miles north-northwest of Havana - This additional heavy rain aggravated the Illinois River flooding situation and the River continued to rise through the end of February and crested at the beginning of March.
5/27/1997	7:00 a.m.	- Havana^ - Mason City^	1.78 in.	n/a	n/a	n/a	- COOP observer measured 1.78 inches 4 miles north-northwest of Havana
7/20/1997	6:00 p.m.	- Havana^ - Mason City^	1.08 – 2.09 in.	n/a	n/a	n/a	- COOP observers measured: • 2.09 inches 1 mile west of Mason City • 1.08 inches 4 miles north-northwest of Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 39 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
8/4/1997	7:00 p.m.	Havana^	1.55 in.	n/a	n/a	n/a	- COOP observer measured 1.55 inches 4 miles north-northwest of Havana
8/17/1997	2:00 a.m.	- Havana^ - Mason City^	1.17 – 1.87 in.	n/a	n/a	n/a	- COOP observers measured: • 1.87 inches 4 miles north-northwest of Havana • 1.17 inches 1 mile west of Mason City
11/5/1997 thru 11/6/1997	n/a	- Havana^ - Mason City^	1.09 – 1.45 in.	n/a	n/a	n/a	- COOP observers measured: • 1.45 inches 4 miles north-northwest of Havana • 1.09 inches 1 mile west of Mason City
2/10/1998 thru 2/12/1998	n/a	- Havana^ - Mason City^	1.57 – 1.90 in.	n/a	n/a	n/a	- COOP observers measured: • 1.90 inches 4 miles north-northwest of Havana • 1.57 inches 1 mile west of Mason City - Heavy rain fell across central Illinois causing the Illinois River to rise about 1 foot above flood stage from Havana to Beardstown.
3/17/1998 thru 3/18/1998	n/a	- Havana^ - Mason City^	1.27 – 1.65 in.	n/a	n/a	n/a	- COOP observers measured: • 1.65 inches 4 miles north-northwest of Havana • 1.27 inches 1 mile west of Mason City
5/7/1998 thru 5/8/1998	n/a	- Havana^ - Mason City^	2.20 – 2.65 in.	n/a	n/a	n/a	- COOP observers measured: • 2.65 inches 1 mile west of Mason City • 2.20 inches 4 miles north-northwest of Havana
5/20/1998	n/a	Havana^	1.57 in.	n/a	n/a	n/a	- COOP observer measured 1.57 inches 4 miles north-northwest of Havana
6/11/1998	n/a	Mason City^	1.56 in.	n/a	n/a	n/a	- COOP observer measured 1.56 inches 1 mile west of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 40 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
6/16/1998	n/a	Mason City^	2.06 in.	n/a	n/a	n/a	- COOP observer measured 2.06 inches 1 mile west of Mason City
6/29/1998	n/a	Mason City^	1.73 in.	n/a	n/a	n/a	- COOP observer measured 1.73 inches 1 mile west of Mason City
8/18/1998	n/a	Mason City^	2.69 in.	n/a	n/a	n/a	- COOP observer measured 2.69 inches 1 mile west of Mason City
11/10/1998	n/a	Havana^	1.50 in.	n/a	n/a	n/a	- COOP observer measured 1.50 inches 4 miles north-northwest of Havana
4/15/1999 thru 4/16/1999	n/a	- Havana^ - Mason City^	1.91 – 2.16 in.	n/a	n/a	n/a	- COOP observers measured: • 2.16 inches 1 mile west of Mason City • 1.91 inches 4 miles north-northwest of Havana
5/13/1999	n/a	- Havana^ - Mason City^	1.15 – 2.00 in.	n/a	n/a	n/a	- COOP observers measured: • 2.00 inches 4 miles north-northwest of Havana • 1.15 inches 1 mile west of Mason City
5/17/1999 thru 5/18/1999	n/a	- Havana^ - Mason City^	1.39 – 2.27 in.	n/a	n/a	n/a	- COOP observers measured: • 2.27 inches 4 miles north-northwest of Havana • 1.39 inches 1 mile west of Mason City
6/2/1999	6:00 p.m.	- Havana^ - Mason City^	1.19 – 1.88 in.	n/a	n/a	n/a	- COOP observers measured: • 1.88 inches 4 miles north-northwest of Havana • 1.19 inches 1 mile west of Mason City
6/12/1999 thru 6/13/1999	3:00 p.m.	- Havana^ - Mason City^	2.04 – 2.14 in.	n/a	n/a	n/a	- COOP observers measured: • 2.14 inches 1 mile west of Mason City • 2.04 inches 4 miles north-northwest of Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 41 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
7/1/1999	n/a	- Havana^ - Mason City^	1.48 – 1.58 in.	n/a	n/a	n/a	- COOP observers measured: • 1.58 inches 1 mile west of Mason City • 1.48 inches 4 miles north-northwest of Havana
7/27/1999 thru 7/28/1999	9:30 p.m.	- Havana^ - Mason City^	1.42 – 1.53 in.	n/a	n/a	n/a	- COOP observers measured: • 1.53 inches 1 mile west of Mason City • 1.42 inches 4 miles north-northwest of Havana
8/12/1999 thru 8/13/1999	2:00 a.m.	- Havana^ - Mason City^	1.65 – 1.90 in.	n/a	n/a	n/a	- COOP observers measured: • 1.90 inches 1 mile west of Mason City • 1.65 inches 4 miles north-northwest of Havana
5/26/2000 thru 5/27/2000	n/a	- Havana^ - Mason City^	1.46 – 1.73 in.	n/a	n/a	n/a	- COOP observers measured: • 1.73 inches 4 miles north-northwest of Havana • 1.46 inches 1 mile west of Mason City
6/20/2000 thru 6/21/2000	n/a	- Havana^ - Mason City^	1.42 – 2.06 in.	n/a	n/a	n/a	- COOP observers measured: • 2.06 inches 1 mile west of Mason City • 1.42 inches 4 miles north-northwest of Havana
7/5/2000	n/a	Mason City^	1.69 in.	n/a	n/a	n/a	- COOP observer measured 1.69 inches 1 mile west of Mason City
7/11/2000	n/a	- Havana^ - Mason City^	1.03 – 3.39 in.	n/a	n/a	n/a	- COOP observers measured: • 3.39 inches 1 mile west of Mason City • 1.03 inches 4 miles north-northwest of Havana
2/24/2001 thru 2/25/2001	n/a	- Havana^ - Mason City^	1.90 – 2.13 in.	n/a	n/a	n/a	- COOP observers measured: • 2.13 inches 4 miles north-northwest of Havana • 1.90 inches 1 mile west of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 42 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
6/6/2001	2:00 a.m.	Havana^	2.82 in.	n/a	n/a	n/a	- COOP observer measured 2.82 inches 4 miles north-northwest of Havana
1/30/2002 thru 1/31/2002	1:00 a.m.	- Havana^ - Mason City^	2.64 – 2.69 in.	n/a	n/a	n/a	- COOP observers measured: • 2.69 inches 1 mile east of Mason City • 2.64 inches 4 miles north-northwest of Havana
4/28/2002	7:00 a.m.	- Havana^ - Mason City^	1.60 – 2.19 in.	n/a	n/a	n/a	- COOP observers measured: • 2.19 inches 1 mile east of Mason City • 1.60 inches 4 miles north-northwest of Havana
6/12/2002 thru 6/13/2002	1:00 a.m.	- Havana^ - Mason City^	3.57 – 6.10 in.	n/a	n/a	n/a	- COOP observers measured: • 6.10 inches 4 miles north-northwest of Havana • 3.57 inches 1 mile east of Mason City - Heavy rain caused flash flooding of numerous rural roads across the County.
7/27/2002	10:30 a.m.	Havana^	3.86 in.	n/a	n/a	n/a	- COOP observer measured 3.86 inches 4 miles north-northwest of Havana
8/19/2002 thru 8/20/2002	4:00 a.m.	Havana^	2.07 in.	n/a	n/a	n/a	- COOP observer measured 2.07 inches 4 miles north-northwest of Havana
8/23/2002	n/a	- Havana^ - Mason City^	1.91 – 3.75 in.	n/a	n/a	n/a	- COOP observers measured: • 3.75 inches 4 miles north-northwest of Havana • 1.91 inches 1 mile east of Mason City
12/18/2002 thru 12/19/2002	12:30 a.m.	- Havana^ - Mason City^	1.66 – 2.00 in.	n/a	n/a	n/a	- COOP observers measured: • 2.00 inches 4 miles north-northwest of Havana • 1.66 inches 1 mile east of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 43 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
4/4/2003 thru 4/5/2003	n/a	Havana^	1.50 in.	n/a	n/a	n/a	- COOP observer measured 1.50 inches 4 miles north-northwest of Havana
4/7/2003	n/a	Mason City^	1.90 in.	n/a	n/a	n/a	- COOP observer measured 1.90 inches 1 mile east of Mason City
6/13/2003	n/a	Havana^	2.00 in.	n/a	n/a	n/a	- COOP observer measured 2.00 inches 4 miles north-northwest of Havana
6/23/2003 thru 6/24/2003	8:30 p.m.	- Havana^ - Mason City^	1.37 – 1.52 in.	n/a	n/a	n/a	- COOP observers measured: • 1.52 inches 4 miles north-northwest of Havana • 1.37 inches 1 mile east of Mason City
7/9/2003 thru 7/10/2003	2:00 p.m.	- Havana^ - Mason City^ - Manito	4.08 – 4.27 in.	n/a	n/a	n/a	- COOP observers measured: • 4.27 inches 4 miles north-northwest of Havana • 4.08 inches 1 mile east of Mason City - Very heavy rains fell for several hours resulting in flash flooding of many streets and roads in and around Manito.
7/18/2003	1:00 a.m.	Mason City^	1.60 in.	n/a	n/a	n/a	- COOP observer measured 1.60 inches 1 mile east of Mason City
8/3/2003 thru 8/4/2003	2:00 a.m.	- Havana^ - Mason City^	1.92 – 2.20 in.	n/a	n/a	n/a	- COOP observers measured: • 2.20 inches 4 miles north-northwest of Havana • 1.92 inches 1 mile east of Mason City
8/29/2003	4:00 a.m.	- Havana^ - Mason City^	1.11 – 2.04 in.	n/a	n/a	n/a	- COOP observers measured: • 2.04 inches 1 mile east of Mason City • 1.11 inches 4 miles north-northwest of Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 44 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
9/1/2003 thru 9/2/2003	12:30 a.m.	- Havana^ - Mason City^	2.91 – 4.20 in.	n/a	n/a	n/a	- COOP observers measured: • 4.20 inches 1 mile east of Mason City • 2.91 inches 4 miles north-northwest of Havana
11/18/2003	12:30 a.m.	- Havana^ - Mason City^	1.10 – 2.56 in.	n/a	n/a	n/a	- COOP observers measured: • 2.56 inches 1 mile east of Mason City • 1.10 inches 4 miles north-northwest of Havana
5/14/2004	3:00 a.m.	Mason City^	1.47 in.	n/a	n/a	n/a	- COOP observer measured 1.47 inches 1 mile east of Mason City
5/25/2004	5:00 p.m.	- Havana^ - Mason City^	1.35 – 2.71 in.	n/a	n/a	n/a	- COOP observers measured: • 2.71 inches 1 mile east of Mason City • 1.35 inches 4 miles north-northwest of Havana
6/15/2004	6:30 a.m.	- Havana^ - Mason City^	1.25 – 2.03 in.	n/a	n/a	n/a	- COOP observers measured: • 2.03 inches 1 mile east of Mason City • 1.25 inches 4 miles north-northwest of Havana
7/10/2004 thru 7/11/2004	9:00 p.m.	- Havana^ - Mason City^	2.23 – 2.68 in.	n/a	n/a	n/a	- COOP observers measured: • 2.68 inches 1 mile east of Mason City • 2.23 inches 4 miles north-northwest of Havana
8/24/2004	1:00 a.m.	Havana^	1.45n.				- COOP observer measured 1.45 inches 4 miles north-northwest of Havana
8/25/2004	n/a	- Havana^ Mason City	1.22 – 1.97 in.	n/a	n/a	n/a	- COOP observers measured: • 1.97 inches 1 mile east of Mason City • 1.22 inches 4 miles north-northwest of Havana - Heavy rains caused flash flooding of several streets in Mason City.
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 45 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
10/27/2004	n/a	Havana^	1.51 in.	n/a	n/a	n/a	- COOP observer measured 1.51 inches 4 miles north-northwest of Havana
9/16/2004	6:30 p.m.	- Havana^ - Mason City^	1.05 – 1.92 in.	n/a	n/a	n/a	- COOP observers measured: • 1.92 inches 1 mile east of Mason City • 1.05 inches 4 miles north-northwest of Havana
1/2/2005 thru 1/3/2005	7:30 a.m.	- Havana^ - Mason City^	1.74 in.	n/a	n/a	n/a	- COOP observer measured 1.74 inches 4 miles north-northwest of Havana
8/13/2005 thru 8/14/2005	3:00 a.m.	Havana^	2.00 in.	n/a	n/a	n/a	- COOP observer measured 2.00 inches 4 miles north-northwest of Havana
8/22/2005	n/a	- Havana^ - Mason City^	1.69 in.	n/a	n/a	n/a	- COOP observer measured 1.69 inches 1 mile east of Mason City
4/6/2006 thru 4/7/2006	n/a	- Havana^ - Mason City	1.59 – 1.60 in.	n/a	n/a	n/a	- COOP observers measured: • 1.60 inches 4 miles north-northwest of Havana • 1.59 inches at Mason City
7/11/2006 thru 7/12/2006	3:00 p.m.	Mason City	1.57 in.	n/a	n/a	n/a	- COOP observer measured 1.57 inches at Mason City
7/20/2006 thru 7/21/2006	6:00 p.m.	Havana^	1.72 in.	n/a	n/a	n/a	- COOP observer measured 1.72 inches 4 miles north-northwest of Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 46 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
7/27/2006	n/a	Mason City	1.95 in.	n/a	n/a	n/a	- COOP observer measured 1.95 inches at Mason City
8/9/2006 thru 8/10/2006	n/a	- Havana^ - Mason City	1.51 – 2.16 in.	n/a	n/a	n/a	- COOP observers measured: • 2.16 inches 4 miles north-northwest of Havana • 1.51 inches at Mason City
9/11/2006 thru 9/12/2006	7:30 a.m.	- Havana - Mason City	1.70 – 2.15 in.	n/a	n/a	n/a	- COOP observers measured: • 2.15 inches 4 miles north-northwest of Havana • 1.70 inches at Mason City - Heavy rains resulted in flash flooding of numerous roads within Havana.
11/11/2006	n/a	Mason City	1.70 in.	n/a	n/a	n/a	- COOP observer measured 1.70 inches at Mason City
11/30/2006	8:00 a.m.	- Havana^ - Mason City	1.43 – 2.15 in.	n/a	n/a	n/a	- COOP observers measured: • 2.15 inches 4 miles north-northwest of Havana • 1.43 inches at Mason City
12/21/2006 thru 12/22/2006	12:00 a.m.	- Havana^ - Mason City	1.24 – 2.20 in.	n/a	n/a	n/a	- COOP observers measured: • 2.20 inches at Mason City • 1.24 inches 4 miles north-northwest of Havana
6/28/2007	1:00 a.m.	Havana	2.30 in.	n/a	n/a	n/a	- COOP observer measured 2.30 inches at Havana
12/11/2007 thru 12/12/2007	n/a	Mason City^	2.90 in.	n/a	n/a	n/a	- COOP observer measured 2.90 inches 2 miles north of Mason City
1/8/2008 thru 1/9/2008	n/a	Mason City^	2.67 in.	n/a	n/a	n/a	- COOP observer measured 2.67 inches 2 miles north of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 47 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
6/2/2008 thru 6/4/2008	12:30 p.m.	- Havana - Mason City^	2.34 – 3.77 in.	n/a	n/a	n/a	- COOP observers measured: • 3.77 inches 2 miles north of Mason City • 2.34 inches at Havana
7/12/2008	n/a	Mason City^	2.35 in.	n/a	n/a	n/a	- COOP observer measured 2.35 inches 2 miles north of Mason City
8/28/2008	10:30 a.m.	Havana	2.10 in	n/a	n/a	n/a	- COOP observer measured 2.10 inches at Havana
9/3/2008 thru 9/5/2008	8:30 a.m.	- Havana - Mason City^	2.14 – 2.67 in.	n/a	n/a	n/a	- COOP observers measured: • 2.67 inches at Havana • 2.14 inches 2 miles north of Mason City
9/11/2008 thru 9/15/2008	10:00 a.m.	- Havana - Mason City^	5.80 – 6.30 in.	n/a	n/a	n/a	- COOP observers measured: • 6.30 inches 2 miles north of Mason City • 5.80 inches at Havana
4/19/2009 thru 4/20/2009	n/a	Havana	1.70 in.	n/a	n/a	n/a	- COOP observer measured 1.70 inches at Havana
4/28/2009	n/a	Havana	1.70 in.	n/a	n/a	n/a	- COOP observer measured 1.70 inches at Havana
5/13/2009	12:00 a.m.	Havana	1.74 in.	n/a	n/a	n/a	- COOP observer measured 1.74 inches at Havana
5/15/2009 thru 5/16/2009	2:00 a.m.	- Havana - Mason City^	1.21 – 3.50 in.	n/a	n/a	n/a	- COOP observers measured: • 3.50 inches at Havana • 1.21 inches 2 miles north of Mason City
6/18/2009	n/a	Mason City^	1.64 in.	n/a	n/a	n/a	- COOP observer measured 1.64 inches 2 miles north of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 48 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
7/4/2009 thru 7/5/2009	n/a	- Havana - Mason City^	1.64 – 2.15 in.	n/a	n/a	n/a	- COOP observers measured: • 2.15 inches at Havana • 1.64 inches 2 miles north of Mason City
7/8/2009	n/a	Havana	2.15 in.	n/a	n/a	n/a	- COOP observer measured 2.15 inches at Havana
7/15/2009	n/a	- Havana - Mason City^	1.38 – 2.62 in.	n/a	n/a	n/a	- COOP observers measured: • 2.62 inches 2 miles north of Mason City • 1.38 inches at Havana
7/28/2009 thru 7/29/2009	n/a	Mason City^	2.48 in.	n/a	n/a	n/a	- COOP observer measured 2.48 inches 2 miles north of Mason City
8/17/2009 thru 8/18/2009	n/a	Mason City^	2.39 in.	n/a	n/a	n/a	- COOP observer measured 2.48 inches 2 miles north of Mason City
8/20/2009	n/a	Havana	2.20 in.	n/a	n/a	n/a	- COOP observer measured 2.20 inches at Havana
8/28/2009 thru 8/29/2009	n/a	- Havana - Mason City^	1.24 – 3.60 in.	n/a	n/a	n/a	- COOP observers measured: • 3.60 inches at Havana • 1.24 inches 2 miles north of Mason City
9/6/2009 thru 9/7/2009	n/a	Havana	1.50 in.	n/a	n/a	n/a	- COOP observer measured 1.50 inches at Havana
10/23/2009	n/a	- Havana - Mason City^	2.25 – 2.43 in.	n/a	n/a	n/a	- COOP observers measured: • 2.43 inches 2 miles north of Mason City • 2.25 inches at Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 49 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
10/30/2009	n/a	- Havana - Mason City^	1.81 – 2.50 in.	n/a	n/a	n/a	- COOP observers measured: • 2.50 inches at Havana • 1.81 inches 2 miles north of Mason City
11/16/2009 thru 11/17/2009	n/a	- Havana - Mason City^	2.18 – 2.20 in.	n/a	n/a	n/a	- COOP observers measured: • 2.20 inches at Havana • 2.18 inches 2 miles north of Mason City
12/24/2009 thru 12/25/2009	n/a	- Havana - Mason City^	2.13 – 2.90 in.	n/a	n/a	n/a	- COOP observers measured: • 2.90 inches at Havana • 2.13 inches 2 miles north of Mason City
4/24/2010 thru 4/25/2010	n/a	- Havana - Mason City^	1.18 – 1.85 in.	n/a	n/a	n/a	- COOP observers measured: • 1.85 inches at Havana • 1.18 inches 2 miles north of Mason City
5/11/2010	n/a	- Havana - Mason City^	1.48 – 2.00 in.	n/a	n/a	n/a	- COOP observers measured: • 2.00 inches at Havana • 1.48 inches 2 miles north of Mason City
5/17/2010 thru 5/18/2010	n/a	- Havana - Mason City^	1.70 – 2.07 in.	n/a	n/a	n/a	- COOP observers measured: • 2.07 inches 2 miles north of Mason City • 1.70 inches at Havana
6/1/2010 thru 6/2/2010	n/a	- Havana - Mason City^	2.26 – 2.48 in.	n/a	n/a	n/a	- COOP observers measured: • 2.48 inches at Havana • 2.26 inches 2 miles north of Mason City
6/13/2010 thru 6/14/2010	n/a	- Havana - Mason City^	1.04 – 1.63 in.	n/a	n/a	n/a	- COOP observers measured: • 1.63 inches 2 miles north of Mason City • 1.04 inches at Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 50 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
6/21/2010 thru 6/24/2010	n/a	- Havana - Southern Portion of the County	4.20 in.	n/a	n/a	n/a	- COOP observer measured 4.20 inches at Havana - Heavy rain fell on already saturated ground producing rapid flash flooding in a small part of southern Mason County on the 22nd.
6/26/2010	n/a	Mason City^	2.60 in.	n/a	n/a	n/a	- COOP observer measured 2.60 inches 2 miles north of Mason City
7/19/2010 thru 7/20/2010	n/a	- Havana - Mason City^ - Southern Portion of the County	2.71 – 3.30 in.	n/a	n/a	n/a	- COOP observers measured: • 3.00 inches at Havana • 2.71 inches 2 miles north of Mason City - Heavy rains fell across southern Mason County at rates of 2 inches per hour for more than 3 hours which produced widespread flash flooding. Total rainfall accumulations reached nearly 6 inches along the Illinois River from just south of Havana to near Snicarte.
7/28/2010	n/a	Snicarte	4.00 – 5.00 in.	n/a	n/a	n/a	- A slow moving system produced copious amount of rain in a small part of southwest Mason County. Rainfall amounts of 4 to 5 inches were measured in 90 minutes which led to flash flooding.
8/10/2010 thru 8/11/2010	n/a	Havana	3.18 in.	n/a	n/a	n/a	- COOP observer measured 3.18 inches at Havana
8/14/2010	n/a	Havana	1.75 in.	n/a	n/a	n/a	- COOP observer measured 1.75 inches at Havana
9/1/2010	n/a	- Havana - Mason City^	1.01 – 1.50 in.	n/a	n/a	n/a	- COOP observers measured: • 1.50 inches at Havana • 1.01 inches 2 miles north of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 51 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
9/3/2010	n/a	- Havana - Mason City^	1.00 – 2.47 in.	n/a	n/a	n/a	- COOP observers measured: • 2.47 inches 2 miles north of Mason City • 1.00 inches at Havana
10/24/2010 thru 10/25/2010	n/a	- Havana - Mason City^	1.56 – 2.00 in.	n/a	n/a	n/a	- COOP observers measured: • 2.00 inches at Havana • 1.56 inches 2 miles north of Mason City
12/31/2010 thru 1/1/2011	n/a	- Havana - Mason City^	1.99 – 2.44 in.	n/a	n/a	n/a	- COOP observers measured: • 2.44 inches 2 miles north of Mason City • 1.99 inches at Havana
2/27/2011 thru 2/28/2011	n/a	Havana	1.50 in.	n/a	n/a	n/a	- COOP observer measured 1.50 inches at Havana
3/5/2011 thru 3/6/2011	n/a	- Havana - Mason City^	1.15 – 1.50 in.	n/a	n/a	n/a	- COOP observers measured: • 1.50 inches at Havana • 1.15 inches 2 miles north of Mason City
4/15/2011	n/a	Southern Portion of the County	3.00 – 4.00 in.	n/a	n/a	n/a	- Several round of heavy rain produced 3 to 4 inches of rain in 4 hours causing flash flooding of rural roads and creeks.
4/19/2011 thru 4/20/2011	n/a	- Havana - Mason City^	1.25 – 2.08 in.	n/a	n/a	n/a	- COOP observers measured: • 2.08 inches at Havana • 1.25 inches 2 miles north of Mason City
4/22/2011 thru 4/23/2011	n/a	- Havana - Mason City^	1.54 – 1.68 in.	n/a	n/a	n/a	- COOP observers measured: • 1.68 inches 2 miles north of Mason City • 1.54 inches at Havana
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 52 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
5/25/2011 thru 5/26/2011	n/a	- Havana - Mason City^	1.02 – 2.70 in.	n/a	n/a	n/a	- COOP observers measured: • 2.70 inches at Havana • 1.02 inches 2 miles north of Mason City
6/14/2011 thru 6/15/2011	n/a	- Havana - Mason City^ - Manito - Northern Portion of the County	1.48 – 2.40 in.	n/a	n/a	n/a	- COOP observers measured: • 2.40 inches at Havana • 1.48 inches 2 miles north of Mason City - Heavy rain fell across northern Mason County producing more than 2 inches in less than 90 minutes causing flash flooding. - Many streets in Manito were flooded.
6/26/2011 thru 6/27/2011	n/a	- Havana - Mason City^	1.95 – 2.18 in.	n/a	n/a	n/a	- COOP observers measured: • 2.18 inches at Havana • 1.95 inches 2 miles north of Mason City
9/19/2011	n/a	- Havana	1.90 in.	n/a	n/a	n/a	- COOP observer measured 1.90 inches at Havana
11/3/2011 thru 11/4/2011	n/a	- Havana	1.75 in.	n/a	n/a	n/a	- COOP observer measured 1.75 inches at Havana
12/14/2011 thru 12/15/2011	n/a	- Havana	1.90 in.	n/a	n/a	n/a	- COOP observer measured 1.90 inches at Havana
9/1/2012 thru 9/2/2012	n/a	- Havana - Mason City^	2.30 – 2.76 in.	n/a	n/a	n/a	- COOP observers measured: • 2.76 inches at Havana • 2.30 inches 4 miles southeast of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 53 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
10/13/2012	7:00 a.m.	- Havana - Mason City^	1.95 – 2.73 in.	n/a	n/a	n/a	- COOP observers measured: • 2.73 inches 4 miles southeast of Mason City • 1.95 inches at Havana
1/29/2013	4:00 p.m.	- Havana - Mason City^	1.53 – 1.58 in.	n/a	n/a	n/a	- COOP observers measured: • 1.58 inches at Havana • 1.53 inches 4 miles southeast of Mason City
3/10/2013 thru 3/11/2013	n/a	- Havana	1.98 in.	n/a	n/a	n/a	- COOP observer measured 1.98 inches at Havana
4/10/2013	8:00 p.m.	- Havana - Mason City^	2.13 – 2.20 in.	n/a	n/a	n/a	- COOP observers measured: • 2.20 inches at Havana • 2.13 inches 4 miles southeast of Mason City
4/18/2013	n/a	- Havana	2.10 in.	n/a	n/a	n/a	- COOP observer measured 2.10 inches at Havana
5/2/2013 thru 5/3/2013	7:00 p.m.	- Havana - Mason City^	1.44 – 2.80 in.	n/a	n/a	n/a	- COOP observers measured: • 2.80 inches at Havana • 1.44 inches 4 miles southeast of Mason City
5/20/2013 thru 5/21/2013	n/a	- Havana	2.00 in.	n/a	n/a	n/a	- COOP observer measured 2.00 inches at Havana
5/25/2013 thru 5/27/2013	n/a	- Havana - Mason City^	3.00 – 4.30 in.	n/a	n/a	n/a	- COOP observers measured: • 4.30 inches at Havana • 3.00 inches 4 miles southeast of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Figure 14
(Sheet 54 of 54)
Severe Storms – Heavy Rain Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Deaths	Property Damage	Description
5/30/2013 thru 6/1/2013	7:00 p.m.	- Havana - Mason City^	2.14 – 3.15 in.	n/a	n/a	n/a	- COOP observers measured: • 3.15 inches at Havana • 2.14 inches 2 miles north of Mason City
6/26/2013	n/a	Havana	1.65 in.	n/a	n/a	n/a	- COOP observer measured 1.65 inches at Havana
7/10/2013	8:00 a.m.	Mason City^	1.87 in.	n/a	n/a	n/a	- COOP observer measured 1.87 inches 2 miles north of Mason City
Subtotal:				**0**	**0**	**$0**	

^ Heavy rain event verified in the vicinity of this location(s).

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Image and Publications System, COOP Data / Record of Climatological Observations.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

3.2 SEVERE WINTER STORMS (SNOW & ICE) AND EXTREME COLD

IDENTIFYING THE HAZARD

What is the definition of a severe winter storm?

A severe winter storm can range from moderate snow over a few hours to significant accumulations of sleet and/or ice to blizzard conditions with blinding wind-driven snow that last several days. The amount of snow or ice, air temperature, wind speed and event duration all influence the severity and type of severe winter storm that results. In general there are three types of severe winter storms: blizzards, heavy snow storms and ice storms. The following provides a brief description of each type.

- **Blizzards.** Blizzards are characterized by strong winds of at least 35 miles per hour and are accompanied by considerable falling and/or blowing snow that reduces visibility to ¼ mile or less for at least three hours. Blizzards are the most dangerous of all winter storms.
- **Heavy Snow Storms.** A heavy snow storm occurs when a winter storm produces snowfall accumulations of four inches or more in 12 hours or less or six inches or more in 24 hours or less.
- **Ice Storms.** An ice storm occurs when substantial accumulations of ice, generally ¼ inch or more, build up on the ground, trees and utility lines as a result of freezing rain.

While extreme cold (i.e., dangerously low temperatures and wind chill values) often accompanies or is left in the wake of a severe winter storm, the National Weather Service (NWS) does not use it to define a severe winter storm. However, a discussion of extreme cold is included in this section since it has the ability to cause property damage, injuries and even fatalities (whether or not it is accompanied by freezing rain, ice or snow).

What is snow?

Snow is precipitation in the form of ice crystals. These ice crystals are formed directly from the freezing of water vapor in wintertime clouds. As the ice crystals fall toward the ground, they cling to each other creating snowflakes. Snow will only fall if the temperature remains at or below 32°F from the cloud base to the ground.

What is sleet?

Sleet is precipitation in the form of ice pellets. These ice pellets are composed of frozen or partially frozen rain drops or refrozen partially melted snowflakes. Sleet typically forms in winter storms when snowflakes partially melt while falling through a thin layer of warm air. The partially melted snowflakes then refreeze and form ice pellets as they fall through the colder air mass closer to the ground. Sleet usually bounces after hitting the ground or other hard surfaces and does not stick to objects.

What is freezing rain?

Freezing rain is precipitation that falls in the form of a liquid (i.e., rain drops), but freezes into a glaze of ice upon contact with the ground or other hard surfaces. This occurs when snowflakes

descend into a warmer layer of air and melt completely. When the rain drops that result from this melting fall through another thin layer of freezing air just above the surface they become "supercooled", but they do not have time to refreeze before reaching the ground. However, because the rain drops are "supercooled", they instantly refreeze upon contact with anything that is at or below 32°F (i.e., the ground, trees, utility lines, etc.).

What is the wind chill?

The wind chill, or wind chill factor, is a measure of the rate of heat loss from exposed skin resulting from the combined effects of wind and temperature. As the wind increases, heat is carried away from the body at a faster rate, driving down both the skin temperature and eventually the internal body temperature.

The unit of measurement used to describe the wind chill factor is known as the wind chill temperature. The wind chill temperature is calculated using a formula. **Figure 24** identifies the formula and calculates the wind chill temperatures for certain air temperatures and wind speeds.

Figure 24
Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Source: NOAA, National Weather Service.

As an example, if the air temperature is 5°F and the wind speed is 20 miles per hour, then the wind chill temperature would be -15°F. The wind chill temperature is only defined for air temperatures at or below 50°F and wind speeds above three miles per hour. In addition, the wind chill temperature does not take into consideration the effects of bright sunlight which may increase the wind chill temperature by 10°F to 18°F.

Use of the current Wind Chill Temperature (WCT) index was implemented by the NWS on November 1, 2001. The new WCT index was designed to more accurately calculate how cold air feels on human skin. The new index uses advances in science, technology and computer modeling to provide an accurate, understandable and useful formula for calculating the dangers from winter winds and freezing temperatures. The former index was based on research done in 1945 by Antarctic researchers Siple and Passel.

Exposure to extreme wind chills can be life threatening. As wind chills edge toward -19°F and below, there is an increased likelihood that exposure will lead to individuals developing cold-related illnesses.

What cold-related illnesses are associated with severe winter storms and extreme cold?

Frostbite and hypothermia are both cold-related illnesses that can result when individuals are exposed to dangerously low temperatures and wind chills during severe winter storm and extreme cold events. The following provides a brief description of the symptoms associated with each.

- **Frostbite.** During exposure to extremely cold weather the body reduces circulation to the extremities (i.e., feet, hands, nose, cheeks, ears, etc.) in order to maintain its core temperature. If the extremities are exposed, then this reduction in circulation coupled with the cold temperatures can cause the tissue to freeze.

  Frostbite is characterized by a loss of feeling and a white or pale appearance. At a wind chill of -19°F, exposed skin can freeze in as little as 30 minutes. Seek medical attention immediately if frostbite is suspected. It can permanently damage tissue and in severe cases can lead to amputation.

- **Hypothermia.** Hypothermia occurs when the body's temperature begins to fall because it is losing heat faster than it can produce it. If an individual's body temperature falls below 95°F, then hypothermia has set in and immediate medical attention should be sought.

  Hypothermia is characterized by uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness and exhaustion. Left untreated, hypothermia will lead to death. Hypothermia occurs most commonly at very cold temperatures, but can occur at cool temperatures (above 40°F) if an individual isn't properly clothed or becomes chilled.

Are alerts issued for severe winter storms?

Yes. The National Weather Service Weather Forecast Office in Lincoln, Illinois is responsible for issuing ***winter storm watches*** and ***warnings*** for Mason County depending on the weather conditions. The following provides a brief description of each type of alert.

- **Watch.** Winter watches are issued when severe winter weather is possible in the next 1 to 2 days. Winter watches are issued for blizzards, winter storms with heavy snow, sleet or a combination of heavy snow, sleet and icing and extreme wind chill values.

- **Advisories.** Winter advisories are issued for winter weather events that will most likely cause significant inconvenience especially to motorist, but should not be life-threatening

if caution is exercised. The following advisories will be issued when an event is occurring, is imminent or has a high probability of occurring.

- **Freezing Rain Advisory.** A freezing rain advisory is issued when freezing rain will produce light icing with accumulations less than ¼ inch.
- **Winter Weather Advisory.** A winter weather advisory is issued for:
  - three to six inches of snow;
  - sleet resulting in less than ½ inch of accumulation; or
  - blowing and/or drifting snow or a combination of winter weather.
- **Wind Chill Advisory.** A wind chill advisory is issued when the wind chill values are expected to be between -15°F and -24°F.

➢ **Warnings.** The following winter weather warnings are issued when severe winter weather conditions are imminent within the next 12 to 24 hours. Individuals are advised to avoid travel and stay indoors.

- **Blizzard Warning.** A blizzard warning is issued when sustained winds or frequent gusts of 35 mph or more are accompanied by falling/blowing/drifting snow that frequently reduces visibility to less than ¼ mile for three hours or more.
- **Ice Storm Warning.** An ice storm warning is issued when freezing rain will result in ¼ inch or more of ice accumulation.
- **Winter Storm Warning.** A winter storm warning is issued for:
  - six inches or more of snow;
  - ½ inch or more of sleet accumulation; or
  - A combination of heavy snow, sleet, icing and/or blowing snow.
- **Wind Chill Warning.** A wind chill warning is issued when wind chill values are expected to be -25°F or below.

PROFILING THE HAZARD

When have severe winter storms and extreme cold occurred previously? What is the extent of these previous severe winter storms and extreme cold events?

Figures 25 and **26**, located at the end of this section, summarize the previous occurrences as well as the extent or magnitude of severe winter storms (snow & ice) and extreme cold events recorded in Mason County.

Severe Winter Storms & Extreme Cold Events
Fast Facts – Occurrences

Number of Severe Winter Storms Reported (1950 – 2013): ***109***
Number of Extreme Cold Events Reported (1996 – 2013): ***3***
Maximum One-Day Snow Accumulation: ***16 inches (Feb. 2, 2011)***
Coldest Temperature Recorded in the County: ***-30°F (Jan. 5, 1999)***
Most Likely Month for Severe Winter Storms to Occur: ***February***
Most Likely Time for Severe Winter Storms to Occur: ***Morning***

Severe Winter Storms

NOAA's Storm Events Database, National Weather Service COOP Data records, the Illinois State Water Survey, records from the National Weather Service Central Illinois Weather Forecast Office in Lincoln and Planning Committee member records were used to document 109 reported occurrences of severe winter storms (snow, ice and/or a combination of both) in

Mason County between 1950 and 2013. Of the 109 occurrences, 95 were heavy snow storms or blizzards, eight were ice storms and six were a combination of freezing rain, sleet, ice and snow.

Since 1995, at least one severe winter storm has occurred every year in Mason County with the exception of 2001. Anecdotal information shared by long-time residents suggests that severe winter storms have occurred with similar frequency between 1950 and 1995.

Figure 27 charts the reported occurrences of severe winter storms by month. Of the 109 events, 57 (52%) took place in January and February. Of these 57 events, 29 (51%) occurred during February, making this the peak month for severe winter storms. There were four events that spanned two months; however for illustration purposes only the month the event started in is graphed.

Figure 27
Severe Winter Storms by Month
1950 – 2013

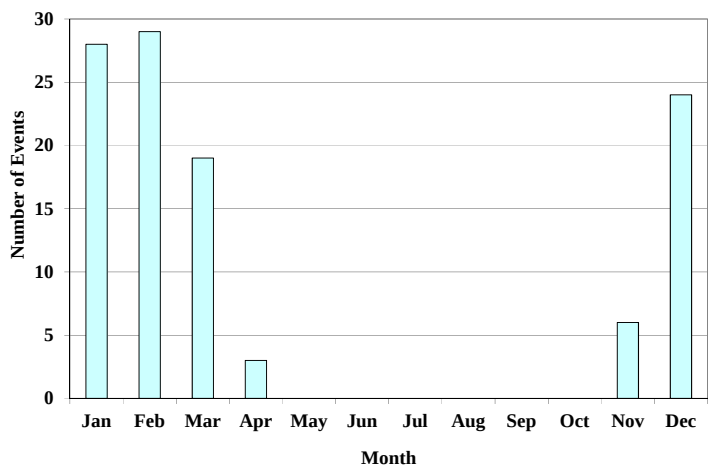
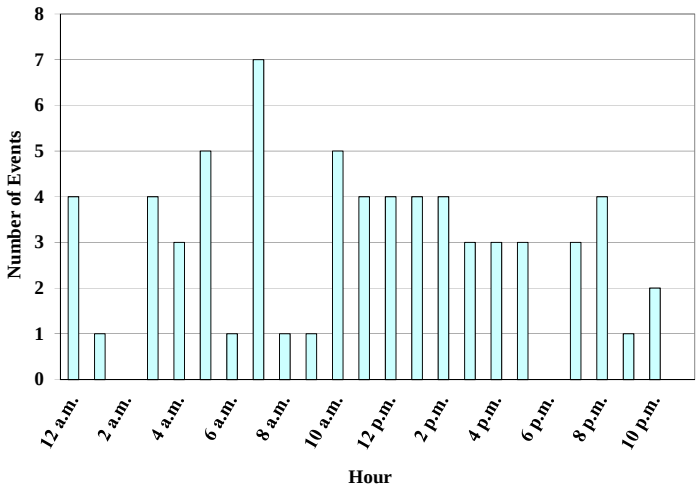


Figure 28 charts the reported occurrences of severe winter storms by hour. Of the 109 occurrences, start times were unavailable for 42 events. Of the remaining 67 severe winter storm events with recorded times, approximately 54% began during the a.m. hours, with 21 (31%) beginning between 3 a.m. and 9 a.m.

According to the National Weather Service Central Illinois Weather Forecast Office in Lincoln, the maximum one-day snow accumulation total recorded over the last 95 years in Mason County was 16.0 inches which occurred at or near Havana on February 2, 2011. The heaviest seasonal snowfall on record for Mason County is 69.5 inches which occurred during the winter of 1981-1982, the second heaviest seasonal snowfall on record is 60.5 inches which occurred during the winter of 1977-1978.

Figure 28
Severe Winter Storms by Hour
1950 – 2013



Extreme Cold

NOAA's Storm Events Database was used to document three occurrences of extreme cold (dangerously low temperatures and wind chill values) in Mason County between 1996 and 2013. Of the three occurrences, one followed a recorded severe winter storm. Two of the three events (66%) took place in January and the remaining event took place in February. All of the events began during the a.m. hours.

According to the Midwestern Regional Climate Center and the National Weather Service COOP records from 1893 through 2003, the coldest temperature recorded in Mason County was -30°F at Havana on January 5, 1999.

What locations are affected by severe winter storms and extreme cold?

Severe winter storms and extreme cold affect the entire County. All communities in Mason County have been affected by severe winter storms and extreme cold. Severe winter storms and extreme cold generally extend across the entire County and affect multiple locations. The *2013 Illinois Natural Hazard Mitigation Plan* prepared by IEMA classifies the Mason County's hazard rating for severe winter storms as "high."

Do any of the participating municipalities have designated warming centers?

Yes. Three of the nine participating municipalities have designated warming centers. A "designated" warming center is identified as any facility that has been *formally* identified by the municipality (through emergency planning, resolution, Memorandum of Agreement, etc.) as a location available for use by residents during severe winter storms and extreme cold events. **Figure 29** identifies the location of each warming center by jurisdiction. The County is also served by one state-designated warming center located at the Illinois Department of Human Services office, 323 W. Main Street in Havana.

Figure 29
Designated Warming Centers by Participating Municipality

Name/Address	Name/Address
Bath	*Manito*
Community Center, 205 E. First St.	Forman Fire Department, 205 N. Broadway St.
Easton	Forman Center, 308 S. Harrison St.
---	*Mason City*
Forest City	---
---	*San Jose*
Havana	---
Havana Fire & Police Building, 226 W. Market St.	*Topeka*
Kilbourne	---

What is the probability of future severe winter storms and extreme cold events occurring?

Severe Winter Storms

Mason County has had 109 verified occurrences of severe winter storms between 1950 and 2013. With 109 occurrences over the past 64 years, Mason County should expect at least one severe winter storm each year. There were 26 years over the past 64 years where two or more severe winter storms occurred. This indicates that the probability that more than one severe winter storm may occur during any given year within the County is 41%.

Extreme Cold

Given the limited amount of data available for extreme cold events, it is difficult to establish a precise probability; however, Mason County should expect to experience extreme cold events again in the future.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to severe winter storms and extreme cold?

Yes. All of Mason County, including the participating municipalities, is vulnerable to the dangers presented by severe winter storms and extreme cold. Severe winter storms are among the most frequently occurring natural hazards in Illinois. Since 2004, Mason County has experienced 21 severe winter storms and extreme cold events. Severe winter storms have immobilized portions of the County, blocking roads; downing power lines, trees and branches; causing power outages and property damage; and contributing to vehicle accidents. In addition, the County and municipalities must budget for snow removal and de-icing of roads and bridges as well as for roadway repairs.

Snow from the February 2011 blizzard blocks a truck in on Market Street in Havana.

Photograph courtesy of The Mason County Democrat

What impacts resulted from the recorded severe winter storms and extreme cold events?

The following summarize the impacts of severe winter storms and extreme cold events recorded in Mason County.

While severe winter storms and extreme cold occur regularly in Mason County, the number of injuries and fatalities is very low. Even taking into consideration the potential for hazardous driving conditions, snow-removal related injuries and power outages that could leave individuals vulnerable to hypothermia, the risk to public health and safety from severe winter storms is seen as relatively low.

Severe Winter Storms & Extreme Cold Events
Fast Facts – Impacts/Risk

Severe Winter Storm (Snow & Ice) Impacts
- Total Property Damage: ***$120,000***^
- Infrastructure/Critical Facilities Damage*: ***$10,000***
- Injuries: ***0***
- Fatalities: ***0***

Extreme Cold Impacts
- Total Property Damage: ***n/a***
- Infrastructure/Critical Facilities Damage*: ***n/a***
- Injuries: ***0***
- Fatalities: ***0***

Severe Winter Storm Risk/Vulnerability to:
- Public Health & Safety: ***Low***
- Buildings/Infrastructure/Critical Facilities: ***Medium***

^ Included in the property damage total is $110,000 for the December 2008 ice storm and February 2011 blizzard which represent losses sustained by three or more counties (including Mason County). A detailed breakdown by county was not available.

* Infrastructure/Critical Facilities Damage totals are included in the Total Property Damage amounts.

Severe Winter Storms

Data obtained from NOAA's Storm Events Database and Planning Committee member records indicates that between 1950 and 2013, two severe winter storms caused $120,000 in property damage. Included in the property damage total is $100,000 for the December 18, 2008 ice storm which represents losses sustained in three counties (including Mason County) and $10,000 for the February 1, 2011 blizzard which represents losses sustained by five counties (including Mason County). A detailed breakdown of the damages by county was unavailable for either event. Property damage information was either unavailable or none was recorded for the remaining 107 reported occurrences of severe winter storms.

In comparison, the State of Illinois has averaged an estimated $102 million annually in property damage losses from severe winter storms since 1950, ranking severe winter storms second only to flooding in terms of economic loss. While behind floods in terms of the amount of property damage caused, severe winter storms have a greater ability to immobilize larger areas, with rural areas being particularly vulnerable.

Included in the total property damage figure provided above is $10,000 in verified infrastructure and critical facilities damage sustained by the County Highway Department and the Village of Bath as a result of the February 2011 blizzard. The County Highway department spent $7,000 to repair damaged sustained by highway department trucks, grader, etc. while Bath spent $3,000 to provide emergency protective measures, including snow removal. This event was part of a federally-declared disaster.

No injuries or fatalities were reported as a result of any of the recorded severe winter storms.

Extreme Cold

Damage information was either unavailable or none was recorded for any of the reported extreme cold events. In addition, no injuries or fatalities were reported.

What other impacts can result from severe winter storms and extreme cold events?

In Mason County, the largest risk to health and safety from severe winter storms and extreme cold is vehicle accidents which account for the majority of severe winter storm injuries and fatalities. Traffic accident data assembled by the Illinois Department of Transportation shows that between 2008 and 2012 hazardous driving conditions (i.e., reduced visibility, icing road conditions, strong winds, etc.) caused by snow and ice were present for 8.6% to 14.8% of all crashes recorded annually in the County. **Figure 30** provides a breakdown by year of the number of crashes and corresponding injuries and fatalities that occurred when treacherous road conditions caused by snow and ice were present.

Figure 30
Severe Winter Weather Crash Data for Mason County

Year	Total # of Crashes	Presence of Treacherous Road Conditions caused by Snow and Ice		
		# of Crashes	# of Injuries	# of Fatalities
2008	380	46	6	0
2009	332	36	15	0
2010	263	39	14	0
2011	245	29	2	0
2012	255	22	5	0
Total:	**1,475**	**172**	**42**	**0**

Source: Illinois Department of Transportation.

Persons who are outdoors during and immediately following severe winter storms and extreme cold events can experience other health and safety problems. Frostbite to hands, feet, ears and nose and hypothermia are common injuries. Treacherous walking conditions also lead to falls which can result in serious injuries, including fractures and broken bones, especially in the elderly. Over exertion from shoveling driveways and walks can lead to life-threatening conditions such as heart attacks in middle-aged and older adults who are susceptible.

Are existing buildings, infrastructure and critical facilities vulnerable to severe winter storms and extreme cold events?

Yes. All existing buildings, infrastructure and critical facilities located in Mason County and the participating municipalities are vulnerable to damage from severe winter storms and extreme cold. The following summarize the vulnerabilities by severe winter storms and extreme cold events .

Based on the frequency with which severe winter storms and extreme cold events occur in Mason County, the amount of property damage previously reported and the potential for disruptions to power distribution and communication; the risk or vulnerability to buildings, infrastructure and critical facilities from severe winter storms is medium.

Severe Winter Storm

Structural damage to buildings caused by severe winter storms (snow and ice) is very rare, but can occur particularly to flat rooftops. Information gathered from Mason County residents indicates that snow and ice accumulations on communication and power lines as well as key roads presents the greatest vulnerability to infrastructure and critical facilities within the County. Snow and ice accumulations on lines often lead to disruptions in communications and create power outages. Depending on the damage, it can take anywhere from several hours to several days to restore service.

Snow plows work to clear streets, drives and parking lots following the February 2011 blizzard.

Photograph courtesy of The Mason County Democrat

In addition to affecting communication and power lines, snow and ice accumulations on state and local roads hampers travel and can cause dangerous driving conditions. Blowing and drifting snow can lead to road closures and increases the risk of automobile accidents. Even small accumulations of ice can be extremely dangerous to motorists since bridges and overpasses freeze before other surfaces.

When transportation is disrupted, schools close, emergency and medical services are delayed, some businesses close and government services can be affected. When a severe winter storm hits there is also an increase in cost to the County and municipalities for snow removal and de-icing. Road resurfacing and pothole repairs are additional costs incurred each year as a result of severe winter storms.

Extreme Cold

Extreme cold events can also have a detrimental impact on buildings, infrastructure and critical facilities. Pipes and water mains are especially susceptible to freezing during extreme cold events. This freezing can lead to cracks or ruptures in the pipes in buildings as well as in buried service lines and mains. As a result, flooding can occur as well as disruptions in service. Since most buried service lines and water mains are located under local streets and roads, fixing a break requires portions of the street or road to be blocked off, excavated and eventually repaired. These activities can be costly and must be carried out under less than ideal working conditions.

Are future buildings, infrastructure and critical facilities vulnerable to severe winter storms and extreme cold events?

Yes and No. While four of the participating municipalities have building codes in place that will likely help lessen the vulnerability of new buildings and critical facilities to damage from severe winter storms and extreme cold, the County and five other municipalities do not.

Infrastructure such as new communication and power lines will continue to be vulnerable to severe winter storms, especially to ice accumulations, as long as they are located above ground. Rural areas of Mason County have experienced extended periods without power due to severe

winter storms. Steps to bury all new lines would eliminate the vulnerability, but this action would be cost prohibitive in most areas. In terms of new roads and bridges, there is very little that can be done to reduce or eliminate their vulnerability to severe winter storms.

What are the potential dollar losses to vulnerable structures from severe winter storms?

Unlike other natural hazards, such as tornadoes, there are no standard loss estimation models or methodologies for severe winter storms and extreme cold events. With only two of the 112 recorded events listing property damage numbers for severe winter storms and extreme cold, there is no way to accurately estimate future potential dollar losses. Since all existing structures within Mason County are vulnerable to damage, it is likely that there will be future dollar losses from severe winter storms and extreme cold.

Figure 25
(Sheet 1 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
3/10/1951 thru 3/12/1951	10:00 a.m.	Heavy Snow	- Havana COOP observer measured 9.5 inches of snow - Havana No. 2 COOP observer measured 5.5 inches of snow	n/a	n/a	n/a
12/21/1953 thru 12/22/1953	8:00 p.m.	Heavy Snow	- Havana No. 2 COOP observer measured 5.8 inches of snow - Havana COOP observer measured 4.0 inches of snow	n/a	n/a	n/a
3/2/1954	10:00 a.m.	Heavy Snow	- Havana COOP observer measured 6.5 inches of snow - Havana No. 2 COOP observer measured 6.0 inches of snow	n/a	n/a	n/a
12/8/1956	4:30 a.m.	Heavy Snow	Havana COOP observer measured 7.0 inches of snow	n/a	n/a	n/a
3/24/1957 thru 3/25/1957	9:00 p.m.	Heavy Snow	Havana COOP observer measured 6.0 inches of snow	n/a	n/a	n/a
1/20/1959 thru 1/21/1959	5:30 a.m.	Heavy Snow	- Havana COOP observer measured 10.0inches of snow - Havana No. 2 COOP observer measured 7.5 inches of snow	n/a	n/a	n/a
2/20/1960 thru 2/21/1960	2:00 p.m.	Heavy Snow	Havana and Havana No. 2 COOP observers measured 5.0 inches of snow respectively	n/a	n/a	n/a
2/23/1960 thru 2/25/1960	4:00 p.m.	Heavy Snow	- Havana No. 2 COOP observer measured 8.0 inches of snow - Havana COOP observer measured 6.5 inches of snow	n/a	n/a	n/a
3/8/1960 thru 3/9/1960	8:00 p.m.	Heavy Snow	- Havana COOP observer measured 6.0 inches of snow - Havana No. 2 COOP observer measured 4.0 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 2 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
3/15/1960 thru 3/17/1960	8:00 p.m.	Heavy Snow	- Havana COOP observer measured 8.5 inches of snow - Havana No. 2 COOP observer measured 6.0 inches of snow	n/a	n/a	n/a
2/2/1961 thru 2/3/1961	11:00 a.m.	Blizzard	- Strong winds and nearly 5.0 inches of snow produced extensive drifting and blizzard conditions across the County - Havana No. 2 COOP observer measured 4.5 inches of snow - Havana COOP observer measured 4.1 inches of snow	n/a	n/a	n/a
1/6/1962	n/a	Heavy Snow	- Havana COOP observer measured 5.0 inches of snow - Havana No. 2 COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
1/23/1962 thru 1/24/1962	7:00 a.m.	Heavy Snow	- Havana COOP observer measured 8.0 inches of snow - Havana No. 2 COOP observer measured 7.0 inches of snow	n/a	n/a	n/a
1/11/1964 thru 1/12/1964	4:30 a.m.	Heavy Snow	Havana and Havana No. 2 COOP observers measured 6.0 inches of snow respectively	n/a	n/a	n/a
3/4/1964 thru 3/5/1964	11:00 a.m.	Heavy Snow	Havana No. 2 COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
3/11/1964	12:00 p.m.	Heavy Snow	Havana No. 2 COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
11/29/1964	3:30 a.m.	Heavy Snow	- Havana No. 2 COOP observer measured 5.0 inches of snow - Havana COOP observer measured 4.0 inches of snow	n/a	n/a	n/a
12/2/1964 thru 12/4/1964	10:30 a.m.	Heavy Snow	- Havana No. 2 COOP observer measured 9.0 inches of snow - Havana COOP observer measured 8.1 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 3 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
2/24/1965 thru 2/25/1965	2:00 p.m.	Heavy Snow	- Havana COOP observer measured 8.0 inches of snow - Havana No. 2 COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
3/2/1965 thru 3/3/1965	3:00 p.m.	Heavy Snow	- Havana COOP observer measured 5.6 inches of snow - Havana No. 2 COOP observer measured 4.0 inches of snow	n/a	n/a	n/a
1/26/1967 thru 1/27/1967	3:00 a.m.	Heavy Snow	Mason City COOP observer measured 11.0 inches of snow	n/a	n/a	n/a
2/27/1969 thru 2/28/1969	10:30 p.m.	Heavy Snow	- Havana Power Station COOP observer measured 6.3 inches of snow - Mason City COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
2/10/1972 thru 2/11/1972	7:30 a.m.	Heavy Snow	- Havana Power Station COOP observer measured 6.0 inches of snow - Mason City COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
3/28/1972 thru 3/29/1972	4:00 p.m.	Heavy Snow	- Mason City COOP observer measured 6.0 inches of snow - Havana Power Station COOP observer measured 4.0 inches of snow	n/a	n/a	n/a
12/18/1973 thru 12/20/1973	n/a	Heavy Snow	Mason City COOP observer measured 10.0 inches of snow	n/a	n/a	n/a
2/23/1975 thru 2/24/1975	n/a	Heavy Snow	Mason City COOP observer measured 7.0 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 4 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
11/26/1975 thru 11/27/1975	4:30 a.m.	Heavy Snow	- Havana Power Station COOP observer measured 8.0 inches of snow - Mason City COOP observer measured 6.0 inches of snow	n/a	n/a	n/a
1/27/1977 thru 1/30/1977	n/a	Blizzard	7 inches of snow on the ground from previous snow events was blown around by a strong wind and produced blizzard conditions	n/a	n/a	n/a
11/26/1977 thru 11/27/1977	n/a	Heavy Snow	- Havana Power Station COOP observer measured 5.0 inches of snow - Mason City COOP observer measured 4.0 inches of snow	n/a	n/a	n/a
2/13/1978 thru 2/14/1978	5:00 a.m.	Heavy Snow	- Havana Power Station COOP observer measured 10.0 inches of snow - Mason City COOP observer measured 4.0 inches of snow	n/a	n/a	n/a
3/3/1978	7:00 a.m.	Heavy Snow	- Havana Power Station COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
3/24/1978 thru 3/27/1978	n/a	Ice Storm	Planning Committee members indicated that the ice damaged the electrical lines and that there were power disruptions for several days	n/a	n/a	n/a
12/31/1978 thru 1/1/1979	n/a	Heavy Snow	- Havana Rural COOP observer measured 6.0 inches of snow - Mason City COOP observer measured 4.0 inches of snow	n/a	n/a	n/a
1/12/1978 thru 1/14/1978	12:30 a.m.	Heavy Snow	- Havana Rural COOP observer measured 14.0 inches of snow - Mason City COOP observer measured 8.0 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 5 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
2/7/1979 thru 2/9/1979	n/a	Heavy Snow	Havana Rural COOP observer measured 5.5 inches of snow	n/a	n/a	n/a
2/5/1980	1:30 a.m.	Heavy Snow	Havana Rural COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
3/12/1980 thru 3/13/1980	n/a	Heavy Snow	- Havana Rural COOP observer measured 7.5 inches of snow - Mason City COOP observer measured 3.0 inches of snow	n/a	n/a	n/a
4/14/1980 thru 4/15/1980	12:00 a.m.	Heavy Snow	- Havana Rural COOP observer measured 7.5 inches of snow - Mason City COOP observer measured 6.0 inches of snow	n/a	n/a	n/a
11/27/1980 thru 11/28/1980	5:00 a.m.	Heavy Snow	- Mason City COOP observer measured 6.0 inches of snow - Havana Rural COOP observer measured 3.5 inches of snow	n/a	n/a	n/a
2/10/1981	12:00 a.m.	Heavy Snow	- Mason City COOP observer measured 11.0 inches of snow - Havana Rural COOP observer measured 9.0 inches of snow	n/a	n/a	n/a
12/17/1981	n/a	Heavy Snow	- Havana Rural COOP observer measured 8.0 inches of snow - Mason City COOP observer measured 4.0 inches of snow	n/a	n/a	n/a
12/31/1981 thru 1/1/1982	n/a	Heavy Snow	Havana Rural COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
1/15/1982 thru 1/16/1982	n/a	Heavy Snow	Havana Rural COOP observer measured 6.0 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 6 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
3/3/1982 thru 3/4/1982	1:00 p.m.	Heavy Snow	Havana Rural COOP observer measured 5.5 inches of snow	n/a	n/a	n/a
4/8/1982 thru 4/9/1982	n/a	Heavy Snow	- Havana Rural COOP observer measured 7.5 inches of snow - Mason City COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
3/19/1983 thru 3/21/1983	8:00 a.m.	Heavy Snow	Havana Rural COOP observer measured 6.0 inches of snow	n/a	n/a	n/a
2/28/1984	7:30 a.m.	Heavy Snow	- Havana Rural COOP observer measured 6.0 inches of snow - COOP observer indicated in his notes that there were high winds and 6 foot drifts	n/a	n/a	n/a
2/10/1985 thru 2/11/1985	n/a	Heavy Snow	Havana Rural COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
2/21/1986	7:00 a.m.	Heavy Snow	- Havana Rural COOP observer measured 5.0 inches of snow - Mason City COOP observer measured 4.0 inches of snow	n/a	n/a	n/a
2/23/1986 thru 2/24/1986	n/a	Heavy Snow	- Havana Rural COOP observer measured 8.5 inches of snow - Mason City COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
1/9/1987 thru 1/10/1987	n/a	Heavy Snow	- Havana Rural COOP observer measured 8.5 inches of snow - Mason City COOP observer measured 6.0 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 7 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
1/18/1987 thru 1/19/1987	n/a	Heavy Snow	- Havana Rural COOP observer measured 16.0 inches of snow - Mason City COOP observer measured 8.0 inches of snow	n/a	n/a	n/a
12/14/1987 thru 12/15/1987	n/a	Blizzard	- High winds in excess of 50 mph accompanied the snow to produce blizzard conditions across the County - Havana Rural COOP observer measured 8.0 inches of snow - Mason City COOP observer measured 6.5 inches of snow	n/a	n/a	n/a
2/4/1988	n/a	Heavy Snow	Havana Rural COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
2/10/1988 thru 2/11/1988	n/a	Heavy Snow	- Havana Rural COOP observer measured 9.0 inches of snow - Mason City COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
12/27/1988	n/a	Heavy Snow	- Havana Rural COOP observer measured 6.4 inches of snow - Mason City COOP observer measured 4.5 inches of snow	n/a	n/a	n/a
2/4/1989 thru 2/5/1989	n/a	Heavy Snow	Havana Rural and Mason City COOP observers measured 5.0 inches of snow respectively	n/a	n/a	n/a
2/20/1989 thru 2/21/1989	n/a	Heavy Snow	- Havana Rural COOP observer measured 6.0 inches of snow - Mason City COOP observer measured 4.5 inches of snow	n/a	n/a	n/a
1/25/1990 thru 1/26/1990	n/a	Heavy Snow	- Havana Rural COOP observer measured 7.5 inches of snow - Mason City COOP observer measured 3.0 inches of snow	n/a	n/a	n/a
1/5/1991	n/a	Heavy Snow	- Havana Rural COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
1/10/1993	n/a	Heavy Snow	Havana Rural and Mason City COOP observers measured 5.0 inches of snow respectively	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 8 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
2/16/1993	n/a	Heavy Snow	- Havana Rural COOP observer measured 5.0 inches of snow - Mason City COOP observer measured 4.0 inches of snow	n/a	n/a	n/a
2/25/1993 thru 2/26/1993	n/a	Heavy Snow	- Havana Rural COOP observer measured 8.5 inches of snow - Mason City COOP observer measured 4.5 inches of snow	n/a	n/a	n/a
2/22/1993 thru 2/25/1993	n/a	Heavy Snow	- Havana Rural COOP observer measured 12.0 inches of snow - Mason City COOP observer measured 6.0 inches of snow	n/a	n/a	n/a
12/18/1995 thru 12/19/1995	7:00 p.m.	Winter Storm	- Heavy rains on the evening of the 18th changed to freezing rain overnight before changing to all snow by the morning of the 19th - Numerous accidents were reported - Numerous power lines were knocked down throughout central Illinois due to the freezing rain and strong winds of 20 to 30 mph - Strong winds also caused considerable blowing and drifting of snow closing some roads - Mason City COOP observer measured 2.0 inches of snow - 1 fatality was recorded over a 24 county area (including Mason County)	n/a	n/a	n/a
1/18/1996 thru 1/19/1996	10:00 a.m.	Winter Storm	- Thunderstorms moved through the area on the 18th and as the day progressed the temperatures dropped quickly causing the rain to change to ice and then snow - Numerous power outages and minor accidents were reported - Gusty winds of 25 to 35 mph created wind chills near -40ºF across most of central Illinois	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 9 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
1/8/1997 thru 1/9/1997	n/a	Heavy Snow	- Havana Rural COOP observer measured 6.3 inches of snow - Mason City COOP observer measured 5.5 inches of snow - Numerous accidents were reported throughout central Illinois - 6 minor injuries were recorded over a 24 county area (including Mason County) – a detailed breakdown by county was unavailable	n/a	n/a	n/a
1/15/1997 thru 1/17/1997	3:00 a.m.	Winter Storm	- A winter storm brought 4 to 6 inches of snow to a large part of central Illinois north of I-70 - Havana Rural COOP observer measured 6.3 inches of snow - Mason City COOP observer measured 5.5 inches of snow - Following the storm the winds picked up to between 20 and 30 mph with higher gusts, causing near whiteout conditions - Temperatures fell below zero across the entire area and wind chill readings dipped well below -40ºF in many locations - Numerous accidents were reported - 6 minor injuries, 1 serious injury and 1 fatality were recorded over a 24 county area (including Mason County) – a detailed breakdown by county was unavailable	n/a	n/a	n/a
1/24/1997	7:00 a.m.	Winter Storm	- Rain freezing rain, sleet and snow - The storm caused numerous accidents though no injuries were reported - Mason City COOP observer reported ice pellets and glaze ice	n/a	n/a	n/a
1/26/1997 thru 1/27/1997	5:00 a.m.	Heavy Snow	- Havana Rural COOP observer measured 8.1 inches of snow and reported ice pellets and glaze ice - Mason City COOP observer measured 6.5 inches of snow - Numerous accidents were reported, especially during the morning of the 27th - 9 minor injuries were recorded over a 24 county area (including Mason County) – a detailed breakdown by county was unavailable	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 10 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
4/11/1997	n/a	Heavy Snow	- Havana Rural COOP observer measured 10.8 inches of snow	n/a	n/a	n/a
12/9/1997 thru 12/10/1997	3:00 p.m.	Heavy Snow	- Havana Rural COOP observer measured 6.1 inches of snow - Mason City COOP observer measured 4.5 inches of snow - Numerous traffic accidents were reported	n/a	n/a	n/a
1/8/1998	5:00 a.m.	Heavy Snow	- Havana Rural COOP observer measured 7.2 inches of snow - Mason City COOP observer measured 4.0 inches of snow - Numerous traffic accidents were reported	n/a	n/a	n/a
1/14/1998	6:00 a.m.	Winter Storm	- Freezing rain, sleet and snow - Several traffic accidents were reported			
3/8/1998 thru 3/9/1998	10:00 p.m.	Winter Storm	- Havana Rural COOP observer measured 5.2 inches of snow - Mason City COOP observer measured 3.0 inches of snow - After the snow subsided, gusty winds up to 50 mph created near white-out conditions in most locations - Numerous accidents were reported - Dozens of minor injuries were recorded over a 24 county area (including Mason County) – a detailed breakdown by county was unavailable	n/a	n/a	n/a
12/30/1998 thru 12/31/1998	2:30 p.m.	Heavy Snow	- Havana Rural COOP observer measured 6.0 inches of snow - Mason City COOP observer measured 5.0 inches of snow	0	0	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 11 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
1/1/1999 thru 1/3/1999	12:00 p.m.	Heavy Snow	- Havana Rural COOP observer measured 15.0 inches of snow - Mason City COOP observer measured 8.0 inches of snow - Mason City Planning Committee members indicated that the City received 18 inches of snow - After the snow subsided, winds increased from the northwest and temperatures dropped, causing dangerous wind chills and treacherous driving conditions with extensive blowing and drifting - Many locations sustained temporary or extended power outages during the storm	n/a	n/a	n/a
3/8/1999 thru 3/9/1999	12:00 p.m.	Heavy Snow	- Havana Rural COOP observer measured 11.0 inches of snow - Mason City COOP observer measured 9.5 inches of snow - Dozens of accidents occurred throughout the area - 5 minor injuries were recorded over a 19 county area (including Mason County) – a detailed breakdown by county was unavailable	n/a	n/a	n/a
12/11/2000 thru 12/12/2000	n/a	Heavy Snow	- Havana Rural COOP observer measured 7.0 inches of snow - Mason City COOP observer measured 3.5 inches of snow	n/a	n/a	n/a
12/13/2000 thru 12/14/2000	n/a	Heavy Snow	- Havana Rural COOP observer measured 5.0 inches of snow - Mason City COOP observer measured 3.0 inches of snow	n/a	n/a	n/a
12/29/2000 thru 12/30/2000	n/a	Heavy Snow	- Mason City COOP observer measured 7.0 inches of snow - Havana Rural COOP observer measured 6.0 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 12 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
1/30/2002 thru 1/31/2002	10:00 a.m.	Ice Storm	- Approximately ¼ inch of ice accumulated across the extreme northern part of Mason County, around Manito and Sand Ridge State Forest - Several trees and power lines were downed from ice accumulations across the region with power disruptions lasting several hours to a couple of days	n/a	n/a	n/a
3/1/2002 thru 3/3/2002	5:00 p.m.	Heavy Snow	- Havana Rural COOP observer measured 5.0 inches of snow - Strong northwest winds, with gusts approaching 40 mph produced significant blowing and drifting - Most roads were snow and ice covered, with numerous traffic accidents reported	n/a	n/a	n/a
12/24/2002 thru 12/25/2002	12:00 p.m.	Heavy Snow	Havana Rural COOP observer measured 7.6 inches of snow	n/a	n/a	n/a
1/2/2003	12:00 a.m.	Heavy Snow	Havana Rural COOP observer measured 6.5 inches of snow	n/a	n/a	n/a
1/4/2003	n/a	Heavy Snow	Havana Rural COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
2/10/2003 thru 2/11/2003	n/a	Heavy Snow	Havana Rural COOP observer measured 7.0 inches of snow	n/a	n/a	n/a
2/14/2003 thru 2/16/2003	5:00 p.m.	Heavy Snow	- Havana Rural COOP observer measured 6.0 inches of snow - Winds of 30 to 50 mph caused major blowing and drifting snow across the area, with drifts as high as 3 to 5 feet	n/a	n/a	n/a
12/14/2003	9:00 a.m.	Heavy Snow	Havana Rural COOP observer measured 5.7 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 13 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
11/24/2004	3:00 p.m.	Winter Storm	- Havana Rural COOP observer measured 8.0 inches of snow - Sustained winds of 20 to 39 mph with gusts of 40 to 50 mph caused considerable blowing and drifting - High winds and the weight of the wet snow downed numerous trees and power lines	n/a	n/a	n/a
1/5/2005 thru 1/6/2005	1:00 p.m.	Ice Storm	- Ice accumulations of ¼ to ½ inch - Havana Rural COOP observer indicated that there was glaze ice present both days - Numerous reports of downed trees and power lines - Numerous traffic accidents	0	0	n/a
11/30/2006 thru 12/1/2006	7:30 a.m.	Winter Storm	- Freezing rain with ice accumulations of ¼ to 1 ½ inches, sleet accumulations of ½ to 2 ¼ inches and 8 to 15 inches of snow - Havana Rural COOP observer measures 14.6 inches of snow and indicated that there was glaze ice both days - Considerable tree and power line damage resulted from the storm, power was not restored across some locales for several days - Snow and ice covered roads also resulted in numerous traffic accidents	n/a	n/a	n/a
1/12/2007 thru 1/13/2007	4:00 p.m.	Ice Storm	- Freezing rain with ice accumulations of ¼ to ½ inch - Ice caused modest tree limb and power line damage - Numerous traffic accidents	n/a	n/a	n/a
2/12/2007 thru 2/14/2007	n/a	Blizzard	- Havana Rural COOP observer measured 12.0 inches of snow - Strong northerly winds gusting from 35 to 45 mph created blizzard conditions - Many locations reported snow drifts ranging from 3 to 6 feet, prompting the closure of many area roadways	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 14 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
2/24/2007	11:00 a.m.	Ice Storm	- Ice accumulations of ¼ inch were common - The accumulations were primarily a travel hazard	n/a	n/a	n/a
12/8/2007 thru 12/9/2007	1:00 p.m.	Ice Storm	- Freezing rain with the Mason City COOP observer measuring ¼ inch in ice accumulations - Many minor traffic accidents were reported on the ice roads	n/a	n/a	n/a
12/15/2007 thru 12/16/2007	n/a	Heavy Snow	Mason City COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
1/31/2008 thru 2/1/2008	2:00 p.m.	Heavy Snow	- Mason City COOP observer measured 9.0 inches of snow - Havana Rural COOP observer measured 5.5 inches of snow	n/a	n/a	n/a
12/18/2008 thru 12/19/2008	7:00 p.m.	Ice Storm	- ¼ to ¾ inch of ice accumulations - Widespread tree damage and power outages reported - Increasing west to northwest winds in the wake of the departing storm system resulted in additional downed tree branches and power outages	n/a	n/a	$100,000†
3/29/2009 thru 3/30/2009	n/a	Heavy Snow	Havana Rural COOP observer measured 5.0 inches of snow	n/a	n/a	n/a
1/6/2010 thru 1/7/2010	7:30 p.m.	Winter Storm	- Havana Rural COOP observer measured 6.0 inches of snow - Once the snow subsided gusty northwesterly winds created considerable blowing and drifting across the area	n/a	n/a	n/a
2/8/2010 thru 2/9/2010	n/a	Heavy Snow	- Havana Rural COOP observer measured 7.0 inches of snow - Mason City COOP observer measured 3.0 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$100,000†**

† The property damage total of $100,000 for the December 2008 ice storm represent losses sustained in 3 counties, including Mason County. A breakdown by county was not available.

Figure 25
(Sheet 15 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
12/12/2010 thru 12/13/2010	n/a	Blizzard	2 to 4 inches of snow with winds in excess of 35 mph produced blizzard conditions	n/a	n/a	n/a
2/1/2011 thru 2/2/2011	11:00 a.m.	Blizzard	- 1 to 2 inches of sleet along with 12 to 18 inches of snow accompanied by 45 to 55 mph winds produced blizzard conditions which resulted in drifts more than 7 feet high - Havana Rural COOP observer measured 16.0 inches of snow - Mason City COOP observer measured 12.4 inches of snow - Planning Committee members from Bath indicated that $3,000 was spent to provide emergency protective measures, including snow removal - The County Highway Engineer's records indicated that $7,000 was spent to repair damage sustained by highway department trucks, grader, etc. - Numerous traffic accidents and injuries were reported across central Illinois - Most county roads were closed and well as several interstates - All schools in the county were closed for at least 3 days - Power outages were widespread - This event was part of a federally-declared disaster (Declaration #1960)	n/a	n/a	$20,000^
12/20/2012	1:00 p.m.	Blizzard	- 1 to 2 inches of snow with winds gusting over 50 mph created blizzard conditions - Numerous traffic accidents were reported across the County	n/a	n/a	n/a
2/22/2013	n/a	Heavy Snow	Havana Rural COOP observer measured 5.5 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$20,000^**

^ Property damages totaling $10,000 for the February 2011 blizzard represent losses sustained in 5 counties, including Mason County. A breakdown by county was not available.

Figure 25
(Sheet 16 of 16)
Severe Winter Storms – Snow and Ice Events Reported in Mason County
1950 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
3/24/3013	3:00 a.m.	Heavy Snow	- Havana Rural COOP observer measured 11.2 inches of snow - Mason City COOP observer measured 9.0 inches of snow - Snow accumulations led to the closing of many area schools and businesses - Numerous traffic accidents were reported across the area	n/a	n/a	n/a
12/13/2013 thru 12/14/2013	5:00 p.m.	Heavy Snow	- Weather observer near Manito measured 5.5 inches of snow - Havana Rural COOP observer measured 5.0 inches of snow - Numerous traffic accidents were reported	n/a	n/a	n/a
12/21/2013 thru 12/22/2013	8:00 p.m.	Ice Storm	Weather observers measured between one-tenth and ¼ inch of freezing rain across Mason County, including ¼ inch near Manito	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**
GRAND TOTAL:				**0**	**0**	**$120,000[§]**

[§] Property damages totaling $110,000 represent losses sustained in three or more counties, including Mason County. A breakdown by county was not available.

Sources: Climate Atlas of Illinois.
Mason County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Member responses to Mason County Natural Hazard Events Questionnaire.
Illinois State Water Survey.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Image and Publications System, COOP Data / Record of Climatological Observations.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

Figure 26
Extreme Cold Events Reported in Mason County
1996 – 2013

Date(s)	Start Time	Event Type	Magnitude	Injuries	Deaths	Property Damages
2/2/1996 thru 2/4/1996	12:00 a.m.	Extreme Cold	- Bitterly cold weather swept across central Illinois causing many people to experience problems with cars and frozen pipes - COOP observer northeast of Havana measured actual temperatures ranging from 15°F to -10°F on the 2nd; -4°F to -18°F on the 3rd and -1°F to -15°F on the 4th	n/a	n/a	n/a
1/5/1999	5:00 a.m.	Extreme Cold	- Clear skies, light winds and thick snow cover set the stage for record cold morning temperatures across the region - COOP observer northeast of Havana recorded a low temperature of -30°F - COOP observer west of Mason City recorded a low temperature of -21°F	n/a	n/a	n/a
1/15/2009 thru 1/16/2009	12:00 a.m.	Extreme Cold/ Windchill	- Bitterly cold weather swept across central Illinois; early morning temperatures well below zero combined with brisk northeasterly winds to produce wind chill values of -25°F to -40°F - COOP observer west of Mason Citymeasured actual temperatures ranging from 27°F to -15°F on the 15th and -1°F to -16°F on the 16th	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Image and Publications System, COOP Data / Record of Climatological Observations.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

3.3 FLOODS

IDENTIFYING THE HAZARD

What is the definition of a flood?

The Federal Emergency Management Agency (FEMA) defines a "flood" as a general or temporary condition where two or more acres of normally dry land or two or more properties are inundated by:

- overflow of inland or tidal waters;
- unusual and rapid accumulation or runoff of surface waters from any source;
- mudflows; or
- a sudden collapse or subsidence of shoreline land.

The severity of a flooding event is determined by a combination of topography and physiography, ground cover, precipitation and weather patterns and recent soil moisture conditions. On average, flooding causes more than $5 billion in damages each year in the United States. Floods cause utility damage and outages, infrastructure damage (both to transportation and communication systems), structural damage to buildings, crop loss, decreased land values and impede travel.

What types of flooding occur in Mason County?

There are three main types of flooding that affect Mason County: general flooding, flash flooding and groundwater flooding. General flooding can be broken down into two categories: riverine flooding and shallow flooding. The following provides a brief description of each type.

General Flooding – Riverine Flooding

Riverine flooding occurs when the water in a river or stream gradually rises and results in the waterway overflowing its banks. This type of flooding affects low lying areas near rivers, streams, lakes and reservoirs and generally occurs when:

- persistent storm systems enter the area and remain for extended periods of time,
- winter and spring rains combine with melting snow to fill river basins with more water than the river or stream can handle,
- ice jams create natural dams which block normal water flow, and
- torrential rains from tropical systems make landfall.

General Flooding – Shallow Flooding

Shallow flooding occurs in flat areas where there are no clearly defined channels (i.e., rivers and streams) and water cannot easily drain away. There two main types of shallow flooding: sheet flow and ponding. If the surface runoff cannot find a channel, it may flow out over a large area at a somewhat uniform depth in what's called sheet flow. In other cases the runoff may collect in depressions and low-lying areas where it cannot drain out, creating a ponding effect. Ponding floodwaters do not move or flow away, they remain in the temporary ponds until the water can infiltrate the soil, evaporate or are pumped out.

Flash Floods

Flash flooding occurs when there is a rapid rise of water along a stream or low-lying area. This type of flooding generally occurs within six hours of a significant rain event and is usually produced when heavy localized precipitation falls over an area in a short amount of time. Considered the most dangerous type of flood event, flash floods happen quickly with little or no warning. Typically, there is no time for the excess water to soak into the ground nor are the storm sewers able to handle the shear volume of water. As a result, streams overflow their banks and low-lying (such as underpasses, basements etc.) areas can rapidly fill with water.

Flash floods are very strong and can tear out trees, destroy buildings and bridges and scour out new channels. Flash flood-producing rains can also weaken soil and trigger mud slides that damage homes, roads and property. A vehicle caught in swiftly moving water can be swept away in a matter of seconds. Twelve inches of water can float a car or small SUV and 18 inches of eater can carry away large vehicles.

Groundwater Flooding

Groundwater flooding is an unusual phenomenon that occurs when subsurface water (i.e., the water table) emerges above the ground surface and can include the rising of groundwater into basements and other subsurface infrastructures (i.e., utilities, septic and sewer systems, etc.). This type of flooding occurs outside of a defined river or stream in low-lying or depressed areas when permeable strata become saturated and high groundwater levels are exacerbated by prolonged excessive rainfall and high river levels.

Groundwater flooding can form intermittent ponds and lakes in topographic depressions and seepages in sloping ground. If the capacity of the depressions or low-lying areas is insufficient to hold the amount of water surfacing, the water will spill over onto roads, and into ditches. This type of flooding is often lengthy in its duration.

Mason County has experienced severe groundwater flooding, especially in and around the Bath and Havana areas, on several occasions. The severity of the groundwater flooding experienced in Mason County is unique in Illinois.

What is a base flood?

A base flood refers to any flood having a 1% chance of occurring in any given year. It is also known as the 100-year flood or the one percent annual chance flood. The base flood is the national standard used by the National Flood Insurance Program (NFIP) and the State of Illinois for the purposes of requiring the purchase of flood insurance and regulating new development.

Many individuals misinterpret the term “100-year flood”. This term is used to describe the risk of future flooding; it does not mean that it will occur once every 100 years. Statistically speaking, a 100-year flood has a 1/100 (1%) chance of occurring in any given year. In reality, a 100-year flood could occur two times in the same year or two years in a row, especially if there are other contributing factors such as unusual changes in weather conditions, stream channelizations or changes in land use (i.e., open space land developed for housing or paved parking lots). It is also possible not to have a 100-year flood event over the course of 100 years.

While the base flood is the standard most commonly used for floodplain management and regulatory purposes in the United States, the 500-year flood is the national standard for protecting critical facilities, such as hospitals and power plants. A 500-year flood has a 1/500 (0.2%) chance of occurring in any given year.

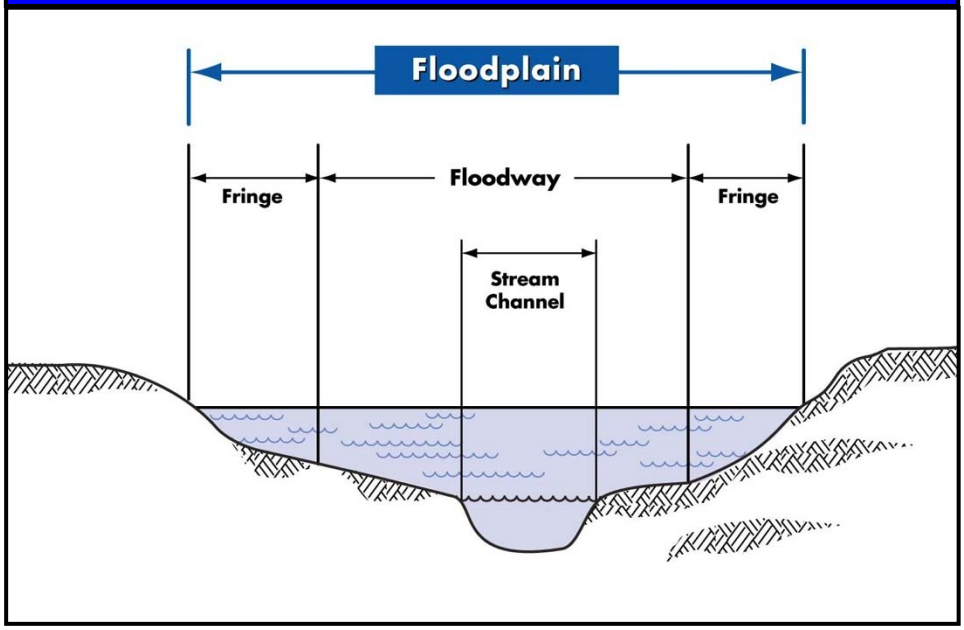
What is a floodplain?

The general definition of a floodplain is any land area susceptible to being inundated or flooded by water from any source (i.e., river, stream, lake, estuary, etc.). This general definition differs slightly from the regulatory definition of a floodplain.

A regulatory or base floodplain is defined as the land area that is covered by the floodwaters of the base flood. This land area is subject to a 1% chance of flooding in any given year. The base floodplain is also known as the 100-year floodplain or a Special Flood Hazard Area (SFHA). It is this second definition that is generally most familiar to people and the one that is used by the NFIP and the State of Illinois.

A base floodplain is divided into two parts: the floodway and the flood fringe. **Figure 31** illustrates the various components of a base floodplain.

Figure 31
Floodplain Illustration



Source: Illinois Department of Natural Resources, Quick Guide to Floodplain Management.

The floodway is the channel of a river or stream and the adjacent floodplain that is required to store and convey the base flood without increasing the water surface elevation. Typically the floodway is the most hazardous portion of the floodplain because it carries the bulk of the base flood downstream and is usually the area where water is deepest and is moving the fastest. Floodplain regulations prohibit construction within the floodway that results in an increase in the floodwater's depth and velocity.

The flood fringe is the remaining area of the base floodplain, outside of the floodway, that is subject to shallow inundation and low velocity flows. In general, the flood fringe plays a relatively insignificant role in storing and discharging floodwaters. The flood fringe can be quite wide on large streams and quite small or nonexistent on small streams. Development within the flood fringe is typically allowed via permit if it will not significantly increase the floodwater's depth or velocity and the development is elevated above or otherwise protected to the base flood elevation.

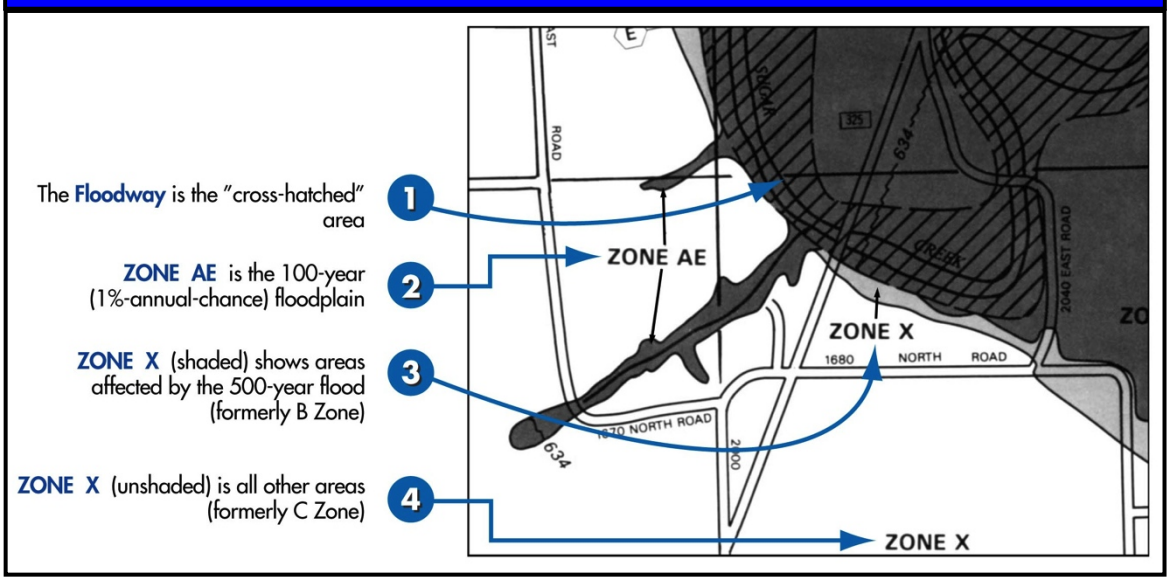
What is a Special Flood Hazard Area?

A Special Flood Hazard Area (SFHA) is the base floodplain. As discussed previously, this is the land area that is covered by the floodwaters of the base flood and has a 1% chance of flooding in any given year. The term SFHA is most commonly used when referring to the based floodplain on the Flood Insurance Rate Maps (FIRM) produced by FEMA. The SFHA is the area where floodplain regulations must be enforced by a community as a condition of participation in the NFIP and the area where mandatory flood insurance purchase requirements apply. Special Flood Hazard Areas are delineated on the FIRMs and may be designated as Zones A, AE, A1-30, AO, AH, AR, and A99 depending on the amount of flood data available, the severity of the flood hazard or the age of the flood map.

What are Flood Insurance Rate Maps?

Flood Insurance Rate Maps (FIRMs) are maps that identify both the Special Flood Hazard Areas and the risk premium zones applicable to a community. These maps are produced by FEMA in association with the NFIP for floodplain management and insurance purposes. Digital versions of these maps are referred to as DFIRMs. **Figure 32** shows an example of a FIRM.

Figure 32
Example of a Flood Insurance Rate Map (FIRM)



Source: Illinois Department of Natural Resources, Quick Guide to Floodplain Management.

A FIRM will generally shows a community's base flood elevations, flood zones and floodplain boundaries. The information presented on a FIRM is based on historic, meteorological, hydrologic and hydraulic data as well as open-space conditions, flood-control projects and development. ***These maps only define flooding that occurs when a creek or river becomes overwhelmed. They do not define overland flooding that occurs when an area receives extraordinarily intense rainfall and storm sewers and roadside ditches are unable to handle the surface runoff.***

What are flood zones?

Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk and type of flooding. These zones are depicted on a community's FIRM. The following provides a brief description of each flood zone.

- **Zone A.** Zone A, also known as the Special Flood Hazard Area (SFHA) or base floodplain, is defined as the floodplain area that has a 1% chance of flooding in any given year. There are multiple Zone A designations, including Zones A, AO, AH, A1-30, AE, AR or A99. Land areas located within Zone A are at a high risk for flooding.

  During a 30 year period, the length of many mortgages, there is at least a 1 in 4 chance that a base flood will occur in a SFHA. All home and business owners in SFHAs with mortgages from federally regulated or insured lenders are required to purchase flood insurance.

- **Zone X (shaded).** Zone X (shaded), formerly known as Zone B, is defined as the floodplain area between the limits of the base flood (Zone A) and the 500-year flood. Land areas located within Zone X (shaded) are affected by the 500-year flood and are considered at a moderate risk for flooding.

  Zone X (shaded) is also used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, shallow flooding areas with average depths of less than one foot or drainage areas less than one square mile. While flood insurance is not federally required in Zone X (shaded), it is recommended for all property owners and renters.

- **Zone X (unshaded).** Zone X (unshaded), formerly known as Zone C, is defined as all other land areas outside of Zone A and Zone X (shaded). Land areas located in Zone X (unshaded) are considered to have a low or minimal risk of flooding. While flood insurance is not federally required in Zone X (unshaded), it is recommended for all property owners and renters.

What is a Repetitive Loss Structure or Property?

FEMA defines a "repetitive loss structure" as a National Flood Insurance Program-insured structure that has received two or more flood insurance claim payments of more than $1,000 each within any 10-year period since 1978. These structures/properties account for approximately one-fourth of all National Flood Insurance Program (NFIP) insurance claim payments since 1978.

Currently, repetitive loss properties make up 1.3% of all policies, but are expected to account for 15% to 20% of future losses. These structures not only increase the NFIP's annual losses, they drain funds needed to prepare for catastrophic events. As a result, FEMA and the NFIP are working with states and local governments to mitigate these properties.

What is floodplain management?

Floodplain management is the administration of an overall community program of corrective and preventative measures to reduce flood damage. These measures take a variety of forms and generally include zoning, subdivision or building requirements, special-purpose floodplain ordinances, flood control projects, education and planning. Where floodplain development is permitted, floodplain management provides a framework that minimizes the risk to life and property from floods by maintaining a floodplain's natural function. Floodplain management is a key component of the National Flood Insurance Program.

What is the National Flood Insurance Program?

The National Flood Insurance Program (NFIP) is a federal program, administered by FEMA, that:

- mitigates future flood losses nationwide through community-enforced building and zoning ordinances; and
- provides access to affordable, federally-backed insurance protection against losses from flooding to property owners in participating communities.

It is designed to provide an insurance alternative to disaster assistance to meet escalating costs of repairing damage to buildings and their contents due to flooding. The U.S. Congress established the NFIP on August 1, 1968 with the passage of the National Flood Insurance Act of 1968. This Program has been broadened and modified several times over the years, most recently with the passage of the Flood Insurance Reform Act of 2004.

Prior to the creation of the NFIP, the national response to flood disasters was generally limited to constructing flood-control projects such as dams, levees, sea-walls, etc. and providing disaster relief to flood victims. While flood-control projects were able to initially reduce losses, their gains were offset by unwise and uncontrolled development practices within floodplains. In light of the continued increase in flood losses and the escalating costs of disaster relief to taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for protection.

Participation in the NFIP is voluntary and based on an agreement between local communities and the federal government. If a community agrees to adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in a Special Flood Hazard Area (base floodplain), then the government will make flood insurance available within the community as a financial protection against flood losses.

If a community chooses not to participate in the NFIP or a participating community decides not to adopt new floodplain management regulations or amend its existing regulations to reference new flood hazard data provided by FEMA, then the following sanctions will apply.

- Property owners will not be able to purchase NFIP flood insurance policies and existing policies will not be renewed.
- Federal disaster assistance will not be provided to repair or reconstruct insurable buildings located in identified flood hazard areas for presidentially-declared disasters that occur as a result of flooding.
- Federal mortgage insurance and loan guarantees, such as those written by the Federal Housing Administration and the Department of Veteran Affairs, will not be provided for acquisition or construction purposes within an identified flood hazard areas. Federally-insured or regulated lending institutions, such as banks and credit unions, are allowed to make conventional loans for insurable buildings in identified flood hazard areas of non-participating communities. However, the lender must notify applicants that the property is in an identified flood hazard area and that it is not eligible for federal disaster assistance.
- Federal grants or loans for development will not be available in identified flood hazard areas under programs administered by federal agencies such as the Environmental Protection Agency, Small Business Administration and the Department of Housing and Urban Development.

What is the NFIP's Community Rating System?

The NFIP's Community Rating System (CRS) is a voluntary program developed by FEMA to provide incentives (in the form of flood insurance premium discounts) for NFIP participating communities that have gone beyond the minimum NFIP floodplain management requirements to develop extra measures to provide protection from flooding. CRS discounts on flood insurance premiums range from 5% up to 45%. Those discounts provide an incentive for new flood protection activities that can help save lives and property in the event of a flood.

Are alerts issued for flooding?

Yes. The National Weather Service Weather Forecast Office in Lincoln, Illinois is responsible for issuing ***flood watches*** and ***warnings*** for Mason County depending on the weather conditions. The following provides a brief description of each type of alert.

- **Flood Watch.** A flash flood or flood watch is issued when flooding is possible in or close to the watch area. It does not mean that flooding is imminent, just that individuals need to be alert and prepared.
- **Flood Warning.** A flood warning is issued when flooding is occurring or will occur soon and is expected to last for several days or weeks. Warnings indicate imminent danger to life and property for those who are in the area of the flooding.
- **Flash Flood Warning.** A flash flood warning is issued when flash flooding is imminent or occurring. Individuals should never drive across a flooded road, especially if the road is closed by barricades.

- **Flood Advisory.** A flood advisory is issued when minor flooding of creeks and streams, streets, low-lying areas or basement flooding is occurring or is imminent.

PROFILING THE HAZARD

When has flooding occurred previously? What is the extent of these previous floods?

Figures 33 and **34**, located at the end of this section, summarize the previous occurrences as well as the extent or magnitude of the flood events recorded in Mason County. The flood events are separated into two categories: general (riverine and shallow/overland) & groundwater floods and flash floods.

Flood Fast Facts – Occurrences

Number of General & Groundwater Floods Reported (1973 – 2013): ***12***

Number of Flash Floods Reported (1995 – 2013): ***11***

Most Likely Month for General & Groundwater Floods to Occur: ***February***

Most Likely Month for Flash Floods to Occur: ***June or July***

Most Likely Time for Flash Floods to Occur: ***Late Evening***

NOAA's Storm Events Database, National Weather Service COOP and storm data records, Illinois State Water Survey, Illinois Department of Natural Resources, Office of Water Resources and Planning Committee member records have documented 12 reported occurrences of general and groundwater flooding in Mason County between 1973 and 2013 and 11 reported occurrences of flash flooding between 1995 and 2013.

Included in 12 general and groundwater flooding events are several historic Illinois River floods. Based on historical gage data from the river gage at Havana, the flood of record set in 1943 was recently broken during the April 2013 flood event. On April 25, 2013 the Illinois River crested at 27.78 feet, more than four feet above major flood stage. The third, fourth and fifth highest crests at this location occurred during 1985, 1995 and 1982, respectively.

Figure 35 charts the reported occurrences of flooding by month. Of the 12 general and groundwater flooding events, six (50%) began or took place in February and March. Of these six events, four (67%) began or occurred in February, making this the peak month for general and groundwater flooding. There were seven events that spanned more than one month; however, for illustration purposes only the month the event started in is graphed.

In comparison, eight (73%) of the 11 flash flooding events took place in May, June and July. Of these eight event, three took place in June and three too place in July, making this the peak period for flash flooding in Mason County.

Figure 36 charts the reported occurrences of flooding by hour. Of the 12 general and groundwater flooding events, start times were unavailable for five events. Of the remaining seven events with recorded times, approximately 57% began during the a.m. hours. In comparison, approximately 64% of all flash flood events began during the p.m. hours.

Figure 35
Flood Events by Month

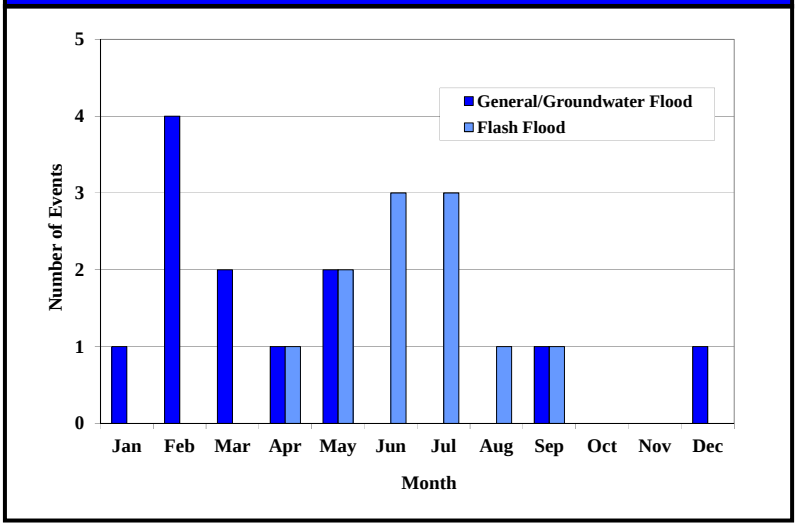
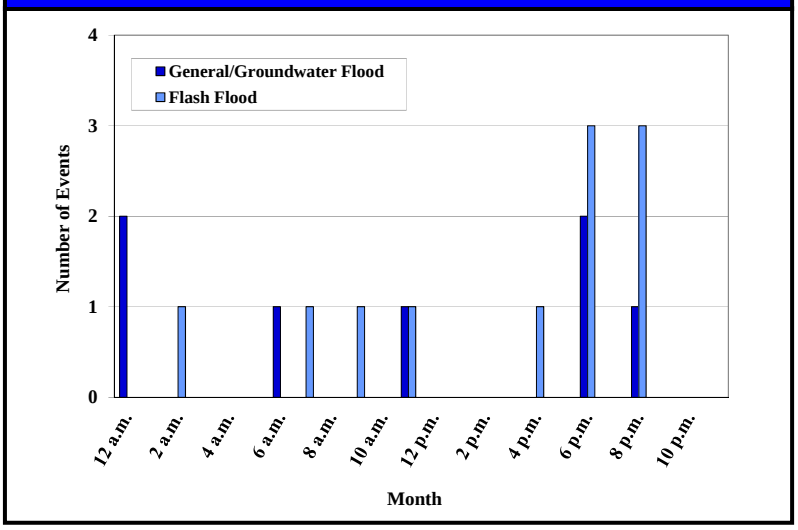


Figure 36
Flood Events by Hour



What locations are affected by floods?

While specific locations are affected by general and groundwater flooding, many areas of the County can be impacted by overland and flash flooding because of the topography and high water table of the area. Approximately 15.7% of the area in Mason County is designated as being within the base floodplain and susceptible to riverine floods. The *2013 Illinois Natural Hazard Mitigation Plan* by IEMA classifies Mason County's hazard rating for floods as "elevated."

Figure 37 identifies the floodplains in Mason County. This figure is based on the DFIRMs for Mason County that became effective January 6, 2012. While a large portion of the area prone to riverine flooding is in the unincorporated portions of the County, Bath, Forest City, Havana, Manito, Mason City and Topeka are also susceptible to riverine flooding because of their proximity to floodplains. To view the DFIRMs for the participating municipalities, see **Appendix J**.

It should be noted that the floodplain delineations east of Illinois Route 78 in Bath resulted from studies conducted by the Illinois State Geological Survey and the Illinois State Water Survey following the Great Flood of 1993. This floodplain identifies areas in and around Bath that are susceptible to groundwater flooding and basement inundation and are not part of the Illinois River floodplain.

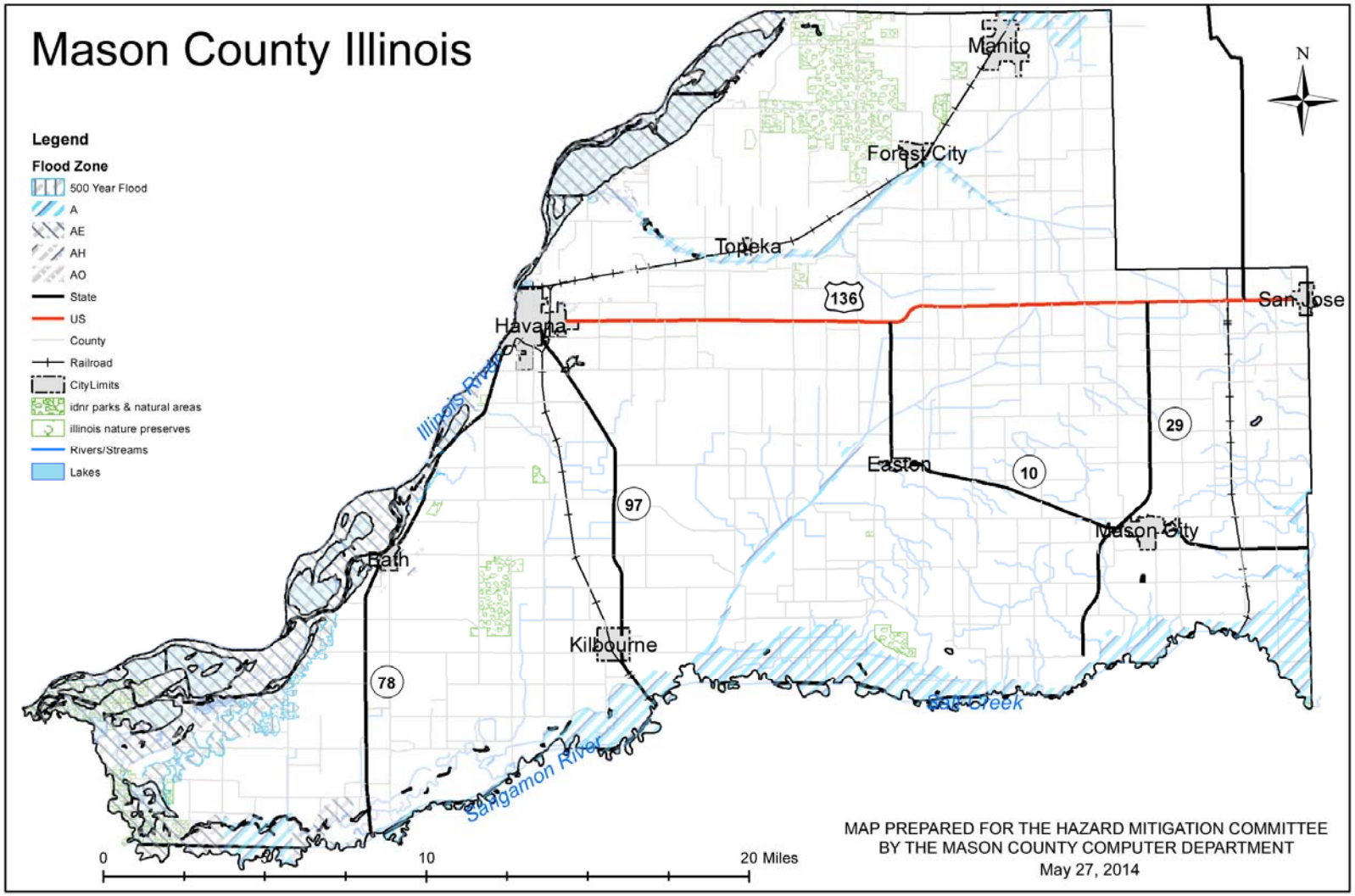
Figure 38 identifies the bodies of water by participating jurisdictions that are known to cause flooding or have the potential to flood. Water bodies with Special Flood Hazard Areas are identified in bold.

Figure 38
Bodies of Water Subject to Flooding in Mason County

Participating Jurisdiction	Water Bodies
Bath	**East Branch Illinois River**
Easton	---
Forest City	**Mason Tazewell Drainage Ditch, North Quiver Ditch**
Havana	**Illinois River**, unnamed tributary
Kilbourne	---
Manito	---
Mason City	---
San Jose	---
Topeka	**Mason Tazewell Drainage Ditch**
Unincorporated Mason County	Allens Grove Ditch, Anderson Slough, Angela Lake, **Back Lake**, **Bath Lake**, **Beans Lake**, **Bell Lake**, Beris Lake, Biggs Ditch, Blue Hole, Bowles Lake, Breedlove Ditch, Central Ditch, **Chain Lake**, **Chautauqua Lake**, **Clear Lake**, County Creek, **Cow Lake**, **Curtis Lake**, **Crane Creek**, **Crane Lake**, Dieker Lake, **East Branch Illinois River**, Fairview Ditch, **Finch Lake**, Fish Creek, Fish Lake, Furrer Ditch, **Goose Lake**, **Grass Lake**, Hall Ditch, Hardin Ditch, **Herget Drainage Ditch**, **Hickory Slough**, Hurd Lake Ditch, **Illinois River**, **Ingram Lake**, **Jack Lake**, **Johnson Slough**, Jordan Creek, Lily Lake, **Liverpool Lake**, Main Ditch, **Mason Tazewell Ditch**, **Matanzas Lake**, Matthew Bay, McFadden Ditch, McHenry Slough, **Moscow Lake**, **Mound Lake**, **Mud Lake**, Mud Slough, Negro Lake, Newton Ditch, North Quiver Ditch, Norton Lake, Otter Lake, **Patterson Bay**, **Perry Slough**, **Picket Lake**, Prairie Creek, Pratt Lake, **Quiver Creek**, **Quiver Lake**, Red Oak Ditch, **Revis Lake**, **Salt Creek**, Samuels Ditch, **Sangamon Lake**, **Sangamon River**, **Sliver Moon Lake**, Sleepy Hollow Ditch, Smith Lake, **Snicarte Slough**, **Spring Lake**, **Stafford Lake**, **Stewart Lake**, **Sugar Creek**, **Swan Lake**, Tomlin Ditch, Waldmeier Ditch, **White Oak Creek**, **Wilcox Lake**, **Wolf Lake**

Source: FEMA DFIRMs.

Figure 37
Floodplain Areas in Mason County



Do any of the participating jurisdictions take part in the NFIP?

Yes. Mason County, Bath, Forest City, Havana and Mason City all participate in the NFIP while Manito is currently in the process of becoming a participant. **Figure 39** provides information about each jurisdiction's participation in the NFIP, including the date each participant joined and the year of the most recently adopted floodplain zoning ordinance.

Easton, Kilbourne and San Jose have no identified flood hazard boundaries within their corporate limits and are not required to participate. At this time Topeka is not a participant of the NFIP. Since the current effective DFIRMs identify Special Flood Hazard Areas within Topeka's corporate limits, it is presently sanctioned by the Program.

Figure 39
NFIP Participating Jurisdictions

Participating Jurisdictions	Participation Date	Current Effective FIRM Date	CRS Participation	Most Recently Adopted Floodplain Zoning Ordinance
Mason County	02/01/1984	01/06/2012	No	2011
Bath	01/05/1984	01/06/2012	No	2012
Forest City	02/07/2013	01/06/2012	No	2012
Havana	07/23/1981	01/06/2012	No	2012
Manito	*	01/06/2012	No	2015
Mason City	07/18/1985	01/06/2012	No	2011

* Manito has submitted its application to become a participant in the NFIP and is currently awaiting FEMA approval.

Source: FEMA, Community Status Book.

What is the probability of future flood events occurring?

General & Groundwater Floods

Mason County has had 12 verified occurrences of general and groundwater flooding between 1973 and 2013. With 12 occurrences over the past 41 years, the probability or likelihood of a general and/or groundwater flood event occurring in Mason County in any given year is 29%. There was one year over the past 41 years where two or more general and/or groundwater flood events occurred. This indicates that the probability that more than one general and/or groundwater flood event may occur during any given year within the County is 2.4%.

The Havana Nature Center flooded when the Illinois River overflowed its banks in April, 2013.

Photograph courtesy of Greg Griffin, Mason County ESDA Director

Flash Floods

There have been 11 verified occurrences of flash flooding between 1995 and 2013. With 11 occurrences over the past 19 years, the probability or likelihood of a flash flood event occurring in Mason County in any given year is 58%. There were three years over the past 19 years where two or more flash flood events

occurred. This indicates that the probability that more than one flash flood event may occur during any given year within the County is 16%.

ASSESSING VULNERABILITY

Several factors including topography, precipitation and an abundance of rivers and streams make Illinois especially vulnerable to flooding. Since the 1940s, Illinois climate records show an increase in heavy precipitation which has led to increased flood peaks on Illinois rivers.

Are the participating jurisdictions vulnerable to flooding?

Yes. Mason County, including the participating municipalities, is vulnerable to the dangers presented by flooding. Precipitation levels, a high water table, porous soils, and topography that includes the Illinois River, Sangamon River and their associated watersheds are all factors that cumulatively make virtually the entire County susceptible to some form of flooding. Flooding occurs along the floodplains of all the rivers and streams within the County as well as outside of the floodplains in areas where the water table is unusually high and in low-lying areas where drainage problems occur due to culvert or drainage ditches that need improvement or proper maintenance. In the Havana and Bath areas, groundwater levels occasionally rise above the ground surface to create surface water flooding.

Floodwaters cover IL Rte. 97 at the railroad tracks southeast of Havana during the 1993 flood.

Photograph courtesy of Greg Griffin, Mason County ESDA Director

Figure 40 details the number of *recorded* flash flood events by participating jurisdiction. All of the general and groundwater flood events either impacted the entire County or a large portion of it and were not location specific.

Vulnerability to flooding can change depending on several factors, including land use. As land used primarily for agricultural and open space purposes is converted for residential and commercial/industrial uses, the number of buildings and impervious surfaces (i.e., parking lots, roads, sidewalks, etc.) increases. As the number of buildings and impervious surfaces increases, so too does the potential for flash flooding. Rather than infiltrating the ground slowly, rain and snowmelt that falls on impervious surfaces runs off and fills ditches and storm drains quickly creating drainage problems and flooding.

As described in Section 1.3, substantial changes in land use (from forested, open and agricultural land to residential, commercial and industrial) are not anticipated within the County in the immediate future. No substantial increases in residential or commercial/industrial developments are expected within the next five years.

Figure 40
Verified Flash Flood Events by Participating Jurisdiction

Participating Municipality	Number	Year
Bath	1	2010*
Easton	0	---
Forest City	0	---
Havana	2	2006*, 2010
Kilbourne	0	---
Manito	3	2002, 2003*, 2011*
Mason City	1	2004*
San Jose	0	---
Topeka	0	---
countywide	2	1995, 2002
central portion of the County	1	2011
northern portion of the County	1	2011
southern portion of the County	3	2010, 2010, 2011

* Flash flood verified within the municipality.

What impacts resulted from the recorded floods?

Floods as a whole have caused an estimated $7 million in property damages and resulted in 20 injuries and one fatality. The following provides a breakdown of impacts by category.

In comparison, the State of Illinois averages four fatalities per year and an estimated $257 million annually in property damage losses, making flooding the single most financially damaging natural hazard in Illinois.

While both general and groundwater floods and flash floods occur on a fairly regular basis within the County, the number of injuries and fatalities is relatively low. Consequently, the risk or vulnerability to public health and safety from *general and groundwater floods* is seen as low. However, nearly half of the recorded flood events are a result of flash flooding. Since there is very little warning associated with flash flooding, the risk to public health and safety from *flash floods* is elevated to medium.

Flood Fast Facts – Impacts/Risk

General & Groundwater Flood Impacts
- Total Property Damage: ***$7 million***
- Infrastructure/Critical Facilities Damage*: ***n/a***
- Total Crop Damage: ***n/a***
- Injuries: ***20***
- Fatalities: ***1***

Flash Flood Impacts
- Total Property Damage: ***n/a***
- Infrastructure/Critical Facilities Damage*: ***n/a***
- Total Crop Damage: ***n/a***
- Injuries: ***n/a***
- Fatalities: ***n/a***

Flood Risk/Vulnerability to:
- Public Health & Safety – General & Groundwater Flooding: ***Low***
- Public Health & Safety – Flash Flooding: ***Medium***
- Buildings/Infrastructure/Critical Facilities: ***Medium/High***

* Infrastructure/Critical Facilities Damage totals are included in the Total Property Damage amounts.

Located throughout this section and in **Appendix K** are select photographs provided by the Mason County ESDA Director showing the extent of flooding experienced within the County.

General & Groundwater Floods

Data obtained from NOAA's Storm Events Database and Planning Committee member records indicates that between 1973 and 2013, two of the 12 general and groundwater flood events caused at least $7 million in property damage. Both events were part of federally-declared disasters. A brief description of each event is provided below. Damage information was either unavailable or none was recorded for the remaining 10 reported occurrences. Eight of the 12 general and groundwater flood events were part of federally-declared disasters.

- Nearly continuous rises in the water table beginning in the summer of 1992 culminated in serious groundwater flooding in and around Havana and Bath in September 1993. While specific damage estimates were unavailable, Planning Committee member records indicate that several million in damages was sustained in both Havana and Bath. The following provides a brief description of the infrastructure and critical facilities damaged.
  - Many portions of IL Routes 78, 79 and US Route 136 were covered by as much as three feet of water, forcing their closure.
  - The County Health Department in Havana flooded along with the southwestern third of the City.
  - In Bath, streets were covered with 1.5 feet of water and the Village's drinking water well was contaminated by flood waters. In addition, the Village lost electricity, telephone service as well as water and sewer. As a result of this event, $2 million was spent to build a new wastewater treatment facility.

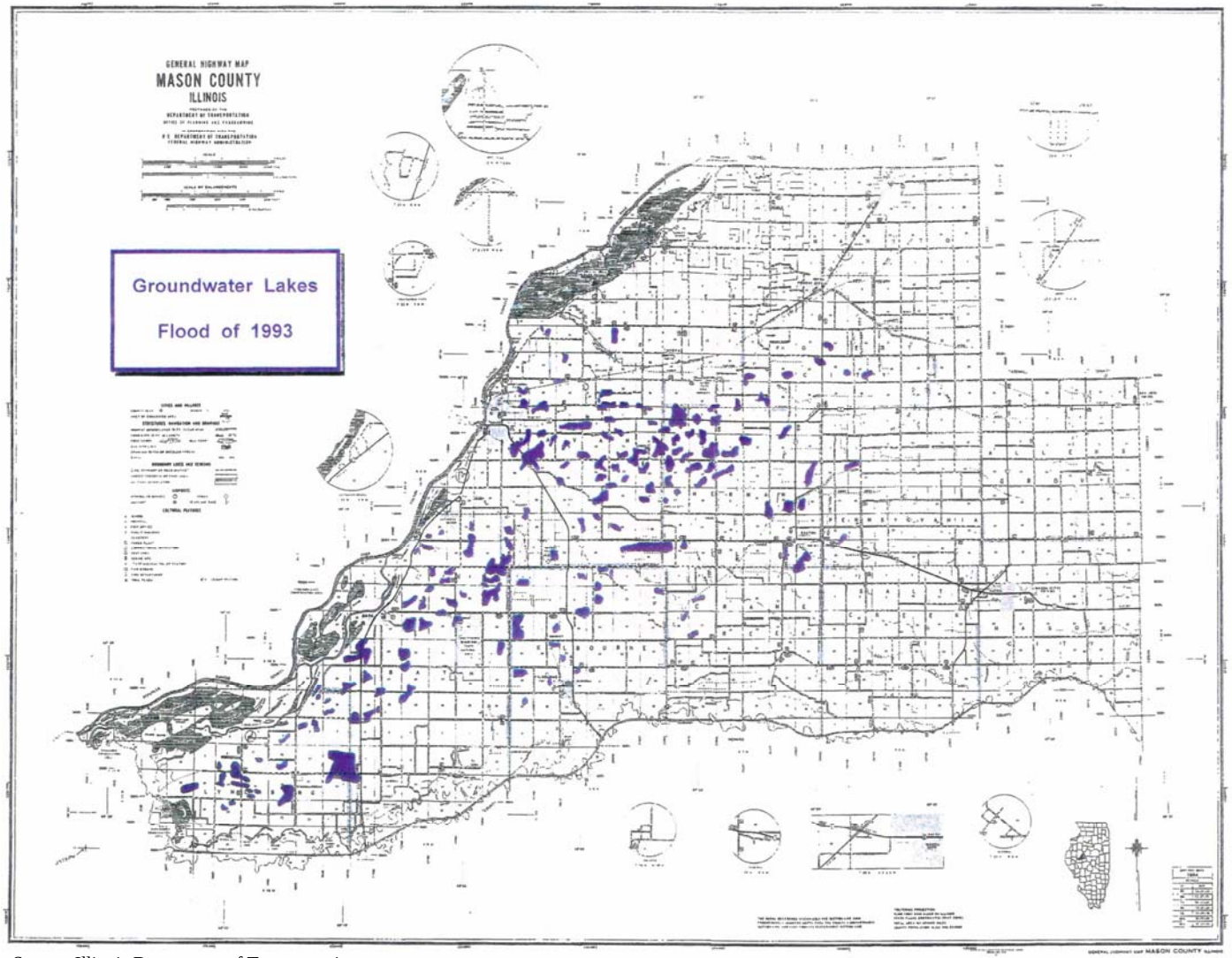
This groundwater lake emerged along IL Rte. 78 south of Bath during the 1993 flooding.

Photograph courtesy of Greg Griffin, Mason County ESDA Director

Appendix L contains news articles that document the flood and its aftermath while **Appendix K** contains photographs that show the extent of the flooding experienced. The flooding also led to the appearance of multiple groundwater lakes across the western portion of the County. **Figure 41** illustrates the location of these lakes.

- Heavy rain combined with saturated soils led to flooding along the Illinois River during April and May, 2013 and resulted in an estimated $5 million in damages. Hundreds of cabins and sheds in wildlife areas along the Illinois River were severely damaged; 25 homes and several other structures were damaged in Bath, Snicarte, Havana and Goofy Ridge and nearly 15 miles of roads were washed out. The Illinois River crested at 27.78 feet on April 25, 2013 at the river gage in Havana and broke the 70 year old flood of record set on May 26, 1943 at 27.1 feet.

Figure 41
Location of Groundwater Lake Occurrences during 1993 Flood



Source: Illinois Department of Transportation

NOAA's Storm Events Database and Planning Committee member records also documented 20 injuries and one fatality as a result of two separate general and groundwater flood events. The following provides a brief description of each event.

- According to the Planning Committee members from Bath, approximately 20 individuals sustained injuries during the September 1993 groundwater flood event.
- During the May/June 2002 riverine flood event, an 8 year-old boy drowned while playing in a boat that was tied to the shore along a flooded part of the Illinois River. The rope got loose and the boat started to drift away causing the boy to panic and jump into the water.

Flash Floods

Damage information was either unavailable or none was recorded for any of the reported flash flood events. In addition, no injuries or fatalities were reported.

What other impacts can result from flooding?

One of the primary threats from flooding is drowning. Nearly half of all flash flood fatalities occur in vehicles as they are swept downstream. Most of these fatalities take place when people drive into flooded roadway dips and low drainage areas. It only takes two feet of water to carry away most vehicles.

Cleanup begins on Locust Street in Bath after the 1993 flooding.

Photograph courtesy of Greg Griffin, Mason County ESDA Director

Floodwaters also pose biological and chemical risks to public health. Flooding can force untreated sewage to mix with floodwaters. The polluted floodwaters then transport the biological contaminants into buildings and basements and onto streets and public areas. If left untreated, the floodwaters can serve as breeding grounds for bacteria and other disease-causing agents. Even if floodwaters are not contaminated with biological material, basements and buildings that are not properly cleaned can grow mold and mildew, which can pose a health hazard, especially for small children, the elderly and those with specific allergies.

Flooding can also cause chemical contaminants such as gasoline and oil to enter the floodwaters if underground storage tanks or pipelines crack and begin leaking during a flood event. Depending on the time of year, floodwaters also may carry away agricultural chemicals that have been applied to farm fields.

Structural damage, such as cracks forming in foundation, can also result from flooding. In most cases, however, the structural damage sustained during a flood occurs to the flooring, drywall and wood framing. In addition to structural damage, a flood can also cause serious damage to a building's content.

Are there any repetitive loss structures/properties within Mason County?

Yes. According to information obtained from IEMA, there are eight repetitive flood loss properties located in or near Bath and Havana. As described previously, FEMA defines a "repetitive loss structure" as an NFIP-insured structure that has received two or more flood insurance claim payments of more than $1,000 each within any 10-year period since 1978.

Figure 42 identifies the repetitive flood loss properties by participating jurisdiction and provides the total flood insurance claim payments. The exact location and/or addresses of the insured properties are not included in this Plan to protect the owners' privacy. According to FEMA, there have been 29 flood insurance claim payments totaling $629,257 for the eight repetitive flood loss structures/properties.

Figure 42
Repetitive Flood Loss Properties

Participating Jurisdiction	Structure Type	Number of Flood Insurance Claim Payments	Flood Insurance Claim Payments		Total Flood Insurance Claim Payments
			Structure	Content	
Bath	Single Family	2	$35,044	$0	$35,044
Bath	Single Family	10	$223,490	$8,401	$231,891
Bath	Single Family	3	$10,090	$1,249	$11,339
Bath	Single Family	4	$12,461	$6,312	$18,773
Bath	Single Family	4	$7,275	$5,686	$12,961
Bath	Single Family	2	$93,921	$0	$93,921
Bath	Single Family	2	$96,155	$26,585	$122,740
Havana	Single Family	2	$98,854	$3,734	$102,588
Total:		**29**	**$577,290**	**$51,967**	**$629,257**

Source: Purchis, Bryan, Hazard Mitigation Planner, Illinois Emergency Management Agency.

Are existing buildings, infrastructure and critical facilities vulnerable to flooding?

Yes. **Figure 43** identifies the existing residential structures by participating jurisdiction located within a base floodplain and vulnerable to flooding. These counts were prepared by the consultant using the effective DFIRMs.

Aside from key roads and bridges and buried power and communication lines, Bath, Havana and Manito all have specific infrastructure/critical facilities located within or adjacent to a floodplain. The following provides a brief description of each.

- *Bath*: The Village's wastewater treatment facility, maintenance garage, park, Village Hall, U.S. Post Office and Bath Fire Protection District building are all located in a base floodplain.
- *Havana*: Riverfront Park and Campground and the Illinois River Biological Field Station are located in the Illinois River base floodplain. The City's wastewater treatment facility, Riverside Estates (an independent living community) and the Dynergy Havana Power Station are all located adjacent to the Illinois River base floodplain. In addition, part of Veteran's Park on the City's eastern edge is also located in a base floodplain.

- *Manito*: The Village's wastewater treatment facility and maintenance garage are located within the base floodplain of North Quiver Ditch.

Figure 43
Existing Residential Structures Located within a Base Floodplain

Participating Jurisdiction	Number of Residential Structures	Participating Jurisdiction	Number of Residential Structures
Bath	123†	Manito	0
Easton	0	Mason City	15§
Forest City	3	San Jose	0
Havana	0	Topeka	0
Kilbourne	0	Unincorp. Mason Co.	396

† Only 16 of the 123 residential structures located in Bath are in the base floodplain of the Illinois River. The remaining 107 structures are located east of Illinois Route 78 in a base floodplain unassociated with any river, stream or creek. These structures are considered vulnerable to groundwater flooding.

§ The residential structures located on the eastern edge of Mason City are located in a base floodplain unassociated with any river, stream or creek.

Source: FEMA DFIRMs

While 15.7% of the land area in Mason County lies within the base floodplain and is susceptible to riverine and groundwater flooding, almost the entire County is vulnerable to flash flooding. As a result, a majority of the buildings, infrastructure and critical facilities that may be impacted by flooding are located outside of the base floodplain and are not easily identifiable.

The risk or vulnerability of existing buildings, infrastructure and critical facilities to all forms of flooding is considered to be medium to high based on: (a) the frequency and severity of recorded flood events within the County; (b) the County's proximity to two major rivers; (c) the unique groundwater flooding experienced in portions of the County; (d) the fact that most of the County is vulnerable to flash flooding and (e) a majority of the buildings, infrastructure and critical facilities that may be impacted are located outside of the base floodplain.

Are future buildings, infrastructure and critical facilities vulnerable to flooding?

The answer to this question depends on the type of flooding being discussed.

Riverine Flooding

In terms of riverine flooding, the vulnerability of future buildings, infrastructure and critical facilities located within NFIP-participating jurisdictions (Mason County, Bath, Forest City, Havana, Mason City and Manito) is low as long as the existing floodplain ordinances are enforced. Enforcement of the floodplain ordinance is the mechanism that ensures that new structures either are not built in flood-prone areas or are elevated or protected to the base flood elevation.

At the time this Plan was prepared the effective DFIRM for Topeka identify Special Flood Hazard Areas within the Village's municipal limits; however the Village is not a participant in the NFIP. As a result, future structures built in or near the base floodplain will be vulnerable to riverine flooding.

Flash Flooding
In terms of flash flooding, all future buildings, infrastructure and critical facilities are still vulnerable depending on the amount of precipitation that is received, the topography and any land use changes undertaken within the participating jurisdictions.

Groundwater Flooding
In terms of groundwater flooding, the vulnerability of future buildings, infrastructure and critical facilities built in areas known to have experienced groundwater flooding is considered to be medium to high based on the County's topography and high water table, proximity to two major rivers and the frequency and severity of past events.

What are the potential dollar losses to vulnerable structures from flooding?

An estimate of the potential dollar losses to vulnerable *residential structures* located within the *participating municipalities* can be calculated if several assumptions are made. These assumptions represent a probable scenario based on the reported occurrences of flooding in Mason County.

The purpose of providing an estimate is to help residents and municipal officials make informed decisions about how they can better protect themselves and their communities. These estimates are meant to provide a ***general idea*** of the magnitude of the potential damage that could occur from a flood event in each of the municipalities.

Assumptions
To calculate the overall potential dollar losses to vulnerable residential structures from a flood, a set of decisions/assumptions must be made regarding:

- type of flood event;
- scope of the flood event;
- number of potentially-damaged housing units;
- value of the potentially-damaged housing units; and
- percent damage sustained by the potentially-damaged housing units (i.e., damage scenario.)

The following provides a detailed discussion of each decision/assumption.

Assumption #1

A riverine flood event will impact vulnerable residential structures within each municipality.

Type of Flood Event. The first step towards calculating the potential dollar losses to vulnerable residential structures is to determine the type of flood event that will be used for this scenario. While the County has experienced all forms of flooding, for this analysis a riverine flood event will be used since it is (a) relatively easy to identify vulnerable residential structures within each municipality (i.e., those structures

located within the base floodplain or Special Flood Hazard Areas of any river, stream or creek); and (b) the number of structures impacted is generally the same from event to event.

Identifying residential structures vulnerable to flash flooding, and to a lesser extent groundwater flooding, is problematic because many are located outside of the base floodplain and the number of structures impacted can change with each event depending on the amount of precipitation received, the topography and the land use of the area.

Assumption #2

All riverine base floodplains within a municipality will flood and experience the same degree of flooding.

Scope of the Flood Event. To establish the number of vulnerable residential structures or potentially-damaged housing units, the scope of the riverine flood event within each municipality must first be determined. In this scenario, the scope refers to the number of rivers, streams and creeks that overflow their banks and the degree of flooding experienced along base floodplains for each river, stream and creek.

Generally speaking, a riverine flood event only affects one or two rivers or streams at a time depending on the cause of the event (i.e., precipitation, snow melt, ice jam, etc.) and usually does not produce the same degree of flooding along the entire length of the river or stream. However, for this scenario, it was decided that:

- all river, streams and creeks with base floodplains would overflow their banks, and
- the base floodplains of each river, stream and/or creek located within the corporate limits of each municipality would experience the same degree of flooding.

This assumption results in the following conditions for each municipality:

- Easton, Kilbourne, Mason City and San Jose would not experience any residential flooding since there are no rivers, streams or creeks with base floodplains located in or adjacent to their municipal limits;
- *Bath*: The Illinois River would overflow its banks and flood the western edge of the Village. The base floodplain area located east of Illinois Route 78 would not experience any residential flooding since it is not associated with any river, stream or creek;
- *Forest City*: The Mason Tazewell Drainage Ditch would overflow its banks and flood a small portion of the Village;
- *Havana*: The Illinois River would overflow its banks and flood the western edge of the City;
- *Manito*: The North Quiver Ditch would overflow its banks and flood a small portion of the Village; and
- *Topeka*: the Mason Tazewell Drainage Ditch would overflow its banks and flood a small portion of the Village.

Number of Potentially-Damaged Housing Units. Since this scenario assumes that a riverine flood will impact all of the riverine base floodplains within a municipality, the number of potentially-damaged housing units can be determined by counting the number of existing residential structures located within the base floodplain(s) of each river, stream and/or creek in or adjacent to each municipality. These counts were prepared by the consultant.

Assumption #3

The number of existing residential structures located within the base floodplain of each river, stream and/or creek in or adjacent to each municipality will be used to determine the number of potentially-damaged housing units.

The following municipalities have existing residential buildings located within the riverine base floodplains of their communities:

- Bath has 16 residential structures (the other 107 residential structures would not experience any flooding since they are not associated with a riverine base floodplain); and
- Forest City has 3 residential structures.

There are no existing residential structures located within the base floodplains of any of the rivers, streams and/or creeks in Havana, Manito or Topeka.

Value of Potentially-Damaged Housing Units. Now that the number of potentially-damaged housing units has been determined, the monetary value of the units must be calculated. Typically when damage estimates are prepared after a natural disaster such as a flood, they are based on the market value of the structure. Since it would be impractical to determine the individual market value of each potentially-damaged housing unit, the average market value for a residential structure in each municipality will be used to calculate the potential dollar losses.

Assumption #4

The average market value for a residential structure in each municipality will be used to determine the value of potentially-damaged housing units.

To determine the average market value, the average assessed value must first be calculated. The average assessed value is determined by taking the total assessed value of residential buildings within a municipality and dividing that number by the total number of housing units in the municipality. **Figure 44** provides a sample calculation. The total assessed value is based on 2013 tax assessment information provided by the Mason County Supervisor of Assessments.

Figure 44 Calculation of Average Assessed Value
Total Assessed Value of Residential Buildings ÷ Total Housing Units = Average Assessed Value (Rounded to the Nearest Penny) Bath: $1,667,816 ÷ 161 housing units = $10,359.11

To determine the average market value, the average assessed value is multiplied by three (the assessed value of a structure in Mason County is approximately one-third of the market value). **Figure 45** provides the average assessed value and average market value for each participating municipality.

Figure 45
Average Market Value of Housing Units

Participating Jurisdiction	Total Assessed Value of Residential Buildings (2013)	Total Housing Units (2010)	Average Assessed Value (Raw)	Average Market Value (Raw)	Average Market Value (Rounded)
Bath	$1,667,816	161	$10,359.10559	$31,077.31677	$31,077
Easton	$2,485,320	165	$15,062.54545	$45,187.63635	$45,188
Forest City	$1,404,961	111	$12,657.30631	$37,971.91893	$37,972
Havana	$23,430,196	1,535	$15,263.97134	$45,791.91402	$45,792
Kilbourne	$1,734,668	143	$12,130.54545	$36,391.63635	$36,392
Manito	$17,137,739	710	$24,137.66056	$72,412.98168	$72,413
Mason City	$17,381,967	1,108	$15,687.69585	$47,063.08755	$47,063
San Jose	$2,773,512	255	$10,876.51765	$32,629.55295	$32,630
Topeka	$487,326	45	$10,829.46667	$32,488.40001	$32,488

Source: Poler, Kristi, Mason County Supervisor of Assessments.

Damage Scenario. The final decision that must be made to calculate potential dollar losses is to determine the percent damage sustained by the structure and the structure's contents during the flood event. In order to determine the percent damage using FEMA's flood loss estimation tables, assumptions must be made regarding (a) the type of residential structure flooded (i.e., manufactured home, one story home without a basement, one or two story home with a basement, etc.) and (b) the flood depth.

Assumption #5

Bath
The potentially-damaged housing units are manufactured homes and the flood depth is two feet.
- Structural Damage = 63%
- Content Damage = 90%

Forest City
The potentially-damaged housing units are one or two story homes with basements and the flood depth is two feet.
- Structural Damage = 20%
- Content Damage = 30%

- *Bath*: It is assumed that the potentially-damaged housing units are manufactured homes and the flood depth is two feet. With these assumptions the expected percent damage sustained by the ***structure*** is estimated to be 63% and the expected percent damage sustained by the structure's ***contents*** is estimated to be 90%.
- *Forest City*: It is assumed that the potentially-damaged housing units are one or two story homes with basements and the flood depth is two feet. With these assumptions the expected percent damage sustained by the ***structure*** is estimated to be 20% and the expected percent damage sustained by the structure's ***contents*** is estimated to be 30%.

Calculations

Now that all of the decisions/assumptions have been made, the potential dollar losses can be calculated. First the potential dollar losses to the ***structure*** of the potentially-damaged housing units must be determined. This is done by taking the average market value for a residential structure and multiplying that by the percent damage to get the average structural damage per unit. Next the average structural damage per unit is multiplied by the number of potentially-damaged housing units. **Figure 46** provides a sample calculation.

Figure 46 ***Structure* – Potential Dollar Loss Calculations**
Average Market Value Per Housing Unit x Percent Damage = Average Structural Damage Bath: $31,077 x 63% = $19,578.51 per unit Average Structural Damage x Number of Potentially-Damaged Housing Units = Potential Dollar Losses – Structure (Rounded to the Nearest Dollar) Bath: $19,578.51 per unit x 16 housing units = $313,256

Next the potential dollar losses to the ***content*** of the potentially-damaged housing units must be determined. Based on FEMA guidance, the value of a residential housing unit's content is approximately 50% of its market value. Therefore, start by taking one-half the average market value for a residential structure and multiply that by the percent damage to get the average content damage per unit. Next the average content damage per unit is multiplied by the number of potentially-damaged housing units. **Figure 47** provides a sample calculation.

Figure 47 ***Content* – Potential Dollar Loss Calculations**
½ (Average Market Value Per Housing Unit) x Percent Damage = Average Content Damage Bath: ½ ($31,077) x 90% = $13,984.65 per unit Average Content Damage x Number of Potentially-Damaged Housing Units = Potential Dollar Losses – Content (Rounded to the Nearest Dollar) Bath: $13,984.65 per unit x 16 housing units = $223,754

Finally the ***total potential dollar losses*** may be calculated by adding together the potential dollar losses to the structure and the content. **Figure 48** provides a breakdown of the total potential dollar losses by municipality.

This assessment illustrates the potential residential dollar losses that should be considered when municipalities are deciding which mitigation projects to pursue. Potential dollar losses caused by riverine flooding to vulnerable residences within the participating municipalities would be

expected to range from $39,000 to $537,000. There are seven participating municipalities in this scenario who do not have any residences considered vulnerable to riverine flooding.

Figure 48
Estimated Potential Dollar Losses to Potentially-Damaged Housing Units from a Riverine Flood Event

Participating Jurisdiction	Average Market Value (2013)	Potentially-Damaged Housing Units (Rounded Up)	Potential Dollar Losses		Total Potential Dollar Losses (Rounded to the Nearest Dollar)
			Structure	Content	
Bath	$31,077	16	$313,256.16	$223,754.40	$537,011
Easton	$45,188	0	$ 0	$ 0	$ 0
Forest City	$37,972	3	$22,783.20	$17,087.40	$39,871
Havana	$45,792	0	$ 0	$ 0	$ 0
Kilbourne	$36,392	0	$ 0	$ 0	$ 0
Manito	$72,413	0	$ 0	$ 0	$ 0
Mason City	$47,063	0	$ 0	$ 0	$ 0
San Jose	$32,630	0	$ 0	$ 0	$ 0
Topeka	$32,488	0	$ 0	$ 0	$ 0

The calculations presented above are meant to provide the reader with a sense of the scope or magnitude of a large riverine flood event in dollars. These calculations do not include the physical damages sustained by businesses or other infrastructure. Monetary impacts to businesses can include loss of sales revenue either through the temporary closure or loss of crucial services (i.e., power, drinking water and sewer).

The damage sustained by infrastructure from a flood event can far surpass the damage experienced by residential structures. As a result, the cumulative monetary impacts to businesses and infrastructure can exceed the cumulative monetary impacts to residences. While average dollar amounts cannot be supplied for these items at this time, they should be taken into account when discussing the overall impacts that a large-scale riverine flood event could have on the participating jurisdictions.

Vulnerable Infrastructure & Critical Facilities

Manito's wastewater treatment facility and maintenance garage are located within the base floodplain of the North Quiver Ditch. The potential dollar loss to relocate the wastewater treatment facility would be several million dollars. In Havana, the City's wastewater treatment facility and the Dynergy Havana Power Station are located adjacent to a riverine base floodplain and are potentially vulnerable to flooding.

No other above-ground infrastructure within the participating jurisdictions, other than key roads and bridges, were identified as being vulnerable to riverine flooding.

Considerations

While the potential dollar loss scenario was only for a riverine flood event, the participating jurisdictions should be aware and consider the impacts that can result from flash flood and groundwater flood events. Mason County has experienced multiple events over the last 20 years.

These events illustrate the fact that all forms of flooding can and will impact the County and should be considered when officials discuss the overall monetary impacts of flooding on their communities. All participants should carefully consider the types of activities and projects that can be taken to minimize their vulnerability to flooding.

Figure 33
(Sheet 1 of 8)
General & Groundwater Flood Events Reported in Mason County
1973 – 013

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Deaths	Property Damages
3/1/1973 thru 4/30/1973	n/a	countywide	A series of late winter/early spring storms produced persistent and heavy rains on an interval of every 2 to 5 days in March and resulted in extensive flooding of Illinois rivers and waterways. By the end of March, many streams and rivers were at or near all-time record flood levels. Thousands of acres of land were flooded. The flooding and flash flooding continued through April with additional thunderstorms producing excessive rain and deluging the state repeatedly. Many rivers and streams experienced flooding or flash flooding on several different occasions during April. Flooding and flash flooding damages, excluding Mississippi River damages, were estimated at $50 to $70 million. Mason County was among the declared disaster areas and included in Federal Disaster Declaration #373.	n/a	n/a	n/a
3/4/1979 thru 4/30/1979	n/a	countywide	A combination of rapidly melting heavy snowpack and occasional moderate to heavy rains caused flooding along virtually every major stream in the state during March and April. Nineteen counties (including Mason County) were declared disaster areas due to the high waters and included in Federal Disaster Declaration #583. An estimated $32 million dollars in damages resulted from this event with some of the hardest hit areas along the Illinois River from LaSalle-Peru to Grafton. The Illinois River crested at 25.1 feet on April 3rd at the river gage in Havana. This event was the 5th highest crest on record at this gage.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 33
(Sheet 2 of 8)
General & Groundwater Flood Events Reported in Mason County
1973 – 2013

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Deaths	Property Damages
12/2/1982 thru 12/11/1982	n/a	countywide	Heavy rain and thunderstorms between the 2nd and the 6th coupled with already saturated soils produced record or near record flooding along most Illinois rivers, streams and creeks. Many roads and bridges were washed away and major property damage occurred. While no specific damages were recorded for Mason County, damages and fatalities were reported in adjacent counties. An estimated $200 million in damages resulted from this event. Mason County was among the declared disaster areas and included in Federal Disaster Declaration #674. The Illinois River crested at 25.2 feet on December 11th at the river gage in Havana. This event was the 4th highest crest on record at this gage.	n/a	n/a	n/a
2/24/1985 thru 3/31/1985	n/a	countywide	A wet fall coupled with extremely low temperatures and significant snow accumulations from late December through mid-February followed by sudden and persistent warming in mid-February and unusually heavy rains on February 21st through the 23rd resulted in flood stages being exceeded on most Illinois rivers by February 24th. The condition persisted throughout March across much of Illinois. The major event was the near-record flooding on the Illinois River. From Havana to Meredosia the flood levels observed were the worst since the record flood of 1943. Mason County was among the declared disaster areas and included in Federal Disaster Declaration #735. The Illinois River crested at 26.4 feet on March 9th at the river gage in Havana. This event was the 2nd highest crest on record at this gage.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 33
(Sheet 3 of 8)
General & Groundwater Flood Events Reported in Mason County
1973 – 2013

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Deaths	Property Damages
9/2/1993 thru 9/14/1993	n/a	western portion of the county	Nearly continuous rises in the water table, beginning in the summer of 1992, culminated in serious groundwater flooding in and around Havana and Bath in September 1993. Mason County was among the declared disaster areas and included in Federal Disaster Declaration #997. Between July 1992 and June 1993 rainfall at Havana was 151 percent of normal with another 9 inches of rain falling in July 1993. The Illinois River spent over a month above flood stage and peaked 9.4 feet above flood stage on July 30. Because of the heavy rainfall over the spring and summer, farmers did not need to use their wells to irrigate their crops and therefore did not pull any of the excess water out of the ground. While August rainfall was closer to normal, the area received additional rain on September 2nd and 3rd (Havana Rural COOP observer measured 2.72 inches) which caused the already high water table to rise to a level that created lakes in depressed areas around Havana. An additional 3 to 4 inches of rain fell on September 14th and 15th (Havana Rural COOP observer measured 3.81 inches) that led to major groundwater flooding. Large capacity pumps and pipelines were procured and dewatering operations continued through at least mid-November. *Impacts* - Many portions of IL Routes 78, 79 and US Route 136 were covered by as much as 3 feet of water, forcing their closure. Roadways were raised at least temporarily with gravel in some places. - Residential basements on the east side of Havana experienced flooding but could not be dewatered for fear of basement wall *NARRATIVE CONTINUED ON NEXT SHEET*	20	n/a	$2,000,000
Subtotal:				**20**	**0**	**$2,000,000**

Figure 33
(Sheet 4 of 8)
General & Groundwater Flood Events Reported in Mason County
1973 – 2013

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Deaths	Property Damages
9/2/1993 thru 9/14/1993	n/a	western portion of the county	*NARRATIVE CONTINUED FREOM PREVIOUS SHEET* *Impacts Continued…* collapses. ESDA staff and local officials worked to sandbag roads and critical areas of the City. Planning Committee member records indicated that the County Health Department flooded along with the southwestern third of the City. Some basements reportedly collapsed from the pressure created by the rising groundwater levels. The flooding caused several million dollars in damages. - In Bath, the streets were covered with 1.5 feet of water and the Village drinking water well was contaminated by flood waters. Planning Committee member records indicated that transportation routes in and out of the Village were cut off limiting emergency services access. Approximately 20 individuals sustained injuries as a result of this event. In addition, the Village lost electricity and telephone services as well as water and sewer. As a result, $2 million was spent to build a new wastewater treatment facility. - According to Planning Committee member records, the major drainage ditch in Forest City flooded, causing the release of hazardous materials from an underground storage tank.	---	---	---
Subtotal:				---	--	--

Figure 33
(Sheet 5 of 8)
General & Groundwater Flood Events Reported in Mason County
1973 – 2013

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Deaths	Property Damages
5/15/1995 thru 6/24/1995	6:00 a.m.	western portion of the county	Higher-than-average precipitation through April and May caused the Illinois River and many of its tributaries to rise above flood stage, starting on May 14th. Flooding persisted through the latter part of May and first half of June before the River dropped below flood stage starting on June 15th. Numerous farm fields and roads were flooded throughout the Illinois River Basin. Mason County was among the declared disaster areas and included in Federal Disaster Declaration #1053. The Illinois River crested at 26.33 feet on May 31st at the river gage in Havana. This event was the 3rd highest crest on record at this gage.	n/a	n/a	n/a
2/21/1997 thru 3/6/1997	6:00 p.m.	western portion of the county	3 to 4.5 inches of heavy rain fell on frozen ground along the Illinois River basin on the 20th and 21st. This caused numerous tributaries of the Illinois River to flood which caused the Illinois River to rise. The River rose above flood stage at Havana on the 21st. Another storm system moved through central Illinois on the 26th producing an additional 1 to 2 inches of rain which aggravated the flooding situation. The river continued to rise through the end of February and crested at the beginning of March.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 33
(Sheet 6 of 8)
General & Groundwater Flood Events Reported in Mason County
1973 – 2013

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Deaths	Property Damages
1/10/1998 thru 1/23/1998	6:00 p.m.	western portion of the county	A combination of persistent rains and some snow melt across Central Illinois through mid-January resulted in minor flooding on the Illinois River from Havana to Beardstown. Only minor flooding in low lying areas adjacent to the River occurred as river levels only rose about 1 foot above flood stage.	n/a	n/a	n/a
2/15/1998 thru 2/26/1998	12:00 a.m.	western portion of the county	1.25 to 2.25 inches of rain fell across central Illinois between February 10th and 12th which caused the Illinois River to rise about 1 foot above flood stage from Havana to Beardstown. Mainly lowland flooding resulted immediately adjacent to the River with no damages reports noted.	n/a	n/a	n/a
2/27/1998 thru 2/28/1998	12:00 a.m.	western portion of the county	An additional 0.5 to 1 inch of rain fell on already saturated grounds and already high Illinois River levels across central Illinois creating additional flooding on the Illinois River from Havana to Beardstown. Once again, only minor flooding of low lying areas adjacent to the River occurred.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 33
(Sheet 7 of 8)
General & Groundwater Flood Events Reported in Mason County
1973 – 2013

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Deaths	Property Damages
5/12/2002 thru 6/8/2002	8:30 p.m.	western portion of the county	Several rounds of precipitation fell across central Illinois during the first few weeks of May resulting in area rivers rising above flood stage in most locations. Both the Illinois River and Sangamon River rose above flood stage. The flooding continued into June along the lower portions of the Illinois River before it crested on June 8th. Mason County was among the declared disaster areas and included in Federal Disaster Declaration #1416. *Impacts* - An 8 year-old boy drowned while playing in a boat that was tied to the shore in a flooded part of the Illinois River. The rope got loose and the boat started to drift away. The boy panicked and jumped into the water.	n/a	1	n/a
4/18/2013 thru 5/19/2013	11:00 a.m.	western portion of the county	Excessive rainfall over the first half of April led to widespread flooding across a large portion of northern and central Illinois that lasted through the middle of May. Locations from the Chicago metro area, southwest along the Illinois River Valley, received 5 to 10 inches of rain over a 2-day period starting on April 17th. This heavy rain combined with already saturated soils resulted in record flooding along the Illinois and Spoon Rivers. The high impact flooding did not subside in Havana until May 19th when the River dropped below a stage of 17 feet. Every county along the Illinois River (including Mason County) was declared a state and federal disaster area and covered under Federal Disaster Declaration #4116. *NARRATIVE CONTINUED ON NEXT SHEET*	0	0	$5,000,000
Subtotal:				**0**	**1**	**$5,000,000**

Figure 33
(Sheet 8 of 8)
General & Groundwater Flood Events Reported in Mason County
1973 – 2013

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Deaths	Property Damages
4/18/2013 thru 5/19/2013	11:00 a.m.	western portion of the county	*NARRATIVE CONTINUED FREOM PREVIOUS SHEET* The Illinois River crested at 27.78 feet on April 25th at the river gage in Havana. This event broke the flood of record set at this gage on May 26, 1943 at 27.1 feet. *Impacts* - Hundreds of cabins and sheds in wildlife areas along the Illinois River were severely damaged. - 25 homes and several other structures were damaged near Bath, Snicarte, Havana and Goofy Ridge. - Nearly 15 miles of roads were washed out. - Planning Committee member records indicate that Patterson Bay, Snicarte and Matanzas Beach suffered flood damages to homes and roads. These areas also suffered power outages.	---	---	---
Subtotal:				---	---	---
GRAND TOTAL:				**20**	**1**	**$7,000,000**

Sources: Illinois Department of Natural Resources, Office of Water Resources.
Illinois State Water Survey.
Mason County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Member responses to Mason County Natural Hazard Events Questionnaire.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Image and Publications System, COOP Data / Record of Climatological Observations.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Image and Publications System, Storm Data.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

Figure 34
(Sheet 1 of 3)
Flash Flood Events Reported in Mason County
1995 – 2013

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Deaths	Property Damages
5/16/1995 thru 5/17/1995	6:00 p.m.	countywide	- 3 to 4 inches of rain fell within a short amount of time causing flash flooding of small streams and closures of flooded roads. - Mason City COOP observer measured 3.89 inches of rain. - Havana Rural COOP observer measured 1.95 inches of rain.	n/a	n/a	n/a
5/11/2002	11:04 a.m.	Manito[^]	- several rural roads were briefly flooded	n/a	n/a	n/a
6/13/2002	7:00 a.m.	countywide	- Heavy rains caused flash flooding of numerous rural roads. - Between the 12th and 13th: • Havana Rural COOP observer measured 6.10 inches of rain. • Mason City COOP observer measured 3.57 inches of rain.	n/a	n/a	n/a
7/9/2003	8:00 p.m.	Manito	- Very heavy rains fell for several hours resulting in flash flooding of many streets and roads in and around the Village.	n/a	n/a	n/a
8/25/2004	4:46 p.m.	Mason City	- Heavy rains caused flash flooding of several streets in the City. - Mason City COOP observer measured 1.97 inches of rain.	n/a	n/a	n/a
9/11/2006	6:25 p.m.	Havana	- Heavy rains resulted in flash flooding of numerous roads within the City. US Route 136 had 1 to 2 feet of water flowing across it for a time. - Havana Rural COOP observer measured 2.15 inches of rain.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

[^] Flash flood event verified in the vicinity of this location(s).

Figure 34
(Sheet 2 of 3)
Flash Flood Events Reported in Mason County
1995 – 2013

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Deaths	Property Damages
6/22/2010	9:15 a.m.	southern portion of the county	- 1.50 to 2.25 inches of rain fell within an hour on already saturated ground producing rapid flash flooding in a small part of southern Mason County. - Rural roads in this area were impassable, particularly those near the Logan and Menard County lines.	n/a	n/a	n/a
7/19/2010 thru 7/20/2010	8:30 p.m.	- Havana^ - Matanzas Beach - Bath - Patterson Bay - Snicarte^ - southern portion of the county	- Heavy rain fell during the late evening hours of the 19th across southern Mason County with rainfall rates of 2 inches per hour for more than 3 hours which produced widespread flash flooding. - Total rainfall accumulations reached nearly 6 inches along the Illinois River from just south of Havana to near Snicarte. - Nearly every rural road in the southern part of the county was closed.	n/a	n/a	n/a
7/28/2010 thru 7/29/2010	8:00 p.m.	Snicarte	- A slow moving thunderstorm system produced copious amounts of rain in a small part of southwest Mason County during the late evening hours of the 28th. Rainfall amounts of 4 to 5 inches were measured in 90 minutes which led to flash flooding. - Nearly 2 feet of water covered many rural roads. Nearly all roads in the vicinity of the Illinois River were closed due to flooding.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

^ Flash flood event verified in the vicinity of this location(s).

Figure 34
(Sheet 3 of 3)
Flash Flood Events Reported in Mason County
1995 – 2013

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Deaths	Property Damages
4/15/2011	6:30 p.m.	- central portion of the county - southern portion of the county	- Several rounds of heavy rain which resulted in 3 to 4 inches of rain in 4 hours caused flash flooding of rural roads and creeks.	n/a	n/a	n/a
6/15/2011	2:30 a.m.	- Manito - northern portion of the county	- Heavy rain fell during the early morning hours across northern Mason County producing more than 2 inches in less than 90 minutes causing flash flooding. - Havana Rural COOP observer measured 2.40 inches of rain. - Many streets in Manito were flooded. - Numerous rural roads near the Illinois River were impassable.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**
GRAND TOTAL:				**0**	**0**	**$0**

^ Flash flood event verified in the vicinity of this location(s).

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Image and Publications System, COOP Data / Record of Climatological Observations.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Image and Publications System, Storm Data.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

3.4 TORNADOES

IDENTIFYING THE HAZARD

What is the definition of a tornado?

A tornado is a violently rotating column of air, usually characterized by a twisting, funnel-shaped cloud, that extends from the cloud formation of a thunderstorm to the ground. The strongest tornadoes have rotating wind speeds of more than 250 miles per hour and can create damage paths in excess of one mile wide and 50 miles long.

Not all tornadoes have a visible funnel cloud. Some may appear nearly transparent until dust and debris are picked up or a cloud forms within the funnel. Generally, tornadoes move from southwest to northeast, but they have been known to travel in any direction, even backtracking. The average forward speed of a tornado is 30 mile per hour, but this may vary from nearly stationary to 70 miles per hour.

About 1,200 tornadoes hit the United States yearly. The destruction caused by a tornado may range from light to catastrophic depending on the intensity, size and duration of the storm. Tornadoes cause crop and property damage, power outages, environmental degradation, injury and death. Torndoes are known to blow off roofs, move cars and tractor trailers and demolish homes. Typically tornadoes cause the greatest damage to structures of light construction, such as residential homes. On average, tornadoes cause 70 facilities and 1,500 injuries in the United States annually.

How are tornadoes rated?

Originally tornadoes were rated using the Fujita Scale (F-Scale), which related the degree of damage caused by a tornado to the intensity of the tornado's wind speed. The Scale identified six categories of damage, F0 through F5. **Figure 49** gives a brief description of each category.

Use of the original Fujita Scale was discontinued on February 1, 2007 in favor of the Enhanced Fujita Scale. The original scale had several flaws including basing a tornado's intensity and damages on wind speeds that were never scientifically tested and proven. It also did not take into consideration that a multitude of factors (i.e. structure construction, wind direction and duration, flying debris, etc.) affect the damage caused by a tornado. In addition, the process of rating the damage itself was based on the judgment of the damage assessor. In many cases, meteorologists and engineers highly experienced in damage survey techniques often came up with different F-scale ratings for the same damage.

The Enhanced Fujita Scale (EF-Scale) was created to remedy the flaws in the original scale. It continues to use the F0 through F5 categories, but it classifies the level of damage (one through eight) as calibrated by engineers and meteorologists to 28 different types of damage indicators (mainly various building types, towers/poles and trees.) The wind speeds assigned to each category are estimates, not measurements, based on the damage assessment. **Figure 49** identifies the Enhanced Fujita Scale.

Figure 49
Fujita & Enhanced Fujita Tornado Measurement Scales

F-Scale		EF-Scale		Description
Category	**Wind Speed (mph)**	**Category**	**Wind Speed (mph)**	
F0	40 – 72	EF0	65 – 85	Light damage – some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; damage to sign boards
F1	73 – 112	EF1	86 – 110	Moderate damage – peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads
F2	113 – 157	EF2	111 – 135	Considerable damage – roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground
F3	158 – 207	EF3	136 – 165	Severe damage – roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off ground and thrown
F4	208 – 260	EF4	166 – 200	Devastating damage – well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated
F5	261 – 318	EF5	Over 200	Incredible damage – strong frame houses lifted off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 yards; trees debarked; incredible phenomena will occur

Source: National Oceanic and Atmospheric Administration, Storm Prediction Center.

The idea behind the EF-Scale is that a tornado scale needs to take into account the typical strengths and weaknesses of different types of construction, instead of applying a "one size fits all" approach. This is due to the fact that the same wind speed can cause different degrees of damage to different kinds of structures. In a real life application, the degree of damage to each of the 28 indicators can be mapped together to create a comprehensive damage analysis. As with the original scale, the EF-Scale rates the tornado as a whole based on the most intense damage within the tornado's path.

While the EF-Scale is currently in use, ***the historical data presented in this report is based on the original F-Scale***. None of the tornadoes rated before February 1, 2007 will be re-evaluated using the EF-Scale.

Are alerts issued for tornadoes?

Yes. The National Weather Service Weather Forecast Office in Lincoln, Illinois is responsible for issuing ***tornado watches*** and ***warnings*** for Mason County depending on the weather conditions. The following provides a brief description of each type of alert.

- **Watch.** A tornado watch is issued when tornadoes are possible in or near the watch area. It does not mean a tornado is imminent, jut that individuals need to stay alert and be prepared to take shelter.

- **Warning.** A tornado warning is issued when a tornado has been sighted or indicated by radar. Individuals should see shelter immediately.

PROFILING THE HAZARD

When have tornadoes occurred previously? What is the extent of these previous tornadoes?

Figure 50, located at the end of this section, summarizes the previous occurrences as well as the extent or magnitude of tornado events recorded in Mason County. NOAA's Storm Events Database, records from the National Weather Service Central Illinois Weather Forecast Office in Lincoln and Planning Committee member records have documented 31 occurrences of tornadoes in Mason County between 1950 and 2013. In comparison, there have been 2,199 tornadoes statewide between 1950 and 2012.

Tornado Fast Facts – Occurrences

Number of Tornadoes Reported (1950 – 2013): ***31***

Highest F-Scale Rating Recorded: ***F3***

Most Likely Month for Tornadoes to Occur: ***April***

Most Likely Time for Tornadoes to Occur: ***Afternoon/ Early Evening***

Average Length of a Tornado: ***4.58 miles***

Average Width of a Tornado: ***120 yards***

Average Damage Pathway of a Tornado: ***0.31 sq. mi.***

Longest Tornado Path in the County: ***25.6 miles (Apr. 13, 1981)***

Widest Tornado Path in the County: ***880 yards (May 13, 1995)***

Figure 51 charts the reported occurrences of tornadoes by magnitude. Of the 31 occurrences, three were classified as F3 tornadoes, six were classified as F2 tornadoes, 11 were classified as F1 tornadoes, nine were classified as F0 tornadoes, one was classified as an EF1 tornado and one was classified as an EF0 tornado.

Figure 51
Tornadoes by Magnitude
1950 – November 30, 2013

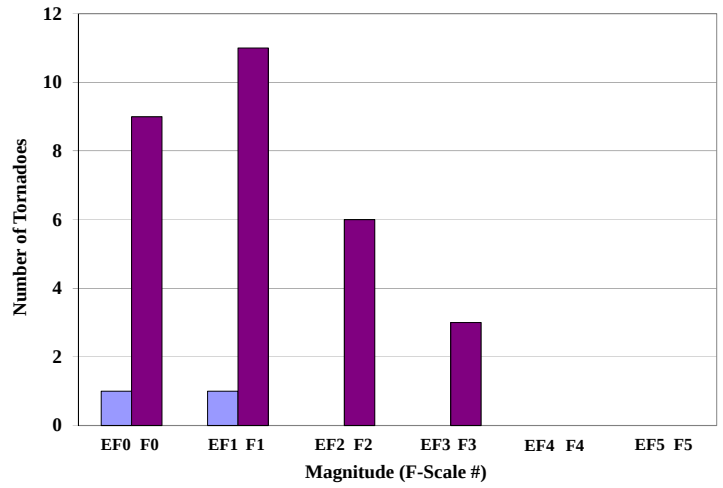


Figure 52 charts the reported tornadoes by month. Of the 31 events, 19 (61%) took place in April, May and June making this the peak period for tornadoes in Mason County. Of those 19 events, eight (42%) occurred during April making this the peak month for tornadoes. In comparison, 1,457 of the 2,199 tornadoes (66%) recorded in Illinois since 1950 also took place in April, May and June.

Figure 52
Tornadoes by Month
1950 – 2013

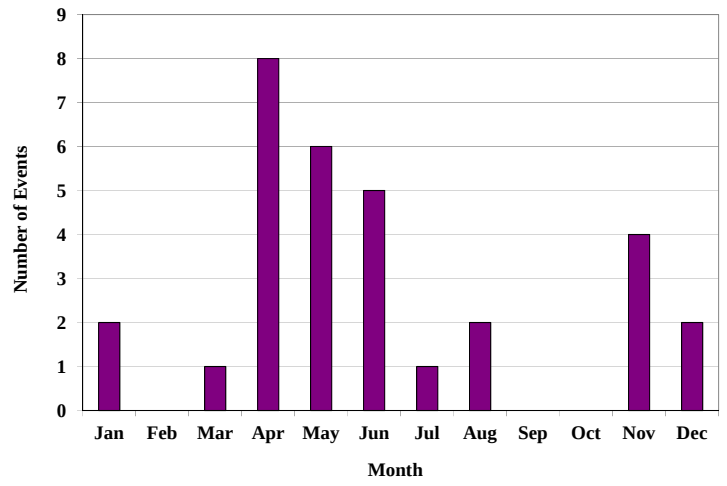
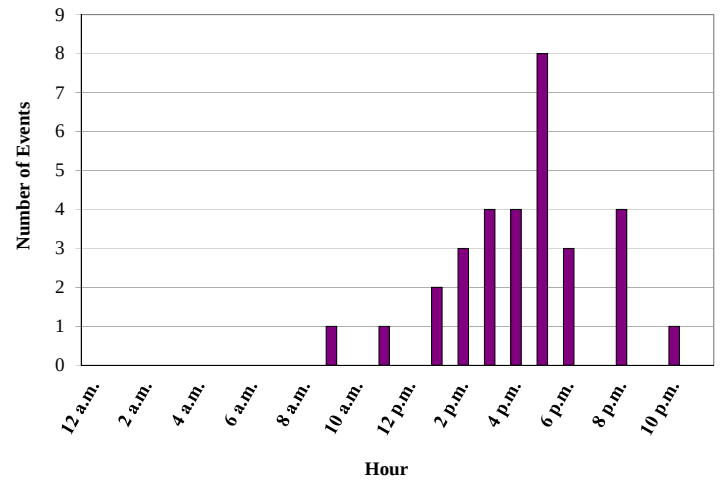


Figure 53 charts the reported tornadoes by hour. Approximately 94% of all tornadoes occurred during the p.m. hours, with 25 of the events (81%) taking place between 1 p.m. and 7 p.m. In comparison, more than half of all Illinois tornadoes occur between 3 p.m. and 7 p.m.

Figure 53
Tornadoes by Hour
1950 – 2013



The tornadoes that have impacted Mason County have varied from 0.1 miles to 25.6 miles in length and from 10 yards to 880 yards in width. The average length of a tornado in Mason County is 4.58 miles and the average width is 120 yards (0.068 miles).

On April 15, 2011 an EF1 tornado near Poplar City destroyed several outbuildings, including this garage.

Photograph courtesy of The Mason County Democrat

Figures 54 shows the pathway of each reported tornado. The numbers by each tornado correspond with the tornado description in **Figure 50**. Records indicate that most of the tornadoes in Mason County move from southwest to northeast across the County. Unlike other natural hazards (i.e., severe winter storms, drought and extreme heat), tornadoes impact a relatively small area. Typically the area impacted by a tornado is less than four square miles. In Mason County, the average damage pathway or area impacted by a tornado is 0.31 square miles.

The longest tornado recorded in Mason County occurred on April 13, 1981. This F1 tornado measured 46.1 miles in length and touched down in Lewistown (Fulton County), traveling southeast to near Havana before tracking eastward across Mason County and into Logan County where it changed courses again, heading southeast before lifting off at Lincoln. The tornado was on the ground in Mason County for approximately 25.6 miles. The damage pathway of this tornado covered an estimated 0.86 square miles, with approximately 0.48 square miles occurring in Mason County.

The widest tornado recorded in Mason County occurred on May 13, 1995. This F3 tornado, measuring 880 yards wide, touched down northeast of Goofy Ridge and traveled northeast through Sand Ridge State Forest and into Tazewell County for approximately 25.0 miles before lifting off in Tremont. The tornado was on the ground in Mason County for approximately 4.5 miles. The damage pathway of this tornado covered an estimated 12.5 square miles, with approximately 2.25 square miles occurring in Mason County.

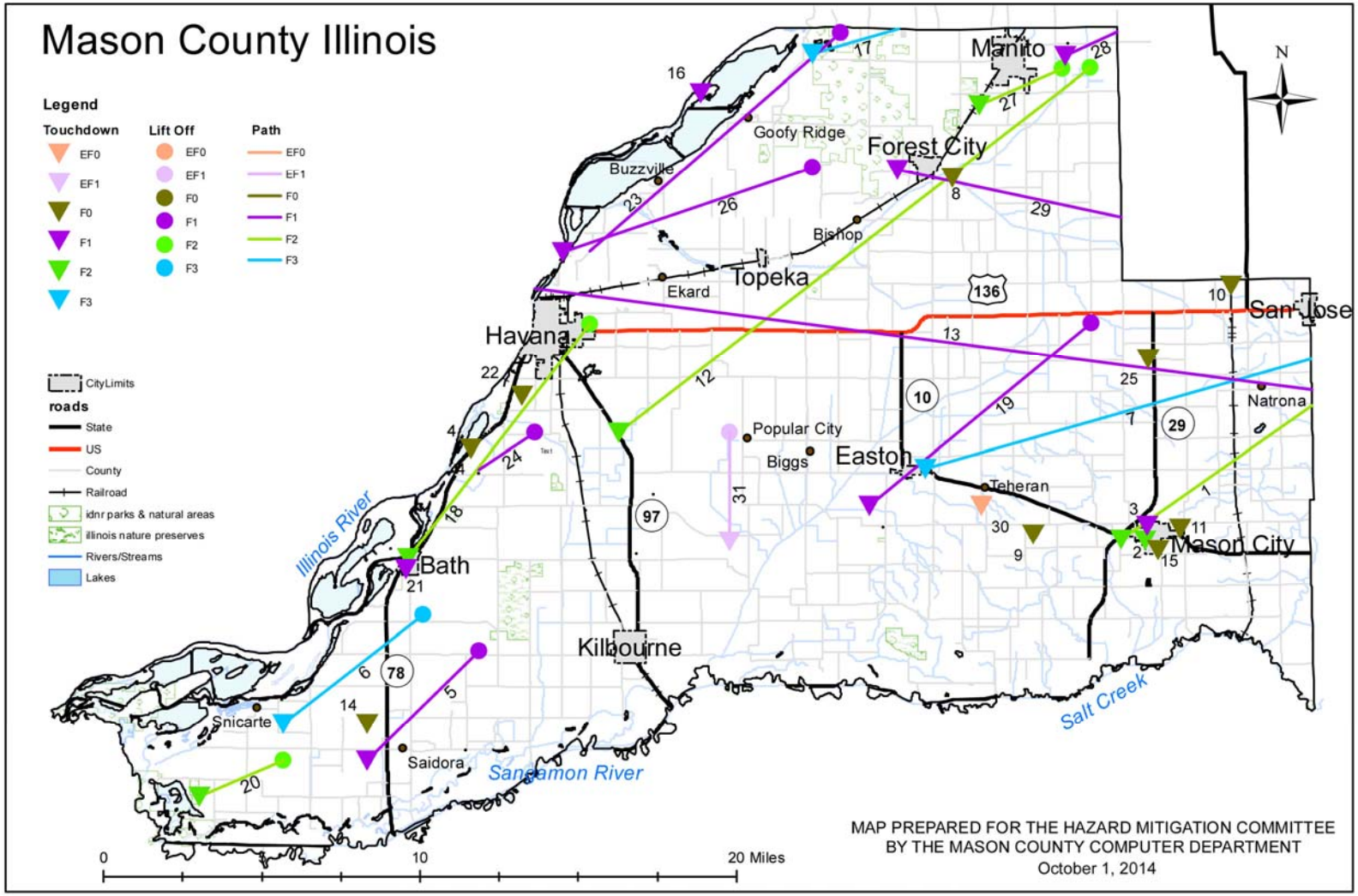
What locations are affected by tornadoes?

Tornadoes have the potential to affect the entire County. Five of the participating municipalities, Bath, Easton, Forest City, Manito and Mason City have had reported occurrences of tornadoes within their corporate limits. The *2013 Illinois Natural Hazard Mitigation Plan* prepared by IEMA classifies Mason County's hazard rating for tornadoes as "elevated."

What is the probability of future tornadoes occurring?

Mason County has had 31 verified occurrences of tornadoes between 1950 and 2013. With 31 tornadoes over the past 64 years, the probability or likelihood that a tornado will touchdown somewhere in the County in any given year is 48%. There were six years over the last 64 years where more than one tornado occurred. This indicates that the probability that more than one tornado may occur during any given year within the County is 9.4%.

Figure 54
Tornado Touchdowns in Mason County: 1950 – 2013



ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to tornadoes?

Yes. All of Mason County is vulnerable to the dangers presented by tornadoes. According to NOAA's Storm Events Database and records from the National Weather Service Central Illinois Weather Forecast Office in Lincoln, a majority of the tornadoes have touched down or passed through the southern half of the County. Havana, Kilbourne, San Jose and Topeka are the only participating municipalities that have not had a tornado touch down or pass through their municipal boundaries. **Figure 55** lists the verified tornadoes that have touched down in or near each participating municipality.

Figure 55
Verified Tornado Touchdowns In or Near Participating Municipalities

Participating Municipality	Number of Verified Tornadoes	Year Tornado Touchdown
Bath	4	1967, 1995, 1996*, 1998*
Easton	2	1968*, 1996*
Forest City	4	1973*, 1975, 2003, 2003*
Havana	7	1975, 1981, 1996, 1998, 1998, 1999, 2003
Kilbourne	1	1967
Manito	3	1975, 2003*, 2003
Mason City	7	1951*, 1957*, 1957*, 1974, 1974*, 1987*, 2001
San Jose	3	1974, 1981, 2003
Topeka	1	1981

***** Tornado touched down or passed through the municipality.

In terms of unincorporated areas vulnerable to tornadoes, Snicarte and Sand Ridge State Forest have had more tornadoes touch down in their vicinity than any other area. **Figure 56** details the verified tornadoes touch downs near unincorporated areas of Mason County.

Figure 56
Verified Tornado Touchdowns In or Near Unincorporated Areas of Mason County

Participating Municipality	Number of Verified Tornadoes	Year Tornado Touchdown
Baldwin Beach	1	1998*
Biggs	0	---
Bishop	1	1975
Buzzville	1	1998
Eckard	1	1981
Goofy Ridge	2	1995, 1998
Matanzas Beach	2	1961*, 1999
Natrona	1	1968*
Poplar City	1	2011
Quiver Beach	1	2003*
Saidora	0	---
Sand Ridge State Forest	4	1990, 1995*, 1998, 2003*
Snicarte	4	1967, 1967, 1995, 1998
Teheran	1	2009

***** Tornado touched down or passed through the area.

What impacts resulted from the recorded tornadoes?

Data obtained from NOAA's Storm Events Database, the National Weather Service Central Illinois Weather Forecast Office in Lincoln and Planning Committee member records indicates that between 1950 and 2013, 13 of the 31 tornadoes caused $8,277,500 in property damage. Included in the property damage total is $2.5 million for the April 13, 1981 tornado which represents losses sustained in three counties (including Mason County). A breakdown by county was unavailable.

There were five events where property damage totals were at least $300,000. Property damage information was either unavailable or none was recorded for the remaining 18 reported occurrences.

Tornado Fast Facts – Impacts/Risk

Tornado Impacts

- Total Property Damage: ***$8,277,500^***
- Infrastructure/Critical Facilities Damage*: ***n/a***
- Total Crop Damage: ***n/a***
- Injuries: ***60***
- Fatalities: ***1***

Tornado Risk/Vulnerability to:

- Public Health & Safety – Rural Areas: ***Low/Medium***
- Public Health & Safety – Municipalities: ***High***
- Buildings/Infrastructure/Critical Facilities – Rural Areas: ***Low***
- Buildings/Infrastructure/Critical Facilities – Municipalities/Populated Unincorp. Areas: ***High***

^ Included in the property damage total is $2.5 million for the April 13, 1981 tornado event which represents losses sustained in three counties (including Mason County). A breakdown by county was not available.

* Infrastructure/Critical Facilities Damage totals are included in the Total Property Damage amounts.

Located in **Appendix K** are select photographs provided by the Mason County Democrat that show the extent of the property damage sustained during the EF1 tornado that touched down near Poplar City on April 15, 2011.

NOAA's Storm Events Database and Planning Committee member records documented a total of 60 injuries and one fatalitie as a result of 10 tornado events. Detailed information was only available for four of the events. The following provides a brief description. In comparison, Illinois averages roughly four tornado fatalities annually; however, this number varies widely from year to year.

- Two children were injured by flying glass when an F0 tornado touched down in Forest City on December 4, 1973.
- A woman sustained minor injuries when an F2 tornado touched down in Bath on April 19, 1996 and destroyed the mobile home she was occupying.
- On May 10, 2003 an elderly woman sustained minor injuries, a cut on her arm and bruises, while taking shelter in her walk-in pantry from an F2 tornado that touched down in Manito.
- An individual was injured by flying glass from an EF1 tornado that touched down near Poplar City on April 15, 2011.

What other impacts can result from tornadoes?

In addition to causing damage to buildings and properties, tornadoes can damage infrastructure and critical facilities such as roads, bridges, railroad tracks, drinking water treatment facilities, water towers, communication towers, antennae, power substations, transformers and poles. Depending on the damage done to the infrastructure and critical facilities, indirect impacts on

individuals could range from inconvenient (i.e., adverse travel) to life-altering (i.e., loss of utilities for extended periods of time).

What is the level of risk/vulnerability to public health and safety from tornadoes?

Mason County ranks in the top 25 counties in Illinois in terms of tornado frequency. This fact alone suggests that the overall risk posed by tornadoes to public health and safety is relatively high. While frequency is important, other factors must be examined when assessing vulnerability including population distribution and density, the ratings and pathways of previously recorded tornadoes, the presence of high risk living accommodations (such as high rise buildings, mobile homes, etc.) and adequate access to health care for those injured following a tornado.

Mason County

For Mason County the level of risk or vulnerability posed by tornadoes to public health and safety is considered to be low to medium. This assessment is based on the fact that despite their relative frequency, a large majority of the tornadoes that have impacted the County have touched down in rural areas away from concentrated populations. This has contributed to a relatively low number of injuries and fatalities. In addition, the County is not densely populated, there is not a large number of high risk living accommodations present.

In terms of adequate access to health care, Mason District Hospital in Havana is equipped to provide continuous care to persons injured by a tornado assuming that it is not directly impacted. In addition there are also nearby hospitals in the Peoria area (Tazewell and Peoria Counties), Lincoln (Logan County) and Canton (Fulton County) which are equipped to provide care.

Participating Municipalities

In general if a tornado were to touchdown or pass through any of the participating municipalities the risk to the public health and safety would be considered high. This is based on the fact that with the exception of Havana, Manito and Mason City all of the participating jurisdictions are less than one square mile in size and have relatively dense and evenly distributed populations within their municipal boundaries. Even Havana, Manito and Mason City are not large in size, covering less than three squares miles. In addition, none of the municipalities have large areas of open, undeveloped land. As a result, if a tornado were to touch down anywhere within the corporate limits of these municipalities it will have a greater likelihood of causing injuries or even fatalities.

Are existing buildings, infrastructure and critical facilities vulnerable to tornadoes?

Yes. All existing buildings, infrastructure and critical facilities located within the County and the participating municipalities are vulnerable to damage from tornadoes. Buildings, infrastructure and critical facilities located in the path of a tornado usually suffer extensive damage, if not complete destruction.

While some buildings adjacent to a tornado's path may remain standing with little or no damage, all are vulnerable to damage from flying debris. It is common for flying debris to cause damage to roofs, siding and windows. In addition, mobile homes, homes on crawlspaces and buildings

with large spans (i.e., schools, barns, airport hangers, factories, etc.) are more likely to suffer damage. Most workplaces and many residential units do not provide sufficient protection from tornadoes.

The damages sustained by infrastructure and critical facilities during a tornado are similar to those experienced during a severe storm. There is a high probability that power, communication and transportation will be disrupted in and around the affected area.

Assessing the Vulnerability of Existing Residential Structures

One way to assess the vulnerability of existing residential structures is to estimate the number of housing units that may be potentially damaged if a tornado were to touchdown or pass through any of the participating municipalities or the County. In order to accomplish this, a set of decisions/assumptions must be made regarding:

- the size of the tornado;
- the method used to estimate the area within each jurisdiction impacted by the tornado; and
- the method used to estimate the number of potentially-damaged housing units.

The following provides a brief discussion of each decision/assumption.

Assumption #1

Size of Tornado = 0.31 sq. miles

Size of Tornado: To calculate the number of existing residential structures vulnerable to a tornado, the size of the tornado must first be determined. There are several scenarios that can be used to calculate the size, including the worst case and the average. For this analysis the average tornado size will be used since it has a higher probability of recurring. In Mason County the average size of a tornado is 0.31 square miles. This average is based on over 50 years of data.

Assumption #2

The entire area impacted by the average-sized tornado falls within the limits of each participating jurisdiction.

Method for Estimating the Area Impacted: Next, a method for determining the area within each jurisdiction impacted by the average-sized tornado needs to be chosen. There are several methods that can be used including creating an outline of the average-sized tornado and overlaying it on a map of each jurisdiction (most notably the municipalities) to see if any portion of the area falls outside of the corporate limits (which would require additional calculations) or just assume that the entire area of the average-sized tornado falls within the limits of each jurisdiction. For this discussion, it is assumed that the entire area of the average-sized tornado will fall within the limits of the participating jurisdictions.

This method is quicker, easier and more likely to produce consistent results when the Plan is updated. There is, however, a greater likelihood that the number of potentially-damaged housing units will be overestimated for those municipalities that have irregular shaped boundaries or occupy less than one square mile.

Assumption #3

The average housing unit density for each municipality will be used to determine the number of potentially-damaged housing units.

Method for Estimating Potentially-Damaged Housing Units: With the size of the tornado calculated and a method for estimating the area impacted chosen, a decision must be made on a method for estimating the number of potentially-damaged housing units. There are several methods that can be used including overlaying the average-sized tornado on a map of each jurisdiction and counting the impacted housing units or calculating the average housing unit density to estimate the number of potentially-damaged housing units. For this analysis, the average housing unit density will be used since it provides a realistic perspective on potential residential damages without conducting extensive counts. Using the average housing unit density also allows future updates to the Plan to be easily recalculated and provides an exact comparison to previous calculations.

The average housing unit density can be calculated by taking the number of housing units in a jurisdiction and dividing that by the land area within the jurisdiction. **Figure 57** provides a sample calculation.

Figure 57 Calculation of Average Housing Unit Density
Total Housing Units ÷ Land Area = Average Housing Unit Density (Rounded Up to the Nearest Whole Number) Mason County: 7,077 housing units ÷ 539.238 sq. miles = 14 housing units/sq. mile

Figure 58 provides a breakdown of housing unit densities by participating municipality as well as for the unincorporated areas of the County and the County as a whole.

While the average housing unit density provides an adequate assessment of the number of housing units in areas where the housing density is fairly constant, such as municipalities, it does not provide a realistic assessment for those counties with large, sparsely populated rural areas such as Mason County

In Mason County, as well as many other west-central Illinois counties, there are pronounced differences in housing unit densities within the County. Approximately 65% of all housing units and 64% of mobile homes are located in three of the County's 13 townships (Havana, Manito and Mason City). **Figure 59** identifies the township boundaries. Tornado damage to buildings (especially mobile homes), infrastructure and critical facilities in these more densely populated townships is likely to be greater than in the rest of the County.

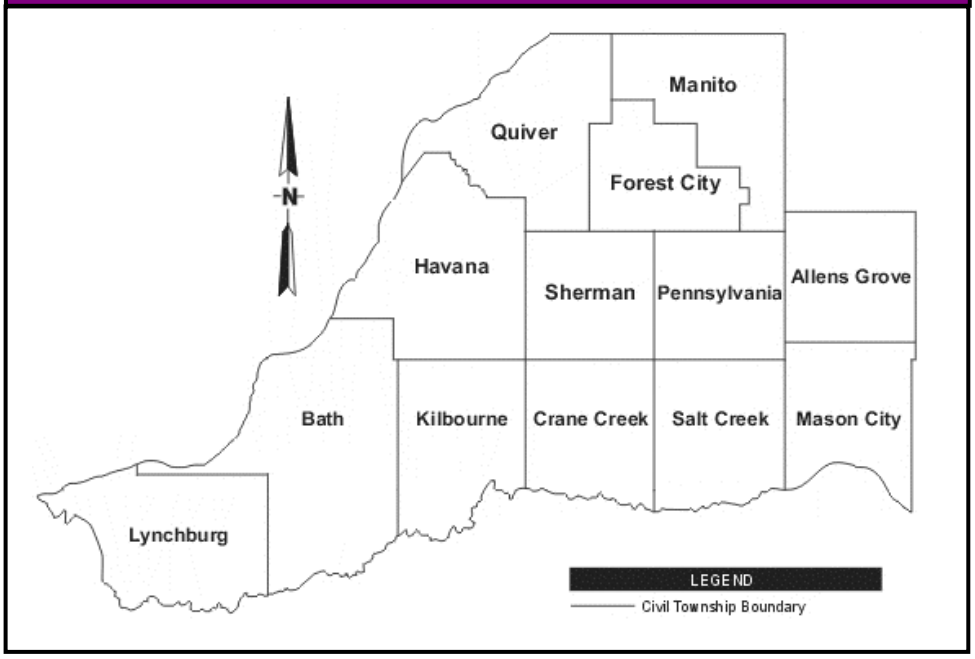
Figure 58
Average Housing Unit Density by Participating Municipality

Jurisdiction	Total Housing Units (2010)	Mobile Homes (2000)*	Land Area (Sq. Miles) (2010)	Average Housing Unit Density (Units/Sq. Mile) (Raw)
Bath	161	43	0.365	---
Easton	165	9	0.240	---
Forest City	111	17	0.523	---
Havana	1,535	110	2.741	560.01459
Kilbourne	143	28	0.889	---
Manito	710	14	1.441	492.71339
Mason City	1,108	121	1.014	1092.70217
San Jose	255	35	0.500	---
Topeka	45	5	0.137	---
Unincorp. County	2,844	330	531.388	5.35202
County	7,077	712	539.238	13.12408

* At the time this Plan was drafted the U.S. Census Bureau had not released the 2010 Census DP-4 Selected Housing Characteristics data tables for geographic type: place (i.e., municipalities.). It was decided that the 2000 census data would be used in its place instead of estimates for mobile homes.

Source: U. S. Census Bureau.

Figure 59
Mason County Township Boundaries



Source: Illinois Secretary of State.

This substantial difference in density skews the average *county* housing unit density in Mason County and is readily apparent when the average *county* housing unit density is compared to the average housing unit densities for each of the townships within the County. **Figure 60** provides a breakdown of housing unit densities by township and illustrates the differences between the various townships and the County as a whole.

Figure 60
Average Housing Unit Density by Township

Township	Total Housing Units (2010)	Mobile Homes (2000)*	Land Area (Sq. Miles) (2010)	Average Housing Unit Density (Units/Sq. Mile) (Raw)
Allens Grove	255	16	35.725	7.13786
Bath	475	64	66.775	7.11344
Crane Creek	73	0	34.011	2.14636
Forest City	228	26	33.312	6.84438
Havana	2,295	220	57.861	39.66402
Kilbourne	245	59	40.102	6.10942
Lynchburg	246	19	42.095	5.84392
Manito	1,088	113	43.771	24.85664
Mason City	1,220	121	35.416	34.44771
Pennsylvania	92	0	35.846	2.56653
Quiver	517	65	42.489	12.16786
Salt Creek	96	0	35.818	2.68022
Sherman	247	9	36.017	6.85787
County	7,077	712	539.238	13.12408
Townships – 3 most populated	4,603	454	137.048	33.58677
Townships – 10 least populated	2,474	258	402.190	6.15132

* At the time this Plan was drafted the U.S. Census Bureau had not released the 2010 Census DP-4 Selected Housing Characteristics data tables for geographic type: county subdivisions (i.e., townships.). It was decided that the 2000 census data would be used in its place instead of estimates for mobile homes.

Source: U. S. Census Bureau.

For 10 of the 13 townships, the average *county* housing unit density is greater (in some cases considerably greater) than the average *township* housing unit densities. In addition, the average *county* housing unit density is considerably less than the housing unit densities for all three of the most populated townships.

Estimating the Number of Potentially-Damaged Housing Units

With the average housing unit densities calculated it is relatively simple to provide an estimate of the number of existing potentially-damaged housing units. This can be done by taking the average housing unit density and multiplying that by the average-sized tornado. **Figure 61** provides a sample calculation.

For those municipalities that cover less than one square mile, the average housing unit density cannot be used to calculate the number of potentially-damaged housing units. The average housing unit density assumes that the land area within the municipality is at least one square mile

and as a result distorts the number of potentially-damaged housing units for very small municipalities.

Figure 61 **Calculation of Potentially-Damaged Existing Housing Units**
Average Housing Unit Density x Average-Sized Tornado= Potentially-Damaged Housing Units (Rounded Up to the Nearest Whole Number) Mason County: 13.12408 housing units/sq. mile x 0.31 sq. miles = 4.06846 housing units **(5 housing units)**

To calculate the number of potentially-damaged housing units for these municipalities, take the average area impacted by the tornado and divide that by the land area within the municipality to get the impacted land area. The impacted land area is then multiplied by the total number of housing units within the municipality to get the number of potentially-damaged housing units. **Figure 62** provides a sample calculation. Since the land area in Easton and Topeka is less than the average area impacted, it is assumed that all of the housing units within each of these municipalities will be potentially damaged.

Figure 62 **Calculation of Potentially-Damaged Housing Units** **for Municipalities Covering Less Than One Square Mile**
Average Area Impacted (Sq. Miles) ÷ Land Area (Sq. Miles) = Impacted Land Area Bath: 0.31 sq. mile ÷ 0.365 sq. miles = 0.84915068 Impacted Land Area x Total Housing Units = Potentially-Damaged Housing Units (Rounded Up to the Nearest Whole Number) Bath: 0.84915068 x 161 housing units = 136.739726 housing units **(137 housing units)**

Figures 63 and **64** provide a breakdown of the number of potentially-damaged housing units by participating municipality as well as by township and for the unincorporated areas of the County and the County as a whole.

It is important to note that for the three most densely populated townships, the estimated number of potentially-damaged housing units would only be reached if a tornado's pathway included the major municipality within the township. If the tornado remained in the rural portion of the township, then the number of potentially-damaged housing units would be considerably lower.

Figure 63
Estimated Number of Housing Units by Municipality Potentially Damaged by a Tornado

Participating Municipality	Total Housing Units (2010)	Land Area (Sq. Miles) (2010)	Average Housing Unit Density (Units/Sq. Mi.) (Raw)	Potentially-Damaged Housing Units (Units/0.31 Sq. Mi.) (Raw)	Potentially-Damaged Housing Units (Units/0.31 Sq. Mi.) (Rounded Up)
Bath	161	0.365	---	136.73973	137
Easton	165	0.240	---	165	165
Forest City	111	0.523	---	65.79350	66
Havana	1,535	2.741	560.01459	173.60452	174
Kilbourne	143	0.889	---	49.86502	50
Manito	710	1.441	492.71339	152.74115	153
Mason City	1,108	1.014	1092.70217	338.73767	339
San Jose	255	0.500	---	158.1	159
Topeka	45	0.137	---	45	45
Unincorp. County	2,844	531.388	5.35202	1.65913	2
County	7,077	539.238	13.12408	4.06846	5

Figure 64
Estimated Number of Housing Units by Township Potentially Damaged by a Tornado

Township	Total Housing Units (2010)	Land Area (Sq. Miles) (2010)	Average Housing Unit Density (Units/Sq. Mi.) (Raw)	Potentially-Damaged Housing Units (Units/0.31 Sq. Mi.) (Raw)	Potentially-Damaged Housing Units (Units/0.31 Sq. Mi.) (Rounded Up)
Allens Grove	255	35.725	7.13786	2.21274	3
Bath	475	66.775	7.11344	2.20517	3
Crane Creek	73	34.011	2.14636	0.66537	1
Forest City	228	33.312	6.84438	2.12176	3
Havana	2,295	57.861	39.66402	12.29585	13
Kilbourne	245	40.102	6.10942	1.89392	2
Lynchburg	246	42.095	5.84392	1.81162	2
Manito	1,088	43.771	24.85664	7.70556	8
Mason City	1,220	35.416	34.44771	10.67879	11
Pennsylvania	92	35.846	2.56653	0.79562	1
Quiver	517	42.489	12.16786	3.77204	4
Salt Creek	96	35.818	2.68022	0.83087	1
Sherman	247	36.017	6.85787	2.12594	3
County	7,077	539.238	13.12408	4.06846	5
Townships – 3 most populated	4,603	137.048	33.58677	10.41190	11
Townships – 10 least populated	2,474	402.190	6.15132	1.90691	2

What is the level of risk/vulnerability to existing buildings, infrastructure and critical facilities vulnerable from tornadoes?

There are several factors that must be examined when assessing the vulnerability of existing buildings, infrastructure and critical facilities to tornadoes. These factors include tornado frequency, population distribution and density, the ratings and pathways of previously recorded tornadoes, and the presence of high risk living accommodations (such as high rise buildings, mobile homes, etc.).

Mason County

For Mason County the level of risk or vulnerability posed by tornadoes to existing buildings, infrastructure and critical facilities is consider to be medium to low. This assessment is based on the frequency with which tornadoes have occurred in the County as well as the amount of damage that has been sustained tempered by the low population density throughout most the County as well as the relative absence of high risk living accommodations. While previously recorded tornadoes have followed largely rural pathways they have caused significant damage on several occasions.

On April 15, 2011 an EF1 tornado near Poplar City destroyed several outbuildings.

Photograph courtesy of The Mason County Democrat

Participating Municipalities

In general if a tornado were to touchdown or pass through any of the participating municipalities the risk to existing buildings, infrastructure and critical facilities would be considered high. This assessment is based on the population and housing unit distribution of the municipalities where wide expanses of open spaces do not generally exist. As a result, if a tornado were to touch down within any of the municipalities it will have a greater likelihood of causing substantial property damage.

Are future buildings, infrastructure and critical facilities vulnerable to tornadoes?

Yes and No. While four of the participating jurisdictions have building codes in place that will likely lessen the vulnerability of new buildings and critical facilities to damage from tornadoes, the County and five other municipalities do not.. However, even new buildings and critical facilities built to code are vulnerable to the risks posed by a high rated tornado.

Infrastructure such as new communication and power lines will continue to be vulnerable to tornadoes as long as they are located above ground. Flying debris can disrupt power and communication lines even if they are not directly in the path of the tornado. Steps to bury all new lines would eliminate the vulnerability, but this action would be cost prohibitive in most areas.

What are the potential dollar losses to vulnerable structures from tornadoes?

Unlike other hazards, such as flooding, there are no standard loss estimation models or methodologies for tornadoes. However, a rough estimate of potential dollar losses to the *potentially-damaged housing units* determined previously can be calculated if several additional decisions/assumptions are made regarding:

- the value of the potentially-damaged housing units; and
- the percent damage sustained by the potentially-damaged housing units (i.e., damage scenario).

These assumptions represent a ***probable scenario*** based on the reported historical occurrences of tornadoes in Mason County. The purpose of providing a rough estimate is to help residents and municipal/county officials make informed decisions to better protect themselves and their communities. These estimates are meant to provide a ***general idea*** of the magnitude of the potential damage that could occur. The following provides a brief discussion of each decision/assumption.

Assumption #4

The average market value for residential structures in each participating jurisdiction will be used to determine the value of potentially-damaged housing units.

Value of Potentially-Damaged Housing Units: In order to determine the potential dollar losses to the potentially-damaged housing units, the monetary value of the units must first be calculated. Typically when damage estimates are prepared after a natural disaster such as a tornado, they are based on the market value of the structure. Since it would be impractical to determine the individual market value of each potentially-damaged housing unit, the average market value of residential structures in each municipality will be used.

To determine the average market value, the average assessed value must first be calculated. The average assessed value is determined by taking the total assessed value of residential buildings within a jurisdiction and dividing that number by the total number of housing units within the jurisdiction. **Figure 65** provides a sample calculation. The total assessed value is based on 2013 tax assessment information provided by the Mason County Supervisor of Assessments.

Figure 65 Calculation of Average Assessed Value
Total Assessed Value of Residential Buildings ÷ Total Housing Units = Average Assessed Value (Rounded to the Nearest Penny) Bath: $1,667,816 ÷ 161 housing units = $10,359.11

To determine the average market value, the average assessed value is multiplied by three (the assessed value of a structure in Mason County is approximately one-third of the market value). **Figure 66** provides the average assessed value and average market value for each participating municipality as well as for the unincorporated areas of the County, the County as a whole and the most and least populated townships.

Damage Scenario: Finally, a decision must be made regarding the percent damage sustained by the potentially-damaged housing units and their contents. For this scenario, the expected percent damage sustained by the structure and its contents is 100%; in other words, all of the potentially-damaged housing units would be completely destroyed. While it is highly unlikely that each and every housing unit would sustain the maximum percent damage, identifying and calculating different degrees of damage within the average area impacted gets complex and provides an additional complication when updating the Plan.

Assumption #5

The tornado would completely destroy the potentially-damaged housing units.

Structural Damage = 100%
Content Damage = 100%

Figure 66
Average Market Value of Housing Units

Participating Jurisdiction	Total Assessed Value of Residential Buildings (2013)	Total Housing Units (2010)	Average Assessed Value (Raw)	Average Market Value (Raw)	Average Market Value (Rounded)
Bath	$1,667,816	161	$10,359.10559	$31,077.31677	$31,077
Easton	$2,485,320	165	$15,062.54545	$45,187.63635	$45,188
Forest City	$1,404,961	111	$12,657.30631	$37,971.91893	$37,972
Havana	$23,430,196	1,535	$15,263.97134	$45,791.91402	$45,792
Kilbourne	$1,734,668	143	$12,130.54545	$36,391.63635	$36,392
Manito	$17,137,739	710	$24,137.66056	$72,412.98168	$72,413
Mason City	$17,381,967	1,108	$15,687.69585	$47,063.08755	$47,063
San Jose	$2,773,512	255	$10,876.51765	$32,629.55295	$32,630
Topeka	$487,326	45	$10,829.46667	$32,488.40001	$32,488
Unincorp. County	$56,238,660	2,844	$19,774.49367	$59,323.48101	$59,323
County	$124,742,165	7,077	$17,626.41868	$52,879.25604	$52,879
Townships – 3 Most Populated	$83,817,345	4,603	$18,209.28633	$54,627.85899	$54,628
Townships – 10 Least Populated	$40,924,820	2,474	$16,541.96443	$49,625.89329	$49,626

Source: Poler, Kristi, Mason County Supervisor of Assessments.

Potential Dollar Losses

Now that all of the decisions/assumptions have been made, the potential dollar losses can be calculated. First, the potential dollar losses to the ***structure*** of the potentially-damaged housing units must be determined. This is done by taking the average market value for a residential structure and multiplying it by the percent damage (100%) to get the average structural damage per unit. Next the average structural damage per unit is then multiplied by the number of potentially-damaged housing units. **Figure 67** provides a sample calculation.

Figure 67 ***Structure* – Potential Dollar Loss Calculations**
Average Market Value per Housing Unit x Percent Damage = Average Structural Damage Bath: $31,077 x 100% = $31,077 per Unit Average Structural Damage x Number of Potentially-Damaged Housing Units = Potential Dollar Losses – Structure (Rounded to the Nearest Dollar) Bath: $31,077 x 137 housing units = $4,257,549

Next, the potential dollar losses to the ***content*** of the potentially-damaged housing units must be determined. Based on FEMA guidance, the value of a residential housing unit's content is approximately 50% of its market value. Therefore, start by taking one-half the average market value for a residential structure and multiply by the percent damage (100%) to get the average content damage per unit. Next the average content damage per unit is multiplied by the number of potentially-damaged housing units. **Figure 68** provides a sample calculation.

Figure 68 ***Content* – Potential Dollar Loss Calculations**
½ (Average Market Value of a Housing Unit) x Percent Damage = Average Content Damage Bath: ½ ($31,077) x 100% = $15,538.50 per Unit Average Content Damage x Number of Potentially-Damaged Housing Units = Potential Dollar Losses – Content (Rounded to the Nearest Dollar) Bath: $15,538.50 x 137 housing units = $2,128,775

Finally the ***total potential dollar losses*** may be calculated by adding together the potential dollar losses to the structure and content. **Figure 69** gives a breakdown of the total potential dollar losses by jurisdiction.

For comparison, an estimate of potential dollar losses was also calculated for the entire County, the unincorporated portions of the County, and for the three most populated and the 10 least populated townships. As discussed previously, the estimate for the County is skewed because it does not take into consideration the differences in the housing density within the County.

This assessment illustrates why potential residential dollar losses should be considered when jurisdictions are deciding which mitigation projects to pursue. Potential dollar losses caused by an average tornado in Mason County would be expected to ***exceed at least $6 million*** in any of the participating municipalities with the exception of Forest City, Kilbourne and Topeka.

Figure 69
Estimated Potential Dollar Losses to Potentially-Damaged Housing Units from a Tornado

Participating Jurisdiction	Average Market Value (2013)	Potentially-Damaged Housing Units (Rounded Up)	Potential Dollar Losses		Total Potential Dollar Losses
			Structure	Content	
Bath	$31,077	137	$4,257,549	$2,128,775	$6,386,324
Easton	$45,188	165	$7,456,020	$3,728,010	$11,184,030
Forest City	$37,972	66	$2,506,152	$1,253,076	$3,759,228
Havana	$45,792	174	$7,967,808	$3,983,904	$11,951,712
Kilbourne	$36,392	50	$1,819,600	$909,800	$2,729,400
Manito	$72,413	153	$11,079,189	$5,539,595	$16,618,784
Mason City	$47,063	339	$15,954,357	$7,977,179	$23,931,536
San Jose	$32,630	159	$5,188,170	$2,594,085	$7,782,255
Topeka	$32,488	45	$1,461,960	$730,980	$2,192,940
Unincorp. County	$59,323	2	$118,646	$59,323	$177,969
County	$52,879	5	$264,395	$132,198	$396,593
Townships – 3 Most Populated	$54,628	11	$600,908	$300,454	$901,362
Townships – 10 Least Populated	$49,626	2	$99,252	$49,626	$148,878

Figure 50
(Sheet 1 of 11)
Tornadoes Reported in Mason County
1950 – 2013

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
1	11/13/1951	1:15 p.m.	Mason City	F2	7.4	50	0	0	$25,000[§]	n/a	*Touchdown/Liftoff –Multiple Counties* touched down in Mason City and traveled northeast crossing southern Tazewell County before lifting off at Hudson In McLean County – total length: 47.4 miles
2	3/14/1957	2:55 p.m.	Mason City	F2	0	100	0	0	$25,000	n/a	a dozen homes were damaged when a tornado traveled northeast across the eastern portion of the City
3	12/18/1957	3:35 p.m.	Mason City	F1	0	33	1	0	$25,000	n/a	a few buildings on the southeast side of the City were damaged
4	8/19/1961	5:00 p.m.	Matanzas Beach	F0	0	33	0	0	$2,500	n/a	a boat dock was destroyed
5	1/24/1967	5:30 p.m.	- Snicarte[^] - Kilbourne[^]	F1	4.5	30	1	0	n/a	n/a	this tornado touched down 3 ¾ mile southeast of Snicarte and moved parallel to the next tornado which touched down at the same time approx. 3 miles away
6	1/24/1967	5:30 p.m.	- Snicarte[^] - Bath[^]	F3	5.1	80	3	1	$25,000	n/a	this tornado touched down ¾ mile southeast of Snicarte and moved parallel to the previous tornado which touched down at the same time approx. 3 miles away
Subtotal:							**5**	**1**	**$102,500**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Mason County.

[^] Tornado path verified in the vicinity of this location(s).

[§] The $25,000 in property damage damages incurred as a result of the November 13, 1951 tornado represent losses sustained in multiple counties. A detailed breakdown by county was not available.

Figure 50
(Sheet 2 of 11)
Tornadoes Reported in Mason County
1950 – 2013

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
7	5/15/1968	2:30 p.m.	- Easton - Natrona	F3	12.6	600	25	0	$2,500,000	n/a	Planning Committee member records indicate that the tornado destroyed farmsteads, downed power lines and littered fields with debris *Natrona* - destroyed 15 homes - injured 25 individuals
8	12/4/1973	9:50 a.m.	Forest City	F0	0	33	2	0	n/a	n/a	2 children were injured by flying glass
9	6/14/1974	8:40 p.m.	Mason City^	F0	n/a	n/a	0	0	n/a	n/a	
10	6/19/1974	6:30 p.m.	San Jose^	F0	0	33	0	0	n/a	n/a	
11	6/19/1974	6:30 p.m.	Mason City	F0	0	33	0	0	n/a	n/a	
12	11/29/1975	10:20 p.m.	- Havana^ - Bishop^ - Forest City^ - Manito^	F2	18.6	33	0	0	$250,000	n/a	
Subtotal:							**27**	**0**	**$2,750,000**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Mason County.

^ Tornado path verified in the vicinity of this location(s).

Figure 50
(Sheet 3 of 11)
Tornadoes Reported in Mason County
1950 – 2013

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
13	4/13/1981	4:50 p.m.	- Havana^ - Eckard^ - Topeka^ - San Jose^	F1	25.6	33	0	0	$2,500,000†	n/a	*Touchdown/Liftoff –Multiple Counties* this tornado took an intermittent path touching down in Lewistown (Fulton County) and traveling southeast to near Havana before tracking eastward across Mason County and into Logan County where it changed courses again, heading southeast before lifting off at Lincoln – total length: 46.1 miles
14	11/18/1995	3:58 p.m.	- Snicarte^ - Bath^	F0	0.1	10	0	0	n/a	n/a	
15	6/2/1987	1:00 p.m.	Mason City	F0	0.1	10	0	0	n/a	n/a	
16	11/27/1990	2:00 p.m.	- Sand Ridge State Forest^	F1	0.5	50	0	0	$25,000	n/a	destroyed a mobile home near Sand Ridge State Forest
Subtotal:							**0**	**0**	**$2,525,000**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Mason County.

^ Tornado path verified in the vicinity of this location(s).

† The $2,500,000 in property damages incurred as a result of the April 13, 1981 tornado represent losses sustained in multiple counties. A detailed breakdown by county was not available.

Figure 50
(Sheet 4 of 11)
Tornadoes Reported in Mason County
1950 – 2013

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
17	5/13/1995	5:15 p.m.	- Goofy Ridge^ - Sand Ridge State Forest	F3	4.5	880	23	0	$2,000,000	n/a	*Touchdown/Liftoff –Two Counties* touched down northeast of Goofy Ridge and traveled northeast through Sand Ridge State Forest and into Tazewell County before lifting off in Tremont – total length: 25.0 miles *Mason County Damages* - damaged or destroyed over 36 homes and mobile homes - injured 23 individuals - blew down numerous trees, especially in Sand Ridge State Forest, as well as numerous power poles
Subtotal:							**23**	**0**	**$2,000,000**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Mason County.

^ Tornado path verified in the vicinity of this location(s).

Figure 50
(Sheet 5 of 11)
Tornadoes Reported in Mason County
1950 – 2013

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
18	4/19/1996	5:07 p.m.	- Bath - Havana^	F2	9.0	250	1	0	n/a	n/a	- blew down numerous power lines *Bath* - destroyed and uprooted numerous trees in the Bath Cemetery - destroyed 2 mobile homes - major damage to 1 home and minor damage to 11 homes - a woman sustained minor injuries when the tornado hit one of the mobile homes *Unincorporated Areas* - destroyed numerous farm buildings - picked up a semi-truck and blew it into a nearby field
19	4/19/1996	5:17 p.m.	Easton	F1	9.0	250	0	0	n/a	n/a	- numerous power lines and trees were blown down *Easton* - destroyed 1 home as it moved along the northwest side of the Village *Unincorporated Areas* - destroyed 1 home - caused major damage to 5 homes - lifted a barn and a home off their foundations
Subtotal:							**1**	**0**	**$0**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Mason County.

^ Tornado path verified in the vicinity of this location(s).

Figure 50
(Sheet 6 of 11)
Tornadoes Reported in Mason County
1950 – 2013

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
20	4/7/1998	3:20 p.m.	Snicarte^	F2	3.0	66	0	0	n/a	n/a	- at a farmstead the tornado moved a two-story farm house 3 feet off its foundation, blew out an exterior wall of the house and caused some roof and siding damage; uprooted two 3 foot diameter trees next to the house and destroyed 3 outbuildings and 2 grain bins just north of the house - tipped over some irrigation equipment - destroyed another barn - blew over numerous large pine trees
21	4/7/1998	3:35 p.m.	Bath	F1	0.3	180	0	0	n/a	n/a	- severely damaged 9 homes and caused minor damage to 34 other homes - destroyed several garages - tore off part of the roof of the fire station - uprooted numerous 3 to 4 foot diameter trees and snapped power poles
Subtotal:							**0**	**0**	**$0**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Mason County.

^ Tornado path verified in the vicinity of this location(s).

Figure 50
(Sheet 7 of 11)
Tornadoes Reported in Mason County
1950 – 2013

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
22	4/7/1998	4:55 p.m.	Havana^	F0	0.1	10	0	0	0	0	
23	4/7/1998	5:06 p.m.	- Havana^ - Baldwin Beach - Buzzville^ - Goofy Ridge^ - Sand Ridge State Forest^	F1	10.0	20	0	0	n/a	n/a	*Touchdown/Liftoff –Two Counties* touched down in Fulton County east-southeast of Sepo and crossed the Illinois River into Mason County 2 miles north of Havana where it hopped and skipped along a northeasterly track before lifting off in the Jake Wolf Memorial Fish Hatchery adjacent to Sand Ridge State Forest – total length: 11.0 miles *Mason County Damages* - damaged 3 homes at Baldwin Beach - caused "spotty" tree damage
Subtotal:							**0**	**0**	**$0**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Mason County.

^ Tornado path verified in the vicinity of this location(s).

Figure 50
(Sheet 8 of 11)
Tornadoes Reported in Mason County
1950 – 2013

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
24	6/1/1999	5:17 p.m.	- Matanzas Beach^ - Havana^	F1	3.5	200	0	0	$500,000	n/a	*Touchdown/Liftoff –Two Counties* touched down northeast of Marbletown (Fulton County) and crossed the Illinois River into Mason County 1 mile south of Matanzas Beach where it traveled northeast before lifting off 3 miles south of Havana – total length: 3.8 miles *Mason County Damages* - severely damaged 2 homes and a garage and caused minor damage to several other homes - blew down numerous trees
25	8/18/2001	11:36 a.m.	Mason City^	F0	0.1	25	0	0	n/a	n/a	- tore the gutters off of a house and blew out some windows - blew an outdoor table into an open garage door - ripped the top off a large tree and carried it 100 feet; snapped a smaller tree
Subtotal:							**0**	**0**	**$500,000**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Mason County.

^ Tornado path verified in the vicinity of this location(s).

Figure 50
(Sheet 9 of 11)
Tornadoes Reported in Mason County
1950 – 2013

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
26	5/10/2003	8:12 p.m.	- Quiver Beach - Havana^ - Forest City^	F1	8.0	150	0	0	n/a	n/a	- destroyed a travel trailer and garage - blew down numerous trees and power lines - this event was part of a federally-declared disaster (Declaration #1469)
27	5/10/2003	8:33 p.m.	Manito	F2	2.5	100	1	0	n/a	n/a	- destroyed 4 homes - 24 homes sustained minor to major damage - an elderly woman sustained minor injuries, a cut on her arm and bruises, while taking shelter in her walk-in pantry - blew down power lines and trees - this event was part of a federally-declared disaster (Declaration #1469)
28	5/10/2003	8:38 p.m.	Manito^	F1	2.0	100	0	0	n/a	n/a	- destroyed several barns, sheds and a garage caused minor damage to a couple homes - numerous trees, power lines and power poles were blown down - this event was part of a federally-declared disaster (Declaration #1469)
Subtotal:							**1**	**0**	**$0**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Mason County.

^ Tornado path verified in the vicinity of this location(s).

Figure 50
(Sheet 10 of 11)
Tornadoes Reported in Mason County
1950 – 2013

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
29	5/30/2003	6:56 p.m.	- Sand Ridge State Forest - Forest City - San Jose^	F1	8.0	100	2	0	$100,000	n/a	*Touchdown/Liftoff –Two Counties* touched down in Sand Ridge State Forest and traveled southeast, impacting the southern part of Forest City, before continuing into Tazewell County and lifting off in approx. 2 miles north of San Jose – total length: 14.0 miles *Forest City* - several homes sustained minor damage - Planning Committee member records indicate that approximately $100,000 in structural damage was sustained and 2 individuals sustained minor injuries *Unincorporated Areas* - destroyed a mobile home as well as several outbuildings on a farm - damaged power lines, trees and irrigation systems
30	7/8/2009	4:03 p.m.	Teheran^	EF0	0	10	n/a	n/a	n/a	n/a	
Subtotal:							**2**	**0**	**$100,000**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Mason County.

^ Tornado path verified in the vicinity of this location(s).

Figure 50
(Sheet 11 of 11)
Tornadoes Reported in Mason County
1950 – 2013

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
31	4/15/2011	4:30 p.m.	Poplar City^	EF1	3.0	100	1	0	$300,000	n/a	- damaged 2 homes, 2 outbuildings and several sheds - knocked over an irrigation unit - damaged several trees - an individual sustained minor injuries from flying glass
Subtotal:							**1**	**0**	**$300,000**	**$0**	
GRAND TOTAL							**60**	**1**	**$8,277,500‡**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Mason County.

^ Tornado path verified in the vicinity of this location(s).

‡ The property damage grand total includes $2,500,000 incurred as a result of the April 13, 1981 tornado and represents losses sustained in multiple counties. A detailed breakdown by county was not available.

Sources: Mason County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Member responses to Mason County Natural Hazard Events Questionnaire.
National Weather Service, Weather Forecast Office – Central Illinois, Chris Miller, Warning Coordination Meteorologist.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

3.5 EXTREME HEAT

IDENTIFYING THE HAZARD

What is the definition of extreme heat?

Extreme heat is characterized by temperatures that hover 10 degrees or more above the average high temperature of a region for a prolonged period of time (several days to several weeks) and is often accompanied by high humidity. In comparison, a heat wave is generally defined as a prolonged period of excessive heat and humidity. While there is no universally agreed upon definition of a heat wave, for most the United States the "standard" definition is a period of three or more consecutive days of highs reaching at least 90°F.

Extreme heat events are usually a result of both high temperatures and high relative humidity. (Relative humidity refers to the amount of moisture in the air.) The higher the relative humidity or the more moisture in the air, the less likely that evaporation will take place. This becomes significant when high relative humidity is coupled with soaring temperatures.

On hot days the human body relies on the evaporation of perspiration or sweat to cool and regulate the body's internal temperature. Sweating does nothing to cool the body unless the water is removed by evaporation. When the relative humidity is high, then the evaporation process is hindered, robbing the body of its ability to cool itself.

On average, more than 1,000 people die each year in the United States from extreme heat. In fact, extreme heat claims more lives each year than floods, lightning, tornadoes and hurricanes combined.

What is the Heat Index?

In an effort to raise the public's awareness of the hazards of extreme heat, the National Weather Service devised the "Heat Index". The Heat Index, sometimes referred to as the "apparent temperature", is a measure of how hot it feels when relative humidity is added to the actual air temperature. **Figure 70** shows the Heat Index as it corresponds to various air temperatures and relative humidity.

As an example, if the air temperature is 96°F and the relative humidity is 65%, then the Heat Index would be 121°F. It should be noted that the Heat Index values were devised for shady, light wind conditions. Exposure to full sunshine can increase Heat Index values by up to 15°F. Also strong winds, particularly with very hot, very dry air, can be extremely hazardous. When the Heat Index reaches 105°F or greater, there is an increased likelihood that continued exposure and/or physical activity will lead to individuals developing severe heat disorders.

What are heat disorders?

Heat disorders are a group of illnesses caused by prolonged exposure to hot temperatures and are characterized by the body's inability to shed excess heat. These disorders develop when the heat gain exceeds the level the body can remove or if the body cannot compensate for fluids and salt lost through perspiration. In either case the body loses its ability to regulate its internal

temperature. All heat disorders share one common feature: the individual has been overexposed to heat, or over exercised for their age and physical condition on a hot day. The following describes the symptoms associated with the different heat disorders.

Figure 70
Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	126	130					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Source: NOAA, National Weather Service.

- **Sunburn.** Sunburn is characterized by redness and pain of skin exposed too long to the sun without proper protection. In severe cases it can cause swelling, blisters, fever and headaches. It can significantly retard the skin's ability to shed excess heat.
- **Heat Cramps.** Heat cramps are characterized by heavy sweating and painful spasms, usually in the muscles of the legs and possibly the abdomen. The loss of fluid through perspiration leaves the body dehydrated resulting in muscle cramps. This is usually the first sign that the body is experiencing trouble dealing with heat.
- **Heat Exhaustion.** Heat exhaustion is characterized by heavy sweating, weakness, nausea, exhaustion, dizziness and faintness. Breathing may become rapid and shallow and the pulse thready (weak). The skin may appear cool, moist and pale. Blood flow to the skin increases, causing blood flow to decrease to the vital organs. This results in a mild form of shock. If not treated, the victim's condition will worsen.
- **Heat Stroke (Sunstroke).** Heat stroke is a life-threatening condition characterized by a high body temperature (106°F or higher). The skin appears to be dry and flushed with very little perspiration present. The individual may become mentally confused and

aggressive. The pulse is rapid and strong. There is a possibility that the individual will faint or slip into unconsciousness. If the body is not cooled quickly, then brain damage and death may result.

Studies indicate that, all things being equal, the severity of heat disorders tend to increase with age. Heat cramps in a 17-year-old may be heat exhaustion in someone 40 and heat stroke in a person over 60. Elderly persons, small children, chronic invalids, those on certain medications and persons with weight or alcohol problems are particularly susceptible to heat reactions.

Figure 71 below indicates the heat index at which individuals, particularly those in higher risk groups, might experience heat-related disorders. Generally, when the heat index is expected to exceed 105°F, the National Weather Service will initiate extreme or excessive heat alert procedures.

Figure 71
Relationship between Heat Index and Heat Disorders

Heat Index (°F)	Heat Disorders
80°F – 90°F	Fatigue is possible with prolonged exposure and/or physical activity
90°F – 105°F	Heat cramps, heat exhaustion and heat stroke possible with prolonged exposure and/or physical activity
105°F – 130°F	Heat cramps, heat exhaustion and heat stroke likely; heat stroke possible with prolonged exposure and/or physical activity
130°F or Higher	Heat stroke highly likely with continued exposure

Source: NOAA, Heat Wave: A Major Summer Killer.

What is an excessive heat alert?

An excessive heat alert is an advisory or warning issued by the National Weather Service when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines the type of alert issued. There are four types of alerts that can be issued for an extreme heat event. The following provides a brief description of each type of alert based on the ***excessive heat advisory/warning criteria*** established by National Weather Service Weather Forecast Office in Lincoln, Illinois. The Central Illinois office is responsible for issuing alerts for Mason County.

- **Outlook.** An excessive heat outlook is issued when the potential exists for an excessive heat event to develop over the next three to seven days.
- **Watch.** An excessive heat watch is issued when conditions are favorable for an excessive heat event to occur within the next 24 to 72 hours.
- **Advisory.** An excessive heat advisory is issued when the maximum heat index is expected to be at least 105°F.
- **Warning.** An excessive heat warning is issued when the maximum heat index is expected to be at least 110°F and the minimum heat index is will be at least 75°F for a 48-hour period.

PROFILING THE HAZARD

When have extreme heat events occurred previously? What is the extent of these events?

Extreme Heat Fast Facts – Occurrences

Number of Extreme Heat Events Reported (1997 – 2013): ***9***

Hottest Temperature Recorded in the County: ***113°F (July 15, 1936)***

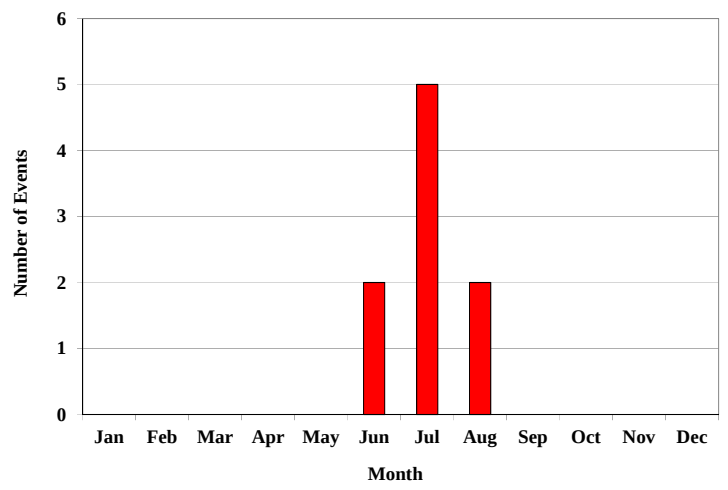
Most Likely Month for Extreme Heat Events to Begin/Occur: ***July***

Most Likely Time for Extreme Heat Events to Begin: ***Morning***

Figure 72, located at the end of this section, summarizes the previous occurrences as well as the extent or magnitude of extreme heat events recorded in Mason County. NOAA's Storm Events Database has documented nine occurrences of extreme heat in Mason County between 1997 and 2013.

Figure 73 charts the reported occurrences of extreme heat events by month. Of the nine events, five (56%) either began or took place in July making this the peak month for extreme heat events in Mason County. There were two events that spanned two months; however, for illustration purposes only the month the event started in is graphed. Approximately 56% of all extreme heat events began during the a.m. hours.

Figure 73
Extreme Heat Events by Month
1997 – 2013



According to the available historical data from the Midwestern Regional Climate Center and the National Weather Service COOP records, the hottest recorded temperature over a 111-year period between 1893 and 2003 in Mason County was 113°F at Havana on July 15, 1936.

What locations are affected by extreme heat?

Extreme heat events affect the entire County. A single extreme heat event will generally extend across an entire region and affect multiple counties. The *2013 Illinois Natural Hazard Mitigation Plan* classifies Mason County's hazard rating for extreme heat as "elevated."

Do any of the participating municipalities have designated cooling centers?

Yes. Three of the nine participating municipalities have designated cooling centers. A "designated" cooling center is identified as any facility that has been *formally* identified by the municipality (through emergency planning, resolution, Memorandum of Agreement, etc.) as a location available for use by residents during extreme heat events. **Figure 74** identifies the location of each cooling center by jurisdiction. The County is also served by one state-designated cooling center located at the Illinois Department of Human Services office, 323 W. Main Street in Havana.

Figure 74
Designated Cooling Centers by Participating Municipality

Name/Address	Name/Address
Bath	*Manito*
Community Center, 205 E. First St.	Forman Fire Department, 205 N. Broadway St.
Easton	Forman Center, 308 S. Harrison St.
---	*Mason City*
Forest City	---
---	*San Jose*
Havana	---
Havana Fire & Police Building, 226 W. Market St.	*Topeka*
Kilbourne	---

What is the probability of future extreme heat events occurring?

Mason County has experienced nine verified extreme heat events between 1997 and 2013. With nine occurrences over the past 17 years, the probability or likelihood that the County may experience an extreme heat event in any given year is 53%. There were two years over the past 17 years where two or more extreme heat events occurred. This indicates that the probability that more than one extreme heat event may occur during any given year within the County is 12%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to extreme heat?

Yes. All of Mason County, including the participating municipalities, is vulnerable to the dangers presented by extreme heat. Since 2004, Mason County has experienced five extreme heat events.

What impacts resulted from the recorded extreme heat events?

Damage information was either unavailable or none was recorded for any of the reported extreme heat events. No detailed injury or fatality information specific to Mason County was reported as a result of any of the extreme heat events recorded. While NOAA's Storm Events Database indicated that there were reports of numerous heat-related injuries at most area hospitals during the 1997 and 1998 extreme heat events, these accounts covered a 25-county area and did not provide a precise number or breakdown by county.

While no specific injuries or fatalities were reported in Mason County, it does not mean that none occurred. It simply means that extreme heat was not identified as the primary cause. This is especially true for fatalities. Usually heat is not listed as the primary cause of death, but rather an underlying cause. The heat indices were sufficiently high for all nine events to produce heat cramps or heat exhaustion with the possibility of heat stroke in cases of prolonged exposure or physical activity.

Extreme Heat Fast Facts – Impacts/Risk

Extreme Heat Impacts

- Total Property Damage: ***n/a***
- Infrastructure/Critical Facilities Damage*: ***n/a***
- Total Crop Damage: ***n/a***
- Injuries: ***n/a***
- Fatalities: ***n/a***

Extreme Heat Risk/Vulnerability to:

- Public Health & Safety – General Population: ***Low/Medium***
- Public Health & Safety – Sensitive Populations: ***Medium***
- Buildings/Infrastructure/Critical Facilities: ***Low***

* Infrastructure/Critical Facilities Damage totals are included in the Total Property Damage amounts.

In comparison, Illinois averages 74 fatalities per year as a result of extreme heat. Extreme heat has triggered more fatalities than any other natural hazard in Illinois. More fatalities are attributed to extreme heat than the combined number of fatalities attributed to floods, tornadoes, lightning and extreme cold.

Even if injuries and death due to extreme heat are under reported in Mason County, the level of risk or vulnerability posed by extreme heat to the public health and safety of the *general population* is considered to be low to medium. This assessment is based on the absences of designated cooling centers in most of the participating municipalities tempered by the impacts of previously reported extreme heat events and the fact that Mason County does not have large urban areas where living conditions (such as older, poorly-ventilated high rise buildings and low-income neighborhoods) tend to contribute to heat-related injuries and fatalities.

The level of risk or vulnerability posed by extreme heat to the public health and safety of *sensitive populations* is considered to be medium. Sensitive populations such as the elderly, small children, individuals with chronic conditions, those on certain medication and persons with weight or alcohol problems are more susceptible to heat-related reactions and therefore their risk is elevated.

What other impacts can result from extreme heat events?

Other impacts of extreme heat include road buckling, power outages, stress on livestock, early school dismissals and school closings. In addition, extreme heat events can also lead to an increase in water usage and may result in municipalities imposing water use restrictions. In Mason County, extreme heat should not impact municipal water supplies since none obtain their water from surface water bodies.

Are existing buildings, infrastructure and critical facilities vulnerable to extreme heat?

No. In general, existing buildings, infrastructure and critical facilities located in the County and the participating municipalities are not vulnerable to extreme heat. The primary concern is for the health and safety of those living in the County (including all of the municipalities).

While buildings do not typically sustain damage from extreme heat, in rare cases infrastructure and critical facilities may be directly or indirectly damaged. While uncommon, extreme heat has been known to contribute to damage caused to roadways within Mason County. The combination of extreme heat and vehicle loads has caused pavement cracking and buckling.

Extreme heat has also been known to indirectly contribute to disruptions in the electrical grid. When the temperatures rise, the demand for energy also rises in order to operate air conditioners, fans and other devices. This increase in demand places stress on the electrical grid components, increasing the likelihood of power outages. While not common in Mason County, there is the potential for this to occur. The potential may increase over the next two decades if new power plants are not built to replace the state's aging nuclear power facilities that are expected to be decommissioned.

In general, the risk or vulnerability to buildings, infrastructure and critical facilities from extreme heat is considered low, even taking into consideration the potential for damage to roadways and disruptions to the electrical grid.

Are future buildings, infrastructure and critical facilities vulnerable to extreme heat?

No. Future buildings, infrastructure and critical facilities within the County and participating municipalities are no more vulnerable to extreme heat events than the existing building, infrastructure and critical facilities. As discussed above, buildings do not typically sustain damage from extreme heat. Infrastructure and critical facilities may, in rare cases, be damaged by extreme heat, but very little can be done to prevent this.

What are the potential dollar losses to vulnerable structures from extreme heat?

Unlike other natural hazards there are no standard loss estimation models or methodologies for extreme heat. With only no recorded events listing property damage numbers for extreme heat, there is no way to accurately estimate future potential dollar losses. Since extreme heat typically does not cause structure damage, it is unlikely that future dollar losses will be excessive. The primary concern associated with extreme heat is the health and safety of those living in the County and municipalities, especially sensitive populations such as the elderly, infants, young children and those with medical conditions.

Figure 72
(Sheet 1 of 3)
Extreme Heat Events Reported in Mason County
1997 – 2013

Date(s)	Start Time	Magnitude	Injuries	Deaths	Property Damage
7/26/1997 thru 7/27/1997	9:00 a.m.	- A brief heat wave hit central Illinois with temperatures ranging from 95°F to 100°F and heat indices ranging from 105°F to 115°F. - The Havana Rural COOP observer recorded high temperatures ranging from 96°F to 100°F and low temperatures ranging from 70°F to 73°F. - The Mason City COOP observer recorded high temperatures ranging from 96°F to 98°F and low temperatures ranging from 75°F to 76°F. - There were numerous reports of heat-related injuries in most area hospitals. - In addition, there were numerous reports of roads buckling due to the high temperatures.	n/a	0	n/a
6/26/1998 thru 6/28/1998	3:00 a.m.	- A hot and humid air mass built across central Illinois causing temperatures to climb into the middle to upper 90s. The combination of high temperatures and high humidity produced heat indices of 105°F to 110°F. - The Havana Rural COOP observer recorded a high temperature of 95°F each day and low temperatures ranging from 71°F to 74°F. - The Mason City COOP observer recorded high temperatures ranging from 93°F to 94°F and low temperatures ranging from 73°F to 75°F. - Several heat-related illnesses were reported in area hospitals. - Also, several highways in the area had sections of roadway buckle due to the excessive heat.	n/a	0	n/a
7/20/1999 thru 7/26/1999	10:00 a.m.	- A heat wave caused temperatures to climb into the lower to middle 90s and heat indices to range from 105°F to 110°F. - The Havana Rural COOP observer recorded a high temperatures ranging from 94°F to 98°F and low temperatures ranging from 64°F to 70°F. - The Mason City COOP observer recorded high temperatures ranging from 93°F to 96°F and low temperatures ranging from 68°F to 74°F.	n/a	0	n/a
Subtotal:			**0**	**0**	**$0**

Figure 72
(Sheet 2 of 3)
Extreme Heat Events Reported in Mason County
1997 – 2013

Date(s)	Start Time	Magnitude	Injuries	Deaths	Property Damage
7/28/1999 thru 7/31/1999	10:00 a.m.	- The heat returned to central Illinois after less than 48 hours with temperatures again in the lower to middle 90s and heat indices ranging from 105°F to 110°F. - The Havana Rural COOP observer recorded a high temperatures ranging from 91°F to 98°F and low temperatures ranging from 65°F to 73°F. - The Mason City COOP observer recorded high temperatures ranging from 90°F to 97°F and low temperatures ranging from 69°F to 76°F.	n/a	0	n/a
7/22/2005 thru 7/25/2005	12:00 p.m.	- A period of excessive heat and humidity developed across central Illinois and led to daytime high temperatures in the middle 90s to around 100°F with overnight lows only falling into the middle to upper 70s. The combination of high temperatures and high humidity pushed afternoon and early evening heat indices into the 105°F to 115°F range. - The Havana Rural COOP observer recorded a high temperatures ranging from 93°F to 105°F and low temperatures ranging from 69°F to 74°F.	n/a	0	n/a
7/30/2006 thru 8/2/2006	11:00 a.m.	- An extended period of heat and humidity across central Illinois led to afternoon high temperatures ranging from 94°F to 100°F with overnight lows only falling into the middle 70s. Afternoon heat indices ranged from 105°F to 110°F. - The Havana Rural COOP observer recorded a high temperatures ranging from 95°F to 99°F and low temperatures ranging from 72°F to 78°F. - The Mason City COOP observer recorded high temperatures ranging from 94°F to 97°F and low temperatures ranging from 71°F to 76°F.	n/a	0	n/a
8/3/2010 thru 8/4/2010	12:00 p.m.	- A large upper-level ridge of high pressure over the southern United States produced an extended period of hot and humid weather across central Illinois that led to temperatures well into the 90s with heat indices above 105°F. - The Mason City COOP observer recorded high temperatures ranging from 90°F to 95°F and low temperatures ranging from 72°F to 76°F.	n/a	n/a	n/a
Subtotal:			**0**	**0**	**$0**

Figure 72
(Sheet 3 of 3)
Extreme Heat Events Reported in Mason County
1997 – 2013

Date(s)	Start Time	Magnitude	Injuries	Deaths	Property Damage
8/11/2010 thru 8/14/2010	2:00 p.m.	- A week after the previous excessive heat event, the hot and humid weather returned to central Illinois producing temperatures well into the 90s with heat indices exceeding 105°F.	n/a	n/a	n/a
6/29/2012 thru 7/7/2012	1:45 p.m.	- An extended period of excessive heat and humidity occurred across central Illinois with afternoon high temperatures ranging from 95°F to 105°F and overnight lows generally remaining in the 70s. The peak heat indices approached 110°F.	n/a	0	n/a
Subtotal:			**0**	**0**	**$0**
GRAND TOTAL:			**0**	**0**	**$0**

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Image and Publications System, COOP Data / Record of Climatological Observations.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

3.6 DROUGHT

IDENTIFYING THE HAZARD

What is the definition of a drought?

While there is no universally accepted definition of drought, it can generally be defined as a period of unusually persistent dry weather that continues long enough to cause serious problems such as crop damage and/or water supply shortages. A drought may also be defined as the cumulative deficit of precipitation relative to what is normal for a region over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group or environmental sector.

There are four types of drought. They are differentiated based on the use and need for water. The following provides a brief description of each type.

- **Meteorological Drought.** Meteorological drought is a period of well-below-average precipitation that spans a few months to a few years. It can be identified by a shortfall in precipitation. Due to climate differences, what might be considered a drought in one location of the country may not be in another location.
- **Agricultural Drought.** An agricultural drought is a period when soil moisture no longer meets the needs of a particular crop to germinate and grow. It can be identified by a deficit in soil moisture.
- **Hydrological Drought.** Hydrological drought is a period when surface and subsurface water supplies (i.e., streams, lakes, aquifers, etc.) drop below normal levels. It can be identified by a deficit in surface and groundwater.
- **Socioeconomic Drought.** Socioeconomic drought is a period when water shortages begin to affect people. In this case, there is not enough water to meet human and environmental needs.

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. It is generally difficult to pinpoint the beginning and the end of a drought. Because the impacts of a drought accumulate slowly at first, a drought may not be recognized until it has become well established. Even during a drought there may be one or two months with above average precipitation totals. These wet months do not necessarily signal the end of a drought and generally do not have a major impact on moisture deficits.

Droughts can be short, lasting just a few months, or they can persist for several years before regional climate conditions return to normal. While drought conditions can occur at any time throughout the year, the most apparent time is during the summer months. Nationally, drought impacts often exceed $1 billion due in part to the sheer size of the areas affected.

How are droughts measured?

There are several quantitative measures (indices) that have been developed to measure drought in the United States. How these indices measure drought depends on the discipline affected (i.e., agriculture, hydrology, meteorology, etc.) and the region being considered. Although none

of the major indices are inherently superior to the rest, some are better suited than others for certain uses. Two of the indices highlighted in this plan are:

- the Palmer Drought Severity Index (PDSI) and
- the U.S. Drought Monitor.

The PDSI was the first comprehensive drought index developed in the United States and is still in use today. It is designed to indicate when weather conditions have been abnormally dry or wet and provides a standardized method of identifying and comparing drought conditions regardless of time or location.

The U.S. Drought Monitor is a relatively new index that combines quantitative measures with input from experts in the field. It is designed to provide the general public, media, government officials and others with an easily understandable "big picture" overview of drought conditions across the United States. In the last several years, NOAA has begun including the U.S. Drought Monitor's drought intensity ratings along with the weather information provided for drought events recorded with the National Climate Data Center.

The following provides a more detailed discussion of these two indices to aid the plan's developers and the general public in understanding how droughts are identified and categorized. The information used to prepare this section utilizes one or both of these indices to identify previous drought events recorded in the County.

Palmer Drought Severity Index (PDSI)

The Palmer Drought Severity Index (PDSI), developed in 1965, was the first comprehensive drought index used in the United States. The PDSI is a long-term meteorological index that indicates when weather conditions have been abnormally dry or abnormally wet. It is most effective at measuring impacts that are sensitive to soil moisture conditions, such as agriculture.

The PDSI is calculated based on precipitation and temperature data, as well as the local available water content of the soil and the cumulative patterns of previous months. The index ranges from +4 (extremely moist) to -4 (extreme drought). **Figure 75** shows the classification system utilized by the PDSI.

The PDSI has been useful as a drought monitoring tool and many federal and state agencies rely on it to trigger drought relief programs. It provides a standardized method to measure moisture conditions so that comparisons can be made between various locations and times. The PDSI is most useful when working with large areas of uniform topography. It is not as well suited for use in the western states, with their mountainous terrain and varying climate extremes.

Figure 75
Palmer Classification System

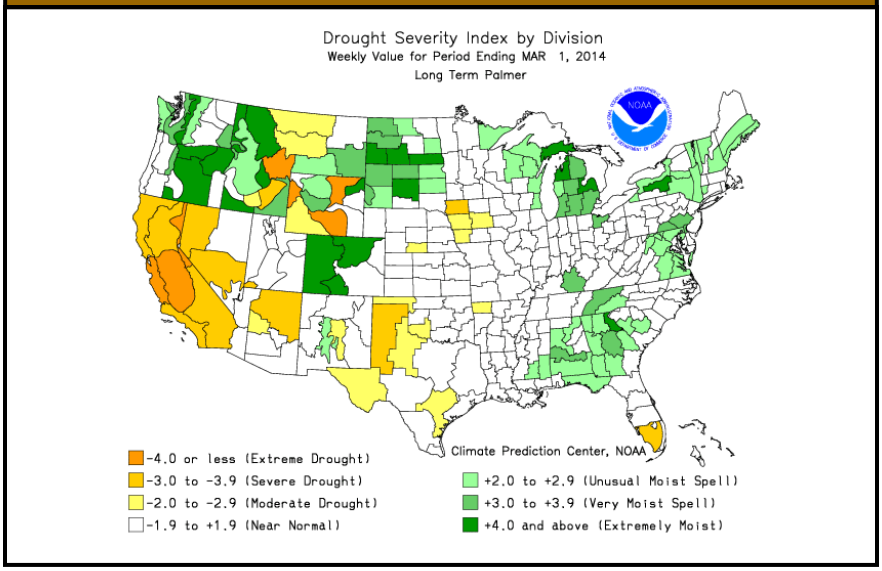
Index Value	Description
4.00 or more	extremely wet
3.00 to 3.99	very wet
2.00 to 2.99	moderately wet
1.00 to 1.99	slightly wet
0.50 to 0.99	incipient wet spell
0.49 to -0.49	near normal
-0.50 to -0.99	incipient dry spell
-1.00 to -1.99	mild drought
-2.00 to -2.99	moderate drought
-3.00 to -3.99	severe drought
-4.00 or less	extreme drought

Source: National Drought Mitigation Center.

Calculations of the PDSI are made for 350 climate divisions in the United States and Puerto Rico. PDSI values have typically been calculated on a monthly basis. The National Climate Data Center has records on the monthly PDSI values for every climate division in the United States dating back to 1895.

In addition to the monthly calculations, weekly PDSI values are now being calculated for the climate divisions during every growing season. NOAA's Climate Prediction Center produces a weekly map that shows the climate divisions and their PDSI value by color. **Figure 76** shows an example of this map.

Figure 76
Palmer Drought Severity Index Map



Source: National Weather Service, Climate Prediction Center.

U.S. Drought Monitor

A relatively new index used for assessing drought conditions is the U.S. Drought Monitor. The U.S. Drought Monitor is unique in that it blends multiple numeric measures of drought with the best judgments of experts to create a weekly map that depicts drought conditions across the United States. It began in 1999 as a federal, state and academic partnership, growing out of a Western Governors' Association initiative to provide timely and understandable scientific information on water supplies and drought for policymakers.

The U.S. Drought Monitor is produced jointly by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Five drought intensity categories, D0 through D4, are utilized to identify areas of drought. **Figure 77** provides a brief description of each category.

The drought intensity categories are based on five key indicators, numerous supplementary indictors and local reports from more than 350 expert observers around the Country. The five

key indicators include the Palmer Drought Severity Index, Climate Prediction Center's Soil Moisture Model (percentiles), United States Geological Survey Weekly Streamflow (percentiles), Standardized Precipitation Index and Objective Short and Long-term Drought Indicator Blends (percentiles).

Figure 77
U.S. Drought Monitor – Drought Severity Classifications

Category	Possible Impacts
D0 (Abnormally Dry)	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.
D1 (Moderate Drought)	Some damage to crops, pastures; streams, reservoirs, or wells low; some water shortages developing or imminent; voluntary water-use restrictions requested
D2 (Severe Drought)	Crop or pasture losses likely; water shortages common; water restrictions imposed
D3 (Extreme Drought)	Major crop/pasture losses; widespread water shortages or restrictions
D4 (Exceptional Drought)	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

Source: U.S. Drought Monitor.

Because the ranges of the various indicators often don't coincide, the final drought category tends to be based on what a majority of the indictors show and on local observations. The authors also weight the indices according to how well they perform in various parts of the country and at different times of the year. It is the combination of the best available data, location observations and experts' best judgment that make the U.S. Drought Monitor more versatile than other drought indices.

In addition to identifying and categorizing general areas of drought, the weekly map also identifies whether a drought's impacts are short-term (typically less than 6 months – agriculture, grasslands) or long-term (typically more than 6 months – hydrology, ecology). **Figure 78** shows an example of the U.S. Drought Monitor weekly map.

The U.S. Drought Monitor is designed to provide a general and up-to-date overview of current drought conditions. It is not designed to depict local conditions. As a result, there could be water shortages or crop failures within areas not designated as drought, just as there could locations with adequate water supplies in an area designated as D3 or D4.

PROFILING THE HAZARD

When have droughts occurred previously? What is the extent of these previous droughts?

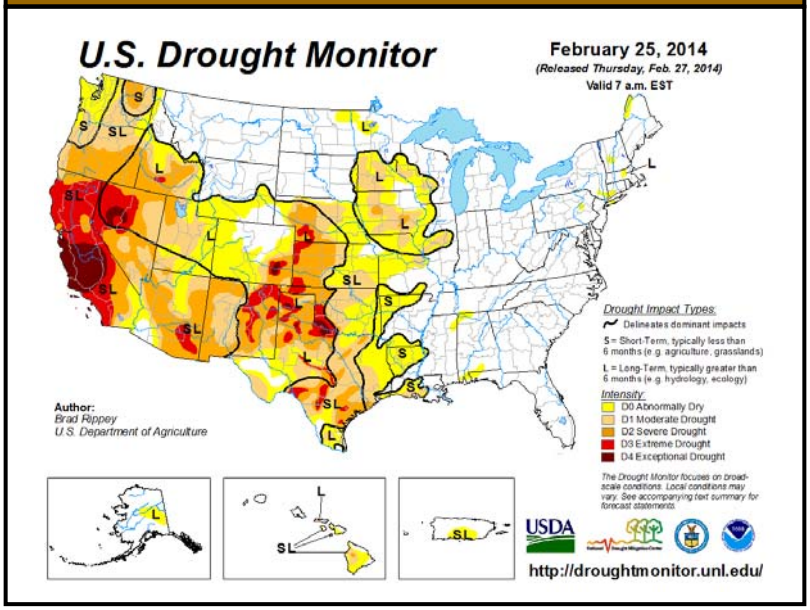
According to NOAA's Storm Events Database, the Illinois State Water Survey, the Illinois Emergency Management Agency and USDA there have been four

Drought Fast Facts – Occurrences

Number of Drought Events Reported (1983 – 2013): ***4***

official drought events reported in Mason County between 1983 and 2013. The following provides a summary of these previous occurrences as well as the extent or severity of each event.

Figure 78
U.S. Drought Monitor Map



Map Courtesy of NDMC-UNL.

- In 1983, all 102 Illinois counties were proclaimed state disaster areas because of high temperatures and insufficient precipitation beginning in mid-June. Corn and soybean yields were 35 to 41 percent lower than the previous year, according to USDA crop yield statistics.
- In 1988, approximately half of all Illinois counties (including Mason County) were impacted by drought conditions, although none of the counties were proclaimed state disaster areas. Lower than normal precipitation levels were recorded between April and June and unusually dry weather conditions persisted throughout the summer months. USDA crop yield statistics indicates that corn and soybean yields were 24 to 42 percent lower than the previous year.
- In 2005-2006, drought conditions impacted much of the state, including Mason County. A dry winter and spring developed into full-blown drought conditions by the end of June. On May 24, 2005 Mason County was designated as D1 – moderate drought and upgraded to D2 –severe drought on June 28, 2005. The next week, on July 5, 2005 the County was classified as D3 – extreme drought.

  On July 27, 2005 the USDA designated 93 counties in Illinois, including Mason County, as primary natural disaster areas due to the damage and losses caused by drought. Extreme to severe drought conditions continued through all of August and most of September. The drought conditions in the County were downgraded to D1 on September

27, 2005. Moderate to severe drought conditions continued through the winter and into the spring before being downgraded to D0 on May 2, 2006.

Corn and soybean yields were 20 to 31 percent lower than the previous year according to USDA crop yield statistics.

- In 2011, drought conditions impacted the central portion of the state. This was a short-term agricultural drought that was over by the end of November. On November 2, 2011 the USDA designated 44 counties in Illinois as primary natural disaster areas because of losses caused by drought and excessive heat that began in July. While Mason County was not one of the designated counties, it did qualify for natural disaster assistance because it was contiguous to the disaster area. USDA crop yield statistics show that soybean yields were 9 percent lower than the previous year.
- In 2012, drought conditions impacted all of Illinois and most of the Midwest. On June 19, 2012 Mason County was designated as D2 – severe drought due to an abnormally warm and dry spring. Then on July 24th the County was upgraded to D3 – extreme drought due to the continued hot and dry conditions. Only 0.20 inches of rain fell in Havana in July, making it the driest July on record.

  Extreme drought conditions continued through August, but were downgraded to D2 – severe drought on September 6th thanks to beneficial rainfall from the remnants of Hurricane Issac. Additional rains in October led to the County being downgraded to D1 – moderate drought on October 30th.

  Crop stress was extreme for corn and soybeans during this event. On August 1, 2012 the USDA designated 66 counties in Illinois, including Mason County, as primary natural disaster areas due to damage and losses caused by drought and excessive heat. Corn and soybean yields were 17 to 23 percent lower than the previous year, according to USDA crop yield statistics.

The Illinois State Water Survey records indicate that droughts also occurred in the region in 1931, 1934, 1936 and 1954; however, the extent to which Mason County was impacted was unavailable.

What locations are affected by drought?

Drought events affect the entire County. Droughts, like extreme heat and severe winter storms, tend to impact large areas, extending across an entire region and affecting multiple counties. The *2013 Illinois Natural Hazard Mitigation Plan* classifies Mason County's hazard rating for drought as "elevated."

What is the probability of future drought events occurring?

Mason County has experienced four droughts between 1983 and 2013. With four occurrences over 31 years, the probability or likelihood that the County may experience a drought in any given year is 12.9%. However, if earlier recorded droughts are factored in, then the probability that Mason County may experience a drought in any given year decreases to 9.6%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to drought?

Yes. All of Mason County is vulnerable to drought. Neither the amount nor the distribution of precipitation; soil types; topography; or water table conditions provides protection for any area within the County. Since 2004 Mason County has experienced two droughts.

What impacts resulted from the recorded drought events?

Specific damage information was only available for one of the four drought events experienced between 1983 and 2013. According to USDA estimates provided by the Mason County Farm Bureau, the 2012 drought caused $69.4 million in crop damage in Mason County.

Drought Fast Facts – Impacts/Risk

Drought Impacts
- Total Property Damage: ***n/a***
- Infrastructure/Critical Facilities Damage*: ***n/a***
- Total Crop Damage: ***$69.4 million***

Drought Risk/Vulnerability to:
- Public Health & Safety: ***Low***
- Buildings/Infrastructure/Critical Facilities: ***Low***

* Infrastructure/Critical Facilities Damage totals are included in the Total Property Damage amounts.

Of the four drought events, disaster relief payment information was only available for one of the events. In 1988, landowners and farmers in Illinois were paid in excess of $382 million in relief payments; however a breakdown by county was unavailable.

No injuries or deaths were reported as a result of any of the recorded drought events in Mason County. Unlike other natural hazards that affect the County, drought events do not typically cause injuries or deaths. The primary concern centers on the financial impacts that result from loss of crop yields and livestock and potential drinking water shortages. Even taking into consideration the potential impacts that a water shortage may have on the general public, the risk or vulnerability to public health and safety from drought is low.

What other impacts can result from drought events?

Based on statewide drought records available from the Illinois State Water Survey, the most common impacts that result from severe drought events in Illinois include reductions in crop yields and drinking water shortages.

Crop Yield Reductions

Agriculture is a major economic enterprise in Mason County. Farmland accounts for approximately 84% of all the land in the County. According to the 2012 Census of Agriculture, there were 490 farms in Mason County occupying 289,841 acres. Of the land in farms, approximately 92% or 265,513 acres is in crop production. Due to its sandy soils and a plentiful supply of water from the Mahomet Aquifer, the farms within the County have developed extensive irrigation systems to help them grow specialty crops. As a result, approximately 35% or 102,317 acres of the land in farms is irrigated. Compared to a majority of the State and even neighboring counties, this is an unusually large amount of irrigated acres.

Crop sales accounted for $178.4 million in revenue while livestock sales accounted for $22.8 million. Mason County ranks 29th in Illinois for crop cash receipts and 49th for livestock

cash receipts. A severe drought would have a great financial impact on the large agricultural community, particularly if it occurred during the growing season. Dry weather conditions, particularly when accompanied by excessive heat, can result in diminished crop yields and place stress on livestock.

A reduction in crop yields was seen as a result of the 1983, 1988, 2005-2006 and 2012 droughts. **Figure 79** illustrates the reduction yields seen for corn and soybeans during the four recorded drought events.

Figure 79
Crop Yield Reductions Due to Drought in Mason County

Year	Corn		Soybeans	
	Yield (bushel)	% Reduction Previous Year	Yield (bushel)	% Reduction Previous Year
1982	126.0	--	39.5	--
1983	**74.0**	**41.3%**	**25.5**	**35.4%**
1984	122.0	--	31.0	--
1987	121.0	--	30.5	--
1988	**70.0**	**42.1%**	**23.0**	**24.6%**
1989	114.0	--	35.5	--
2004	179.0		49.0	--
2005	**123.0**	**31.3%**	**39.0**	**20.4%**
2006	155.0	--	47.0	--
2010	141.0	--	48.7	--
2011	142.7	--	**44.3**	**9.0%**
2012	**110.2**	**22.8%**	**36.8**	**16.9%**

Source: USDA, National Agricultural Statistics Service.

Records obtained from the USDA's National Agricultural Statistics Service show that the 1983 drought resulted in corn yield reductions of 41.3% and soybeans yield reductions of 35.4% while the 1988 drought resulted in corn yield reductions of 42.1% and soybean yield reductions of 24.6%. In 2005, the drought caused a 31.3% reduction in corn yields and a 20.4% reduction in soybean yields while the 2012 drought caused corn yield reductions of 22.8% and soybean yield reductions of 16.9%.

Drinking Water Shortages

Municipalities that rely on surface water sources for their drinking water supplies are more vulnerable to shortages as a result of drought. In Mason County ***none of the participating municipalities rely on surface water sources*** for their drinking water supplies. All obtain water from wells in shallow unconfined aquifers except for Mason City which utilizes deeper wells in a confined aquifer. The high recharge rate found in these unconfined aquifers have generally helped prevent water shortages during drought, but can leave drinking water vulnerable to contamination not likely to occur at wells found in confined aquifers. Prolonged drought or a series of droughts in close succession do have the potential to impact water levels in aquifers used for individual drinking water wells in rural areas.

Are existing buildings, infrastructure and critical facilities vulnerable to drought?

No. In general, existing buildings, infrastructure and critical facilities located in Mason County and the participating municipalities are not vulnerable to drought. The primary concern centers on the financial impacts that result from loss of crop yields and livestock.

While buildings do not typically sustain damage from drought events, in rare cases infrastructure and critical facilities may be directly or indirectly impacted. While uncommon, droughts can contribute to roadway damage. Severe soil shrinkage can compromise the foundation of a roadway and lead to cracking and buckling.

Prolonged heat associated with drought can also increase the demand for energy to operate air conditioners, fans and other devices. This increase in demand places stress on the electrical grid, which increases the likelihood of power outages. Additionally, droughts have the potential to impact drinking water supplies. Reductions in the water levels of wells and surface water supplies can cause water shortages that require water conservation measures to be enacted in an effort to maintain a sufficient supply of water to provide drinking water and fight fires.

In general, the risk or vulnerability to buildings, infrastructure and critical facilities from drought is low, even taking into consideration the potential impact a drought may have on drinking water supplies and the stress that prolonged heat may place on the electrical grid.

Are future buildings, infrastructure and critical facilities vulnerable to drought?

No. Future buildings, infrastructure and critical facilities within the County are no more vulnerable to drought than the existing building, infrastructure and critical facilities. As discussed above, buildings do not typically sustain damage from drought. Infrastructure and critical facilities may, in rare cases, be damaged by drought, but very little can be done to prevent this damage.

What are the potential dollar losses to vulnerable structures from drought?

Unlike other natural hazards there are no standard loss estimation models or methodologies for drought. Since drought typically does not cause structure damage, it is unlikely that future dollar losses will be excessive. The primary concern associated with drought is financial impacts that result from loss of crop yields and the potential impacts to drinking water supplies. Since a majority of the County is involved in farming activities, it is likely that there will be future dollar losses to drought. In addition, reduced water levels and the water conservation measures that typically accompany a drought will most likely impact businesses and industries that are water-dependent (i.e., car washes, landscapers etc.).

3.7 EARTHQUAKES

IDENTIFYING THE HAZARD

What is the definition of an earthquake?

An earthquake is a sudden shaking of the ground caused when rocks forming the earth's crust slip or move past each other along a fault (a fracture in the rocks). Most earthquakes occur along the boundaries of the earth's tectonic plates. These slow-moving plates are being pulled and dragged in different directions, sliding over, under and past each other. Occasionally, as the plates move past each other, their jagged edges will catch or stick causing a gradual buildup of pressure (energy).

Eventually, the force exerted by the moving plates overcomes the resistance at the edges and the plates snap into a new position. This abrupt shift releases the pent-up energy, producing vibrations or seismic waves that travel outward from the earthquake's point of origin. The location below the earth's surface where the earthquake starts is known as the hypocenter or focus. The point on the earth's surface directly above the focus is the epicenter.

The destruction caused by an earthquake may range from light to catastrophic depending on a number of factors including the magnitude of the earthquake, the distance from the epicenter, the local geologic conditions as well as construction standards and time of day (i.e., rush hour). Earthquake damage may include power outages, general property damage, road and bridge failure, collapsed buildings and utility damage (ruptured gas lines, broken water mains, etc.).

Most of the damage done by an earthquake is caused by its secondary or indirect effects. These secondary effects result from the seismic waves released by the earthquake and include ground shaking, surface faulting, liquefaction, landslides and, in rare cases, tsunamis.

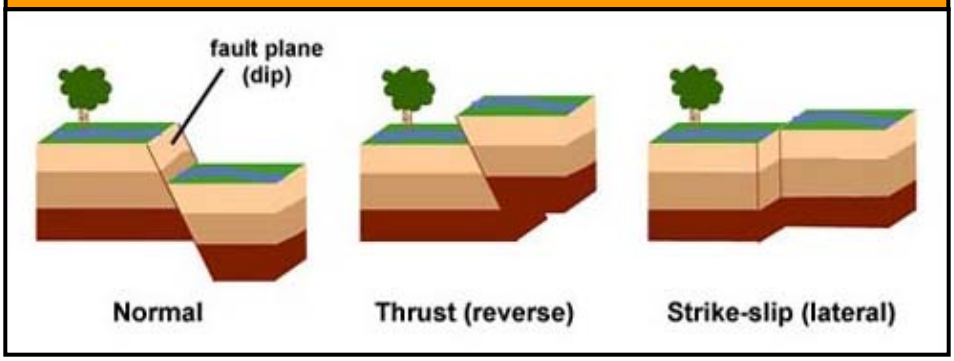
According to the U.S. Geological Survey earthquakes pose a significant risk to more than 75 million Americans in 39 states. Twenty-six urban areas across the United States, including St. Louis, Missouri, are at risk of significant seismic activity. The Federal Emergency Management Agency has estimated future annual earthquake losses in the United States at $5.6 billion a year.

What is a fault?

A fault is a fracture or zone of fractures in the earth's crust between two blocks of rock. They may range in length from a few millimeters to thousands of kilometers. Many faults form along tectonic plate boundaries.

Faults are classified based on the angle of the fault with respect to the surface (known as the dip) and the direction of slip or movement along the fault. There are three main groups of faults: normal, thrust (reverse) and strike-slip (lateral). **Figure 80** provides an illustration of each type of fault.

Figure 80
Fault Illustration



Source: U. S. Geological Survey.

Normal faults occur in response to pulling or tension along the two blocks of rock causing the overlying block to move down the dip of the fault plane. Most of the faults in Illinois are normal faults. Thrust or reverse faults occur in response to squeezing or compression of the two blocks of rock causing the overlying block to move up the dip of the fault plane. Strike-slip or lateral faults can occur in response to either pulling/tension or squeezing/compression causing the blocks to move horizontally past each other.

Geologists have found that earthquakes tend to recur along faults, which reflect zones of weakness in the earth's crust. Even if a fault zone has recently experienced an earthquake, there is no guarantee that all the stress has been relieved. Another earthquake could still occur.

What are tectonic plates?

Tectonic plates are large, irregularly-shaped, relatively rigid sections of the earth's crust that float on the top, fluid layer of the earth's mantle. There are about a dozen tectonic plates that make up the surface of the planet. These plates are approximately 50 to 60 miles thick and the largest are millions of square miles in size.

How are earthquakes measured?

The severity of an earthquake is measured in terms of its magnitude and intensity. A brief description of both terms and the scales used to measure each are provided below.

Magnitude

Magnitude refers to the amount of seismic energy released at the hypocenter of an earthquake. The magnitude of an earthquake is determined from measurements of ground vibrations recorded by seismographs. As a result, magnitude is represented as a single, instrumentally determined value. A loose network of seismographs has been installed all over the world to help record and verify earthquake events.

There are several scales that measure the magnitude of an earthquake. The most well known is the Richter Scale. This logarithmic scale provides a numeric representation of the magnitude of an earthquake through the use of whole numbers and decimal fractions. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold

increase in ground vibrations measured. In addition, each whole number increase corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number. It is important to note that the Richter Scale is used only to determine the magnitude of an earthquake, it does not assess the damage that results.

Once an earthquake's magnitude has been confirmed, it can be classified. **Figure 81** categorizes earthquakes by class based on their magnitude (i.e., Richter Scale value). Any earthquake with a magnitude less than 3.0 on the Richter Scale is classified as a microquake while any earthquake with a magnitude of 8.0 or greater on the Richter Scale is considered a "great" earthquake. Earthquakes with a magnitude of 2.0 or less are not commonly felt by individuals. The largest earthquake to occur in the United States since 1900 took place off the coast of Alaska in Prince William Sound on March 28, 1964 and registered a 9.2 on the Richter Scale.

Figure 81
Earthquake Magnitude Classes

Class	Magnitude (Richter Scale)
micro	smaller than 3.0
minor	3.0 – 3.9
light	4.0 – 4.9
moderate	5.0 – 5.9
strong	6.0 – 6.9
major	7.0 – 7.9
great	8.0 or larger

Source: Michigan Technological University, Department of Geological and Mining Engineering and Sciences, UPSeis

Intensity

Intensity refers to the effect an earthquake has on a particular location. The intensity of an earthquake is determined from observations made of the damage inflicted on individuals, structures and the environment. As a result, intensity does not have a mathematical basis; instead it is an arbitrary ranking of observed effects. In addition, intensity generally diminishes with distance. There may be multiple intensity recordings for a region depending on a location's distance from the epicenter.

Although numerous intensity scales have been developed over the years, the one currently used in the United States is the Modified Mercalli Intensity Scale. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. The lower numbers of the intensity scale are based on human observations (i.e., felt only by a few people at rest, felt quite noticeably by persons indoors, etc).

The higher numbers of the scale are based on observed structural damage (i.e., broken windows, general damage to foundations etc.). Structural engineers usually contribute information when assigning intensity values of VIII or greater. **Figure 82** provides a description of the damages associated with each level of intensity as well as comparing Richter Scales values to Modified Mercalli Intensity Scale values.

Generally the Modified Mercalli Intensity value assigned to a specific site after an earthquake is a more meaningful measure of severity to the general public than magnitude because intensity refers to the effects actually experienced at that location.

Figure 82
Comparison of Richter Scale and Modified Mercalli Intensity Scale

Richter Scale	Modified Mercalli Scale	Observations
1.0 – 1.9	I	Felt by very few people; barely noticeable. No damage.
2.0 – 2.9	II	Felt by a few people, especially on the upper floors of buildings. No damage.
3.0 – 3.9	III	Noticeable indoors, especially on the upper floors of buildings, but may not be recognized as an earthquake. Standing cars may rock slightly; vibrations similar to the passing of a truck. No damage.
4.0	IV	Felt by many indoors and a few outdoors. Dishes, windows, and doors disturbed. Standing cars rocked noticeably. No damage.
4.1 – 4.9	V	Felt by nearly everyone. Small, unstable objects displaced or upset; some dishes and glassware broken. Negligible damage.
5.0 – 5.9	VI	Felt by everyone. Difficult to stand. Some heavy furniture moved. Weak plaster may fall and some masonry, such as chimneys, may be slightly damaged. Slight damage.
6.0	VII	Slight to moderate damage to well-built ordinary structures. Considerable damage to poorly-built structures. Some chimneys may break. Some walls may fall.
6.1 – 6.9	VIII	Considerable damage to ordinary buildings. Severe damage to poorly built buildings. Some walls collapse. Chimneys, monuments, factory stacks, columns fall.
7.0	IX	Severe structural damage in substantial buildings, with partial collapses. Buildings shifted off foundations. Ground cracks noticeable.
7.1 – 7.9	X	Most masonry and frame structures and their foundations destroyed. Some well-built wooden structures destroyed. Train tracks bent. Ground badly cracked. Landslides.
8.0	XI	Few, if any structures remain standing. Bridges destroyed. Wide cracks in ground. Train tracks bent greatly. Wholesale destruction.
> 8.0	XII	Total damage. Lines of sight and level are distorted. Waves seen on the ground. Objects thrown up into the air.

Sources: Michigan Technological University, Department of Geological and Mining Engineering and Sciences, UPSeis.
U.S. Geological Survey.

When and where do earthquakes occur?

Earthquakes can strike any location at any time. However, history has shown that most earthquakes occur in the same general areas year after year, principally in three large zones around the globe. The world's greatest earthquake belt, the circum-Pacific seismic belt (nicknamed the "Ring of Fire"), is found along the rim of the Pacific Ocean, where about 81 percent of the world's largest earthquakes occur.

The second prominent belt is the Alpide, which extends from Java to Sumatra and through the Himalayan Mountains, the Mediterranean Sea and out into the Atlantic Ocean. It accounts for about 17 percent of the world's largest earthquakes, including those in Iran, Turkey and Pakistan. The third belt follows the submerged mid-Atlantic Ridge, the longest mountain range in the world, nearly splitting the entire Atlantic Ocean north to south.

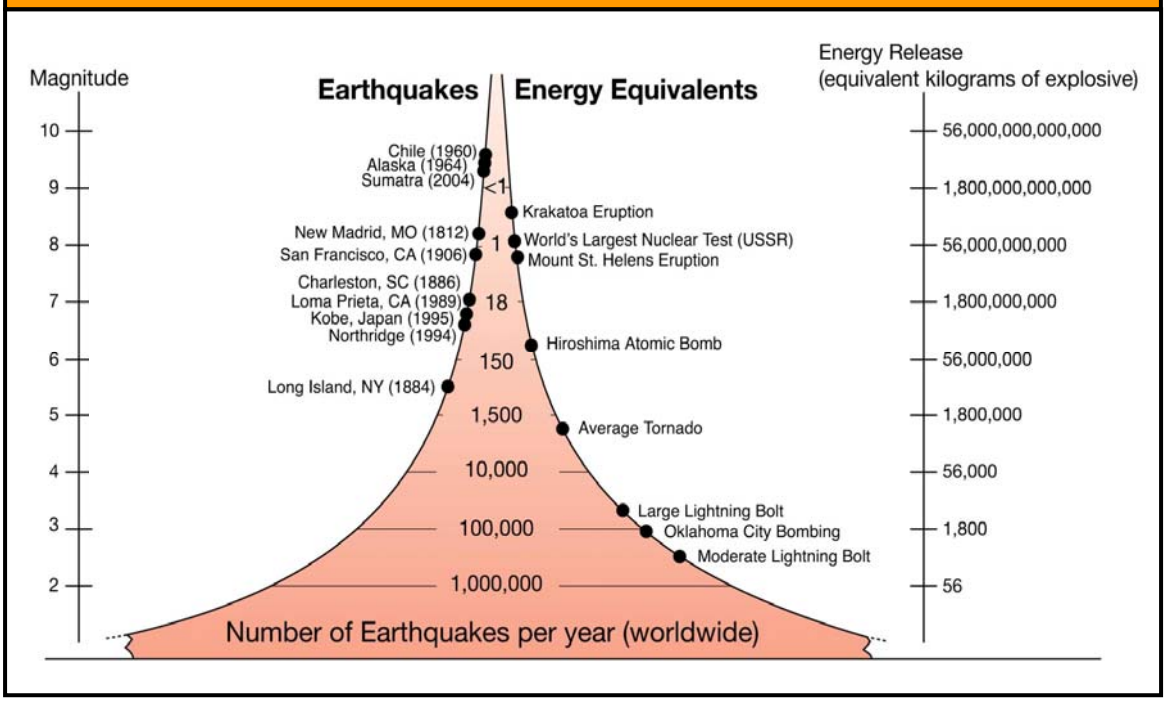
While most earthquakes occur along plate boundaries some are known to occur within the interior of a plate. (As the plates continue to move and plate boundaries change over time,

weakened boundary regions become part of the interiors of the plates.) Earthquakes can occur along zones of weakness within a plate in response to stresses that originate at the edges of the plate or from deep within the earth's crust. The New Madrid earthquakes of 1811 and 1812 occurred within the North American plate.

How often do earthquakes occur?

Earthquakes occur every day. Worldwide, small earthquakes, such as magnitude 2 earthquakes, occur over 2,500 times a day. These earthquakes are known as microquakes and are generally not felt by humans. Major earthquakes, such as magnitude 7 earthquakes, generally occur at least once a month. **Figure 83** illustrates the approximate number of earthquakes that occur worldwide per year based on magnitude. This figure also identifies manmade and natural events that release approximately the same amount of energy for comparison.

Figure 83
Approximate Number of Earthquakes Recorded Annually



Source: Incorporated Research Institutions for Seismology, Education and Outreach Series – Educational One-Pagers, How Often Do Earthquakes Occur?

PROFILING THE HAZARD

Are there any fault zones located within the County?

No. There are no known fault zones located in Mason County or any of the surrounding counties.

When have earthquakes occurred previously? What is the extent of these previous quakes?

According to the Illinois State Geological Survey *Earthquakes of Illinois: 1795 – 2013* map, one earthquake has originated in Mason County during the last 200 years. On July 19, 1909 an

earthquake with an estimated magnitude of 4.5 originated in Mason County approximately three miles north-northeast of Kilbourne. Damage information was unavailable for this event.

Mason County residents have also felt ground shaking caused by earthquakes that have originated outside of the County. The following provides a brief description, by region, of those events.

Earthquake Fast Facts – Occurrences

Earthquakes Originating in the County (1795 – 2013): ***1***

Fault Zones Located within the County: ***None***

Earthquakes Originating in nearby Counties (1795-2013): ***3***

Fault Zones Located in Nearby Counties: ***None***

Central Illinois

Several earthquakes have originated in nearby Menard, Fulton and Peoria Counties. Damage information was unavailable for any of these events.

- An earthquake originated in Menard County approximately 2 miles west-southwest of Petersburg on November 10, 1923 and was estimated to be a magnitude 3.5 earthquake.
- On June 29, 1937 an earthquake originated in Peoria County near downtown Peoria with an estimated magnitude of 3.0.
- An earthquake originated in Fulton County just west of Marietta on March 13, 1956 and was estimated to be a magnitude of 3.7 earthquake.

Southern Illinois

Mason County residents also felt ground shaking caused by several earthquakes that have originated in southeastern Illinois.

- On April 18, 2008, a magnitude 5.4 earthquake was reported in southeastern Illinois near Bellmont in Wabash County. The earthquake was located along the Wabash Valley seismic zone. Minor structural damage was reported in several towns in Illinois and Kentucky. Ground shaking was felt over all or parts of 18 states in the central United States and southern Ontario, Canada.
- A magnitude 5.1 earthquake took place on June 10, 1987 in southeastern Illinois near Olney in Richland County. This earthquake was also located along the Wabash Valley seismic zone. Only minor structural damage was reported in several towns in Illinois and Indiana. Ground shaking was felt over all or parts of 17 states in the central and eastern United States and southern Ontario, Canada. The National Weather Service COOP observer for Mason City noted in his log that he felt earthquake tremors on the 10th at 6:53 p.m.
- The strongest earthquake in the central United States during the 20th century occurred along the Wabash Valley seismic zone in southeastern Illinois near Dale in Hamilton County. This magnitude 5.4 earthquake occurred on November 9, 1968 with an intensity estimated at VII for the area surrounding the epicenter. Moderate structural damage was reported in several towns in south-central Illinois, southwest Indiana and northwest Kentucky. Ground shaking was felt over all or parts of 23 states in the central and eastern United States and southern Ontario, Canada.

Three of the ten largest earthquakes ever recorded within the continental United States took place in 1811 and 1812 along the New Madrid seismic zone. This zone lies within the central

Mississippi Valley and extends from northeast Arkansas through southeast Missouri, western Tennessee, western Kentucky and southern Illinois. These magnitude 7.7 and 7.5 major earthquakes were centered near the town of New Madrid, Missouri and caused widespread devastation to the surrounding region and were felt by people in cities as far away as Pittsburgh, Pennsylvania and Norfolk, Virginia.

The quakes locally changed the course of the Mississippi River creating Reelfoot Lake in northwestern Tennessee. These earthquakes were not an isolated incident. The New Madrid seismic zone is one of the most seismically active areas of the United States east of the Rockies. Since 1974 more than 4,000 earthquakes have been recorded within this seismic zone, most of which were too small to be felt.

What locations are affected by earthquakes?

Earthquake events can affect the entire County. Earthquakes, like drought and extreme heat, impact large areas extending across an entire region and affecting multiple counties. Mason County's proximity to two earthquake fault zones (the New Madrid and the Wabash Valley) makes the entire area likely to be affected by an earthquake if these faults become seismically active. The *2013 Illinois Natural Hazard Mitigation Plan* classifies Mason County's hazard rating for earthquakes as "guarded."

What is the probability of future earthquake events occurring?

As with flooding, calculating the probability of future earthquakes changes depending on the magnitude of the event. According to the ISGS, Illinois is expected to experience a magnitude 3.0 earthquake every year, a magnitude 4.0 earthquake every four years and a magnitude 5.0 earthquake every 20 years. The likelihood of an earthquake with a magnitude of 6.3 or greater occurring somewhere in the central United States within the next 50 years is between 86% and 97%.

While the major earthquakes of 1811 and 1812 do not occur often along the New Madrid fault, they are not isolated events. In recent decades, scientists have collected evidence that earthquakes similar in size and location to those felt in 1811 and 1812 have occurred several times before within the central Mississippi Valley around 1450 A.D., 900 A.D. and 2350 B.C.

The general consensus among scientists is that earthquakes similar to the 1811-1812 earthquakes are expected to recur on average every 500 years. The U.S. Geological Survey and the Center for Earthquake Research and Information (CERI) at the University of Memphis estimate that for a 50-year period the probability of a repeat of the 1811-1812 earthquakes is between 7% and 10% and the probability of an earthquake with a magnitude of 6.0 or larger is between 25% and 40%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to earthquakes?

Yes. All of Mason County is vulnerable to earthquakes. The unique geological formations topped with glacial drift soils found in the central United States conduct an earthquake's energy farther than in other parts of the Nation. Consequently, earthquakes that originate in the

Midwest tend to be felt at greater distances than earthquakes with similar magnitudes that originate on the West Coast.

This vulnerability, found throughout most of Illinois and all of Mason County, is compounded by relatively high water tables within the region. When earthquake shaking mixes the groundwater and soil, ground support is further weakened thus adding to the potential structural damages experienced by buildings, roads, bridges, electrical lines and natural gas pipelines.

The *Projected Earthquake Intensities Map* prepared by the Missouri State Emergency Management Agency predicts that if a magnitude 6.7 earthquake were to take place anywhere along the New Madrid seismic zone, then the highest projected intensity felt in Mason County would be a V on the Modified Mercalli Intensity Scale. If a magnitude 8.6 earthquake were to occur, then the highest projected intensity felt would be a VII.

The infrequency of major earthquakes, coupled with relatively low magnitude/intensity of past events, has led the public to perceive that Mason County is not vulnerable to damaging earthquakes. This perception has allowed the County and participating municipalities to develop largely without regard to earthquake safety.

What impacts resulted from the recorded earthquake events?

Property damage information was either unavailable or none was recorded for the one documented earthquake that occurred in Mason County. While Mason County residents felt the earthquakes that occurred in 2008, 1987 and 1968, no damages were reported as a result of these events either. Given the magnitude of the great earthquakes of 1811 and 1812, it is almost certain that individuals in what is now Mason County felt those quakes; however historical records do not indicate the intensity or impacts that these quakes had on the County.

Earthquake Fast Facts – Risk

Earthquake Risk/Vulnerability to:

- Public Health & Safety – Moderate Quake: ***Low***
- Public Health & Safety – Great Quake: ***Medium***
- Buildings/Infrastructure/Critical Facilities – Moderate Quake: ***Low***
- Buildings/Infrastructure/Critical Facilities – Great Quake: ***Medium***

The risk or vulnerability to public health and safety from an earthquake is dependent on the intensity and location of the event. Since there are no known faults in Mason County, the likelihood that an earthquake will originate in the County is very small, decreasing the chances for catastrophic damages.

Any impacts that are felt by Mason County residents will most likely originate from outside the County, either from the Wabash Valley or New Madrid faults. As a result the risk or vulnerability to public health and safety from a moderate earthquake such as the one that occurred on April 18, 2008 is low. However, if a great earthquake similar to those experienced in 1811 and 1812 were to occur, then the risk or vulnerability to public health and safety would be elevated to medium.

What other impacts can result from earthquakes?

Earthquakes can impact human life, health and public safety. **Figure 84** details the potential impacts that may be experienced by the County should a magnitude 6.0 or greater earthquake occur in the region.

Figure 84
Potential Earthquake Impacts

Direct	Indirect
Buildings • Temporary displacement of businesses, households, schools and other critical services where heat, water and power are disrupted • Long-term displacement of businesses, households, schools and other critical services due to structural damage or fires *Transportation* • Damages to bridges (i.e., cracking of abutments, subsidence of piers/supports, etc.) • Cracks in the pavement of critical roadways • Increased traffic on US and State Routes (especially if the quake originates along the New Madrid fault) as residents move out of the area to seek shelter and medical care and as emergency response, support services and supplies move south to aid in recovery • Misalignment of rail lines due to landslides (most likely near stream crossings), fissures and/or heaving *Utilities* • Downed power and communication lines • Breaks in drinking water and sanitary sewer lines resulting in the temporary loss of service • Disruptions in the supply of natural gas due to cracking and breaking of pipelines *Health* • Injuries/deaths due to falling debris and fires *Other* • Cracks in the earthen dams of the lakes and reservoirs within the County which could lead to dam failures	*Health* • Use of County health facilities to treat individuals injured closer to the epicenter • Emergency services (ambulance, fire, law enforcement) may be needed to provide aid in areas where damage was greater *Other* • Disruptions in land line telephone service throughout an entire region (i.e., central and southern Illinois) • Depending on the seasonal conditions present, more displacements may be expected as those who may not have enough water and food supplies seek alternate shelter due to temperature extremes that make their current housing uninhabitable

Are existing buildings, infrastructure and critical facilities vulnerable to earthquakes?

Yes. All existing buildings, infrastructure and critical facilities located in Mason County and the participating municipalities are vulnerable to damage from earthquakes. Unreinforced masonry buildings are most at risk during an earthquake because the walls are prone to collapse outward. Steel and wood buildings have more ability to absorb the energy from an earthquake while wood buildings with proper foundation ties have rarely collapsed in earthquakes.

Depending on the intensity of the earthquake, building damage in Mason County could range from negligible to moderate in well-built structures and considerable in poorly-built structures. An earthquake has the ability to damage infrastructure and critical facilities such as roads and utilities. In the event of a strong earthquake, bridges are expected to experience moderate damage such as cracking in the abutments and subsidence of piers and supports. The structural integrity may be compromised to the degree where safe passage is not possible, resulting in adverse travel times as alternate routes are taken. Some rural families may become isolated where alternate paved routes do not exist. In addition, cracks may form in the pavement of key roadways.

An earthquake may also down overhead power and communication lines causing power outages and disruptions in communications. Cracks or breaks may form in natural gas pipelines and drinking water and sewage lines resulting in temporary loss of service. In addition, an earthquake could cause cracks to form in the earthen dams located within the County, increasing the likelihood of a dam failure.

As with public health and safety, the risk or vulnerability to buildings, infrastructure and critical facilities is dependent on the intensity and location of the event. The risk to buildings, infrastructure and critical facilities from a moderate earthquake is likely to be low, while the risk from a great earthquake is likely to be medium.

Are future buildings, infrastructure and critical facilities vulnerable to earthquakes?

Yes. While four of the participating municipalities have building codes in place, these codes do not contain seismic provisions that address structural vulnerability for earthquakes. As a result, there is the potential for future buildings, infrastructure and critical facilities face some of the same vulnerabilities as those of existing buildings, infrastructure and critical facilities described previously.

What are the potential dollar losses to vulnerable structures from earthquakes?

Since property damage information was either unavailable or none was recorded for the documented earthquake in Mason County there is no way to accurately estimate future potential dollar losses to vulnerable structures in the County. In addition, there is insufficient data available to make useful predictions regarding potential earthquake damages through the use of computer modeling.

Since all structures within the County are vulnerable to damage, it is likely that there will be future dollar losses from any earthquake ranging from strong to great. As a result, participating jurisdictions were asked to consider mitigation projects that could provide wide ranging benefits for reducing the impacts or damages associated with earthquakes.

3.8 DAMS

IDENTIFYING THE HAZARD

What is the definition of a dam?

A dam is an artificial barrier constructed across a stream channel or a man-made basin for the purpose of storing, controlling or diverting water. Dams typically are constructed of earth, rock, concrete or mine tailings. The area directly behind the dam where water is impounded or stored is referred to as a reservoir.

According to the National Inventory of Dams (NID), there are approximately 87,359 dams in the United States and Puerto Rico, with 1,592 dams located in Illinois. (The NID is maintained by the U.S. Army Corps of Engineers and is updated approximately every two years.) Of the 1,592 dams in Illinois, approximately 93% are constructed of earth.

What is the definition of a dam failure?

A dam failure is the partial or total collapse, breach or other failure of a dam that causes flooding downstream. In the event of a dam failure, the people, property and infrastructure downstream could be subject to devastating damages. The potential severity of a full or partial dam failure is influenced by two factors:

- the capacity of the reservoir and
- the extent and type of development and infrastructure located downstream.

There are two categories of dam failures, “flood” or “rainy day” failures and “sunny day” failures. A “flood” or “rainy day” failure usually results when excess precipitation and runoff cause overtopping or a buildup of pressure behind a dam which leads to a breach. Even normal storm events can lead to “flood” failures if debris plugs the water outlets. Given the conditions that lead to a “flood” failure (i.e., rainfall over a period of hours or days), there is usually a sufficient amount of time to warn and evacuate residents downstream.

Unlike a “flood” failure, there is generally no warning associated with a “sunny day” failure. A “sunny day” failure is usually the result of improper or poor dam maintenance, internal erosion, vandalism or an earthquake. This unexpected failure can be catastrophic because it may not allow enough time to warn and evacuate residents downstream.

No one knows precisely how many dam failures have occurred in the United States, however, it is estimated that hundreds have taken place over the last century. Some of the worst failures have caused catastrophic property and environmental damage and have taken hundreds of lives. The worst dam failure in the last 50 years occurred on February 26, 1972 in Buffalo Creek, West Virginia. A tailings dam owned by the Buffalo Mining Company failed, taking the lives of 125 people, injuring 1,100 people, destroying 500 homes and causing more than $400 million in damages.

Dam failures have been documented in every state, including Illinois. According to the Dam Incident Database compiled by the National Performance of Dams Program, there have been 20 reported dam failures in Illinois between 1950 and 2001.

What causes a dam failure?

Dam failures can result from one or more of the following:

- ***prolonged periods of rainfall and flooding*** (the cause of most failures);
- ***inadequate spillway capacity*** resulting in excess flow overtopping the dam;
- ***internal erosion*** caused by embankment or foundation leakage ;
- ***improper maintenance*** (including failure to remove trees, repair internal seepage problems, maintain gates, valves and other operational components, etc.);
- ***improper design*** (including use of improper construction materials and practices);
- ***negligent operation*** (including failure to remove or open gates or valves during high flow periods);
- ***failure of an upstream dam on the same waterway***;
- ***landslides into reservoirs*** which cause surges that result in overtopping of the dam;
- ***high winds*** which can cause significant wave action and result in substantial erosion; and
- ***earthquakes*** which can cause longitudinal cracks at the tops of embankments that can weaken entire structures.

How are dams classified?

Each dam in Illinois is assigned a hazard classification based on the potential for loss of life and damage to property in the event of a dam failure. The three classifications are Class I, Class II and Class III. **Figure 85** provides a brief description of each hazard classification. The hazard classifications used in Illinois are similar to those used by the U.S. Army Corps of Engineers to classify dams listed in the National Inventory of Dams. It is important to note that the hazard classification assigned is not an indicator of the adequacy of the dam or its physical integrity and in no way reflects the current condition of the dam.

Figure 85
Dam Hazard Classification System

Class	Description
Class I	Dams located where failure has a high probability of causing loss of life or substantial economic loss downstream (i.e., a dam located where its failure may cause additional damage to such structures as a home, a hospital, a nursing home, a highly travelled roadway, a shopping center or similar type facilities where people are normally present downstream of the dam).
Class II	Dams located where failure has a moderate probability of causing loss of life or may cause substantial economic loss downstream (i.e., a dam located where its failure may cause additional damage to such structures as a water treatment facility, a sewage treatment facility, a power substation, a city park, a U.S. Route or Illinois Route highway, a railroad or similar type facilities where people are downstream of the dam for only a portion of the day or on a more sporadic basis).
Class III	Dams located where failure has a low probability of causing loss of life, where there are no permanent structures for human habitation, or minimal economic loss downstream (i.e., a dam located where its failure may cause additional damage to agricultural fields, timber areas, township roads or similar type areas where people seldom are present and where there are few structures).

Source: Illinois Administrative Code.

Are there any classified dams owned by any of the participating jurisdictions?

No. There are no classified dams owned by any of the participating jurisdictions.

Are there any other publicly-owned classified dams within the County?

Yes. There are a total of six publicly-owned classified dams within the County. The Illinois Department of Natural Resources (IDNR) and the U.S. Army Corps of Engineers (USACE) both own three dams a piece respectively. **Figure 86** provides a brief description of each dam.

Figure 86
Publicly-Owned Classified Dams Located in Mason County

Name	Associated Waterway	Owner	Type	Purpose	Completion Date
Class III					
Barkhausen Refuge Dam	Sangamon River	IDNR	Earth	Fish & Wildlife Pond	n/a
Crane Lake Water Control Dam	Crane Lake Channel	IDNR	Other	Fish & Wildlife Pond	n/a
Chain Lake Water Control Dam	Panther Slough	IDNR	Other	Fish & Wildlife Pond	2001
Lake Chautauqua Lower Dam	n/a	USACE	Earth	Fish & Wildlife Pond	1920
Lake Chautauqua Upper Dam	n/a	USACE	Earth	Fish & Wildlife Pond	1916
Lake Chautauqua/Quiver Creek Weir Dam	Quiver Creek	USACE	Other	Fish & Wildlife Pond	1988

Sources: Diedrichsen, Mike, Illinois Department of Natural Resources, Office of Water Resources.
U.S. Army Corps of Engineers, National Inventory of Dams Interactive Report.

Are there any privately-owned classified dams within the County?

Yes. There are three privately-owned classified dams within Mason County. **Figure 87** provides a brief description of each dam.

Figure 87
Privately-Owned Classified Dams Located in Mason County

Name	Associated Waterway	Owner	Type	Purpose	Completion Date
Class I					
Dynegy/Havana Station – Cell 1 & Polishing Pond	Tributary Illinois River	Dynegy Midwest Generation	Earth	Debris Control	1993
Dynegy/Havana Station – East Ash Pond System Cell 2	Tributary Illinois River	Dynegy Midwest Generation	Earth	Other	1999
Dynegy/Havana Station – East Ash Pond System Cell 3	Tributary Illinois River	Dynegy Midwest Generation	Earth	Debris Control	n/a

Sources: Diedrichsen, Mike, Illinois Department of Natural Resources, Office of Water Resources.
U.S. Army Corps of Engineers, National Inventory of Dams Interactive Report.

PROFILING THE HAZARD

When have dam failures occurred previously? What is the extent of these previous dam failures?

According to the data from Stanford University's Nation Performance of Dams Program Dam Incident Database and discussions with Planning Committee members there are no known recorded dam failures in Mason County.

Dam Failure Fast Facts – Occurrences

Number of Dam Failures Reported: ***None***

What locations are affected by dam failure?

Dam failures have the potential to impact Havana and unincorporated areas of Mason County. **Figure 88** shows the locations of the publically and privately-owned classified dams in Mason County.

What is the probability of future dam failure events occurring?

Since none of the dams have experienced a dam failure, it is difficult to specifically establish the probability of a future failure; however, it is estimated to be relatively low.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to dam failures?

Yes. Havana and portions or unincorporated Mason County are vulnerable to the dangers presented by dam failures. However, none of the rest of the County or participating municipalities are considered vulnerable.

What impacts resulted from the recorded dam failures?

Since there have been no *recorded* dam failures in Mason County, there are no recorded impacts to report. In terms of the risk or vulnerability to public health and safety from a dam failure, there are several factors that must be taken into consideration including the severity of the event, the capacity of the reservoir and the extent and type of development and infrastructure located downstream. When these factors are taken into consideration, the overall risk to public health and safety posed by a dam failure in Mason County is low to medium.

Dam Failure Fast Facts – Risk

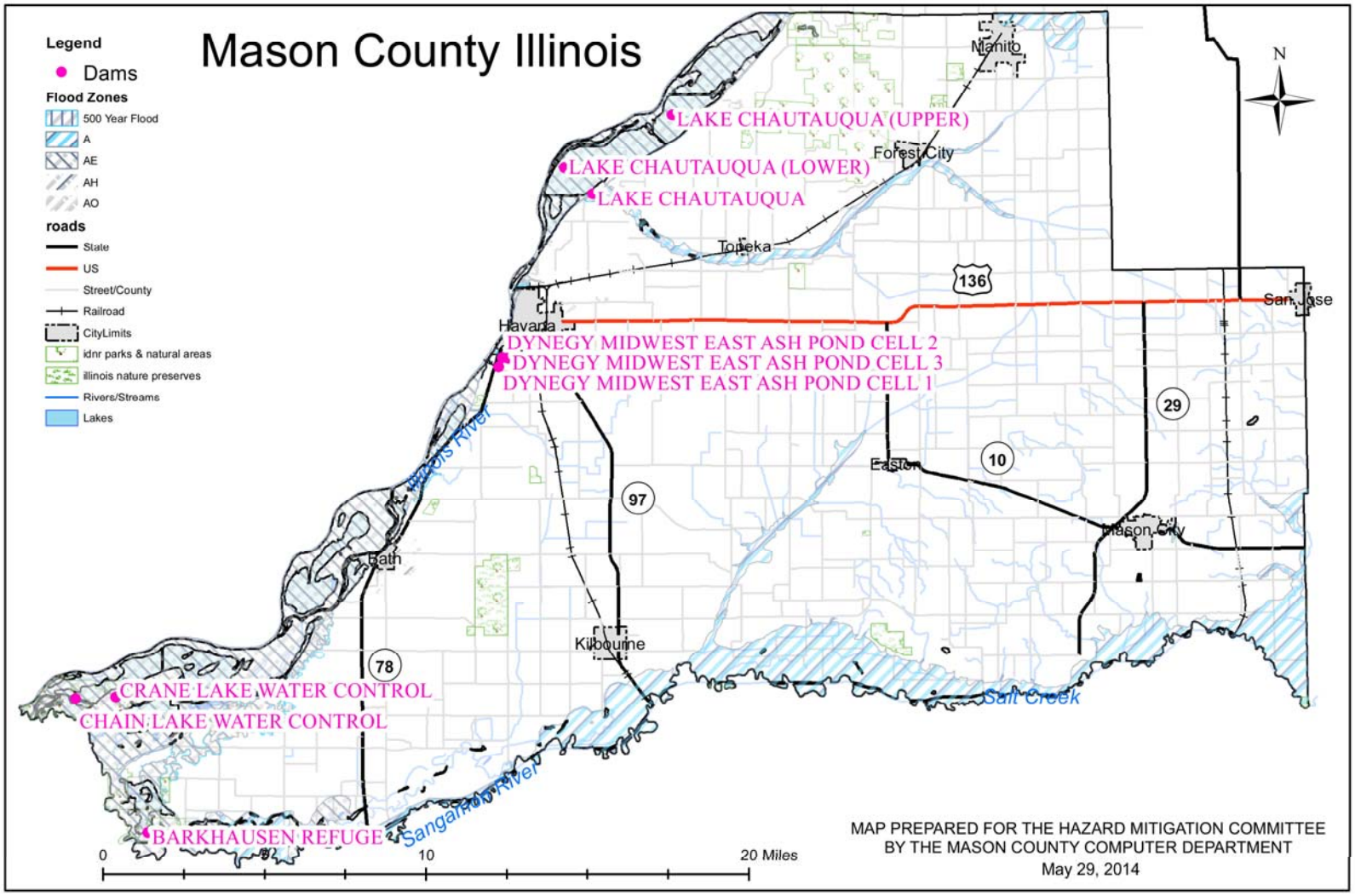
Dam Failure Risk/Vulnerability to:

- Public Health & Safety: – ***Low to Medium***
- Buildings/Infrastructure/Critical Facilities: – ***Low to Medium***

What other impacts can result from dam failures?

The impacts from a dam failure are similar to those of a flood. There is the potential for injuries, loss of life, property damage and crop damage. Depending on the type of dam failure, there may be little, if any warning that an event is about to occur, similar to flash flooding. As a result, one of the primary threats to individuals is from drowning. Motorists who choose to drive over flooded roadways run the risk of having their vehicles swept off the road and downstream.

Figure 88
Locations of Classified Dams in Mason County



Flooding of roadways is also a major concern for emergency response personnel who would have to find alternative routes around any section of road that becomes flooded due to a dam failure.

In addition to concerns about injuries and death, the water released by a dam failure poses the same biological and chemical risks to public health as floodwaters. The flooding that results from a dam failure has the potential to force untreated sewage to mix with floodwaters. The polluted floodwaters then transport the biological contaminants into buildings and basements and onto roads and public areas. If left untreated, the floodwaters can serve as breeding grounds for bacteria and other disease-causing agents. Even if floodwaters are not contaminated with biological material, basements and buildings that are not properly cleaned can grow mold and mildew, which can pose a health hazard, especially for small children, the elderly and those with specific allergies.

Flooding from dam failures can also cause chemical contaminants such as gasoline and oil to enter floodwaters if underground storage tanks or pipelines crack and begin leaking during a dam failure event. Depending on the time of year, the water released by a dam failure may also carry away agricultural chemicals that have been applied to farm fields and cause damage to or loss of crops.

Are existing buildings, infrastructure and critical facilities vulnerable to dam failures?

Yes. The Emergency Action Plan for the Dynegy/Havana Station East Ash Pond System identifies 133 residential structures, nine business, three government facilities and one park in Havana that are vulnerable to a dam failure. Information was unavailable on the number and type of structures vulnerable to a dam failure for the remaining Class III dams; although a visual inspection of the areas surrounding these dams indicates there are few if any structures located nearby.

Depending on whether there is a full or partial dam failure, all of the vulnerable buildings, infrastructure and critical facilities may be inundated by water and structural damage may result. Because none of the reservoirs within the County are immense in size, the damage sustained from dam failure flooding may not be to the structure, but to the contents of the building or nearby infrastructure.

In addition to impacting structures, a dam failure can damage roads and utilities. Roadways, culverts and bridges can be weakened by dam failure floodwaters and may collapse under the weight of a vehicle. Power and communication lines, both above and below ground, are also vulnerable to dam failure flooding. Depending on their location and the velocity of the water as it escapes the dam, power poles may be snapped causing disruptions to power and communication. Water may also get into any buried lines causing damage and disruptions.

As with public health and safety, the risk or vulnerability to buildings, infrastructure and critical facilities is dependent on several factors including the severity of the event, the capacity of the reservoir and the extent and type of development and infrastructure located downstream. In general, the risk from a dam failure in Mason County is low to medium.

Are future buildings, infrastructure and critical facilities vulnerable to dam failures?

Yes. Any future buildings, infrastructure and critical facilities located within the flood path of a classified dam are vulnerable to damage from a dam failure. As a result, future buildings, infrastructure and critical facilities face the same vulnerabilities as those of existing buildings, infrastructure and critical facilities described previously.

What are the potential dollar losses to vulnerable structures from dam failures?

Unlike other hazards, there are no standard loss estimation models or methodologies for dam failures. Given that there have been no recorded dam failures in Mason County, sufficient information was not available to prepare a reasonable estimate of future potential dollar losses to vulnerable structure from dam failures.

3.9 LEVEES

IDENTIFYING THE HAZARD

What is the definition of a levee?

In general, the U.S. Army Corps of Engineers (USACE or the Corps) defines a "levee" as an earthen embankment, floodwall or structure along a water course whose purpose is flood risk reduction or water conveyance. Levees are typically not designed to hold back water for extended periods of time, rather they are meant to provide temporary flood protection from seasonal high water, precipitation and other weather events. While levees reduce the risk from a flooding event, they do not eliminate it. There is always the chance a flood will exceed the capacity of a levee, no matter how well it is built.

The Mississippi and Illinois River valleys were largely transformed from permanent, seasonal wetlands to highly productive agricultural lands by the construction of levees and the organization of drainage districts between 1879 and 1916.

What is the definition of a breach?

A breach is a rupture, break or gap in a levee which causes previously contained water to flood the land behind a levee. If the levee breach is identified as a "failure breach" then the cause of the breach is known and occurred without overtopping. In order for a breach to be termed a failure breach, an investigation is usually required to determine the cause.

What is the definition of overtopping?

Overtopping occurs when the water levels contained by the levee exceed the levee's crest elevation and flood the land behind the levee. The flooding occurs from overflow/overwash (waves) and other sources. In most cases overtopping may damage the levee but not compromise it. If the levee is compromised because of overtopping then it is identified as an "overtopping breach."

What causes a levee breach?

Levee breaches can result from one or more of the following:

- ***erosion of the crown and land-side face of the levee*** caused by overtopping (the higher the velocity of flow over the levee, the more quickly that erosion will occur and cause a failure of the levee);
- ***sand boils and piping*** resulting from the relatively fast passage of flood waters through permeable materials under the base of the levee to the land behind the levee (depending on the amount of sand and soil transported by the waters from the base to the surface, the levee may settle unevenly, crack or even completely fail);
- ***seepage and saturation*** (prolonged exposure to water will cause levee materials to become saturated, leading to seepage and sloughing of the soil on land-side face of the levee and resulting in the loss of slope stability and ultimately failure of the levee);
- ***erosion of the river-side slope of the levee*** as a result of wave action caused by wind and/or commercial or recreational vessels over a long period of time (most Illinois levees

are constructed of sand and alluvial materials, both of which are among the easiest materials to erode);

- ***structural failures*** at gates, walls or closure structures;
- ***improper maintenance*** (including failure to maintain gates, walls or closure structures; remove trees; fill in holes created by burrowing animals, etc.); and
- ***earthquakes*** which can cause loss of soil strength and destabilize the levee and foundation materials.

Who is responsible for regulating levees?

This is no single agency with responsibility for levee oversight nationwide. The USACE has specific and limited authorities for approximately 2,000 levees across the country, totaling 14,000 miles. While the Corps serves as one of the nation's largest infrastructure stewards, the misperception exists that the USACE has universal responsibility for the nation's levees. There are three different classifications of levees:

- ***Federally Authorized Levees***. A levee typically designed and built by the Corps in cooperation with a local sponsor, then turned over to the local sponsor (i.e. drainage district) to operate, maintain, repair and replace the levee.
- ***Non-Federally Authorized Levees***. A levee designed and built by a non-federal agency, which is responsible for the operation, maintenance, repair and replacement of the levee.
- ***Private or Corporate-Owned Levees***. A levee designed and built by a private citizen, company or other public entity, which is responsible for the operation, maintenance, repair and replacement of the levee. The Corps has no responsibility for this type of levee.

What is a drainage district?

A drainage district is a local unit of government formed by area landowners to "…construct, maintain or repair drains or levees or to engage in other drainage or levee work for agricultural, sanitary or mining purposes" (70 ILCS 605/3-1). Drainage districts may be organized by petition or referendum and are approved by the circuit court of the county in which the greater part of the district lies.

Each district is usually governed by three drainage commissioners, although there are districts in Illinois that have as many as five drainage commissioners. The drainage commissioners may be any adult who resides in Illinois and owns land within the district's boundaries. Commissioners are either appointed by the county or elected.

Drainage districts are funded through assessments. Each benefited landowner in a district is assessed a fee for the maintenance and upkeep of the district. Under the Illinois Drainage Code, a district which is organized to maintain levees shall include the term "drainage and levee district" in its name.

Are there any drainage districts in Mason County?

Yes. According to the US Army Corps of Engineers National Levee Database there are three active Sangamon River drainage and levee districts (D&LD) located in Mason County that operate and maintain levees. **Figure 89** provides information on each district while **Figure 90** provides information on the individual levees located within each district. It should be noted that there are no D&LDs located in Mason County along the Illinois River that operate and maintain levees.

A fourth drainage and levee district, the South Sangamon Drainage and Levee District – East, was identified in Mason County along the Sangamon River. However, according to the US Army Corps of Engineers both segments within the D&LD received an "unacceptable" rating during their last inspection in 2010 and the system has been placed on "inactive" status. As a result, it is not included in the following discussions.

Figure 89
Sangamon River Drainage and Levee Districts – Mason County

Drainage & Levee District	Year Completed	Land Protected (Acres)	Length of Levee(s) (Miles)	Inspection Rating
Farmers and Herget*	1941	7,448	12.6	Minimally Acceptable
Mason & Menard	1939	5,885	12.4	Minimally Acceptable
Old River^	n/a	3,811	6.1	Minimally Acceptable

* D&LD extends between Cass, Mason and Menard Counties.

^ D&LD extends between Cass and Mason County with virtually all the protected land and most of the levee located in Cass County.

Sources: US Army Corps. of Engineers, National Levee Database.

Figure 90
Sangamon River Drainage and Levee District Levee Information – Mason County

Levee Segment Name	Levee Classification	Length of Levee (Miles)	Level of Protection	Landowners Protected
Farmers & Herget D&LD				
Farmers	Federal	7.1	50 Year	n/a
Herget	Federal	5.5	n/a	n/a
Mason & Menard D&LD				
Mason & Menard	Federal	12.4	50 Year	n/a
Old River D&LD				
Old River	Non-Fedeal	6.1	n/a	n/a

Sources: US Army Corps. of Engineers, National Levee Database.

PROFILING THE HAZARD

When have levee breaches occurred previously? What is the extent of these previous levee breaches?

There have been no recorded levee breaches along the Sangamon River in Mason County.

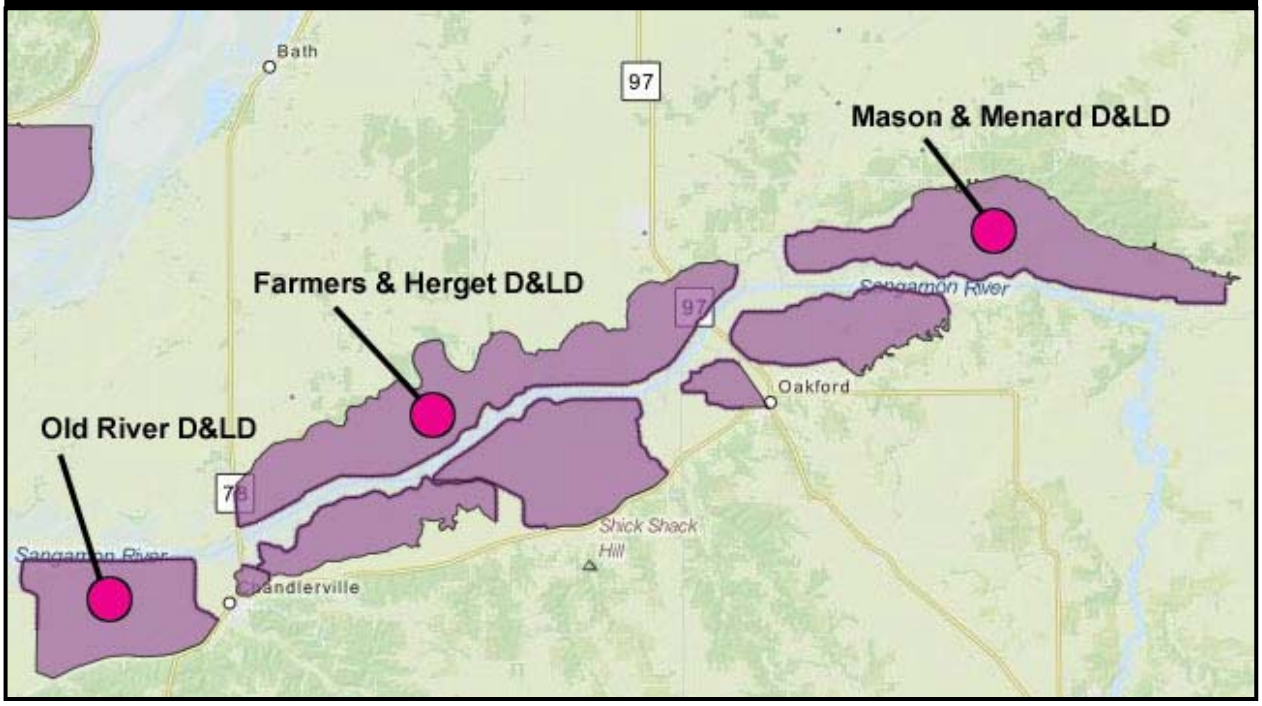
Levee Breach Fast Facts – Occurrences

Number of Levee Breaches Reported: ***None***

What locations are affected by levee breaches?

Levee breaches within the drainage and levee districts have the potential to affect only unincorporated areas of Mason County along the Sangamon River. **Figure 91** illustrates the locations of the drainage and levee districts in Mason County.

Figure 91
Locations of Sangamon River Drainage and Levee Districts – Mason County



What is the probability of future levee breach events occurring?

There are several factors that must be considered when calculating the probability of future levee breaches including whether a breach has occurred previously, the age and current conditions of the levee, whether proper maintenance is ongoing and the magnitude of the event. Since none of the levees in Mason County have experienced a breach it is difficult to specifically establish the probability of future levee breaches; however, it is estimated to be relatively low.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to levee breaches?

Yes. Portions of unincorporated Mason County adjacent to the Sangamon River are vulnerable to the dangers presented by levee breaches. However, none of the rest of the County or participating municipalities are considered vulnerable.

What impacts resulted from the recorded levee breaches?

Levee Failure Fast Facts – Risk

Levee Breach Risk/Vulnerability to:

- Public Health & Safety: – ***Low***
- Buildings/Infrastructure/Critical Facilities: – ***Low***

Since there have been no *recorded* levee breaches in Mason County, there are no recorded impacts to report. In terms of the risk or vulnerability to public health and safety from a levee breach, there are a couple of factors that must be taken into consideration including the magnitude or severity of the precipitating event (whether an earthquake or flooding), the extent and type of development and infrastructure protected by the levee and the amount of time available to enact emergency measures such as evaluations. When all of the factors are taken into consideration, the risk to public health and safety posed by a levee breach in Mason County is considered low.

What other impacts can result from levee breaches?

Aside from causing damage to buildings, infrastructure and critical facilities, floodwaters released due to a levee breach also pose biological and chemical risks to public health. Flooding can force untreated sewage to mix with floodwaters. The polluted floodwaters then transport the biological contaminants into buildings and basements and onto roads and public areas. If left untreated, the floodwaters can serve as breeding grounds for bacteria and other disease-causing agents. Even if floodwaters are not contaminated with biological material, basements and buildings that are not properly cleaned can grow mold and mildew which can pose a health hazard, especially for small children, the elderly and those with specific allergies. Flooding also has the potential to contaminate drinking water sources used for both human and livestock consumption.

Flooding resulting from a levee breach can also cause chemical contaminants such as gasoline and oil to enter the floodwaters if underground storage tanks or pipelines crack and begin leaking during an event. Depending on the time of year, floodwaters also may carry away agricultural chemicals that have been applied to farm fields.

Are existing buildings, infrastructure and critical facilities vulnerable to levee breaches?

Yes. Buildings, infrastructure and critical facilities located within the drainage and levee districts are vulnerable to levee breaches. However, most of the rare within the districts is farmland with only a few residences and farmsteads.

Depending on the magnitude of the breach, all of the vulnerable buildings, infrastructure and critical facilities may be inundated by water and structural and content damage may result. In addition to impacting structures, a levee breach can damage roads and utilities. Roadways,

culverts and bridges can be weakened by levee breach floodwaters and may collapse under the weight of a vehicle. Power and communication lines, both above and below ground, are also vulnerable to levee breach flooding. Depending on their location and the velocity of the water as it escapes the levee, power poles may be snapped causing disruptions to power and communication. Water may also get into any buried lines causing damage and disruptions.

As with public health and safety, the risk or vulnerability to buildings, infrastructure and critical facilities is dependent on a couple factors including the magnitude or severity of the precipitating event (whether an earthquake or flooding), the extent and type of development and infrastructure protected by the levee and the amount of time available to implement emergency measures such as sandbagging. In general, the risk to existing buildings, infrastructure and critical facilities from a levee breach in Mason County is considered low.

Are future buildings, infrastructure and critical facilities vulnerable to levee breaches?

Yes. Any future buildings, infrastructure and critical facilities located within the drainage and levee districts are vulnerable to damage from a levee breach. As a result, future buildings, infrastructure and critical facilities face the same vulnerabilities as those of existing buildings, infrastructure and critical facilities described previously.

What are the potential dollar losses to vulnerable structures from levee breaches?

Unlike other hazards, there are no standard loss estimation models or methodologies for levee breaches. Given that there have been no recorded levee breaches in Mason County, sufficient information is not available to prepare a reasonable estimate of future potential dollar losses to vulnerable structures from levee breaches within the County.

4.0 MITIGATION STRATEGY

4.0 MITIGATION STRATEGY

The mitigation strategy identifies how participating jurisdictions are going to reduce or eliminate the potential loss of life and property damage that results from the natural hazards identified in the Risk Assessment section of this Plan. The strategy includes:

- Developing mitigation goals. Mitigation goals describe the objective(s) or desired outcome(s) that the participants would like to accomplish in term of hazard and loss prevention. These goals are intended to reduce or eliminate long-term vulnerabilities to natural hazards.
- Identifying a comprehensive range of jurisdiction-specific mitigation actions including those related to continued compliance with the National Flood Insurance Program. Mitigation actions are projects, plans, activities or programs that achieve at least one of the mitigation goals identified.
- Analyzing and prioritizing mitigation actions.
- Implementing and administering mitigation actions.

A detailed discussion of each aspect of the mitigation strategy is provided below.

4.1 MITIGATION GOALS

The first step in the mitigation strategy was to develop a set of mitigation goals. Based on early communications with Planning Committee members, the consultant developed a preliminary list of eight hazard mitigation goals. This list was distributed at the first meeting Committee Meeting held on November 14, 2013. Members were asked to review the goals before the second meeting and consider whether any changes needed to be made or if additional goals should be included. At the Planning Committee's March 13, 2014 meeting the group discussed the preliminary goals and approved them with no changes or additions. **Figure 92** identifies the approved mitigation goals.

Figure 92
Mitigation Goals

Goal 1	Educate people about the natural hazards they face and the ways they can protect themselves, their homes, and their businesses from those hazards.
Goal 2	Protect the lives, health, and safety of the people and animals in the County from the dangers of natural and hazards.
Goal 3	Protect existing infrastructure and design new infrastructure (roads, bridges, utilities, water supplies, sanitary sewer systems, etc.) to be resilient to the impacts of natural hazards.
Goal 4	Incorporate natural hazard mitigation into community plans and regulations.
Goal 5	Place a priority on protecting public services, including critical facilities, utilities, roads and schools.
Goal 6	Preserve and protect the rivers and floodplains in our County.
Goal 7	Ensure that new developments do not create new exposures to damage from natural hazards.
Goal 8	Protect historic, cultural, and natural resources from the effects of natural hazards.

4.2 IDENTIFICATION OF MITIGATION ACTIONS

Following the development of the mitigation goals, the Planning Committee members were asked to consult with their respective jurisdictions to identify a comprehensive range of mitigation actions that would meet the specific needs and risks associated with their jurisdiction.

Representatives of the following jurisdictions were also asked to identify mitigation actions that would address their continued compliance with the National Flood Insurance Program.

- Bath
- Forest City
- Havana
- Manito
- Mason City
- Mason County

The compiled lists of mitigation actions were reviewed to assure the appropriateness and suitability of each action. Those actions that were not deemed appropriate and/or suitable were either reworded or eliminated.

4.3 ANALYSIS OF MITIGATION ACTIONS

The mitigation actions identified by each jurisdiction were then assigned to one of six broad mitigation activity categories which allowed Planning Committee members to compare and consolidate similar actions. **Figure 93** identifies each category and provides a brief description.

Figure 93
Types of Mitigation Activities

Category	Description
Regulatory Activities (RA)	Regulatory activities are designed to reduce a jurisdiction's vulnerability to specific hazard events. These activities are especially effective in hazard prone areas where development has yet to occur. Examples include: planning and zoning, floodplain regulations and local ordinances (i.e., building codes, etc.).
Structural Projects (SP)	Structural projects lessen the impact that a hazard has on a particular structure through design and engineering. Examples include: storm sewers, road and bridge projects, storm/tornado shelters, flood walls and seismic retrofits.
Public Information & Awareness (PI)	Public information and awareness activities are used to educate individuals about the potential hazards that affect their community and the mitigation strategies that they can take part in to protect themselves and their property. Examples include: outreach programs, school programs, brochures and handout materials, evacuation planning and drills, volunteer activities (i.e., culvert cleanout days, initiatives to check on the elderly/disabled during hazard events, etc.).
Studies (S)	Studies are used to identify activities that can be undertaken to reduce the impacts associated with certain hazards. Examples include: hydraulic and drainage studies.
Miscellaneous Projects (MP)	Miscellaneous projects is a catchall for those activities or projects that help to reduce or lessen the impact that a hazard may have on a critical facility or community service. Examples include: snow fences, generators, warning sirens, etc.
Property Protection (PP)	Property protection activities are designed to retrofit existing structures to withstand natural hazards or to remove structures from hazard prone areas. In Illinois, this category of activities primarily pertains to flood protection. Examples include: acquisition, relocation, elevation, insurance and retrofitting (i.e., impact resistant windows, etc.).

Each mitigation action was then analyzed to determine:

- the hazard or hazards being mitigated;
- the degree to which the impacts associated with a particular hazard(s) would be mitigated (i.e., reduced or eliminated);
- the general size of the population affected (i.e., small, medium or large);
- the goal or goals fulfilled;
- whether the action would reduce the effects on new or existing buildings and infrastructure; and
- whether the action would ensure continued compliance with the National Flood Insurance Program.

4.4 PRIORITIZATION OF MITIGATION ACTIONS

Next the Planning Committee members worked together with the consultant to develop a method to prioritize each action. **Figure 94** identifies and describes the four-tiered prioritization methodology adopted by the Planning Committee. The methodology developed provides a means of objectively determining which actions have a greater likelihood of eliminating or reducing the long-term vulnerabilities associated with the most frequently-occurring natural hazards.

While prioritizing the projects is useful and does provide the participants with additional information, it is important to keep in mind that the implementation of all the mitigation actions identified is desirable regardless of which prioritization category an action falls under.

Figure 94
Mitigation Action Prioritization Methodology

		Hazard	
		Most Significant Hazard **(M)** (i.e., severe storms, severe winter storms, floods, tornadoes)	Less Significant Hazard **(L)** (i.e., extreme heat, drought, earthquakes, dam failures)
Mitigation Action	Mitigation Action with the Potential to Virtually Eliminate or Significantly Reduce Impacts **(H)**	**HM** mitigation action will virtually eliminate damages and/or significantly reduce the probability of fatalities and injuries from the most significant hazards	**HL** mitigation action will virtually eliminate damages and/or significantly reduce the probability of fatalities and injuries from less significant hazards
	Mitigation Action with the Potential to Reduce Impacts **(L)**	**LM** mitigation action has the potential to reduce damages, fatalities and/or injuries from the most significant hazards	**LL** mitigation action has the potential to reduce damages, fatalities and/or injuries from less significant hazards

4.5 IMPLEMENTATION & ADMINISTRATION OF MITIGATION ACTIONS

Finally, each participating jurisdiction was asked to identify how the mitigation actions will be implemented and administered. This included:

- Identifying the party or parties responsible for oversight and administration.
- Determining what funding source(s) are available or will be pursued.
- Describing the time frame for completion.

In addition, a preliminary qualitative cost/benefit analysis was conducted on each mitigation action. The costs and benefits were analyzed in terms of the general overall cost to complete an action as well as the action's likelihood of permanently eliminating or reducing the risk associated with a specific hazard. The general descriptors of high, medium and low were used. These terms are not meant to translate into a specific dollar amount, but rather to provide a relative comparison between the actions identified by each jurisdiction.

The analysis is only meant to give the participants a starting point to compare which actions are likely to provide the greatest benefit based on the financial cost and staffing effort needed. It is understood that when a grant application is submitted for a specific action, a detailed cost/benefit analysis will most likely be required to receive funding.

4.6 MITIGATION STRATEGY RESULTS

Figures 95 through **106** summarize the results of the mitigation strategy. The mitigation actions are arranged by participating jurisdiction.

Figure 95
(Sheet 1 of 4)
Mason County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
County Board												
HM	Acquire flood-prone properties in Lynchburg Township (located in the extreme southwest corner of the County) and remove any existing structures.	F, SS, SWS	PP	Eliminates	Small	2, 6	n/a	Yes	County Board	TBD	75% Federal 25% Local	Medium/High
HM	Elevate flood-prone residential structures out of the base (100 year) floodplain.	F, SS, SWS	PP	Eliminates	Small	2, 6	n/a	Yes	County Board	TBD	75% Federal 25% Local	Medium/High
LM	Conduct a study to determine the appropriate remedy(s) to alleviate recurring flooding issues associated with aquifer flooding within the County.	F, SS	S	Reduces	Medium	2, 3, 5	Yes	Yes	County Board	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate recurring flooding issues associated with aquifer flooding within the County.	F, SS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	County Board	TBD	TBD	High/Medium
LL	Form a rural water district to supply clean and safe drinking water to rural and unincorporated areas, aid in fire suppression as necessary during natural hazard events and provide an alternative water source to ensure resistance to drought.	DR	SP	Reduces	Medium	2, 3, 5	Yes	Yes	County Board	10 years	75% Federal 25% Local	High/Medium

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 95
(Sheet 2 of 4)
Mason County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
ESDA												
HM	Purchase and install lightning detection/notification system at Sheriff's Office to warn individuals of lightning threats during thunderstorms.	SS	MP	Reduces	Small	2	n/a	n/a	ESDA	5 years	TBD	Low/Medium
HM	Purchase and install grounding systems at vital County facilities to protect critical systems and improve each facility's ability to survive a lightning strike.	SS	MP	Reduces	Small	2, 3, 5	n/a	Yes	ESDA	5 years	TBD	Medium/High
HM	Purchase and install a series of weather stations around the County that would be linked to the data system of NWS Weather Forecast Office in Lincoln to improve the alert information (watches, warnings, etc.) provided to all Mason County residents.	EH, F, SS, SWS, T	MP	Reduces	Large	2	n/a	n/a	ESDA	2 years	TBD	Low/High
HM	Design and construct community safe rooms (tornado/storm shelters) that are equipped with emergency backup generators and heating/air conditioning units that can also serve as emergency shelters/heating & cooling centers for residents at mobile home parks, camp grounds, etc. in unincorporated areas of the County.	EH, EQ, F, SS, SWS, T	SP	Reduces	Small	2	n/a	n/a	ESDA	5 years	75% Federal 25% Local	High/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 95
(Sheet 3 of 4)
Mason County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
ESDA Continued…												
HM	Purchase and distribute NOAA weather radios to all residences and businesses within the County.	EH, EQ, F, SS, SWS, T	MP	Reduces	Large	2	n/a	n/a	ESDA	2-5 year	TBD	Medium/Medium
LM	Make the most recent Flood Insurance Rate Maps available at the County Clerk's Office to assist the public in considering where to construct new buildings.*	F	RA	Reduces	Medium	1, 2, 6, 7	Yes	Yes	ESDA	TBD	County	Low/High
LM	Make County officials aware of the most recent Flood Insurance Rate Maps and issues related to construction in a floodplain.*	F	PI	Reduces	Small	1, 2, 3 5, 6, 7	Yes	Yes	ESDA	TBD	County	Low/Medium
LM	Provide information materials to the public about the National Flood Insurance Program's voluntary Community Rating System.*	F	PP	Reduces	Medium	1, 2, 3, 5, 6, 7	Yes	Yes	ESDA	TBD	County	Low/Low
ESDA / County 911 Board / County Board												
HM	Purchase and install automatic emergency backup generators at 911 centers to provide uninterrupted power to critical systems during power outages	DF, EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	n/a	Yes	ESDA / County 911 Board / County Board	2-5 years	TBD	Medium/High
HM	Purchase and install automatic emergency backup generators at vital County buildings to provide uninterrupted power and maintain operations during power outages.	DF, EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	n/a	Yes	ESDA / County Board	2-5 years	TBD	Medium/High

* Mitigation action to ensure continued compliance with NFIP.

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 95
(Sheet 4 of 4)
Mason County Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
Highway Department												
HM	Raise portions of several county roads at various locations to alleviate recurring flooding/drainage issues.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	n/a	Yes	County Board / Highway Department	2 years	TBD	High/Medium
HM	Replace the CH #20 (N. Manito Rd.) bridge over Quiver Creek to address scour damage caused by repeated flooding and increase flow capacity to help alleviate recurring roadway flooding.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	n/a	Yes	County Board / Highway Department	2 years	TBD	High/Medium
HM	Raise CH #20 (N. Manito Rd.) on both sides of the Quiver Creek Bridge to alleviate periodic roadway overtopping caused by flooding of Quiver Creek.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	n/a	Yes	County Board / Highway Department	2 years	TBD	High/Medium

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 96
(Sheet 1 of 3)
Bath Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and install storm/emergency warning siren system. Currently there are no warning sirens located within the Village.	SS, T	MP	Reduces	Large	2	n/a	n/a	Village Board	1 year	TBD	Medium/High
HM	Install shatter-resistant/shatter-proof glass at the Village Hall (which also acts as a storm shelter) to make the building resistant to natural hazards.	EQ, SS, T	SP	Reduces	Medium	2, 3, 5	n/a	Yes	Village Board	1 year	75% Federal 25% Local	Medium/Medium
HM	*Storm Sewer Improvement*. Install storm sewer lines at various locations within the Village to better manage stormwater runoff in an effort to alleviate drainage/flooding issues. The current system only covers approx. 30% of the Village, leaving major areas to flood. A five stage plan has been developed with the Village Engineer to implement storm sewer extension to cover the remaining flood-prone areas.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	5 years	75% Federal 25% Local	High/High
HM	Install curb and gutter at various locations within the Village to help direct the flow of water runoff to drainage areas to alleviate drainage/flooding issues.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	2 years	TBD	Medium/Medium
HM	Acquire properties in flood-prone areas and remove any existing structures.	F, SS, SWS	PP	Eliminates	Small	2, 6	n/a	Yes	Village Board	2 years	75% Federal 25% Local	Medium/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 96
(Sheet 2 of 3)
Bath Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Construct a public water supply system to ensure resistance to drought, alleviate public health concerns stemming from floodwater contamination of private wells and aid in fire suppression as necessary during natural hazard events.	DR, F	SP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	1 year	TBD	High/High
HM	Purchase and install an automatic emergency backup generator at the wastewater treatment facility to provide uninterrupted power to maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	Yes	Yes	Village Board	1 year	TBD	Medium/High
HM	Purchase and install automatic emergency backup generators at the Village's two (2) lift stations to provide uninterrupted power to maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	Yes	Yes	Village Board	1 year	TBD	Medium/High
LM	Make the most recent Flood Insurance Rate Maps available at Village Hall to assist the public in considering where to construct new buildings.*	F	PI	Reduces	Large	1, 2, 6, 7	Yes	n/a	Village Board	TBD	Village	Low/High

* Mitigation action to ensure continued compliance with NFIP.

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 96
(Sheet 3 of 3)
Bath Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
LM	Make Village officials aware of the most recent Flood Insurance Rate Maps and issues related to construction in a floodplain.*	F	PI	Reduces	Small	1, 2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/Medium
LM	Make informational materials available to the public about the National Flood Insurance Program's voluntary Community Rating System.*	F	PI	Reduces	Large	1, 2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/Low

* Mitigation action to ensure continued compliance with NFIP.

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 97
Easton Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and install a new electronic storm warning siren system.	SS, T	MP	Reduces	Large	2	n/a	n/a	Village Board / Village President	TBD	TBD	Medium/High
HM	Upgrade/retrofit the Village's storm sewer system to better manage stormwater runoff in an effort to alleviate drainage issues.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Water Department	TBD	75% Federal 25% Local	High/Medium
HM	Purchase and install automatic emergency backup generators at the drinking water and wastewater treatment facilities to provide uninterrupted power to maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	n/a	Yes	Water Department	TBD	TBD	Medium/High
HM	Retrofit the Village Garage to serve as a storm safe shelter for staff and Village residents.	SS, T	SP	Reduces	Medium	2, 3	n/a	Yes	Village Board / Village President	TBD	75% Federal 25% Local	High/High
HM	Purchase and install an automatic emergency backup generator at Village Hall to provide uninterrupted power and maintain operation during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	n/a	Yes	Village Board / Village President	TBD	TBD	Medium/High
HM	Identify residents with special needs in order to provide assistance during a natural hazard event.	EH, EQ, F, SS, SWS, T	PI	Reduces	Small	2, 4	n/a	n/a	Village Board / Village President	TBD	Village	Low/High
LM	Purchase NOAA weather radios and distribute to Village residents	EH, F, SS, SWS, T	MP	Reduces	Large	2	n/a	n/a	Village Board / Village President	TBD	TBD	Medium/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 98
(Sheet 1 of 2)
Forest City Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Design and construct a community safe room (tornado shelter) equipped with an emergency backup generator and heating/air conditioning units that can also serve as an emergency shelter/heating and cooling center for Village residents	EH, EQ, F, SS, SWS, T	SP	Reduces	Large	2	Yes	n/a	Village Board	TBD	75% Federal 25% Local	High/High
HM	Remove debris and vegetative overgrowth and clean out drainage ditches to maintain/increase capacity and better manage stormwater runoff in an effort to alleviate flooding of the Manito Blacktop and adjacent streets.	F, SS, SWS	MP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	Village	Low/High
HM	Purchase and install an automatic emergency backup generator at the Fire Department/Village Building to provide uninterrupted power to maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	n/a	Yes	Village Board	TBD	TBD	Medium/High
LM	Make the most recent Flood Insurance Rate Maps available at Village Hall to assist the public in considering where to construct new buildings.*	F	PI	Reduces	Large	1, 2, 6, 7	Yes	n/a	Village Board	TBD	Village	Low/High

* Mitigation action to ensure continued compliance with NFIP.

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 98
(Sheet 2 of 2)
Forest City Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
LM	Make Village officials aware of the most recent Flood Insurance Rate Maps and issues related to construction in a floodplain.*	F	PI	Reduces	Small	1, 2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/Medium
LM	Make informational materials available to the public about the National Flood Insurance Program's voluntary Community Rating System.*	F	PI	Reduces	Large	1, 2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/Low

* Mitigation action to ensure continued compliance with NFIP.

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 99
(Sheet 1 of 3)
Havana Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and install additional storm warning siren(s) with public address system features.	SS, T	MP	Reduces	Medium	2	n/a	n/a	City Council	1-3 years	TBD	Low/High
HM	Design and construct a community safe room (equipped with an emergency backup generator) as a retrofit of the existing fire station and/or as an addition to a new fire station that would function as a heating/cooling center and a shelter for staff and City residents.	DF, EH, EQ, F, SS, SWS, T	SP	Reduces	Medium	2	n/a	Yes	City Council / Fire Department	TBD	75% Federal 25% Local	Medium/High
LM	Construct a new water tower at the Business Park to provide additional capacity to improve resilience to drought, serve as an auxiliary supply during natural hazard events and function as a backup in the event the existing tower becomes inoperable. Currently the City is served by only one water tower.	DF, DR, EQ, F, SS, SWS, T	SP	Reduces	Medium	2, 3, 5	Yes	n/a	City Council	TBD	TBD	High/High
HM	Purchase a reverse 911 telephone warning system to notify residents/responders of a natural hazard event.	DF, EH, EQ, F, SS, SWS, T	MP	Reduces	Large	2	n/a	n/a	City Council / 911 Board / Fire Department / Police Department	1-4 years	TBD	Medium/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 99
(Sheet 2 of 3)
Havana Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Separate the combined sewer system within the City to accommodate stormwater flow, maximize the carrying capacity of the sewer system and reduce the potential for waterborne disease outbreaks from a combined sewer overflow discharge event.	F, SS, SWS	SP	Eliminates	Medium	2, 3, 5	Yes	Yes	City Council / Public Works	TBD	75% Federal 25% Local	High/High
LM	Insulate sanitary and storm sewer mains within the City to minimize service disruptions and prevent costly repairs.	SWS	SP	Reduces	Large	2, 3, 5	Yes	Yes	City Council / Public Works	TBD	TBD	Medium/Medium
LM	Insulate drinking water mains within the City to minimize service disruptions and prevent costly repairs.	SWS	SP	Reduces	Large	2, 3, 5	Yes	Yes	City Council / Public Works	TBD	TBD	Medium/Medium
HM	Install stream gauges/warning sensors along Illinois River to alert the City to rising water levels and the potential for flooding.	F, SS	MP	Reduces	Medium	2	n/a	n/a	City Council / Public Works	TBD	75% Federal 25% Local	Medium/High
HM	Design and construct a storm safe shelter (elevated out of the floodplain, built to high wind standards and equipped with emergency backup generator) at the Riverfront Park Campground for use by campers.	F, SS, SWS, T	SP	Reduces	Small	2	n/a	n/a	City Council / Park District	TBD	75% Federal 25% Local	Medium/High
LM	Identify and install "hardening" materials (i.e., shatter-proof glass, hail resistant shingles/doors, etc.) at the Historic Lawford Theater to the building resistant to natural hazards.	SS, T	SP	Reduces	Small	2, 8	n/a	Yes	City Council	TBD	TBD	Medium/Medium

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 99
(Sheet 3 of 3)
Havana Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and install emergency backup generators at the City's public works buildings to provide uninterrupted power and maintain operation during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	n/a	Yes	City Council / Public Works	TBD	TBD	Low/High
LM	Make the most recent Flood Insurance Rate Maps available at City Clerk's Office to assist the public in considering where to construct new buildings.*	F	PI	Reduces	Large	1, 2, 6, 7	Yes	n/a	Building & Zoning Office	TBD	City	Low/High
LM	Make City officials aware of the most recent Flood Insurance Rate Maps and issues related to construction in a floodplain.*	F	PI	Reduces	Small	1, 2, 3, 5, 6, 7	Yes	Yes	Building & Zoning Office	TBD	City	Low/Medium
LM	Make informational materials available to the public about the National Flood Insurance Program's voluntary Community Rating System.*	F	PI	Reduces	Large	1, 2, 3, 5, 6, 7	Yes	Yes	Building & Zoning Office	TBD	City	Low/Low

* Mitigation action to ensure continued compliance with NFIP.

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 100
Havana Rural Fire Protection District Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Retrofit the Fire Station Building to include a community safe room (equipped with an emergency backup generator, heating/air conditioning units and upgraded bathrooms) to serve as a storm/emergency shelter and heating/cooling center for staff and district residents.	EH, EQ, F, SS, SWS, T	SP	Reduces	Small	2	n/a	Yes	Fire Protection District	TBD	75% Federal 25% Local	High/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 101
Kilbourne Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and install an automatic emergency backup generator at the Community Building (houses Village Hall & Police Department) to provide uninterrupted power and maintain operation during power outages.	EH, EQ, F, SS, SWS, T	MP	Reduces	Small	2, 3, 5	n/a	Yes	Village Board	TBD	TBD	Medium/High
HM	Retrofit the Community Building (houses Village Hall & Police Department) to include a community safe room for use by Village staff and residents	F, SS, SWS, T	SP	Reduces	Medium	2	n/a	Yes	Village Board	TBD	75% Federal 25% Local	High/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 102
(Sheet 1 of 3)
Manito Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and install an automatic emergency backup generator at the wastewater treatment plant to maintain operations during power outages.	EQ, EH, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	n/a	Yes	Village Board	TBD	TBD	Medium/High
HM	Replace/update existing stormwater relief drains.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	Medium/Medium
HM	Install additional stormwater relief drains	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	Medium/Medium
HM	Purchase and install additional storm warning siren(s).	SS, T	MP	Reduces	Medium	2	n/a	n/a	Village Board	TBD	TBD	Medium/High
HM	Design and construct a community safe room (tornado shelter) equipped with an emergency backup generator and heating/air conditioning units that can also serve as an emergency shelter/heating and cooling center for Village residents	EH, EQ, F, SS, SWS, T	SP	Reduces	Large	2	Yes	n/a	Village Board	TBD	75% Federal 25% Local	High/High
LM	Develop public information materials for all natural hazards that inform residents about the risks to life and property associated with each hazard and the proactive measures that they can take to reduce or eliminate their risk.	DR, EH, EQ, F, SS, SWS, T	PI	Reduces	Large	1, 2	n/a	n/a	Village Board	TBD	TBD	Low/High
LM	Purchase NOAA weather radios and distribute to Village residents	EH, F, SS, SWS, T	MP	Reduces	Large	2	n/a	n/a	Village Board	TBD	TBD	Medium/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 102
(Sheet 2 of 3)
Manito Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
LM	Purchase and install an automatic emergency backup generator at Village Hall to provide uninterrupted power and maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	n/a	Yes	Village Board	TBD	TBD	Low/High
HM	Purchase and install automatic emergency backup generator at the Midwest Central Primary School (a designated storm/emergency shelter and heating/cooling center) to provide uninterrupted power to critical systems during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	n/a	Yes	Village Board	TBD	TBD	Medium/High
HM	Install new/upsized water lines and fire hydrants at various locations within the Village to aid in fire suppression in the event of a natural hazard.	DR, EH, EQ, SS, SWS, T	SP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	High/Medium
HM	Identify residents with special needs in order to provide assistance during a natural hazard event.	EH, EQ, F, SS, SWS, T	PI	Reduces	Small	2, 4	n/a	n/a	Village Board	TBD	Village	Low/High
LM	Make the most recent Flood Insurance Rate Maps available at Village Hall to assist the public in considering where to construct new buildings.*	F	PI	Reduces	Large	1, 2, 6, 7	Yes	n/a	Village Board	TBD	Village	Low/High

* Mitigation action to ensure continued compliance with NFIP.

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 102
(Sheet 3 of 3)
Manito Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
LM	Make Village officials aware of the most recent Flood Insurance Rate Maps and issues related to construction in a floodplain.*	F	PI	Reduces	Small	1, 2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/Medium
LM	Make informational materials available to the public about the National Flood Insurance Program's voluntary Community Rating System.*	F	PI	Reduces	Large	1, 2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/Low

* Mitigation action to ensure continued compliance with NFIP.

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 103
(Sheet 1 of 6)
Mason City Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and install storm warning siren(s).	SS, T	MP	Reduces	Medium	2	n/a	n/a	City Council	1 year	TBD	Low/High
LM	Conduct drainage/hydraulic study to determine the cause(s) and identify the appropriate remedy(s) to alleviate recurring flooding/drainage problems in the Hillcrest Subdivision and along Price Ave. (County Road 3600). Remedies to consider include but are not limited to increasing size/adding drainage tile lines, elevating Price Ave., enlarging the drainage ditch and increasing culvert sizes.	F, SS, SWS	S	Reduces	Small	2, 3, 5	n/a	Yes	City Council	1 year	75% Federal 25% Local	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate recurring flooding/drainage problems in the Hillcrest Subdivision and along Price Ave. (County Road 3600).	F, SS, SWS	SP	Reduces	Small	2, 3, 5	n/a	Yes	City Council	1 year	75% Federal 25% Local	High/High
LM	Develop a Memorandum of Agreement, if necessary, with Drainage District to construct the appropriate remedy(s) to alleviate recurring flooding/drainage problems in the Hillcrest Subdivision and along Price Ave. (County Road 3600).	F, SS, SWS	RA	Reduces	Small	2	n/a	n/a	City Council	1 year	City	Low/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 103
(Sheet 2 of 6)
Mason City Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Construct a 6 inch water main loop at the Mason City Area Nursing Home and adjacent Hillcrest Subdivision to aid in fire suppression in the event of a natural hazard. There are no fire hydrants located in this area.	DR, EH, EQ, SS, SWS, T	SP	Reduces	Small	2, 3, 5	n/a	Yes	City Council	3 years	TBD	High/High
HM	Upsize sewer mains from the 200 block of W. Pine St. to Arch St. to the wastewater treatment facility to increase capacity in an effort to alleviate flooding/drainage problems on Chestnut St. and Pine St.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	City Council	3 years	TBD	High/Medium
HM	Purchase and install an automatic emergency backup generator at the Police Station to provide uninterrupted power and maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	n/a	Yes	City Council	1 year	TBD	Low/High
LM	Purchase and install an automatic emergency backup generator at Village Hall to provide uninterrupted power and maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	n/a	Yes	City Council	1 year	TBD	Low/High
HM	Purchase and install an automatic emergency backup generator at Fire Station to provide uninterrupted power and maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	n/a	Yes	City Council	1 year	TBD	Low/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 103
(Sheet 3 of 6)
Mason City Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
LM	Purchase a mobile trailer-mounted 4 inch pump with hoses for use in removing excess water from critical infrastructure during flood events.	F, SS, SWS	MP	Reduces	Medium	2, 3, 5	n/a	Yes	City Council	2 years	TBD	Low/Medium
LM	Conduct drainage/hydraulic study to determine the cause(s) and identify the appropriate remedy(s) to alleviate recurring flooding problems at the intersection of Chestnut St. and N. West Ave. next to Illini Central High School/Grade School.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	n/a	Yes	City Council	2 years	75% Federal 25% Local	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate recurring flooding problems at the intersection of Chestnut St. and N. West Ave. next to Illini Central High School/Grade School.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	n/a	Yes	City Council	2 years	75% Federal 25% Local	High/High
LM	Conduct drainage/hydraulic study to determine the cause(s) and identify the appropriate remedy(s) to alleviate recurring drainage/flooding problems along W. Roosevelt St. and N. Keefer St.	F, SS, SWS	S	Reduces	Small	2, 3, 5	n/a	Yes	City Council	2 years	75% Federal 25% Local	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate recurring drainage/flooding problems along W. Roosevelt St. and N. Keefer St.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	n/a	Yes	City Council	2 years	75% Federal 25% Local	High/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 103
(Sheet 4 of 6)
Mason City Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
LM	Designate the Civic Center as a heating/cooling center and emergency shelter.	EH, EQ, F, SS, SWS, T	MP	Reduces	Large	2	n/a	n/a	City Council	1 year	City	Low/High
HM	Purchase and install an automatic emergency backup generator at the Civic Center (a designated heating/cooling center and emergency shelter) to provide uninterrupted power to critical systems during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	n/a	Yes	City Council	1 year	TBD	Low/High
HM	Separate the combined sewer system within the City to accommodate stormwater flow, maximize the carrying capacity of the sewer system and reduce the potential for waterborne disease outbreaks from a combined sewer overflow discharge event.	F, SS, SWS	SP	Eliminates	Medium	2, 3, 5	Yes	Yes	City Council	5 years	75% Federal 25% Local	High/High
LM	Purchase a stand-alone server with software to backup the City's computer files.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Large	3, 5, 8	n/a	n/a	City Council	1 year	TBD	Low/Medium
LM	Develop a Memorandum of Agreement with Illini Central Middle School/High School designating the school as a storm/emergency shelter and heating/cooling center for City residents.	EH, EQ, F, SS, SWS, T	RA	Reduces	Medium	2	n/a	n/a	City Council	1 year	City	Low/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 103
(Sheet 5 of 6)
Mason City Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
LM	Develop a Memorandum of Agreement with Illini Central Grade School designating the school as a storm/emergency shelter and heating/cooling center for City residents.	EH, EQ, F, SS, SWS, T	RA	Reduces	Medium	2	n/a	n/a	City Council	1 year	City	Low/High
HM	Purchase and install an automatic emergency backup generators at Illini Central Middle School/High School (a designated heating/cooling center and emergency shelter) to provide uninterrupted power to critical systems during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	n/a	Yes	City Council	1 year	TBD	Medium/High
HM	Purchase and install an automatic emergency backup generators at Illini Central Grade School (a designated heating/cooling center and emergency shelter) to provide uninterrupted power to critical systems during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	n/a	Yes	City Council	1 year	TBD	Medium/High
LM	Conduct mock natural disaster drills to provide City officials, staff and volunteers with hands on experience in dealing with different disaster scenarios.	EQ, F, SS, SWS, T	PI	Reduces	Large	1, 2	n/a	n/a	City Council	1 year	City	Low/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 103
(Sheet 6 of 6)
Mason City Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
LM	Make the most recent Flood Insurance Rate Maps available at City Clerk's Office to assist the public in considering where to construct new buildings.*	F	PI	Reduces	Large	1, 2, 6, 7	Yes	n/a	City Council	TBD	City	Low/High
LM	Make City officials aware of the most recent Flood Insurance Rate Maps and issues related to construction in a floodplain.*	F	PI	Reduces	Small	1, 2, 3, 5, 6, 7	Yes	Yes	City Council	TBD	City	Low/Medium
LM	Make informational materials available to the public about the National Flood Insurance Program's voluntary Community Rating System.*	F	PI	Reduces	Large	1, 2, 3, 5, 6, 7	Yes	Yes	City Council	TBD	City	Low/Low

* Mitigation action to ensure continued compliance with NFIP.

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 104
Mason District Hospital Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and install an automatic emergency backup generator at the Mason City ambulance base to provide uninterrupted power to critical systems during power outages. Currently the building has no emergency power to open the bay doors when the power goes out.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	n/a	Yes	Hospital	TBD	TBD	Low/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 105
San Jose Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Design and construct a community safe room (tornado shelter) equipped with an emergency backup generator and heating/air conditioning units that can also serve as an emergency shelter/heating and cooling center for Village residents	EH, EQ, F, SS, SWS, T	SP	Reduces	Large	2	Yes	n/a	Village Board	5 years	75% Federal 25% Local	High/High
HM	Purchase and install automatic emergency backup generator(s) at Police Office Buildings to provide uninterrupted power and maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	n/a	Yes	Village Board	2 years	TBD	Medium/High
LM	Conduct a study of the storm sewer system to identify sections that require replacement/repair and modernizing to improve the capacity of the system and alleviate drainage issues.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Ys	Village Board	5 years	TBD	Medium/Medium
HM	Upgrade/retrofit the Village's storm sewer system to better manage stormwater runoff, increase capacity and alleviate drainage issues.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	High/Medium
HM	Purchase and install an automatic emergency backup generator for the wastewater treatment plant's main lagoon lift station to provide uninterrupted power to maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	n/a	Yes	Village Board	2 years	TBD	Medium/High
LM	Construct a new water tower to increase the amount of water available in reserve and to aid in fire suppression as necessary during natural hazard events.	DR, EQ, F, SS, SWS, T	SP	Reduces	Large	2, 3, 5	Yes	n/a	Village Board	10 years	TBD	High/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 106
Topeka Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and install additional storm warning siren(s).	SS, T	MP	Reduces	Medium	2	n/a	n/a	Village Board	TBD	TBD	Medium/High
LM	Complete the National Flood Insurance Program (NFIP) participation application and present for adoption: 1) a resolution of intent to join the NFIP, 2) a floodplain ordinance and 3) the current Flood Insurance Rate Maps to bring the Village into compliance with the NFIP.*	F	RA	Reduces	Small	2, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/High
LM	Make the most recent Flood Insurance Rate Maps available at City Clerk's Office to assist the public in considering where to construct new buildings.*	F	PI	Reduces	Large	1, 2, 6, 7	Yes	n/a	Village Board	TBD	Village	Low/High
LM	Make City officials aware of the most recent Flood Insurance Rate Maps and issues related to construction in a floodplain.*	F	PI	Reduces	Small	1, 2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/Medium
LM	Make informational materials available to the public about the National Flood Insurance Program's voluntary Community Rating System.*	F	PI	Reduces	Large	1, 2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/Low

* Mitigation action to ensure continued compliance with NFIP.

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

5.0 RECOMMENDATIONS

5.0 RECOMMENDATIONS

The following recommendations came about as a result of the planning process. These recommendations should be reviewed and discussed by the professional staff and elected officials of each participating jurisdiction to determine if actions should be taken.

GENERAL

Mitigate Repetitive Loss Structures and Critical Facilities. Mitigation is strongly encouraged for all structures in the mapped floodplain, with a higher priority given to repetitive loss structures and critical facilities, as funding or other resources become available.

Drinking Water. In Mason County a majority of the municipal drinking water wells are relatively shallow and tap unconfined sand and gravel aquifers. Unconfined means that there are no formations between the earth's surface and the aquifers to help protect contaminants from entering the aquifer. As a result, all of the public drinking water wells in the County considered geologically sensitive (with the exception of Mason City whose wells are drilled into a confined aquifer). Mason County has been designated as part of a priority groundwater protection planning region along with Peoria, Tazewell and Woodford Counties.

Natural hazards have the ability to disrupt public water service and cause drinking water to become contaminated. In Illinois, flooding is a common natural hazard that can cause chemicals and other contaminants to enter drinking water. An inexpensive way to help protect drinking water involves the adoption of maximum setback zones around community water wells. When a setback zone is established, potential sources of compounds that can contaminate drinking water are prevented from being located close to these wells. Consequently, the probability of a flood or tornado causing the release of contamination near a well is substantially reduced. The Illinois Environmental Protection Agency allows county and municipal officials to designate maximum setback zones up to 1,000 feet.

Within the County Havana has adopted maximum setback zones to protect two of its three community drinking water wells. These maximum setback zones reduce the likelihood that man-made contaminants will impact these water supplies. Since the recharge areas for many community drinking water wells in Mason County extend to a radius of several hundred feet around the wells, enacting maximum setback zones is the most effective step that municipalities can take to minimize risk to groundwater. Subsequently, other municipalities should consider adopting setback zones for their community wells too.

Efforts to provide safe drinking water should extend beyond the adoption of setback zones. To provide a sufficient quantity of water during a drought as well as to protect the quality of drinking water, consideration should be given to forming a water district to serve rural residents who live in small municipalities and unincorporated areas.

Emergency Management Plans for Schools. Public Act 094-0600, also known as the School Safety Drill Act, was signed into law August 16, 2005. Its purpose is to improve safety at public and private schools by requiring schools to review their safety plans with first responders and to conduct specific school safety drills. These plans should describe how to mitigate risks from natural hazards, structural failures, shooters and hostage situations, fires and bombs. A no-match federal grant has been used to develop these plans and conduct tabletop and full-scale exercises involving health, law enforcement, fire, and emergency management personnel. While the grant is not currently available, it is expected to resume in the future and in the interim information to assist schools with these tasks is available from the Mason County ESDA Office.

Stormwater Management to Reduce Flooding Problems. Stormwater management practices should be required for new subdivision development and other larger development projects, including commercial and industrial, to reduce flooding problems associated with excess runoff. Management practices could include the construction and use of retention and detention basins. Additional measures may be needed in and around the Havana and Bath areas to mitigate severe damages created by the high water table.

Developing and Disseminating Hazard Information. Public information materials should be prepared that will help residents take protective actions prior to natural hazard events. These materials should be based on risk communication principles to improve their effectiveness. In addition to developing printed materials, feedback from Mason County residents indicates that the radio, television, newspapers and direct mailings should be utilized to disseminate information.

Hazardous Substances. A variety of hazardous substances are transported through Mason County on a daily basis using barges on the Illinois River, the two rail lines that traverse the County and the highways including US Route 136, the four state routes. Knowing where hazardous substances are generated, stored and transported can be useful to reduce impacts before an accident occurs as well as to be better prepared to respond. Fire departments, other first responders and planners can use this information to better prepare when responding to HazMat incidents. Identifying the types of chemicals and how they are transported can be done through a Commodity Flow Study which is currently funded by the Illinois Emergency Management Agency.

Drainage and Flooding Problems. Alleviating flooding and drainage problems across the County is a major concern repeatedly expressed throughout the planning process. The severity of flooding in Mason County is highlighted by the fact that only 11 Illinois counties have had more Federally declared flood disasters. Adding to the complexity of the flooding problem in Mason County is a characteristic rarely encountered elsewhere—groundwater flooding. This phenomenon is particularly troublesome in the areas of Havana and Bath. Temporary closure of state highways in the 1990s triggered action to maintain vehicle transit during periods of prolonged precipitation, but intergovernmental cooperation is still needed to help protect residential and business concerns.

Tornadoes. Mason County is in the "tornado alley" of Illinois and experiences more tornadoes than over two-thirds the counties in the State. There is a need throughout the County to establish tornado safe shelters for residents who do not have basements and for government employees.

JURISDICTION-SPECIFIC

County and municipal officials are encouraged to collaborate in their pursuit of the following actions.

Bath

- Install storm sewer lines at various locations to better manage stormwater runoff in an effort to alleviate drainage/flooding issues.
- Construct public water supply system to ensure a safe supply of water for residential use and fire suppression.

Easton

- Install backup generators at the drinking water and wastewater treatment facilities to maintain operations during power outages.

Forest City

- Implement remedies to reduce flooding and drainage problems near the Manito Blacktop and adjacent streets.
- Install backup generators at the Fire Department/Village Building to maintain operations during power outages.

Havana

- Drainage and flooding issue can be alleviated by separating the combined sewer system.
- To improve resilience to drought while expanding capacity to serve growth areas on the edge of town, an additional water tower should be considered.
- Acquire a warning system to notify residents of impending severe weather especially given the City's location along the flood-prone Illinois River.

Havana Rural Fire Protection District

- Retrofit the Fire Station Building to include a community safe room to serve as a storm shelter for staff and district residents. It should also have the ability to be utilized as a heating/cooling center.

Kilbourne

- The community's capability to maintain essential services during severe weather could be improved by installing a backup generator at the Community building where Village Hall and the Police Department are located.

Manito

- Stormwater relief drains are in need of repair and replacement.
- Backup generators at the Village Hall and the wastewater treatment facility are needed to maintain services during power outages caused by the frequently occurring severe storms.

Mason City

- A drainage/hydraulic study would be useful to identify the most effective remedies for recurring drainage/flooding issues in the Hillcrest Subdivision and along Price Avenue and in the vicinity of the Illini Central High School/Grade School complex.
- Separating the combined sewer system should immediately reduce drainage issues in flood-prone areas.
- Culverts and drainage ditches are in need of cleaning and repair, especially along IL Rte. 29. Some culverts may be undersized.

Mason District Hospital

- Uninterrupted power at the only hospital within the County is crucial in preventing additional health problems during severe weather. A backup generator is needed at this facility.

San Jose

- The storm sewer system has reached the age where repair and modernization is needed to alleviate drainage issues.

Topeka

- A storm warning system is needed for residents of this rural, sparsely populated Village.

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6.0 PLAN MAINTENANCE

6.0 PLAN MAINTENANCE

This section focuses on the Federal Emergency Management Agency (FEMA) requirements for maintaining and updating the Plan once it has been approved by FEMA and adopted by the participating jurisdictions. These requirements include:

- establishing the method and schedule for monitoring, evaluating and updating the Plan;
- describing how the mitigation strategy will be incorporated into existing planning processes; and
- detailing how continued public input will be obtained.

These requirements ensure that the Plan remains an effective and relevant document. Provided below is detailed discussion of each requirement.

6.1 MONITORING, EVALUATING & UPDATING THE PLAN

The County must establish a method and schedule for monitoring, evaluating and updating the Plan. This method allows the participating jurisdictions to review and adjust the planning process as needed, make necessary changes and updates to the Plan and track the implementation and results of the mitigation actions that have been undertaken.

6.1.1 Monitoring and Evaluating the Plan

The Plan will be monitored and evaluated by a Plan Maintenance Subcommittee on an annual basis. The Plan Maintenance Subcommittee will be composed of key members from the original Planning Committee, including representatives from all of the participating jurisdictions. The Subcommittee will be chaired by the Mason County Emergency Services and Disaster Agency (ESDA). All meetings held by the Subcommittee will be open to the public. The information gathered at each Subcommittee meeting will be documented and provided to all participating jurisdictions for their review and use in the Plan update.

The Mason County ESDA will be responsible for monitoring the status of the mitigation actions identified in the Plan and providing the Illinois Emergency Management Agency (IEMA) with an annual progress report. It will be the responsibility of each participating jurisdiction to provide a progress report on the status of their mitigation actions at each Subcommittee meeting.

Monitoring & Evaluating

- A Plan Maintenance Subcommittee will be formed to monitor and evaluate the Plan.
- The Plan will be monitored and evaluated on an ***annual basis***.
- Each participating jurisdiction will be responsible for providing an annual progress report on the status of their mitigation actions.
- New mitigation actions can be added by participating jurisdictions during the annual evaluation.

The Plan Maintenance Subcommittee will also evaluate the Plan on an annual basis to determine the effectiveness of the planning process and the implemented mitigation actions. In addition, the Subcommittee will decide whether any changes need to be made. As part of the evaluation of the planning process, the Subcommittee will review the goals to determine whether they are still relevant or if new goals need to be added; assess whether other natural hazards need to be addressed or included in the Plan and review any

new hazard data that may affect the Risk Assessment portion of the Plan. The Subcommittee will also evaluate whether other County departments should be invited to participate.

In terms of evaluating the effectiveness of the mitigation actions that have been implemented, the Subcommittee will assess whether a project is on time, in line with the budget and moving ahead as planned; whether the project achieved the goals outlined and had the intended result; and whether losses were avoided as a result of the project. In addition, each of the participating jurisdictions will be given an opportunity to add new mitigation actions to the Plan and modify or discontinue mitigation actions already identified. In some cases a project may need to be removed from the list of mitigation actions because of unforeseen problems with implementation.

6.1.2 Updating the Plan

The Plan must be updated within five years of the date the first participating jurisdiction adopts the Plan. (This date can be found in Section 7, Plan Adoption.) This ensures that all the participating jurisdictions will remain eligible to receive federal grant money to implement those mitigation actions identified in this Plan.

It will be the responsibility of the Plan Maintenance Subcommittee to update the Plan. The update will incorporate all of the information gathered and changes proposed at the previous annual monitoring and evaluation meetings. In addition, any government entity that did not take part in the original planning process that now wishes to participate may be added. It will be the responsibility of these entities to provide all of the information needed to be integrated into the Plan.

Updating

- The Plan Maintenance Subcommittee will be responsible for updating the Plan.
- The Plan ***must be updated within 5 years*** of the date the first participating jurisdiction adopts the Plan.
- Any government entities that did not take part in the original planning process but who now wish to participate may do so.
- Once the updated Plan has received FEMA/IEMA approval, each participating jurisdiction ***must re-adopt the Plan*** to remain eligible to receive federal grant money.

A public forum will be held to present the updated Plan to the public for review and comment. The comments received at the public forum will be reviewed and incorporated into the updated Plan. The Subcommittee will then present the updated Plan to the participating jurisdictions for approval.

Once the Subcommittee has received approval from all of the participating jurisdictions, it will submit the updated Plan to the IEMA and FEMA for review. ***Once the updated Plan has received approval, FEMA requires that each of the participating jurisdictions re-adopt the Plan to remain eligible to receive federal grant money to implement identified mitigation actions.***

6.2 INCORPORATING THE MITIGATION STRATEGY INTO EXISTING PLANNING MECHANISMS

As part of the planning process, the Planning Committee identified current plans, policies/ordinances and maps that supplement or help support mitigation planning efforts. **Figure 7** identifies the existing planning mechanism available by jurisdiction. It will be the responsibility of each participating jurisdiction to incorporate, where applicable, the mitigation strategy and other information contained in the Plan into the planning mechanisms identified for their jurisdiction.

6.3 CONTINUED PUBLIC INVOLVEMENT

The County and participating jurisdictions understand the importance of continued public involvement and will seek public input on the Plan throughout the plan maintenance process. A copy of the approved Plan will be maintained and available for review at the Mason County Clerk's Office. Individuals will be encouraged to provide feedback and submit comments for the Plan update to the Mason County ESDA.

The comments received will be compiled and presented at the annual Plan Maintenance Subcommittee meetings where members will consider them for incorporation into the updated Plan. All meetings held by the Plan Maintenance Subcommittee will be noticed and open to the public. A separate public forum will be held prior to updating the Plan to provide the public an opportunity to comment on the updates proposed for the Plan.

7.0 PLAN ADOPTION

7.0 PLAN ADOPTION

The final step in the planning process is the adoption of the approved Plan by each participating jurisdiction. Each jurisdiction must formally adopt the Plan to be eligible for federal grant money to implement mitigation actions identified in this Plan.

7.1 PLAN ADOPTION PROCESS

Before the Plan can be adopted by the participating jurisdictions, it must be made available for public review and comment through a public forum and comment period. Any comments received are incorporated into the Plan and the Plan is then submitted to the Illinois Emergency Management Agency (IEMA) and the Federal Emergency Management Agency (FEMA) for their review and approval.

Once IEMA and FEMA have reviewed and approved the Plan, it will be presented to the County and each participating jurisdiction for adoption. ***Each participating jurisdiction must formally adopt*** the Plan to become eligible to receive federal grant money to implement the mitigation actions identified in this Plan. If any of the jurisdictions choose not to adopt the Plan, their choice will not affect the eligibility of those that do adopt the Plan.

Figure 107 identifies the participating jurisdictions and the date each formally adopted the Plan. Signed copies of the adoption resolutions are located in **Appendix M**.

Figure 107
Plan Adoption Dates

Participating Jurisdiction	Plan Adoption Date
Bath, Village of	8/03/2015
Easton, Village of	8/03/2015
San Jose, Village of	8/04/2015
Mason City, City of	8/10/2015
Havana, City of	8/18/2015
Mason, County of	9/08/2015
Manito, Village of	9/14/2015
Kilbourne, Village of	12/01/2015
Topeka, Village of	12/07/2015
Havana Rural Fire Protection District	12/11/2015
Forest City, Village of	12/14/2015
Mason District Hospital	12/14/2015

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8.0 REFERENCES

Provided below is a listing, by section, of the resources utilized to create this document.

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COUNTY RESOLUTION AUTHORIZING THE DEVELOPMENT OF THE PLAN

APPENDIX A

Resolution 2012-20

Authorizing Agreement for Preparation of Natural Hazard Mitigation Plan and Grant Application for Funding

WHEREAS, pursuant to the federal Disaster Mitigation Act of 2000, Mason County is required to develop a natural hazard mitigation plan for the purpose of reducing or eliminating damages caused by natural hazards such as rain, snow, wind, ice storms, floods, tornadoes, drought, and earthquakes; and

WHEREAS, the establishment of such a plan is a prerequisite to receiving federal funding for any such mitigation projects, and any such plan so established shall include a listing of potential mitigation projects; and

WHEREAS, funding is also available through the Federal Emergency Management Agency for the development of such a plan; and

WHEREAS, the County Board has determined that it is appropriate and necessary to engage the services of a competent firm to provide professional services related to the development of a Natural Disaster Mitigation Plan and to apply to FEMA for funding for such development.

NOW, THEREFORE, BE IT RESOLVED by the County Board of Mason County that the Chairman of the Board is hereby authorized to execute such documents and take such actions as may be necessary to engage the services of a competent firm to develop a Natural Disaster Mitigation Plan which meets the requirements of the Disaster Mitigation Act of 2000, and for such firm to apply for grant funding to pay the cost of such development.

PASSED AND ADOPTED by the County Board of the County of Mason, State of Illinois, on this 14th day of February, 2012.

James C. Griffin

JAMES C. GRIFFIN, Chairman

ATTEST:

WILLIAM R. BLESSMAN, County Clerk

PLANNING COMMITTEE MEETING ATTENDANCE SHEETS

APPENDIX B

Attendance Sheet

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

November 14, 2013

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	John Coker	Red Cross	Govt Liaison
2.	Pete Baven (Charles)	MASON Cty,	Mayor
3.	Jerry Lynn	Easton.	Rep.
4.	Renee Deuth	Mason County Farm Bureau	manager
5.	Sharon Fasulles-Troxell	Kilbourne	board member
6.	STEVEN STOUT	EASTON	REP.
7.	Gregory J. Cox	BATH	Assist
8.	Curt Johnson	Mason County Health/Housing	Director
9.	Bill Blessman	Mason County	Administrator
10.	Kristi Polar	Mason County	Assessor
11.	Mike Rodigo	Mason County	Co. Engineer
12.	[illegible]	Mason Co. Coroners Off	Coroner
13.	Henry Martin	Mason Co Democrat	editor
14.	Brandon Stadtsholt	City of Havana	Mayor
15.	Kevin W. Noble	Havana Police Dep	Chief
16.			

Attendance Sheet

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

November 14, 2013

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	GREG MICHAUD	Johnson, Depp & Quisenberry	MGR, ENV. SERVICES
2.	Andrea Bostwick	Johnson, Depp & Quisenberry	Env. Specialist
3.	Joe Regle	Havana Rural FPD	Lieutenant
4.	GREGORY J. GRIFFIN	MASON County ESDA	Coordinator
5.	JOHN POTTS	ARC	GOVT LIAISON
6.	Elton Gaulrel	Mason County Bd.	County Bd
7.	Beth Reper	Mason County GIS	Computer Op
8.	Wayne Dixon	Mason City	Supt.
9.	NORM LACER	Forest City	Village Board
10.	JOHN KACHANUK	CITY OF HAVANA	FIRE CHIEF
11.	Doug Kosiur	Mason District Hospital	Safety Officer
12.	Floyd Fontch	Village of Bath	Village President
13.	PAUL GANN	MASON CO. SHERIFF'S OFFICE	CHIEF DEPUTY
14.	Harry Pedigo	Mason Co. Sheriffs Office	911 Coordinator
15.	Summer Brown	Mason County Clerk	Mason County Clerk
16.	Ken Walker	Mason County Board	Vice Chairman

Attendance Sheet

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

March 13, 2014

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	GREG MICHAUD	JOHNSON, DEPP & QUISENBERRY	MGR, ENV. SERVICES
2.	Joe Rogle	Havana Rural FD	Lieutenant
3.	GREGORY GRIFFIN	MASON COUNTY ESDA	Coordinator
4.	Steve Burgett	mason co. sheriff's office	Sergeant.
5.	MARION COMBS	MASON CITY	ALDERMAN
6.	Robb Rapp	MASON COUNTY GIS	COMPUTER OP.
7.	DAN KRAFT	MANITO ESDA	ESDA DIRECTOR
8.	Renee Deutsch	Mason County Farm Bureau	Manager
9.	Summer Brown	Mason Co.	Mason Co. Clerk
10.	Scott Williams	Havana Rural Fire	Assist Chief
11.	Eldon Garlisch	Mason City Bd.	
12.	Floyd Foutch	Village of Bath	Village President
13.	Leon W. Noble	Havana PD	Chief of Police
14.	Ray Herman	Forman	Chief EMS
15.	Kurt Sibbel	MCHD	Administrator
16.	Gloria Marshall	Village of Topeka	Clerk

Attendance Sheet

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

March 13, 2014

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	Andrea Bostwick	JDQ	Environmental Specialist
2.	Holly Pedigo	ESDA	911 Secretary/Coordinator
3.	Mike Burris	Mason City (CMT)	Project Manager
4.	Doug Kosier	Mason District Hospital	Safety Officer
5.	Kristi Poler	Mason Co. Assessments	
6.	Chris Troxell	Mason District Hospital	Director of Emergency Services
7.	JOHN KACHANUK	CITY OF HAVANA FIRE	FIRE CHIEF/ZONING
8.	Larry Acker	NWS	Climatologist
9.	Brenda ~~Sladshots~~	City of Havana	Mayor Havana
10.	Bill Blessman	Mason County	Administrator
11.	John Coker	Red Cross (Peoria Region)	Govt Operations - Liaison
12.	Gregory Cox	Village of Bath	Village Manager
13.	Wendy Martin	Mason Co. Democrat	Newspaper
14.			
15.			
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Attendance Sheet

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

March 13, 2014

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	Mike Podrazo	Mason Co Hwy Dept	Co. Engineer
2.	Sherry Troyer	Kilbourne town board member	
3.	Charlene Fangmeier	Village of Easton	Village Trustee
4.	Dixie Riegel	Village of Easton	Village Trustee
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Attendance Sheet

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

June 26, 2014

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	John Coker	Red Cross	Gov't Liaison
2.	Larry Acker	National Weather Service	Consultant
3.	Summer Brown	Mason County	M County Clerk
4.	RALPH E. COON JR	SAN JOSE POLICE / FIRE	COMISSIONER / FF-EMT
5.	Ken Walker	Mason County Board	vice chairman
6.	Wendy Martin	Mason Co. Prosecutor	editor
7.	Scott Williams	Havana Rural Fire Dept	Assist. chief
8.	[illegible]	Mason County ESDA	Coordinator
9.	Wayne Dixon	City of Mason City	Supt
10.	Gregory J. Cox	Village of Bath	Village Administrator
11.	GREG MICHAUD	Johnson, Depp & Quisenberry	Mgr, Env. Services
12.	Andrea Bostwick	IDEQ	Environmental Specialist
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Attendance Sheet

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

June 26, 2014

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	Doug Kosir	Mason District Hospital	Safety Officer
2.	Maria Cupi	San Jose P.D.	Police Chief
3.	Robb Roper	Mason County GIS	Data Processing Man.
4.	Bill Blessman	" " Administrator	Administrator
5.	Kristi Poler	Mason County	Assessor
6.	Chris Troxell	Mason Dist Hospital	ED Director
7.	Ellen Garlick	Mason City Bd.	Bd Member
8.	Michael Hurley	Mason Co Coroner	Coroner
9.	Mike Burris	City of Mason City	Consulting Engineer
10.	Floyd Fautch	Village of Bath	Village President
11.	John Kachanuik	City of Havana	Fire Chief
12.	Joe Rayle	Havana Rural Fire Dept	Lt.
13.	Curt J. Jibbe	Mason County Health/Housing	Admin.
14.	Mike Rodiga	Mason Co Hwy Dept	Co. Engineer
15.	Sherry Troxell	Kilbourne	Board Member
16.	Kevin W Noble	Havana Police	Chief

Attendance Sheet

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

October 9, 2014

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	Andrea Bostwick	Johnson, Depp & Quisenberry	Env. Spec.
2.	John Coker	Am. Red Cross	Govt Opns Liaison
3.	Floyd Fautch	Village of Bath	Village President
4.	Norm Lacek	Village of Forest City	Trustee
5.	Wayne Dixon	City Mason City	Supt
6.	Brenda Stabholt	Mayor City of Havana	Mayor
7.	Gregory J Cox	Bath	City Admin
8.	Sharon Troxell	Kilbourne	Trustee
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Attendance Sheet

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

October 9, 2014

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	GREG MICHAUD	JOHNSON, DEPP & QUINSENBERRY	MGR, ENV. SERVICES
2.	Larry Acker	3F Forecasts	Editor. NWS
3.	Summer Brown	Mason County	Mason County Clerk
4.	Chris Troxell	MDH	ED Director
5.	Robb Pryor	MASON COUNTY	GIS MANAGER
6.	Dylan	Mason District Hospital	Safety
7.	Renee Deuth	Mason Co. Farm Bureau	Manager
8.	Kristi Poler	Mason Co Assessmets	Assessor
9.	Bill Blessman	Mason County	Administrator
10.	GREG GRIFFIN	MASON COUNTY ESOA	Coordinator
11.	Charlene Fangmeier	Easton	Trustee
12.	Mike Burris	City of Mason City	Engineer
13.	Sharon Troxell	Kilborne	Trustee
14.	Joe Rezle	Havana Rura FD / Topeka	Lt. / Public Rep.
15.			
16.			

Attendance Sheet

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

January 13, 2015

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	GREG R. MICHAUD	Johnson, Depp & Quisenberry	
2.	Andrea Bostwick	JDQ	
3.	Summer Brown	Mason County	County clerk
4.	Ross McDowell	Havana City	Alderman
5.	Eldon Garlisch	Mason County	County Board
6.	Cliff Sanders	Manito	Supervisor PW
7.	Joe Ragle	Havana Rural FD	Lt.
8.	Floyd Foutch	Bath, IL	President
9.	Greg Cox	BATH, IL / Mason Co Coroner	
10.	Mike Burris	Mason City	Engineer
11.	[illegible]	M. C.	Mayor
12.	Tom Laen	Forest City	Trustee
13.	John Uhle	Forest City	Trustee
14.	Devin Wooding	Forest City	Trustee
15.	JOHN KACHANUK	HAVANA CITY	ZONING / FIRE
16.	Kevin Noble	Havana Police Dept	Police Dept

Attendance Sheet

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

January 13, 2015

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	Larry Acker	3F Forecasts & NWS	Editor, Official Obs.
2.	[illegible]	MASON COUNTY	DATA PROCESSING MAN.
3.	[illegible]	MASON COUNTY ESDA	Coordinator
4.	Ken Walker	mason Co. Board	Chairman
5.	Nina Krueger	Mason Co. Health Dept	Director of Nurses
6.	Wayne [illegible]	Mason City	Supt
7.	Scott Williams	Havana Rural + Insurance And Real Estate	Asst. Chief / Owner Insurance
8.	RALPH E. COON JR	SAN JOSE	VILLAGE TRUSTEE
9.	Terri McDowell	ROE #38	Asst. Reg. Supt.
10.	~~Brandon Slabaugh~~	City of Havana - Mayor	Mayor
11.	Joe Rogle	City of Topeka	PIO
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Attendance Sheet

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

January 13, 2015

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	Mike Pedigo	Mason Co Highways	Co Engineer
2.	PAUL GANN	MASON CO. SHERIFF'S OFFICE	SHERIFF
3.	Julie Moore	Village of Manito & FORMAN FIRE PROT DIST	ESDA — Trustee
4.	Krista Poler	Mason Co. Assessor	Mason Co Assessor
5.	Maria Cupi	San Jose P.D.	Chief of Police
6.	Charlene Fangmeier	Easton, IL	Trustee
7.	Mindy Lowers	Easton, IL	Village President
8.	Wendy Martin	Mason Co. Democrat	
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PLANNING COMMITTEE MEETING MINUTES

APPENDIX C

Meeting Minutes

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee

November 14, 2013
Havana Rural Fire Department
318 S. McKinley, Havana
1:00 p.m.

Committee Members

American Red Cross
Bath, Village of
Easton, Village of
Forest City, Village of
Havana, City of
Havana Rural Fire Protection District
Kilbourne, Village of
Mason City, City of
Mason County Offices:
- Administrator/Zoning
- Assessor
- Board
- Clerk
- Coroner
- ESDA
- GIS
- Health Department/Housing
- Highways
- Sheriff

Mason County Democrat Newspaper
Mason County Farm Bureau
Mason District Hospital
Mitigation Planning Consultants
- Johnson, Depp & Quisenberry

Welcome and Introductions

Greg Griffin, Mason County ESDA Director, welcomed attendees. He thanked attendees for agreeing to serve on this Committee and he noted that everyone on the Committee has information that is vital in developing the Plan that will reduce damages caused by severe weather.

Binders and handout materials were distributed to each member.

What Is A Natural Hazard Mitigation Plan and Why Should We Prepare It?

Greg Michaud, Johnson, Depp & Quisenberry (JDQ), described why mitigation planning is needed and how participating jurisdictions can benefit.

Although Mason County has an emergency response plan with strong protocols and working relationships established, the purpose of a natural hazard mitigation plan is to prevent or reduce the damages caused by severe storms and other natural hazards. Since the early 1990s damages caused by weather extremes have risen substantially. In 2011, the United States experienced $52 billion in severe storm damages. In 2012, these damages ballooned to $110 billion. As damages from severe storms and other natural hazards continue to rise, the Federal Emergency Management Agency (FEMA) is encouraging counties throughout the United States to prepare natural hazard mitigation plans. Natural hazard refers to floods, tornadoes, severe summer

storms (including thunderstorms, hail and lightning events), severe winter storms (including ice and snow storms), extreme heat, drought, earthquakes, and dam failures.

From the damages caused by natural disasters, FEMA has calculated that for every dollar spent on mitigation, $3 to $4 dollars can be reaped in savings.

Developing this plan provides three major benefits:

(1) ***Money***: When the next federally-declared natural disaster occurs, Mason County and all impacted municipalities who participate in the planning process will received the full amount of money that they are eligible for from FEMA.

(2) ***More Money***: Specific projects and recommendations will be developed through the planning process to help each participating jurisdiction reduce damages. By including these projects in this Plan, the participating jurisdictions will have an opportunity to receive state and federal funds to complete projects that might not otherwise be realized.

(3) ***Protecting Public Health and Property***: Verifiable information about the natural hazards that occur in Mason County will be gathered that will help participants in municipal and county meetings make decisions about how to better protect citizens and property from storm damages.

The Planning Process

The goal of the Committee meetings is to develop a Plan that will be approved by the Illinois Emergency Management Agency (IEMA) and FEMA. A five meeting process has been developed to achieve this goal. Specific activities for the Committee meetings include:

1st Committee meeting	Orientation to the Planning Process Begin identifying Critical Facilities & Existing Planning Documents
2nd Committee meeting	Discuss the Risk Assessment Approve Mission Statement & Goals Committee returns the Critical Facilities List and the Existing Planning Documents List
3rd Committee meeting	Begin discussing Mitigation Projects and Activities Develop a Mitigation Strategy Committee returns list of Mitigation Projects and Activities
4th Committee meeting	Finish discussing Mitigation Projects and Activities Committee discusses approval/adoption of the Plan
5th Committee meeting (Public Forum)	Present the Draft Plan for public review Committee helps answer questions from the public

Andrea Bostwick, JDQ, is a certified risk assessor who will work with Greg to prepare the Risk Assessment. She distributed the Hazard Events Questionnaire. Members were asked to record

how damages sustained by severe weather on this form. Members were also asked to share their memories of severe weather events.

Among the events described by Committee members were the following:

- Countywide straight line winds in August, 2009, damaged the junior high school, communications tower, and caused fire damage to the funeral home in Havana.
- A group of tornadoes in the vicinity of Bath knocked out drinking water, sewer, and communication services to residents. These tornadoes are thought to have occurred in 1995 but may have been a few years afterwards.
- Heavy rain in September, 1993, exacerbated aquifer flooding. The County Health Department was flooded. Some basements reportedly collapsed from the pressure created by rising groundwater levels. In Forest City, the major drainage ditch flooded and hazardous material was released from an underground storage tank.
- An ice and snow storm in February, 2011, left approximately 17 inches of snow and 2 inches of ice across much of Mason County disrupting schools, emergency services, and power. White out conditions impaired driving and many county roads were closed.
- Approximately 14 inches of snow fell on Thanksgiving in 1975.

John Potts, American Red Cross, mentioned that his organization has begun maintaining damage records since the Joplin, Missouri tornado. He also added the Red Cross sets up emergency shelters when they respond to a disaster.

While Andrea and Greg will be conducting the research and writing the mitigation plan, there is information that the Committee needs to provide.

Critical Facilities for each participating municipality and the County must be identified. Andrea distributed the Critical Facilities form for each municipality and the County to be completed and returned no later than the next Committee meeting. The listing of critical facilities will only be included in the master copy of the Plan.

A Severe Weather Shelter form was distributed to the members to help identify where shelters are located.

An Existing Planning Documents List was also distributed. This list includes Land Use Plans, Flood Ordinances, and related documents. If comprehensive municipal plans have been developed, copies these of these documents should be sent to Andrea or Greg so that these documents can be evaluated and described in the Plan.

Other highlights of this discussion included:

- Mitigation projects are to be developed by each municipality. The County will develop a list of projects for the unincorporated area. These lists help assure eligibility for funding. All mitigation projects and activities for which federal funding will be sought, must be included in the Plan.

- This is not a competition between municipalities or the County. Each participating jurisdiction picks the mitigation projects that they feel will best protect their residents and property.
- FEMA's intent is to encourage mitigation. FEMA has not used these Plans to "penalize" municipalities or counties who do not implement mitigation projects included in their Plans.

Mission Statement & Goals

Andrea began this presentation by asking members to review the draft mission statement and goals contained in the handout materials. The goals were drafted in a manner that should help cover most, if not all, mitigation projects that are anticipated to be submitted. However, specific goals related to where you live can be added to this list. Every project included in the Plan should be aimed at one or more of the goals developed by this Committee. Committee Members were asked to review and discuss these drafts at the next meeting.

What Happens Next?

The risk assessment, goal setting, and the mission statement will be the main topics of the next committee meeting. Examples of mitigation projects will be distributed to help members prepare their own mitigation lists. Mitigation project lists will not be due until the third Committee meeting. In response to a question from Mason City, Committee members were advised that the presence of mobile home parks and special needs individuals (persons with physical or mental impairments) can be used to justify a storm shelter.

Committee members were asked to complete a citizen survey before they left, and to make copies of this survey available in their jurisdictions. Paper copies of this survey and a fact sheet titled "Frequently Asked Questions," were provided to participating municipalities to make available to the public from their offices. Additional copies, in paper or electronic format, will be provided by JDQ upon request.

Photographs of storm damages are needed for this Plan. Photographs should be provided to Andrea or Greg.

The second meeting of the Committee was set for:

Thursday, March 13
Havana Rural Fire Protection District
318 S. McKinley Street
1 p.m.

Public Comment

With no further comments or questions, Greg Griffin thanked the Committee members for their attendance. He encouraged Committee members to bring information about storm damages so that it can be added to the Plan.

Meeting Minutes

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee

March 13, 2014
Mason County Farm Bureau
127 S. High Street, Havana
1:00 p.m.

Committee Members

American Red Cross
Bath, Village of
Easton, Village of
Forman Ambulance
Havana, City of
Havana Rural Fire Department
Kilbourne, Village of
Manito, Village of
Mason City, City of
Mason County Offices
- Administrator/Zoning
- Assessor
- Board
- Clerk

Mason County Offices Continued…
- ESDA
- GIS
- 911
- Health Department/Housing
- Highways
- Sheriff'S Office

Mason County Democrat Newspaper
Mason County Farm Bureau
Mason District Hospital
Mitigation Planning Consultants
- Johnson, Depp & Quisenberry

Topeka, Village of
Weather Observer
- 3 F Forecasts

Welcome and Introductions

Greg Griffin, Mason County ESDA Director, welcomed attendees. GIS maps required by FEMA to be in the Plan have been prepared by Robb Roper and are mounted on the walls for Committee members to review. (Handout materials were distributed to each member as they signed-in.)

Risk Assessment

Greg Michaud, JDQ, began the presentation by reminding Committee members that at the previous meeting we discussed cumulative storm damages nationwide, but we did not know how much storm damage occurred in Mason County. With the completion of the Risk Assessment we now have verifiable information to share.

Natural Hazards

An overview of the 108 page Risk Assessment contained in the handout materials was provided. The frequency, magnitude and property damages for each category of natural hazard were described. Since 1965, Mason County has had twelve Federal declared disasters with flooding occurring during eleven of these disasters. Documented damages from severe storms and other

natural hazards in Mason County reveal dollar losses exceeding $16 million with at least 155 injuries and 3 deaths. Multiple severe weather events have occurred during every decade since 1950.

Severe Storms

Over $800,000 in damages has resulted from severe thunderstorms with damaging winds and hail since 1964. Severe storms are the most frequently occurring natural hazard in Mason County. At least 33 injuries and 1 fatality can be attributed to severe storms. An increase in the severity and number of thunderstorms since the 1990s has been observed throughout Illinois.

Tornadoes

Since 1950, at least 31 tornadoes have been verified in Mason County. While Mason County is located on the edge of the "tornado alley" in Illinois, it is not in the top ten counties for verified tornadoes but it has experienced more tornadoes than most other Illinois counties. Damages have exceeded $8.2 million including 60 injuries and 1 fatality. One out of every two tornadoes has caused substantive damages to homes or structures in Mason County, which is a more frequent rate of damage than has been observed in some other Illinois counties.

Twelve of these tornadoes caused over $25,000 in property damage during each event. Two of these tornadoes caused over $2 million in damages during each event. Severe damage to homes and other structures have been documented in half of the verified tornado events occurring in Mason County.

The average tornado in Mason County is approximately 4 ½ miles long and 120 yards wide. There have been three F3, six F2, eleven F1, nine F0, 1 EF1, and 1 EF0 tornadoes.

The worst tornadoes in the county, based on verified damages, occurred in May of 1968, 1995, and 2003. The F3 tornado of 1968 destroyed 15 homes in the Natrona area, causing at least 25 injuries and approximately $2.5 million in damages. Another F3 tornado occurred in 1995 in the vicinity of Sand Ridge State Forest which damaged 36 homes, causing at least 23 injuries and approximately $2 million in damages. Four homes were destroyed and 24 homes suffered severe damage in the Manito area from an F2 tornado in 2003. An F1 tornado in the vicinity of Bath on April 7, 1998, is also worth noting since it created similar amounts of damage to the 2003 tornado.

Floods

Floods contributed to eleven of the twelve Federal disaster declarations. With two major rivers bordering Mason County, at least twenty-three flood and flash flood events have been documented since 1973 causing over $7 million in property and crop damage. Mason County is one of the few areas in Illinois where groundwater flooding occurs.

Severe Winter Storms

One hundred and six events involving excessive snow or ice have been verified since 1950. At least 42 injuries can be attributed to severe winter storms and this number is likely to be much higher since National Weather Service records tend to not have severe winter storm information earlier than the mid-1990s.

Sixteen inches is the highest one day snow which was recorded on February 2, 2011 in Havana. Sixty-nine and one-half inches is the largest seasonal snow record which was recorded in 1981-1982. The coldest temperature recorded was -30 degrees Farenheit on January 5, 1999 in Havana.

Extreme Heat

Nine extreme heat events have been reported since 1997. Road buckling and crop damage often occur, but crop damage is usually not measurable unless drought occurs.

Drought

Four major droughts have occurred during the last three decades—1983, 1988, 2005 and 2012. Following each drought, crop yield reductions were substantial.

Year	Corn	Soybeans
1983	41%	35%
1988	42%	24%
2005	31%	20%
2012	22%	17%

Earthquakes

Earthquakes have been felt in Mason County but no damages have been reported. There are no geologic faults in the county.

Greg added that Chris Miller, National Weather Service in Lincoln, helped provide some of the data used in this assessment. Committee members were asked to provide information on events not included in the tables in the Risk Assessment handout.

To help better identify storm damages to critical facilities, Andrea Bostwick, JDQ, distributed a **Critical Facilities Damage Questionnaire.** Committee members were requested to provide information on this form about dates, type of hazard event, critical facility damaged, and, if available, the amount of damages incurred. Information provided by the Committee will be used to supplement other information to complete the Vulnerability Assessment for each participating jurisdiction.

Mission Statement & Goals

Andrea reminded members that a draft mission statement and goals were provided at the previous committee meeting. She asked if any revisions were needed for the mission statement. No revisions were proposed. She then asked if any additions were needed to the draft goals. No revisions were proposed.

Mitigation
Andrea reminded Committee Members that the purpose of the next meeting is to bring ideas for mitigation projects.

She referred everyone to examples of mitigation projects in the handout materials. The following categories of projects were described.

Studies may be needed to identify causes of problems associated with natural hazard events. A drainage problem may exist, but the most effective remedy may be uncertain. Debris in culverts, undersized culverts, and changes in land use all contribute to drainage problems. A drainage study may be needed to determine the cause or group of causes for a recurring drainage problem.

Structural projects typically are the most frequently mentioned category of mitigation projects. Storm shelters, wastewater/stormwater treatment facilities, and levees are among the kind of structural projects proposed in other counties.

Public information/education activities. These activities have been proven to be useful to alert people about how to protect themselves and their property.

Long-term and ***permanent*** are the key characteristics FEMA considers when determining whether a project is fundable. However, the Committee may also want to include other types of mitigation actions. Tree trimming is helpful in reducing downed power lines during an ice storm, but because trees will often continue to grow new limbs, FEMA will not fund this activity. Utility companies will trim trees along roads and main power lines, but not along the service lines which extend to each residence and business.

She described several problems to avoid when completing these forms. If a backup generator is on your list, tell us if you want a portable or stationary generator and, if it is intended as a stationary generator, where it will be located.

She emphasized that submitting a project does not obligate any jurisdiction to complete the project. FEMA is trying to stimulate mitigation to reduce the extraordinary amount of money being expended on storm damages. When there is doubt about whether to include a project on your list, it would be wise to include it. Only projects included on your list will be eligible for IEMA/FEMA funds. Committee members were also encouraged to include projects that might be fundable from other sources. Examples were provided to help Committee members assemble their lists.

What Happens Next?
The Committee set **Thursday, June 26** as the date for its next meeting. The starting time will remain at 1 p.m. and the location is tentatively set for the **Mason County Farm Bureau.**

Public Comment
With no additional questions or comments, Greg Griffin adjourned the meeting.

Meeting Minutes

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee

June 26, 2014
Mason County Farm Bureau
127 S. High Street, Havana
1:00 p.m.

Committee Members

American Red Cross
Bath, Village of
Havana, City of
Havana Rural Fire Protection District
Kilbourne, Village of
Mason City, City of
Mason County Offices
- Administrator/Zoning
- Assessor
- Board
- Clerk
- Coroner

Mason County Offices Continued…
- ESDA
- GIS
- Health Department/Housing
- Highways

Mason County Democrat Newspaper
Mason District Hospital
Mitigation Planning Consultants
- Johnson, Depp & Quisenberry

San Jose, Village of
Weather Observer/NWS
- 3 F Forecasts

Welcome and Introductions

Greg Griffin, Mason County ESDA Director, welcomed attendees. Handout materials were distributed to each member when they registered.

Vulnerability Assessment

Greg Michaud, JDQ, noted that the recent natural hazard events—especially the tornadoes in Nebraska and floods in Minnesota—underline the importance of this Committee's work. The Vulnerability Assessment estimates future damages in terms of dollar loss to residences including contents based on FEMA acceptable formulas. The most recent property tax assessment figures were provided by the County Supervisor of Assessments to help calculate these estimates. Damage estimates calculated for tornadoes and flood were included in the handout materials.

Tornadoes

Mason County is located on the edge of "tornado alley" in Illinois where the most tornadoes occur. Using information about each of the thirty-one (31) verified tornadoes, damages were calculated based on an "average" tornado. In Mason County, the average sized tornado impacts approximately 0.31 square miles (3.8 miles long x 433 feet wide). Housing densities were calculated from U.S. Census Bureau information for each of the participating jurisdictions.

Losses in the unincorporated townships of the County differ sharply between the three most populated townships and the other townships. Damages are estimated to range from approximately $150,000 in the lesser populated areas to $900,000 in the three most populated townships.

Potential dollar losses for residences and contents would be expected to exceed at least $6 million in any of the participating municipalities except for Forest City, Kilbourne and Topeka. Potential damages in Havana, Manito and Mason City would be expected to exceed $11 million in each municipality.

Floods

Approximately 16% of the land area in Mason County is in the floodplain and thus susceptible to flooding from creeks and streams. With two major rivers bordering the County, riverine flooding has historically been a major concern. This vulnerability assessment makes projected damage estimates based solely on riverine flooding that impacts residential structures.

Easton, Kilbourne, Mason City and San Jose would not experience this kind of riverine flooding since there are no streams or creeks with floodplains within their municipal limits. However, flash flooding or groundwater flooding would impact these municipalities as well as the rest of Mason County.

Groundwater flooding has also impacted Mason County and the participating municipalities. Groundwater flooding, like flash flooding is harder to calculate, but both of these types of flooding have severely impacted Mason County.

Groundwater flooding causes more severe damage than seen elsewhere in Illinois. Groundwater flooding occurs when sub-surface water emerges from the ground at the surface or into structures such as basements. Portions of State Routes 78 and 97 and U.S. Route 136 were covered by as much as 3 feet of water from groundwater flooding in 1992 and 1993. Among the estimated 70,000 acres of farm ground impacted by high groundwater tables, 171 lakes appeared with a measured area of 9,180 acres during the 1992/1993 floods.

Several Committee members who were involved in flood response efforts described their recollections of the magnitude of groundwater flooding. The Village of Bath was completely surrounded by water with Route 78 under water which delayed assistance from emergency responders. While flash flooding associated with heavy rains in 1992 and 1993 contributed to the problem, it was also noted that when flash floodwaters receded, groundwater flooding continued for prolonged periods affecting crops, travel, and residences.

The Community Rating System is a federal program that can help reduce the cost of flood insurance premiums for those who live within designated floodplains. Various activities, most of which are informational and administrative, can be selected by each impacted jurisdiction to reduce insurance premium costs for all residents who live within their jurisdiction. Information about this program was shared with Bath and Havana.

Project Prioritization Method
A Project Prioritization Method is required by FEMA in the Plan. The term Project Prioritization Method actually refers to a method to classify each project.

Greg identified the two primary factors in the development of this strategy:

1). Frequency of hazard—severe storms occur more frequently than earthquakes.

2). Degree of mitigation—some projects will *eliminate* damages while most projects will reduce, but not eliminate damages.

Greg acknowledged that while this methodology does not take cost or politics into consideration, these factors may affect the order in which projects are implemented.

Mitigation Projects

Committee members were asked to submit their Mitigation Projects forms. Andrea Bostwick, JDQ, then proceeded to illustrate how the Project Prioritization Method, the lists of Mitigation Projects, and other information will be presented for Committee review.

Andrea chose a frequently needed mitigation project, a storm safe shelter, as an example to show how a typical project is prioritized and entered into the Plan on a Mitigation Table. A sufficiently large-size chart was placed on the wall so that everyone in the room could read it from where they sat. Andrea entered information about each category describing various factors that will be used to make determinations about each project and activity.

She explained that all mitigation projects submitted will be organized by participating jurisdiction. At the next Committee meeting, all of the mitigation projects will be presented in the format that Andrea described. Each jurisdiction will have the opportunity to review their projects as well as those projects submitted by other participants. In response to a question from Greg Griffin, JDQ explained how they will continue to help jurisdictions assemble their lists of mitigation projects. When needed, JDQ will make suggestions, but each jurisdiction will decide which projects they want on their list.

What Happens Next?

It is anticipated that about three months will be needed for all of the participants to assemble their mitigation project lists. Consequently, the Committee agreed to schedule the next meeting on:

Thursday, October 9
Mason County Farm Bureau
1 p.m.

Clarification about levees in Mason County will be needed for the Plan. A short discussion ensued about the various levees, their governing boards, and locations. Bill Blessman, Rob Roper, and Greg Griffin will provide information to help finish this portion of the Plan.

Public Comment

Larry Acker asked Committee members to seriously consider mitigation projects aimed at protecting wastewater, drinking water, and other critical infrastructure. He mentioned that the severe temperatures and higher than average snowfall of the previous winter created additional costs to remove snow and repair frozen water pipes. Living snow fences (evergreens) are one example of a mitigation project that reduces the number of snowplow passes needed to keep roads clear. With similar severe winter weather predicted for next winter, Larry encouraged the Committee to consider winter impacts in addition to flood and tornado impacts.

Greg Griffin thanked the Committee members for attending.

With no additional questions or comments, the meeting was adjourned.

Meeting Minutes

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee

October 9, 2014
Mason County Farm Bureau
127 S. High Street, Havana
1:00 p.m.

Committee Members

American Red Cross
Bath, Village of
Easton, Village of
Forest City, Village of
Havana, City of
Havana Rural Fire Protection District
Kilbourne, Village of
Mason City, City of
Mason County Offices
- Administrator/Zoning
- Assessor

Mason County Offices Continued…
- Clerk
- ESDA
- GIS

Mason County Farm Bureau
Mason District Hospital
Mitigation Planning Consultants
- Johnson, Depp & Quisenberry

Topeka, Village of
Weather Observer
- 3 F Forecasts

Welcome and Introductions

Greg Griffin, Mason County ESDA Director, opened the meeting by welcoming attendees. Handout materials were provided to all attendees.

Mitigation Project Submittal & Action Tables

Before beginning this presentation, Greg Michaud, JDQ, provided a brief recap to help reorient Committee members as to what has been accomplished and what will be covered at this meeting.

Greg commended the Committee Members for assembling their lists of mitigation projects and activities. Ninety-five mitigation projects and activities were described and prioritized in the Action Tables.

Committee members were provided approximately 20 minutes during the meeting to review the Action Tables containing the descriptions of mitigation projects and activities. Andrea Bostwick and Greg moved throughout the room to discuss questions with each member. Some additional mitigation projects were provided and will be added to these tables.

Plan Maintenance and Update

Andrea described the Plan maintenance and update commitments that are detailed in the Plan. A subgroup of the Natural Hazard Mitigation Committee will meet annually under the direction of the Mason County ESDA to report on the progress of their projects and make any additions or

edits to their list of projects. There is no penalty for not building any project. The intent of the planning process is to encourage mitigation, not to penalize municipalities or counties.

A public forum will be conducted to present the draft Plan to the public. Interested persons can comment on the Plan at this forum or by providing comments to Committee members or Mason County ESDA.

Every five years, the Plan is formally updated and resubmitted to IEMA/FEMA. At the five year update, any jurisdiction who wants to become part of the Plan may do so. Any new jurisdiction must supply the same information that all of the current jurisdictions provided.

The first jurisdiction to formally adopt the Plan begins the five year clock. If a jurisdiction decides not to adopt the Plan, FEMA will still approve the Plan and those jurisdictions who adopt the Plan become eligible for state/federal funds.

She cautioned all of the jurisdictions not to adopt the Plan until after FEMA provides preliminary approval. An e-mail will be issued notifying the Committee members that the Plan has received approval.

In response to a question, she said that Committee members will receive an e-mail alerting them when FEMA has issued tentative approval of the Plan so that the Plan adoption process can begin.

Weather Forecast

Larry Acker, 3F Forecasts, is a third generation weather information collector in northern Illinois. In addition to monitoring weather information for the National Weather Service, he does analyses to make long-range weather predictions.

The coming winter is anticipated to be as severe, and perhaps worse, than last winter based on information that Larry has analyzed. Because of severe cold temperatures, he cautioned Committee members to prioritize projects involving critical infrastructure, such as water pipes, roads, and storm shelters. He described how drinking water is vulnerable to pipes freezing and breaking as happened frequently in Illinois due to the severe weather experienced last winter.

What Happens Next?

Although much of today's meeting has focused on mitigation projects and activities, the primary purpose for preparing this Plan is to make sure the participating jurisdictions can be better prepared for natural hazards and in a position to receive all of the money that is due when the next federal declaration occurs.

To help Committee members pursue grants for their projects, a summary of the most frequently tapped grants for mitigation projects is included in their meeting packets. When questions about grants arise, Committee members were encouraged to contact Andrea or Greg for further assistance.

The final Committee meeting will be conducted in the early evening as an open-house style public forum where the draft Plan will be presented for review and comment. Contrary to conventional public meetings, at an open-house style public forum the public can come and go at their convenience.

The Committee chose to hold the public forum on:

Tuesday, January 13
Mason County Farm Bureau
5 p.m. to 6:30 p.m.

In case of inclement weather, Tuesday, January 27 was chosen as the alternate date.

Committee members were asked their preferences regarding format of the draft Plan that they will make available for public comment. A two week public comment period will follow the public forum. Bath, Easton, Forest City, Havana, Kilbourne, Mason City and Topeka will be provided paper copies and a CD. Manito and San Jose will be contacted to determine their preferences. Mason County will make a copy of the draft Plan available on their website and at the County Clerk's office.

Public Comment

With no other questions, the meeting was adjourned.

CITIZEN QUESTIONNAIRE

APPENDIX D

QUESTIONNAIRE

Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan

You can help protect lives and property from storm damage in Mason County by taking a few moments to complete this questionnaire.

1. Please indicate where you live in Mason County:

_____ Bath
_____ Biggs
_____ Bishop
_____ Easton
_____ Forest City
_____ Havana
_____ Kilbourne
_____ Manito
_____ Mason City
_____ Matanzas Beach
_____ Natrona
_____ Poplar City
_____ Saidora
_____ San Jose
_____ Snicarte
_____ Teheran
_____ Topeka
_____ Union
_____ Unincorporated Mason County

_____ Other (please specify): _____

2. Please place a check mark next to each of the natural hazards listed below that you have experienced in Mason County. (Please check all that apply.)

_____ Severe Summer Storms (thunderstorms, hail and/or lightning strikes)
_____ Floods
_____ Severe Winter Storms (snow, sleet, ice and/or extreme cold)
_____ Extreme Heat
_____ Tornadoes
_____ Earthquakes
_____ Drought
_____ Other (please specify): _____

3. Which of the natural hazards above have you encountered most frequently?

_____

4. Rank the natural hazards listed below in sequential order from 1 to 7 based on which hazard you feel poses the greatest threat. (1 = greatest threat and 7 = least threat). *Each number should only be used once.*

_____ Severe Summer Storms
_____ Floods
_____ Severe Winter Storms
_____ Extreme Heat
_____ Tornadoes
_____ Earthquakes
_____ Drought
_____ Other (please specify): _____

5. What types of mitigation projects or activities are most needed in Mason County? (Please check the ***five*** you feel are most important.)

_____ Public information fact sheets and brochures describing actions residents can take to protect themselves and their property against natural hazard impacts

_____ Floodplain Ordinances

_____ Building Codes and Enforcement

_____ Sirens or other Alert Systems

_____ Flood or Drainage Protection (If selected, please check the type of flood or drainage activity that is needed below.)

- ____ Culvert and drainage ditch maintenance
- ____ Retention pond construction
- ____ Dam or levee construction/maintenance
- ____ Hydraulic studies to determine cause of drainage problems

_____ Maintain power during storms by burying power lines, trimming trees and/or purchasing a back-up generator

_____ Tornado Safe Shelters

_____ Maintain roadway passage during snow storms and heavy rains

_____ Provide sufficient water supply during drought

_____ Identify residents with special needs in order to provide assistance during a natural hazard event

_____ Retrofit critical infrastructure(public water supplies, schools, sewage treatment facilities, bridges, hospitals and other important services) to reduce potential damages

_____ Other (please specify): _____

6. What are the most effective ways ***for you*** to receive information about how to make your household and property safer from natural disasters? (Please check all that apply.)

_____ Newspapers
_____ Television
_____ Radio
_____ Internet
_____ Schools
_____ Mail
_____ Fact Sheet/Brochure
_____ Extension Service
_____ Public Workshops/Meeting
_____ Fire Department/Law Enforcement
_____ Public Health Department
_____ Municipal/County Government
_____ Other (please specify): _____

Thank you for your time in assisting with the development of the County's Natural Hazards Mitigation Plan.

Mason County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee

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FREQUENTLY ASKED QUESTIONS FACT SHEET

APPENDIX E

Frequently Asked Questions

Mason County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee

1) What is the Mason County Natural Hazards Mitigation Plan?
The Mason County Natural Hazards Mitigation Plan evaluates damage to life and property from storms and other natural hazards in this county and identifies projects and activities that can reduce these damages. The Plan is considered to be multi-jurisdictional because it includes municipalities and institutions who want to participate.

2) What is natural hazard mitigation?
Natural hazard mitigation is any action taken to reduce or eliminate long-term risk to life and property from a natural hazard. Storms are the most frequently occurring natural hazards, but other natural hazards being considered in this Plan include drought and earthquakes.

3) Why is this Plan being developed?
The Plan fulfills federal planning requirements of Section 104 of the Disaster Mitigation Act of 2000 and the Stafford Act. Three key benefits this plan will provide Mason County are:

a) Funding following declared disasters.
b) Funding for mitigation projects and activities before disasters occur.
c) Increased awareness about natural hazards and closer cooperation among the various organizations and political jurisdictions involved with emergency planning and response.

4) Who is developing this Plan?
The Mason County Natural Hazards Mitigation Planning Committee is preparing the Plan with assistance from technical experts in emergency planning, environmental matters, and infrastructure. The Committee includes members from agriculture, business and economic development, emergency services, municipal, county and state government, health care, insurance, law enforcement, and institutions such as the American Red Cross.

5) How can I participate?
You are invited to attend public meetings of the Mason County Natural Hazards Mitigation Planning Committee. In addition you are encouraged to provide photographs, other documentation, and anecdotal information about damages you experienced with natural hazards in Mason County. Surveys will be available at participating municipalities and through Mason County to help gather specific information from residents. All of this information will be used to draft the Plan. The draft Plan will be presented in a public forum for further public input.

More information can be obtained by contacting:

Greg Griffin, Director
Mason County ESDA
102 W. Market St.
Havana, Illinois 62644
(309) 543-3758

PRINT MEDIA OUTLETS AND NEWS ARTICLES

APPENDIX F

Print Media Serving Mason County

Mason County Democrat (weekly)
219 W. Market St.
Havana, IL 62644
(309) 543-3311
www.masoncountydemocrat.com

Banner Times (weekly)
126 N. Tonica St.
P.O. Box 71
Mason City, IL 62664
(217) 482-3276

Mason County Democrat
November 6, 2013

See More Photos Online
www.masoncountydemocrat.com

Mason County DEMOCRAT

Mason County's Oldest Business - Est. 1849

HAVANA, ILLINOIS
Wednesday
November 6, 2013
#45 $1.00

ESDA makes plans for dealing with disasters

Communities must participate or miss out on funding

Mason County will begin preparing a countywide plan to reduce the damages caused by natural hazards such as floods, snow storms, thunderstorms, tornadoes, and ice storms among others. The plan is called a Natural Hazard Mitigation Plan and will be funded through a grant from the Federal Emergency Management Agency (FEMA).

Mason County is vulnerable to severe storms and flooding. Since 1980, Mason County has nine Federal declared disasters with flooding occurring during seven of these disasters. These disasters occurred in 1982, 1985, 1993, 1994, 1995, 1996, 2002, 2003 and 2011.

All Mason County municipalities are urged to participate in this planning process.

Bath, Havana, Kilbourne, Manito, Mason City, and San Jose have expressed interest in participating. There is still time for other municipalities to join the process.

"This is a "living plan" which will be updated annually allowing participants to add projects to the plan; however, municipalities that do not participate during the formation of the plan must wait five years before they will have the opportunity to participate again," said Mason County ESDA Director Greg Griffin.

"Developing this plan will help

See DISASTER Page 3

Disaster

From Page 1

us be better prepared before storms hit. The focus of this plan is to reduce the harm to property and residents," Griffin added.

Mason County has an emergency response plan. This mitigation plan is aimed at prevention. The county and each participating municipality that adopts the plan will become eligible for federal funds, Griffin said.

A Mason County Hazard Mitigation Planning Committee has been created with representatives from each participating municipality along with technical partners and other stakeholders. Meetings of this committee will be conducted as working sessions so that any interested resident can attend and ask questions. The purpose of these working sessions is to gather and discuss information that will be used to prepare the plan.

The first meeting of this committee will be held on November 14 at the Havana Rural Fire District beginning at 1 p.m. The committee will meet periodically through the next several months to develop a draft plan.

Griffin may be reached at 309-543-3758.

"...municipalities that do not participate during the formation of the plan must wait five years before they will have the opportunity to participate again,"
GREG GRIFFIN, ESDA

Fans

From Page 1

flooding in 1993.

That means they can build a permanent structure on the property, and that permanent struc-

increased the amount they would pay for the property from $21,500 to $30,600.

"We've waited years for this

Appendix F

MASON COUNTY EMERGENCY SERVICES AND DISASTER AGENCY
102 West Market Street
Havana, Illinois 62644
309/543-3758

ESDA

Contact: Greg Griffin
309/543-3758

Reducing Damages Caused By Severe Weather

Havana, IL (March 3, 2014)—Extreme weather events encountered in Mason County raises important questions. How vulnerable are residents to these storms? What are the most frequently occurring natural hazards? How much damage do storms and other natural hazards, such as drought, cause?

These questions and other related issues will be discussed when representatives from Mason County and local municipalities meet Thursday, March 13 at the Mason County Farm Bureau at 127 South High Street in Havana. This group, the Mason County Hazard Mitigation Committee, will meet through the next several months to prepare the plan to reduce damages caused by natural hazards. The Committee Meeting begins at 1 p.m. and all Committee Meetings are open to the public.

"The plan should become our best resource to help county and municipal officials decide what steps to take to prepare for storms and other natural hazards. After this Plan is completed, comprehensive information will be available in one document to help guide those who are making decisions about how to better protect residents," said Greg Griffin, Mason County Emergency Services & Disaster Director.

Developing public information materials, building storm shelters, designing roads, bridges, water supplies and other services to better withstand natural disasters, are some examples of the kind of projects and activities that can reduce storm damages.

While the plan is being developed, at least four Mitigation Committee meetings will be conducted. Interested persons can provide input at these meetings, or submit their comments and questions to their municipal or county representatives.

Public comments will be used to develop a draft plan. After the draft plan is developed, a public forum will be held where the draft plan will be presented for review and comment.

"By identifying the frequency of each natural hazard and their magnitude, projects can be identified to reduce damages caused by these events," added Griffin.

XXXXXXXXXXXXXXXXX

Mason County Democrat
June 18, 2014

MASON COUNTY EMERGENCY SERVICES AND DISASTER AGENCY
102 West Market Street
Havana, Illinois 62644
309/543-3758

ESDA

DEMOCRATIC
TIMES
OF MASON
COUNTY
SINCE 1849

HAVANA, ILLINOIS
Wednesday
June 18, 2014
#25 $1.00

Local entities to take steps to reduce damage from disasters

Steps to prevent injuries and deaths while maintaining vital services for Mason County residents when floods and severe storms hit will be discussed when the Mason County Natural Hazard Mitigation Planning Committee meets at 1 p.m. on June 26, at the Mason County Farm Bureau office in Havana. Committee meetings are open to the public.

This committee began work in November to develop a plan that will identify projects and activities to protect Mason County residents and property from storms and other natural disasters. This plan, called a mitigation plan, identifies projects and activities that can be taken before these disasters occur.

"Other emergency plans are directed at responding after a storm or natural disaster hits. With this plan, we will identify actions that can reduce or eliminate damages caused by specific types of storms and other natural disasters for each participating municipality and unincorporated areas of Mason County," said Greg Griffin, Mason County ESDA Director.

"With this plan, we will identify actions that can reduce or eliminate damages caused by specific types of storms and other natural disasters in Mason County."
GREG GRIFFEN, ESDA

See DISASTER Page 2

Disaster

From Page 1

Bath, Havana, Kilbourne, Manito, and Mason City are the municipalities participating in the planning process.

Building storm shelters, resolving drainage problems, retrofitting water supplies and other critical facilities to better withstand natural disasters are a few of the more frequently encountered mitigation projects in Illinois. Developing public information materials and conducting drainage studies are examples of other activities that might also be included in the Natural Hazard Mitigation Plan.

"Developing this Plan will help assure each participating municipality of receiving all of the money for which they are due when a catastrophic storm—such as a flood or tornado occurs. In addition, obtaining FEMA's approval of our Plan will make all of the participants eligible to receive federal grant money for mitigation projects" added Griffin.

CONTACT: Greg Griffin
309/543-3758

Projects to Reduce Damages Caused By Storms

Havana, IL (OCTOBER 6, 2014)—Projects and activities to protect residents and property from storms and other hazards will be discussed at the Mason County Natural Hazards Mitigation Planning Committee meeting on October 9 at the Mason County Farm Bureau in Havana. The meeting begins at 1 p.m. and is open to the public.

"Severe storms frequently cause damages to buildings, crops, roads, and other critical infrastructure in this area and across Illinois. We have experienced an increase in the severity of heavy rainfall events during the last two decades. Taking preventative steps reduces the number of personal injuries and the amount of dollars lost," according to Greg Griffin, Director, Mason County Emergency Services & Disaster Agency.

Mason County has an emergency response plan, but not a mitigation plan. "Emergency response plans prescribe what actions should be taken after a storm hits, this mitigation plan identifies actions that should be taken before a storm occurs," added Griffin.

Bath, Easton, Forest City, Havana, Kilbourne, Manito, Mason City, San Jose and Topeka are the municipalities participating in the planning process.

While the public has provided input on portions of the plan, the entire plan will be presented for public review and comment before it is submitted to the state and federal government for approval.

"A public forum will be conducted for interested persons to review the plan and ask questions of Committee members. A two week public comment period will be established to accommodate interested persons who are unable to attend the forum. We want to make sure that anybody who is interested has an opportunity to review and comment on the draft plan," said Griffin.

"We want to make it as easy as possible for all residents to view this draft Plan so that they can read about what type of storm damage reduction projects are being considered," he added.

Interested persons can submit questions and comments to the Committee members or directly to the Mason County Emergency Services & Disaster Agency.

XXXXXXXXXXXXXXXXX

MASON COUNTY EMERGENCY SERVICES AND DISASTER AGENCY
102 West Market Street
Havana, Illinois 62644
309/543-3758

ESDA

Contact: Greg Griffin
309/543-3758

Public Forum on Plan to Reduce Storm Damages

Havana, IL (January 5, 2015)--Projects and activities to prevent injuries, deaths and property damage from major storms will be presented for public comment as part of the draft Mason County Natural Hazards Mitigation Plan. The Plan will be available for review at a public forum on January 13 from 5 p.m. to 7 p.m. at the Mason County Farm Bureau in Havana. Members from the Mason County Natural Hazards Mitigation Planning Committee will be available to discuss this Plan.

"Persons can come and go at their convenience to review the plan and comment. If someone only has a few minutes to review the plan, ask a question, or make a comment, they can easily do so at anytime during the forum. This forum is designed to accommodate busy schedules. Unlike conventional meetings, there are no formal presentations forcing attendees to wait before providing input," according to Greg Griffin, Mason County Hazard Mitigation Committee Chairperson.

Nearly 110 projects and activities were identified to protect Mason County residents and property from storms and other natural disasters. This plan, unlike all other emergency plans, is aimed at identifying projects and activities that can be taken before a natural disaster occurs. This Committee has been conducting working meetings open to the public since November, 2013.

The American Red Cross, the Havana Rural Fire Protection District and the Mason District Hospital are on the Committee along with Bath, Easton, Forest City, Havana, Kilbourne, Manito, Mason City, San Jose and Topeka.

"We have received public input to develop this Plan since we began meeting. This input has included photographs and documentation about damages caused by storm events as well as suggestions about potential projects that could reduce harm to people and property. This forum is an opportunity to see the entire draft plan," added Griffin.

A public comment period will remain open until January 27. Comments can be directed to the Mason County Emergency Services and Disaster Agency. Following the public comment period, any revisions that are needed will be made before the Plan is submitted to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for approval.

Each participating jurisdiction must adopt the plan to become eligible for project funds distributed by the state and federal emergency management agencies.

XXXXXXXXXXXXXXXXXX

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PUBLIC FORUM – PLANNING PROCESS SUMMARY HANDOUT

APPENDIX G

MASON COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

PUBLIC FORUM – OPEN HOUSE

JANUARY 13, 2015
MASON COUNTY FARM BUREAU
5:00 P.M. – 7:00 P.M.

Each year natural hazards (i.e., severe thunderstorms, tornadoes, severe winter storms, flooding, etc.) cause damage to property and threaten the lives and health of Mason County residents. Since 1965, Mason County has had 13 federally-declared disasters.

In addition, between 2004 and 2013 there have been 83 heavy rain events, 32 thunderstorms with damaging winds, 20 severe winter storms (snow and ice), 8 flood and flash flood events, 5 extreme heat events, 4 severe hail storms, 2 tornadoes, 2 droughts 1 extreme cold event, 1 lightning strike event, and 1 earthquake felt by residents in the County. While natural hazards cannot be avoided, their impacts can be reduced through effective hazard mitigation planning.

What is hazard mitigation planning?

Hazard mitigation planning is the process of determining how to reduce or eliminate property damage and loss of life from natural hazards. This process helps the County and participating municipalities reduce their risk by identifying vulnerabilities and developing mitigation actions to lessen and sometimes even eliminate the effects of a hazard. The results of this process are documented in a natural hazards mitigation plan.

Why prepare a natural hazards mitigation plan?

By preparing and adopting a natural hazards mitigation plan, participating jurisdictions become eligible to apply for and receive federal hazard mitigation funds to implement mitigation actions identified in the Plan. These funds, made available through the Disaster Mitigation Act of 2000, can help provide local government entities with the opportunity to complete mitigation projects that would not otherwise be financially possible.

Who participated in the development of the Mason County Multi-Jurisdiction Natural Hazards Mitigation Plan?

Recognizing the benefits that could be gained from preparing a natural hazards mitigation plan, the Mason County Board passed a resolution on February 14, 2012 authorizing the development of the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan. The County then invited all the local government entities within Mason County to participate. The following jurisdictions chose to participate in the Plan's development:

- Bath
- Easton
- Forest City
- Havana
- Havana Rural Fire Department
- Kilbourne
- Manito
- Mason City
- Mason District Hospital
- San Jose
- Topeka

MASON COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

How was the Plan developed?

The Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan was developed through the Mason County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee. The Planning Committee included representatives from each participating jurisdiction, as well as agriculture, education, emergency services (Red Cross, fire and law enforcement), healthcare, and GIS. The Planning Committee met five times between November 2013 and January 2015.

Which natural hazards are included in the Plan?

After much discussion, the Planning Committee chose to include the following natural hazards in this Plan:

- severe storms (thunderstorms, hail, lighting & heavy rain)
- severe winter storms (snow, ice & extreme cold)
- flood
- tornadoes
- extreme heat
- drought
- earthquakes
- dams
- levees

What is included in the Plan?

The Plan is divided into sections that cover the planning process; the risk assessment; the mitigation strategy, including lists of mitigation actions identified for each participating jurisdiction; recommendations; and plan maintenance and adoption. The majority of the Plan is devoted to the risk assessment.

This risk assessment identifies the natural hazards that pose a threat to the County and includes a profile of each natural hazard which describes the location and severity of past occurrences, reported damages to public health and property, and the likelihood of future occurrences. It also provides a vulnerability assessment that estimates the potential impacts each natural hazard would have on the health and safety of the residents of Mason County as well as the buildings, critical facilities and infrastructure located within the County.

What happens next?

Any comments received at tonight's public forum will be are incorporated into the draft Plan before it is submitted to the Illinois Emergency Management Agency (IEMA) and the Federal Emergency Management Agency (FEMA) for review. Once IEMA and FEMA have reviewed and approved the Plan, it will be presented to the County and each participating jurisdiction for formal adoption. After adopting the Plan, each participating jurisdiction can apply for federal mitigation funds and begin implementation of the mitigation actions identified in the Plan.

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PUBLIC FORUM – PLAN COMMENT SHEET

APPENDIX H

MASON COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

PUBLIC FORUM – JANUARY 13, 2015
COMMENT SHEET

The Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan evaluates damage to life and property from natural hazards that occur in the County. This Plan also identifies projects and activities submitted by the County and each participating jurisdiction that will help reduce these damages. This comment sheet should be used to provide feedback on the draft Plan.

What comments, concerns or questions do you have regarding the draft Plan? (Use additional sheets if necessary.)

_____

_____

_____

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_____

Please Print Your Name, Address, and Phone Number Below

Name: _____ Phone: _____

Address: _____

_____ Zip Code: _____

Comments will be accepted until January 27, 2015.

Place
Stamp
Here

Mr. Greg Griffin, Director
Mason County ESDA
102 E. Market St.
Havana, IL 62644

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HAZARD MITIGATION PLANNING LETTER SENT TO ADJACENT COUNTIES

APPENDIX I

MASON COUNTY EMERGENCY SERVICES
AND DISASTER AGENCY
102 West Market Street
Havana, Illinois 62644
309/543-3758

ESDA

TO: Tazewell County (Dawn Cook); Logan County (Dan Fulscher); Menard County (Larry Graf); Fulton County (Chris Helle); Schuyler County (Richard Utter); Cass County (Roger Lauder)

From: Greg Griffin, Mason County EMA

Subject: Hazard Mitigation Planning

Date: January 6, 2015

You are invited you to attend a planning meeting of the Mason County Natural Hazards Mitigation Committee. This committee is preparing a countywide Natural Hazards Mitigation Plan. Since we share a common border, there may be issues and concerns you have regarding this Plan.

Johnson, Depp & Quisenberry, an emergency management and engineering consulting firm experienced in preparing these plans, is leading our planning process.

This meeting will be:

Tuesday, January 13
Mason County Farm Bureau
127 S. High Street
Havana, IL
5 p.m. – 7 p.m.

Food will be served at this meeting, so let us know if you can attend.

If you have questions or comments on our mitigation planning effort, please feel free to contact me or Greg Michaud, our mitigation planning consultant, at 217/529-4534

FIRMS FOR NFIP-PARTICIPATING MUNICIPALITIES

APPENDIX J

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

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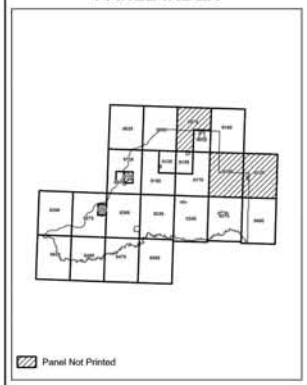

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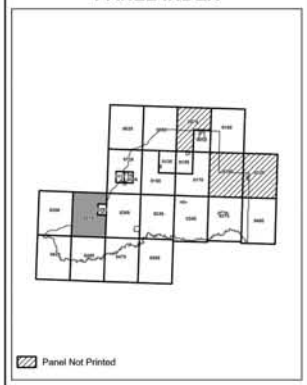

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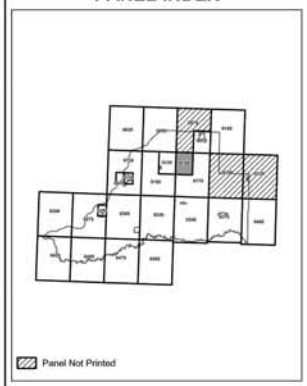

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
(EL 987) — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

(A)—(A) Cross section line
(23)- - - -(23) Transect line
45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4507000 m N — 1000-meter Universal Transverse Mercator grid values, zone 16
1500000 FT — 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPSZONE 1202) Transverse Mercator
CK5510 $_{DJ}$ — Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 6, 2012

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

NFIP

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

150 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0155D

FIRM
FLOOD INSURANCE RATE MAP
MASON COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 155 OF 500

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
FOREST CITY, VILLAGE OF	170827	0155	D
MASON COUNTY	170463	0155	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17125C0155D

EFFECTIVE DATE
JANUARY 6, 2012

Federal Emergency Management Agency

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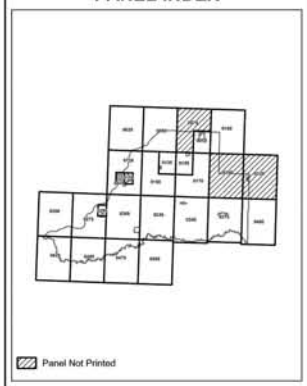

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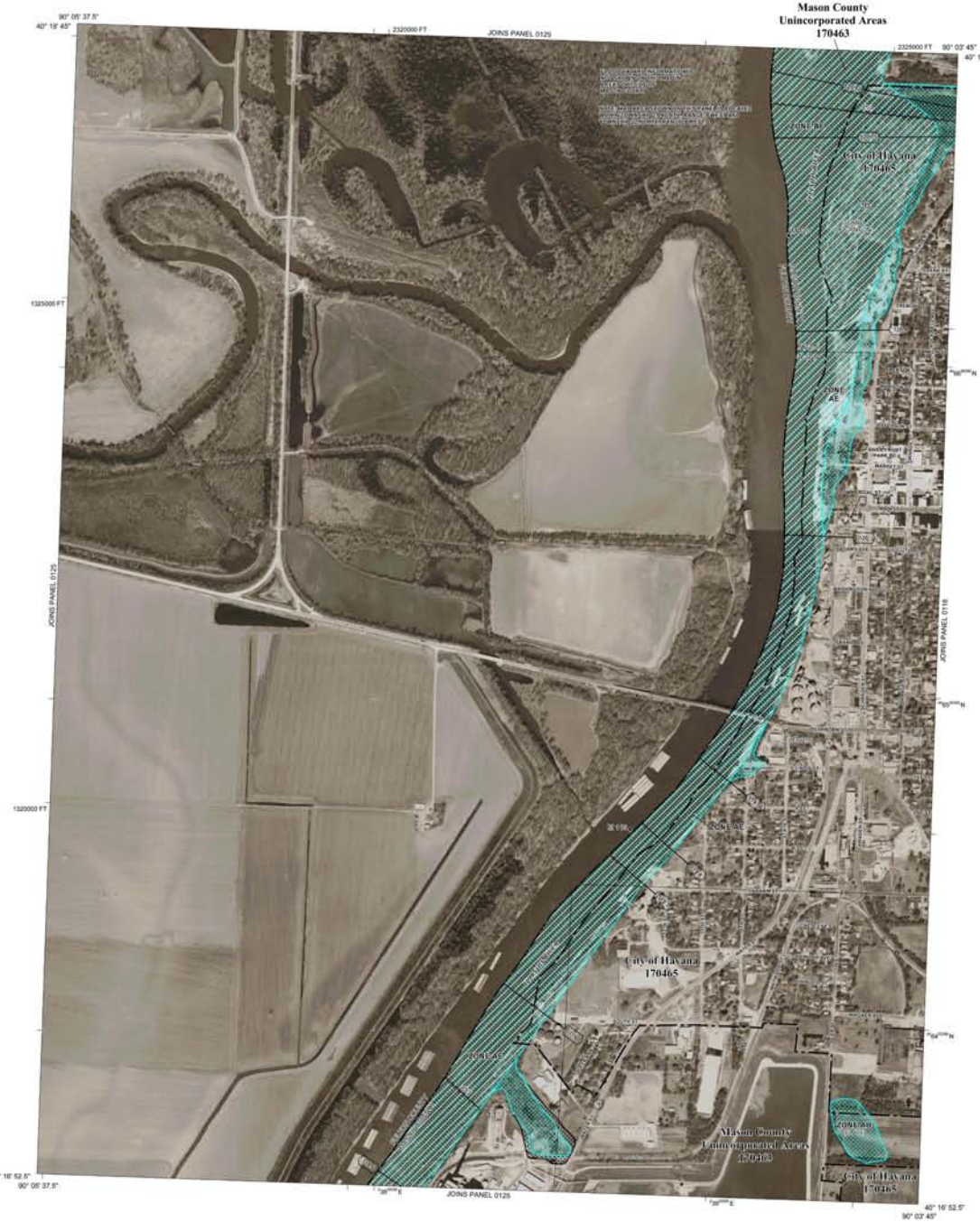

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

(A)———(A) Cross section line

(23)- - - - -(23) Transect line

45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

^{4000000} N — 1000-meter Universal Transverse Mercator grid values, zone 16

^{1000000} FT — 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPSZONE 1202) Transverse Mercator

$^{CK5510}_{DX}$ — Bench mark (see explanation in Notes to Users section of this FIRM panel)

• M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 6, 2012

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

NFIP

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0112D

FIRM
FLOOD INSURANCE RATE MAP
MASON COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 112 OF 500

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
HAVANA, CITY OF	170465	0112	D
MASON COUNTY	170463	0112	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17125C0112D

EFFECTIVE DATE
JANUARY 6, 2012

Federal Emergency Management Agency

Appendix J

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or flood plain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or flood plain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

In the State of Illinois, any portion of a stream or watercourse that lies within the **floodway fringe** of a studied (AE) stream may have a state regulated floodway. The FIRM may not depict these state regulated floodways.

Floodways restricted by anthropogenic features such as bridges and culverts are drawn to reflect natural conditions and may not agree with the model computed widths listed in the Floodway Data table in the Flood Insurance Study report.

Multiple **topographic sources** may have been used in the delineation of Special Flood Hazard Areas. See Flood Insurance Study report for details on source resolution and geographic extent.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 16. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services, NOAA, N/NGS12
National Geodetic Survey SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at www.ngs.noaa.gov.

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This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The Special Flood Hazard Areas and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

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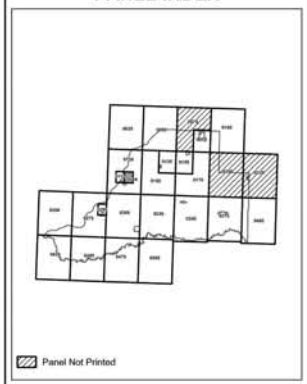
PANEL INDEX



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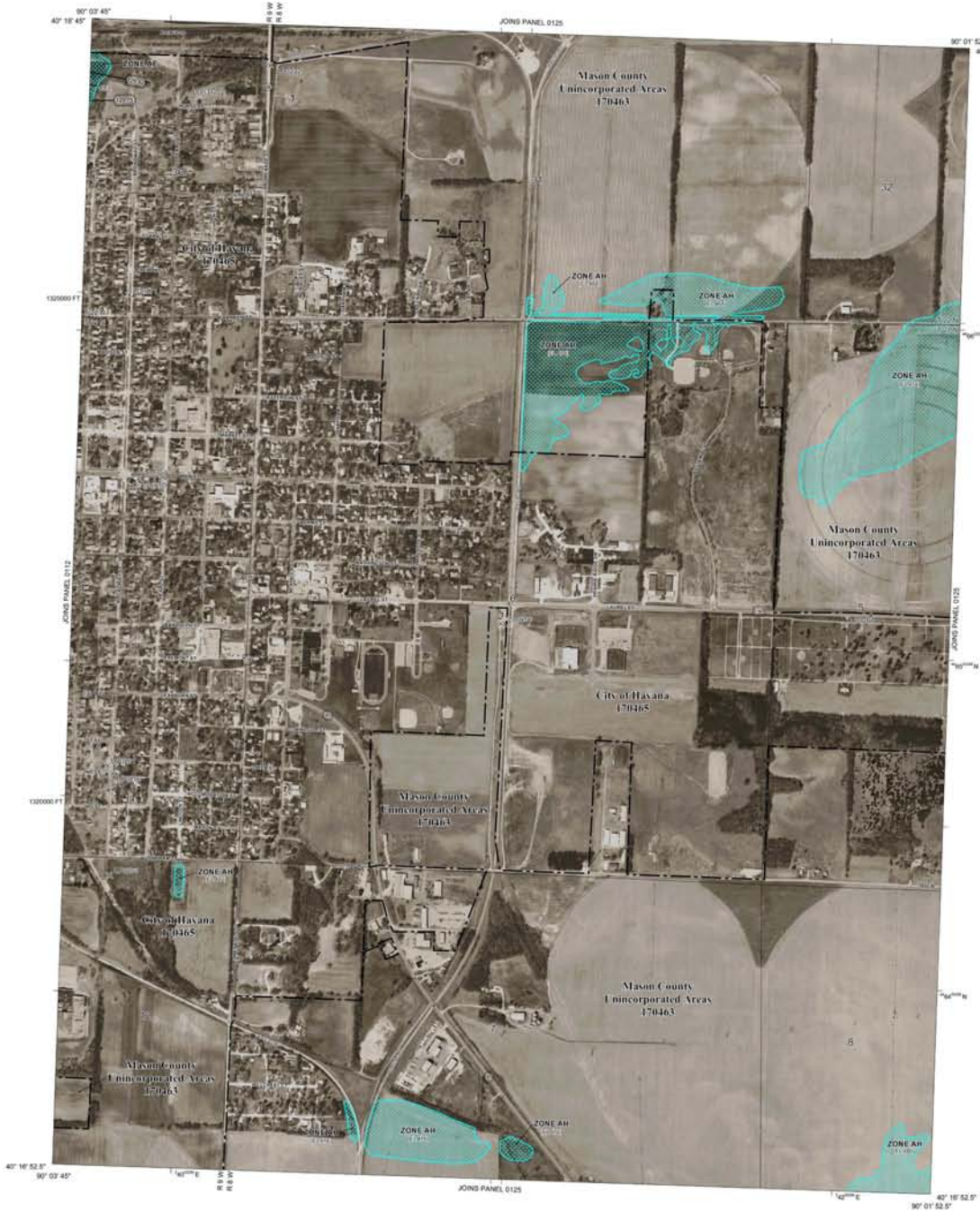

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A Cross section line
23 - - - - 23 Transect line
45° 02' 08", 93° 02' 12" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4507000 N 1000-meter Universal Transverse Mercator grid values, zone 16
1500000 FT 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPSZONE 1202) Transverse Mercator
CK5510 X Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 6, 2012

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0116D

FIRM
FLOOD INSURANCE RATE MAP
MASON COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 116 OF 500

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
HAVANA, CITY OF	170465	0116	D
MASON COUNTY	170463	0116	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17125C0116D

EFFECTIVE DATE
JANUARY 6, 2012

Federal Emergency Management Agency

Appendix J

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

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Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or flood plain management purposes when they are higher than the elevations shown on this FIRM.

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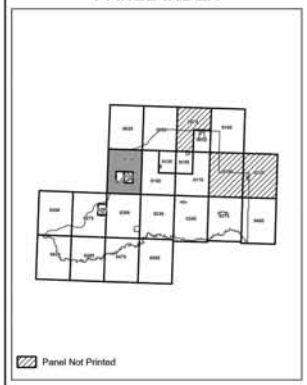
PANEL INDEX



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
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FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
13 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A Cross section line
23 - - - - 23 Transect line
45° 02' 08", 93° 02' 12" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4489000 M 1000-meter Universal Transverse Mercator grid values, zone 16
1565000 FT 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPSZONE 1202) Transverse Mercator
CK5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 6, 2012

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0125D

FIRM
FLOOD INSURANCE RATE MAP
MASON COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 125 OF 500

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
HAVANA, CITY OF	170465	0125	D
MASON COUNTY	170463	0125	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17125C0125D

EFFECTIVE DATE
JANUARY 6, 2012

Federal Emergency Management Agency

Appendix J

NOTES TO USERS

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Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or flood plain management purposes when they are higher than the elevations shown on this FIRM.

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1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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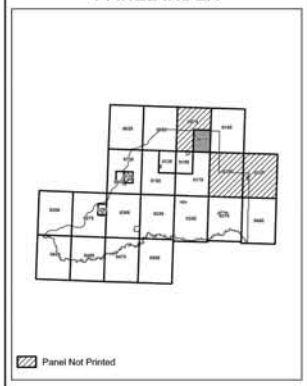
PANEL INDEX



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

(A)—(A) Cross section line
(23)- - - -(23) Transect line
45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4000000 FT — 1000-meter Universal Transverse Mercator grid values, zone 16
1565000 FT — 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3551 zone (FIPSZONE 1202) Transverse Mercator
CK5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.6 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 6, 2012

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0070D

FIRM
FLOOD INSURANCE RATE MAP
MASON COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 70 OF 500
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MANITO, VILLAGE OF	171250	0070	D
MASON COUNTY	170463	0070	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17125C0070D

EFFECTIVE DATE
JANUARY 6, 2012

Federal Emergency Management Agency

Appendix J

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or flood plain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or flood plain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

In the State of Illinois, any portion of a stream or watercourse that lies within the **floodway fringe** of a studied (AE) stream may have a state regulated floodway. The FIRM may not depict these state regulated floodways.

Floodways restricted by anthropogenic features such as bridges and culverts are drawn to reflect natural conditions and may not agree with the model computed widths listed in the Floodway Data table in the Flood Insurance Study report.

Multiple **topographic sources** may have been used in the delineation of Special Flood Hazard Areas. See Flood Insurance Study report for details on source resolution and geographic extent.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 16. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services, NOAA, N/NGS12
National Geodetic Survey SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at www.ngs.noaa.gov.

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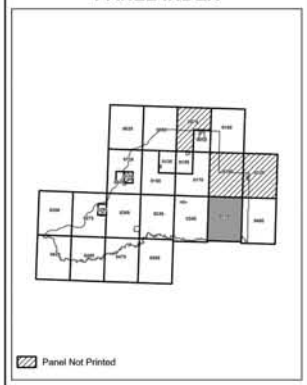

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	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 - - - - 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4988000 m N	1000-meter Universal Transverse Mercator grid values, zone 16
1000000 FT	5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPSZONE 1202) Transverse Mercator
CK5510 $_{BM}$	Bench mark (see explanation in Notes to Users section of this FIRM panel)
♦ M1.5	River Mile

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EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 6, 2012

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0375D

FIRM
FLOOD INSURANCE RATE MAP
MASON COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 375 OF 500

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MASON CITY, CITY OF	170466	0375	D
MASON COUNTY	170463	0375	D

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MAP NUMBER
17125C0375D

EFFECTIVE DATE
JANUARY 6, 2012

Federal Emergency Management Agency

Appendix J

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HAZARD EVENT PHOTOGRAPHS

APPENDIX K

1993 Illinois River and Aquifer Flooding
Bath, Illinois

12 inch cristafoil pump in operation

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Bath, Illinois

Aftermath of flooding along Locust Street

Aftermath of flooding along Locust Street

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Bath, Illinois

Looking east on First Street at Sycamore Street

Looking west on First Street at Sycamore Street

Southeast edge of the Village

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Bath, Illinois

Looking south along IL Route 78 at Bath

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Bath, Illinois

Looking north along IL Route 78 south of Bath

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Havana, Illinois

Havana Metal Culverts along
IL Rte. 97 south of the railroad tracks
(southeast of Havana)

Looking south along IL Rte. 97 at the
railroad tracks(southeast of Havana)

Looking south along IL Rte. 97 at the
railroad tracks (southeast of Havana)

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Havana, Illinois

Dean Foods and the Paddlewheel
along IL Rte. 97
(southeast of Havana)

South of Dean Foods - driveway to
the Paddlewheel
(southeast of Havana)

Looking north along IL Rte. 97 south
of Havana

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Havana, Illinois

IL Rte. 79 south of Havana

IL Rte. 97 at the railroad tracks (southeast of Havana)

Looking north along IL Rte. 97 south of Havana

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Havana, Illinois

Looking west as IL Rte. 97 curves into Havana on the eastern edge of the City

Flood waters impacted Havana High School's football statidum

Looking south at Havana High School and IL Rte. 97 as it enters Havana on the eastern edge of the City

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Havana, Illinois

Jefferson St. at Schrader St. where high school pump is draining into sewer drain

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Havana, Illinois

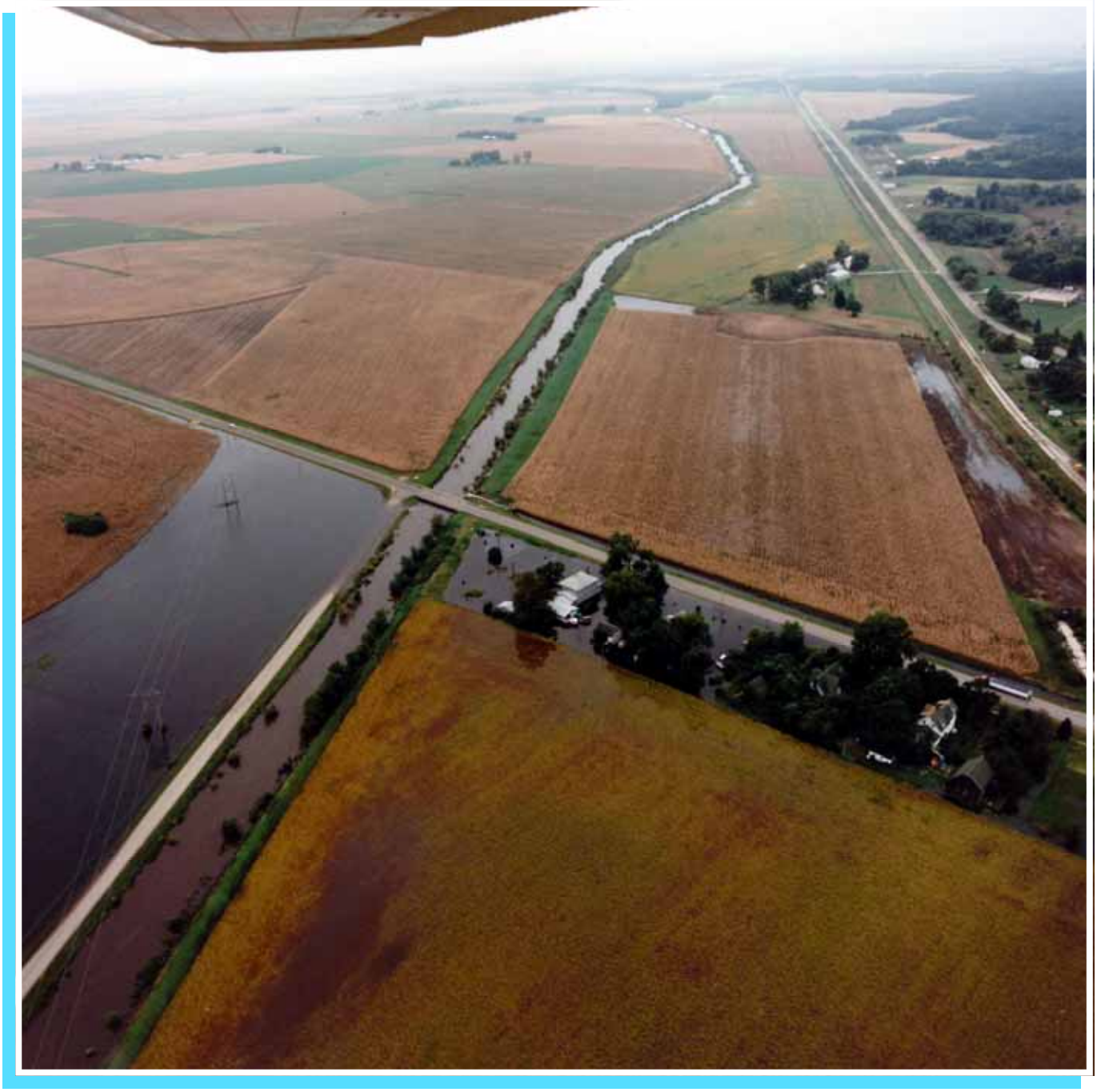
Former Scarborough Estates northeast of the City; now the site of the Park District's new Veteran's Park

Looking west of Havana approximately 1/2 mile

Looking west of Havana approximately 1/2 mile

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Forest City, Illinois



Looking southwest along the Mascon-Tazewell Drainage Ditch at Forest City

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Unincorporated Mason County, Illinois

4-H Blacktop 8 miles west of 1900E

Pond on 4-H Blacktop

4-H Blacktop 1/2 mile east of 1800E

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Unincorporated Mason County, , Illinois

Evening Star Campground off of US Rte. 136

Looking south across US Rte. 136 at Evening Star Campground

1900E directly south of US Rte. 136

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Unincorporated Mason County, Illinois

Looking east from pond at Roat's Strawberry Patch
(1900E and US Rte. 136)

Looking northeast at the Havana Regional Airport

Looking west at the Havana Regional Airport

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Unincorporated Mason County, , Illinois

Sand Lake at IL Rte. 97 southeast of Havana

Sand Lake at IL Rte. 97 southeast of Havana

One mile east of Mason District Hospital

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Unincorporated Mason County, Illinois

IL Rte. 78 at 1500N

Road Closure along IL Rte. 78 south of Bath

Looking south along IL Rte. 78 south of Bath

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Unincorporated Mason County, , Illinois

Finished drainage system in front of drive-in along IL Rte. 78

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Unincorporated Mason County, Illinois

Looking south along completed drainage system in front of the drive-in along IL Rte. 78

Drainage area into White Oak Creek near drive-in along IL Rte. 78

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Unincorporated Mason County, Illinois

Looking west at 1970E / 1700N east of Havana

Photographs provided by Greg Griffin, Mason County ESDA Director

1993 Illinois River and Aquifer Flooding
Unincorporated, Illinois

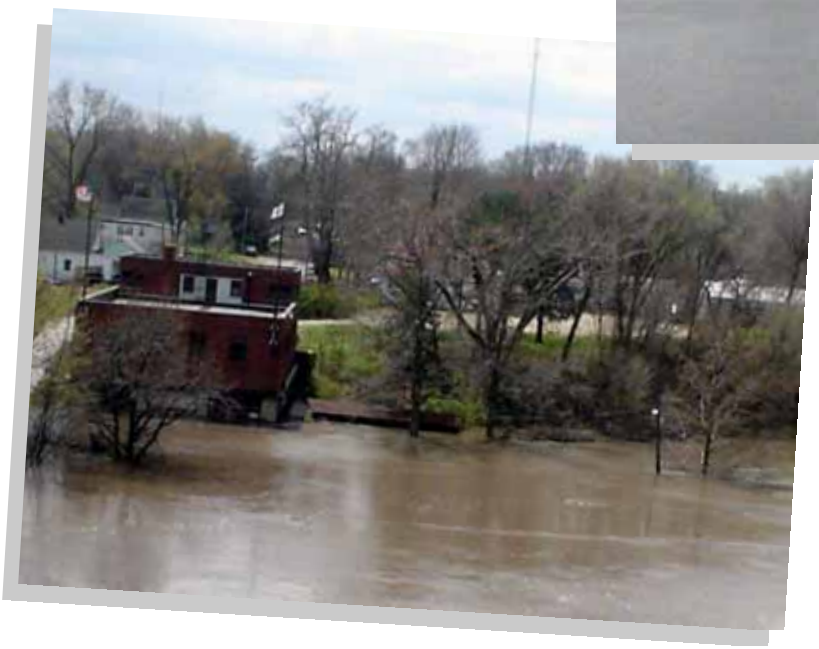
Looking south along 1970E towards US Rte. 136 east of Havana

Photographs provided by Greg Griffin, Mason County ESDA Director

Spring 2013 Illinois River Flooding
Havana, Illinois

Looking north from the Lucas Bridge

Looking northeast from Lucas Bridge



Looking southeast from the Lucas Bridge

Photographs provided by Greg Griffin, Mason County ESDA Director

Spring 2013 Illinois River Flooding
Havana, Illinois

Havana Nature Center

Photographs provided by Greg Griffin, Mason County ESDA Director

Spring 2013 Illinois River Flooding
Havana, Illinois

River Front Park

Lift Station protected by sand bags along the river front

River Front Park

Photographs provided by Greg Griffin, Mason County ESDA Director

Spring 2013 Illinois River Flooding
Havana, Illinois

Havana Marina

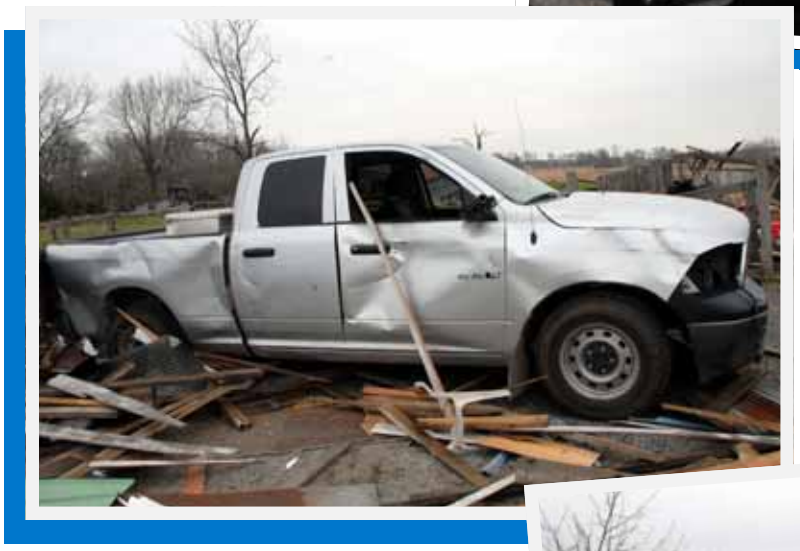
Matanzas Beach area

Photographs provided by Greg Griffin, Mason County ESDA Director

April 15, 2011 Tornado
Unincorporated Mason County, Illinois

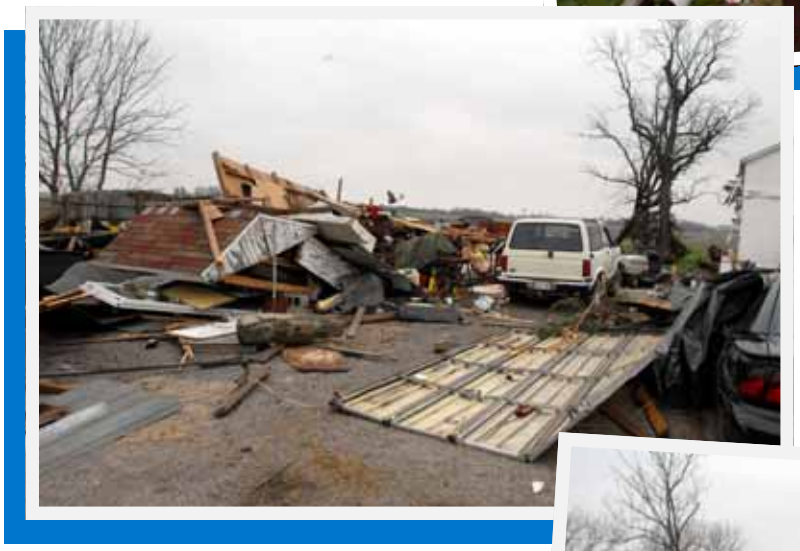
Photographs provided by The Mason County Democrat

April 15, 2011 Tornado
Unincorporated Mason County, Illinois



Photographs provided by The Mason County Democrat

April 15, 2011 Tornado
Unincorporated Mason County, Illinois



Photographs provided by The Mason County Democrat

April 15, 2011 Tornado
Unincorporated Mason County, Illinois

Photographs provided by The Mason County Democrat

April 15, 2011 Tornado
Unincorporated Mason County, Illinois

Photographs provided by The Mason County Democrat

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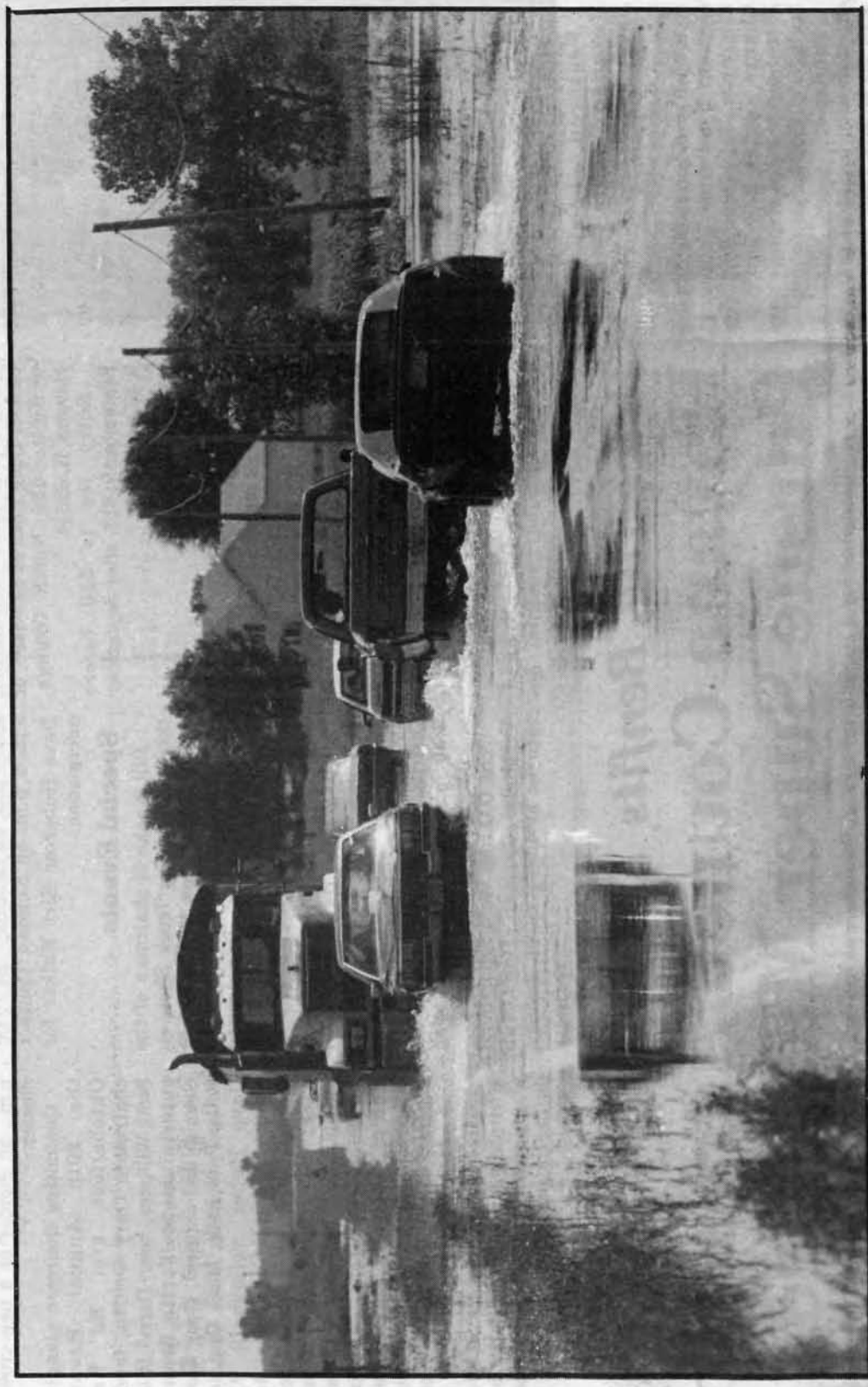
HAZARD EVENT NEWS ARTICLES

APPENDIX L

The Mason County Democrat
September 8, 1993



Flooding on Route 97, South of Havana, created fear in motorists traveling to and from Havana on Thursday.

The late Senator Mary Lou Kent sponsored legislation to build up the highway in 1974. Excessive flooding occurred at Walker Forge and Havana Culvert from Thursday's downpour.

The Mason County Democrat
September 15, 1993

County Beseiged By Flood From Below

by Wendy Martin

Throughout the summer a great number of Mason County residents and Havanans have donated time, energy or money or all three to assist the victims of the Great Floods of 1993, grateful, no doubt, that the Illinois River spared them.

But now many are counted among the victims of flooding from an unexpected source...the aquifer.

Local lore has always proudly told of the hidden underground river below Mason County. While the flow is not as swift as the Illinois River's, it looks like the water is cresting at near record heights.

The water table that normally rests 5 to 12 feet below the surface is at surface level or above in much of the area south of Havana.

Area residents remember at least two other times that similar water disasters occurred here. Severe flooding was seen in 1974, and was even worse in 1926.

According to Adrian Visocky, Director of the Office of Ground-water Resources for the Illinois State Water Survey, the way above normal rainfall seen here in the past 14 months is the "obvious" cause of the problems.

Visocky noted at an ad hoc emergency meeting of the Havana City Council and Mason County Board Wednesday evening that the average rainfall per year here is 36.2 inches.

But July 1992 saw nearly 10 inches of rain in a single month, and in the time between July 1992 and June 1993 more than 54 inches of precipitation has drenched this area.

While an average July sees 3.8 inches of rain, this July saw another 9 inches.

Visocky showed charts from an observation well located near Bath that has been tracked since the late 1950s.

Current levels in that well are the same as the highest levels seen in the mid-70s when the height of the well water peaked, leading Visocky to hint that based on the historic data, the water probably would not raise much more.

"I realize you don't have any crystal balls, but based on what we're seeing are we looking at the tip of the iceberg?" asked Havana Mayor Allan McNeil.

"No, I'd say you've seen most of the iceberg, based on the historic record we have here...We seem to be at a peak now, and one shouldn't expect that the worst is yet to come. It never has gotten much above what it is now," Visocky said.

At the time of that Wednesday evening meeting water was still rising in the ditches coming into Havana along Route 97 at an estimated rate of two inches every four hours.

Visocky said the high water table has been the result of a combination of situation. In addition to the increased amounts of rain, higher river levels have resulted in slower drainage from the aquifer.

He also noted that irrigation units generally draw down the water table some, but very little irrigation has been run this year because of all the rain.

The Mason County Democrat
September 15, 1993

Businesses, County Affected By Flood

Walker Forge on Route 97 was the first of several businesses to be threatened by flood waters on the southeast of Havana. On the Tuesday after Labor Day they lost one full day of production because of the water.

They have since built a wall around the plant and have had all three shifts back to work.

A spokesman for the company said Monday morning that things appeared to be fine, but he feared if there were substantially more rain things could get serious again for them and their 135 employees.

Havana Metal Culverts began taking on water the Friday before Labor Day according to President Ben Bielski.

Continuous pumping has allowed them to finally get the floor of the plant dry he said Monday, but it is now really a question of weather and how high the water rises, and how fast it is moving whether they can get back into full operation this week.

Bielski, who helped with the sandbagging late last week, said he couldn't say enough good things about the crew which has split into three shifts to keep 24-hour duty on the pumps.

He also praised local officials for their cooperation and assistance.

Some of the worst flooding appears to have affected the Country Boy Store which has been surrounded by water since early last week.

The owner could not be reached for an update.

Before Monday's rain Dairy Queen owner Jim Meyerhoff said things were getting back to normal after high water threatened to close his doors for several days.

Customers, friends and employees helped sandbag the building, and a city sewer has so far kept water below the curb at the building.

The Mason County Health Department is among those who have been affected by the rising water table.

According to Administrator Gary Zaborac three programs have had to evacuate the basement of the building on Route 136.

The Women, Infants, Children program and a new state program called Healthy Kids, Healthy Moms, have temporarily been moved to the old Gorsuch building on Plum Street.

Environmental Health has been moved out of the basement for the time being.

Zaborac added that the Health Department will be offering free water testing to those whose private water wells have been adversely affected by rising ground water.

Pumps And Pipelines Planned To Reduce Water

While polkas played on in Havana for the 20th Annual Oktoberfest monitors were being set up Saturday to track what is happening with water levels on the south and east of Havana.

The monitors are among the things Environmental Science Engineering of Peoria will do for Havana and Mason County in trying to find a way to meet the current flooding problems.

Meanwhile Soil Conservation Service employees were busy surveying over the weekend to decide where the best place would be to run a pipeline to pump surface water off from the area of Negro Lake.

Preliminary findings indicate that running along the county road at 1500 North (known as Beer Can Alley), would be more efficient than following the C&IM railroad right of way to the Illinois River.

At Sunday's evening briefing Sheriff Richard Walker reported that one to three pipes will need to be placed, either behind the pumping station at Walker Forge or behind the main lake.

Both are about the same distance, according to Walker.

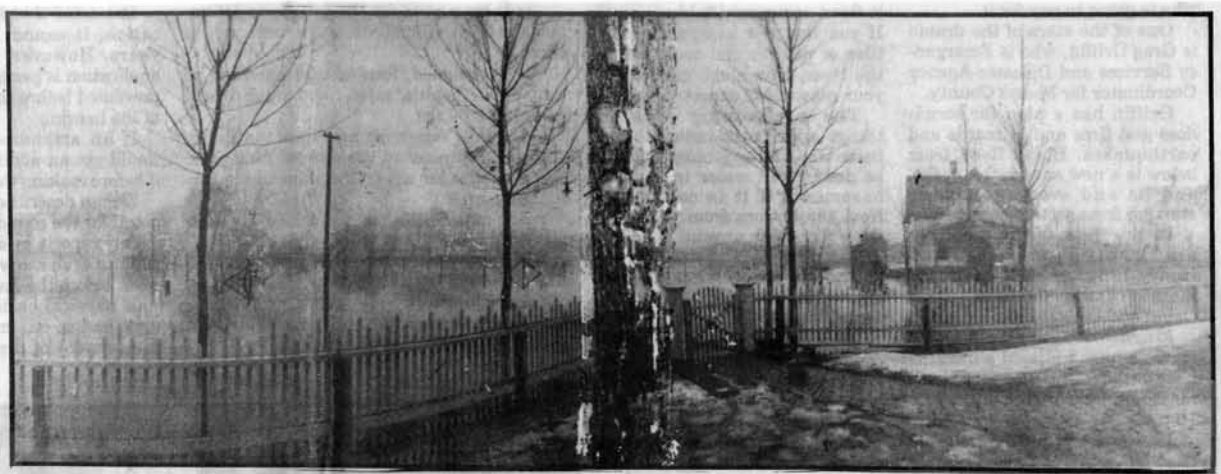
He added that the railroad right of way would have been farther and involved more landowners.

The plan is to pump off as much water as possible to reduce the flow of surface water coming from the Negro Lake area.

Local officials hope to find both short term and long term solutions to the problem of surface water. It is unlikely that anything can be done about the ground water.

An emergency agreement has been signed between the Mason County Board, City of Havana, and Soil Conservation Service that will provide 100% funding for the cost of construction.

The Mason County Democrat
September 15, 1993



This photograph of flooding on the east end of Havana was taken from the yard at 503 E. Market Street. That would put it near the intersection with McKinley.

High water in 1974 encouraged Leo Borgelt, then a correspondent for another area newspaper, to dig out what he could on flooding in Havana.

His research indicated that flooding also occurred between 1886 and 1905.

(The original photograph had been broken or torn in half and was taped back together at one time, accounting for the stripe in the middle of the picture.)

Photo courtesy of the Karl Collection.

Officials Use Emergency Powers

As rushing waters overflowing Negro Lake out-paced attempts to corral them into the Havana sewer system late last week, school, city, and county officials searched for ways to protect property.

An emergency meeting of the Havana District 126 Board of Education was called Tuesday afternoon where board members studied topographic maps showing the Junior High School to be five feet in elevation below Negro Lake, making it a likely place for water to pool if it were to continue to rise.

At Tuesday evening's meeting of the Havana City Council theories and suggestions on what to do were welcomed from the audience of forty some visitors.

An emergency joint meeting of city and county officials was held Wednesday night which spawned another emergency meeting Thursday night with engineers from Environmental Science Engineering of Peoria.

At that meeting Havana Mayor Allan McNeil and County Board Chairman Henry Imig used their emergency powers to authorize up to $10,000 each for engineering to discover what exactly is causing the problem and what the short term and long term solutions should be.

At the same time, broad emergency powers of the Soil Conservation Service will be used to bail Havana and Mason County out figuratively, if not literally.

Local SCS representative Kevin Donoho was flanked Wednesday night by two superiors when he announced that when an "exigency" exists - an urgent situation such as the one facing local officials - 100% federal funding is available.

Donaho noted that while nothing could be done to control the ground water making its way into peoples' basements, it appeared to SCS engineers that something could be done to control the surface water.

On Friday McNeil and Imig signed a cooperative agreement with the Soil Conservation Service.

SCS and ESE employees are working together to find a way to provide relief from the surface flooding. Water level monitors were placed by ESE engineers and surveying work was conducted over the weekend by SCS volunteers.

Until the crisis subsides briefings and updates on what has happened and what is being done have been scheduled for 5 p.m. at the Mason County Courthouse until further notice.

Water began crossing Route 97 and Route 78 as area residents prepared for the long Labor Day weekend.

City and county officials foundered as the water began threatening the city with no clear idea of what was causing the problem, what would relieve the problem, and whose problem was it anyway (that is, who will pay to fix it).

With no way to guess how high the water might get members of the Havana District 126 Board of Education met in emergency session Tuesday afternoon and agreed to sandbag the Junior High School as a preventative measure.

As they were meeting, a hydrologist from Springfield was getting the aerial helicopter tour of the flooded areas, using the baseball field as a heliport, and outside city employees jerry-rigged a pipe to direct water from the ditch along Route 97 to a city sewer.

School, city and county officials are concerned with both the surface water pouring in

continued on Page 3

The Mason County Democrat
September 15, 1993

Old Stories Talk About Negro Lake

Just south of Havana lies a natural depression that frequently fills up with water. More recent maps refer to it as Negro Lake, although it is commonly known by a rougher name.

According to an article written for the Mason County Democrat in the late 1950s or early 1960s by Fred C. Speckman it was almost always wet southeast of Havana at what is known as Negro Lake.

He reported that in 1883 the Havana Township Drainage District No. 1 - the first in the county - was organized. This drainage district drained the "lake" through a sewer laid along the road which joined one of the sewers in the city. The waters ultimately emptied into the Illinois River.

"In 1926, after a wet spring and summer, the low ground was again filled with water and remained that way for the better part of 3 years, owing to the poor condition of the sewer," Speckman reported. "The land owners finally corrected the trouble and the water was drained."

How the District Received Name

About 100 years ago, or thereabouts, Speckman wrote 30-some years ago, a Negro operated a small grocery store a short distance south of the Negro Lake crossroads and was there for some time. Just where he came from seems to be a mystery. Some say he was a driver of a road-circus wagon which came to Havana in the early days, and the wagon mired down on the road going through the lake area and that is how it received its name.

Later in the article Speckman said he didn't know if the story about the circus wagon was true or not, but he was pretty sure about the story about the man with the grocery store. Be that as it may, Speckman said, the fact remains that a Negro operated the store.

He also reported that a few old bricks are still around where the Negro's store used to stand on the west side of the highway and south of the cross-roads, and the presence of him in the vicinity gave the name to the lake.

Photographs by Chris Young / The State Journal-Register

Don Hughes, left, Joe Ray and Ernie Carlock sandbag a street in Bath to divert water to an area where it can be pumped out of town.

Bath getting ready for next round

Water levels drop; more rain expected

By KEVIN McDERMOTT and STEPHEN BEAVEN
STAFF WRITERS

BATH — As this tiny Mason County community attempts to dry off after a bizarre assault from below, residents are only now sorting out exactly how it happened — and preparing for it to happen again if predictions of more rain come true.

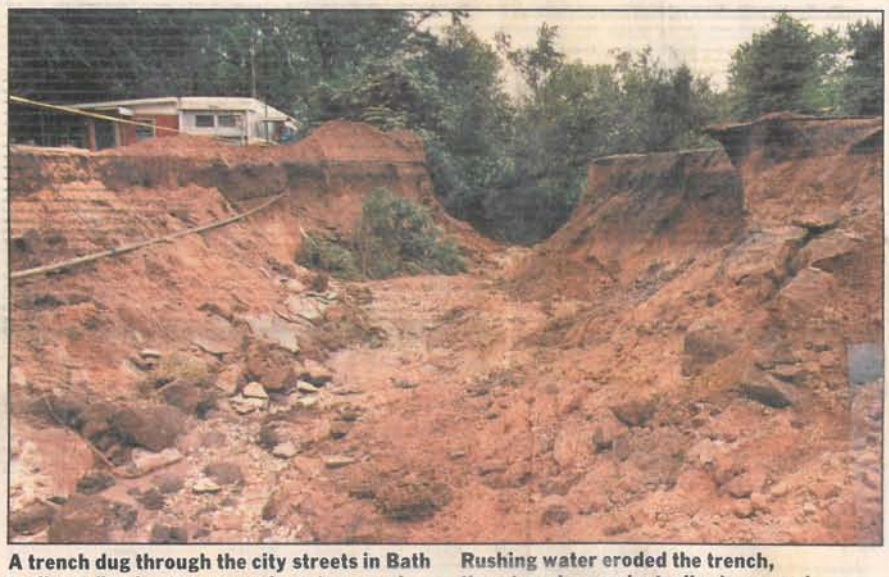
"It rained like hell Monday night, and we got a phone call at 6 in the morning (from a neighbor) saying her whole house was flooded," recalled resident Becky Conway, who didn't know at first what the neighbor was talking about.

"Then I walked outside, and it was just everywhere."

That was how Tuesday greeted most of Bath's 388 residents: They awoke to find their houses flooded, yards and streets under water and their town virtually cut off from the rest of the world.

Most surprising of all was that, for once, the

See **BATH** on page 4



A trench dug through the city streets in Bath to direct floodwaters away from town and into the Illinois River is no longer being used. Rushing water eroded the trench, threatened a nearby trailer home and exposed a gas line.

BATH

From page 1

nearby Illinois River had nothing to do with it.

Deep below the town, the Sankoty Sand Aquifer — the huge underground lake that extends beneath most of Mason County, northwest of Springfield — had taken in all the water it could hold from one of the wettest seasons on record. Over the rainy months since spring, it had gradually pushed the excess back up to the surface, giving local lawns and fields the glossy look of a saturated sponge.

Then, on Monday night, it rained one time too many.

"You've got this aquifer coming up at you from the bottom, and Mother Nature coming at you from the top, and there's nowhere for the water to go, so it stays in the middle," explained Mayor Floyd Dooley, who was assisting with fresh-water distribution and other relief efforts at Bath's community center Thursday.

"It's a shock to everybody," said Conway, whose home is surrounded on all sides by water. "Even the older people have never seen anything like it."

In the modest downtown area, two huge, jagged trenches had been gouged into two city streets to channel the water away. A white and black sign at First and Oak streets warned residents: "DON'T DRINK THE WATER; GET DRINKING WATER FROM THE COMM. CENTER."

Sandbags and plastic pipes lined wet streets, and pumps were running nonstop throughout the community Thursday, with some success.

Surface water levels were dropping as the water was pumped into the river, and areas that had been virtual lakes a day earlier had been reduced to large puddles. Motorists could get in and out of town again — provided they knew which back roads to take — and the Red Cross was providing assistance for the beleaguered residents, some of whom have been driven from their homes by the water.

One of them was Dellann Stutsman, who awoke at 4 a.m. to find one basement wall collapsed and the water rising.

"It just kept rising and rising. We couldn't stop it," said Stutsman, who is living in a camper with her husband while they wait for the water to recede. "We can't live in the camper through the winter. I don't know where we're going to live."

Drinking water throughout town remained contaminated from sewer backflows.

"All we're trying to do here is steer the water out of town," explained village board member Don Hughes, as he and two companions piled sandbags along a road next to his house in anticipation of more rain.

The road was dry, but the field just beyond it had become a lake that threatened to cross over to the house. "We're just getting ready for the next round," said Hughes, referring to a 30-day outlook that calls for more rain than normal.

The flood submerged low spots on Illinois 78, closing the highway both north and south of town. It also shut down access to virtually all the smaller back roads Tuesday and Wednesday, although they were passable in some spots Thursday.

"I hadn't been able to come to work for two days," said Trish Little, standing behind the bar in The Brick tavern, a popular duck-hunters' gathering place. Little, a bar employee who lives out of town, finally was able to get into the village Thursday, though she might as well have stayed home; the once-bustling tavern has remained utterly empty since the roads disappeared.

"I can't find anyone who remembers anything like this, not even people in their 80s and 90s," said Dooley, the mayor.

He said he had to complain to Gov. Jim Edgar's office to get the attention of Mason County's overwhelmed emergency services system, which was struggling with similar flooding problems in the larger town of Havana, to the north.

"I don't think they realized how bad it was here," Dooley said. "We've really got a situation here. The water could be down by next week if it doesn't rain anymore ... but if it rains another inch, it's going to be worse than it is now."

Major roads in Mason County remained closed on Thursday.

Illinois 97 was closed for 4 miles south of Havana, said Mason County Chief Deputy Leland Keith. U.S. 136 was closed from Illinois Route 10 to Havana, a total of about 12 miles, Keith said.

Illinois 78 is closed from Bath to just south of Havana, a total of about 3 miles, he said.

The Mason County Democrat
September 22, 1993

Bath Inundated After 6-7 Inch Rainfall

Run-off from a 6 to 7 inch rain Monday night inundated approximately one-third of the village of Bath with a foot to a foot and a half of water early last week.

Rising water Tuesday forced the American Red Cross to abandon plans to open a shelter in the village, although services were not otherwise affected.

A deep trench was dug Tuesday to channel water to the Bath Chute, but the force of the water at the end of Chestnut Street carved a deep gorge in the sandy soil, collapsing the last block of the road and threatening other property.

Up to six inches of water stood on some streets in Easton, and a drainage ditch overflowed in Forest City.

By Friday reports from Bath indicated two pools of water still standing. One was located on the south side of town and the other on the northeast side.

If more rain comes, engineers agreed a 200-foot ditch could be dug from the pond toward the river under the highway to a culvert already there.

Health Department officials arrived in Bath Friday to provide residents with tetanus shots. Meanwhile, the Red Cross provided food and drinking water to to disaster workers and victims throughout the week.

On Sunday the Red Cross conducted a Stress Recognition and Stress Management meeting in Bath.

The Mason County Democrat
September 22, 1993

Monday Rains Spawn Tuesday Flood Crisis

The east end of Havana came perilously close to being swamped with up to 5 feet of water in the dark hours between Tuesday night and Wednesday morning.

Over four inches of rain Monday, September 13 caused Sand Lake to overflow re-flooding Walker Forge and Havana Metal Culverts, and inundating the Havana Dairy Queen and the neighborhood behind it.

By early Tuesday evening the parking lots of both the high school and junior high were filled with water, as was the track around the football field. Water was filling up the baseball diamond as well.

Water poured out of the high school parking lot onto U.S. Route 136 and headed down Harpham Street to a low point at Main Street.

The flow was stanched by 9 p.m., by a wall of sandbags at the end of the parking lot, but when the water level began to threaten the school buildings a breech was made in the wall to buy time while another wall of sandbags was completed across Route 97 at the railroad tracks.

By the wee hours of the morning the sewer at Main and Harpham was overwhelmed and water crept up on the boulevard on Main Street and lapped at yards until the flow from Route 97 was stopped and the sewers had a chance to catch up.

Water also poured out of the high school's teachers parking lot at McKinley and Route 97 Tuesday night. It flowed past the McKinley St. Apartments and into Promenade Street.

A four-foot whirlpool developed around the storm sewer at the east edge of the Alco parking lot, and what the sewer couldn't handle flowed through the lot south of Alco, inundating the home of George Porter, located behind Green Oil.

Engineers worked feverishly much of day Tuesday taking elevation measurements in Havana and trying to predict where flood waters were most likely to go.

It appeared they might have run from a low place at Market and McKinley to Promenade. The next low spot appeared to be behind the Pepsi plant, then back to the river via the coal docks.

At the 5 p.m. briefing Tuesday engineers were anxious to get away to complete their calculations on the flooding.

A special briefing set for 8 p.m., started 20 minutes late as frightened residents waited for the engineers to arrive

As conditions appeared then they predicted water would reach an elevation of 472.9 at the high school when it peaked around 11 a.m. Wednesday morning.

The low point in the area east of Promenade St. and north of 136 to Adams St. was 467.2, indicating that there could be up to five-and-a-half feet of water in that neighborhood.

ESE engineer Gary Davis noted that the predictions were based on the worst case scenario, and did not take into account what would go down the storm sewers and what would percolate into the ground.

In addition to the homes in the east half of town as well as both the high school and junior high, flood waters would have threatened the city's waste water treatment plant and city wells.

The Mason County Democrat
September 22, 1993

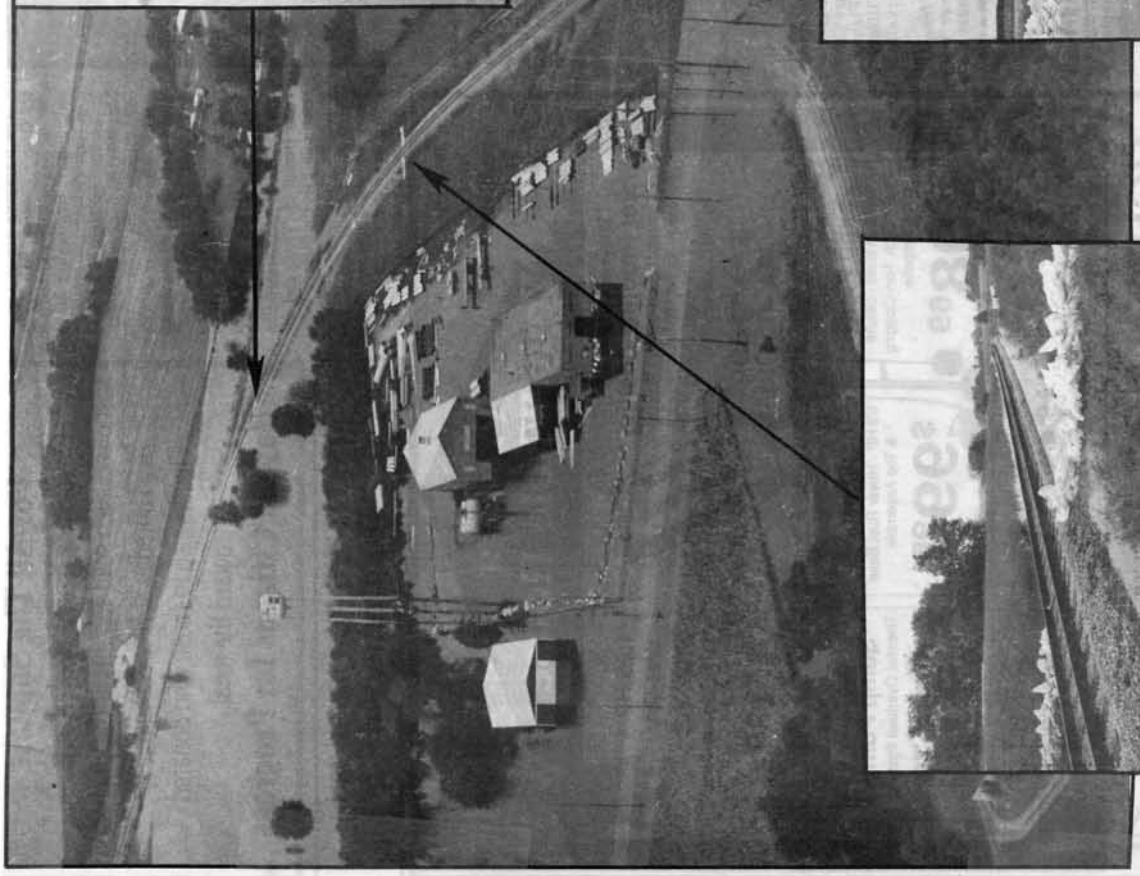
The Mason County Democrat, Havana, IL, September 22, 1993 Page 6

Flood Waters Continue To Threaten Havana Area

C&IM Railroad employees used a special trenching bucket to scoop gravel from between railroad ties Saturday so that pipes could be placed under the track to aid in moving water out of the pond behind Walker Forge.

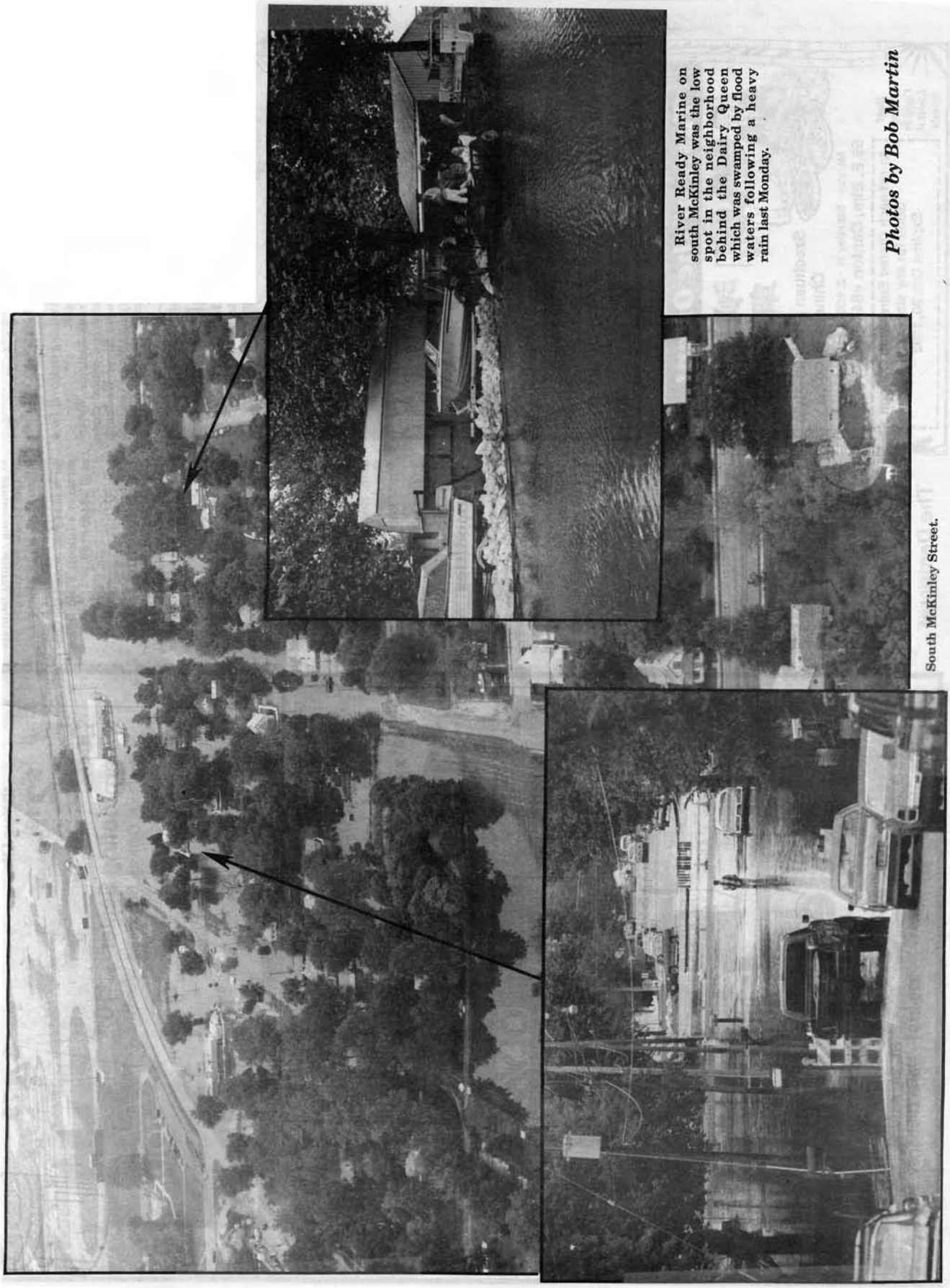
Gravel had to be dug out by hand between the rails because high water prevented the trencher from reaching at the best angle.

Sand bags were placed on Route 97 late Tuesday to stanch the flow of flood waters from Pool No. 2 into Havana.



Sand bags at the C&IM railroad were used to keep water from running down Route 97 and inundating the south and east ends of Havana.

The Mason County Democrat
September 22, 1993

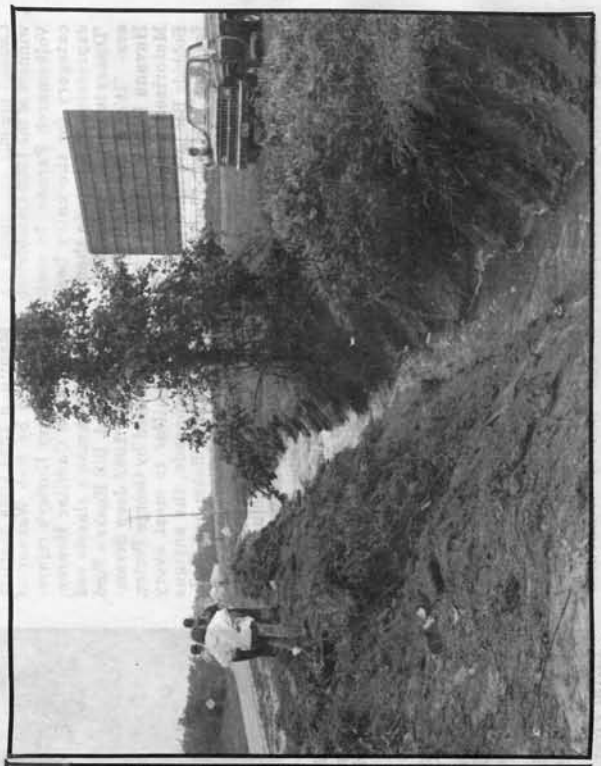


River Ready Marine on south McKinley was the low spot in the neighborhood behind the Dairy Queen which was swamped by flood waters following a heavy rain last Monday.

Photos by Bob Martin

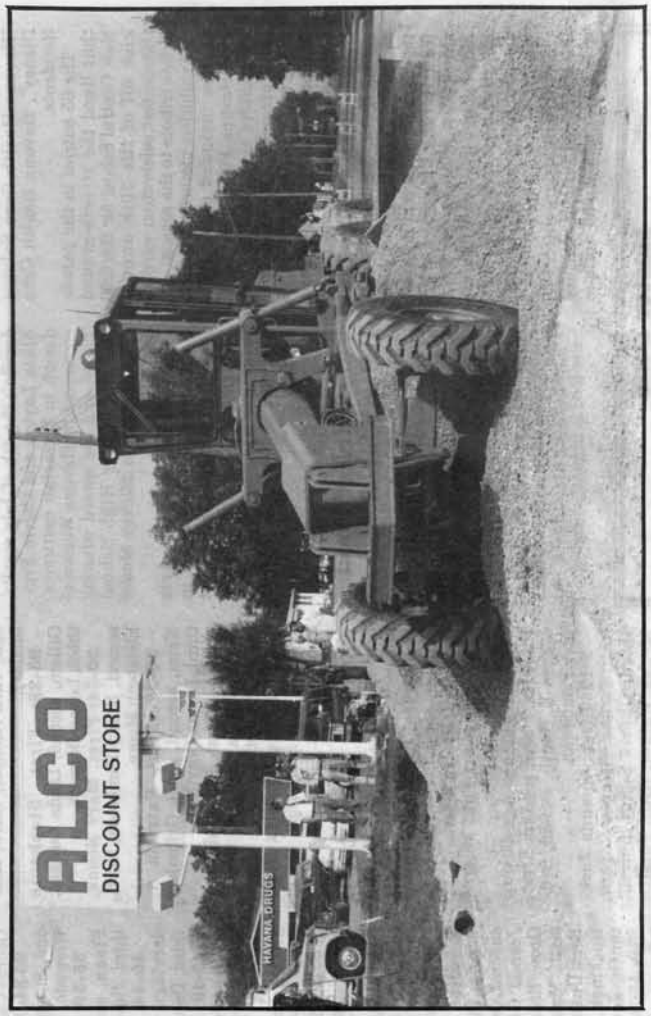
South McKinley Street.

The Mason County Democrat
September 22, 1993

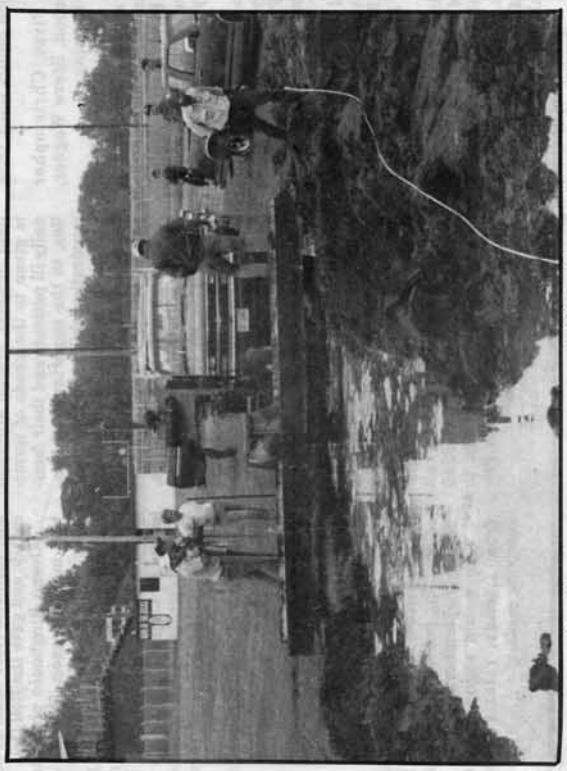


Sunday morning a trench was dug along Route 78 near the old drive-in theatre to facilitate the movement of water to White Oak Creek and into the river.

Water could be seen washing over Promenade Street just south of Beer Can Alley Friday as it makes it way toward White Oak Creek and the Illinois River.



The Illinois Department of Transportation brought in white rock and equipment Saturday to build a ramp on Promenade Street in front of Alco to go over a pipeline that reached from the high sewer at the corner of Jefferson and Schrader. The ramp enabled the highway to remain open.



A large pump was installed at the Havana High School ball diamond Saturday afternoon. Pipes were laid Sunday and it was used to pipe water away from the south east end of Havana.

Photos by Bob Martin

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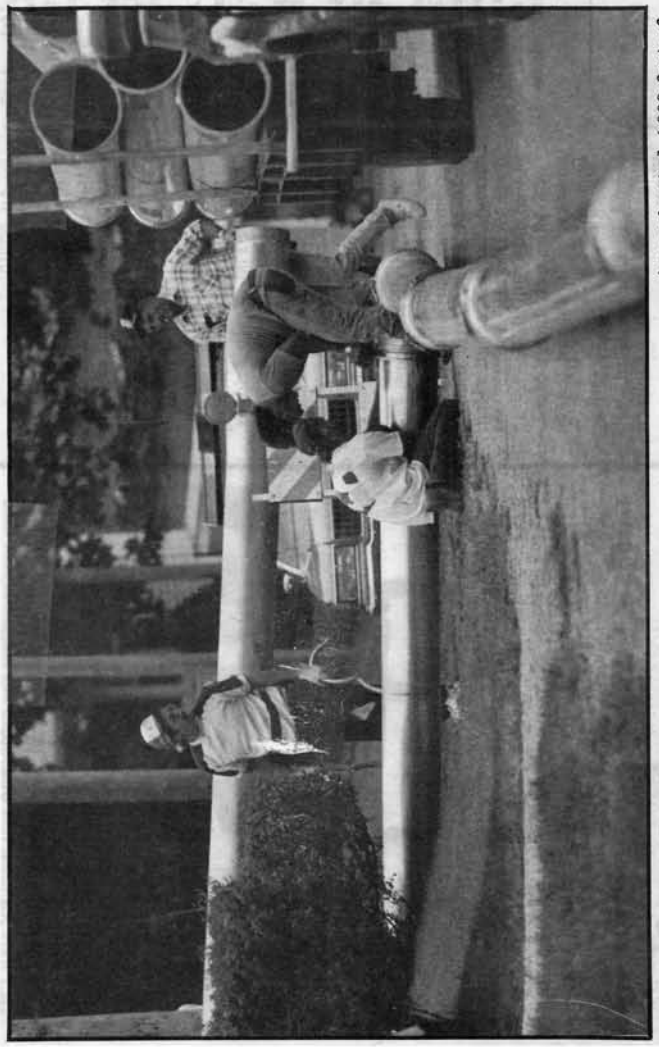
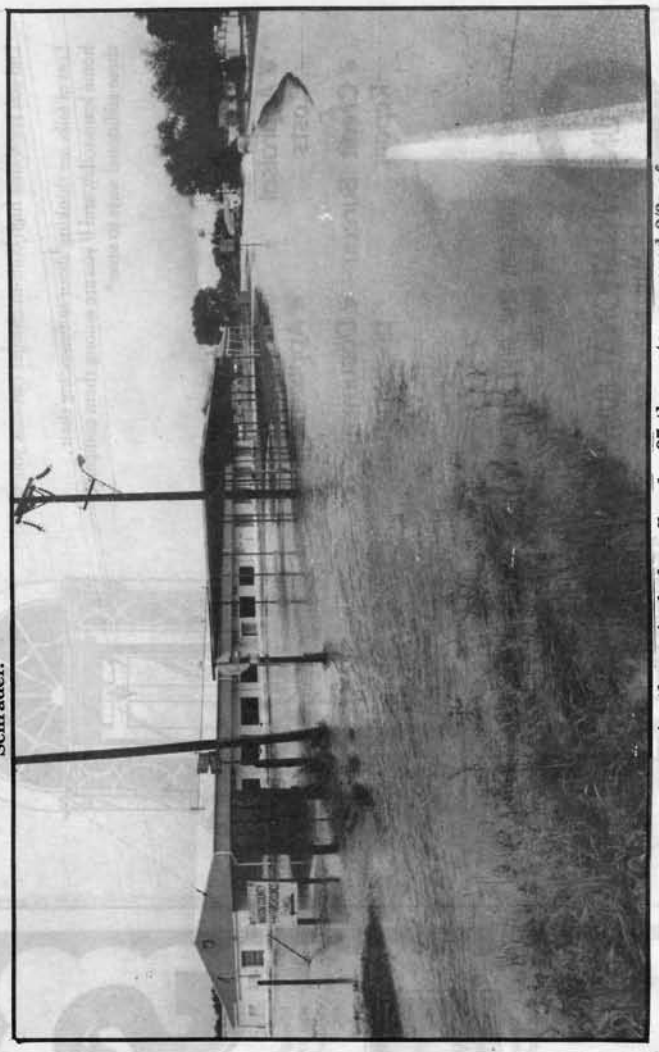
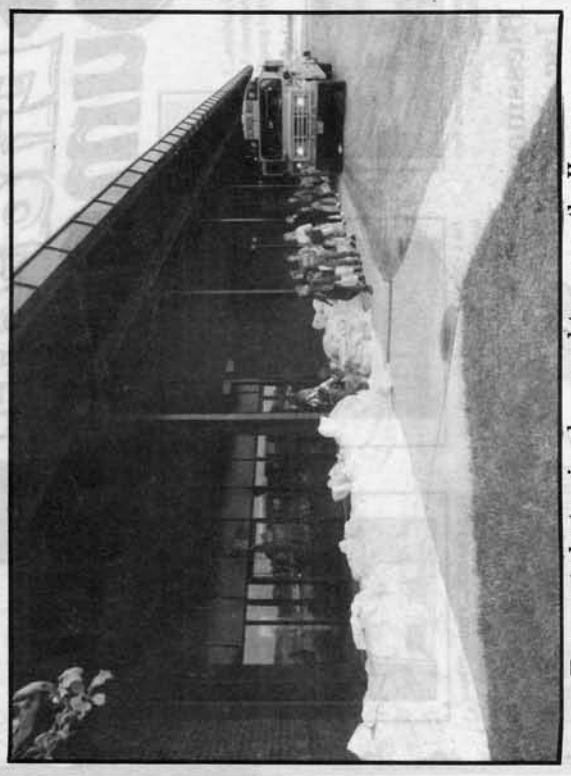


An estimated 4,000 feet of reusable aluminum irrigation pipe was laid Sunday across Havana to pump water from the south end to a sewer at Jefferson and Schrader.



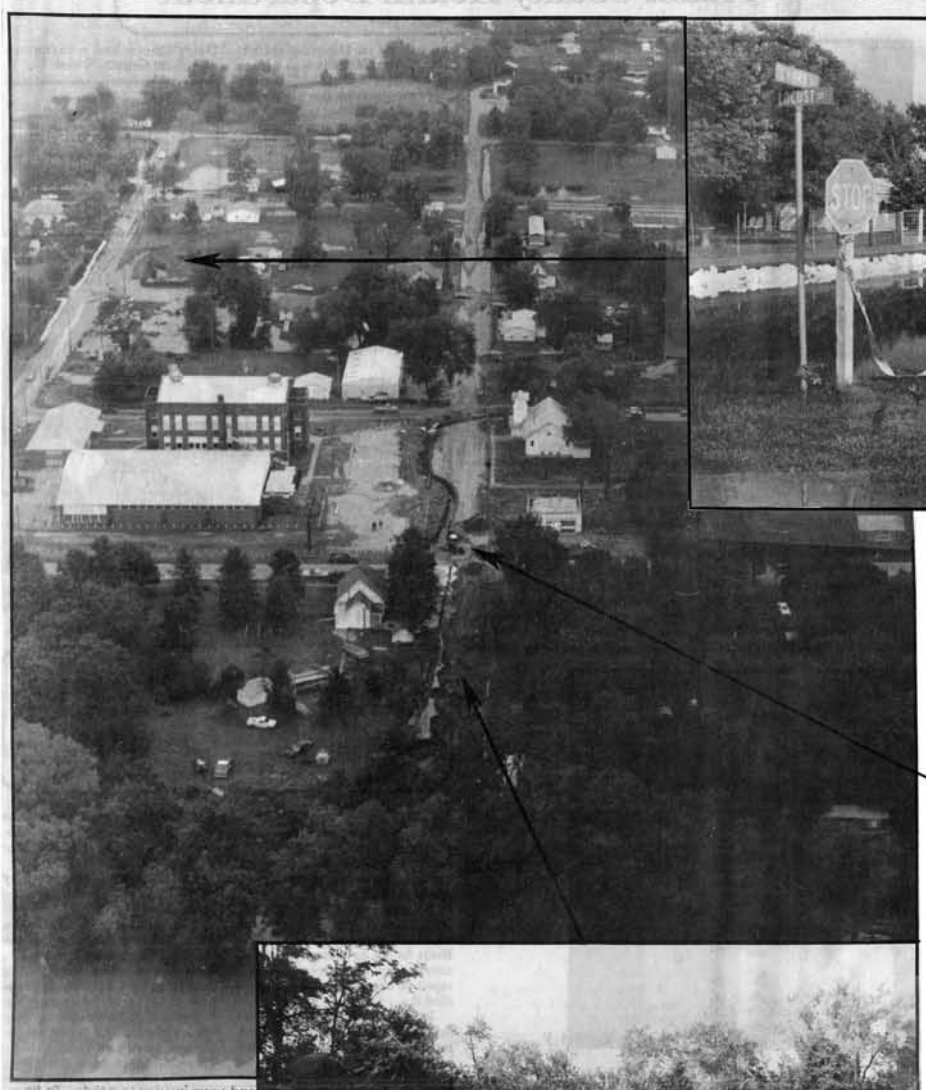
As the rain-laden flood waters peaked Tuesday at 97 the water covered 2/3s of Green Bay Foods on Route the highway.



Havana students missed two days of school last week when flood water threatened to swamp the Havana Junior High.

The Mason County Democrat
September 22, 1993

6-7 Inch Rain Inundates Bath With Overflow



Bath as seen from above Thursday morning.

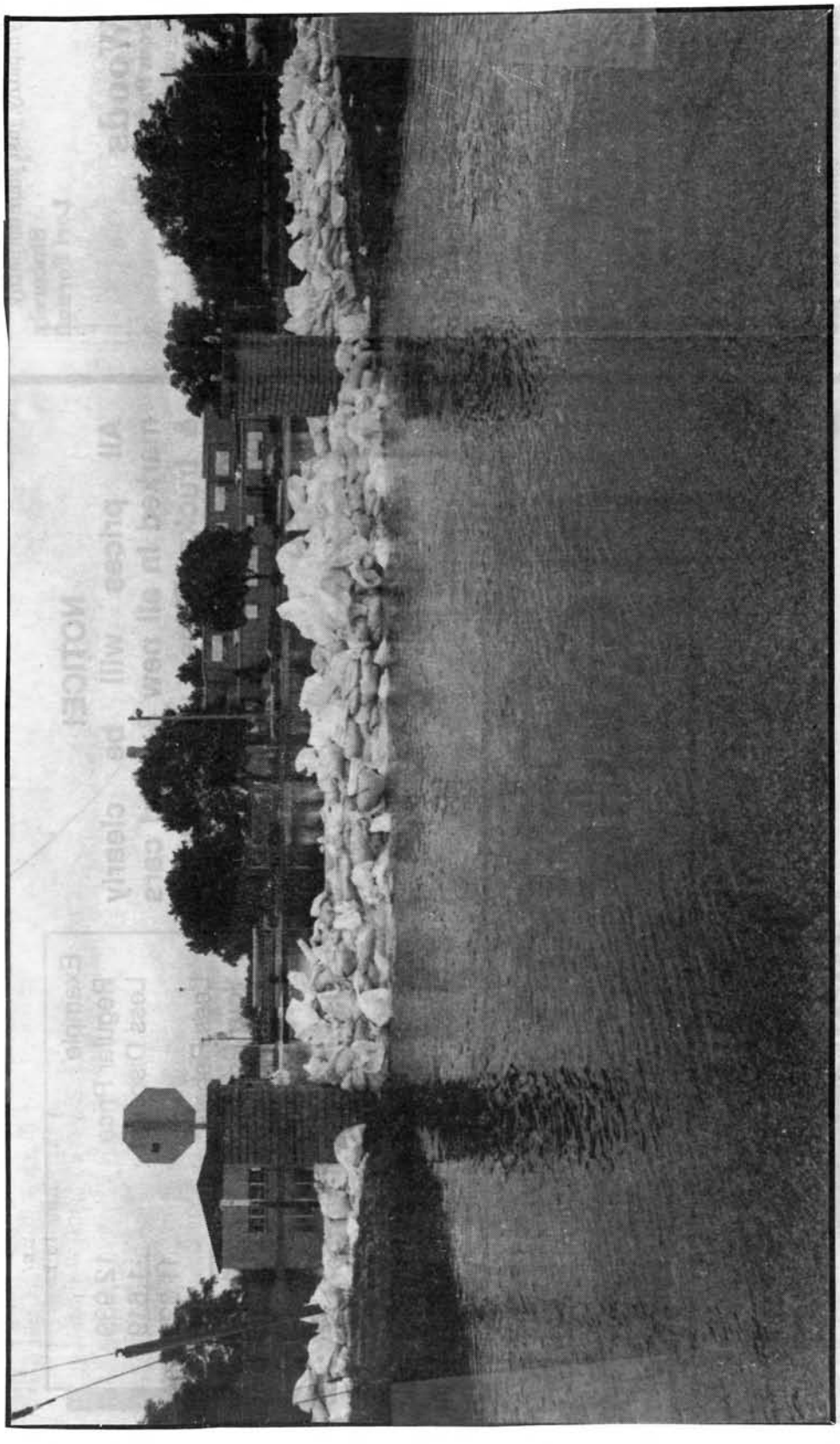
The corner of Cedar and Locust streets were still under water Friday in Bath which was drenched with 6 to 7 inches of rain Monday.

A power take off pump at Route 78 was used to lift water over the highway from a ditch in Bath.
One-third of the village was under water Tuesday.

A gully washed out the end of Chestnut Street in Bath from the force of water flowing from a ditch that was dug to connect floodwaters in the village with the Bath Chute.

Photos by Bob Martin

The Mason County Democrat
September 22, 1993



A wall of sandbags was placed at the end of the parking lot at Havana High School early Tuesday evening when water began pouring through and down Harpham Street to Main. A 4 to 5 inch rainfall Monday night caused the water at Sand Lake to rise to record levels, flooding the south corner of Havana. Bath was also inundated and water was reported in the roads at Easton and Forest City as well.

Unidentified Article from 1993

Residents cope with flooding

Saturated aquifer causes water to rise

The Associated Press

HAVANA, Ill. — Like thousands in the Midwest, Julie Reed has spent months fighting a flood. The basement is awash, the water heater ruined, the building foundation weakened.

What's strange is that her house is two miles from any river.

The flood that shows no signs of receding anytime soon comes from an underground lake so swollen with rainwater that it has risen above ground.

Tears welling, Reed described the frustration: water pumps running constantly, bringing a new baby home to a damp house with no hot water and, most of all, knowing the high water won't go away.

"They say it will be a couple of years before the water really leaves," Reed said. "Our next big worry is what will happen when the ground freezes. It's so soaked with water that it could crush the water pipes."

Ponds and streams have sprung up everywhere in western Mason County, a farming area about 35 miles southwest of Peoria.

Three state roads and a dozen county roads have been closed at one time or another. Up to half the farmland might not be harvested. Sandbags surround houses to keep out the new streams, while pumps work furiously to empty basements of seepage.

The cause of all this flooding is the Sankoty Aquifer — trillions of gallons of water suspended in Mason County's loose, sandy soil. Almost twice the normal amount of rain has fallen there over the last year, filling the aquifer far beyond capacity.

But the aquifer can't drain into the Illinois River, as it usually does, because the river is at flood stage.

That means the underground water has risen above ground in low areas, forming ponds that drain into homes, businesses and fields.

Only ducks seem happy. They now enjoy "Sand Lake" — acres of waist-deep water in what are normally dry fields.

The boundaries of flooded roads must be marked with small flags so drivers can creep through. Road crews dump load after load of gravel to raise highway beds above the water.

When torrential rains hit a couple of weeks ago, Havana and nearby Bath got a taste of the flooding that plagued Mississippi River residents all summer.

The Havana Dairy Queen was surrounded by water 20 inches deep. Only emergency sandbagging and around-the-clock pumping kept water out of the restaurant, owner James Meyerhoff said.

"A lot of homes are still flooded," he said. "They're in a dilemma about whether to pump the basements out. The ones that pumped them out have had walls collapse and floors buckle."

Residents know they are only one good rainfall away from another flood. With the ground soaked, rain has nowhere to go but into their homes.

While a flooded river will subside in days or weeks, a flooded aquifer drains much more slowly — perhaps only two or three inches a week. If the area sees normal rainfall, it could take months for the pooled water to drain away and even longer for the soaked ground to dry out.

If rain falls in buckets — well, people don't want to think about that.

AP photo

A man walks around sandbag dikes used to divert water from the overflowing aquifer away from the railroad tracks in Havana, Ill.

The Mason County Democrat
December 29, 1993

The Mason County Democrat, Havana, IL, December 29, 1993 Page 2

Washington Okays Waiver For "Seepage" Flooding

While the National Flood Insurance Program (NFIP) specifically excludes coverage of losses due to seepage or other sources of underground water when no surface flooding has occurred, an exception has been made that will directly affect Havana.

Donald L. Collins, acting administrator of the Federal Insurance Administration, informed Congressman Robert Michel (R-Peoria), earlier this month that he would waive the exclusion if surface flood waters were prevented from touching the property because of sandbags or flood shields or other actions taken to protect property from flood water.

Collins' ruling was made in response to a letter from Havana insurance agent Michael Snedeker who argued that homeowners shouldn't be penalized for protecting their property.

Collins agreed. "The Federal Emergency Management Agency (FEMA) does not wish to have these policy holders, who very commendably took action to protect their property and by so doing prevented covered flood damage to their buildings, to be penalized by their actions."

Collins said he would waive the exclusion for loss from seepage or hydrostatic pressure so that the losses will be covered if individual, temporary structural protection, such as sandbags, prevented surface flood water from touching the insured structure.

"The waiver will also apply where the protective action which prevent surface waters from touching an insured structure was taken by the community," Collins said.

Ironically, while the sandbags at the intersection of Route 97 and the C&IM Railroad are the object of a lawsuit recently filed against the county, those sandbags, which may have prevented surface water flood damage to a number of Havana homes, could activate flood insurance coverage for residents with water in their basements.

The Mason County Democrat
December 29, 1993

Bath Official Investigates Water Deal

Bath Mayor Flood Dooley has expressed an interest in possibly working with the city of Havana in providing his community with municipal water.

Havana Mayor Allan McNeil relayed that he had met with Dooley last week to discuss the possibility of purchasing water for Bath from Havana.

Bath residents currently get their water from individual well supplies, but flooding this year has caused contamination problems for many.

"From talking to the engineers, I could see where this could be advantageous to both communities," McNeil said.

The Mason County Democrat
December 29, 1993

Council: County Must Take Lead On Ditch Project

Because part of the project lays outside the city's jurisdiction Havana officials said Tuesday night that Mason County should take the lead in advancing the proposed ditch project.

Meanwhile, Alderman James Stelter was named to head up a committee to decide what flood mitigation measures the city needs.

The council discussed working with the county on a long-term solution to the flooding problem at their meeting Tuesday night.

Alderman James Trimpe suggested the council vote officially to work together with the county.

"That might be a little premature," suggested City Attorney Don Boggs. "There's no plan on the table yet. You would be voting without knowing exactly what the city's role would be."

A proposal has been made to construct a $1.3 million ditch from Sand Lake through the city of Havana, but council members questioned who was in charge of getting things going.

Mayor Allan McNeil indicated that he did not think it would be appropriate for him to get vocal in the county "outside my authority and jurisdiction".

"I think its fairly evident and obvious I would like to cooperate with those people, but I can't take the leadership, the county's got to," McNeil said.

He added that he was under the impression that the county was working on finding grant money for the ditch project. McNeil noted that taxes couldn't even pay the interest on the debt it would create unless some grants are sought to pay some of the cost.

"People want answers and I don't feel we're getting anywhere," said Stelter.

"Talk to the county, not the city," McNeil suggested.

"They want to know to what extent you'll cooperate," Stelter pressed.

"I haven't said 'no' yet," McNeil replied.

One major question in regard to the ditch is how will it help city residents. McNeil reiterated that it was not expected to have any appreciable effect on water in peoples' basements.

Stelter noted that "other things" could be added to the ditch that would help with drainage.

Other things, such as individual drainage lines are not currently part of the $1.3 million ditch project.

McNeil suggested Stelter head a committee to come up with a plan for a mitigation project that would help the city. He also suggested that the committee look into ways to pay for the project.

Boggs suggested insurance companies as one possible source of funding.

"They may find it cheaper to contribute to something like this than pay the insurance," he said.

Aldermen Trimpe, Steven Spring, Ed Ray and Robert O'Shaughnessy volunteered to serve on the committee with Stelter.

The council also directed Boggs to write a letter informing county officials that they were forming a committee to come up with suggestions, but were awaiting suggestions from the county as well.

The Mason County Democrat
December 29, 1993

Volunteers Lay Pipe

Volunteers worked several days last week laying out pipe in preparation for pumping water from Walker Forge Pond to the Illinois River.

Volunteers helping with this operation included Speed Dowell, Lynnea Dowell, Kevin Miller Penny Jacobus, Ed Karasek, Ken Meyer, John Roat, John Fisk, Bill Row, Ed Haage, Robert W. Martin, Jr., Bob Oest, Larry Hatfield, Harry Fornoff, Steve Fornoff, Randy Fornoff, Darryl Fornoff, Roger Thompson, Jim Stelter, Eric Stelter, Eldon Frye, Julius Stelter, Louis Stelter, Dan Roat, Kevin Donoho, Dale Osing, and Dick Heinie.

Businesses and friends and their donations included Havana Metal Culverts (culverts), David Larson (six inch pipe), Petersburg Plumbing and Heating (pipe fittings), Griffin Electric (extra material for fittings), and Lee Gruber, Lewistown, (aluminum welding).

Oney's furnished coffee for the workers and Ceil Stelter, Shirley Fornoff and Mele Oswalt furnished cookies and donuts.

Volunteer workers put a culvert under the road by the Catholic Cemetery Thursday.

The culvert will be used to hold the pipe installed to carry water from Walker Forge Pond with the pump loaned by the City of Havana to county officials.

The Mason County Democrat
January 5, 1994

Flood Assistance Meeting Set For January 26

While some flood-affected Mason County residents feel like nothing is being done about the flooding, Cindy Geuder doesn't agree.

When the flooding first began the Central Illinois Economic Development Corporation (CIEDC), also known as Community Action Agency, immediately applied for flood mitigation funds from the Federal Emergency Management Agency (FEMA).

Among the programs they applied for was the HOME program, designed to provide low interest loans, and the Community Service Block Grant (CSBG).

According to Geuder, director in charge of managing the HOME program, about $2 million has been approved for the five county area served by CIEDC. The budget for the funds was approved in mid-December and Geuder says she was hired right away.

"I was whisked off to Springfield for two days of training," she said, before coming to Havana to open an office on the second floor of the "old jail" on the 200 block of N. Broadway.

Geuder plans an informational meeting for residents throughout the county on January 26 at the C.I. Chester Center.

That meeting is for homeowners, community officials, farmers, business owners - anyone who could possibly benefit, Geuder said.

"When you have a disaster, there's lots of devastation. We have to look at the future and how we can economically help the community," Geuder said.

The list of options includes obtaining new land, new home construction, and relocating some homes to higher ground.

"My long range goals are to get people educated as to what loans are available, qualify them, and then look at moving them or rebuilding their homes when the danger of flooding or frost is gone," she said.

Geuder noted that you can't remodel homes when there is still water in the basements to deal with and the threat of problems from frost and freezing.

"We don't want to sink thousands and thousands of dollars to do a quick fix when we can look long range about fixing it permanently," she added.

Funds from the HOME program will fill in the gaps not covered by either insurance or FEMA.

The first source of funding will be through the insurance benefits an homeowner might receive, Geuder said. That would be followed by FEMA mitigation funds which can cover up to 50% of the remaining cost for rehabilitation. The HOME program kicks in after that, providing low interest loans to cover the remaining costs.

Cathy Blankenship is in charge of the CSBG flood grant program designed to assist low income households with utilities, and cleaning supplies, water heaters, and, in some cases, even furnaces. A total of $25,000 has been allocated to Mason County for that program, with another $21,900 in direct client assistance for both Mason and Fulton counties for flood victims who have had to maintain two residences because of the flooding.

The HOME office will have four full time staff members. In addition to Geuder there will be a case manager to work directly with families, a construction specialist who will be working directly with contractors, and an office receptionist.

Those who want more information about the flood mitigation programs may call 543-2594 where applications are being taken by appointment.

The Mason County Democrat
January 5, 1994

County Wants Solution To Water Before Spring

by Wendy Martin

Members of the Mason County Board Flood Committee agreed Monday morning that they'd like to have a solution to the county's high water problems in place by spring before seasonal rains have a chance to aggravate the situation.

Whether they can avoid additional flooding is unknown, but board members indicated they felt they could lessen the impact of flood waters if they did something now.

On the top of their list is finding a way to drain down Sand Lake enough to forestall surface flooding in the spring.

Board members Richard Heinie, Dale Osing, James Griffin and Henry Imig met with Cindy Geuder who will be administering the HOME flood mitigation program from the Federal Emergency Management Agency (FEMA). They had hoped to find some funding leads through Geuder to get something under way.

Although a super ditch has been discussed at length, board members doubted anything could be started in time for it to help the immediate situation.

Committee chairman Heinie suggested that a drainage pipe, similar to what had been reported to exist in the distant past between what is now called Sand Lake and the Illinois River, be tried instead.

Heinie added that it would probably require easements only, which would be a lot easier to obtain than purchasing land for the ditch.

Board member Osing agreed that they need to start something.

"We need to be looking at something that will have an impact, very strong impact, on the water situation, but could move a lot faster. Piping would be a solution...It doesn't require a lot of land problems, and we could get something done quicker," he said.

"The whole purpose of a plan is to have something in effect working for us before spring rains come and do some real serious damage...if it can get worse," he added.

Geuder asked board members if they had considered a county-wide drainage system, similar to the irrigation systems in the southwest.

However, since this is the only time in memory the water has been this high, board members questioned the need for such an extensive response.

"Just four years ago we were worried that the county would go dry and there wouldn't be enough water to run the irrigation systems," said County Clerk William Blessman.

It wasn't clear if the program Geuder will administer will have any funds for the county. The flood mitigation program apparently will concentrate in providing funds for low income residents to pay for home repairs.

According to Geuder money is also being earmarked for buy-outs of homes too damaged to be occupied.

Blessman indicated the county will continue to search for funds to pay flood-related costs.

He reported that while FEMA only approved half of what the county spent on engineering, county officials will "strenuously" appeal that decision.

The county has also received a grant for $25,000 for planning future flood mitigation action, but it is not clear at this point what those funds can be used for.

Geuder suggested the county attempt to get publicity to call attention to Mason County's problems, and noted that she has arranged interviews with area daily newspapers.

One County Board member noted that getting an Associated Press story would bring Mason County to the attention of the powers that be in Washington D.C.

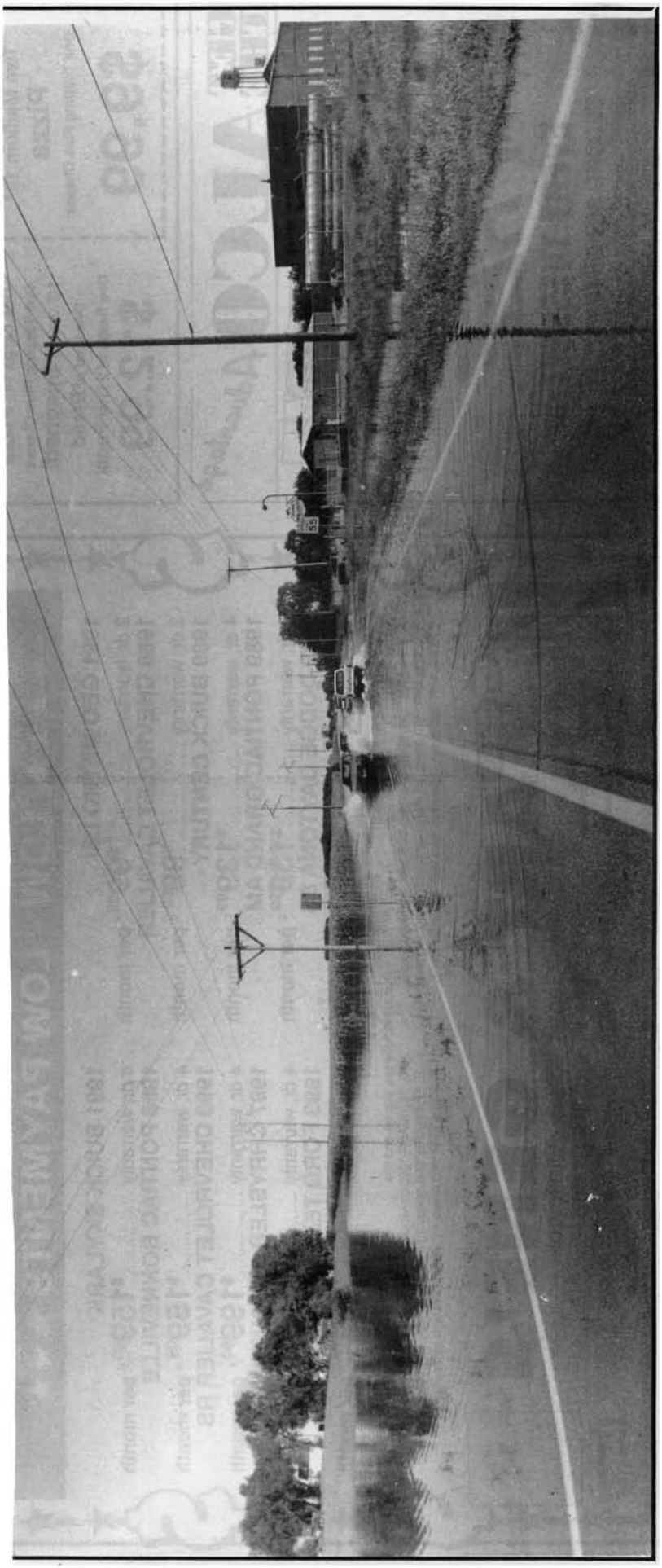
The Mason County Democrat
January 5, 1994

Appendix L

The Mason County Democrat January 5, 1994

Appendix L

The Mason County Democrat
January 5, 1994



Appendix L

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February 16 ,1994
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In 1974

Water Group Formed To Study Lowering Lake

Twenty years ago area residents were as consumed with looking for ways to address flooding problems here as they are today.

Old Times editor Mele Oswalt discovered the following story in a February 16, 1974 issue of the Mason County Democrat:

Group Formed To Study Lowering Water Level of Negro Lake

Approximately 50 interested citizens attended a meeting held at Stelters Sales and Service building on Thursday night, February 14, 1974, to discuss the problems caused by the rising water in the Negro (Sand) Lake area adjacent to and southeast of Havana.

A committee of three, composed of Dietrich Frye, Eldon Yetter and Jerry Neteler, was formed to study the feasibility of pumping the water to White Oak Creek, southwest of the area. This was suggested as a possible solution after an engineering survey was made. The engineers suggested the water could be pumped 2.15 miles south as the closest outlet.

Those landowners whose property would be affected and who were in attendance at the meeting voted to permit this action if it is found to be feasible. It was suggested that temporary pumping systems be borrowed from area farmers.

According to Trevor Jones, who acted as temporary chairman for this meeting attended by soil and water conservationists, farmers and engineers, the high water in the area is a dual problem: 1–the Mahomet underground flow, running from the eastern part of the country is rising due to heavy rainfall during the past year, and , 2 –there is a geological barrier, an underground reef of hardpan between between Negro Lake and the Illinois River which allows the water to seep out very slowly.

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Lake

from Page 1

The highest level in the Negro Lake area in memory of those present was only four feet higher than it now stands, and that was in 1926. Already it is jeopardizing hundreds of acres of land - even as far north as Forest City where water has begun to appear in basements and low places.

The records show a drain pipe was installed from Negro Lake to Havana in 1885, draining the water through the Havana sewer system and into the Illinois River. This is no longer functioning and has been out of use many years. Those attending Thursday night's meeting agreed it was no longer feasible to reinstate that system.

Future meetings concerning the matter will be announced later.

Jerry Neteler, a member of that 1974 committee, told the Democrat this week that the committee never got off the ground.

"We got about the same feed back then as now...The only way to do it was to pump. The cost at the time was prohibitive," he said.

Neteler added that it took three years to get the water down in 1974, which he said was nothing compared to the current flood.

He added that an attempt was made to dig along the highway to find an old tile to the city's sewer system, but it was never found.

The Mason County Democrat
February 16, 1994

Conclusions are disputed

Pair Cite Irrigation Wells As Cause Of Flooding

A retired mechanical engineer and a long-time resident of the Havana area have come up with a theory on what they believe has really caused the flooding this year.

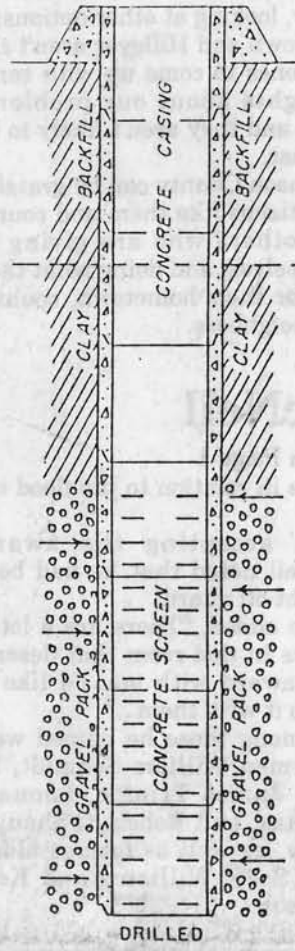
But in private meetings with city, and county officials and engineers from Environmental Science and Engineering, retired engineer Richard "Dick" Hilleyer and Havana Postmaster William Brown have had trouble obtaining acceptance for their ideas.

Hilleyer and Brown believe that irrigation wells in general, and four wells right around Havana in particular, are the source of the water that has been plaguing this area since summer.

"What is our blessing here, the aquifer, is also our downfall," said Brown.

A paragraph in a 1965 report by the Illinois Geological Survey on Groundwater Resources of the Havana Region describing artesian wells reinforces their theory that water is being forced by hydrostatic pressure up through the gravel pack around well casings from the aquifer to the surface.

The Geological Survey report says that if an aquifer is confined between two layers of non-permeable material - sometimes called hardpan - when more water is added from a higher elevation there will be hydraulic pressure.



"When such a aquifer is penetrated by a well, water will rise above the aquifer in the well to a height equal to the hydraulic head of the aquifer...Wells penetrating such aquifers are called artesian wells," the 1965 report says.

At least four wells in the Havana area are acting as artesian wells, flooding the area the new report contends.

Hilleyer and Brown believe that water under pressure under ground is able to leak out where wells have been dug through a hardpan layer, and according to their calculations, enough water could have come up to account for the flooding at Sand Lake.

The list of references for their report include a study on the Water Resources in Mason County, the Sand Lake Watershed Feasibility Study prepared by ESE, a hydraulics engineering handbook, and "just plain hydraulic engineering facts plus common sense", they say.

Among the facts they recite is a note that in 1960 there were only 11 irrigation wells in Mason County.

"The irrigation boom started in the late 60s and 70s, with several hundred or perhaps even thousands of wells existing now in Mason County."

The pair disputes ESE reports that the last four years have been wet years. They believe that gravel areas around the wells allows rainwater to get back into the aquifer faster so that pressure can build up

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from Page 1
faster.

"The high water levels have risen, since 1965, in direct correlation with the number of irrigation wells. This proves that we are not looking at a '100 year flood' or a '20 year flood' but that it can happen again in any wet year from here forward unless something is done," they write.

In addition to flooding, the pair expresses concern that when water isn't coming up through the gravel, farm chemicals can be going down it to possibly pollute the ground water.

Their recommendations include forbidding construction below the aquifer's highest level, and "pressure grouting" existing wells to keep water from coming back to the surface through the gravel.

Both Brown and Hilleyer say they know witnesses or have seen pictures of water either coming up from around a well, or of water being pushed up and out irrigation arms.

They believe that that evidence is being ignored because of concerns of making the flood situation a "city versus farm" issue.

The pair has submitted copies of their 50-page report to a wide variety of groups, including the Soil Conservation Service, Mason County Water Authority, and Mason County Board.

It was discussed briefly at the February County Board meeting. County Clerk William Blessman noted that there is a consensus the the phenomenon Brown and Hilleyer describe probably occurs, although there is disagreement in regard to the extent to which it happens.

"There have been a lot of different ideas on cause and effect during this crisis. The board's position has been not to rule anything out. All ideas will receive due consideration," Blessman said.

The Mason County Democrat
February 23, 1994

$1,467,000 Set Aside For Buy-Out Of Scarborough

Preliminary approval has been given to provide the state of Illinois with $36 million to aid victims of the Great Flood of '93, including $1.467 million to buy out 20 homes in and around Scarborough Estates.

The subdivision is among the areas in Mason County that has flooded from below since July as the water level of the aquifer approaches ground level.

According to Mayor Allan McNeil the figure announced by Governor Jim Edgar's office Wednesday matches to the dollar what the city had requested for the besieged subdivision located just past Mason District Hospital on Franklin Street.

McNeil said the application papers he received from the governor's office had a deadline of March 15, but he expects to have them completed and submitted well in advance of that date.

"The application is a formality. It's virtually certain we'll get the money in a few weeks (after that)," Mc Neil said.

He added that two buyouts are currently being planned. In addition to the initial 20 homes in the Scarborough area, there is a "high probability" that 46 more homes will be purchased in Havana and 25 in Bath.

The grant application seeking the buy-out for Scarborough Estates sought an average of just over $73,000 per home. The actual amount each homeowner receives will depend on how each property is appraised, based on pre-flood conditions.

Over the weekend McNeil said he was not sure how the process will work, but he intended to suggest that work on obtaining appraisals begin right away to facilitate the process.

"If people knew some money was coming, at least they could go out and begin to make arrangements," McNeil said.

Three-fourths of the buy-out will be funded through federal sources. The remaining quarter will be covered by a Community Development Action Program grant from the state.

If the buy-out comes to pass, the land will eventually belong to the City of Havana with the condition that no one will be permitted to build on it ever again.

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Need a place to go, way to get there

Quick Thaw Causing More Woes For Scarborough Area Residents

An estimated 200 to 250 Havana school children will have to find their own ways to school until area roads improve.

At the request of Havana Township Road Commissioner Robert Oest School District 126 has been asked to stop running busses on all roads south of U. S. Route 136 and east of Route 97 to the Easton Blacktop.

Additional roads may be closed as the frost leaves the ground, and decisions will be made on a day-to-day basis, said school superintendent Dr. Jack Wagoner.

Even the roads in the Laurel Hill Cemetery have been closed to vehicles for the time being.

Some county and township roads in the Havana area feel like sponges when you drive on them following the quick thaw that took place last week. Franklin Street, the road that leads into Scarborough Estates subdivision deteriorated quickly, turning the road to mush.

Emergency Services and Disaster Agency Coordinator Greg Griffin closed the road to all but local traffic Friday, but traffic over the weekend included both sightseers and residents moving out.

"We expected it would happen, but we never dreamed it would happen that quick," Havana Mayor Allan McNeil said.

Township and city officials worked together over the weekend hauling rock to the road in an attempt to stabilize it.

At least one family moved out over the weekend because they were afraid they would become marooned, and unable to get to work.

Allen and Debbie Trone received temporary assistance from the Salvation Army to stay at a local motel.

Trone reported that roads in the subdivision may soon be as bad as the road leading to it.

He said he was standing in the street looking at his compact car on Friday when he saw water bubbling up.

"I put my heel down on the black top and water shot out," Trone said.

"I called the police and they

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Thaw from Page 1

came out. At first they didn't think too much about it, until their squad car started sinking," Trone added.

Another family moved out over the weekend after they reportedly received funding from the Federal Emergency Management Agency (FEMA) to provide temporary housing in Pekin for up to 18 months.

Griffin suggested that residents could use the temporary housing grants through FEMA until the federal buy-out of the subdivision is completed. **(See BUY-OUT)**

He said residents need to keep in touch with FEMA to get the housing assistance. While the help is available, he indicated it takes persistence to get grant money.

Others, including the McNeils who live in the subdivision, fear they have no other options at this time.

Generosity by area residents may provide some assistance. Wesley and Dixie Hilst, owners of the River Park Retirement Home have offered the temporary use of their facility to lodge stranded residents.

Work is also continuing to obtain trailers from FEMA.

Temporary use of a lot has been offered that could hold ten trailers, but McNeil indicated that FEMA needed a firmer commitment on how many are needed.

"They told Greg (Griffin) they didn't want to move ten trailers in and then have only two people use them," he said.

Griffin agreed. "For the first time this weekend we got seven residents to commit that they would use the trailers," said Griffin.

Efforts to get assistance were bogged down by the Monday state holiday.

Both McNeil and Griffin had a list of government offices they planned to contact first thing Tuesday.

"If it cools off again that might save our bacon another 30 days. A lot have moved out this weekend. Sharon and I talked it over and we'll stay as long as possible. We don't know where we can go," McNeil said.

Water forces Havana families out

Rich Saal/The State Journal-Register

Havana Mayor Allan McNeil stands in the flooded basement of his home in Scarborough Estates. McNeil will probably be forced to abandon his home when spring arrives and access to the subdivision through fields is cut off.

Government to buy 637 flooded homes

By STEPHEN BEAVEN
STAFF WRITER

The Federal Emergency Management Agency pledged this week to provide nearly $12 million to buy 637 flood-ravaged homes in Illinois.

FEMA announced on Friday that homeowners in 21 municipalities will be eligible for federal aid totaling $11.8 million. That includes $1.1 million for Havana, $540,000 for Greene County and $1.2 million for Hardin.

In Havana, the money will be used to buy 20 homes in the Scarborough Estates subdivision. Most of the people in the subdivision moved out over the last week after the only access road, Franklin Street, had deteriorated to the point it had to be closed.

"This is helpful for some of the residents," said Havana Mayor Allan McNeil, who lives in Scarborough Estates. "It's a big deal."

The state applied for $1.4 million to buy 20 homes in Havana, Gov. Jim Edgar announced two weeks ago. McNeil hopes the state will make up the approximately $300,000 the federal government won't provide.

Offers on the houses may be made in the next three months, McNeil said. But he had no timetable for the rest of the buyout process.

The approximately $1.4 million the state asked for averages out to about $73,000 per house, McNeil said Saturday.

"I've got my fingers crossed that we'll get a fair market value," McNeil said.

Next month McNeil will apply for funds to buy an additional 46 homes in Havana.

Athough he is happy with state and federal response to Havana's plight since its underground aquifer began to rise last spring, all of Mason County needs more money, he said.

"They've got to cut loose with more money," he said. "In Mason County alone, there's going to be millions of dollars (needed) just for the roads. This has got to be addressed. And it's only going to get worse."

All homes in the 21 eligible areas must be demolished. Local government bodies must then convert the land to green space and maintain it.

Other areas eligible for federal funds include:

Twenty-seven properties in the village of Fults, for $535,800; 192 properties in Monroe County for $3.225 million; 43 properties in Hardin, for $1.2 million; 69 properties in Jersey County, for $829,800; three properties in the village of Browning, for $51,000; 33 properties in Pike County, for 439,200; eight properties in the village of Rockwood, for $51,000; and 17 properties in the village of Evansville, for $222,000.

Four properties on Kaskaskia Island, for $55,200; 12 properties in Randolph County, for $229,800; 29 properties in East St. Louis, for $339,381; 21 properties in Adams County, for $140,013; 36 properties in Greene County, for $540,000; 20 properties in Kampsville, for $600,000; 38 properties in Calhoun County, for $977,846; 41 properties in Madison County, for $825,000; five properties in the village of Pearl, for $75,000; five properties in the village of Elsah, for $150,000; three properties in the village of Hamburg, for $111,900; and 11 properties in Warsaw, for $132,000.

Aquifer flood persists after rivers retreat

By STEPHEN BEAVEN
STAFF WRITER

HAVANA — Since Franklin Street Road closed about nine days ago, the half-dozen flood-weary families that still live in Scarborough Estates have been taking an alternate route.

They drive out Illinois 136, east of Havana, turn into the parking lot at the Red Lion Motor Lodge, take a right into the cornfield, and drive through to their subdivision.

In Havana, where an underground aquifer has created emergency flood conditions since last summer, this is known as coping.

But with the spring thaw and potentially heavy rains imminent, the worst may be yet to come.

"What's going to happen down the road, I don't know," Mayor Allan McNeil said last week. "But it's scary."

McNeil is still living in Scarborough Estates, pumping water from his basement all day, every day. But he may have to move soon. When the weather warms and the cornfield that is his only access to home thaws, the makeshift road he and his neighbors have been using will turn to muck.

"When it heats up, I'm not going to have any choice," McNeil said. "I'm sitting here praying for the first time for it to stay cold for a while."

Since the underground aquifer in Mason County began to rise last spring, residents of Havana and the small towns around it have fought to save homes, property and farmland. At one point last fall, all three of the highways leading into Havana were closed at the same time, McNeil said. He estimated road damage in Mason County will cost "millions and millions of dollars."

Last fall, one pump was purchased and another rented with the financial help of the U.S. Soil Conservation Service. Those pumps are now at work on the north and south sides of Havana, McNeil said.

Water along Illinois 97, south of town, was diverted last year through farmland to White Oaks Creek to avert potential flooding

See **HAVANA** on page 14

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February 27, 1994
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HAVANA

From page 9

of Mason District Hospital, Havana High School and hundreds of homes. Farmers subsequently filed suit against the city and the county.

With the arrival of spring in the next month or so comes the potential for more flooding. As the Illinois River rises, the aquifer will have no outlet. McNeil said Havana will "do what we have to do" to avoid a possibly disastrous spring and summer.

But there seem to be few solutions.

In the short term, said Mason County Emergency Services and Disaster Agency director Greg Griffin, pumps will be used to to stay ahead of the water. Long-term solutions are being considered by the Soil Conservation Service.

Pumping, McNeil said, affects only surface water, leaving groundwater behind. Digging a ditch from Sand Lake to the Illinois River was discussed. But that also addresses only the surface water and presents many logistical problems, McNeil said.

One bright spot came Friday, when the Federal Emergency Management Agency awarded Havana $1.1 million to buy the 20 homes in Scarborough Estates. McNeil hopes the state will provide another $367,000 to match the sum promised earlier this month by Gov. Jim Edgar.

The land will be converted to open space, owned and maintained by the city.

Edgar's office also has said there is a "high probability" that 46 more Havana homes will be purchased.

McNeil credited state and federal agencies for their help, but said the entire county needs more help to get by. He and his neighbors, he said, have been counting on the buyout.

Like McNeil, Terry Stein hasn't moved yet. When Stein, his wife and two children are forced to move, he's not sure where they'll go.

"We've got no place to go right now," Stein said. "We don't really want to leave everything here because of the vandalism. I guess that's the biggest (concern)."

Stein's basement flooded for the first time in July and has had water in it continually since the fall, he said. He remembers lying in bed one night when he heard a pop that sounded "like a shotgun." He went to the basement and found a crack in the foundation.

Stein said he will accept the federal buyout. But he's not looking forward to it.

"I like the house," Stein said. "It's a well-built house. I'd hate to see it bulldozed down."

Mike Cowan and his family moved out on Monday. Moving was difficult, Cowan said. But staying was worse.

"It's kind of (tough) when you have to leave a house you've lived in for 16 years," Cowan said. "It was a sad moment when we took the last load. It was a sad moment. But it was a relief. It was just too much of a hardship."

The Mason County Democrat, Havana, IL, March 9, 1994, Page 8

"We still have a crisis - fear the worst is yet to come"

White House Task Force Takes A Look At "Real America" From Mason County

For seven days last week a dozen Washington D. C. area officials left their east coast offices to take a look at what one of them called "real America".

One of the three-man teams spent Wednesday morning in Havana finding out face-to-face what local officials have had to deal with - and are still dealing with - and they looked for suggestions on how to make the system work better.

The Floodplain Management Review Committee headed by Thomas Wehri is charged with reviewing what happened in the Flood of '93.

In addition to looking at what happened physically, they are also looking at the various responses - was done, what worked and what didn't. From that information they will be making recommendations for changes in policies and programs in the future in the area of flood plain management and water resource policy.

Among those who observed the meeting were representatives of Senators Paul Simon and and Carol Mosely Braun.•

WE'RE NOT THE SAME...

Speaking on behalf of the county County Clerk William Blessman was the first to emphasize that the situation in Mason County was different than that of the rest of the country affected by the Flood of '93.

"Mason County is in the unique position of being lumped in with the Flood of '93, when the situation is very different," Blessman said.

He explained that while the Great Flood came and then went away, the water is still here.

The water here is in the Mahomet-Teays Aquifer, which is about 300 feet deep. It is usually 12 to 15 feet below the surface.

Blessman explained that three conditions led to the aquifer rising: heavier than normal rainfall; lack of the need to run irrigation systems which would draw down the level; and the high level of the Illinois River which prevented the aquifer from discharging, causing it to back up.

"When (the aquifer) rises bodies of water appear in depressional areas. When they fill up they spill over and act like a normal flood, and create a secondary flooding situation," Blessman said.

Two communities in Mason County, Havana and Bath, were inundated by run off flood waters when a heavy rain came in mid-September after the aquifer was already very saturated.

Havana Mayor Allan McNeil attempted to describe the scope of the situation by describing the size of the aquifer.

It covers 840,000 acres and measures 70 miles by 12 miles, and it recharges at a rate of 350 million gallons a day, he said.

"If it were above ground we'd be talking about the largest body of water in the state of Illinois flooding," McNeil said.

Descriptions were provided of the mold in homes, sidewalks caving in, foundations sinking, sinus and breathing problems.

"People in our area have handled it about as well as can be expected, but the people are really getting stressed out now," said McNeil, who lives in one of the worst affected areas.

McNeil also speculated that problems would continue and would get worse.

"We're all holding our breath when this thaw comes. I think it will be devastating. It will bust our townships. We'll be looking at millions and millions of dollars of roads that will be absolutely disintegrated.

McNeil added that it was wrecking havoc on the city's sewer system as well where sand pumped from basements was clogging combined sanitary and storm sewers.•

NO ONE KNEW...

Committee chairman Wehri asked Emergency Services and Disaster Agency coordinator Greg Griffin if Mason County had a hazard mitigation plan in place before the disaster struck.

"When it first started it was just a trickle," Griffin noted. "We didn't know where it was coming from, or how long it would run. And it was a holiday (Labor Day) weekend."

State agencies - the Illinois Department of Transportation's division of water resources, and State Water Survey were in the same boat as local officials. No one knew what was happening, Griffin added.

"In Mason County we have a plan for tornados and fires," commented Blessman. There's not been much reason before to plan for floods."•

DEADLINES ARE WRONG...

Mason County doesn't fit into the mold of the typical Flood of '93 disaster area, and the disaster deadlines set for other locations just don't fit here either, federal representatives were told.

For example, noted Griffin, the Disaster Assistance Center opened in August, long before flood waters headed down the streets of Havana and Bath.

Jane Poertner, executive director of the Central Illinois Economic Development Corporation added that her agency has received funds to do home repairs that must be accomplished by a certain date, but repairs haven't even been started because the water is still there.

Jan Horton, representing the Federal Emergency Management Agency expressed the same problem in her own agency.

"FEMA sees a beginning and an end, but this county is still flooding, then and now," Horton said.

One of the difficulties Mason County faces is the "window" for public assistance funding is already closed when public facility damage - such as the disintegration of Franklin Street - is still occurring.

In fact, the cutoff date for flood assistance from FEMA was October 22, 1993.•

HELP IS NEEDED...

A variety of suggestions were offered on how to best help disaster areas in general and Mason County in particular.

One problem that plagued local officials was there was no clear definition of the roles of the various governmental entities.

"We know what needs to be done, but we need the dollars and the freedom to do them. We also need the expertise," Blessman said.

Wehri suggested that more flexibility in the system would be appropriate for Mason County, and wondered if a coordinator of some kind would be helpful to identify what kinds of help are available.

While Community Action (CIEDC) has taken over the role of coordinating assistance programs, Horton said she thought engineering help is most needed.

Blessman agreed. "We've spent more than $50,000 on engineering. That's a lot of money to us. We've learned some about the water problem, but not enough. Many believe Sand Lake is the problem. We would like to know if it is."

While the Soil Conservation Service is looking into that question, Blessman said the county would be interested in listening to a second opinion.•

FLEXIBILITY IS THE KEY

In addition to providing more local authority, McNeil noted that one of the most frustrating problems has been rigidity in rules that don't allow for the most logical responses.

The prime example was the emergency response of September 14-15, 1993 when a wall of sand bags was placed across Route 97 at the C & IM Railroad tracks on the south side of Havana to staunch a torrent of water flowing into the city.

"That action by emergency personnel prevented a great magnitude of damage. The water was diverted to other areas, and created other damage, but less," Blessman said.

He noted that there are no provisions that the subsequent damage could be paid for, even though if the water had hit the city with its full force instead FEMA would have paid for that unquestionably.

The water would have been in the nursing home, the high school, and the city wells. There was no question, local officials agreed, that the right decision was made.

"That decision saved the government millions of dollars in claims," McNeil noted.

"There's no incentive to prevent damage from your point of view, except good common sense?" Wehri asked.

The decision was made on good sound economics, McNeil said. He added that they had saved millions of dollars in legitimate claims, but the government was denying those who ended up getting hurt.

"If we had done it wrong the government would have paid, but because we did it right to save money and do the best for the people those who bore the brunt of it were left out in the cold," McNeil said.•

TRADITIONAL ANSWERS...

Wehri wondered about the Mason County response to flood insurance coverage for affected areas, and turning areas into wetlands.

Wehri noted that there appeared to be only two flood insurance policies in the Village of Bath, and 387 in all of Mason County.

"In Bath there was very little advance warning before the flood. A lake like Sand Lake overflowed over night and swept the town. Nothing like that ever happened before.

There was little enthusiasm for the idea of converting more land to wetlands.

"You could have a wetland that wasn't wet for 20 years at a time," McNeil said.

Local officials speculated that the cause of some of Mason County's problems may have been preventable. They suggested that perhaps the Illinois River was kept artificially high by the release of water from Lake Michigan which prevented the aquifer from draining.

The Mason County Democrat
March 9, 1994

Pumping Must Stop Going Into Sewers

No one would suggest that any Havana residents stop pumping water from their basements, but residents of East Main Street, East Adams Street and Shawgo Avenue are being asked to direct their pumps into their own yards and not directly into city sewers.

If they don't they could end up plugging their own sewers with sand, backing sewage up into their own basements from the combined sanitary and storm sewers.

The city of Havana has spent more than $12,000 running television cameras in the sewers there which have become clogged with the "sugar sand" that is being pumped into them with the water.

An estimated $23,000 to $24,000 has also been spent lining eight of eleven sewers, and nearly $60,000 worth of additional television inspection and lining has been recommended.

The city will employ an inspector to make sure none of the 60 homes on the Main-Shawgo-Adams loop is pumping into the sewer, "or we'll be right back in the muck" said a city official.

Mayor Allan McNeil told council members Tuesday night the city may be able to turn the bills over to the Federal Emergency Management Agency (FEMA), but the city cannot get approval until a FEMA inspector makes a visit here.

That could take time since there are only one or two inspectors in the state at this time, McNeil said.

It also takes time to get money from FEMA. McNeil announced that the City of Havana has just received their first check from the federal agency, representing 90% of the expenses Havana submitted. The check for $48,900 covered emergency flood response activities by the city up to October 22, the cut off date set by FEMA.

The Pekin Daily News
March 23, 1994

Havana treads water waiting for flood aid

By Times staff

HAVANA — Ed Haage thinks city residents' efforts here to bring home government flood aid haven't garnered much more than bureaucratic hot air.

"We've talked it to death," Haage said at an ad-hoc flood meeting Tuesday among state and local officials and residents. "All we hear is the city doesn't have any money, the state doesn't have the money and the feds don't know about the money.

"It's been a big frustration."

The meeting, called by Rep. Bob Michel's Chief of Staff, Ray LaHood, focused on long-term flood solutions for the water-plagued city. The residents attending questioned the status of the government buyout of flooded homes and offered their own solutions for the area's aquifer flooding.

State officials countered that buyout funding still is being processed, and warned that finding a long-term solution will take more extensive engineering studies.

Merry Eccles / Times correspondent

Ray LaHood, Rep Bob Michel's chief of staff, talks with Havana Mayor Allan McNeil, residents and state officials at a special meeting Tuesday about solutions to aquifer flooding in the area. LaHood was representing Michel at the meeting but also is the Republican candidate to replace the retiring, long-time congressman.

But for the short-term, officials agreed to study the residents' proposed solution — to continue pumping standing standing water near the Walker Forge Inc. plant into the Illinois River.

Residents whose homes have been damaged by flooding heard state officials explain flood relief funding is working through the necessary red tape.

Allen Grosboll, an executive assistant to Gov. Jim Edgar, said that state agencies are in the process of putting together a buyout package for flooded homes around the city — $1.4 million for Scarborough Estates alone.

Grosboll said Havana is on the state's short list of communities needing flood help and could receive more cash through the Community Development Block Grant, increased by Congress this year for flood relief.

He added that the city also should start considering long-term solutions to prevent future floods.

Haage and Havana Alderman Jim Stelter said something should be done now, while the weather is dry.

"We need to continue pumping to control (the water)," Haage said. "We're only a five- or six-inch rain away from disaster."

Adrian Visocky, a senior hydrologist with the state Division of Water Resources, said it would probably take a seven- to eight-inch rain — what he called an unlikely prospect — to plunge the area back into significant flooding.

Visocky estimated that since September, the area's overflowed water table has dropped about four feet, mostly because of a recent spell of dry weather.

But he warned that a high Illinois River level is slowing down the aquifer's return to normal levels.

Haage and Stelter pushed for continued pumping of standing water west of the Walker Forge Inc. plant —

See FLOODS, A12

Floods

Continued from page A1

what residents now call Walker Pond.

Water from the flooded Sand Lake is flowing into the low-lying areas around Walker Forge. Residents fear a repeat of the area's worst flooding last fall, when Walker Pond flooded and water began flowing into town.

To protect Havana, the city and Mason County began pumping water away from Walker Pond late last year, lowering that standing water and Sand Lake in the process. Pumping stopped in mid-February and resumed last week after more water had gathered in the area.

Bill Koellner, chief of water control for the U.S. Army Corps of Engineers in Rock Island, said pumping could help, but warned a long-term fix still is required.

"This would be strictly a band-aid approach; it might give them some temporary satisfaction," Koellner said. He warned without a long-term plan the flooding will repeat.

LaHood, also a November candidate for Michel's 18th Congressional District seat, said pumping seemed the most feasible short-term fix but hoped for more divine help.

"I hope that's what they decide to do," he said. "But we have to hope the good Lord gives us a break on the rain."

The Mason County Democrat
July 6, 1994

The Sand Lake Decision

Since the fateful night of September 14-15 what to do about "Sand" Lake has been a constant question for local officials, whose first action was to give it a more acceptable name than the derogatory slang term it was commonly known by.

Long discussed was a proposed ditch - some called it a channel - that would be used to control how deep Sand Lake would be allowed to get before it overflowed into a spillway to the Illinois River.

Last week the ad hoc flood committee voted to recommend to the Mason County Board that they step back and re-evaluate their their flood mitigation plans, and suspend, for the time being, their efforts to obtain a grant for the Sand Lake ditch project.

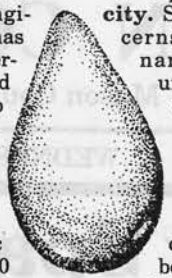
Countless hours and innumerable meetings have been held, and the committee's decision was not made lightly.

Among the items they took under consideration were:

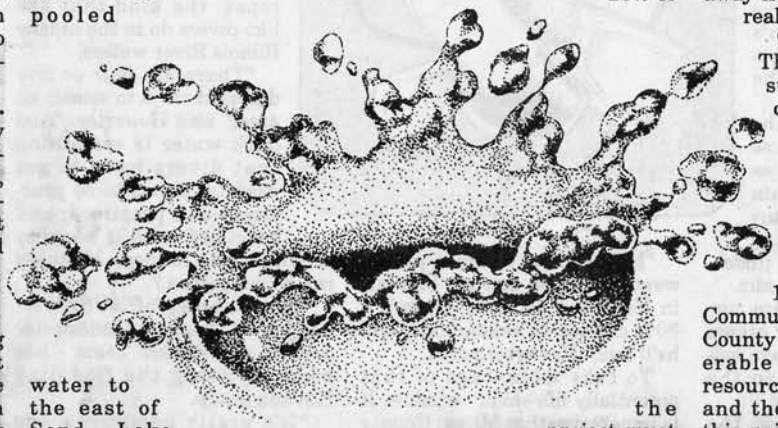
1. **Do something.** There is a perception in the area that "somebody should do something". Lack of any tangible action creates the perception that the area is vulnerable to another disaster and is unsuitable for future development.

2. **Engineering costs.** Mason County has already incurred over $50,000 in engineering costs during the flood, some of which has been reimbursed. The flood control project has cost over $7,800 so far, and is projected to cost a minimum total of $25,000. This figure could go anywhere from $50,00 to $100,000, depending on the environmental, permit and mitigation costs. If the grant is not awarded, all such costs would have to be borne by the county.

3. **404 Permit.** A good portion of the up-front engineering costs would be related to obtaining a 404 permit which deals with environmental and wetlands issues. Environmental Science and Engineering (ESE) of Peoria has cautioned that such a permit is not a certainty and would be difficult to obtain, at best. Of the anticipated 230 man-hours expected to be used to complete the planning and presentation of the Economic Development Grant, 130 of them would be devoted to the 404 permit alone.



4. **Basement de-watering.** One of the desired results of any project has been relief from flooded basements. Both ESE and the State Water Survey engineers have advised local officials that neither lowering Sand Lake or a ditch as proposed would have any significant impact on the water level in basements more than a few hundred feet from Sand Lake. They have also maintained that such a project would have very limited, if any, impact on other areas of pooled water to the east of Sand Lake. Time constraints on the grant and jurisdictional questions prohibit a more comprehensive drainage approach for eastern Havana on this grant.



5. **Open ditch through city.** Some have raised concerns of safety, maintenance, sanitation, and unsightliness of an open channel through a residential area. Changing the plans at this point to even a scaled back volume using 36-inch pipe rather than an open ditch would add to both the initial engineering costs and the total project costs. Even a scaled back project would require the same 404 permitting.

6. **Right of Way acquisition.** This would be difficult in those areas where the owner opposes the project. There is also an environmental issue of potential contamination since much of the route has been involved in commercial use for many years.

7. **Local cost share.** 20% of the project must be funded locally. This may be eligible for reimbursement through the Department of Commerce and Community Affairs (DCCA). If this source does not come through, as much as $600,000 may have to be raised through local property taxes on Havana Township. A tax rate of .25% would raise $110,000 in Havana Township and cost the owner of a $60,000 home $50.

8. **Cost versus benefit.** The Sand Lake feasibility study identifies "doing nothing" with Sand Lake other than sand bagging in the event of severe flooding as being the most cost-effective alternative by a margin of more than 15 to 1. A scaled back project would have a very narrow threshold of benefits. No benefit would occur until water in Sand Lake reached the spillway level. If a significant rainfall occurred after reaching this point, ESE estimates that the lake would overflow toward the city even with the smaller spillway in place. Every expert consulted on this project has agreed that the only significant benefit from such a project would be a degree of control over Sand Lake surface flooding. No relief from flooded basements or ground water flooding in areas away from Sand Lake would be realized.

9. **Question of chance.** The chances of being a successful grant applicant may be hampered by the fact that much of the detailed planning for the project, environmental permit issues, and right of way acquisition remain in question.

10. **Wasted effort.** Community Action and Mason County have expended considerable time, effort and resources in developing plans and the grant application to this point. Much of this effort will have been wasted if the project is abandoned or placed on hold at this point.

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PLAN ADOPTION RESOLUTIONS

APPENDIX M

Village of Bath, Illinois
Resolution of Adoption
of the
Mason Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, the Village of Bath, Illinois is subject to natural hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, the Village of Bath, Illinois desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) requires that local jurisdictions have in place a FEMA-approved Hazard Mitigation Plan as a condition of receipt of certain future Federal mitigation funding after November 1, 2004; and

WHEREAS, the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of the Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, Village of Bath, Illinois has participated in developing the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Mason County:

NOW THERFORE, be it resolved that the Village of Bath, Illinois hereby:

1. Adopts the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of Village of Bath, Illinois; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on August 3, 2015

CERTIFIED by
Floyd Fouteh Village
President

ATTESTED by
Gerta Jean Griffin
Clerk

The Village of Easton, Mason County Illinois
Resolution of Adoption
of the
Mason Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, Village of Easton, Mason County is subject to natural hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, the Village of Easton, Mason County desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) requires that local jurisdictions have in place a FEMA-approved Hazard Mitigation Plan as a condition of receipt of certain future Federal mitigation funding after November 1, 2004; and

WHEREAS, the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of the Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, Village of Easton, Mason County has participated in developing the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Mason County:

NOW THERFORE, be it resolved that the Village of Easton, Mason County hereby:

1. Adopts the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of The Village of Easton, Mason County; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on August 3, 2015

CERTIFIED by _____
Mindy Lowers, President
Village of Easton

ATTESTED by Kate Nunn
Kate Nunn, Clerk
Village of Easton

The Village of San Jose, Illinois
Resolution of Adoption
of the
Mason Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, The Village of San Jose is subject to natural hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, The Village of San Jose desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) requires that local jurisdictions have in place a FEMA-approved Hazard Mitigation Plan as a condition of receipt of certain future Federal mitigation funding after November 1, 2004; and

WHEREAS, the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of the Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, The Village of San Jose has participated in developing the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Mason County:

NOW THERFORE, be it resolved that The Village of San Jose hereby:

1. Adopts the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of The Village of San Jose; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on August 4, 2015

CERTIFIED by Stacy Coon
Village Clerk

ATTESTED by
Chief Maria Cupi

STACY A COON
OFFICIAL SEAL
Notary Public, State of Illinois
My Commission Expires
June 07, 2016

City of Mason City, Illinois
Resolution of Adoption
of the
Mason Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, the City of Mason City is subject to natural hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, the City of Mason City desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) requires that local jurisdictions have in place a FEMA-approved Hazard Mitigation Plan as a condition of receipt of certain future Federal mitigation funding after November 1, 2004; and

WHEREAS, the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of the Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, the City of Mason City has participated in developing the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Mason County:

NOW THERFORE, be it resolved that the City of Mason City hereby:

1. Adopts the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of the City of Mason City; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on August 10, 2015

CERTIFIED by Charles "Pete" Barber (SEAL)

ATTESTED by Karla S. Daubs

08/11/2015 13:01 2174823669 CITY OF MASON CITY PAGE 01

Havana, Illinois
Resolution No. 04-15
Adoption of the
Mason Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, **Havana, Illinois** is subject to natural hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, the **Havana, Illinois** desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) requires that local jurisdictions have in place a FEMA-approved Hazard Mitigation Plan as a condition of receipt of certain future Federal mitigation funding after November 1, 2004; and

WHEREAS, the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of the Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, **Havana, Illinois** has participated in developing the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Mason County:

NOW THERFORE, be it resolved that the **Havana, Illinois** hereby:

1. Adopts the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of Havana, Illinois; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on August 18, 2015

CERTIFIED by Brenda Stadsholt (SEAL)
Brenda Stadsholt
Mayor

ATTESTED by Martha Balbinot
Martha Balbinot
City Clerk

MASON COUNTY, Illinois
Resolution of Adoption
of the
Mason Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, the County of Mason is subject to natural hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, the County of Mason desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) requires that local jurisdictions have in place a FEMA-approved Hazard Mitigation Plan as a condition of receipt of certain future Federal mitigation funding after November 1, 2004; and

WHEREAS, the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of the Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, the County of Mason has participated in developing the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Mason County:

NOW THERFORE, be it resolved that the County of Mason hereby:

1. Adopts the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of the County of Mason; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on September 8, 2015

CERTIFIED by Kenneth Walker (SEAL)
Kenneth Walker,
Chairman

ATTESTED by Summer R Brown
Summer R. Brown,
County Clerk

VILLAGE OF MANITO ILLINOIS
Resolution 015-001
Adoption of the Mason Multi-Jurisdictional
Natural Hazards Mitigation Plan

WHEREAS, the VILLAGE OF MANITO is subject to natural hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, the VILLAGE OF MANITO desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) requires that local jurisdictions have in place a FEMA-approved Hazard Mitigation Plan as a condition of receipt of certain future Federal mitigation funding after November 1, 2004; and

WHEREAS, the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of the Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, the VILLAGE OF MANITO has participated in developing the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Mason County:

NOW THERFORE, be it resolved that the VILLAGE OF MANITO hereby:

1. Adopts the Mason Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of the VILLAGE OF MANITO and

2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on ~~September 14, 2016~~
September 14, 2015

CERTIFIED: _____
Tim Sondag, Mayor

ATTESTED by: _____
Lee R Lacey, Clerk

(Seal)

Kilbourne, Illinois
Resolution of Adoption
of the
Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, Kilbourne is subject to natural hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, the Kilbourne desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) requires that local jurisdictions have in place a FEMA-approved Hazard Mitigation Plan as a condition of receipt of certain future Federal mitigation funding after November 1, 2004; and

WHEREAS, the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of the Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, Kilbourne has participated in developing the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of ~~Montgomery~~ Mason County; and

NOW THERFORE, be it resolved that the Kilbourne hereby adopts the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of ~~Topeka~~ Kilbourne and agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on Monday, December 1, 2015

CERTIFIED by Dean Sim - Pres

ATTESTED by Lynn E. Hodgson, Clerk

Topeka, Illinois
Resolution of Adoption
of the
Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, Topeka is subject to natural hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, the Topeka desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) requires that local jurisdictions have in place a FEMA-approved Hazard Mitigation Plan as a condition of receipt of certain future Federal mitigation funding after November 1, 2004; and

WHEREAS, the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of the Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, Topeka has participated in developing the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Montgomery County; and

NOW THERFORE, be it resolved that the Topeka hereby adopts the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of Topeka and agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on Monday, December 7, 2015

CERTIFIED by G M Woods

ATTESTED by Gloria J Marshall
Clerk

Havana Rural Fire Protection District
Resolution of Adoption
of the
Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, the Havana Rural Fire Protection District is subject to natural hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, the Havana Rural Fire Protection District desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) requires that local jurisdictions have in place a FEMA-approved Hazard Mitigation Plan as a condition of receipt of certain future Federal mitigation funding after November 1, 2004; and

WHEREAS, the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of the Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, the Havana Rural Fire Protection District has participated in developing the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Mason County; and

NOW THERFORE, be it resolved that the Havana Rural Fire Protection District hereby adopts the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of the District and agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on 12/11/15

CERTIFIED by Scott Williams

ATTESTED by _____

Forest City, Illinois
Resolution of Adoption
of the
Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, Forest City is subject to natural hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, the Forest City desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) requires that local jurisdictions have in place a FEMA-approved Hazard Mitigation Plan as a condition of receipt of certain future Federal mitigation funding after November 1, 2004; and

WHEREAS, the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of the Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, Forest City has participated in developing the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Mason County; and

NOW THERFORE, be it resolved that the Forest City hereby adopts the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of Forest City and agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on December 14, 2015

CERTIFIED by Danny Gardner

ATTESTED by Kate Woodring

Mason District Hospital
Resolution of Adoption
of the
Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, the Mason District Hospital is subject to natural hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, the Mason District Hospital desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the United States Federal Emergency Management Agency (FEMA) requires that local jurisdictions have in place a FEMA-approved Hazard Mitigation Plan as a condition of receipt of certain future Federal mitigation funding after November 1, 2004; and

WHEREAS, the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of the Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, the Mason District Hospital has participated in developing the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Mason County; and

NOW THERFORE, be it resolved that the Mason District Hospital hereby adopts the Mason County Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of the District and agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on 12/14/15

CERTIFIED by _____

ATTESTED by _____