MORGAN COUNTY

Multi-Jurisdictional Natural Hazards Mitigation Plan

PARTICIPANTS

Chapin, Village of
Franklin, Village of
Jacksonville, City of
Meredosia, Village of
Morgan County
Murrayville, Village of
South Jacksonville, Village of
Woodson, Village of

March 2014

The five year update of this Plan must be completed on or before May 12, 2019.

ACKNOWLEDGEMENTS

Developing the first Natural Hazards Mitigation Plan for Morgan County and the participating municipalities involved input from many people. All of these contributions have helped to make this Plan the definitive source of information on natural hazards, their impacts, and the various options to eliminate or reduce these impacts on current and future generations. Information from government sources has been supplemented by photographs and weather data from personal collections.

Morgan County and Scott County share many commonalities. In 1823 Morgan County was organized from part of Greene County and its original boundaries included Scott and Cass Counties. Scott County was later formed from part of Morgan County in 1839. Both Counties are bordered by the Illinois River on the west.

The spirit of cooperation and sharing forged between these two counties resulted in both working together throughout this planning process. The Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee was organized to represent the various jurisdictions and interests in both counties. Although they worked together by participating in the same planning meetings and sharing discussions on similar topics, each County developed separate, independent Plans. Each Plan reflects the differences in severe weather history and specific approaches to reducing potential impacts.

Identifying, verifying, and gathering information about severe weather events involves research into various files and discussions with individuals. Gaps exist in weather records, especially for severe winter storms and floods. Verifying the date, time, and location of a severe weather event can involve multiple steps and this task is further complicated by the fact that information about property damages is often lacking.

Chris Miller at the National Weather Service Weather Forecast Office in Lincoln responded to numerous requests by providing useful information that was able to fill in many of the gaps. Several committee members were also able to identify critical facilities and infrastructure damaged by natural hazard events and provide property damage amounts that were unavailable through conventional records. These efforts helped to personalize the Plan and greatly enhanced its value to future users.

Photographs depicting storms and storm damages are often difficult to find. Beth Hopkins and Bob Fitzsimmons (Jacksonville/Morgan County ESDA), Steve Turner (Turner Insurance) and Richard Evans (South Jacksonville Police Department) were able to provide photographs depicting the severity associated with severe storms that are hard to capture with words.

This Plan is the first attempt to provide a single compendium of knowledge on severe weather in Morgan County. As this Plan is updated, we hope that future generations will continue to build on this document with more information and photographs.

MORGAN COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

MORGAN COUNTY, ILLINOIS

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Researched and written for the Morgan & Scott Counties 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

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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 Morgan County. Since 1965, Morgan County has had 10 federally-declared disasters. **Figure 1** identifies each declaration including the year the disaster was declared and the type of natural hazard that triggered the declaration.

Figure 1
Federal Disaster Declarations for Morgan County

Declaration #	Year	Type of Natural Hazard(s) Event
373	1973	flooding and severe storms
583	1979	flooding and severe storms
674	1982	flooding, severe storms, torrential rains, severe winds and tornadoes
735	1985	severe storms, excessive rain, ice jams and flooding
871	1990	severe winds, thunderstorms, torrential rains, flooding and tornadoes
997	1993	flooding
1053	1995	severe winds, thunderstorms, torrential rains, severe storms, flash flooding and tornadoes
1416	2002	severe storms, excessive rainfall, flooding and tornadoes
1633	2006	severe storms and tornadoes
1960	2011	severe winter storm

In addition, in the past decade alone, there have been 43 thunderstorms with damaging winds, 26 severe hail storms, 17 heavy rain events, 14 severe winter storms (snow and ice), 14 flood and flash flood events, 9 tornadoes, 8 lightning strike events, 6 extreme heat events, 3 droughts, 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-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 Morgan 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 Morgan County Board passed a resolution on December 13, 2010 authorizing the development of the Morgan 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 Morgan County to participate. **Figure 2** identifies the municipalities that are represented in the Plan. The Jacksonville/Morgan County Emergency Services and Disaster Agency administers the Plan.

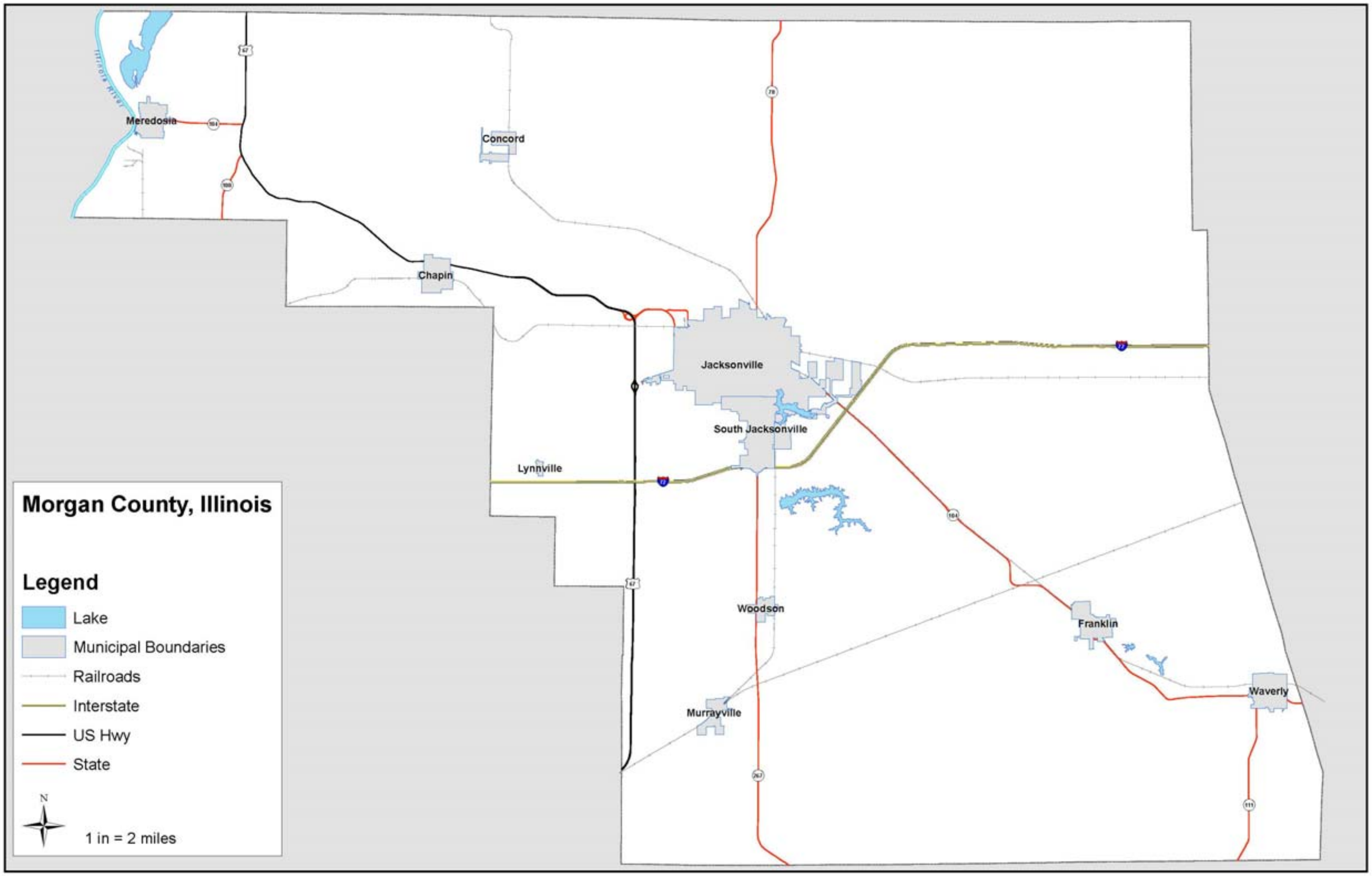
Figure 2
Participating Jurisdictions Represented in the Plan

- Chapin, Village of
- Franklin, Village of
- Jacksonville, City of
- Meredosia, Village of
- Murrayville, Village of
- South Jacksonville, Village of
- Woodson, Village of

1.2 DEMOGRAPHICS

Morgan County is located in west-central Illinois and covers approximately 572 square miles. **Figure 3** provides a location map of Morgan County and the participating municipalities. The topography of the County is varied with flat to gently sloping farmland in the eastern and central portions and deep valleys and narrow upland ridges in the northwestern and southern portions. Steep bluffs rise above the flat bottom lands along the Illinois River in the northwestern corner of the County.

Figure 3
Location Map



The County is bounded to the north by Cass County, to the south by Greene and Macoupin Counties, to the east by Sangamon County and to the west by the Illinois River and Scott County. The county seat is located in Jacksonville.

Agriculture is the main economic enterprise in the County. According to the 2007 Census of Agriculture, there were 740 farms in Morgan County occupying approximately 88% (320,512 acres) of the total land acreage in the County. The major crops include corn, soybeans and wheat while the major livestock includes hogs and cattle. The County ranks 23rd in the State for soybean production and 29th for corn. In terms of livestock, the County ranks 29th in the State for cattle and calves and 39th for hogs and pigs. Morgan County ranks in the top 30 Illinois counties for crop cash receipts and in the top 45 for livestock cash receipts. The region is served by a grain terminal located at Meredosia. Grain from the west-central part of the State is transported to this terminal and then shipped downriver to New Orleans for export.

While agriculture is a major industry, over half of the County's employment is found in manufacturing, retail trade and services sectors. Manufacturing is primarily located in Jacksonville where packaging, condiments and dry condensed and evaporated dairy products are produced and book binding takes place. Other important industries located in the County include healthcare, information technology services, education, and corrections. Historically strong employment sectors, such as manufacturing, experienced declines in Morgan County during the past two decades with the closure of the EMI Manufacturing, AC Humko and other workforce reductions while job increases in the service sector occurred.

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 Morgan 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 (2011)
Morgan County (unincorporated)	8,198	9,324	568.791	3,612	7	$102,148,770
Chapin	512	582	0.974	229	---	$4,139,220
Franklin	610	694	0.744	274	---	$5,274,540
Jacksonville	19,446	22,117	10.474	8,162	780	$148,148,370
Meredosia	1,044	1,187	0.833	464	---	$6,736,620
Murrayville	587	668	0.490	261	---	$5,048,300
South Jacksonville	3,331	3,788	2.290	1,671	730	$38,681,320
Woodson	512	582	0.391	220	---	$4,414,990

Sources: Vogt, Allen, Morgan County Supervisor of Assessments.
Illinois Department of Commerce and Economic Opportunity, Census 2010 Data.
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. Morgan County is largely rural with a population that experienced a decrease of 2.9% between 2000 and 2010. Since 1960, the County's population has alternately experienced modest decreases and increases every other census period. Four of the seven participating municipalities (Chapin, Murrayville, South Jacksonville and Woodson) experienced declines in their populations since 2000, with some experiencing sharp declines. Franklin, Jacksonville and Meredosia all experienced modest increases in their population between 2000 and 2010.

Land use in Morgan County is primarily agricultural. As discussed in the previous section, approximately 88% of the land within the County is used as farmland. 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.

Construction of the world's first large-scale project to test clean coal technology coupled with a carbon dioxide capture and storage system is anticipated to begin in Morgan County by mid-2014. FutureGen 2.0 is a $1.65 billion joint project of the U.S. Department of Energy and the FutureGen Industrial Alliance. This project will include three distinct but related components: (1) a combustion system designed to burn coal cleanly that will be retrofitted to a currently inactive boiler located in Meredosia; (2) an underground pipeline to connect the Meredosia facility with a 4,000 acre underground injection site where carbon dioxide will be stored in northeastern Morgan County; and (3) a visitor, research and training facility located in the Jacksonville area.

The economic benefits for Morgan County are expected to include the creation of approximately 300 permanent jobs over a 20 year period and $7.3 billion in business volume by 2037, of which approximately $320 million is wages and salaries. These jobs are expected to help, but will not fully replace the number of jobs lost in the last decade following the closure of the EMI Manufacturing (600+ jobs), AC Humko (200+ jobs), downsizing by other major employers and the loss of over 500 jobs at the Jacksonville Developmental Center.

Besides the FutureGen project, 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

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The Morgan County Multi-Jurisdictional Natural Hazards Mitigation Plan (the Plan) was developed through the Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee (Planning Committee). The Plan was prepared to comply with the Disaster Mitigation Act of 2000 and incorporates the Federal Emergency Management Agency's (FEMA) 10 step planning process approach. **Figure 5** provides a brief description of the process utilized to prepare this Plan.

Figure 5
Description of Planning Process

Tasks	**Description**
Task One: Organize	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.

Plan development was led at the staff level by Bob Fitzsimmons, Director of the Jacksonville/Morgan County Emergency Services and Disaster Agency. 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 Morgan & Scott Counties 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, 911 and law enforcement), healthcare, GIS, insurance and utilities.

Figure 6 details the entities represented on the Planning Committee and the individuals who attended on their behalf. The Planning Committee was chaired by Jacksonville/ Morgan County Emergency Services and Disaster Agency (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, the Illinois State Water Survey, the Illinois State Geological Survey, and the University of Illinois.

Figure 6
(Sheet 1 of 2)
Morgan & Scott Counties Planning Committee Member Attendance Record

Representing	Name	11/13/2012	2/7/2013	6/20/2013	10/3/2013	2/20/2014
Ameren Illinois	Calwell, Jon			X		
Ameren Illinois	Cooper, Pat	X				
Ameren Illinois	Parmar, Yuvraj		X			
American Red Cross - Prairie Central Chapter	Gregory, Katie			X		
Benton & Associates, Inc.	Benton, Reg		X			
Benton & Associates, Inc.	Calise, John	X		X		
Benton & Associates, Inc.	Gilbreth, Steve				X	X
Bluffs, Village of	Edlen, Max			X	X	X
Bluffs, Village of	McEvers, Sam	X	X			
Cass-Morgan Farm Bureau	Thompson, Bruce	X				
Chapin, Village of	McCormick, Bryce			X		X
Franklin, Village of	Lowe, Greg	X		X		X
Franklin, Village of	Smith, Darrell		X			
Franklin, Village of	Turpin, Paul					X
Franklin, Village of	Watret, John				X	
Glasgow, Village of	Doolin, Steve	X	X		X	X
Illinois Central Management Services	Hoots, Diane	X	X	X	X	
Illinois Rural Electric	Gumbel, Justin	X	X	X	X	
Illinois Rural Electric	Taylor, Dennis	X				
Jacksonville, City of	Beard, Mike	X				
Jacksonville, City of	Ezard, Andy	X				X
Jacksonville, City of	Hall, Kelly		X	X	X	X
Jacksonville/Morgan County ESDA	Burnham, Abby			X		
Jacksonville/Morgan County ESDA	Fitzsimmons, Bob	X	X	X	X	X
Jacksonville/Morgan County ESDA	Hopkins, Beth	X	X		X	X
Johnson, Depp & Quisenberry	Bostwick, Andrea	X	X	X	X	X
Johnson, Depp & Quisenberry	Michaud, Greg	X	X	X	X	X
Manchester, Village of	Drake, Ron	X	X	X	X	X
Meredosia, Village of	Rausch, James			X	X	X
Meredosia-Bluffs Ambulance District	Huseman, Virgil	X	X	X		X
Morgan Co. - Commissioner	Meier, Bill	X				
Morgan Co. - Commissioner	Rawlings, Dick		X	X	X	X
Morgan Co. - GIS	Artis, Shawn	X	X			X
Morgan Co. - Health Department	Bainter, Dale					X
Morgan Co. - Health Department	Smith, Richard	X	X		X	
Morgan Co. - Regional Planning Commission	Douglas, Dusty	X	X	X	X	X
Morgan Co. - Sheriff	Duvendack, Randy	X	X	X		
Morgan & Scott County Highway Department	Coultas, Matt	X	X	X		X

Figure 6
(Sheet 2 of 2)
Morgan & Scott Counties Planning Committee Member Attendance Record

Representing	Name	11/13/2012	2/7/2013	6/20/2013	10/3/2013	2/20/2014
Murrayville, Village of	Braley, Kevin			X	X	X
Murrayville, Village of	Lakin, Steve		X			
Murrayville, Village of	Murphy, John			X		
North Scott Fire Protection District	Bailey, James	X		X		
Prairie Power, Inc.	Seipel, Greg	X	X	X		
Public Representative	Lowe, Greg	X		X		X
Scott Co. - 911	Walquist, William	X	X	X	X	X
Scott Co. - Chief County Assessment Officer/ESDA	Koch, Lorrie	X	X	X	X	X
Scott Co. - Health Department	Shireman, Pam	X				
Scott Co. - Health Department	Shireman, Steve	X	X			X
Scott County Farm Bureau	Roderick, Blake			X		
South Jacksonville, Village of	Evans, Richard	X	X	X	X	X
Turner Insurance	Turner, Steve	X	X	X		X
Winchester, City of	McIntire, Rex			X	X	
Winchester, City of	Newman, David		X			
Woodson, Village of	Cors, Rhonda			X	X	X
Woodson, Village of	Gehrke, Darin	X	X			
Woodson, Village of	Marlow, Greg		X			
Woodson Fire Protection District	Marlow, Greg		X			

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 Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Plan Committee is to develop a mitigation plan that can reduce the negative impacts of natural hazards on citizens, infrastructure, private property and critical facilities."

Planning Committee Meetings
The Planning Committee met five times between November, 2012 and February, 2014. **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 provided below.

First Planning Committee Meeting – November 13, 2012

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 each County and the participating jurisdictions were asked to complete the forms entitled "List of Existing Planning Documents" and "Critical Facilities" and return them at the next meeting. Copies of a hazard events questionnaire and citizen questionnaire were also distributed.

Second Planning Committee Meeting – February 7, 2013

At the second Planning Committee meeting the natural hazard risk assessment sections for both counties were 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 each 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 20, 2013

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 for both counties were presented for review.

Fourth Planning Committee Meeting – October 3, 2013

At the fourth meeting the sections of each Plan focusing on the mitigation strategy and plan maintenance 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.

Fifth Planning Committee Meeting – February 20, 2014

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 for each County to gather facts and gauge public perceptions about natural hazards. Each questionnaire was made available at the offices of the appropriate participating jurisdictions. A copy of the Morgan County questionnaire is contained in **Appendix D**.

A total of six (6) questionnaires for Morgan County were completed and returned to the Planning Committee. The questionnaires were filled out by residents of several 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 have been the most frequently encountered natural hazards in Morgan County. This response is consistent with the weather records compiled for the County and as described in this Plan.
- ❖ Electronic and print media (television, radio and newspapers) were identified as the most effective means of disseminating information about natural hazards. Mailings and materials distributed via fire and law enforcement departments also received strong support among respondents.
- ❖ Two (2) 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 power during storms by burying power lines, trimming trees and/or purchasing backup generators (100%); and
    - ➢ retrofit critical infrastructure (public water supplies, schools, sewage treatment facilities, bridges, hospitals and other important services) to reduce potential damages (83.3%).

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 that were printed. No newspaper articles were published for the June 20, 2013 or October 3, 2013 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 February 20, 2014, 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 activities. At the forum, residents could review the draft Plans; meet with representatives from the Counties, the participating local government entities and the Consultant to discuss the Plans; ask any questions; and provide comments on the Plans. Individuals attending the public forum were provided with a two-page handout summarizing the planning process and a separate comment sheet for each draft Plan that could be used to provide feedback. **Appendices G** and **H** contain copies of the planning process summary handout and the comment sheet for the Morgan County draft Plan.

Public Comment Period

After the public forum, the Morgan County draft Plan was made available for public review and comment through March 7, 2014 at the Jacksonville/Morgan County ESDA 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 provides a clearer assessment of the extent and magnitude of natural hazards that have impacted the County. This information included damage estimates for thunderstorms with damaging winds, lightning strikes, severe winter storms and tornadoes 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 information was used in 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 160 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 the main economic enterprises in both Counties. 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 and his perspectives on storm damages were valuable in the development of both Plans.

Not-For-Profit Organizations

The American Red Cross served on the Planning Committee as well. The executive director of the Central Prairie Chapter, which serves Morgan, Scott, Greene and Cass Counties, participated and provided input into the planning process.

The Morgan County Regional Planning Commission (RPC) also served on the Planning Committee. Since its inception in 1996 the RPC has worked to evaluate area-wide problems that affect growth and development in the region. The development to of a Plan to reduce damages caused by severe weather was an activity that appealed to the Commission. The RPC's Director, Dusty Douglas, was an active participant from the beginning and assisted in obtaining signed intent-to-participate letters from area municipalities. The RPC continued its participation throughout the process by assisting members with questions about mitigation projects, coordinating with county and municipal officials, providing support to the planning consultant and attending each of the Planning Committee meetings.

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. These documents were reviewed and incorporated into the Plan whenever applicable.

Figure 7
Existing Planning Documents by Participating Jurisdiction

Existing Planning Documents	Participating Jurisdiction							
	Morgan County	Chapin	Franklin	Jacksonville	Meredosia	Murrayville	South Jacksonville	Woodson
Plans								
Comprehensive Plan	X			X		X	X	
Emergency Management Plan	X	X		X		X	X	
Land Use Plan								
Codes & Ordinances								
Building Codes	X	X		X	X	X	X	
Drainage Ordinances					X	X	X	X
Historic Preservation Ordinance	X			X				
Subdivision Ordinance(s)	X			X		X	X	
Zoning Ordinances	X			X		X	X	
Maps								
Existing Land Use Map	X			X				X
Infrastructure Map	X		X	X		X		
Zoning Map	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								
Elevation Certificates for Buildings					X			

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 Morgan 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 that 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 different types of thunderstorms: single cell storm, multicell cluster storm, multicell line storm (squall line) and supercell storm. The following provides a brief description of each.

Single Cell Storms

Single cell storms last 20-30 minutes and are not usually considered severe. A true single cell storm is actually quite rare because the leading edge of rain-cooled air (gust front) of one cell triggers the growth of another. Occasionally a single cell storm will become severe, but only briefly. When this happens, it is called a pulse severe storm. Pulse severe storms have the potential to produce small hail, brief damaging winds, heavy rainfall and weak tornadoes.

Multicell Cluster Storms

Multicell cluster storms are the most common type of thunderstorm. A multicell cluster storm consists of a group of cells, moving along as on unit. Each cell usually lasts about 20 minutes while the cluster itself may persist for several hours. This type of storm is usually more intense than a single cell storm, but is much weaker than a supercell storm. Multicell cluster storms can produce moderate size hail, flash floods and weak tornadoes.

Multicell Line Storms (Squall Line)

Multicell line storms, or squall lines, consist of a long line of storms with a continuous well-developed gust front. The line of storms can be solid or there can be gaps and breaks in the line. Multicell line storms are best known for producing strong damaging winds in the form of downdrafts, but can also produce hail up to 1 ¾ inch in diameter, heavy rainfall, and weak tornadoes.

Supercell Storm

Supercell storms are highly organized thunderstorms that have one main current of rising air (updraft) which is extremely strong, reaching estimated speeds of 150 to 175 miles per hour. 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, such as giant hail (more than 2 inches in diameter) strong damaging winds in the form of downbursts (with speeds of 80 miles an hour or more) and strong to violent tornadoes. While supercell storms are rare, they pose a high threat to life and property.

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, derechos and bow echoes.

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. These winds can also be extremely dangerous for aircrafts.

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. There are two ideas about how hail is formed. In the past, the prevailing thought was that hailstones grew by colliding with supercooled water drops. The supercooled water drops would freeze on contact with ice crystals, frozen rain drops, dust, etc. Thunderstorms with strong updrafts would continue lifting the hailstones to the top of the cloud where it would encounter more supercooled water and continue to grow. Eventually the hail would become too heavy to be supported by the updraft and would fall to the ground.

Recent studies, however, suggest that supercooled water may accumulate on frozen particles near the back side of the storm as the particles are pushed forward, across and above the updrafts by the prevailing winds near the top of the storm. Eventually the hailstones encounter rapidly sinking columns of air (downdrafts) and fall to the ground.

In the United States, hail annually causes more than $1 billion in damages. Much of the damage done by hail is to crops, although it can damage buildings and homes as well as automobiles and landscaping. Hail has been known to cause injuries to individuals, but is very rarely fatal.

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	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.

Figure 10
TORRO Hailstorm Intensity Scale

Intensity Category		Typical Hail Diameter millimeters (approx.)*	Typical Hail Diameter inches (approx.)*	Description	Typical Damage Impacts
H0	Hard Hail	5 mm	0.2”	pea	no damage
H1	Potentially Damaging	5-15 mm	0.2” – 0.6”	pea / marble	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.

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.

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. While it is difficult to quantify lightning-related losses, the

National Oceanic and Atmospheric Administration's (NOAA) National Severe Storms Laboratory estimates that lightning causes $4 to $5 billion in damages 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 ***warning****s* for Morgan 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 favorable for the development of a severe thunderstorm in or close to the watch area. Watches are usually in effect for several hours and cover large areas of one or more states.
- **Warning.** A severe thunderstorm warning is issued when a thunderstorm is currently producing or is expected to produce severe weather (i.e., hail 1 inch in diameter or greater and/or damaging winds of 58 miles or greater). Warnings are generally in effect for around an hour and cover individual counties or portions of counties.

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 Morgan 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 Morgan County.

Thunderstorms with Damaging Winds

NOAA's Storm Events Database has documented 123 reported occurrences of thunderstorms with damaging winds in Morgan County between 1956 and 2012. Of the 123 occurrences, 72 had reported wind speeds of 50 knots or greater. There were 51 occurrences, however, where the wind speed was not recorded.

The highest wind speed recorded in Morgan County occurred in Jacksonville on May 24, 2004 when winds reached 78 knots (90 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 (1956 – 2012): ***123***

Number of Severe Hail Events (1964 – 2012): ***46***

Number of Lightning Strike Events (1997 – 2012): ***11***

Number of Heavy Rain Events (1993 – 2012): ***27***

Highest Recorded Wind Speed: ***78 knots (90 mph)***

Largest Hail Recorded: ***3.50 inches in diameter***

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

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

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

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

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

Figure 15 charts the reported occurrences of thunderstorms with damaging winds in Morgan County by month. Of the 123 events, 87 (71%) took place in May, June, July and August making this the peak period for thunderstorms with damaging winds in Morgan County.

Figure 15
Thunderstorms with Damaging Winds by Month
1956 – 2012

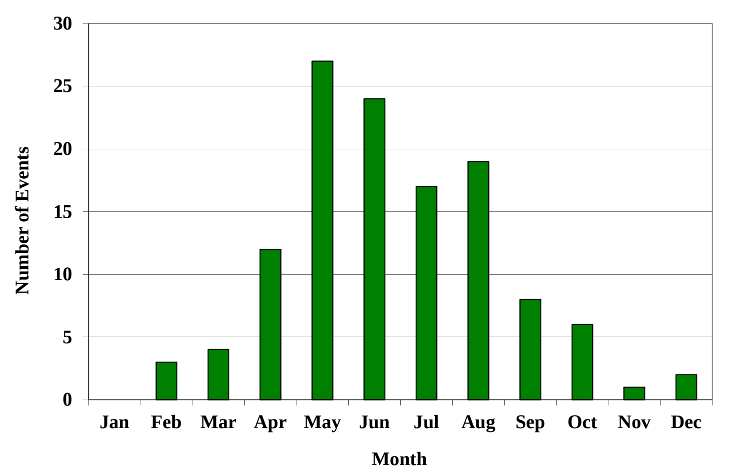
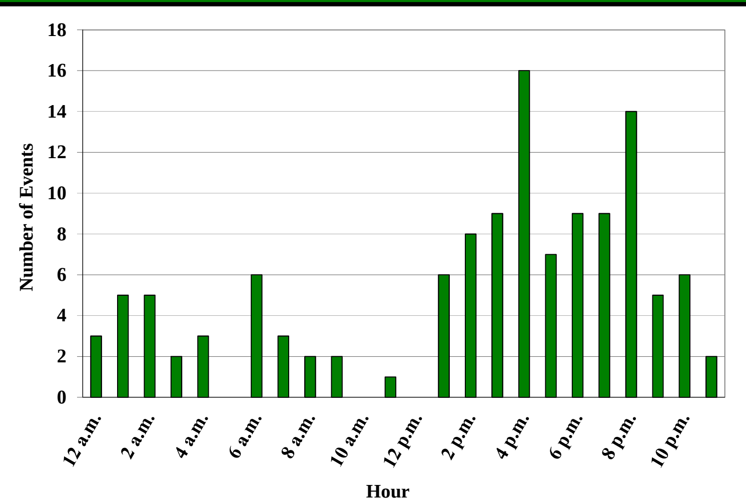


Figure 16 charts the reported occurrences of thunderstorms with damaging winds by hour. Approximately 74% of all thunderstorms with damaging winds occurred during the p.m. hours, with 64 of the events (52%) taking place between 3 p.m. and 9 p.m.

Figure 16
Thunderstorms with Damaging Winds by Hour
1956 – 2012



Hail

NOAA's Storm Events Database has documented 46 reported occurrences of severe storms with hail one inch in diameter or greater in Morgan County between 1964 and 2012. Of the 46 occurrences, 22 produced hailstones 1.50 inches or larger in diameter. The largest hail documented in Morgan County measured 3.50 inches in diameter (larger than a tea cup) and fell on May 5, 1977 in Literberry. Hail one inch in diameter or greater has been recorded at least once in every participating municipality, with the exception of South Jacksonville.

Figure 17 charts the reported occurrences of hail by month. Thirty-three (33) of the 46 hail events (72%) took place in April and May. Of those 33 events, 22 occurred during May, making this the peak month for hail events in Morgan County.

Figure 17
Hail Events by Month
1964 – 2012

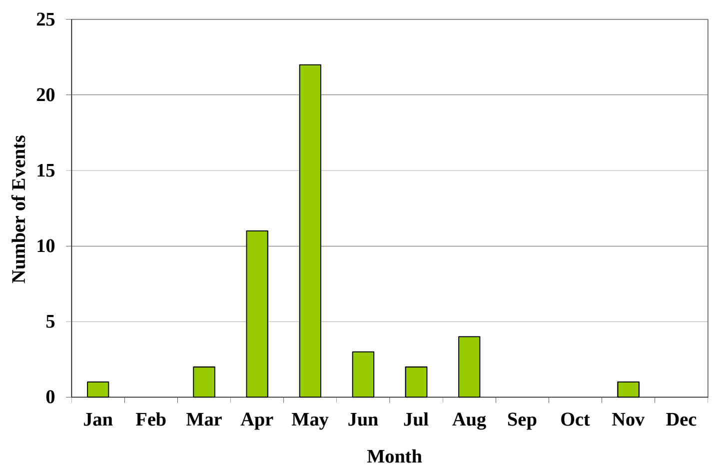


Figure 18 charts the reported occurrences of hail by hour. Approximately 91% of all severe hail events occurred during the p.m. hours, with 25 of the events (54%) taking place between 2 p.m. and 6 p.m.

Lightning

Planning Committee member records and local newspaper articles have documented 11 reported occurrences of lightning strikes in Morgan County between 1997 and 2012. Ten (10) of the 11 lightning strikes (91%) took place in May, June, July and August. Of the 10 strikes, four (4) took place in June making this the peak month for lightning strikes. Start times were unavailable for a majority of the events.

Heavy Rain

The Storm Events Database and COOP data records have documented 27 reported occurrences of heavy rain in Morgan County between 1993 and 2012. Of the 27 occurrences, 12 events

(44%) produced three inches or more of rain. Flooding and/or flash flooding resulted from 18 of the 27 heavy rain events (67%).

Figure 18
Hail Events by Hour
1964 – 2012

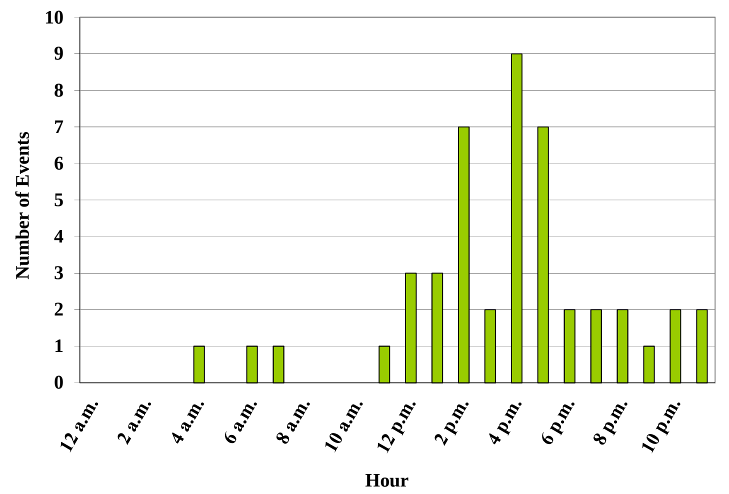


Figure 19 charts the reported occurrences of heavy rain by month. Seventeen (17) of the 27 events (63%) took place in June and September. Of those 17 heavy rain events, 10 occurred in June, making this the peak month for heavy rain in Morgan County.

Figure 19
Heavy Rain Events by Month
1993 – 2012

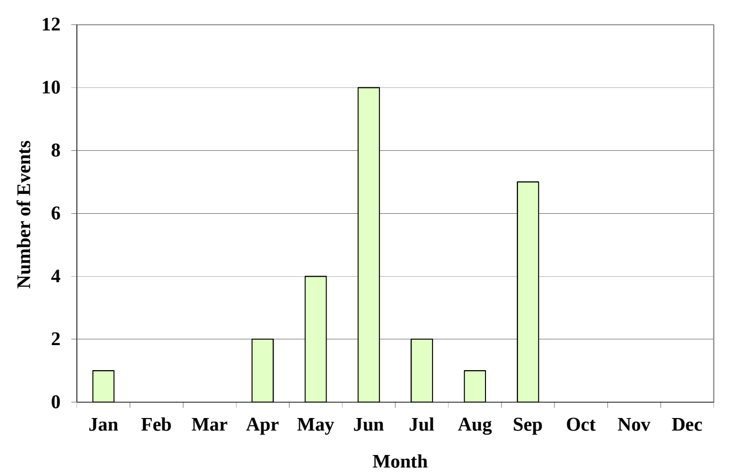
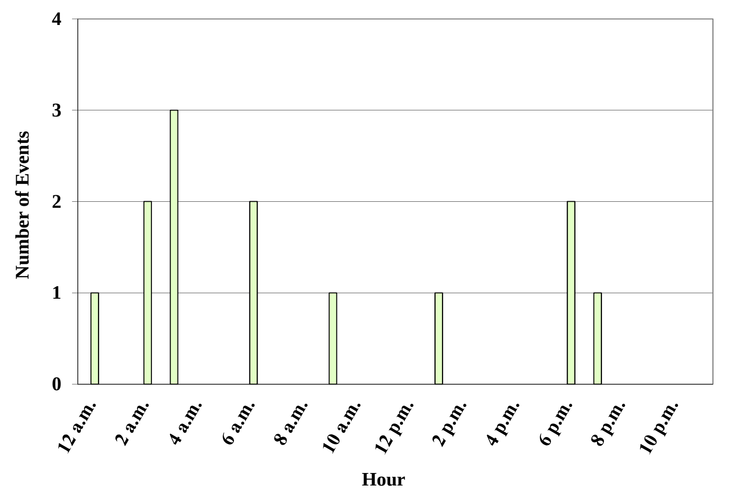


Figure 20 charts the reported occurrences of heavy rain by hour. Of the 27 occurrences, start times were unavailable for 14 events. Of the remaining 13 heavy rain events with recorded times, approximately 69% occurred during the a.m. hours. Seven (7) of the events (54%) took place between 2 a.m. and 7 a.m.

Figure 20
Heavy Rain Events by Hour
1993 – 2012



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 *2010 Illinois Natural Hazard Mitigation Plan* prepared by the Illinois Emergency Management Agency (IEMA) classifies Morgan 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?

Morgan County has had 123 verified occurrences of thunderstorms with damaging winds between 1956 and 2012. With 123 occurrences over the past 57 years, Morgan County should expect to experience at least two thunderstorms with damaging winds each year. There were 20 years over the last 57 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 35%.

There have been 46 verified occurrences of hail one inch in diameter or greater between 1964 and 2012. With 46 occurrences over the past 49 years, the probability or likelihood of a severe hail event occurring in Morgan County in any given year is 96%. There were 10 years over the last 49 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 20%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to severe storms?

Yes. All of Morgan 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 central Illinois. Since 2003, Morgan County has experienced 43 thunderstorms with damaging winds, 26 severe hail events, 17 heavy rain events and eight lightning strikes.

Of the participating municipalities, Jacksonville has by far had the most recorded occurrences of hail and thunderstorms with damaging winds. **Figure 21** details the number of severe storm events by category for each participating municipality. The difference in the number of recorded events may be due to the fact that Jacksonville is the county seat and largest municipality in the County. In addition, the two COOP observers for the National Weather Service in Morgan County are located in the Jacksonville area.

Figure 21
Verified Severe Storm Events by Participating Municipality

Participating Municipality	Number of Events			
	Thunderstorm & High Wind	Severe Hail	Lightning	Heavy Rain
Chapin	6	3	0	0‡
Franklin	8	4	0	1
Jacksonville	75	20	1	13
Meredosia	4	3	0	0‡
Murrayville	8	2	0	0‡
South Jacksonville	2	0*	10	0‡
Woodson	8	2	0	0‡

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

‡ While no verified heavy rain events were recorded specifically for this municipality, there have been multiple verified heavy rain events that have impacted the entire County.

Figure 22 details the number of thunderstorms with damaging winds and hail events for unincorporated areas of Morgan 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. However, the County as a whole has been impacted by multiple verified heavy rain events.

Figure 22
Verified Severe Storm Events in Unincorporated Morgan County

Unincorporated Area	Number of Events			Unincorporated Area	Number of Events	
	Thunderstorm & High Wind	Severe Hail			Thunderstorm & High Wind	Severe Hail
Alexander	3	1		Nortonville	2	1
Arcadia	0	1		Pisgah	0	2
Clements	2	0		Prentice	2	0
Lake Jacksonville	1	0		Sinclair	1	0
Literberry	1	1		Yatesville	2	0

What impacts resulted from the recorded severe storms?

Severe storms as a whole have caused an estimated $12,300,000 in crop damage and $1,879,198 in property damages and resulted in two injuries. The following provides a breakdown of impacts by category.

While severe summer storms frequently occur in Morgan County, the number of injuries and deaths is low. The hospital in Jacksonville, as well as hospitals in Springfield (Sangamon County), Carlinville (Macoupin County), and Carrollton (Greene 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: ***$1,787,500***
- Infrastructure/Critical Facilities Damage*: ***$4,000***
- Crop Damage: ***$11,800,000***
- Injuries: ***2***

Severe Hail Impacts
- Crop Damage: ***$500,000***

Lightning Strike Impacts
- Total Property Damage: ***$91,698***
- Infrastructure/Critical Facilities Damage*: ***$91,698***

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

The data provided by NOAA's Storm Events Database and Planning Committee member records indicates that between 1956 and 2012, 29 of the 123 thunderstorms with damaging winds caused $1,787,500 in property damage and $11,800,000 in crop damage. Damage information was either unavailable or none was recorded for the remaining 94 reported occurrences.

Included in the property damage figures provided above is $4,000 in verified infrastructure and critical facilities damage sustained in Franklin. Damaging winds associated with a September 5, 2012 thunderstorm caused property damage to the Village water tower and public restroom facilities.

NOAA's Storm Events Database also documented two injuries as a result of two separate thunderstorm events. The following provides a brief description of each event.

- On February 11, 1999 an individual sustained minor injuries from flying glass when a window was blown in at a restaurant in Jacksonville.
- An individual suffered minor injuries after being trapped beneath debris when a tree fell onto a home causing major damage at Lake Jacksonville on May 8, 2000.

Hail

The data provided by NOAA's Storm Events Database indicates that between 1964 and 2012, one of the 46 hail events caused $500,000 in crop damage. Damage information was either unavailable or none was recorded for the remaining 45 reported occurrences. No injuries or deaths were reported as a result of any of the hail events.

Lightning

Information obtained from Planning Committee member records and local newspapers indicates that between 1997 and 2012, nine of the 11 lightning strikes caused $91,698 in property damage. Damage information was either unavailable or none was recorded for the remaining two reported occurrences. No injuries or deaths were reported as a result of these lightning events.

The property damage figure provided above is composed entirely of infrastructure and critical facilities damage sustained by South Jacksonville. The Village's well site was struck five times between 2005 and 2012 causing $71,960 in property damages while the Village Hall was struck on two separate occasions (2003 and 2012) causing $16,487 in damages. The remaining $3,251 in property damages occurred as a result of lightning strikes that damaged the Village's communications room and communication tower and antenna in 1997 and 1999.

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 deaths were reported as a result of these events.

What other impacts can result from severe storms?

In Morgan 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 2007 and 2011 indicates that wet road surface conditions were present for 10.4% to 14.3% 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 deaths that occurred when wet road surface conditions were present.

Figure 23
Severe Weather Crash Data for Morgan County

Year	Total # of Crashes	Presence of Wet Road Surface Conditions		
		# of Crashes	# of Injuries	# of Deaths
2007	976	103	25	0
2008	940	120	34	2
2009	706	98	27	0
2010	700	73	20	0
2011	686	98	25	0
Total:			**131**	**2**

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 Morgan 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 Morgan 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. While six of the participating jurisdictions, including the County, have building codes in place that will likely help lessen the vulnerability of new buildings and critical facilities to damage from severe storms, two of the municipalities do not. Infrastructure such as new communication and power lines also 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 hazards, such as flooding, there are no standard loss estimation models or methodologies for severe storms. With only 39 of the 207 recorded events listing property and crop damage numbers for all categories of severe storms, there is no way to accurately estimate future potential dollar losses. Since all existing structures within Morgan County are vulnerable to damage, it is highly probable that there will be future dollar losses from severe storms.

Figure 11
(Sheet 1 of 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Morgan County
1956 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
8/8/1956	6:50 p.m.	Jacksonville^	65 kts	n/a	n/a	n/a	n/a	
8/3/1957	4:00 p.m.	Jacksonville^	n/a	n/a	n/a	n/a	n/a	
6/4/1960	11:50 p.m.	Jacksonville^	67 kts	n/a	n/a	n/a	n/a	
6/8/1961	2:05 p.m.	Jacksonville^	52 kts	n/a	n/a	n/a	n/a	
8/1/1961	4:45 p.m.	Jacksonville^	52 kts	n/a	n/a	n/a	n/a	
9/30/1961	11:30 a.m.	Jacksonville^	56 kts	n/a	n/a	n/a	n/a	
3/11/1962	3:15 p.m.	Jacksonville^	58 kts	n/a	n/a	n/a	n/a	
4/17/1963	6:30 p.m.	Jacksonville^	62 kts	n/a	n/a	n/a	n/a	
4/27/1964	5:53 p.m.	Jacksonville^	56 kts	n/a	n/a	n/a	n/a	
6/20/1964	7:57 a.m.	Jacksonville^	54 kts	n/a	n/a	n/a	n/a	
6/21/1964	2:50 a.m.	Jacksonville^	65 kts	n/a	n/a	n/a	n/a	
8/27/1965	7:30 a.m.	Jacksonville^	n/a	n/a	n/a	n/a	n/a	
4/21/1967	6:12 p.m.	Jacksonville^	56 kts	n/a	n/a	n/a	n/a	
6/10/1967	4:00 p.m.	Jacksonville^	n/a	n/a	n/a	n/a	n/a	
4/4/1969	8:35 p.m.	Jacksonville^	56 kts	n/a	n/a	n/a	n/a	
7/8/1969	2:45 p.m.	Jacksonville^	70 kts	n/a	n/a	n/a	n/a	
10/10/1969	10:10 p.m.	Jacksonville^	61 kts	n/a	n/a	n/a	n/a	
6/11/1971	1:25 p.m.	Jacksonville^	52 kts	n/a	n/a	n/a	n/a	
3/14/1973	1:05 a.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
12/4/1973	8:40 a.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
3/29/1974	1:10 p.m.	Jacksonville	65 kts	n/a	n/a	n/a	n/a	
5/20/1975	11:00 p.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
7/5/1975	2:18 p.m.	Jacksonville	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 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Morgan County
1956 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
8/6/1977	3:43 p.m.	Waverly	52 kts	n/a	n/a	n/a	n/a	
7/26/1978	3:20 p.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
6/22/1979	2:45 a.m.	Jacksonville	52 kts	n/a	n/a	n/a	n/a	
7/5/1980	2:10 a.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
7/5/1980	3:00 a.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
4/13/1981	4:30 p.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
3/16/1982	1:30 a.m.	Jacksonville	56 kts	n/a	n/a	n/a	n/a	
4/16/1982	6:25 a.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
5/20/1982	3:14 p.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
5/30/1982	2:38 p.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
5/1/1983	7:00 p.m.	Franklin	n/a	n/a	n/a	n/a	n/a	
5/13/1983	7:10 p.m.	Franklin	n/a	n/a	n/a	n/a	n/a	
5/22/1983	7:10 p.m.	Franklin	n/a	n/a	n/a	n/a	n/a	
8/22/1983	12:39 a.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
8/6/1985	2:42 p.m.	Murrayville	n/a	n/a	n/a	n/a	n/a	
9/22/1985	6:45 p.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
7/29/1986	2:10 a.m.	Jacksonville	61 kts	n/a	n/a	n/a	n/a	
7/29/1986	2:30 a.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
8/3/1987	6:50 p.m.	Jacksonville	52 kts	n/a	n/a	n/a	n/a	
5/8/1988	3:20 p.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
5/8/1988	4:41 p.m.	Nortonville^	n/a	n/a	n/a	n/a	n/a	
5/8/1988	4:57 p.m.	Waverly	n/a	n/a	n/a	n/a	n/a	
6/26/1989	8:57 p.m.	Jacksonville	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 3 of 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Morgan County
1956 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
5/14/1991	3:42 p.m.	Waverly	n/a	n/a	n/a	n/a	n/a	
6/22/1991	6:30 a.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
10/4/1991	4:25 p.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
4/15/1992	3:15 p.m.	Alexander^	n/a	n/a	n/a	n/a	n/a	
7/2/1992	4:12 p.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
7/2/1992	8:30 p.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
7/2/1992	9:39 p.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
7/3/1992	1:08 a.m.	Waverly	n/a	n/a	n/a	n/a	n/a	
9/9/1992	5:15 p.m.	Jacksonville	n/a	n/a	n/a	n/a	n/a	
5/16/1995	7:45 p.m.	Alexander	n/a	n/a	n/a	n/a	n/a	winds blew down several trees; a garage and house sustained minor damage
6/21/1995	8:48 p.m.	Meredosia	n/a	n/a	n/a	n/a	n/a	winds blew down a large tree
10/17/1996	1:45 p.m.	Jacksonville	n/a	0	0	$0	$0	winds blew down a large tree just west of Jacksonville
4/5/1997	2:20 p.m.	Jacksonville	n/a	0	0	n/a	n/a	winds damaged the tin roof of a trailer home
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Figure 11
(Sheet 4 of 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Morgan County
1956 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
5/20/1998	8:20 a.m.	Jacksonville Alexander^	n/a	0	0	$6,000	$0	winds blew down several trees and power lines and caused minor damage to the roof of a livestock building at the Morgan County Fairgrounds
5/22/1998	3:00 a.m.	Woodson^	n/a	0	0	$500	$0	winds blew down numerous power lines
6/18/1998	6:05 p.m.	Waverly	n/a	n/a	n/a	n/a	n/a	winds blew down several power lines and power poles
6/29/1998	4:00 p.m.	countywide	52 kts	n/a	n/a	n/a	n/a	winds caused widespread damage to trees, power poles, power lines and structures
2/11/1999	2:30 p.m.	Lynnville Jacksonville	n/a	1	0	n/a	n/a	destroyed a greenhouse in Lynnville; in Jacksonville 4 businesses sustained major roof damage and a window in a restaurant was blown in, causing one minor injury from flying glass; several sheds were either damaged or destroyed; winds blew down numerous trees and power poles and a chimney was blown off a house
Subtotal:				**1**	**0**	**$6,500**	**$0**	

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

Figure 11
(Sheet 5 of 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Morgan County
1956 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
4/8/1999	7:30 p.m.	Jacksonville	n/a	0	0	n/a	n/a	winds blew down 10 power poles and caused minor damage to a few houses
6/11/1999	1:00 p.m.	Meredosia	61 kts	0	0	$0	$0	winds blew down several large trees
8/12/1999	7:45 p.m.	Concord Jacksonville Franklin[ᐃ] Waverly	n/a	n/a	n/a	$22,000	$11,800,000	winds blew down numerous trees, tree limbs, and power lines countywide; in Jacksonville 5 mobile homes sustained moderate damage and several car windows were broken by falling tree limbs; thousands of acres of corn were destroyed
2/29/2000	9:55 p.m.	Concord[ᐃ]	n/a	0	0	n/a	n/a	winds blew the roof off of a metal storage building and downed several large trees
4/20/2000	4:10 a.m.	Concord Jacksonville	n/a	0	0	$30,000	$0	winds blew down numerous trees, tree limbs and power lines; in Concord part of the roof of a mobile home was torn off causing moderate damage; a garage suffered minor damage
Subtotal:				**0**	**0**	**$52,000**	**$11,800,000**	

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

Figure 11
(Sheet 6 of 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Morgan County
1956 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
5/8/2000	8:54 p.m.	Murrayville^ Woodson Lake Jacksonville	n/a	1	0	$30,000	$0	winds blew down numerous trees and power lines; in Woodson a tree fell onto a house causing minor damage; on the southeast side of Lake Jacksonville a tree fell onto a home causing major damage, one of the home's occupants sustained minor injuries after being trapped beneath the debris
5/26/2000	10:35 p.m.	Murrayville^ Clements	52 kts	0	0	n/a	n/a	winds blew down numerous trees, tree limbs, power poles and power lines
5/26/2000	10:35 p.m.	Lynnville South Jacksonville Jacksonville	52 kts	0	0	n/a	n/a	winds blew down numerous trees, tree limbs, power poles, and power lines; at Nichols Park in Jacksonville, about 3 dozen trees were destroyed
6/12/2000	7:20 p.m.	Chapin	n/a	0	0	$0	$0	a large tree was blown down
6/20/2000	6:14 p.m.	Alexander	n/a	0	0	n/a	n/a	winds flipped a mobile home and destroyed it
7/5/2000	3:45 p.m.	Jacksonville Franklin Waverly	n/a	n/a	n/a	n/a	n/a	winds blew down several trees in Jacksonville; several power lines were blown down in Jacksonville and Waverly
Subtotal:				**1**	**0**	**$30,000**	**$0**	

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

Figure 11
(Sheet 7 of 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Morgan County
1956 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
8/23/2000	9:17 p.m.	Waverly	n/a	n/a	n/a	n/a	n/a	winds blew down several power lines
7/17/2001	4:22 p.m.	Concord Chapin Murrayville	50 kts	n/a	n/a	n/a	n/a	winds blew down several trees, tree limbs and power lines
6/25/2002	5:00 p.m.	Chapin	50 kts	n/a	n/a	n/a	n/a	winds blew down several trees as well as a power pole; one of the fallen trees caused minor roof damage to a house
8/5/2002	4:22 p.m.	Jacksonville^	50 kts	n/a	n/a	n/a	n/a	winds blew down several trees
12/18/2002	12:00 a.m.	Jacksonville Sinclair^ Yatesville^ Prentice^	70 kts	0	0	$100,000	$0	winds blew down numerous trees, tree limbs, power lines, and power poles in Jacksonville; some of the fallen trees destroyed several garages, cars and the roof of one home; at the Morgan County Courthouse, a 35 ft. x 40 ft. section of roof was blown off and a 50 ft. fire dispatch radio tower was blown down; near Prentice, a tree and a grain bin were blown over onto power lines
4/16/2003	7:58 p.m.	Jacksonville	50 kts	n/a	n/a	n/a	n/a	winds blew down a large tree on the north side of the city
Subtotal:				**0**	**0**	**$100,000**	**$0**	

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

Figure 11
(Sheet 8 of 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Morgan County
1956 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
5/10/2003	6:00 a.m.	Woodson	60 kts	n/a	n/a	n/a	n/a	winds blew down several power poles
5/24/2004	10:36 p.m.	Jacksonville	78 kts	0	0	$1,000,000	$0	winds blew down numerous trees, tree limbs, and power lines; several homes sustained minor roof damage; the Morgan Count Courthouse sustained roof damage
5/31/2004	6:25 p.m.	Murrayville Franklin^	55 kts	n/a	n/a	n/a	n/a	winds blew down several trees
8/25/2004	1:20 p.m.	Prentice^	55 kts	n/a	n/a	n/a	n/a	winds blew down several trees and power lines; the roof was blown off a shed; some of the debris from the storm landed on IL Rte. 123
10/29/2004	10:30 p.m.	Lynnville Jacksonville^	50 kts	n/a	n/a	n/a	n/a	winds blew down a few trees and power lines
5/11/2005	6:30 p.m.	Woodson	50 kts	n/a	n/a	n/a	n/a	winds blew down a few power lines
5/19/2005	8:00 p.m.	Chapin	50 kts	n/a	n/a	n/a	n/a	winds blew down a few trees
5/19/2005	8:05 p.m.	Woodson	50 kts	n/a	n/a	n/a	n/a	winds blew down several tree limbs
6/13/2005	4:57 p.m.	Murrayville^ Waverly	55 kts	n/a	n/a	n/a	n/a	winds blew down numerous trees and tree limbs
8/19/2005	8:15 p.m.	Jacksonville	50 kts	n/a	n/a	n/a	n/a	winds blew down a few trees
9/8/2005	4:45 p.m.	Jacksonville	50 kts	n/a	n/a	n/a	n/a	winds blew down a few tree limbs
Subtotal:				**0**	**0**	**$1,000,000**	**$0**	

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

Figure 11
(Sheet 9 of 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Morgan County
1956 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
9/8/2005	4:53 p.m.	Yatesville^	50 kts	n/a	n/a	n/a	n/a	winds blew down a 1 ft. diameter tree
9/19/2005	5:50 p.m.	Murrayville	50 kts	n/a	n/a	n/a	n/a	winds blew down a large tree
11/5/2005	8:33 p.m.	Jacksonville	50 kts	n/a	n/a	n/a	n/a	winds blew down power lines
4/18/2006	10:25 p.m.	Jacksonville Municipal Airport	51 kts	n/a	n/a	n/a	n/a	
5/24/2006	2:18 p.m.	Jacksonville	52 kts	n/a	n/a	n/a	n/a	winds blew down several trees and power lines
7/19/2006	4:30 p.m.	Jacksonville Franklin Waverly	56 kts	n/a	n/a	n/a	n/a	winds blew down numerous trees and power lines
7/19/2006	5:00 p.m.	Jacksonville	60 kts	n/a	n/a	n/a	n/a	winds blew down numerous trees and tree limbs; a section of bleachers at a little league baseball field was destroyed
8/18/2006	8:20 p.m.	Alexander^	50 kts	n/a	n/a	n/a	n/a	winds blew small tree limbs across I-72 along the Morgan/Sangamon County line
8/16/2007	9:56 a.m.	Waverly^	50 kts	n/a	n/a	n/a	n/a	winds blew down several 2 in. diameter tree limbs
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Figure 11
(Sheet 10 of 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Morgan County
1956 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
10/18/2007	12:50 a.m.	Meredosia	61 kts	n/a	n/a	$30,000	$0	winds blew down numerous tree limbs and power lines; siding was blown off several houses; tree tops were sheared off along a 100 yd. path near the intersection of US 67 and IL Rte. 104
10/18/2007	1:05 a.m.	Woodson	61 kts	n/a	n/a	$5,000	$0	winds blew trees down on IL Rte. 267 near the Winchester blacktop
5/30/2008	4:23 p.m.	Chapin^	56 kts	n/a	n/a	$10,000	$0	winds blew down several large tree limbs
6/3/2008	9:10 a.m.	Chapin	52 kts	n/a	n/a	$10,000	$0	winds blew down several large tree limbs
7/27/2008	8:15 p.m.	Jacksonville	52 kts	n/a	n/a	$25,000	$0	winds blew down numerous trees and power lines
8/5/2008	5:10 p.m.	Jacksonville South Jacksonville	52 kts	n/a	n/a	$5,000	$0	in Jacksonville, winds blew down several 2 ft. diameter trees; an 8 in. diameter tree limb was blown onto a house; power lines were blown down and blocked IL Rte. 104; in South Jacksonville, a power pole was blown down onto a house
5/13/2009	9:30 p.m.	Jacksonville	52 kts	n/a	n/a	$20,000	$0	winds blew down several trees on the south side of the city
6/19/2009	3:55 p.m.	Jacksonville	52 kts	n/a	n/a	$30,000	$0	winds blew down numerous trees and tree limbs
Subtotal:				**0**	**0**	**$135,000**	**$0**	

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

Figure 11
(Sheet 11 of 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Morgan County
1956 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
6/27/2009	8:15 p.m.	Meredosia	52 kts	n/a	n/a	$15,000	$0	winds blew down power lines
8/42009	6:45 a.m.	Jacksonville	61 kts	n/a	n/a	$20,000	$0	winds blew down numerous power lines
8/19/2009	1:14 p.m.	Woodson^ Clements^	52 kts	n/a	n/a	$5,000	$0	winds blew down power lines onto Woodson Blacktop and Crow Rd.
7/18/2010	7:24 a.m.	Jacksonville^	52 kts	n/a	n/a	$7,000	$0	winds blew down a tree and a power line
8/20/2010	5:10 p.m.	Jacksonville	52 kts	n/a	n/a	$45,000	$0	winds blew down numerous tree limbs; a tree snapped at its trunk and feel onto Hoagland Blvd.; a large window at a bridal shop was broken and several houses lost shingled from their roofs
2/27/2011	9:07 p.m.	Murrayville^	52 kts	n/a	n/a	$10,000	$0	trees were blown down across US 267 just north of Whitlock Rd.
5/25/2011	4:00 a.m.	Jacksonville Nortonville^	52 kts	n/a	n/a	$33,000	$0	wind blew down several large tree limbs in Jacksonville; near Nortonville, winds blew down several large tree limbs causing roof damage to a barn and toppled a TV antenna
5/25/2011	4:15 a.m.	Jacksonville^	52 kts	n/a	n/a	$10,000	$0	the tops of several 8 to 10 in. diameter trees were snapped off near US 67 and Old IL 36
Subtotal:				**0**	**0**	**$145,000**	**$0**	

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

Figure 11
(Sheet 12 of 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Morgan County
1956 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
6/25/2011	7:50 p.m.	Concord	52 kts	n/a	n/a	$10,000	$0	winds blew down power lines
6/25/2011	8:00 p.m.	Jacksonville Municipal Airport	52 kts	n/a	n/a	$25,000	$0	winds blew down several tree limbs and power lines near IL Rte. 78 and Baldwin Rd.
6/25/2011	8:30 p.m.	Alexander	52 kts	n/a	n/a	$50,000	$0	winds blew down numerous trees
6/27/2011	1:30 a.m.	Literberry	70 kts	n/a	n/a	$200,000	$0	winds blew down several trees and power lines; the walls of a mobile home were blown out and numerous other houses experienced minor roof and siding damage
9/5/2012	6:45 a.m.	Jacksonville	52 kts	n/a	n/a	$15,000	$0	winds blew down several 2 in. diameter tree limbs in Jacksonville
9/5/2012	6:50 a.m.	Woodson^ Franklin	52 kts	n/a	n/a	$19,000	$0	winds blew down numerous 3 in. diameter tree limbs just southwest of Woodson; in Franklin winds damaged the water tower and public restroom facilities
Subtotals:				**0**	**0**	**$319,000**	**$0**	
GRAND TOTAL:				**2**	**0**	**$1,787,500**	**$11,800,000**	

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

Source: Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Member responses to Morgan County – Damages to Critical Facilities Questionnaire.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

Figure 12
(Sheet 1 of 3)
Severe Storms – Hail Events Reported in Morgan County
1964 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Diameter)	Injuries	Death	Property Damage	Crop Damage	Description
4/2/1964	4:30 p.m.	Jacksonville^	1.25 in.	n/a	n/a	n/a	n/a	
4/19/1964	8:00 p.m.	Jacksonville^	2.00 in.	n/a	n/a	n/a	n/a	
5/24/1971	12:30 p.m.	Jacksonville^	1.00 in.	n/a	n/a	n/a	n/a	
5/11/1975	5:05 p.m.	Murrayville	2.00 in.	n/a	n/a	n/a	n/a	
7/5/1975	2:18 p.m.	Jacksonville	1.75 in.	n/a	n/a	n/a	n/a	
5/5/1977	6:30 p.m.	Literberry	3.50 in.	n/a	n/a	n/a	n/a	
4/5/1978	2:18 p.m.	Jacksonville	1.75 in.	n/a	n/a	n/a	n/a	
4/11/1979	4:50 p.m.	Jacksonville	1.75 in.	n/a	n/a	n/a	n/a	
5/21/1987	7:55 p.m.	Jacksonville	1.75 in.	n/a	n/a	n/a	n/a	
6/2/1987	11:25 a.m.	Jacksonville	1.25 in.	n/a	n/a	n/a	n/a	
5/8/1988	3:50 p.m.	Chapin	1.00 in.	n/a	n/a	n/a	n/a	
5/4/1991	7:33 p.m.	Meredosia	1.75 in.	n/a	n/a	n/a	n/a	
7/9/1992	4:47 p.m.	Arcadia^	1.75 in.	n/a	n/a	n/a	n/a	
4/18/1996	5:35 p.m.	Jacksonville	1.00 in.	n/a	n/a	n/a	n/a	
4/18/1996	6:01 p.m.	Jacksonville	1.50 in.	n/a	n/a	n/a	n/a	
5/12/1998	5:45 p.m.	Chapin	1.75 in.	n/a	n/a	n/a	n/a	
8/18/1999	11:30 p.m.	Jacksonville	1.75 in.	n/a	n/a	n/a	n/a	
4/16/2000	4:25 p.m.	Waverly^	1.75 in.	n/a	n/a	n/a	n/a	
5/1/2002	1:45 p.m.	Pisgah^	1.00 in.	n/a	n/a	n/a	n/a	
5/27/2002	2:13 p.m.	Waverly	1.00 in.	n/a	n/a	n/a	n/a	
4/4/2003	3:15 p.m.	Waverly	1.75 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 3)
Severe Storms – Hail Events Reported in Morgan County
1964 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Diameter)	Injuries	Death	Property Damage	Crop Damage	Description
5/8/2003	10:00 p.m.	Alexander	1.00 in.	n/a	n/a	n/a	n/a	
5/9/2003	5:57 p.m.	Jacksonville	1.00 in.	n/a	n/a	n/a	n/a	
5/10/2003	6:00 a.m.	Woodson Nortonville	1.75 in.	n/a	n/a	n/a	n/a	
5/23/2004	5:39 p.m.	Franklin Waverly	1.75 in.	n/a	n/a	n/a	n/a	
11/5/2005	11:30 p.m.	Jacksonville^	1.00 in.	n/a	n/a	n/a	n/a	
1/7/2008	5:40 p.m.	Murrayville^	1.50 in.	n/a	n/a	n/a	n/a	
6/22/2008	4:00 p.m.	Meredosia	1.00 in.	n/a	n/a	n/a	n/a	
5/13/2009	8:45 p.m.	Meredosia	1.00 in.	n/a	n/a	n/a	n/a	
5/13/2009	9:32 p.m.	Murrayville	1.00 in.	n/a	n/a	n/a	n/a	
8/3/2009	2:18 p.m.	Woodson^	1.00 in.	n/a	n/a	n/a	n/a	
4/15/2011	4:40 p.m.	Waverly^	2.00 in.	n/a	n/a	n/a	n/a	
4/19/2011	4:23 a.m.	Jacksonville	1.50 in.	n/a	n/a	n/a	n/a	
4/22/2011	7:55 a.m.	Chapin	1.75 in.	n/a	n/a	n/a	n/a	
5/22/2011	1:05 p.m.	Jacksonville	1.00 in.	n/a	n/a	n/a	n/a	
5/22/2011	1:10 p.m.	Jacksonville	1.00 in.	n/a	n/a	n/a	n/a	
5/22/2011	2:00 p.m.	Franklin	1.00 in.	n/a	n/a	n/a	n/a	
5/28/2011	12:53 p.m.	Jacksonville	1.00 in.	n/a	n/a	n/a	n/a	
5/28/2011	12:55 p.m.	Jacksonville	1.75 in.	n/a	n/a	n/a	n/a	
6/10/2011	5:42 p.m.	Lynnville^	1.00 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 3 of 3)
Severe Storms – Hail Events Reported in Morgan County
1964 – 2012

Date(s)	Start Time	Location(s)	Magnitude (Diameter)	Injuries	Death	Property Damage	Crop Damage	Description
8/13/2011	2:48 p.m.	Jacksonville	1.25 in.	n/a	n/a	n/a	n/a	hail ranged from pea sized to half-dollar sized
8/13/2011	2:52 p.m.	Pisgah^	1.75 in.	n/a	n/a	$0	$500,000	hail did significant crop damage to a bean field
3/15/2012	4:40 p.m.	Waverly^	1.00 in.	n/a	n/a	n/a	n/a	
3/15/2012	4:45 p.m.	Franklin	1.00 in.	n/a	n/a	n/a	n/a	
5/4/2012	10:47 p.m.	Jacksonville	1.00 in.	n/a	n/a	n/a	n/a	
5/20/2012	4:45 p.m.	Franklin	1.00 in.	n/a	n/a	n/a	n/a	
Subtotal:				**0**	**0**	**$0**	**$500,000**	
GRAND TOTAL:				**0**	**0**	**$0**	**$500,000**	

^ 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 Morgan County
1997 – 2012

Date(s)	Start Time	Location(s)	Injuries	Death	Property Damage	Crop Damage	Description
6/6/1997	n/a	South Jacksonville	0	0	$2,330	n/a	lightning damaged the communications room
8/12/1999	n/a	South Jacksonville	0	0	$921	n/a	lightning damaged the communications tower and antenna
6/20/2000	n/a	South Jacksonville	0	0	n/a	n/a	lightning damaged the Village's alarm system
7/18/2003	n/a	South Jacksonville	0	0	$14,017	n/a	lightning damaged Village Hall
5/11/2005	n/a	South Jacksonville⮝	0	0	$5,919	n/a	lightning damaged the Village's well site
7/13/2006	n/a	South Jacksonville⮝	0	0	$17,191	n/a	lightning damaged the Village's well site
6/3/2008	n/a	South Jacksonville⮝	0	0	$27,265	n/a	lightning damaged the Village's well and pump site
6/18/2011	n/a	South Jacksonville⮝	n/a	n/a	$13,085	n/a	lightning damaged the Village's well site
5/27/2012	n/a	South Jacksonville⮝	0	0	$8,500	n/a	lightning damaged the Village's well site
8/13/2012	n/a	South Jacksonville	n/a	n/a	$2,470	n/a	lightning damaged Village Hall
9/25/2012	3:15 a.m.	Jacksonville	n/a	n/a	n/a	n/a	lightning either struck near the Jacksonville Municipal Building or hit the building itself, frying some of the phone lines and affecting various city departments and 911
GRAND TOTAL:			**0**	**0**	**$91,698**	**$0**	

Source: Jacksonville Journal Courier.
Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Member responses to Morgan County – Damages to Critical Facilities Questionnaire.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

Figure 14
(Sheet 1 of 6)
Severe Storms – Heavy Rain Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Description
9/2/1993 thru 9/3/1993	9:00 a.m.	Jacksonville	3.26 in.	n/a	n/a	n/a	COOP observer at Jacksonville measured 3.26 inches of rain
9/13/1993 thru 9/15/1993	7:30 p.m.	Jacksonville	4.48 in.	n/a	n/a	n/a	COOP observer at Jacksonville measured 3.11 inches of rain on the 14th and 1.37 inches on the 15th
9/22/1993 thru 9/24/1993	3:00 a.m.	countywide	4 – 7 in.	n/a	n/a	n/a	4 to 7 inches of rain fell resulting in flash flooding of streets, businesses and homes during the late evening hours of the 22nd into the early morning of the 23rd; COOP observer at Jacksonville measured 5.02 inches on the 23rd and reported that most of the rain fell in a 2 to 4 hour period causing severe flooding
5/16/1995 thru 5/18/1995	6:00 p.m.	countywide	1.95 in.	n/a	n/a	n/a	flash flooding occurred during the late evening hours of the 16th but a detailed description was unavailable; COOP observer at Jacksonville measured 0.88 inches of rain on the 17th and 1.07 inches on the 18th
6/6/2001	12:00 a.m.	countywide	3.38 in.	n/a	n/a	n/a	heavy rains resulted in flash flooding across the county; numerous roads were flooded and Mauvaise Terre Creek overflowed its banks; COOP observer at Jacksonville measured 3.38 inches of rain and reported flooding in the area
4/21/2002	2:00 a.m.	Jacksonville	1.75 in.	n/a	n/a	n/a	COOP observer at Jacksonville measured 1.75 inches of rain
Subtotal:				**0**	**0**	**$0**	

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

Figure 14
(Sheet 2 of 6)
Severe Storms – Heavy Rain Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Description
4/27/2002	2:30 a.m.	Alexander[^]	2.34 in.	n/a	n/a	n/a	heavy rains caused flash flooding of County Highway 123 between Alexander and Ashland in Cass County; one foot of water covered the southbound lane; COOP observer at Jacksonville measured 2.34 inches of rain
5/6/2002 thru 5/7/2002	3:00 a.m.	Jacksonville	2.20 in.	n/a	n/a	n/a	very heavy rains fell over a large portion of central Illinois south of a Winchester to Charleston line; numerous roads experienced flash flooding on the 6th; COOP observer at Jacksonville measured 0.48 inches of rain on the 6th and 1.72 inches on the 7th
5/12/2002 thru 5/13/2002	3:00 a.m.	countywide	2.88 in.	n/a	n/a	n/a	heavy rains caused flash flooding of numerous roads, including Old Rte. 36 near Lynnville and IL Rte. 11 near Waverly on the 12th; several cars had to be towed after being driven into flooded areas but no injuries were reported; COOP observer at Jacksonville measured 1.72 inches of rain on the 12th and 1.16 inches on the 13th
6/11/2002	n/a	northern portion of the county	2.61 in.	n/a	n/a	n/a	heavy rains resulted in flash flooding of several roads; IL Rte. 78 north Jacksonville and Old Rte. 36 near Jacksonville both had water flowing over them; COOP observer at Jacksonville measured 2.61 inches of rain and reported torrential rains
8/25/2004	1:30 p.m.	Jacksonville	2.16 in.	n/a	n/a	n/a	heavy rains resulted in flash flooding of several city streets; COOP observers at Jacksonville measured between 2.11 and 2.16 inches of rain
Subtotal:				**0**	**0**	**$0**	

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

Figure 14
(Sheet 3 of 6)
Severe Storms – Heavy Rain Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Description
1/12/2005 thru 1/13/2005	6:00 p.m.	Jacksonville	1.65 in.	n/a	n/a	n/a	heavy rains caused flash flooding of numerous streets in the city; COOP observers at Jacksonville measured 1.65 inches of rain
9/4/2008 thru 9/5/2008	6:00 a.m.	Jacksonville	1.78 in.	n/a	n/a	n/a	COOP observers at Jacksonville measured between 1.70 and 1.78 inches of rain
9/11/2008 thru 9/15/2008	n/a	Jacksonville	4.86 in.	n/a	n/a	n/a	heavy rains fell for 4 days as the remnants of Hurricane Ike moved through the area; flash flooding occurred on the 11th and again on the 13th in Jacksonville; COOP observers at Jacksonville measured between 4.77 and 4.86 inches of rain
5/13/2009 thru 5/14/2009	6:00 a.m.	northern portion of the county	2 – 4 in.	n/a	n/a	n/a	2 to 4 inches of heavy rain fell within 2 hours producing significant flash flooding of most roads, particularly those in the northern portions of the County; COOP observers at Jacksonville measured between 1.70 and 1.72 inches of rain
9/6/2009 thru 9/7/2009	n/a	Jacksonville	2.13 in.	n/a	n/a	n/a	COOP observers at Jacksonville measured between 1.70 and 2.13 inches of rain
Subtotal:				**0**	**0**	**$0**	

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

Figure 14
(Sheet 4 of 6)
Severe Storms – Heavy Rain Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Description
9/20/2009	n/a	western & central portions of the county	4.5 – 5 in.	n/a	n/a	n/a	4.5 to 5 inches of heavy rain were reported within 2 hours in a 15-mile wide band across western and central portions of the County; flooding caused numerous road closures and claimed the life of a man near Woodson; COOP observers at Jacksonville measured between 4.00 and 4.73 inches of rain
6/9/2010	n/a	Jacksonville	2.13 in.	n/a	n/a	n/a	COOP observers at Jacksonville measured between 1.76 and 2.13 inches of rain
6/15/2010	n/a	Franklin Waverly	3 in.	n/a	n/a	n/a	nearly 3 inches of rain fell in about 2 hours producing flash flooding in a small part of southeast Morgan County; streets were flooded in Waverly, as were most of the rural roads south of the city toward the Macoupin County line
6/19/2010	n/a	Jacksonville	1.57 in.	n/a	n/a	n/a	COOP observers at Jacksonville measured between 1.14 and 1.57 inches of rain
6/22/2010	n/a	Jacksonville	1.55 in.	n/a	n/a	n/a	COOP observers at Jacksonville measured between 1.21 and 1.55 inches of rain
7/18/2010 thru 7/21/2010	n/a	Jacksonville	6.12 in.	n/a	n/a	n/a	COOP observers at Jacksonville measured between 1.15 and 1.28 inches of rain on the 19th; between 1.99 and 2.93 inches on the 20th; and between 2.04 and 2.24 inches on the 21st
Subtotal:				**0**	**0**	**$0**	

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

Figure 14
(Sheet 5 of 6)
Severe Storms – Heavy Rain Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Description
7/24/2010	n/a	western portion of the county	3 – 4 in.	n/a	n/a	n/a	3 to 4 inches of heavy rain resulted in flash flooding in much of the western portion of the County; rainfall rates topped 2 inches per hour and caused flooding of numerous roads and creeks; 2 parks near Jacksonville were closed due to the flooded creeks and several homes in Jacksonville had flooded basements; COOP observers at Jacksonville measured between 2.00 and 3.26 inches of rain
6/2/2011	n/a	northwestern portion of the county	3+ in.	n/a	n/a	n/a	more than 3 inches of rain fell in about 2 hours resulting in flash flooding in the northwestern portion of the County; numerous roads were flooded around Meredosia and IL Routes 67 and 104 were closed during the early morning
6/17/2011 thru 6/18/2011	n/a	countywide	5 – 10 in.	n/a	n/a	n/a	a stationary, back-building storm system stalled over a relatively small area of central Illinois, the system produced 5 to 10 inches of rain in a short amount of time resulting in historic flash flooding across much of Morgan County; property damage was extensive; COOP observers at Jacksonville measured between 5.11 and 5.60 inches of rain;
Subtotal:				**0**	**0**	**$0**	

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

Figure 14
(Sheet 6 of 6)
Severe Storms – Heavy Rain Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Description
6/25/2011 thru 6/26/2011	n/a	countywide	1 – 2 in.	n/a	n/a	n/a	1 to 2 inches of rain fell on extremely saturated soils resulting in rapid flash flooding of creeks, streams and roads in the County; COOP observers at Jacksonville measured between 1.22 and 1.30 inches of rain
6/27/2011	n/a	northern and central portions of the county	1 – 2 in.	n/a	n/a	n/a	an additional 1 to 2 inches fell across the County resulting in flash flooding of creeks and roads across northern and central Morgan County, including the water logged city of Jacksonville; nearly all rural roads were impassable in the northern half of the County during the early morning; COOP observers at Jacksonville measured between 1.08 and 1.11 inches of rain
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, 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 & 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 death (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?

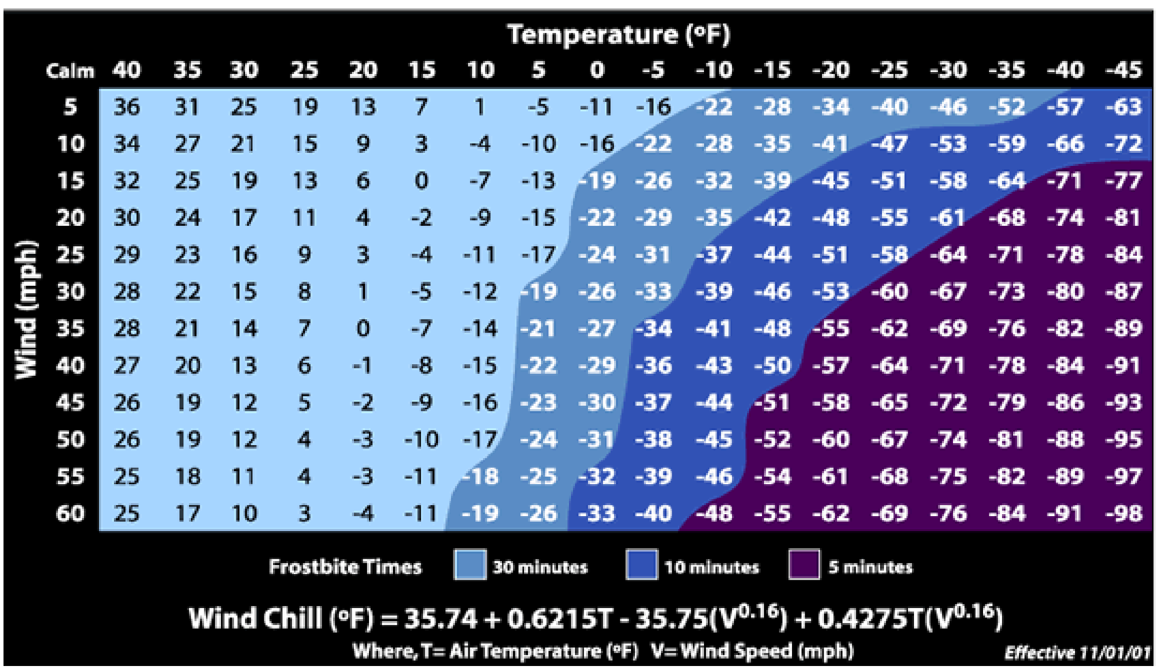
Freezing rain is precipitation that falls in the form of a liquid (i.e., rain drops), but freezes into a glaze of ice upon contact with the ground or other hard surfaces. This occurs when snowflakes descend into a warmer layer of air and melt completely. When the rain drops that result from this melting 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



Temperature (°F)

Wind (mph) \ 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?

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 storms. 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 Morgan 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. A watch will often be issued when there is still uncertainty about the path and strength of a developing winter storm. 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 lesser 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.** Winter weather warnings are issued for severe winter weather events that can be life threatening. Individuals are advised to avoid travel and stay indoors. The following warnings will be issued when an event is imminent within the next 12 to 24 hours.
  - **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 occurred previously? What is the extent of these previous severe winter storms?

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 and extreme cold events recorded in Morgan County.

Severe Winter Storm Fast Facts – Occurrences

Number of Snow & Ice Events Reported (1951 – 2012): ***50***

Number of Extreme Cold Events Reported (1995 – 2012): ***5***

Maximum One-Day Snow Accumulation: ***12 inches (Feb. 2, 2011)***

Coldest Temperature Recorded in the County: ***-28°F (Feb. 27, 1934)***

Most Likely Month for Snow & Ice Events to Occur: ***January***

Most Likely Month for Extreme Cold Events to Occur: ***January***

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 50 reported occurrences of severe winter storms (snow, ice and/or a combination of both) in Morgan County between 1951 and 2012. Of the 50 occurrences, 36 were heavy snow storms or blizzards, five were ice storms and nine were a combination of freezing rain, sleet, ice and snow.

Since 1995, at least one severe winter storm has occurred each year in Morgan County with the exception of 2001, 2002, 2005 and 2009. 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 50 events, 29 (58%) took place in January and February. There were two events that spanned two months; one took place between November and December while the other took place between January and February; however, for illustration purposes only the month the event started in is graphed.

Figure 27
Severe Winter Storms by Month
1951 – 2012

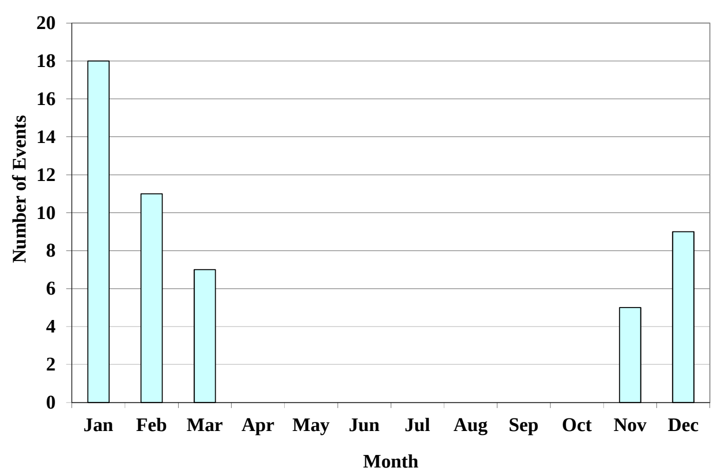
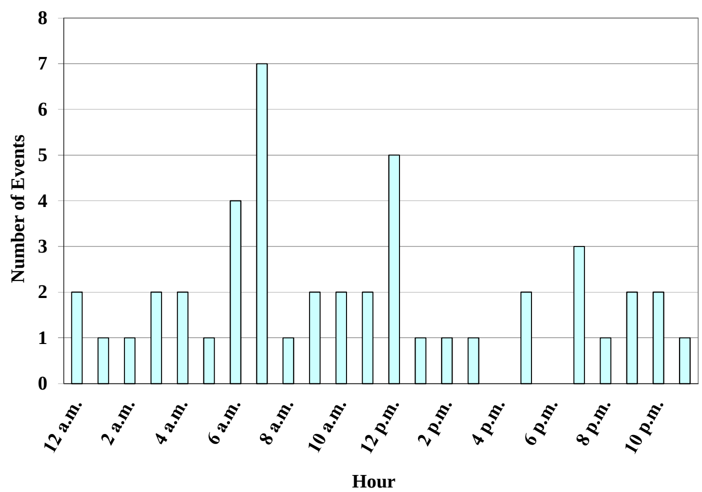


Figure 28 charts the reported occurrences of severe winter storms by hour. Of the 50 occurrences, start times were unavailable for four events. Of the remaining 46 severe winter storm events with recorded times, approximately 59% began during the a.m. hours, with 16 (35%) beginning between 6 a.m. and 11 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 110 years in Morgan County was 12.0 inches which occurred east of Jacksonville on February 28, 1900 and again on February 2, 2011. The heaviest seasonal snowfall on record for Morgan County is 54.0 inches which occurred during the winter of 1977-1978, the second heaviest seasonal snowfall on record is 42.0 inches which occurred during the winter of 1981-1982.

Figure 28
Severe Winter Storms by Hour
1951 – 2012



Extreme Cold

NOAA's Storm Events Database was used to document five occurrences of extreme cold (dangerously low temperatures and wind chill values) in Morgan County between 1995 and 2012. Of the five occurrences, one corresponded with and one followed recorded severe winter storms. Four of the five events (80%) took place in January and the remaining event took place in February. Approximately 80% of all events began during the a.m. hours.

According to records from the Midwestern Regional Climate Center, the coldest temperature recorded in Morgan County was -28°F near Jacksonville on February 27, 1934. The second coldest temperature recorded was -24°F near Jacksonville on January 7, 1912.

What locations are affected by severe winter storms?

Severe winter storms affect the entire County. All communities in Morgan County have been affected by severe winter storms. Severe winter storms generally extend across the entire County and affect multiple locations. The *2010 Illinois Natural Hazard Mitigation Plan* prepared by IEMA classifies the Morgan County's hazard rating for severe winter storms as "severe."

What is the probability of future severe winter storms occurring?

Severe Winter Storms

Morgan County has had 50 verified occurrences of severe winter storms between 1951 and 2012. With 50 occurrences over the past 62 years, the probability or likelihood that a severe winter storm will occur in the County in any given year is 81%. There were 11 years over the past 62 years where two or more severe winter storms occurred. This indicates that the probability

An ice storm on December 8th and 9th, 2007 downed numerous trees and power lines.

Photograph provided by South Jacksonville Police Department.

that more than one severe winter storm may occur during any given year within the County is 18%. However gaps in the data, especially between 1951-1961, have the potential to cause a distortion in both these probabilities.

If only the events recorded by NOAA's Storm Events Database are analyzed, then there have been 23 verified occurrences of severe winter storms between 1995 and 2012. With 23 events in 18 years, Morgan County should expect to experience at least one severe winter storm each year. There were five years over the past 18 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 28%.

A probability based on 18 years of data may not be as accurate as a probability based on 62 years of data. However, a probability based on the 1995 through 2012 data may provide a more reliable representation of the threat the County faces from severe winter storms than a probability calculated from a longer time frame with gaps.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to severe winter storms?

Yes. All of Morgan County, including the participating municipalities, is vulnerable to the dangers presented by severe winter storms. Severe winter storms are among the most frequently occurring natural hazards in Illinois. Morgan County is served by one state-designated warming center located at the Illinois Department of Human Services office in Jacksonville.

Since 2003, Morgan County has experienced 14 snow and ice events and one extreme cold event. 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.

Located throughout this section and in **Appendix J** are select photographs provided by Planning Committee members that depict the effects of severe winter storms in Morgan County.

What impacts resulted from the recorded severe winter storms?

The data provided by NOAA's Storm Events Database and Planning Committee member records indicates that between 1951 and 2012, two of the 57 severe winter storms caused $281,114 in property damage. Included in the property damage total is $220,000 for the February 2011 blizzard which represents losses sustained in both Morgan and Scott Counties. A breakdown by county was unavailable. Property damage information was either unavailable or none was recorded for the remaining 48 reported occurrences.

Severe Winter Storm Fast Facts – Impacts/Risk

Snow & Ice Impacts
- Total Property Damage: ***$281,114***
- Infrastructure/Critical Facilities Damage*: ***$11,114***
- Injuries: ***6***

Severe Winter 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.

Included in the property damage figures provided above is $11,114 in verified infrastructure and critical facilities damage sustained in South Jacksonville. An ice storm that began on December 8, 2007 caused a power surge that damaged the Village's drinking water wells and lift station.

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.

Information obtained from COOP data records identified six injuries as a result of one severe winter storm. According to remarks recorded by the COOP observer in Jacksonville, six individuals were hospitalized with frostbite as a result of the January 27 and 28, 1977 blizzard.

Ice downed numerous trees and power lines on December 8th and 9th, 2007.

Photograph provided by South Jacksonville Police Department.

While severe winter storms occur regularly in Morgan County, the number of injuries and deaths is low. The combination of treacherous road conditions and a temporary loss of power can make individuals who are not able to reach emergency shelters more vulnerable to hypothermia and other common winter-related injuries. However, even taking into consideration the increased impacts from power outages, the risk to public health and safety from severe winter storms is relatively low.

What other impacts can result from severe winter storms?

In Morgan County, vehicle accidents are the largest risk to health and safety from severe winter storms. Hazardous driving conditions (i.e., reduced visibility, icing road conditions, strong winds, etc.) contribute to the increase in accidents that result in injury and death. A majority of all severe winter storm injuries result from vehicle accidents.

Traffic accident data assembled by the Illinois Department of Transportation between 2007 and 2011 indicates that treacherous road conditions caused by snow and ice were present for 7.4% to 13.1 % of all crashes recorded annually in the County. **Figure 29** provides a breakdown by year of the number of crashes and corresponding injuries and deaths that occurred when treacherous road conditions caused by snow and ice were present.

Figure 29
Severe Winter Weather Crash Data for Morgan County

Year	Total # of Crashes	Presence of Treacherous Road Conditions caused by Snow and Ice		
		# of Crashes	# of Injuries	# of Deaths
2007	976	107	30	0
2008	940	123	19	0
2009	706	52	20	0
2010	700	77	20	0
2011	686	61	18	0
Total:			**107**	**0**

Source: Illinois Department of Transportation.

Persons who are outdoors during and immediately following severe winter storms 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?

Yes. All existing buildings, infrastructure and critical facilities located in Morgan County and the participating municipalities are vulnerable to damage from severe winter storms. Structural damage to buildings caused by severe winter storms is very rare, but can occur particularly to flat rooftops.

Crews work to restore power in South Jacksonville after the December 8th and 9th, 2007 ice storm.

Photograph provided by South Jacksonville Police Department.

Information gathered from Morgan 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.

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 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.

Based on the frequency with which severe winter storms occur in Morgan 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 to high.

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

Yes. While six of the participating jurisdictions, including the County, have building codes in place that will likely help lessen the vulnerability of new buildings and critical facilities to damage from severe winter storms, two of the municipalities do not.

Infrastructure such as new communication and power lines also will continue to be vulnerable to severe winter storms. Ice accumulations on power lines can disrupt power service. Rural areas of Morgan 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. There is very little that can be done to reduce or eliminate the vulnerability of new critical facilities such as roads and bridges to severe winter storms.

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

Unlike other hazards, such as flooding, there are no standard loss estimation models or methodologies for severe winter storms. Since there were limited recorded events listing property damage numbers for severe winter storms, there is no way to accurately estimate future potential dollar losses. However, since all structures within Morgan County are vulnerable to damage it is likely that there will be future dollar losses from severe winter storms.

Figure 25
(Sheet 1 of 9)
Severe Winter Storms – Snow & Ice Events Reported in Morgan County
1951 – 2012

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
11/5/1951 thru 11/6/1951	10:30 p.m.	Heavy Snow	COOP observer at Jacksonville measured 5.5 inches of snow	n/a	n/a	n/a
3/8/1960 thru 3/9/1960	7:00 a.m.	Heavy Snow	COOP observer at Jacksonville measured 10.5 inches of snow	n/a	n/a	n/a
3/15/1960 thru 3/16/1960	7:00 a.m.	Winter Storm	COOP observer at Jacksonville measured 6.5 inches of snow and indicated that there were high winds and drifting snow	n/a	n/a	n/a
2/2/1961 thru 2/3/1961	7:00 a.m.	Heavy Snow	COOP observer at Jacksonville measured 9.0 inches of snow	n/a	n/a	n/a
2/23/1963 thru 2/24/1963	6:30 a.m.	Heavy Snow	COOP observer at Jacksonville measured 9.5 inches of snow and indicated that the event slowed traffic	n/a	n/a	n/a
1/11/1964 thru 1/12/1964	2:00 p.m.	Blizzard	COOP observer east of Jacksonville measured 12.0 inches of snow and indicated that the winds were blowing 40 mph with gusts up to 60 mph which caused drifting that blocked all roads and closed everything, including schools, on the 13th	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 2 of 9)
Severe Winter Storms – Snow & Ice Events Reported in Morgan County
1951 – 2012

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
2/23/1965 thru 2/24/1965	12:00 p.m.	Blizzard	COOP observer at Jacksonville measured 12.0 inches of snow and indicated that all schools were closed and all meetings were cancelled on the 24th and that some highways were also closed; the observer also reported that on the 25th the winds were blowing 30 mph with gusts up to 40 mph which caused drifting as high as 4 feet and blocked all highways and many city streets, and kept everything closed for another day	n/a	n/a	n/a
1/26/1967 thru 1/27/1967	1:00 a.m.	Winter Storm	COOP observer at Jacksonville measured ½ to ¾ inches of ice on trees and power lines, 2.0 inches of sleet and 5.0 inches of snow and indicated that there were damaging winds associated with the storm and that all area schools were closed	n/a	n/a	n/a
1/12/1968 thru 1/14/1968	7:30 a.m.	Winter Storm	COOP observer at Jacksonville measured 6.0 inches of snow and indicated the presence of glaze ice on the 12th and that many meetings were cancelled on the 12th and 13th and that area schools were closed on the 15th	n/a	n/a	n/a
12/18/1973 thru 12/19/1973	9:00 p.m.	Heavy Snow	COOP observer at Jacksonville measured 15.0 inches of snow and indicated that schools were closed, many businesses closed early and there were hundreds of cancellations and that the roads were snow packed and hazardous	n/a	n/a	n/a
11/26/1975 thru 11/27/1975	2:00 a.m.	Heavy Snow	COOP observer at Jacksonville measured 10.0 inches of snow	n/a	n/a	n/a
1/4/1977	11:00 a.m.	Heavy Snow	COOP observer at Jacksonville measured 8.0 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25 (Sheet 3 of 9) Severe Winter Storms – Snow & Ice Events Reported in Morgan County 1951 – 2012						
Date(s)	**Start Time**	**Event Type**	**Magnitude**	**Injuries**	**Death**	**Property Damages**
1/27/1977 thru 1/28/1977	n/a	Blizzard	COOP observer at Jacksonville measured 2.5 inches of snow and reported that there were low temperatures and strong winds that caused the 8 inches of snow already on the ground to create drifts 5 to 10 feet high in rural areas; closed all roads, highways, schools and many businesses and hospitalized 6 people with frostbite	6	0	n/a
11/26/1977 thru 11/27/1977	8:30 p.m.	Heavy Snow	COOP observer at Jacksonville measured 7.0 inches of snow	n/a	n/a	n/a
3/1/1978 thru 3/2/1978	7:00 p.m.	Heavy Snow	COOP observer at Jacksonville measured 7.0 inches of snow	n/a	n/a	n/a
3/7/1978 thru 3/8/1978	12:00 a.m.	Heavy Snow	COOP observer at Jacksonville measured 10.0 inches of snow	n/a	n/a	n/a
3/24/1978 thru 3/26/1978	n/a	Ice Storm	COOP observer at Jacksonville reported ice pellets, glaze ice and damaging winds on the 24th; committee members indicated that there were power outages that lasted up to 3 weeks in some areas	n/a	n/a	n/a
1/26/1979 thru 1/27/1979	5:00 p.m.	Winter Storm	COOP observer at Jacksonville measured 6.5 inches of snow	n/a	n/a	n/a
12/16/1981 thru 12/17/1981	10:00 a.m.	Winter Storm	COOP observer at Jacksonville measured 7.0 inches of snow and indicated that there was some blowing and drifting	n/a	n/a	n/a
Subtotal:				**6**	**0**	**$0**

Figure 25
(Sheet 4 of 9)
Severe Winter Storms – Snow & Ice Events Reported in Morgan County
1951 – 2012

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
12/22/1981	12:00 p.m.	Heavy Snow	COOP observer at Jacksonville measured 8.5 inches of snow	n/a	n/a	n/a
2/23/1986	8:30 a.m.	Heavy Snow	COOP observer at Jacksonville measured 5.0 inches of snow while the observer at Waverly measured 6.1 inches of snow	n/a	n/a	n/a
1/9/1987	7:00 a.m.	Heavy Snow	COOP observer at Jacksonville measured 7.0 inches of snow	n/a	n/a	n/a
2/16/1987	n/a	Ice Storm	(no description available)	n/a	n/a	n/a
12/14/1987 thru 12/15/1987	9:00 a.m.	Blizzard	COOP observer at Jacksonville measured 7.5 inches of snow which combined with high winds in excess of 50 mph to produce blizzard conditions	n/a	n/a	n/a
2/3/1988 thru 2/4/1988	11:00 a.m.	Heavy Snow	COOP observer at Jacksonville measured 6.0 inches of snow	n/a	n/a	n/a
2/10/1988 thru 2/11/1988	6:30 a.m.	Heavy Snow	COOP observer at Jacksonville measured 7.0 inches of snow	n/a	n/a	n/a
2/14/1990 thru 2/15/1990	n/a	Ice Storm	(no description available)	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 18^{th} changed to freezing rain overnight before changing to all snow by the morning of the 19^{th}; 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; the COOP observer at Jacksonville measured 1.5 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 5 of 9)
Severe Winter Storms – Snow & Ice Events Reported in Morgan County
1951 – 2012

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
1/18/1996 thru 1/19/1996	10:00 a.m.	Winter Storm	severe thunderstorms moved through the area and as the day progressed the temperatures dropped quickly causing the rain to change to ice then snow; numerous power outages and minor accidents were reported; gusty winds of 25 to 35 mph created wind chills near -40°F across most of central Illinois	n/a	n/a	n/a
1/8/1997 thru 1/9/1997	9:00 p.m.	Heavy Snow	COOP observer at Jacksonville measured 8.0 inches of snow; numerous accidents were reported throughout central Illinois	n/a	n/a	n/a
1/15/1997 thru 1/17/1997	3:00 a.m.	Winter Storm	winter storm brought 4 to 6 inches of snow to a large part of central Illinois north of I-70; after the snow stopped, the winds picked up to between 20 and 30 mph causing near whiteout conditions; temperatures fell below zero across the entire area and wind chill reading dipped well below -40°F in many locations; numerous accidents were reported across the region; COOP observer at Jacksonville measured 4.0 inches of snow and reported blowing snow and wind chill readings of -45°F	n/a	n/a	n/a
1/24/1997	7:00 a.m.	Winter Storm	rain, freezing rain, sleet and snow; numerous accidents reported across central Illinois; COOP observer at Jacksonville measured 1.0 inches of snow and reported freezing rain	n/a	n/a	n/a
1/26/1997 thru 1/27/1997	5:00 a.m.	Winter Storm	COOP observer at Jacksonville measured 9.0 inches of snow and reported freezing rain, sleet and snow on the 27th	n/a	n/a	n/a
1/14/1998	6:00 a.m.	Winter Storm	freezing rain, sleet and snow; several traffic accidents reported across the region	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 6 of 9)
Severe Winter Storms – Snow & Ice Events Reported in Morgan County
1951 – 2012

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
1/1/1999 thru 1/3/1999	12:00 p.m.	Heavy Snow	COOP observer at Jacksonville measured 14.0 inches of snow; after the snowfall, winds increased from the northwest and temperatures dropped, causing dangerous wind chills and treacherous driving conditions with extensive blowing and drifting; many locations across the region sustained temporary or extended power outages	n/a	n/a	n/a
3/11/2000	4:00 a.m.	Heavy Snow	heavy snowfall of 6 to 8 inches occurred from eastern Morgan County into northern Sangamon County	n/a	n/a	n/a
1/2/2003	12:00 a.m.	Heavy Snow	COOP observer at Jacksonville measured 6.0 inches of snow; only minor blowing and drifting of snow was associated with this storm	n/a	n/a	n/a
2/14/2003 thru 2/16/2003	11:00 p.m.	Winter Storm	4 to 8 inches of snow accumulated along and north of I-72; around ¼ inch of ice also accumulated along the I-72 corridor; in addition, winds of 30 to 50 mph caused major blowing and drifting of snow across the area, with drifts as high as 3 to 5 feet; COOP observer reported wind gusts of 25 to 30 mph	n/a	n/a	n/a
11/24/2004	3:00 p.m.	Winter Storm	rain, 4 to 6 inches of wet snow; sustained winds of 30 mph with gusts to 40 to 50 mph caused considerable blowing and drifting; in addition, the high winds and the weight of the wet snow downed numerous trees and power lines; COOP observer at Chapin measured 6.2 inches of snow while the observers at Jacksonville measured between 4.0 and 4.5 inches of snow	n/a	n/a	n/a
3/21/2006	4:30 a.m.	Blizzard	COOP observers at Jacksonville measured between 8.0 and 8.6 inches of snow; wind gusts to 45 mph were recorded; numerous vehicle accidents occurred across the region	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 7 of 9)
Severe Winter Storms – Snow & Ice Events Reported in Morgan County
1951 – 2012

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
11/30/2006 thru 12/1/2006	7:30 a.m.	Winter Storm	freezing rain, heavy sleet and snow with ice accumulations between ¼ to 1.5 inches and heavy sleet accumulations between ½ to 2.2 inches; considerable tree and power line damage was caused by the ice and heavy snow; power was not restored across some locales in the region for several days; snow and ice covered roads also resulted in numerous vehicle accidents; COOP observers at Jacksonville measured between 8.0 and 8.5 inches of snow; both observers reported glaze ice on the 30th	n/a	n/a	n/a
1/12/2007 thru 1/13/2007	5:00 p.m.	Ice Storm	freezing rain with ice accumulations of ¼ to ½ inch; ice caused modest tree limb and power line damage and numerous vehicle accidents across the area; COOP observer at Jacksonville measured 0.3 inches of ice on the ground at 7:00 a.m. on the 13th	n/a	n/a	n/a
2/12/2007 thru 2/13/2007	10:00 p.m.	Blizzard	8 to 14 inches of snow with COOP observers at Jacksonville measuring 8.0 inches of snow; strong northerly winds gusting from 35 to 45 mph created blizzard conditions; many locations reported drifting ranging from 3 to 6 feet, prompting the closure of many area roads	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 8 of 9)
Severe Winter Storms – Snow & Ice Events Reported in Morgan County
1951 – 2012

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
12/8/2007 thru 12/9/2007	12:00 p.m.	Ice Storm	significant icing with localized measurements of ½ to ¾ inch of ice in Scott, Morgan and Cass Counties; numerous trees and power lines downed by the weight of the ice; numerous vehicle accidents were reported across the region due to icy roads; a committee member indicated that there were power outages, trees down and streets blocked in Jacksonville; South Jacksonville experienced a power surge that damaged their lift station and wells as a result of this storm	n/a	n/a	$61,114^
12/15/2007 thru 12/16/2007	3:00 a.m.	Heavy Snow	COOP observers at Jacksonville measured between 5.8 and 6.0 inches of snow	n/a	n/a	n/a
1/31/2008 thru 2/1/2008	1:00 p.m.	Heavy Snow	COOP observers at Jacksonville measured 8.0 inches of snow	n/a	n/a	n/a
1/6/2010 thru 1/7/2010	7:30 p.m.	Winter Storm	5 to 7 inches of snow along and north of I-72; once the snow subsided, gusty northwesterly winds created considerable blowing and drifting across the area; COOP observers at Jacksonville measured between 4.2 and 5.0 inches of snow	n/a	n/a	n/a
12/12/2010 thru 12/13/2010	6:00 a.m.	Blizzard	2 to 4 inches of snow; strong northwesterly winds gusting over 50 mph at times developed, creating white-out conditions in many location; sharply colder air resulted in wind chill values plunging well below zero; COOP observers at Jacksonville measured between 2.0 and 2.6 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$61,114**

^ Property damages totaling $50,000 for the ice storm on December 8th and 9th, 2007 represents losses sustained in 5 counties, including Morgan County. A breakdown by county was not available.

Figure 25
(Sheet 9 of 9)
Severe Winter Storms – Snow & Ice Events Reported in Morgan County
1951 – 2012

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
2/1/2011 thru 2/2/2011	9:00 a.m.	Blizzard	10 to 16 inches of snow with the COOP observers at Jacksonville measuring between 10.4 and 12.0 inches of snow; high winds of 40 to 50 mph created blizzard conditions, reducing visibility to near zero; this event was part of a federally-declared disaster (Declaration #1960)	n/a	n/a	$220,000^
12/20/2012	12:00 p.m.	Blizzard	1 to 2 inches of snow with the COOP observers at Jacksonville measuring between 1.8 and 3.0 inches of snow; winds gusting over 50 mph created blizzard conditions, causing numerous traffic accidents across the county	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$220,000^**
GRAND TOTAL:				**6**	**0**	**$281,114†**

^ The property damage total of $220,000 for the blizzard on February 1st and 2nd, 2011 represents losses sustained in Morgan and Scott Counties. A breakdown by county was not available.

† Property damages totaling of $270,000 represents losses sustained in two or more counties, including Morgan County. A detailed breakdown by county was not available.

Sources: Climate Atlas of Illinois.
Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Member responses to Morgan County – Damages to Critical Facilities Questionnaire.
Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Member responses to Morgan & Scott Counties Natural Hazard Events Questionnaire.
Illinois State Water Survey.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, 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 Morgan County
1995 – 2012

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
1/3/1995 thru 1/6/1995	10:00 p.m.	Extreme Cold	several days of cold weather took hold of the region with high temperatures only reaching the teens and low temperatures in the single digits; COOP observer at Jacksonville recorded actual temperatures on the 5th ranging from 13°F and -1°F	n/a	n/a	n/a
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 at Jacksonville recorded actual temperatures on the 3rd ranging from -2°F to -20°F and on the 4th from -1°F to -21°F	n/a	n/a	n/a
1/15/1997 thru 1/17/1997	3:00 a.m.	Extreme Windchill	winter storm accompanied by strong winds between 20 and 30 mph combined with cold temperatures to produce wind chill values of -45°F	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 at Jacksonville 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/ Winchill	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 at Jacksonville recorded a wind chill reading of -30°F and reported that schools were closed both days	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, 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 $2 billion in property damage 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 Morgan County?

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

Flash Floods

A flash flood 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. Six inches of fast-moving water can knock a person off their feet, while it takes only two feet of water to carry away most vehicles.

Riverine Floods

A riverine flood is a gradual rise of water in a river or stream that 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.

Shallow/Overland Floods

A shallow or overland flood is the pooling of water outside of a defined river or stream. There are a couple of types of overland flooding including sheet flow and ponding. Overland flooding generally occurs when the ground is still frozen or persistent storm systems have left the ground saturated and additional rainfall can not soak in.

If the surface runoff can not 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.

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.

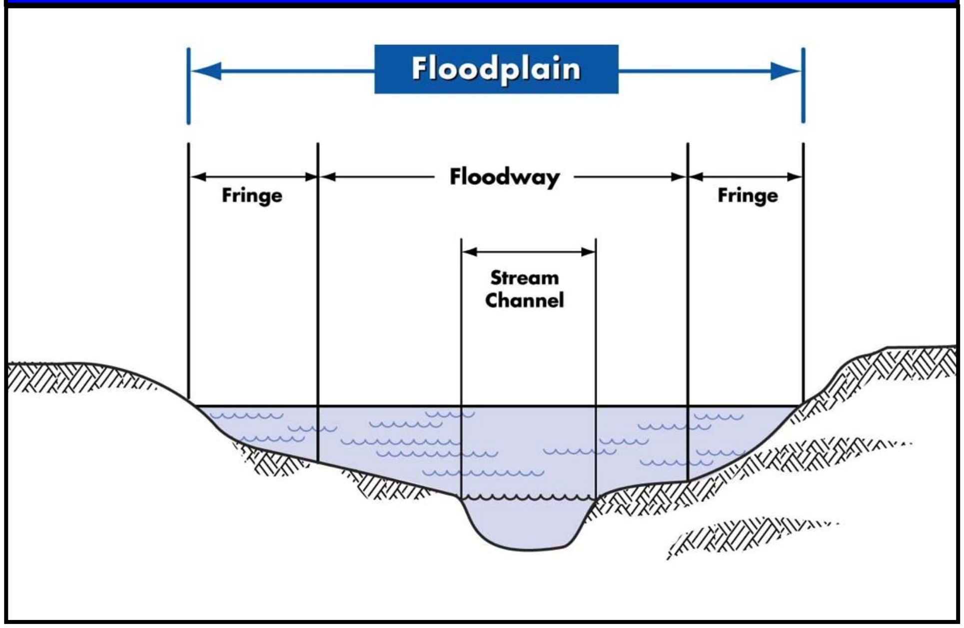
What is a floodplain?

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 30** illustrates the various components of a base floodplain.

Figure 30
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.

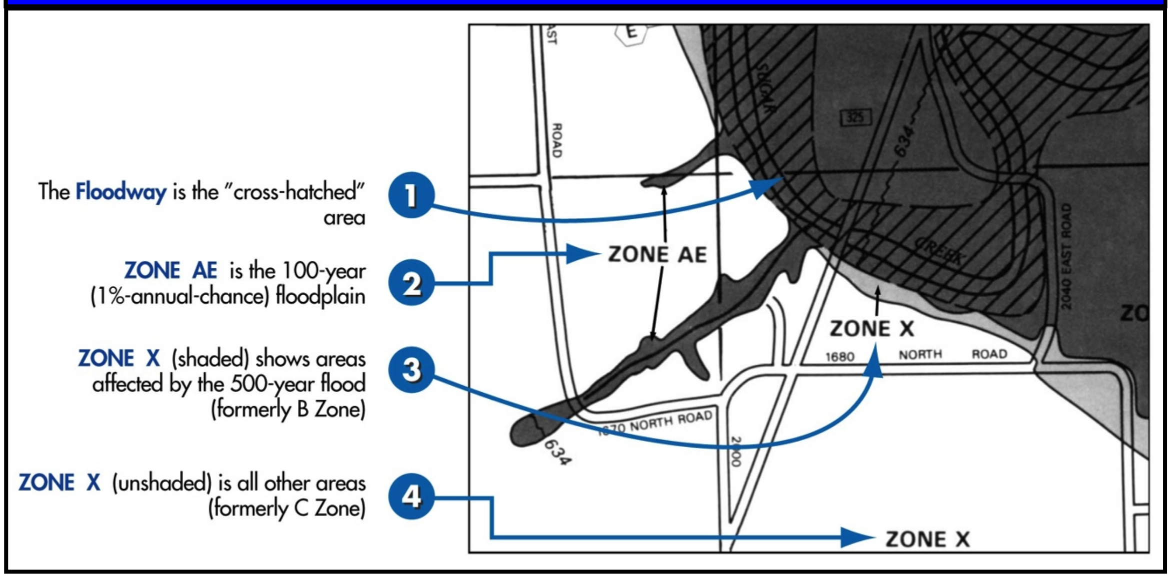
What is a Special Flood Hazard Area?

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 31** shows an example of a FIRM.

Figure 31
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. These zones are depicted on a community's FIRM. Each zone reflects the severity or type of flooding in the area. The following provides a brief description of each of the flood zones that may appear on a community's FIRM.

- **Zone A.** Zone A, also know 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.

  A home located with Zone A has a 26% chance of suffering flood damage over the life of a 30 year mortgage. In communities that participate in the NFIP, structures located within Zone A 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 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. In communities that participate in the NFIP, structures located within Zone X (shaded) are not required to purchase flood insurance, however it is made available to 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. In communities that participate in the NFIP, structures located with Zone X (unshaded) are not required to purchase flood insurance, however it is made available to 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. Historically, these structures account for approximately one-third of the nation's flood insurance claim payments. Identifying these structures and working with local jurisdictions to implement the appropriate mitigation measures to eliminate or reduce the damages caused by repeated flooding to these structures is important to FEMA and the NFIP. These structures not only increase the NFIP's annual losses, they drain funds needed to prepare for catastrophic events.

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 Morgan County depending on the weather conditions. The following provides a brief description of each type of alert.

- **Watch.** A flash flood or flood watch is issued when current or developing hydrologic conditions are favorable for flash flooding or flooding to develop in or close to the watch area. It does not mean that flooding is imminent, just that individuals need to be alert and prepared.
- **Warning.** A flash flood or flood warning is issued when flooding is in progress, imminent or highly likely. Warnings indicate imminent danger to life and property for those who are in the area of the flooding.
- **Urban and Small Stream Flood Advisory.** An urban and small stream flood advisory is issued when heavy rain will cause flooding of streets and low-lying places in urban areas or if small rural or urban streams are expected to reach or exceed their banks. Advisories alert the public to flooding which is generally only an inconvenience and does not pose a threat to life and/or property.

PROFILING THE HAZARD

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

Figures 32 and **33**, located at the end of this section, summarize the previous occurrences as well as the extent or magnitude of the flood events recorded in Morgan County. The flood events are separated into two categories: general floods (riverine and shallow/overland) and flash floods.

<u>Flood Fast Facts – Occurrences</u>

Number of General Floods Reported (1993 – 2012): ***6***
Number of Flash Floods Reported (1993 – 2012): ***21***
Most Likely Month for General Floods to Occur: ***May***
Most Likely Month for Flash Floods to Occur: ***June***
Most Likely Time for Flash Floods to Occur: ***Late Evening***

General Floods

The Storm Events Database and the Illinois Department of Natural Resources, Office of Water Resources records have documented six reported occurrences of general flooding in Morgan County between 1993 and 2012.

Included in these six events are several historic Illinois River floods. Based on historical gage data from the river gage attached to the intake pier on the left bank of the river at the Central Illinois Public Services Company in Meredosia, the record setting Illinois River flood in this area occurred in 1943. On May 26, 1943 the Illinois River crested at 446.7 feet, more than eight feet above major flood stage. The second, third and fourth highest crests at this location occurred during 1995 (446.3 feet), 1985 (445.62 feet) and 2002 (445.57 feet), respectively.

Flash Floods

The Storm Events Database and National Weather Service COOP records have documented 21 reported occurrences of flash flooding in Morgan County between 1993 and 2012. Included in these events is the historic flash flooding of June 17 and 18, 2011. Heavy rains started late in the evening on the 17^{th} and continued throughout most of the day on the 18^{th}. A total of 5 to 10 inches of rain fell across much of the County, with a majority of the rain produced between 10 p.m. and 3 a.m. Jacksonville and South Jacksonville recorded nearly 6 inches of rain in less than 6 hours. The excessive rainfall caused creeks and streams to rise rapidly and resulted in flash flooding to an extent that had never before been seen in Morgan County.

Figure 34 charts the reported occurrences of general flooding and flash flooding by month. Four of the six general flood events (67%) took place in April, May and June. One February event, one April event and two May events spanned more than one month, however, for illustration purposes only the month the event started is graphed. In comparison, 13 of the 21 flash flood events (62%) took place in May and June.

Figure 34
Flood Events by Month

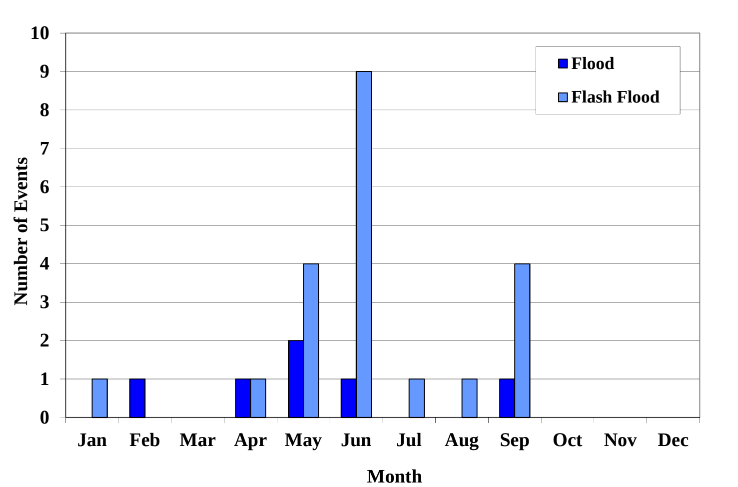
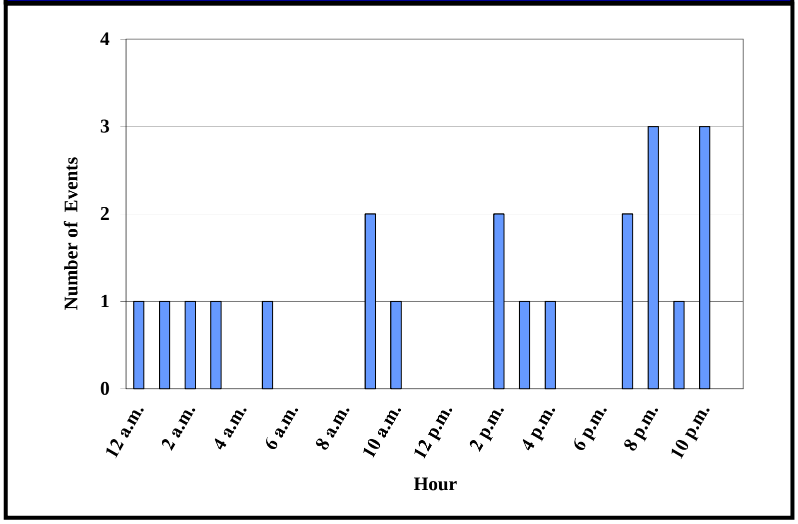


Figure 35 charts the reported occurrences of flash flooding in Morgan County by hour. There was insufficient data available to chart the reported general flood events. Approximately 62% of all flash flood events began during the p.m. hours with nine of the events (43%) taking place between 7 p.m. and 11 p.m.

Figure 35
Flash Flood Events by Hour
1981 – 2012



What locations are affected by floods?

While specific locations are affected by general flooding, many areas of the County can be impacted by overland and flash flooding because of the topography and seasonally high water table of the area. Approximately 10% of the area in Morgan County is designated as being within the base floodplain and susceptible to riverine floods. The *2010 Illinois Natural Hazard Mitigation Plan* by IEMA classifies Morgan County's hazard rating for floods as "elevated."

Figure 36 identifies the floodplains in Morgan County. This figure is based on the DFIRMs for Morgan County that became effective August 18, 2009. While a large portion of the area prone to riverine flooding is in the unincorporated portions of the County, Jacksonville, Meredosia and South Jacksonville are also susceptible to riverine flooding because of their proximity to floodplains. To view the DFIRMs for the participating municipalities, see **Appendix K**.

Figure 37 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 36
Floodplain Areas in Morgan County

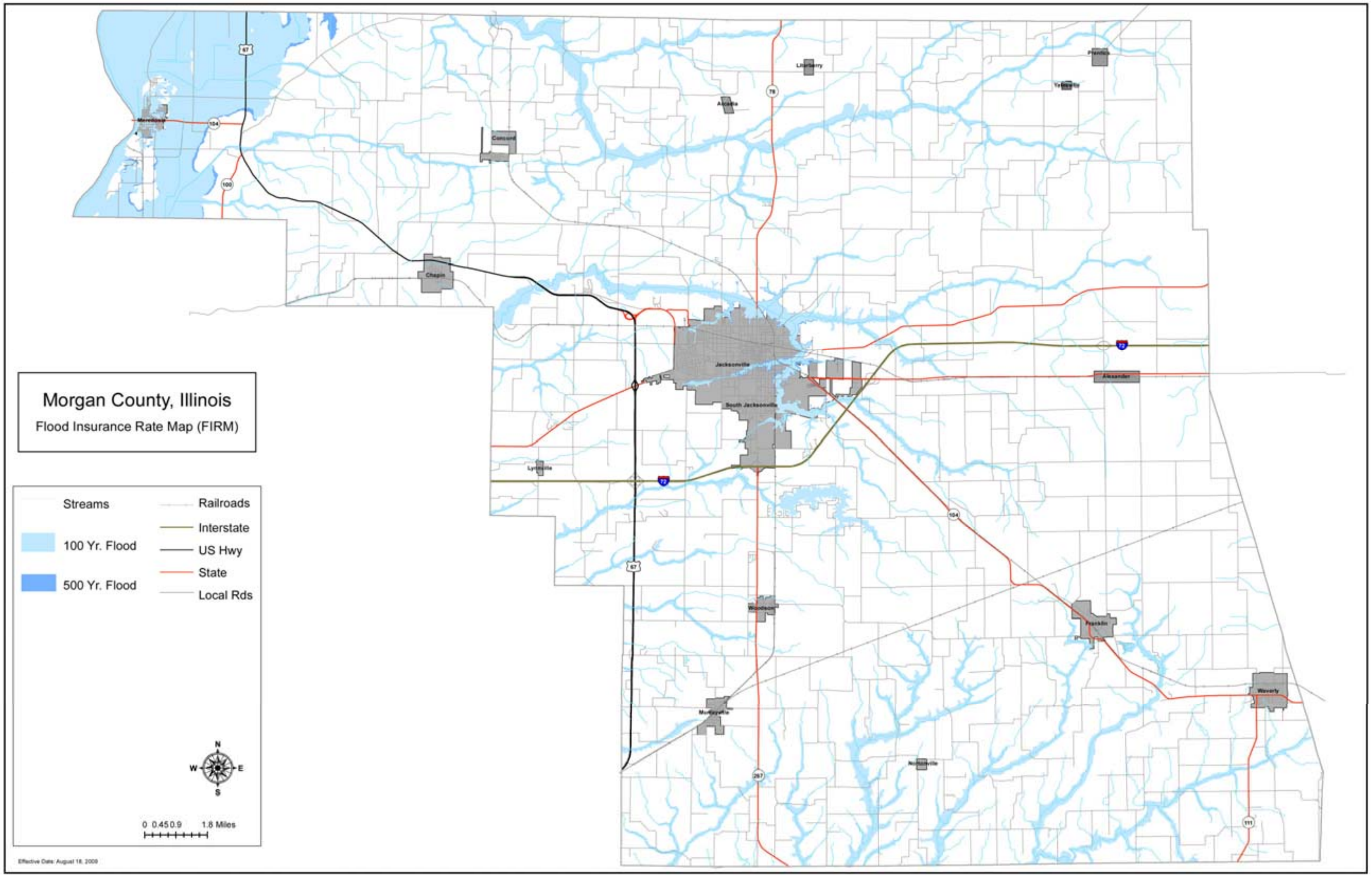


Figure 37 **Bodies of Water Subject to Flooding in Morgan County**	
Participating Jurisdiction	**Water Bodies**
Chapin	unnamed tributary of Mauvaise Terre Creek
Franklin	---
Jacksonville	**Mauvaise Terre Creek, Mauvaise Terre Lake, Morgan Lake, Town Branch, Tributary #1 of Mauvaise Terre Creek**
Meredosia	**Illinois River**
Murrayville	Little Sandy Creek
South Jacksonville	**Tributary #4 of Morgan Lake**
Woodson	Spoon Creek
Unincorporated Morgan County	**Apple Creek**, Baitter Branch, **Big Branch**, Billings Lake, **Brushy Fork Creek**, **Bucks Branch**, Carver Lake, **Coal Creek**, **Conover Branch**, **Conover Reservoir**, **Coon Run**, **Dick Woods Branch**, Duncan Spring Lake, Eagle Run, **Henry Creek**, **Illinois River**, **Indian Creek**, **Lake Jacksonville**, **Left Fork Apple Creek**, Leland Lake, **Lick Branch**, **Lick Creek**, **Little Apple Creek**, **Little Indian Creek**, **Little Mooney Creek**, **Little Sandy Creek**, **Mauvaise Terre Creek**, **Meredosia Lake**, Mooney Branch, Mud Creek, **Murrayville-Woodson Lake**, **North Fork Mauvaise Terre Creek**, Pankey Pond Ditch, Roegge Lake, **Sandy Creek**, Seamans Pond, **Seymour Branch**, **Snake Creek**, **Spoon Creek**, Spring Creek, **Spring Run**, **Town Branch**, **Tributary #2 Mauvaise Terre Creek**, **Tributary #3 Mauvaise Terre Creek**, **Tributary to North Little Sandy Creek**, Turkey Creek, **Turner Creek**, Valevue Lake, **Vanwinkle Branch**, Walnut Creek, **Waverly City Lake**, **Willow Branch**, **Willow Creek**, **Wolf Run**, **Woods Creek**

Source: FEMA DFIRMs.

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

Yes. Morgan County, Jacksonville, Meredosia and South Jacksonville all participate in the NFIP. **Figure 38** 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. Chapin, Murrayville and Woodson have no identified flood hazard boundaries within their corporate limits and are not required to participate.

Figure 38 **NFIP Participating Jurisdictions**				
Participating Jurisdictions	**Participation Date**	**Current Effective FIRM Date**	**CRS Participation**	**Most Recently Adopted Floodplain Zoning Ordinance**
Morgan County	01/17/1986	08/18/2009	No	2009
Jacksonville	06/15/1979	08/18/2009	No	2009
Meredosia	04/15/1982	08/18/2009	No	2009
South Jacksonville	08/04/1987	08/18/2009	No	2009

Source: FEMA, Community Status Book.

At this time Franklin is not a participant of the NFIP. Since the current effective DFIRMs identify Special Flood Hazard Areas within Franklin's corporate limits, it is presently sanctioned by the Program.

What is the probability of future flood events occurring?

Morgan County has had 27 verified occurrences of flooding (both general and flash flooding) between 1993 and 2012. With 27 occurrences over the past 20 years, Morgan County should expect to experience at least one flood event each year. There were six years over the past 20 years where two or more flood events occurred. This indicates that the probability that more than one flood event may occur during any given year within the County is 30%.

ASSESSING VULNERABILITY

The MacMurray College Gym in Jacksonville was flooded with water as a result of the historic June 2011 flash flood event.

Photograph provided by Jacksonville/Morgan County ESDA.

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. Morgan County, including the participating municipalities, is vulnerable to the dangers presented by flooding. Precipitation levels, a high seasonal water table, and topography that include the Illinois River and its associated watersheds are 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 low-lying areas where drainage problems occur due to culvert or drainage ditches that need improvement or proper maintenance.

Figure 39 details the number of flash flood events by participating jurisdiction. All of the general flood events either impacted the entire County or a large portion of it and were not location specific.

Meredosia City Hall – Illinois River Flood of 1943

Photograph provided by Jacksonville/Morgan County ESDA.

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.

Figure 39
Verified Flash Flood Events by Participating Jurisdiction

Participating Jurisdiction	Flash Flood Events	
	Number	Year
Chapin	0	---
Franklin	1	2010
Jacksonville	5	2002, 2004, 2004, 2008, 2008
Meredosia	0	---
Murrayville	0	---
South Jacksonville	0	---
Woodson	0	---
countywide	5	1993, 1995, 2001, 2002, 2011
unincorporated areas	1	2002
central portion of the county	2	2009,2011
northern portion of the county	5	2002, 2009, 2011, 2011, 2011
northwestern portion of the county	1	2011
western portion of the county	2	2009, 2010
southwestern portion of the county	1	2011

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.

Located throughout this section and in **Appendix J** are select photographs provided by Planning Committee members showing the extent of flooding experienced within the County.

What impacts resulted from the recorded floods?

Floods as a whole have caused an estimated $150,410,000 in property damages and resulted in one injury and one death. In comparison, the State of Illinois averages four deaths per year and an estimated $257 million annually in property damage losses, making flooding the single most financially damaging natural hazard in Illinois. The following provides a breakdown of impacts by category.

While both general and flash flooding events occur on a fairly regular basis within the County, the number of injuries and deaths is low. Consequently, the risk or vulnerability to public health and safety from <u>*general flooding*</u> is seen as relatively low. However, a majority of the recorded flood events are a result of flash

<u>Flood Fast Facts – Impacts/Risk</u>

<u>General Flood Impacts</u>
- Total Property Damage: ***$250,000***
- Injuries: ***1***

<u>Flash Flood Impacts</u>
- Total Property Damage: ***$150,160,000***
- Infrastructure/Critical Facilities Damage: ***n/a****
- Fatalities: ***1***

<u>Overall Risk/Vulnerability to:</u>
- Public Health & Safety – General Flooding: ***Low***
- Public Health & Safety – Flash Flooding: ***Medium***
- Buildings/Infrastructure/Critical Facilities: ***Medium/High***

* During the June 2011 flash flood event the Jacksonville drinking water treatment facility was damaged; however a damage estimate was unavailable.

flooding. Since there is very little warning associated with flash flooding, the risk to public health and safety from *flash flooding* is elevated to medium.

General Floods

The data provided by NOAA's Storm Events Database indicates that between 1993 and 2012, one of the six general flood event caused $250,000 in property damages. This event was part of a federally-declared disaster. Damage information was either unavailable or none was recorded for the remaining five reported occurrences. Three of the six general flood events were part of federally-declared disasters.

While no damage information was available for the 1943 Illinois River flood of record, information was available for the 1995 flood which resulted in the second highest crest at the river gauge in Meredosia.

The 1995 flood resulted from heavy and continuous rains during much of May causing the Illinois River and many of its tributaries to overflow their banks. The subsequent flooding caused a minimum of $250,000 in property damages and was covered under Presidential Disaster Declaration 1053. Numerous farm fields and roads were flooded and many basements in Morgan County were damaged as a result of this event.

NOAA's Storm Events Database also documented one injury as a result of a general flood event. On May 12, 2002 three teenagers had to be rescued after they drove onto a flooded section of road near Jacksonville and were swept several feet downstream until the car came to rest next to a power pole. One of the teens sustained minor leg injuries as a result of the incident. This event was part of Presidential Disaster Declaration 1416.

Flash Floods

The data provided by NOAA's Storm Events Database indicates that between 1993 and 2012, four of the 21 flash flood events caused $150,160,000 in property damages. Damage information was either unavailable or none was recorded for the remaining 17 reported occurrences.

Included in the property damage figures is the historic flash flooding event of June 17 and 18, 2011. While this event did not meet the threshold for a Presidentially-declared disaster, it did cause significant and devastating damage in Jacksonville and as well as across much of the County. A total of 5 to 10 inches of rain fell within a 6-hour period causing flash flooding to an extent that had never been seen before in Morgan County. The property damage estimates for this event alone totaled $150 million. Photographs depicting the property damages sustained during this event can be found in **Appendix J**.

The Jacksonville drinking water treatment facility was inundated with water during the historic June 2011 flash flood event.

Photograph provided by Jacksonville/Morgan County ESDA.

While individual damage estimates were unavailable, the following provides a brief description of the infrastructure and critical facilities damaged in Jacksonville alone.

- The City's drinking water treatment facility sustained significant damage, including the destruction of much of its equipment and resulted in the water supply being shut down for almost 3 weeks while repairs were made. A boil order was issued for almost 25,000 individuals as a result of the damage.
- Nearly 2,500 homes and more than 100 businesses (including the Nestle Chocolate Plant, MacMurray College and the Jacksonville Correctional Center) sustained major flood damage.
- Most of the streets in the eastern and southern parts of Jacksonville were covered with several feet of water and effectively isolating parts of the City.
- Numerous individuals had to be rescued from their vehicles and from the Rolling Acres Mobile Estates mobile home park. While there were no reports of injuries or deaths, several pets drowned due to the flooding at the mobile home park.

Also included in the property damage figure is $35,000 in infrastructure damage sustained by the Westfair Christian Academy on September 13, 2008 when flash flooding caused the basement of the school to become flooded.

NOAA's Storm Events Database also documented one death as a result of a flash flood event. On September 20, 2009 a man drowned near Woodson while trying to clear debris from an intake valve and culvert near a flooded pond.

What other impacts can result from flooding?

One of the primary threats from flooding is drowning. Nearly half of all flash flood deaths occur in vehicles as they are swept downstream. Most of these deaths 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.

Determined motorists drive through flood water covering a roadway in South Jacksonville following flash flooding on September 20, 2009.

Photograph provided by South Jacksonville Police Department.

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 Morgan County?

Yes. According to information obtained from IEMA, there are seven repetitive flood loss properties located within Morgan County. There are two single family dwellings located in Jacksonville; two single family dwellings located in Meredosia; and two single family dwellings and one other residence located in unincorporated Morgan County. 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 40 identifies the repetitive flood loss structures/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 16 flood insurance claim payments totaling $18,478 for the seven repetitive flood loss structures/properties located in Morgan County.

Figure 40
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	
Jacksonville	Single Family	2	$4,482	$0	$4,482
Jacksonville	Single Family	2	$2,395	$1,657	$4,052
Meredosia	Single Family	2	$15,529	$0	$15,529
Meredosia	Single Family	2	$3,653	$0	$3,653
Unincorp. Morgan Co.	Single Family	3	$15,777	$0	$15,777
Unincorp. Morgan Co.	Single Family	3	$5,544	$459	$6,003
Unincorp. Morgan Co.	Other Residence	2	$7,513	$0	$7,513
Totals:		**16**	**$54,893**	**$2,116**	**$57,009**

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

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

Yes. **Figure 41** identifies the existing residential structures by participating jurisdiction located within the base floodplain and vulnerable to riverine flooding. These counts were prepared by the Morgan County Geographic Information Systems (GIS) Department.

Aside from key roads and bridges and buried power and communication lines, only Jacksonville and Meredosia have specific infrastructure/critical facilities located within or adjacent to a floodplain. In Jacksonville, both the wastewater treatment facility and the drinking water treatment facility are located within the base floodplain of Mauvaise Terre Creek. The City decided in October 2012 to construct a new drinking water treatment facility located outside of the base floodplain. Temporary flood prevention measures are being designed and constructed to protect the current facility as the new facility is being built. In Meredosia, the wastewater treatment lagoons are located within the base floodplain of the Illinois River while the drinking water treatment facility is located adjacent to the Illinois River base floodplain.

Figure 41
Existing Residential Structures Vulnerable to Riverine Flooding

Participating Jurisdiction	Number of Residential Structures
Morgan County (unincorporated)	180
Chapin	0
Franklin	0
Jacksonville	217
Meredosia	228
Murrayville	0
South Jacksonville	4
Woodson	0

Source: Morgan County GIS Department

While 10% of the land area in Morgan County lies within the base floodplain and is susceptible to riverine 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.

Emergency responders work to rescue individuals at the Rolling Acres mobile home park in Jacksonville during the historic June 2011 flash flood event.

Photograph provided by Jacksonville/Morgan County ESDA.

Based on the frequency and severity of recorded flood events within the County, the fact that most of the County is vulnerable to flash flooding and a majority of the buildings, infrastructure and critical facilities that may be impacted are located outside of the base floodplain, the risk or vulnerability of existing buildings, infrastructure and critical facilities to all forms of flooding is considered to be medium to high.

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 (Morgan County, Jacksonville, Meredosia and South Jacksonville) 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.

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.

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 Morgan 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.

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.

Type of Flood Event

Assumption #1

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

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 flash flood events have caused the greatest amount of recorded flood damages in the County, identifying residential structures vulnerable to flash flooding is problematic because most are located outside of the base floodplain. In addition, 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.

Therefore, a riverine flood event will be used since it is a) relatively easy to identify vulnerable residential structures (i.e., those structures located within the base floodplain or Special Flood Hazard Areas) within each municipality using the DFIRMs and b) the number of structures impacted is generally the same from event to event.

Scope of the Flood Event

Assumption #2

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

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 streams and creeks that overflow their banks and the degree of flooding experienced along base floodplains for each 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 creek. However, for this scenario, it was decided that:

- ❖ all streams and creeks with base floodplains would overflow their banks, and
- ❖ the base floodplains of each 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:

- ➢ Chapin, Franklin, Murrayville and Woodson would not experience any flooding since there are no streams or creeks with base floodplains located within their municipal limits;
- ➢ Town Brook and Mauvaise Terre Creek and its tributaries would overflow their banks and flood Jacksonville;
- ➢ The Illinois River would overflow its banks and flood Meredosia; and
- ➢ a tributary of Morgan Lake would overflow its banks and flood a small portion of South Jacksonville.

Number of Potentially-Damaged Housing Units

Assumption #3

The number of existing residential structures located within the base floodplain in each municipality will be used to determine the number of potentially-damaged housing units.

Since this scenario assumes that a riverine flood will impact all of the 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) in each municipality. These counts were prepared by the Morgan County GIS Department.

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

- ❖ Jacksonville has 217 residential buildings;
- ❖ Meredosia has 228 residential buildings; and
- ❖ South Jacksonville has 4 residential buildings.

Value of Potentially-Damaged Housing Units

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.

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.

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 non farm buildings within a municipality and dividing that number by the total number of housing units in the municipality. **Figure 42** provides a sample calculation. The total assessed value is based on 2011 tax assessment information provided by the Morgan County Supervisor of Assessments.

Figure 42
Calculation of Average Assessed Value

Total Assessed Value of Non Farm Buildings ÷ Total Housing Units = Average Assessed Value (Rounded to the Nearest Penny)

Jacksonville: $148,148,370 ÷ 8,162 housing units = $18,150.99

To determine the average market value, the average assessed value is multiplied by three (the assessed value of a structure in Morgan County is approximately one-third of the market value). **Figure 43** provides the average assessed value and average market value for each participating municipality.

Figure 43
Average Market Value of Housing Units

Participating Jurisdiction	Total Assessed Value of Non Farm Buildings (2011)	Total Housing Units (2010)	Average Assessed Value (Raw)	Average Market Value (Raw)	Average Market Value (Rounded)
Chapin	$4,139,220	229	$18,075.19651	$54,225.58953	$54,226
Franklin	$5,274,540	274	$19,250.14599	$57,750.43797	$57,750
Jacksonville	$148,148,370	8,162	$18,150.98873	$54,452.96619	$54,453
Meredosia	$6,736,620	464	$14,518.57759	$43,555.73277	$43,556
Murrayville	$5,048,300	261	$19,342.14559	$58,026.43677	$58,026
South Jacksonville	$38,681,320	1,671	$23,148.60563	$69,445.81689	$69,446
Woodson	$4,414,990	220	$20,068.13636	$60,204.40908	$60,204
Unincorp. County	$102,148,770	3,612	$28,280.39037	$84,841.17111	$84,841
County	$325,315,490	15,515	$20,967.80471	$62,903.41413	$62,903

Source: Vogt, Allen, Morgan 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. For this scenario, 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%.

Assumption #5

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%

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 that by the percent damage (20%) 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 44** provides a sample calculation.

Figure 44
Structure **– Potential Dollar Loss Calculations**

Average Market Value Per Housing Unit x Percent Damage = Average Structural Damage

Jacksonville: $54,453 x 20% = $10,890.60 per unit

Average Structural Damage x Number of Potentially-Damaged Housing Units = Potential Dollar Losses – Structure
(Rounded to the Nearest Dollar)

Jacksonville: $10,890.60 per unit x 217 housing units = $2,363,260

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 (30%) 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 45** provides a sample calculation.

Finally the ***total potential dollar losses*** may be calculated by adding together the potential dollar losses to the structure and the content. **Figure 46** provides a breakdown of the total potential dollar losses by municipality.

Figure 45
***Content* – Potential Dollar Loss Calculations**

½ (Average Market Value Per Housing Unit) x Percent Damage = Average Content Damage
Jacksonville: ½ ($54,453) x 30% = $8,167.95 per Unit

Average Content Damage x Number of Potentially-Damaged Housing Units =
Potential Dollar Losses – Content
(Rounded to the Nearest Dollar)
Jacksonville: $8,167.95 x 217 housing units = $1,772,445

Figure 46
Estimated Potential Dollar Losses to Potentially-Damaged Housing Units from a Riverine Flood Event

Participating Jurisdiction	Average Market Value (2011)	Potentially-Damaged Housing Units	Potential Dollar Losses		Total Potential Dollar Losses
			Structure	Content	
Chapin	$54,226	0	$0	$0	$0
Franklin	$57,750	0	$0	$0	$0
Jacksonville	$54,453	217	$2,363,260	$1,772,445	$4,135,705
Meredosia	$43,556	228	$1,986,154	$1,489,615	$3,475,769
Murrayville	$58,026	0	$0	$0	$0
South Jacksonville	$69,446	4	$55,557	$41,668	$97,225
Woodson	$60,204	0	$0	$0	$0

This assessment illustrates why potential residential dollar losses 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 $97,000 to $4.1 million. There are four participating municipalities in this scenario who do not have any residences considered vulnerable to riverine flooding.

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.

Infrastructure & Critical Facilities

In Jacksonville, the wastewater treatment facility and drinking water treatment facility are both located within the base floodplain and have experienced flooding issues, most recently in 2011. As a result of the 2011 flooding, the City has decided to construct a new drinking water treatment facility outside of the floodplain. The expected cost for the project is estimated at approximately $30 million.

In Meredosia the wastewater treatment lagoons are located in the base floodplain and the drinking water treatment facility is located adjacent to the based floodplain. Consideration should be given to moving the lagoons out of the floodplain and away from Willow Creek.

No other above-ground infrastructure or critical facilities 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 a flash flood event. Morgan County has experienced multiple flash flood events over the last 20 years, including the large scale flash flood event in June 2011. This historic event was extraordinary in magnitude and resulted in approximately $150 million in recorded damages.

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 32
(Sheet 1 of 4)
General Flood Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages
4/13/1993 thru 10/22/1993	n/a	northwestern portion of the county	Higher-than-average precipitation through the spring and summer and the occurrence of this precipitation on a more or less continuous basis caused the Illinois River to overflow its banks. The flooding caused seepage water damage to the McGee Creek Drainage and Levee District. This event was part of a federally-declared disaster (Declaration #997). The Illinois River crested at 444.96 feet on July 28th at the river gage attached to the intake pier on the left bank of the river at the Central Illinois Public Service Company in Meredosia. This event is the 6th highest crest at this gage. Flood stage at this location is 432.0 feet and major flood stage is 438.0 feet. At 436.0 feet Meredosia plugs its storm sewer outlets; at 440.4 feet Meredosia Lake Road is overtopped and at 444.9 feet floodwaters overtop the Little Creek Levee.	n/a	n/a	n/a
9/13/1993 thru 9/14/1993	5:00 p.m.	countywide	4 to 7 inches of rain fell over the region causing urban and small stream flooding throughout the county. At Jacksonville, the floodwaters killed 4 puppies at an animal shelter. Many roads and basements were flooded throughout the area.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 32 (Sheet 2 of 4) General Flood Events Reported in Morgan County 1993 – 2012						
Date(s)	**Start Time**	**Location(s)**	**Magnitude**	**Injuries**	**Death**	**Property Damages**
5/16/1995 thru 6/27/1995	6:00 a.m.	countywide	Heavy and continuous rains over the first part of the month caused the Illinois River and many of its tributaries to begin to rise above flood stage on May 14th. The flooding continued into June as even more rain fell over the area during the last half of May and into the first part of June. Numerous farm fields and roads were flooded throughout the Illinois River basin. The flooding damaged many basements in Morgan County. This event was part of a federally-declared disaster (Declaration #1053). The Illinois River crested at 446.3 feet on May 30th at the river gage attached to the intake pier on the left bank of the river at the Central Illinois Public Service Company in Meredosia. This event is the second highest crest at this gage. Flood stage at this location is 432.0 feet and major flood stage is 438.0 feet. At 436.0 feet Meredosia plugs its storm sewer outlets; at 440.4 feet Meredosia Lake Road is overtopped; at 444.9 feet floodwaters overtop the Little Creek Levee; and at 446.0 feet floodwaters overtop the Northern Meredosia Levees.	n/a	n/a	$250,000
2/21/1997 thru 3/6/1997	6:00 p.m.	countywide	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 in turn caused the Illinois River to rise. Another 1 to 2 inches of rain fell over the Illinois River basin on the 26th, exacerbating the flooding situation. The river continued to rise at the end of February and crested at the beginning of March.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$250,000**

Figure 32
(Sheet 3 of 4)
General Flood Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages
5/12/2002 thru 6/8/2002	9:00 a.m.	countywide	After several rounds of precipitation fell over central Illinois during the first part of the month, the Illinois River rose above flood stage. The flooding continued into June along the lower portions of the Illinois River. The river flooding finally subsided on June 8th. In Morgan County IL Rte. 78 at IL Rte. 104 was closed due to flooding on May 12th and 13th. Also, 3 teenagers had to be rescued the evening of the 12th after they drove into a flooded section of roadway near Jacksonville and were swept several feet downstream until the car came to rest next to a power pole. One individual sustained minor leg injuries. This event was part of a federally-declared disaster (Declaration #1416). The Illinois River crested at 445.57 feet on May 19th at the river gage attached to the intake pier on the left bank of the river at the Central Illinois Public Service Company in Meredosia. This event is the fourth highest crest at this gage. Flood stage at this location is 432.0 feet and major flood stage is 438.0 feet. At 436.0 feet Meredosia plugs its storm sewer outlets; at 440.4 feet Meredosia Lake Road is overtopped; at 444.9 feet floodwaters overtop the Little Creek Levee; and at 446.0 feet floodwaters overtop the Northern Meredosia Levees.	1	0	n/a
Subtotal:				**1**	**0**	**$0**

Figure 32
(Sheet 4 of 4)
General Flood Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages
6/18/2011 thru 6/20/2011	9:33 p.m.	countywide	Additional showers and thunderstorms on the 19th and 20th aggravated ongoing flooding concerns created by the historic flash flood event that occurred late in the evening on the 17th.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**
GRAND TOTAL:				**1**	**0**	**$250,000**

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.
Illinois Department of Natural Resources, Office of Water Resources.

Figure 33
(Sheet 1 of 7)
Flash Flood Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damage	Crop Damage
9/22/1993 thru 9/23/1993	8:00 p.m.	countywide	4 to 7 inches of rain fell resulting in flash flooding of streets, businesses and homes; COOP observer at Jacksonville measured 5.02 inches and reported that most of the rain fell in a 2 to 4 hour period causing severe flooding	n/a	n/a	n/a	n/a
5/16/1995 thru 5/17/1995	7:25 p.m.	countywide	no description was available – COOP observer at Jacksonville measured 0.88 inches of rain and reported that there was thunder and straight-line winds in Alexander	n/a	n/a	n/a	n/a
6/6/2001	12:00 a.m.	countywide	heavy rains resulted in flash flooding across the county; COOP observer at Jacksonville measured 3.38 inches of rain and reported flooding in the area ➢ water was reported over many road in Waverly ➢ flooding occurred in and around Jacksonville, including US Rte. 67 south of the city ➢ Mauvaise Terre Creek east of Jacksonville overflowed its banks resulting in the closures of a few local roads ➢ Water was also reported over IL Rte. 104 near Pisgah and IL Rte. 267 near Murrayville	n/a	n/a	n/a	n/a
4/27/2002	10:20 a.m.	Alexander^	heavy rains caused flash flooding of County Highway 123 between Alexander and Ashland in Cass County; one foot of water covered the southbound lane; COOP observer at Jacksonville measured 2.34 inches of rain	n/a	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**	**$0**

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

Figure 33
(Sheet 2 of 7)
Flash Flood Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damage	Crop Damage
5/6/2002	9:15 a.m.	Jacksonville	very heavy rains fell over a large portion of central Illinois south of a Winchester to Charleston line; numerous roads experienced flash flooding; COOP observer at Jacksonville measured 0.48 inches of rain on the 6th and 1.72 inches on the 7th	n/a	n/a	n/a	n/a
5/12/2002	3:58 a.m.	countywide	heavy rains caused flash flooding of numerous roads, including Old Rte. 36 near Lynnville and IL Rte. 11 near Waverly; several cars had to be towed after being driven into flooded areas but no injuries were reported; COOP observer at Jacksonville measured 1.72 inches of rain	0	0	n/a	n/a
6/11/2002	3:30 p.m.	northern portion of the county	heavy rains resulted in flash flooding of several roads; IL Rte. 78 north Jacksonville and Old Rte. 36 near Jacksonville both had water flowing over them; COOP observer at Jacksonville measured 2.61 inches of rain and reported torrential rains	n/a	n/a	n/a	n/a
8/25/2004	4:13 p.m.	Jacksonville	heavy rains resulted in flash flooding of several city streets; COOP observers at Jacksonville measured between 2.11 and 2.16 inches of rain	n/a	n/a	n/a	n/a
1/12/2005 thru 1/13/2005	10:08 p.m.	Jacksonville	heavy rains caused flash flooding of numerous streets in the city; COOP observers at Jacksonville measured 1.65 inches of rain	n/a	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**	**$0**

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

Figure 33
(Sheet 3 of 7)
Flash Flood Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damage	Crop Damage
9/11/2008	2:00 p.m.	Jacksonville	heavy rains during the afternoon caused localize flash flooding; numerous basements in Jacksonville flooded; COOP observers at Jacksonville measured between 1.28 and 1.34 inches of rain	n/a	n/a	$25,000	$0
9/13/2008	8:00 p.m.	Jacksonville	heavy rains combined with already saturated soils led to additional flash flooding; the basement at the Westfair Christian Academy in Jacksonville flooded; COOP observers at Jacksonville measured between 1.30 and 2.18 inches of rain	n/a	n/a	$35,000	$0
5/13/2009 thru 5/14/2009	10:00 p.m.	northern portion of the county	2 to 4 inches of heavy rain fell within 2 hours producing significant flash flooding of most roads, particularly those in the northern portions of the County; COOP observers at Jacksonville measured between 1.70 and 1.72 inches of rain; the one observer reported that 3 heavy storms rolled through the area	n/a	n/a	n/a	n/a
9/20/2009	9:30 a.m.	western & central portions of the county	4.5 to 5 inches of heavy rain were reported within 2 hours in a 15-mile wide band across western and central portions of the County; COOP observers at Jacksonville measured between 4.00 and 4.73 inches of rain ➢ numerous streets were flooded in Jacksonville ➢ a man drowned near Woodson while trying to clear debris from an intake valve and culvert near a flooded pond	0	1	n/a	n/a
Subtotal:				**0**	**1**	**$60,000**	**$0**

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

Figure 33
(Sheet 4 of 7)
Flash Flood Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damage	Crop Damage
6/15/2010	2:45 p.m.	Franklin Waverly	nearly 3 inches of rain fell in about 2 hours producing flash flooding in a small part of southeast Morgan County; streets were flooded in Waverly, as were most of the rural roads south of the city toward the Macoupin County line	n/a	n/a	n/a	n/a
7/24/2010	7:15 p.m.	western portion of the county	3 to 4 inches of heavy rain resulted in flash flooding in much of the western portion of the County; rainfall rates topped 2 inches per hour and caused flooding of numerous roads and creeks; 2 parks near Jacksonville were closed due to the flooded creeks and several homes in Jacksonville had flooded basements; COOP observers at Jacksonville measured between 2.00 and 3.26 inches of rain	n/a	n/a	$100,000	$0
6/2/2011	5:15 a.m.	northwestern portion of the county	more than 3 inches of rain fell in about 2 hours resulting in flash flooding in the northwestern portion of the County; numerous roads were flooded around Meredosia and IL Routes 67 and 104 were closed during the early morning	n/a	n/a	n/a	n/a
6/17/2011 thru 6/18/2011	10:45 p.m.	countywide	flash flooding of historic proportions occurred across much of Morgan County from late in the evening on the 17th through much of the 18th; rainfall amounts of 5 to 10 inches were reported with a majority of the rain was produced between 10 pm and 3 am; the highest rain totals were in east-central Morgan County from Alexander to Franklin; COOP observers at Jacksonville measured between 5.11 and 5.60 inches of rain *NARRATIVE CONTINUED ON NEXT SHEET*	0	0	$150,000,000	n/a
Subtotal:				**0**	**0**	**$150,100,000**	**$0**

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

Figure 33
(Sheet 5 of 7)
Flash Flood Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damage	Crop Damage
6/17/2011 thru 6/18/2011	10:45 p.m.	countywide	*NARRATIVE CONTINUED FROM PREVIOUS SHEET* ➢ Jacksonville & South Jacksonville recorded nearly 6 inches of rain in less than 6 hours, which was 1 inch higher than a 100 year flood for that time period ➢ in Jacksonville, nearly 2,500 homes and more than 100 businesses (including the Nestle Chocolate plant, many restaurants, MacMurray College, and a state prison with more than 1,600 inmates) sustained major flash flood damage; a levee for Mauvaise Terre Creek Lake was overtopped at the Jacksonville drinking water treatment facility, destroying much of the equipment at the facility and shutting off the water supply for about 3 weeks until the equipment could be replaced and tested; the damage at the facility resulted in a boil order for almost 25,000 people; most of the streets in the eastern and southern parts of Jacksonville were covered with several feet of water; numerous people had to be rescued from their vehicles and from the Rolling Acres Mobile Estates mobile home park; while there were no reports of injuries or deaths, several pets drowned due to the flooding at the mobile home park ➢ several miles of I-72 east and south of Jacksonville were closed due to high water during the morning of the 18th	---	---	---	---
Subtotal:				**0**	**0**	**$0**	**$0**

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

Figure 33
(Sheet 6 of 7)
Flash Flood Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damage	Crop Damage
6/25/2011 thru 6/26/2011	8.45 p.m.	northern portion of the county	1 to 2 inches of rain fell on extremely saturated soils resulting in rapid flash flooding of creeks, streams and roads in northern Morgan County, including the city of Jacksonville; IL Rte. 78 and US Rte. 67 had several areas of standing water, streets were flooded throughout Jacksonville and most rural roads were impassable; COOP observers at Jacksonville measured between 1.22 and 1.30 inches of rain	n/a	n/a	n/a	n/a
6/25/2011 thru 6/26/2011	9:00 p.m.	southwestern portion of the county	1 to 2 inches of rain fell on extremely saturated soils resulting in rapid flash flooding of creeks, streams and roads in southwest Morgan County; IL Rte. 267 south of Woodson was flooded and US Rte. 67 and I-72 both had several areas of standing water; most creeks overflowed their banks and nearly all rural road were impassable; COOP observers at Jacksonville measured between 1.22 and 1.30 inches of rain	n/a	n/a	n/a	n/a
6/26/2011	1:30 a.m.	northern portion of the county	rainfall from the evening of the 25th sparked another round of flash flooding in the northern portions of the County; flooding was very slow to recede due to the extremely saturated ground and the major flash flooding experienced the previous week; area roads remained inundated throughout much of the day	n/a	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**	**$0**

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

Figure 33
(Sheet 7 of 7)
Flash Flood Events Reported in Morgan County
1993 – 2012

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damage	Crop Damage
6/27/2011	2:30 a.m.	northern and central portions of the county	another round of thunderstorms produced 1 to 2 inches of rain that led to flash flooding of creeks and roads across northern and central Morgan County, including the water logged city of Jacksonville; streets in Jacksonville were flooded and IL Rte. 78 and US Rte. 67 had standing water; nearly all rural roads were impassable in the northern half of the County during the early morning; COOP observers at Jacksonville measured between 1.08 and 1.11 inches of rain	n/a	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**	**$0**
GRAND TOTAL:				**0**	**1**	**$150,160,000**	**$0**

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

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, COOP Data / Record of Climatological Observations.
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 1,000 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 kill 60 people per year, mostly from flying or falling debris.

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 47** 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 47** identifies the Enhanced Fujita Scale.

Figure 47
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 Morgan County depending on the weather conditions. The following provides a brief description of each type of alert.

- **Watch.** A tornado watch is issued when conditions are favorable for the development of tornadoes in and close to the water area. Watches cover large areas of one or more states and are usually in effect for several hours. It does not mean that a tornado is imminent, just that individuals need to be alert and prepared.

- **Warning.** A tornado warning is issued when a tornado has been sighted or indicated by radar. Warnings are generally in effect for about 45 minutes or less, cover all or portions of specific counties and indicate imminent danger to life and property for those who are in the path of the tornado. Individuals should see shelter immediately.

PROFILING THE HAZARD

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

Figure 48, located at the end of this section, summarizes the previous occurrences as well as the extent or magnitude of tornado events recorded in Morgan County. NOAA's Storm Events Database and records from the National Weather Service Central Illinois Weather Forecast Office in Lincoln have documented 30 occurrences of tornadoes in Morgan County between 1955 and 2012. In comparison, there have been 2,047 tornadoes statewide between 1950 and November 30, 2009.

Tornado Fast Facts – Occurrences

Number of Tornadoes Reported (1955 – 2012): ***30***

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

Most Likely Month for Tornadoes to Occur: ***May or August***

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

Average Length of a Tornado: ***3.74 miles***

Average Width of a Tornado: ***145 yards***

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

Longest Tornado Path in the County: ***19.7 miles***

Widest Tornado Path in the County: ***880 yards***

Figure 49 charts the reported occurrences of tornadoes by magnitude. Of the 30 occurrences, one was classified as an F3 tornado, eight were classified as F2 tornadoes, eight were classified as F1 tornadoes, eight were classified as F0 tornadoes, and five were classified as EF1 tornadoes.

Figure 49
Tornadoes by Magnitude
1955 – 2012

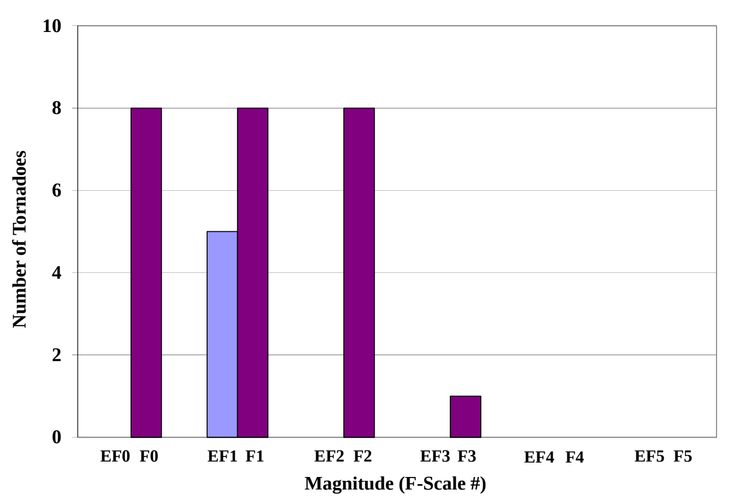


Figure 50 charts the reported tornadoes by month. Of the 30 events, 20 (67%) took place in March, April, May and June making this the peak period for tornadoes in Morgan County. In comparison, 1,355 of the 2,047 tornadoes (66%) recorded in Illinois since 1950 also took place in April, May and June.

Figure 50
Tornadoes by Month
1955 – 2012

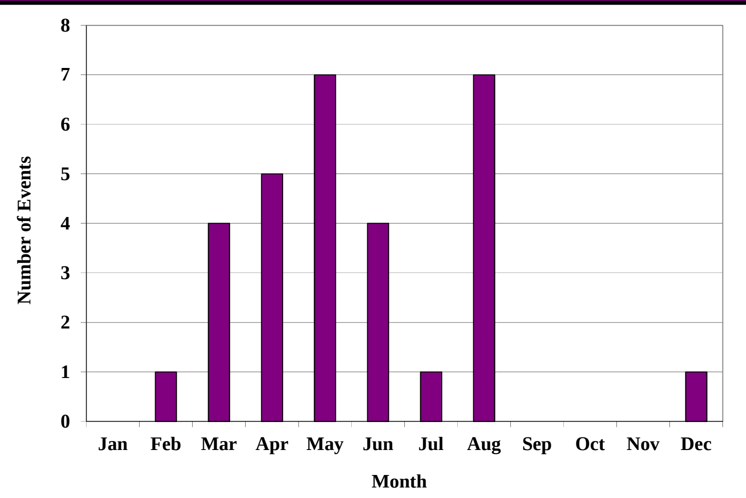
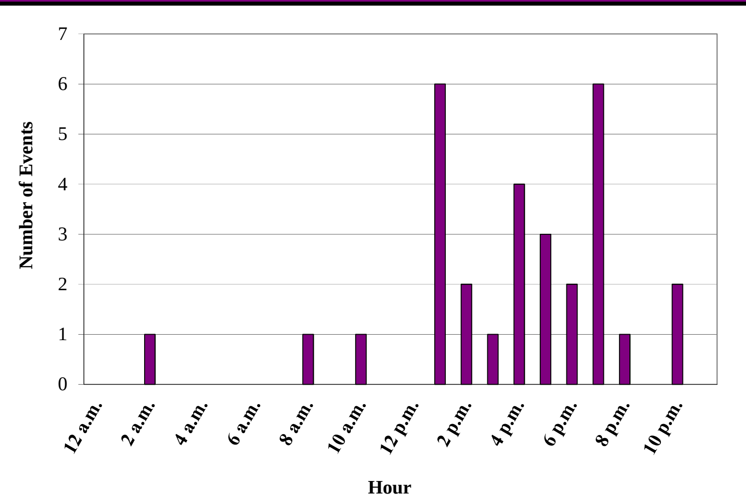


Figure 51 charts the reported tornadoes by hour. Approximately 90% of all tornadoes occurred during the p.m. hours, with 15 of the events (50%) taking place between 4 p.m. and 8 p.m. In comparison, more than half of all Illinois tornadoes occur between 3 p.m. and 7 p.m.

Figure 51
Tornadoes by Hour
1955 – 2012



The tornadoes that have impacted Morgan County have varied from 0.1 miles to 19.7 miles in length and from 10 yards to 880 yards in width. The average length of a tornado in Morgan County is 3.74 miles and the average width is 145 yards (0.08 miles).

Figures 52 shows the pathway of each reported tornado. The numbers by each tornado correspond with the tornado description in **Figure 48**. **Figure 53** illustrates the tornado damage assessment results of the August 19, 2009 outbreak in Morgan County. This map was created by the Morgan County GIS Department using GPS coordinates taken by Morgan County ESDA officials while conducting their damage assessment. The photographs are linked to the GPS coordinates and track the path of the tornadoes across the County.

A house on Leetham Road sustained structural damage as a result of an August 19, 2009 EF1 tornado.

Photograph provided by Jacksonville/Morgan County ESDA.

Records indicate that most of the tornadoes in Morgan 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 Morgan County, the average damage pathway or area impacted for a tornado is 0.31 square miles.

The longest tornado recorded in Morgan County occurred on March 12, 2006. This F2 tornado measured 66 miles in length and touched down approximately 4 miles south of Pearl in Pike County and traveled northeast across Greene, Scott, and Morgan Counties before lifting off in Springfield in Sangamon County. The tornado was on the ground in Morgan County for approximately 19.7 miles. The damage pathway of this tornado covered an estimated 3.4 square miles in Morgan County alone.

An August 19, 2009 EF1 tornado caused damage to a farm along Hughes Road.

Photograph provided by Jacksonville/Morgan County ESDA.

The widest tornado recorded in Morgan County occurred on April 19, 1996. This F2 tornado, measuring 880 yards wide, touched down approximately 2 miles east of Jacksonville and traveled east for approximately 6 miles before lifting off 1 mile north of Orleans. The damage pathway of this tornado covered an estimated 3.0 square miles.

What locations are affected by tornadoes?

Tornadoes have the potential to affect the entire County. Three of the participating municipalities, Jacksonville, Meredosia and Murrayville have had reported occurrences of tornadoes within their corporate limits. The *2010 Illinois Natural Hazard Mitigation Plan* prepared by IEMA classifies Morgan County's hazard rating for tornadoes as "elevated."

Figure 52
Tornado Touchdowns in Morgan County: 1955 – 2012

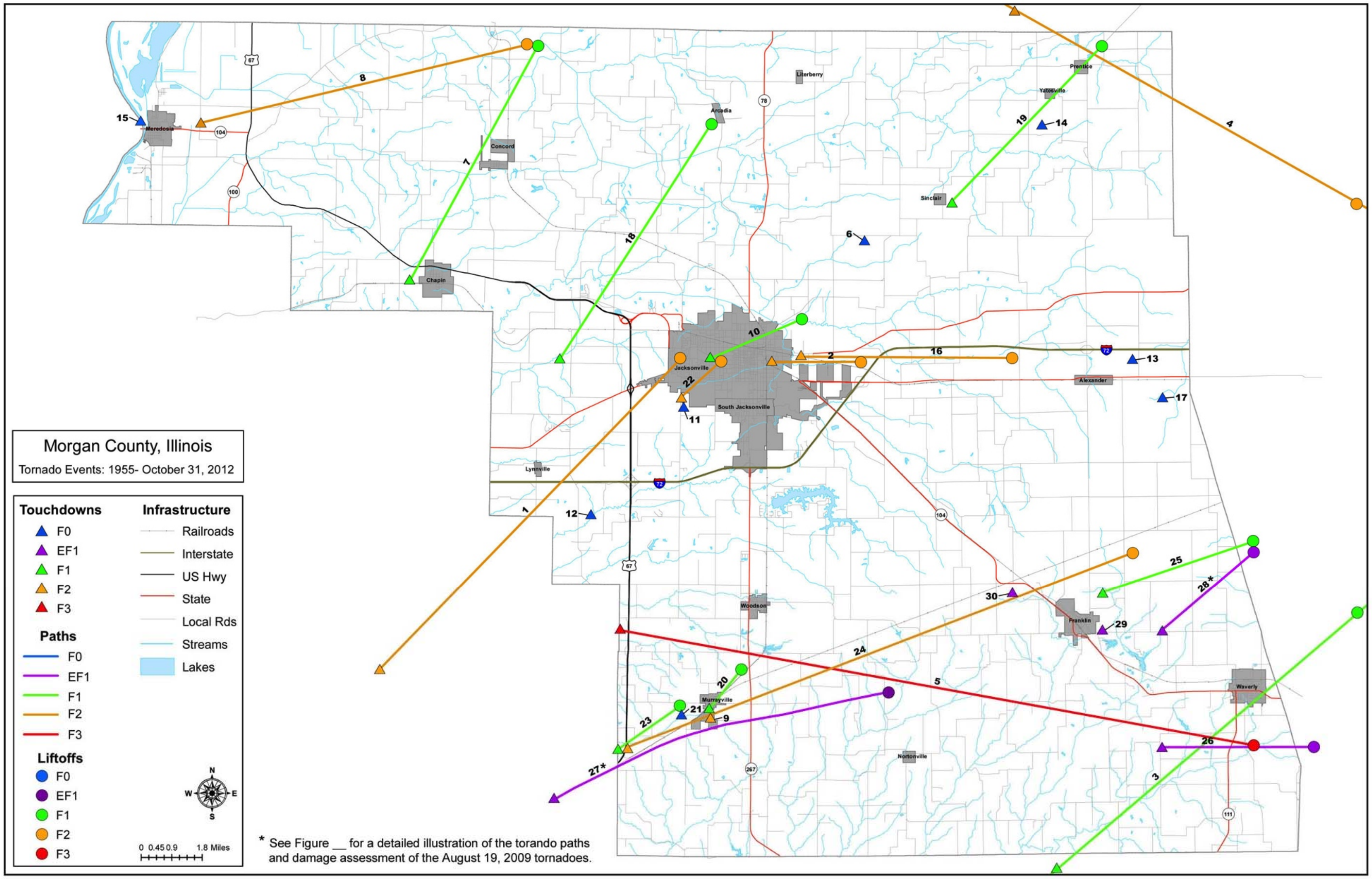
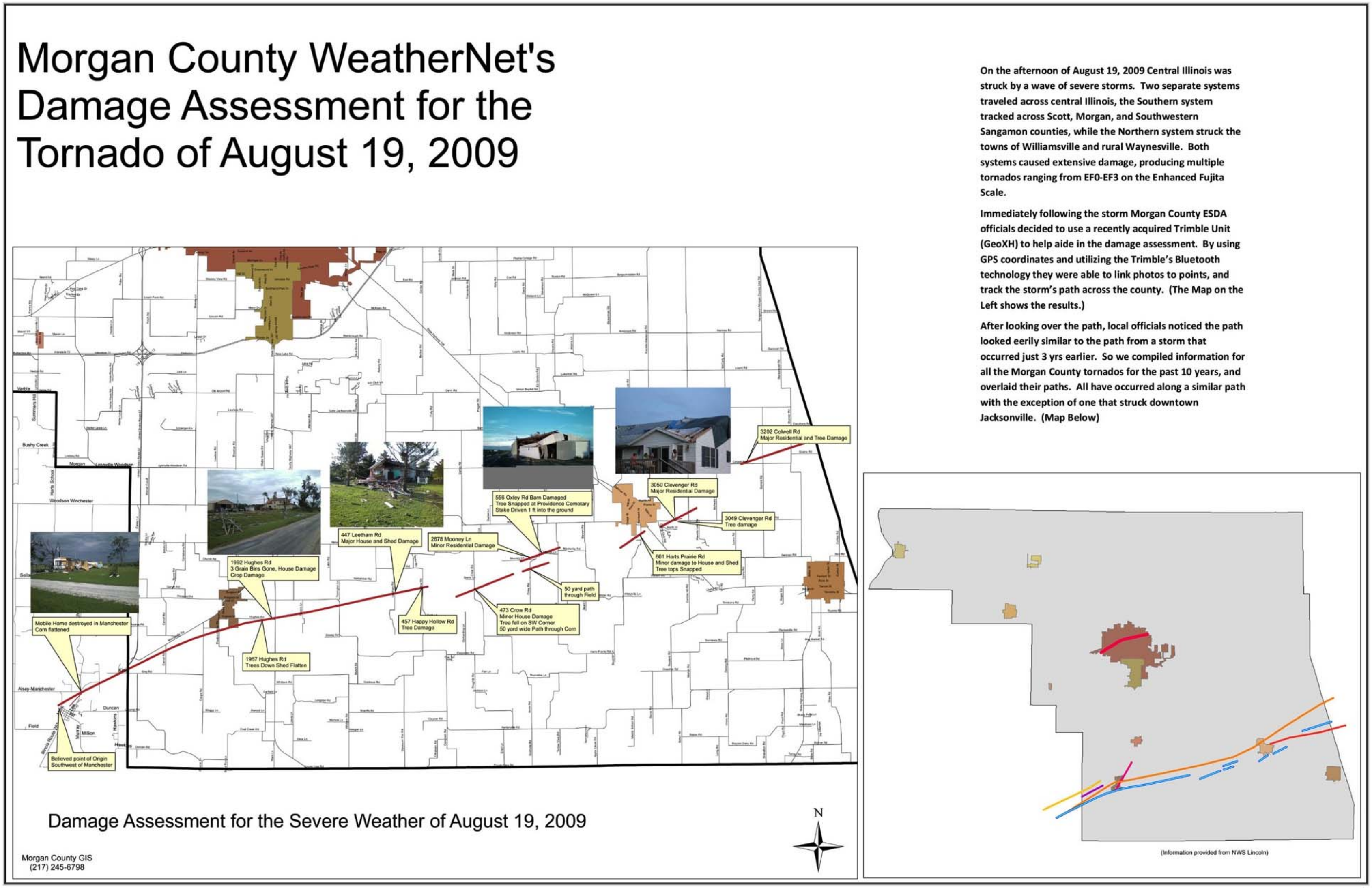


Figure 53
Morgan County Tornado Damage Assessment Map: August 19, 2009



What is the probability of future tornadoes occurring?

Morgan County has had 30 verified occurrences of tornadoes between 1955 and 2012. With 30 tornadoes over the past 58 years, the probability or likelihood that a tornado will touchdown somewhere in the County in any given year is 52%. There were nine years over the last 58 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 15.5%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to tornadoes?

Yes. All of Morgan 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 and central portions of the County. Chapin, Franklin, South Jacksonville and Woodson are the only participating communities that have not had a tornado touch down or pass through their municipal boundaries. **Figure 54** lists the verified tornadoes that have touched down in or near each participating municipality.

Figure 54
Verified Tornado Touchdowns In or Near Participating Municipalities

Participating Municipality	Number of Verified Tornadoes	Year Tornado Touchdown
Chapin	1	1971
Franklin	5	2006, 2006, 2009, 2012, 2012
Jacksonville	8	1955*, 1957*, 1961, 1974*, 1987, 1996*, 1999, 2004*
Meredosia	2	1973, 1995*
Murrayville	6	1973*, 2000*, 2002, 2006, 2006*, 2009
South Jacksonville	0	---
Woodson	1	1961

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

In terms of unincorporated areas vulnerable to tornadoes, Alexander and Prentice have had more tornadoes touch down in their vicinity than any other area. **Figure 55** details the verified tornadoes touch downs near unincorporated areas of Morgan County.

Figure 55
Verified Tornado Touchdowns In or Near Unincorporated Areas of Morgan County

Unincorporated Area	Number of Verified Tornadoes	Year Tornado Touchdown	Unincorporated Area	Number of Verified Tornadoes	Year Tornado Touchdown
Alexander	3	1995, 1996, 1996	Pisgah	0	---
Arcadia	1	1999*	Prentice	3	1960, 1995, 1999
Bethel	0	---	Rees Station	0	---
Literberry	0	---	Sinclair	1	1999
Nortonville	1	2009	Yatesville	1	1999
Orleans	0	---			

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

What impacts resulted from the recorded tornadoes?

According to the data provided by NOAA's Storm Events Database and Planning Committee member records, 12 of the 30 tornadoes caused $5,870,500 in property damage and $235,000 in crop damage between 1955 and 2012. There were six events where property damage totals were at least $250,000 each. 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: ***$5,870,500***
- ❖ Infrastructure/Critical Facilities Damage*: ***n/a***
- ❖ Crop Damage: ***$235,000***
- ❖ Injuries: ***12***

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

* An August 31, 2012 EF1 tornado damaged the top of the Franklin water tower and the water tower ladder; however, a detailed damage estimate was unavailable.

Included in the August 31, 2012 property damage total of $300,000 is property damage sustained by infrastructure and critical facilities in Franklin. While a detailed breakdown of damages was unavailable, Planning Committee member records indicate that this EF1 tornado damaged the Franklin water tower.

NOAA's Storm Events Database also documented 12 injuries as a result of seven separate tornado events. Detailed information was only available for three of the events. The following provides a brief description. In comparison, Illinois averages four tornado fatalities annually; however, this number varies widely from year to year.

- ❖ On April 19, 1996 an F2 tornado touched down 2 miles east of Jacksonville and traveled east over a portion of the Jacksonville Correctional Facility injuring one person at the prison.
- ❖ An F2 tornado on May 24, 2004 touched down in the southwest corner of Jacksonville and moved northeast damaging a motel and injuring one guest.
- ❖ On August 31, 2012 an EF1 tornado touched down south of Franklin and rolled a mobile home off its foundation onto Illinois Route 104, injuring one person inside.

An F2 tornado on May 24, 2004 caused structure and content damage to a church in Jacksonville.

Photograph provided by Steve Turner.

Despite their relative frequency, a large majority of the tornadoes that have impacted Morgan County have touched down in rural areas away from concentrated populations. This has contributed to the relatively low number of injuries and fatalities. Another factor that has contributed to the low number of injuries and fatalities is adequate access to health care for those injured following a tornado. Assuming that the hospital in Jacksonville is not directly impacted by a tornado event, it is equipped to provide continuous care to those injured. There are also nearby hospitals in Springfield (Sangamon County), Carlinville (Macoupin County), and Carrollton (Greene County) which are equipped to provide care.

If the aforementioned factors (tornado touchdown locations and proximity of health care facilities) are taken into consideration, the risk to public health and safety from tornadoes is low to medium. However, if a tornado were to touchdown in any of the municipalities, the risk or vulnerability for that location would be elevated to high.

Words alone cannot fully convey the scope of the damages caused by tornadoes in Morgan County. Select photographs provided by committee members are located throughout this section and in **Appendix J**.

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).

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.

A May 24, 2004 F2 tornado damaged buildinsg and downed power poles and transformers in Jacksonville.

Photograph provided by Steve Turner.

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.

<u>Assessing the Vulnerability of Existing Residential Structures</u>

One way to access 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 Morgan 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 56** calculates the average housing unit density for Morgan County.

Figure 56 **Calculation of Average Housing Unit Density**
Total Housing Units ÷ Land Area = Average Housing Unit Density (Rounded Up to the Nearest Whole Number)
Morgan County: 15,515 housing units ÷ 569 square miles = 28 housing units/square mile

Figure 57 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.

Figure 57
Average Housing Unit Density by Participating Jurisdiction

Jurisdiction	Total Housing Units (2010)	Mobile Homes (2000)*	Land Area (Sq. Miles) (2010)	Average Housing Unit Density (Units/Sq. Mile) (Raw)
Chapin	229	30	0.974	---
Franklin	274	20	0.744	---
Jacksonville	8,162	557	10.474	779.26294
Meredosia	464	75	0.833	---
Murrayville	261	28	0.490	---
South Jacksonville	1,671	19	2.290	729.69432
Woodson	220	59	0.391	---
Unincorp. County	3,612	542	551.562	6.54867
County	15,515	1,381	568.791	27.27715

* The U.S. Census Bureau has not released the 2010 Census data which provide a breakdown of housing units by type. As a result, the 2000 census data will be used in its place instead of estimates.

Source: U. S. Census Bureau.

Estimating the Number of Potentially-Damaged Housing Units

With the average housing unit density 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 58** 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 58 **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) Morgan County: 27.27715 housing units/sq. mile x 0.31 sq. miles = 8.45592 housing units **(9 housing units)**

To calculate the number of potentially-damaged housing units for these municipalities, take the average area impacted 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-damage housing units. **Figure 59** provides a sample calculation

Figure 59 **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 Chapin: 0.31 sq. mile ÷ 0.974 sq. miles = 0.318275154 Impacted Land Area x Total Housing Units = Potentially-Damaged Housing Units (Rounded Up to the Nearest Whole Number) Chapin: 0.318275154 x 229 housing units = 72.88501027 housing units **(73 housing units)**

Figure 60 provides a breakdown of the number of potentially-damaged housing units by participating jurisdiction. By comparing the average *county* housing unit density to the average *unincorporated county* housing unit density, the shortcomings of using a countywide average become apparent. While the average county housing unit density provides an adequate assessment of the number of housing units that may be potentially damaged in a densely populated county, it does not provide an accurate assessment for those counties with large, sparsely populated rural areas such as Morgan County. In the absence of townships, the average unincorporated county housing unit density provides a better estimate of the number of residential buildings that would be impacted by a tornado in the rural portions of the County.

Establishing the Level of Risk/Vulnerability for the County and Municipalities

Morgan County is among the top 35 counties in Illinois in terms of tornado frequency. This fact alone suggests that the overall risk posed by tornadoes to existing buildings, infrastructure and critical facilities in Morgan County is relatively high. While frequency is important, other factors must be examined when assessing vulnerability.

Figure 60
Estimated Number of Housing Units Potentially Damaged by a Tornado

Participating Municipality	Total Housing Units (2010)	Land Area (Sq. Miles) (2010)	Average Housing Unit Density (Units/Sq. Mile) (Raw)	Potentially-Damaged Housing Units (Units/0.31 Sq. Miles) (Raw)	Potentially-Damaged Housing Units (Units/0.31 Sq. Miles) (Rounded Up)
Chapin	229	0.974	---	72.88501	73
Franklin	274	0.744	---	114.16667	115
Jacksonville	8,162	10.474	779.26294	241.57151	242
Meredosia	464	0.833	---	172.67707	173
Murrayville	261	0.490	---	165.12245	166
South Jacksonville	1,671	2.290	729.69432	226.20524	227
Woodson	220	0.391	---	174.42455	175
Unincorp. County	3,612	551.562	6.54867	2.03009	3
County	15,515	568.791	27.27715	8.45592	9

Source: U. S. Census Bureau

When such factors as population distribution, the absence of high risk living accommodations (such as high rise buildings, etc.), and the largely rural pathway of the previously recorded tornadoes are taken into consideration, the overall risk posed by tornadoes becomes medium to low. While the risk to the County is medium to low, if a tornado were to touchdown in any of the municipalities, the risk or vulnerability for that location would be elevated to high.

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

Yes. While six of the participating jurisdictions (Morgan County, Chapin, Jacksonville, Meredosia, Murrayville and South Jacksonville) have building codes in place that will likely lessen the vulnerability of new buildings and critical facilities to damage from tornadoes, two of the participating municipalities do not.

Infrastructure such as new communication and power lines also will continue to be vulnerable to tornadoes as long as they are located aboveground. Steps to bury all new lines would eliminate the vulnerability, but this action would be cost prohibitive in most areas. There is very little that can be done to reduce or eliminate the vulnerability of critical facilities constructed in the future other than enacting building codes where none exist and enforcing existing building codes.

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 Morgan 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 from a tornado event. The following provides a brief discussion of each decision/assumption.

Assumption #4

The average market value for a residential structure 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 for a residential structure 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 non farm buildings within a jurisdiction and dividing that number by the total number of housing units within the jurisdiction. **Figure 61** provides a sample calculation. The total assessed value is based on 2011 tax assessment information provided by the Morgan County Supervisor of Assessments.

Figure 61
Calculation of Average Assessed Value

Total Assessed Value of Non-Farm Buildings ÷ Total Housing Units = Average Assessed Value
(Rounded to the Nearest Penny)

Franklin: $5,274,540 ÷ 274 housing units = $19,250.15

To determine the average market value, the average assessed value is multiplied by three (the assessed value of a structure in Morgan County is approximately one-third of the market value). **Figure 62** provides the average assessed value and average market value for each participating municipality as well as for the unincorporated areas of the County and the County as a whole.

Assumption #5

The tornado would completely destroy the potentially-damaged housing units.

Structural Damage = 100%
Content Damage = 100%

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.

Figure 62
Average Market Value of Housing Units

Participating Jurisdiction	Total Assessed Value of Non Farm Buildings (2011)	Total Housing Units (2010)	Average Assessed Value (Raw)	Average Market Value (Raw)	Average Market Value (Rounded)
Chapin	$4,139,220	229	$18,075.19651	$54,225.58953	$54,226
Franklin	$5,274,540	274	$19,250.14599	$57,750.43797	$57,750
Jacksonville	$148,148,370	8,162	$18,150.98873	$54,452.96619	$54,453
Meredosia	$6,736,620	464	$14,518.57759	$43,555.73277	$43,556
Murrayville	$5,048,300	261	$19,342.14559	$58,026.43677	$58,026
South Jacksonville	$38,681,320	1,671	$23,148.60563	$69,445.81689	$69,446
Woodson	$4,414,990	220	$20,068.13636	$60,204.40908	$60,204
Unincorp. County	$102,148,770	3,612	$28,280.39037	$84,841.17111	$84,841
County	$325,315,490	15,515	$20,967.80471	$62,903.41413	$62,903

Source: Vogt, Allen, Morgan 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 63** provides a sample calculation.

Figure 63
***Structure* – Potential Dollar Loss Calculations**

Average Market Value per Housing Unit x Percent Damage = Average Structural Damage
Franklin: $57,750 x 100% = $57,750 per Unit

Average Structural Damage x Number of Potentially-Damaged Housing Units =
Potential Dollar Losses – Structure
(Rounded to the Nearest Dollar)

Franklin: $57,750 x 115 housing units = $6,641,250

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 64** provides a sample calculation.

Figure 64
***Content* – Potential Dollar Loss Calculations**

½ (Average Market Value of a Housing Unit) x Percent Damage = Average Content Damage
Franklin: ½ ($57,750) x 100% = $28,875 per Unit

Average Content Damage x Number of Potentially-Damaged Housing Units =
Potential Dollar Losses – Content
(Rounded to the Nearest Dollar)

Franklin: $28,875 x 115 housing units = $3,320,625

Finally the ***total potential dollar losses*** may be calculated by adding together the potential dollar losses to the structure and content. **Figure 65** gives a breakdown of the total potential dollar losses by jurisdiction.

Figure 65
Estimated Potential Dollar Losses to Potentially-Damaged Housing Units from a Tornado

Participating Jurisdiction	Average Market Value (2011)	Potentially-Damaged Housing Units (Rounded Up)	Potential Dollar Losses		Total Potential Dollar Losses
			Structure	Content	
Chapin	$54,226	73	$3,958,498	$1,979,249	$5,937,747
Franklin	$57,750	115	$6,641,250	$3,320,625	$9,961,875
Jacksonville	$54,453	242	$13,177,626	$6,588,813	$19,766,439
Meredosia	$43,556	173	$7,535,188	$3,767,594	$11,302,782
Murrayville	$58,026	166	$9,632,316	$4,816,158	$14,448,474
South Jacksonville	$69,446	227	$15,764,242	$7,882,121	$23,646,363
Woodson	$60,204	175	$10,535,700	$5,267,850	$15,803,550
Unincorp. County	$84,841	3	$254,523	$127,262	$381,785
County	$62,903	9	$566,127	$283,064	$849,191

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 Morgan County would be expected to ***exceed at least $5 million*** in any of the participating municipalities.

Figure 48
(Sheet 1 of 9)
Tornadoes Reported in Morgan County
1955 – 2012

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
1	8/29/1955	6:00 p.m.	Jacksonville	F2	n/a	n/a	2	0	n/a	n/a	touched down in Scott County and traveled northeast along an intermittent path into Morgan County before lifting off in the northwest corner of Jacksonville; removed the roofs of several homes
2	6/14/1957	1:30 p.m.	Jacksonville	F2	1.9	33	5	0	$250,000	$0	40 buildings had significant or total roof damage
3	5/6/1960	1:20 p.m.	Waverly^	F1	n/a	n/a	0	0	n/a	n/a	touched down near Carrollton in Greene County and traveled along an intermittent path northeast, crossing northwest Macoupin County and southeast Morgan County before lifting off near Springfield in Sangamon County
4	6/23/1960	2:40 a.m.	Prentice^	F2	n/a	n/a	0	0	n/a	n/a	touched down near Virginia in Cass County and traveled southeast through Morgan County before lifting off near Springfield in Sangamon County
Subtotal:							**7**	**0**	**$250,000**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Morgan County.

^ Tornado touchdown verified in the vicinity of this location(s).

Figure 48
(Sheet 2 of 9)
Tornadoes Reported in Morgan County
1955 – 2012

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
5	4/24/1961	8:26 p.m.	Woodson^ Waverly^	F3	18.9	33	0	0	$250,000	$0	touched down in Pike County near Kinderhook and traveled east-southeast across central Scott County and southern Morgan County before lifting off just south of Waverly
6	7/21/1961	2:40 p.m.	Jacksonville^	F0	0.0	33	0	0	$0	$0	
7	2/19/1971	1:30 p.m.	Chapin^ Concord^	F1	7.7	440	0	0	$25,000	$0	destroyed several farm buildings; severely damaged a house and other buildings
8	6/4/1973	10:45 a.m.	Meredosia^	F2	10.0	n/a	0	0	n/a	n/a	destroyed a barn and a garage
9	12/4/1973	8:30 a.m.	Murrayville	F2	0.0	33	1	0	n/a	n/a	caused extensive damage to homes and buildings
10	8/2/1974	1:00 p.m.	Jacksonville	F1	2.3	33	0	0	$50,000	$0	
11	8/8/1987	7:30 p.m.	Jacksonville^	F0	0.2	10	0	0	$2,500	$0	
12	3/6/1992	3:51 p.m.	Lynnville^	F0	0.2	10	0	0	n/a	n/a	damaged the roof of a building
13	5/9/1995	4:01 p.m.	Alexander^	F0	0.1	10	0	0	n/a	n/a	destroyed a two sheds and damaged one home
14	5/9/1995	4:05 p.m.	Prentice^	F0	0.1	10	0	0	n/a	n/a	destroyed several outbuildings and damaged two homes; numerous trees were blown down
Subtotal:							**1**	**0**	**$327,500**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Morgan County.

^ Tornado touchdown verified in the vicinity of this location(s).

Figure 48
(Sheet 3 of 9)
Tornadoes Reported in Morgan County
1955 – 2012

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
15	5/27/1995	5:45 p.m.	Meredosia	F0	0.1	10	0	0	n/a	n/a	caused minor damage to several buildings; downed several trees and power lines; caused some crop damage
16	4/19/1996	5:18 p.m.	Jacksonville Alexander^	F2	6.0	880	1	0	$400,000	$0	two railroad cars were turned over at the MOBIL Chemical Plant, which sustained some roof damage; two guard towers, a greenhouse and a fence were damaged at the Jacksonville Correctional Facility; East of the prison one home was destroyed; three homes sustained major damage and several farm buildings were damaged or destroyed; one person at the prison sustained minor injuries
17	4/19/1996	5:31 p.m.	Alexander^	F0	0.1	100	0	0	$0	$0	
Subtotal:							**1**	**0**	**$400,000**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Morgan County.

^ Tornado touchdown verified in the vicinity of this location(s).

Figure 48
(Sheet 4 of 9)
Tornadoes Reported in Morgan County
1955 – 2012

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
18	4/8/1999	7:27 p.m.	Jacksonville^ Arcadia	F1	9.5	200	0	0	n/a	n/a	a boat was lifted off of its trailer and thrown a quarter of a mile into a neighbor's pond; a nearby home sustained shingle and window damage and a truck was damaged; dozens of trees and power poles were blown down and a barn was destroyed; an airplane hanger roof was peeled back the roof; in Arcadia, several outbuildings were destroyed, a barn was severely damaged, a garage was damaged and roof damage to several homes was reported
19	4/8/1999	7:45 p.m.	Sinclair^ Yatesville^ Prentice^	F1	6.0	33	0	0	n/a	n/a	flipped over a mobile home and destroyed a barn, two outbuildings, and a hog shelter near Yatesville; near Prentice it destroyed a small shed, blew out windows on a house and left scour marks in a field
Subtotal:							**0**	**0**	**$0**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Morgan County.

^ Tornado touchdown verified in the vicinity of this location(s).

Figure 48
(Sheet 5 of 9)
Tornadoes Reported in Morgan County
1955 – 2012

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
20	5/26/2000	10:36 p.m.	Murrayville	F1	1.5	100	0	0	$44,000	$0	a large tree was blown over causing major damage to a home and a car parked nearby; a garage was destroyed and the two cars parked inside damaged; a lumber yard and a grain bin were also destroyed; a church lost seven stained glass windows and sustained minor roof damage; numerous trees, limbs and power lines were blown down
21	6/11/2002	2:39 p.m.	Murrayville^	F0	0.3	10	0	0	$0	$0	
22	5/24/2004	10:35 p.m.	Jacksonville	F2	1.2	100	1	0	$4,000,000	$0	destroyed a furniture store, house and church; caused major damage to a motel and caused minor damage to several more homes and businesses; one occupant of the motel sustained minor injuries
Subtotal:							**1**	**0**	**$4,044,000**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Morgan County.

^ Tornado touchdown verified in the vicinity of this location(s).

Figure 48
(Sheet 6 of 9)
Tornadoes Reported in Morgan County
1955 – 2012

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
23	3/12/2006	7:35 p.m.	Murrayville^	F1	1.3	75	0	0	n/a	n/a	touched down in northern Greene County northwest of Barow and traveled northeast into Scott County passing just north of Manchester before crossing into Morgan County and lifting off approx. 1.25 miles west of Murrayville; damaged trees, power lines and outbuildings and caused minor damage to homes and businesses; this event was part of a federally-declared disaster (Declaration #1633)
Subtotal:							**0**	**0**	**$0**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Morgan County.

^ Tornado touchdown verified in the vicinity of this location(s).

Figure 48
(Sheet 7 of 9)
Tornadoes Reported in Morgan County
1955 – 2012

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
24	3/12/2006	7:36 p.m.	Murrayville Franklin^	F2	19.7	300	1	0	n/a	n/a	touched down in Pike County and traveled northeast through Greene and Scott Counties before entering Morgan County where it moved through Murrayville and passed within 1.5 miles of Franklin before continuing northeast into Sangamon County, lifting off in Springfield; snapped power poles, damaged trees and damaged or destroyed numerous farm buildings; this event was part of a federally-declared disaster (Declaration #1633)
25	3/12/2006	7:58 p.m.	Franklin^	F1	4.6	440	0	0	n/a	n/a	touched down just northeast of Franklin and traveled northeast into Sangamon County, lifting off north northeast of Loami; snapped power poles, damaged trees and farm buildings; this event was part of a federally-declared disaster (Declaration #1633)
Subtotal:							**1**	**0**	**$0**	**$0**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Morgan County.

^ Tornado touchdown verified in the vicinity of this location(s).

Figure 48
(Sheet 8 of 9)
Tornadoes Reported in Morgan County
1955 – 2012

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
26	5/30/2008	6:17 p.m.	Waverly^	EF1	4.0	100	0	0	$129,000	$0	touched down 3 miles west-southwest of Waverly and traveled east lifting off in Sangamon County; snapped trees and caused minor damage to roofs and a garage; damaged two houses and a pole barn and destroyed a garage, shed, pole barn and two grain bins
27	8/19/2009	1:23 p.m.	Murrayville^ Nortonville^	EF1	8.0	250	0	0	$320,000	$175,000	touched down in extreme northern Greene County and traveled northeast across the southeastern tip of Scott before entering Morgan County, lifting off approx. 1.5 miles northwest of Nortonville; widespread tree and crop damage occurred along its path, numerous grain bins and sheds were damaged.
28	8/19/2009	1:46 p.m.	Franklin^	EF1	3.0	440	0	0	$100,000	$60,000	touched down 2 miles northeast of Franklin and traveled east northeast lifting off in Sangamon County northeast of Chatham; major tree and crop damage occurred
Subtotal:							**0**	**0**	**$549,000**	**$235,000**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Morgan County.

^ Tornado touchdown verified in the vicinity of this location(s).

Figure 48
(Sheet 9 of 9)
Tornadoes Reported in Morgan County
1955 – 2012

Map No.	Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
29	8/31/2012	4:12 p.m.	Franklin^	EF1	0.3	75	1	0	$300,000	$0	destroyed an auto shop; damaged the roof of a house; a mobile home was rolled off of its foundation onto IL Rte. 104, injuring one person inside; damaged ladder and top of water tower; several trees were blown down and tree branches knocked down
30	8/31/2012	4:32 p.m.	Franklin^	EF1	0.2	10	0	0	$0	$0	
Subtotal:							**1**	**0**	**$300,000**	**$0**	
GRAND TOTAL:							**12**	**0**	**$5,870,500**	**$235,000**	

[1] The length provided is only for the portion(s) of the tornado that occurred in Morgan County.

^ Tornado touchdown verified in the vicinity of this location(s).

Sources: Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Member responses to Morgan & Scott Counties 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 66** 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 66
Heat Index

Temperature (^{o}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 67 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 67
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 Morgan 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 equal or exceed 100°F and/or the air temperature is expected to reach at least 95°F.
- **Warning.** An excessive heat warning is issued when the maximum heat index is expected to equal or exceed 105°F and the minimum heat index is expected to equal or exceed 75°F during 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 (1995 – 2012): ***12***

Hottest Temperature Recorded in the County: ***114°F (July 14, 1954)***

Most Likely Month for Extreme Heat Events to Occur: ***July***

Figure 68, located at the end of this section, summarizes the previous occurrences as well as the extent or magnitude of extreme heat events recorded in Morgan County. NOAA's Storm Events Database has documented 12 occurrences of extreme heat in Morgan County between 1995 and 2012. According to the available historical data from the Midwestern Regional Climate Center, the hottest recorded temperature in Morgan County was 114°F on July 14, 1954 at the Jacksonville monitoring station.

Figure 69 charts the reported extreme heat events by month. Of the 12 events, seven (58%) took place in July making this the peak month for extreme heat events in Morgan County. There were two events that spanned two month; one took place between June and July while the other took place between July and August; however, for illustration purposes only the month the event started in is graphed.

Figure 69
Extreme Heat Events by Month
1995 – 2012

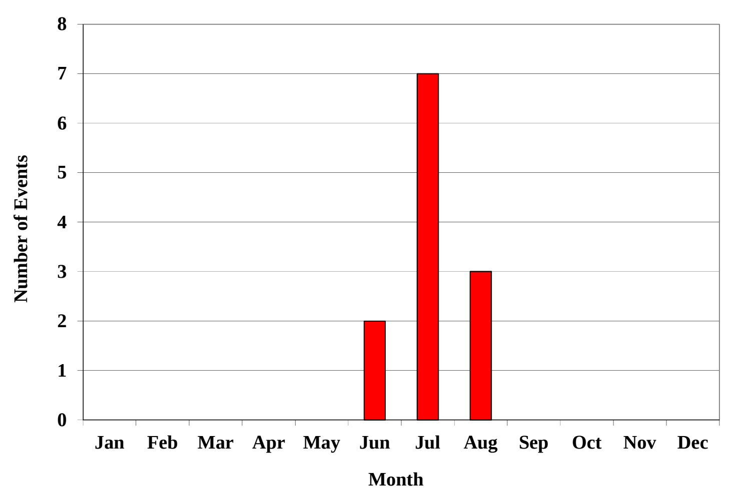
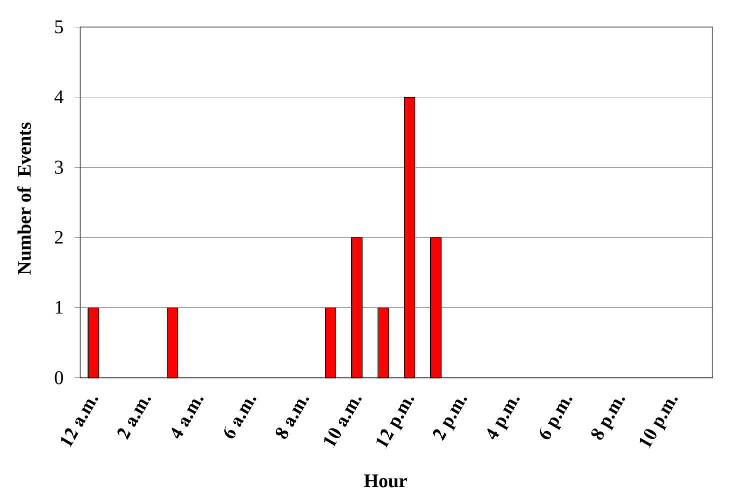


Figure 70 charts the reported extreme heat events by hour. The recorded events were split evenly between the a.m. hours and the p.m. hours, with 10 of the events (83%) taking place between 9 a.m. and 2 p.m.

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 *2010 Illinois Natural Hazard Mitigation Plan* classifies Morgan County's hazard rating for extreme heat as "high."

Figure 70
Extreme Heat Events by Hour
1995 – 2012



What is the probability of future extreme heat events occurring?

Morgan County has experienced 12 verified extreme heat events between 1995 and 2012. With 12 occurrences over the past 18 years, the probability or likelihood that the County may experience an extreme heat event in any given year is 67%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to extreme heat?

Yes. All of Morgan County, including the participating municipalities, is vulnerable to the dangers presented by extreme heat. Since 2003, Morgan County has experienced six extreme heat events. Morgan County is served by one state-designated warming center located at the Illinois Department of Human Services office in Jacksonville.

What impacts resulted from the recorded extreme heat events?

Damage information was either unavailable or none was recorded for any of the reported occurrences. NOAA's Storm Events Database did document one death as a result of the July 20, 2011 extreme heat event. A 75 year old woman passed away in her home in Chapin. There was no air conditioning in the house and the temperature inside had reached 100°F.

Extreme Heat Fast Facts – Impacts/Risk

Extreme Heat Impacts
- Fatalities: ***1***

Extreme Heat Risk/Vulnerability to:
- Public Health & Safety – General Population: ***Low***
- Public Health & Safety – Sensitive Populations: ***Medium***
- Buildings/Infrastructure/Critical Facilities: ***Low***

No other injuries or fatalities were reported as a result of extreme heat in Morgan County. This does not mean however that none occurred; it simply means that extreme heat was not identified as the primary cause. This is especially true for deaths. Usually heat is not listed as the primary cause of death, but rather an underlying cause. The heat indices were sufficiently high for all 12 events to produce heat cramps or heat exhaustion with the possibility of heat stroke in cases of prolonged exposure or physical activity.

In comparison, Illinois averages 74 deaths per year as a result of extreme heat. Extreme heat has triggered more deaths than any other natural hazard in Illinois. More deaths are attributed to extreme heat than the combined number of deaths attributed to floods, tornadoes, lightning and extreme cold.

Even if injuries and death due to extreme heat are under reported in Morgan County, the risk or vulnerability to public health and safety is relatively low for the general population. The risk or vulnerability is elevated to medium for sensitive populations such as the elderly, small children, chronic invalids, those on certain medications and persons with weight or alcohol problems who are more susceptible to heat reactions.

What other impacts can result from extreme heat events?

Other impacts of extreme heat include loss of livestock, road buckling, power outages, 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 Morgan County, extreme heat has the ability to impact multiple municipal water supplies. While Jacksonville has three groundwater wells it also obtains a portion of its drinking water from Mauvaise Terre Lake and provides drinking water to Chapin, Franklin and the Murrayville-Woodson Water Commission (which serves both Murrayville and Woodson).

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 events. Unlike other natural hazards, extreme heat events typically do not cause damage to buildings, infrastructure or critical facilities. The primary concern is for the health and safety of those living in the County and municipalities.

While buildings do not typically sustain damage from extreme heat events, in rare cases infrastructure and critical facilities may be directly or indirectly damaged. While uncommon, extreme heat events have been known to contribute to damage caused to roadways within Morgan County. The combination of extreme heat and vehicle loads has caused pavement cracking and buckling.

Extreme heat events have 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 Morgan 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 events is low, even taking into consideration the potential for 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 events. 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 that affect the County, extreme heat events do not typically damage buildings. The primary concern associated with extreme heat is the health and safety of those living in the County and municipalities, especially vulnerable populations such as the elderly, infants, young children and those with medical conditions.

Unlike other counties within the region, Morgan 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 deaths and injuries during extreme heat events due to the lack of air-conditioning units, fans and cooling centers.

Figure 68
(Sheet 1 of 3)
Extreme Heat Events Reported in Morgan County
1995 – 2012

Date(s)	Start Time	Magnitude	Injuries	Death
7/11/1995 thru 7/17/1995	12:00 p.m.	a very hot and humid air mass settled over the region causing nearly a week of high temperatures close to 100°F and heat indices approaching 120°F at times; many roads throughout the region experienced buckling and crops withered with the dry weather; there was no widespread loss of livestock although dairy cows produced less milk and cattle/swine/chickens put on less weight	n/a	n/a
8/9/1995 thru 8/24/1995	1:00 p.m.	a heat wave developed during most of the middle of August with high temperatures near the 100°F mark and heat indices over 110°F; area crops suffered greatly from the hot and dry weather	n/a	n/a
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; there were numerous reports of heat-related injuries in most area hospitals; numerous reports of road buckling due to the high temperatures; COOP observer at Jacksonville recorded a high temperature of 97°F on the 26th and 98°F on the 27th and a low temperature of 70°F on the 26th and 76°F on the 27th	0	0
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; several heat-related illnesses were reported in area hospitals; several highways in the area had sections of roadway buckle due to the excessive heat; COOP observer at Jacksonville recorded highs in the low 90s and lows in the mid to low 70s for all three days	0	0
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 between 105°F to 110°F	0	0
Subtotal:			**0**	**0**

Figure 68
(Sheet 2 of 3)
Extreme Heat Events Reported in Morgan County
1995 – 2012

Date(s)	Start Time	Magnitude	Injuries	Death
7/28/1999 thru 7/31/1999	10:00 a.m.	the heat returned to central Illinois after a two day break with temperatures again in the lower to middle 90s and heat indices ranging from 105°F to 110°F; COOP observer at Jacksonville recorded a high temperature of 99°F on the 30th and 31st	0	0
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 the high temperatures and high humidity produced heat indices of 105°F to 115°F; COOP observer at Jacksonville recorded a high temperature of 102°F and a low temperature of 76°F on the 25th	0	0
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; the combination of the high temperatures and high humidity produced heat indices of 105°F to 110°F; COOP observers at Jacksonville recorded high temperatures ranging from 94°F to 101°F and low temperatures ranging from 68°F to 76°F	0	0
8/3/2010 thru 8/4/2010	12:00 p.m.	a larger upper-level ridge of high pressure over the southern US 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; a COOP observer at Jacksonville recorded a high temperature of 98°F and a low temperature of 77°F on the 4th	n/a	n/a
8/9/2010 thru 8/14/2010	12:00 p.m.	after a brief break the hot and humid weather returned to central Illinois producing temperatures well into the 90s with heat indices exceeding 105°F; COOP observers at Jacksonville recorded high temperatures ranging from 91°F to 99°F and low temperatures ranging from 69°F to 77°F	n/a	n/a
Subtotal:			**0**	**0**

Figure 68
(Sheet 3 of 3)
Extreme Heat Events Reported in Morgan County
1995 – 2012

Date(s)	Start Time	Magnitude	Injuries	Death
7/20/2011	12:00 a.m.	a large upper-level ridge of high pressure brought oppressively hot and humid conditions to central Illinois that led to afternoon highs in the middle to upper 90s with heat indices climbing into the 105°F to 115°F range; this event claimed the life of a 75 year old woman who was found in her home in Chapin, she had no air conditioning and the temperature inside her house had reached 100°F	0	1
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; peak heat indices approached 110°F; COOP observers at Jacksonville recorded high temperatures ranging from 94°F to 104°F and low temperatures ranging from 68°F to 78°F	n/a	n/a
Subtotal:			**0**	**1**
GRAND TOTAL:			**0**	**1**

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, 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 71** shows the classification system utilized by the PDSI.

Figure 71
Palmer Classification System

Index Value	Description
4.0 or more	extremely wet
3.0 to 3.99	very wet
2.0 to 2.99	moderately wet
1.0 to 1.99	slightly wet
0.5 to 0.99	incipient wet spell
0.49 to -0.49	near normal
-0.5 to -0.99	incipient dry spell
-1.0 to -1.99	mild drought
-2.0 to -2.99	moderate drought
-3.0 to -3.99	severe drought
-4.0 or less	extreme drought

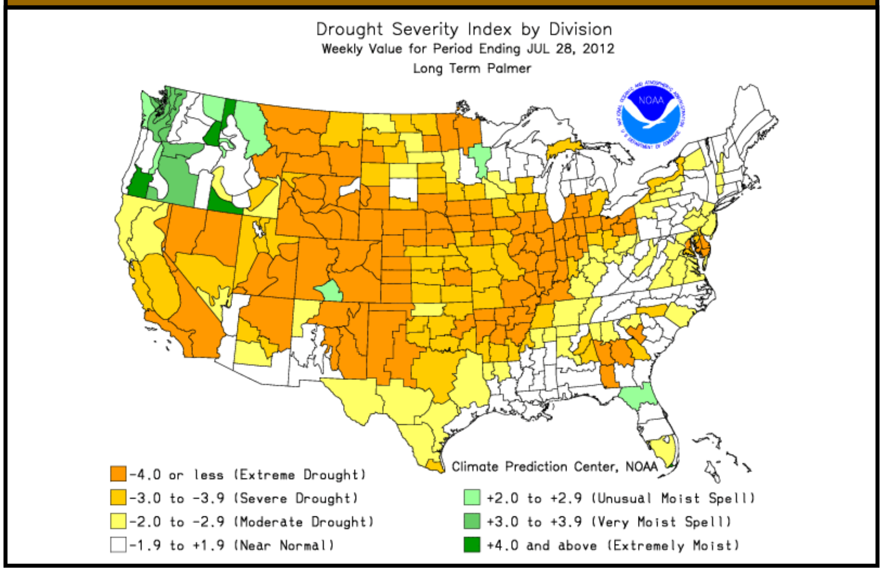
Source: National Drought Mitigation Center.

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.

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 72** shows an example of this map.

Figure 72
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 Drought Monitor is produced by a rotating group of authors from the U.S. Department of Agriculture (USDA), the NOAA and the National Drought Mitigation Center located at the University of Nebraska – Lincoln. It incorporates reviews from a group of 250 climatologists, extension agents and others across the nation.

The Drought Monitor utilizes five drought intensity categories, D0 through D4, to identify areas of drought. **Figure 73** provides a brief description of each category.

Figure 73 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: National Drought Mitigation Center.

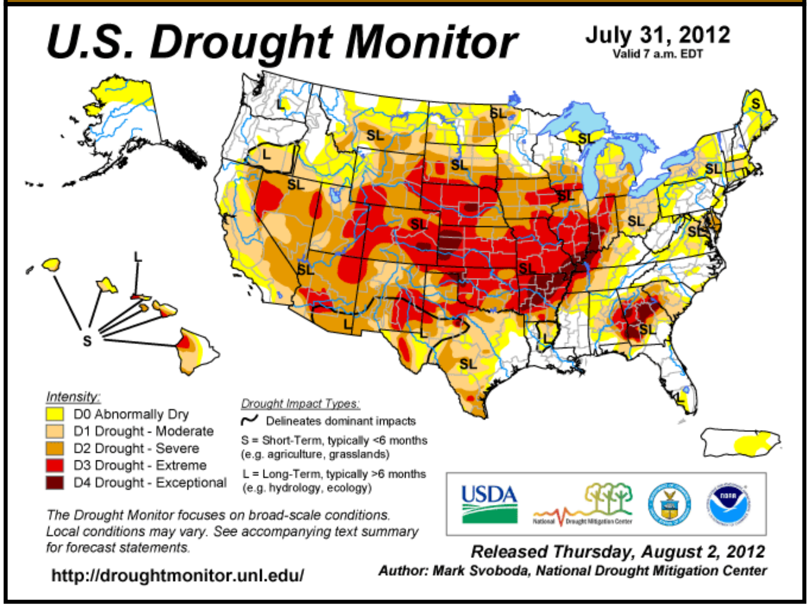
The drought intensity categories are based on five key indicators and numerous supplementary indictors. The five key indicators include the Palmer Drought Severity Index, Climate Prediction Center's Soil Moisture Model (percentiles), United States Geological Survey Weekly Streamflow (percentiles), Standardized Precipitation Index and Objective Short and Long-term Drought Indicator Blends (percentiles).

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. 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. While the maps are based in part on the key indices and other measures of moisture, they also incorporate real-world conditions as reported by numerous experts throughout the country, providing a more comprehensive approach to identifying and monitoring drought conditions.

In addition to identifying and categorizing general areas of drought, the weekly map also identifies whether a drought's impacts are agricultural (crops, pastures and grasslands) and/or hydrological (rivers, groundwater and reservoirs). **Figure 74** shows an example of the U.S. Drought Monitor weekly map. A summary also accompanies the map outlining the general conditions by regions.

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.

Figure 74
U.S. Drought Monitor Map



Source: National Drought Mitigation Center.

PROFILING THE HAZARD

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

Drought Fast Facts – Occurrences

Number of Drought Events Reported (1983 – 2012): ***5***

According to NOAA's Storm Events Database, the Illinois State Water Survey, the Illinois Emergency Management Agency and USDA there have been five official drought events reported in Morgan County between 1983 and 2012. The following provides a summary of these previous occurrences as well as the extent or severity of each event.

- In 1983, all 102 Illinois counties were proclaimed state disaster areas because of high temperatures and insufficient precipitation beginning in mid-June.
- In 1988, approximately half of all Illinois counties (including Morgan 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.
- In 2005-2006, drought conditions impacted much of the state, including Morgan County. A dry winter and spring developed into full-blown drought conditions by the end of June. On May 24, 2005 Morgan County was designated as D1 – moderate drought and upgraded to D2 –severe drought on July 5, 2005. By July 26, 2005 the County was classified as D3 – extreme drought.

  On July 27, 2005 the USDA designated 93 counties in Illinois, including Morgan County, as primary natural disaster areas due to the damage and losses caused by drought. While damage estimates were unavailable for this event, crop yield data from the USDA indicates that corn and soybean yields were 10 to 25 percent lower than the previous year.

Severe to extreme drought conditions continued through all of August and most of September. The drought conditions in the County were downgraded to D1 on September 20, 2005. Moderate to severe drought conditions continued through the winter and into the spring before being downgraded to D0 on April 11, 2006. Morgan County remained under the D1 designation throughout the summer and fall before finally being removed on December 5, 2006.

- In 2011, drought conditions impacted the central portion of the state. On November 2, 2011 the USDA designated 44 counties in Illinois (including Morgan County) as primary natural disaster areas because of losses caused by drought and excessive heat that began in July. The US Drought Monitor maps for August show Morgan County beginning the month as D0 – abnormally dry and ending it as D2 – severe drought. This was a short-term agricultural drought that was over by the end of November.

  In 2012, drought conditions impacted all of Illinois and most of the Midwest. On July 10, 2012 Morgan 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 0.50 inches of rain fell near Jacksonville in July, making it the 2nd driest July on record. As a result of the hot and dry conditions, mandatory water restrictions were established in Jacksonville and local officials instituted a ban on open burning.

  Extreme drought conditions continued through August, but were downgraded to D1 – moderate drought on September 6th thanks to beneficial rainfall from the remnants of Hurricane Issac. Crop stress was extreme for corn and soybeans during this event. On August 1, 2012 the USDA designated 66 counties in Illinois, including Morgan County, as primary natural disaster areas due to damage and losses caused by drought and excessive heat.

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 Morgan 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 *2010 Illinois Natural Hazard Mitigation Plan* classifies Morgan County's hazard rating for drought as "guarded."

What is the probability of future drought events occurring?

Morgan County has experienced five droughts between 1983 and 2012. With five occurrences over 30 years, the probability or likelihood that the County may experience a drought in any given year is 17%. However, if earlier recorded droughts are factored in, then the probability that Morgan County may experience a drought in any given year decreases to 11%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to drought?

Yes. All of Morgan 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.

What impacts resulted from the recorded drought events?

Drought Fast Facts – Impacts/Risk

Drought Impacts
- ❖ Crop Damage: ***$43.2 million***

Drought Risk/Vulnerability to:
- ❖ Public Health & Safety: ***Low***
- ❖ Buildings/Infrastructure/Critical Facilities: ***Low***

Damage information was only available for one of the drought events between 1983 and 2012. According to NOAA's Storm Events Database, the 2012 drought caused an estimated $43.2 million in damages to the corn crop in Morgan County. Disaster relief payment information was only available for 1998 drought event. 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 Morgan 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 the main economic enterprise in Morgan County. According to the 2007 Census of Agriculture, there were 740 farms in Morgan County occupying 320,512 acres. Farmland accounts for approximately 88% of all the land in the County. Of the 320,512 acres of farmland, approximately 88% or 281,053 acres of this land was in crop production. Approximately 1% of this land is irrigated.

Crop sales accounted for $131,020,000 in revenue while livestock sales accounted for $18,497,000. Morgan County ranks in the top 30 Illinois counties for crop cash receipts and in the top 40 counties 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, 2011 and 2012 droughts. **Figure 75** illustrates the reduction yields seen for corn and soybeans during the five recorded drought events.

Figure 75
Crop Yield Reductions Due to Drought in Morgan County

Year	Corn		Soybeans	
	Yield (bushel)	% Reduction Previous Year	Yield (bushel)	% Reduction Previous Year
1982	145	--	43	--
1983	**84**	**42.1%**	**29.5**	**31.4%**
1984	133	--	38	--
1987	149	--	38.5	--
1988	**93**	**37.6%**	**32.5**	**15.6%**
1989	142	--	47	--
2004	200		55	--
2005	**146**	**27.0%**	**49**	**10.9%**
2006	171	--	53	--
2010	146.5	--	54.1	--
2011	**157.2**	**--**	**50.6**	**7.4%**
2012	**112.4**	**28.5%**	**46.4**	**8.3%**

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 42.1% and soybeans yield reductions of 31.4% while the 1988 drought resulted in corn yield reductions of 37.6% and soybean yield reductions of 15.6%. In 2005, the drought caused a 27.0% reduction in corn yields and a 10.9% reduction in soybean yields. The 2011 drought resulted in only modest soybean reductions (7.4%) while the 2012 drought caused corn yield reductions of 28.5% and soybean yield reductions of 8.3%.

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 Morgan County, Jacksonville obtains a portion of its drinking water from a surface water source, Mauvaise Terre Lake. However, the City also utilizes three groundwater wells to offset its susceptibility to drinking water shortages. The City then provides drinking water to Chapin, Franklin and the Murrayville-Woodson Water Commission (which serves both Murrayville and Woodson).

Because these participants receive at least a portion of their drinking water supply from a surface water source they are more vulnerable to shortages as a result of a prolonged drought or a series of droughts in close succession. Those participants that obtain water from wells are less vulnerable to drinking water shortages, although 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 Morgan County and the participating municipalities are not vulnerable to drought. As with extreme heat events, droughts typically do not cause damage to buildings, infrastructure or critical facilities. 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 that affect the County, drought does not typically damage buildings. The primary concern associated with drought is financial impacts that result from loss of crop yields and the potential impacts to drinking water supplies.

With no comprehensive damage information available for previous occurrences there is no way to accurately estimate future potential dollar losses. However, since a major portion 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.

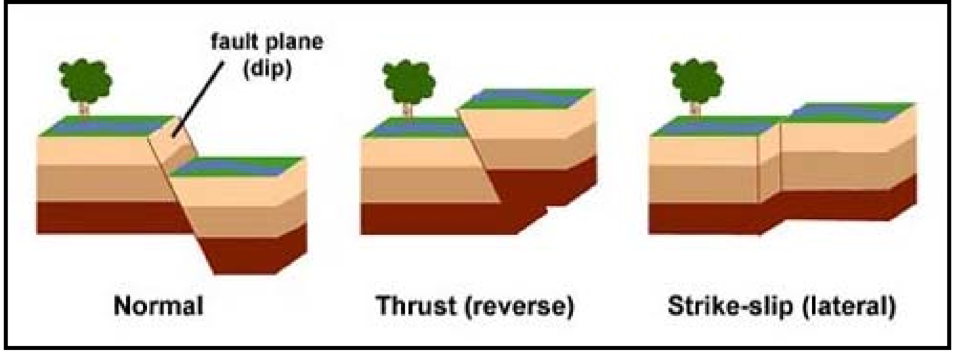
According to the U.S. Geological Survey earthquakes pose a significant risk to more than 75 million Americans in 39 states. Twenty-six urban areas across the United States, including St. Louis, Missouri, are at risk of significant seismic activity. The Federal Emergency Management Agency has estimated 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 76** provides an illustration of each type of fault.

Figure 76
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 77** 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 on March 28, 1964 and registered a 9.2 on the Richter Scale.

Figure 77
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 78** 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 78
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.

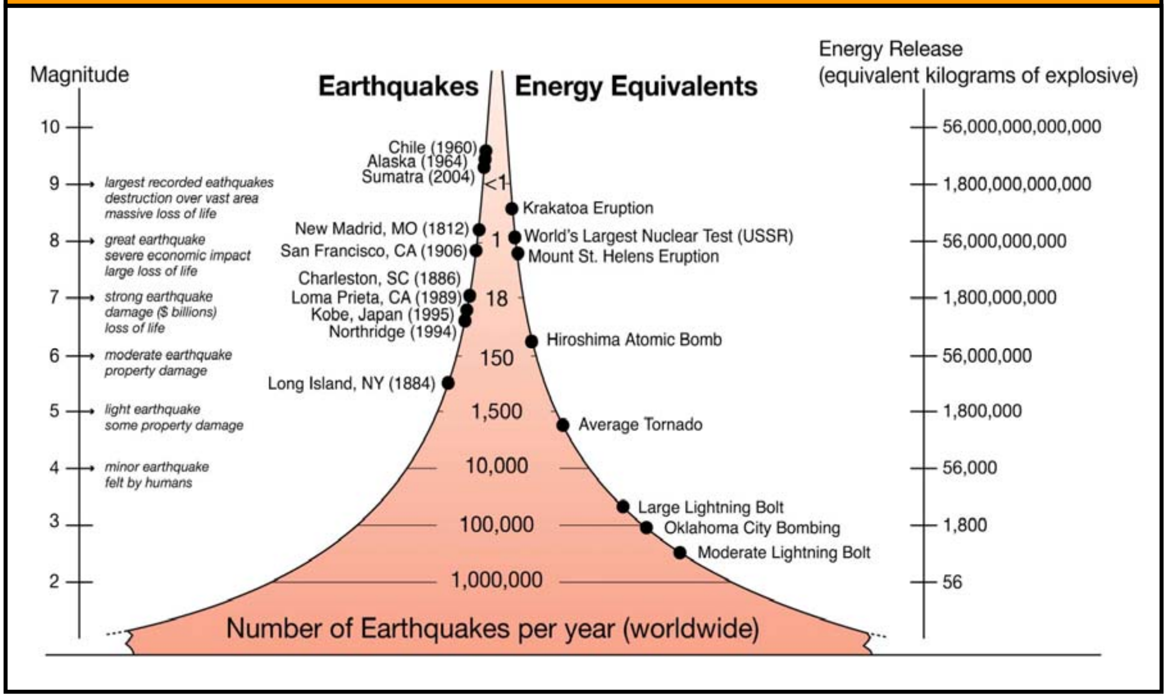
The second prominent belt is the Alpide, which extends from Java to Sumatra and through the Himalayan Mountains, the Mediterranean Sea and out into the Atlantic Ocean. It accounts for about 17 percent of the world's largest earthquakes, including those in Iran, Turkey and Pakistan. The third belt follows 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 everyday. Worldwide, small earthquakes, such as magnitude 2 earthquakes, occur several hundred 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 more than one a month. **Figure 79** 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 79
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 Morgan 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 – 2012* map, no earthquakes have originated in Morgan County during the last 200 years. While no earthquakes have originated in the County, residents have 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 – 2012): ***0***
Fault Zones Located within the County: ***None***
Earthquakes Originating in nearby Counties (1795-2012): ***3***
Fault Zones Located in Nearby Counties: ***None***

Central Illinois

Several earthquakes have originated in nearby Mason, Menard and Pike Counties. Damage information was unavailable for any of these events.

- On July 19, 1909 an earthquake originated in Mason County approximately 3 miles north-northeast of Kilbourne with an estimated magnitude of 4.5
- 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 October 29, 1935 an earthquake originated in Pike County at Pittsfield with an estimated magnitude of 3.0.

Southern Illinois

Morgan 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 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 which lies within the central Mississippi Valley, extending 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 rang church bells 1,000 miles away in Boston.

The quakes locally changed the course of the St. Francis and Mississippi Rivers and created Reelfoot Lake, which covers an area of more than 10 square miles 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. Morgan 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 *2010 Illinois Natural Hazard Mitigation Plan* classifies Morgan County's hazard rating for earthquakes as "elevated."

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 Morgan 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 Morgan 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 Morgan 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 Morgan 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?

While Morgan County residents felt the earthquakes that occurred in 2008, 1987 and 1968, no damages were reported as a result of these events. Given the magnitude of the great earthquakes of 1811 and 1812, it is almost certain that individuals in what is now Morgan County felt those quakes; however historical records do not indicate the intensity or impacts that these quakes had on the County.

<u>Earthquake Fast Facts – Risk</u>

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 Morgan 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 Morgan 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 80** details the potential impacts that may be experienced by the County should a magnitude 6.0 or greater earthquake occur in the region.

Figure 80 **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 Interstate 72 and US 67/IL 267 (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 Morgan 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 Morgan 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. All future buildings, infrastructure and critical facilities located in Morgan County and the participating municipalities are vulnerable to damage from earthquakes. While six of the participating jurisdictions have building codes in place, these codes do not contain seismic provisions that address structural vulnerability for earthquakes. 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 earthquakes?

With no reports of property damage associated with the recorded earthquake events, there is no way to accurately estimate future potential dollar losses to vulnerable structures in Morgan County. Sufficient information was not available to make useful predictions regarding potential earthquake damage 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 a strong earthquake. 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 84,130 dams in the United States and Puerto Rico, with 1,504 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 1,504 dams in Illinois, 94% 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 81** 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 81
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?

Yes. Jacksonville and Waverly both own classified dams. **Figure 82** provides a brief description of each dam.

Figure 82
Publicly-Owned Classified Dams Located in Morgan County

Name	Owner	Type	Purpose	Completion Date	Classification
Mauvaise Terre Lake Dam	Jacksonville	Earth	Water Supply, Recreation	1923	Class I
Lake Jacksonville Dam	Jacksonville	Earth	Water Supply, Recreation	1939	Class II
Lake Mauvaise Terre Dredge Basin Dam	Jacksonville	n/a	n/a	n/a	Class III
Waverly City Lake Dam	Waverly	Earth	Water Supply	1939	Class III

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 13 privately-owned classified dams within Morgan County. **Figure 83** provides a brief description of each dam.

Figure 83
Privately-Owned Classified Dams Located in Morgan County

Name	Owner	Type	Purpose	Completion Date	Classification
Murrayville Woodson Lake Dam	Murrayville Woodson Water Commission	Earth	Water Supply	1963	Class I
Rowe Lake Dam	Private	Earth	Recreation	1970	Class II
Valevue Lake Dam	Valevue Acre Assoc.	Earth	Recreation	1970	Class II
Applebee Pond Dam	Applebee Farms, Inc.	Earth	Recreation	1967	Class III
Concord Reservoir Dam	St. Luke Church	Earth	Recreation	1910	Class III
Defrates-Shaeffer Lake Dam	De Frates Shaeffer Land Co.	Earth	Recreation	1976	Class III
Franklin Waverly Outing Club Lake Dam	Franklin Waverly Outing Club	Earth	Recreation	1900	Class III
Fretag Lake Dam	Private	Earth	Recreation	1970	Class III
Gravel Springs Dam	Private	Earth	Recreation, Fish & Wildlife Pond	1990	Class III
Gross Farms Dam	Private	Earth	Recreation	2005	Class III
Jurgens Brothers Lake Dam	Private	Earth	Recreation	1968	Class III
Panhandle Eastern Waverly Lake Dam	Panhandle Eastern Pipeline Co.	Earth	Recreation	1966	Class III
Ware Brothers Pond Dam	Private	Earth	Recreation	1968	Class III

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?

There have been no recorded dam failures in Morgan 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 Jacksonville, South Jacksonville, and unincorporated areas of Morgan County. **Figure 84** shows the locations of the publically and privately-owned classified dams in Morgan 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. Jacksonville, South Jacksonville and portions of unincorporated Morgan County are vulnerable to the dangers presented by dam failures; however, none of the other participating municipalities are vulnerable.

What impacts resulted from the recorded dam failures?

Since there have been no recorded dam failures in Morgan County, there are no recorded impacts.

Dam Failure Fast Facts – Risk

Dam Failure Risk/Vulnerability to:

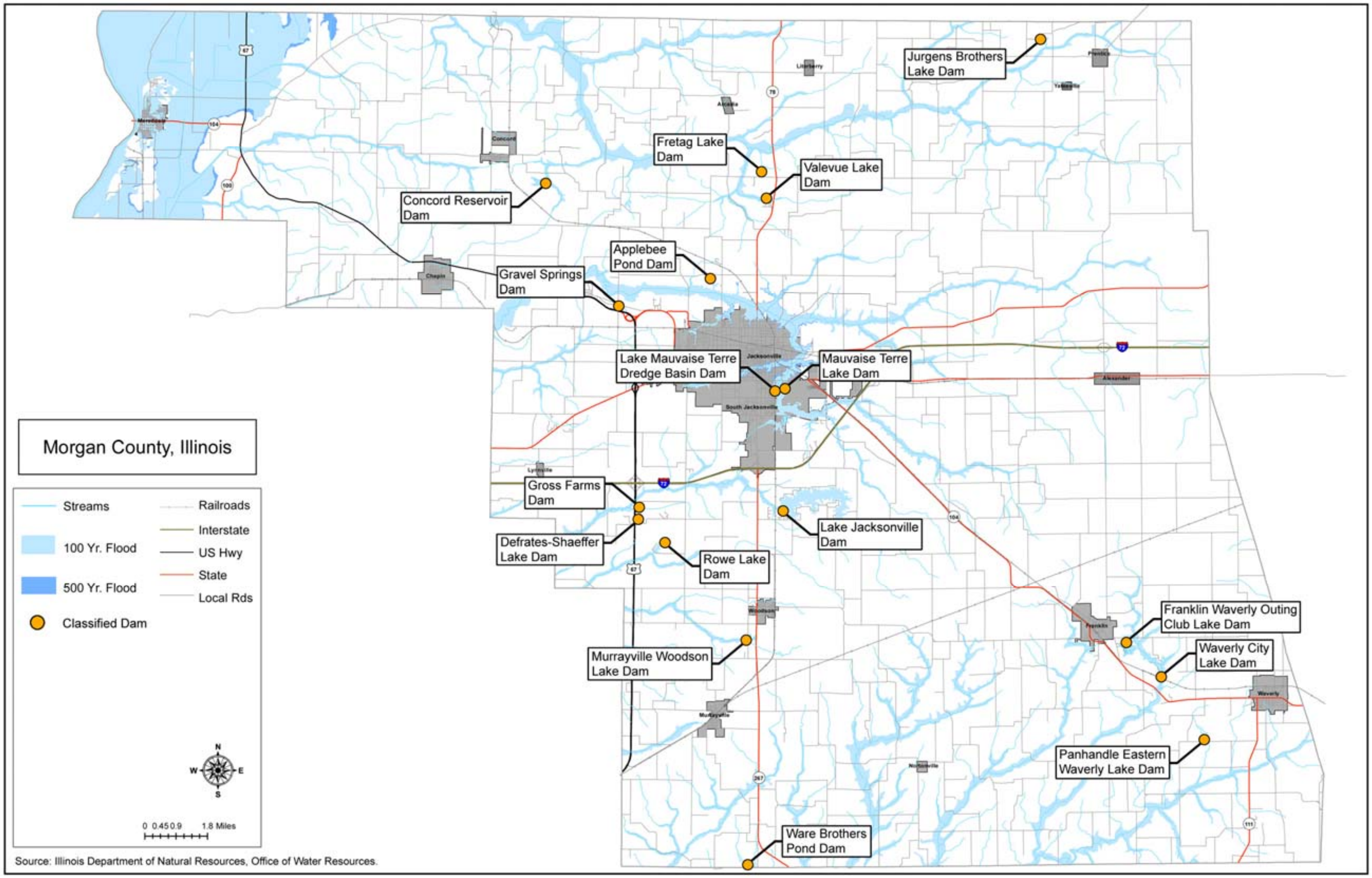
- Public Health & Safety: – ***Low to Medium***
- Buildings/Infrastructure/Critical Facilities: – ***Low to Medium***

The risk or vulnerability to public health and safety from a dam failure 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. When these factors are taken into consideration, the overall risk to public health and safety posed by a dam failure is 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 and property 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. 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.

Figure 84
Locations of Classified Dams in Morgan County



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. While Emergency Action Plans were not available for any of the classified dams, a visual inspection of the area surrounding several of these dams indicates that there are buildings, infrastructure and critical facilities that are vulnerable to dam failures.

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 Morgan County is low to medium.

Are future buildings, infrastructure and critical facilities vulnerable to dam failures?

Yes. All 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, such as flooding, there are no standard loss estimation models or methodologies for dam failures. Given that there have been no recorded dam failures in Morgan 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 Morgan County?

Yes. There are four drainage and levee districts located in Morgan County. **Figure 85** provides information on each district including the year organized, acres of land protected, length of levee, etc.

Figure 85
Drainage and Levee Districts Located in Morgan County

Drainage & Levee District	Levee Type	Year Organized	Land Protected (Acres)	Length of Levee (Miles)	Landowners Protected	Level of Protection
Coon Run*	Federal	1899	4,600	9.4	42	100 Year
Meredosia Lake^	Federal	1903	8,100	10.8	220†	30 Year
Smith Lake	Private	n/a	1,500	n/a	16	n/a
Willow Creek	Federal	1903	4,000	7.0	220†	12 Year

* The District extends between Morgan and Scott Counties.
^ The District extends between Morgan and Cass Counties.
† Documentation obtained from the USACE St. Louis District's Public Affairs Office jointly lists the number of property owners protected by the Meredosia Lake and Willow Creek Drainage and Levee Districts. A breakdown by district was not available.

Sources: Illinois State Water Survey, "The 1993 Flood on the Mississippi River in Illinois," Miscellaneous Publication 151, 1994.
Peterson, Mike. Public Affairs Office. U.S. Army Corps of Engineers, St. Louis District. Telephone Interview with Greg Michaud regarding Levees in Greene County. August 5, 2011.
U.S. Army Corps of Engineers, St. Louis District, "Levee Summit: State of Illinois, Illinois River Levees," Map.

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 in Morgan County.

What locations are affected by levee breaches?

Levee breaches have the potential to affect areas of unincorporated Morgan County. **Figure 86** shows the locations of the levees in Morgan County.

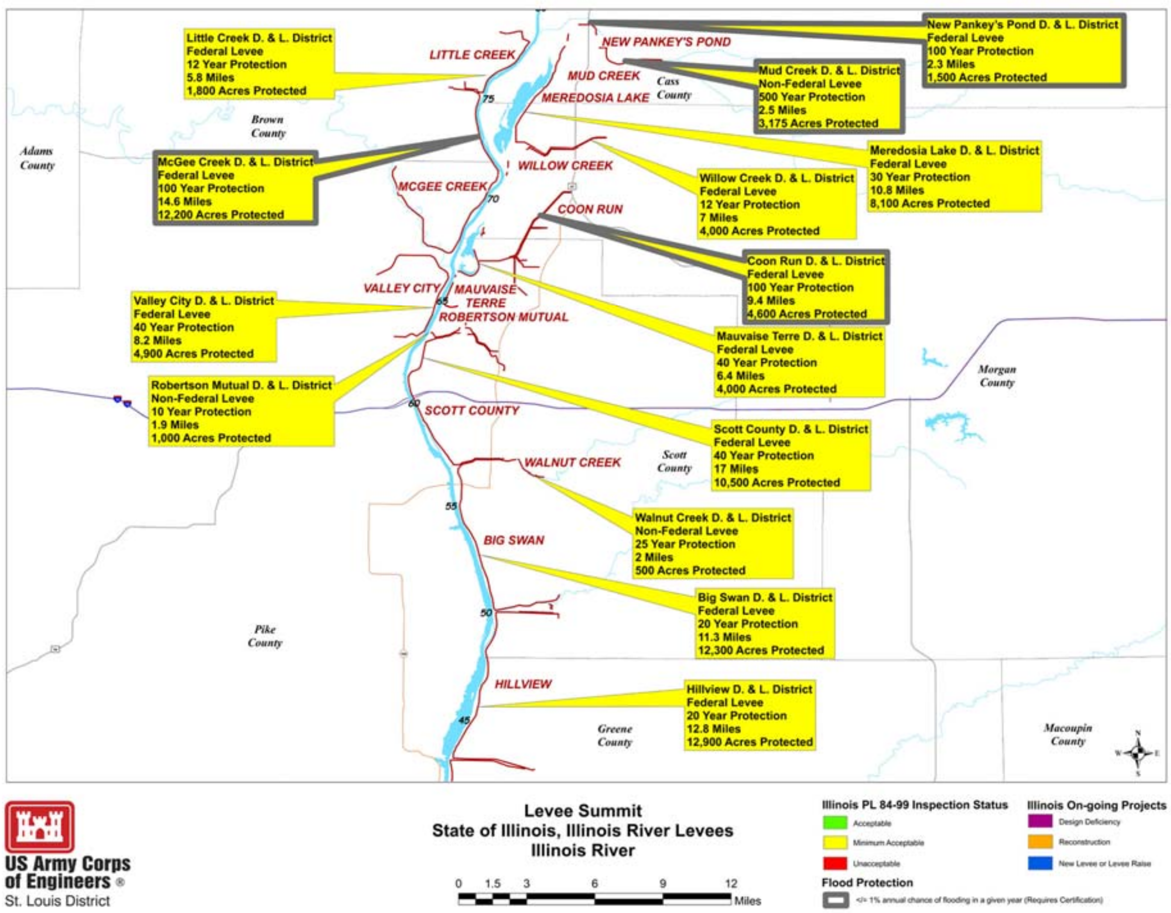
Levee Breach Fast Facts – Occurrences

Number of Levee Breaches Reported: ***None***

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 Morgan 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.

Figure 86
Location of Drainage and Levee Districts in Morgan County



ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to levee breaches?

Yes. While portions of unincorporated Morgan County are vulnerable to the dangers presented by levee breaches, none of the rest of the County or participating municipalities are vulnerable.

What impacts resulted from the recorded levee breaches?

Since there have been no recorded levee breaches in Morgan County, there are no recorded impacts. The risk or vulnerability to public health and safety from a levee breach is dependent on a couple factors including the magnitude or

Dam Failure Fast Facts – Risk

Levee Breach Risk/Vulnerability to:
- Public Health & Safety: – ***Low***
- Buildings/Infrastructure/Critical Facilities: – ***Low***

severity of the flood event and the extent and type of development and infrastructure protected by the levee. When all of the factors are taken into consideration, the risk to public health and safety posed by a levee breach in Morgan County is 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 area 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 couple factors including the magnitude or severity of the flood event and the extent and type of development and infrastructure protected by the levee. In general, the risk to existing buildings, infrastructure and critical facilities from a levee breach in Morgan County is low.

Are future buildings, infrastructure and critical facilities vulnerable to levee breaches?

Yes. All 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 Morgan 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

This section focuses on determining how 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. In order to accomplish this objective, the Planning Committee developed a mitigation strategy that included the following steps:

- formulating mitigation goals to reduce or eliminate long-term vulnerabilities to natural hazards;
- identifying, analyzing and prioritizing a comprehensive range of specific mitigation actions including those related to continued compliance with the National Flood Insurance Program; and
- describing how each jurisdiction will implement the mitigation actions identified.

Provided below is a detailed discussion of each mitigation strategy step.

4.1 HAZARD MITIGATION GOALS

The first step outlined in the mitigation strategy is to develop mitigation goals that aim to reduce or eliminate long-term vulnerabilities to the natural hazards identified. The mitigation goals are general guidelines that explain what the participants want to achieve in terms of hazard and loss prevention.

A preliminary list of eight hazard mitigation goals was developed and distributed to the Planning Committee members at the first meeting on November 13, 2013. Members were asked to review the list 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 February 7, 2013 meeting, the group discussed the preliminary list of goals and approved them with no changes or additions. **Figure 87** lists the approved goals.

Figure 87
Hazard 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 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 IDENTIFYING, ANALYZING & PRIORITIZING MITIGATION ACTIONS

The second step outlined in the mitigation strategy involves identifying, analyzing and prioritizing a comprehensive range of specific mitigation actions. Mitigation actions include any projects, plans, activities or programs identified by participants that helps achieve one or more of the goals identified above.

4.2.1 Identification and Analysis

After developing hazard mitigation goals and reviewing the results of the risk assessment, Committee members representing the County and participating municipalities were asked to consult with their respective government entities to identify a comprehensive range of mitigation actions specific to the hazards and vulnerabilities associated with their jurisdiction. Representatives of Morgan County, Jacksonville, Meredosia, and South Jacksonville were asked to identify mitigation actions that ensure their continued compliance with the National Flood Insurance Program.

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. Next, each mitigation action was assigned to one of six broad categories which allowed Committee members to compare and consolidate similar actions. **Figure 88** identifies each category and provides a brief description.

Figure 88
Mitigation Action Categorization

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 in on the elderly/disabled during hazard events such as storms and extreme heat 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, foundation elevation, insurance (i.e., flood, homeowners, etc.) and retrofitting (i.e., impact resistant windows, etc.).

Finally, each mitigation action was analyzed to determine:

- which hazard or hazards are being mitigated for;
- whether the impacts associated with a particular hazard(s) would be reduced or eliminated;
- the general size of the population affected by the action (i.e., small, medium or large);
- what goal or goals would be fulfilled;
- whether the effects on new or existing buildings and infrastructure would be reduced; and
- continued compliance with the National Flood Insurance Program.

4.2.2 Prioritization

After reviewing and analyzing the identified mitigation actions, the Planning Committee members worked together to develop a method to prioritize each action. **Figure 89** identifies and describes the four-tiered prioritization methodology adopted by the 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.

<table>
<tr><th colspan="4">Figure 89
Mitigation Action Prioritization Methodology</th></tr>
<tr><td colspan="2" rowspan="2"></td><th colspan="2">Hazard</th></tr>
<tr><td>Most Significant Hazard
(M)
(i.e., severe storms, severe winter storms, floods, tornadoes)</td><td>Less Significant Hazard
(L)
(i.e., extreme heat, drought, earthquakes, dam failures)</td></tr>
<tr><th rowspan="2">Mitigation Action</th><td>Mitigation Action with the Potential to Virtually Eliminate or Significantly Reduce Impacts
(H)</td><td>HM
mitigation action will virtually eliminate damages and/or significantly reduce the probability of deaths and injuries from the most significant hazards</td><td>HL
mitigation action will virtually eliminate damages and/or significantly reduce the probability of deaths and injuries from less significant hazards</td></tr>
<tr><td>Mitigation Action with the Potential to Reduce Impacts
(L)</td><td>LM
mitigation action has the potential to reduce damages, deaths and/or injuries from the most significant hazards</td><td>LL
mitigation action has the potential to reduce damages, deaths and/or injuries from less significant hazards</td></tr>
</table>

4.3 IMPLEMENTING MITIGATION ACTIONS

The final step outlined in the mitigation strategy involves describing how each jurisdiction will implement the mitigation actions identified. For each of mitigation action identified by the participants, the appropriate government entity was asked to:

- identify the party or parties responsible for oversight and administration;
- determine what funding source(s) are available or will be pursued; and
- describe 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.

4.4 MITIGATION STRATEGY RESULTS

Figures 90 through **97** summarize the results of the mitigation strategy. The mitigation actions identified are arranged by participating jurisdiction.

Figure 90
(Sheet 1 of 3)
Morgan 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	Purchase and install an automatic emergency backup generator at the County Courthouse 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	County Board	TBD	TBD	Low/High
HM	Purchase and install an automatic emergency backup generator at the County Highway Department 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	County Board	TBD	TBD	Low/High
HM	Purchase and install an automatic emergency backup generator at the County Annex Building 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	County Board	TBD	TBD	Low/High
LM	Conduct a county-wide hazardous substances Commodity Flow Study to identify chemical transportation concerns and substantive stationary chemical concentrations.	MMH	S	Reduces	Medium	2, 3, 5	Yes	Yes	County Board	TBD	75% Federal 25% Local	Low/Medium
LM	Participate in the Community Rating System to reduce the cost of flood insurance for residents of unincorporated Morgan County.	F	PP	Reduces	Small	2, 3, 4, 5 7, 8	Yes	Yes	County Board	TBD	County	Low/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	MMH	Man-Made Hazards
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado
F	Flood		

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 90
(Sheet 2 of 3)
Morgan 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 storm warning sirens in unincorporated communities and subdivisions in Morgan County, including but not limited to Alexander, Literberry, Prentice, Arcadia and Nortonville.	SS, T	MP	Reduces	Small	2	n/a	n/a	ESDA	TBD	TBD	Low/High
HM	Design and construct storm safe shelters (built to high wind and seismic standards and equipped with emergency backup generators and air conditioning units) that can also serve as emergency shelters for residents in unincorporated communities and subdivisions in Morgan County, including but not limited to Alexander, Literberry, Prentice, Arcadia and Nortonville.	EH, EQ, F, SS, SWS, T	SP	Reduces	Small	2	n/a	n/a	ESDA	TBD	75% Federal 25% Local	Medium/High
Health Department												
HM	Create a registry of residents with special needs and determine the best method(s) to alert these individuals to an oncoming natural hazard event.	DF, EH, EQ, F, SS, SWS, T	PI	Reduces	Small	1, 2, 4	n/a	n/a	Health Department/ ESDA	3 years	TBD	Low/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	MMH	Man-Made Hazards
DR	Drought	SS	Severe Storms (Thunderstorms, etc.)
EH	Extreme Heat	SWS	Severe Winter Storms (Snow, etc.)
EQ	Earthquake	T	Tornado
F	Flood		

Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 90
(Sheet 3 of 3)
Morgan 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				
Regional Planning Commission												
LM	Make the most recent Flood Insurance Rate Maps available at the Regional Planning Commission Office to assist the public in considering where to construct new buildings.*	F	RA	Reduces	Medium	1, 2, 3 5, 6, 7	Yes	Yes	Regional Planning Commission	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	Regional Planning Commission	TBD	County	Low/High
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	Regional Planning Commission	TBD	County	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 91
(Sheet 1 of 2)
Chapin 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	Conduct a drainage/hydraulic study of the northeast portion of the Village to determine the cause(s) and identify the appropriate remedy(s) to alleviate recurring drainage problems.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	1-2 years	75% Federal 25% Local	Medium/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate recurring drainage problems on the northeast side of the Village.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	2-3 years	75% Federal 25% Local	High/Medium
HM	Repair/reline sewer line sections damaged by storm water infiltration.	F, SS, SWS	SP	Eliminates	Small	2, 3, 5	Yes	Yes	Village Board / Sewer Department	2-3 years	75% Federal 25% Local	High/High
HL	Seismically retrofit the Village water tower to protect it from earthquake damage.	EQ	SP	Reduces	Small	2, 3, 5	n/a	Yes	Village Board / Water Department	5-10 years	75% Federal 25% Local	Medium/Medium
HM	Insulate water tower to guard against freezing.	SWS	MP	Eliminates	Large	2, 3, 5	n/a	Yes	Village Board / Water Department	6-12 years	TBD	Medium/High
LM	Construct 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, EH, F, SS, SWS, T	SP	Reduces	Medium	2, 3, 5	Yes	n/a	Village Board / Water Department	15-20 years	TBD	High/High
HM	Upgrade pumps at sanitary lift stations to maximize pumping capacity and alleviate recurring drainage problems and sewer backups.	F, SS, SWS	MP	Reduces	Large	2, 3, 5	n/a	Yes	Village Board / Sewer Department	5-10 years	TBD	Medium/High
HM	Purchase and install an automatic emergency backup generator at Village Hall (designated primary EOC) 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	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 91
(Sheet 2 of 2)
Chapin 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				
HL	Retrofit Village Hall to seismic standards to protect the building from earthquake damage.	EQ	SP	Reduces	Small	2, 3, 5	n/a	Yes	Village Board	5-10 years	75% Federal 25% Local	Medium/Medium
HM	Retrofit Village Hall to high wind standards (including but not limited to installation of a roof anchoring system) to protect the building from high wind damage.	SS, T	SP	Reduces	Small	2, 3, 5	n/a	Yes	Village Board	5-10 years	75% Federal 25% Local	Medium/Medium
HM	Design and construct a storm safe shelter (built to high wind and seismic standards and equipped with an emergency backup generator and 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	n/a	Yes	Village Board	5-10 years	75% Federal 25% Local	High/High
HM	Upgrade storm warning siren to allow remote activation.	SS, T	MP	Reduces	Large	2	n/a	n/a	Village Board / Fire Department	1-3 years	TBD	Low/High
LL	Secure agreement with North Morgan Water Coop to provide an alternate/backup drinking water supply to the Village.	DR, F	RA	Reduces	Large	2, 3, 5	Yes	Yes	Village Board / Water Department	10-20 years	Village	Low/High
HL	Construct service line North Morgan Water Coop water system to the Village's existing drinking water distribution network to provide the Village with a backup water supply.	DR, F	SP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board / Water Department	10-20 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 92
Franklin 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	Replace 560 feet of drainage tile and construct an inlet/outlet structure on the southwest side of Franklin to alleviate recurring drainage problems.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Medium/Medium
HM	Construct new drainage ditches along Mill St. and install two-12 inch culverts under the BNSF rail line and Illinois Route 104 to redirect stormwater and alleviate recurring drainage problems.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Medium/Medium
HM	Construct a storm safe shelter(s) (built to high wind standards and equipped with an emergency backup generator and air conditioning units) that can also serve as a community heating/cooling center for residents.	EH, EQ, F, SS, SWS, T	SP	Reduces	Large	2	n/a	n/a	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 93
(Sheet 1 of 7)
Jacksonville 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: New	Reduce Effects of Hazard(s) on Buildings & Infrastructure: Existing	Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
HM	Replace/upsize roadway culverts along major drainage routes as needed to alleviate drainage/flooding problems.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	City Council	TBD	TBD	Medium/Medium
HM	Elevate flood-prone residential structures out of the base (100 year) floodplain.	F, SS, SWS	PP	Eliminates	Small	2, 6	n/a	Yes	City Council	TBD	75% Federal 25% Local	Medium/High
HM	Acquire properties in flood-prone areas and remove any existing structures.	F, SS, SWS	PP	Eliminates	Small	2, 6	n/a	Yes	City Council	TBD	75% Federal 25% Local	Medium/High
HM	Design and construct stormwater retention basins in subdivisions and mobile home parks in or near flood prone areas to better manage stormwater runoff in an effort to reduce the likelihood of flooding.	F, SS	SP	Reduces	Small	2, 3, 5	Yes	Yes	City Council	TBD	75% Federal 25% Local	Medium/High
HM	Replace the Old State Rd. (CH 3) bridge over Town Brook/Mauvaise Terre Creek to increase flow capacity and alleviate flooding problems.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	n/a	Yes	City Council	TBD	TBD	High/Medium
HM	Install riprap at the structures over Town Brook and Mauvaise Terre Creek to protect the roadways and structures from erosion caused by flooding.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	n/a	Yes	City Council	TBD	TBD	Medium/Medium
HM	Elevate electrical equipment in the basement of City Hall to reduce the likelihood that the equipment will sustain damage due to flooding.	F, SS	MP	Eliminates	Small	2, 3, 5	n/a	Yes	City Council	TBD	TBD	Low/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 93
(Sheet 2 of 7)
Jacksonville 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	Elevate electrical equipment in the basements of the drinking and wastewater treatment facilities to reduce the likelihood that the equipment will sustain damage due to flooding.	F, SS	MP	Eliminates	Small	2, 3, 5	n/a	Yes	City Council	TBD	TBD	Low/Medium
LM	Conduct a drainage/hydraulic study of Town Brook to determine the cause(s) and identify the appropriate remedy(s) to alleviate recurring flooding problems in the vicinity of Hardin Avenue and the MacMurray College maintenance building.	F, SS, SWS	S	Reduces	Small	2, 3, 5	n/a	Yes	City Council	TBD	75% Federal 25% Local	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate recurring flooding problems associated with Town Brook in the vicinity of Hardin Avenue and the MacMurray College maintenance building.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	n/a	Yes	City Council	TBD	75% Federal 25% Local	Medium/Medium
HM	Floodproof wastewater treatment facility, including but not limited to installation of a grit chamber to keep floodwater contaminants (i.e., sand, grit, etc.) from damaging the system.	F, SS, SWS	SP	Reduces	Large	2, 3, 5	Yes	Yes	City Council	TBD	75% Federal 25% Local	High/High
HM	Install stream gauge/warning sensor along the Mauvaise Terre Creek to alert City officials to rising water levels and the potential for flooding.	F, SS	MP	Reduces	Medium	2	n/a	n/a	City Council	TBD	75% Federal 25% Local	Medium/High

Acronyms

<u>Hazard(s) to be Mitigated:</u>

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

<u>Type of Mitigation Activity:</u>

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 93
(Sheet 3 of 7)
Jacksonville 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				
HL	Install warning sensors at Mauvaise Terre Lake dam and Lake Jacksonville dam to alert City officials to rising water levels and the potential for flood failure event.	F, SS	MP	Reduces	Medium	2	n/a	n/a	City Council	TBD	75% Federal 25% Local	Medium/High
HM	Expand/improve storm sewer lines/system within the City to reduce flooding/drainage problems.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	City Council	TBD	75% Federal 25% Local	High/Medium
HM	Install new storm sewer lines/system in the areas around Mauvaise Terre Creek and Town Brook to reduce flooding/drainage problems.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	Yes	Yes	City Council	TBD	75% Federal 25% Local	High/Medium
HM	Increase pump capacity at the wastewater treatment facility pump station to maximize the operating reliability of the station, increase capacity and improve flow during heavy rain/flood events.	F, SS, SWS	MP	Reduces	Large	2, 3, 5	Yes	Yes	City Council	TBD	TBD	Medium/High
HM	Construct an emergency floodway at Mauvaise Terre Lake to manage excess water during flood events.	F, SS, SWS	SP	Reduces	Small	2, 3, 5, 6	Yes	Yes	City Council	TBD	75% Federal 25% Local	High/Medium
HM	Construct an emergency floodway at Lake Jacksonville to manage excess water during flood events.	F, SS, SWS	SP	Reduces	Small	2, 3, 5, 6	Yes	Yes	City Council	TBD	75% Federal 25% Local	High/Medium
HM	Install gate valves on sewer services to prevent sewage backups caused by heavy rains/flooding.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	City Council	TBD	75% Federal 25% Local	Medium/Medium
HM	Reshape and regrade drainage ditches to increase carrying capacity and reduce/prevent flooding.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	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 93
(Sheet 4 of 7)
Jacksonville 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: New	Reduce Effects of Hazard(s) on Buildings & Infrastructure: Existing	Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
HM	Remove debris, vegetative overgrowth, snags and drifts from floodways and drainage ways and ditches to increase carrying capacity and reduce/prevent flooding.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	City Council	TBD	City	Low/Medium
HM	Shape, grade and align Town Brook to increase carrying capacity and reduce/prevent flooding.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	City Council	TBD	TBD	Medium/Medium
HM	Shape, grade and align Mauvaise Terre Creek (within the City limits) to increase carrying capacity and reduce/prevent flooding.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	City Council	TBD	TBD	Medium/Medium
LL	Secure agreement with neighboring water system(s) to provide an alternate/backup drinking water supply to the City.	DR, F	RA	Reduces	Large	2, 3, 5	Yes	Yes	City Council	TBD	City	Low/High
HL	Construct service line from neighboring water system(s) to the City's existing drinking water distribution network to provide the City with a backup water supply.	DR, F	SP	Reduces	Large	2, 3, 5	Yes	Yes	City Council	TBD	75% Federal 25% Local	High/High
LM	Conduct sewer line reconnaissance study to identify locations where storm water infiltrates the lines.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Yes	City Council	TBD	75% Federal 25% Local	Medium/High
HM	Repair/reline sewer line sections where storm water infiltration is occurring to prevent sewage backups.	F, SS, SWS	SP	Eliminates	Medium	2, 3, 5	Yes	Yes	City Council	TBD	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 93
(Sheet 5 of 7)
Jacksonville 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	Install riprap at all waterway crossings of the Rainey wells raw water main to protect the main from erosion caused by flooding.	F, SS, SWS	SP	Reduces	Large	2, 3, 5	n/a	Yes	City Council	TBD	TBD	Medium/High
LM	Install riprap along the banks of the all major waterways and ditches within the City to stabilize the banks, reduce erosion and maximize carrying capacity.	F, SS, SWS	SP	Reduces	Medium	3, 5, 6	Yes	Yes	City Council	TBD	TBD	Medium/Medium
HM	Retrofit City Hall to include a storm safe shelter (tornado shelter) for use by staff and City residents.	SS, T	SP	Reduces	Medium	2	n/a	Yes	City Council	TBD	75% Federal 25% Local	Medium/High
HM	Retrofit the Community Park Center to include a storm safe shelter (tornado shelter) that can also be used as an emergency shelter and heating/cooling center for City residents.	EH, F, SS, SWS, T	SP	Reduces	Medium	2	n/a	Yes	City Council	TBD	75% Federal 25% Local	Medium/High
HM	Install roof anchoring systems at critical municipal buildings to protect them from high wind damage.	SS, T	SP	Reduces	Small	2, 3, 5	n/a	Yes	City Council	TBD	75% Federal 25% Local	Medium/Medium
HM	Purchase NOAA weather radios and distribute to City residents.	EH, EQ, F, SS, SWS, T	MP	Reduces	Small	2	n/a	n/a	City Council	TBD	TBD	Low/High
HM	Purchase and install a weather station with electronic reporting application to provide City employees/emergency responders/residents with real-time weather information via the City's website.	EH, F, SS, SWS, T	MP	Reduces	Large	1, 2	n/a	n/a	City Council	TBD	TBD	Low/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 93
(Sheet 6 of 7)
Jacksonville 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 and implement a community outreach program that informs residents about the risks to life and property associated with each type of natural hazard event and the proactive actions that they can take to reduce or eliminate their risk.	DF, EH, EQ, F, SS, SWS, T	PI	Reduces	Large	1, 2	n/a	n/a	City Council	TBD	TBD	Low/High
HM	Purchase and install additional storm warning sirens.	SS, T	MP	Reduces	Large	2	n/a	n/a	City Council	TBD	TBD	Low/High
HM	Purchase and install grounding system at City Hall to protect critical systems and improve the building's ability to survive a lightning strike.	SS	MP	Reduces	Small	2, 3, 5	n/a	Yes	City Council	TBD	TBD	Medium/High
HM	Insulate water towers to guard against freezing.	SWS	MP	Eliminates	Large	2, 3, 5	n/a	Yes	City Council	TBD	TBD	Medium/High
HM	Bury utility lines to critical facilities to limit service disruptions during natural hazard events.	SS, SWS, T	MP	Reduces	Large	2, 3, 5	Yes	Yes	City Council	TBD	TBD	Medium/High
HM	Relocate and/or separate combined sewer mains.	F, SS, SWS	SP	Eliminates	Small	2, 3, 5	Yes	Yes	City Council	TBD	75% Federal 25% Local	High/High
HM	Purchase and install automatic emergency backup generator at City Hall and Police Department 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	TBD	TBD	Low/High
HM	Purchase and install automatic emergency backup generator at Fire Stations 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	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 93
(Sheet 7 of 7)
Jacksonville 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	Install landscape barriers (living snow fences) along select city-owned streets and roadways to maintain access to critical facilities and ease hazardous driving conditions.	SWS	MP	Reduces	Medium	2, 3, 5	n/a	Yes	City Council	TBD	TBD	Medium/Low
LM	Make the most recent Flood Insurance Rate Maps available at the City Clerk's Office to assist the public in considering where to construct new buildings. *	F	RA	Reduces	Small	1, 2, 3, 5, 6, 7	Yes	Yes	City	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	RA	Reduces	Small	1, 2, 3, 5, 6, 7	Yes	Yes	City	TBD	City	Low/High
LM	Make information materials available to the public about the National Flood Insurance Program's voluntary Community Rating System.*	F	PP	Reduces	Small	1, 2, 3, 5, 6, 7	Yes	Yes	City	TBD	City	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 94
(Sheet 1 of 5)
Meredosia 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	Replace/upsize roadway culverts along major drainage ditches and install new drainage structures where needed to alleviate drainage/flooding problems.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Medium/Medium
HM	Elevate flood-prone residential structures out of the base (100 year) floodplain.	F, SS, SWS	PP	Eliminates	Small	2, 6	n/a	Yes	Village Board	TBD	75% Federal 25% Local	Medium/High
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	TBD	75% Federal 25% Local	Medium/High
HM	Design and construct a stormwater retention basin to contain seep water and manage stormwater runoff to reduce the likelihood of flooding.	F, SS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	Medium/High
HM	Raise the north levee along the Illinois River three (3) feet to reduce the likelihood of overtopping and flooding of homes and critical facilities due to major flood events.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5, 8	Yes	Yes	Village Board	TBD	TBD	High/High
HM	Raise Lake Road (east of the north levee) three (3) feet for approximately ½ mile to act as a secondary barrier and protect homes and critical facilities from major flood events.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	High/Medium
HM	Seal the outside of the Village-owned levee that protects the downtown area with clay to reduce seepage during major flood events.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	n/a	Yes	Village Board	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 94
(Sheet 2 of 5)
Meredosia 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	Floodproof wastewater treatment facility, including but not limited to installation of a grit chamber to keep floodwater contaminants (i.e., sand, grit, etc.) from damaging the system.	F, SS, SWS	SP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	High/High
HM	Install stream gauge/warning sensor along the Illinois River to alert the Village to rising water levels and the potential for flooding.	F, SS	MP	Reduces	Medium	2	n/a	n/a	Village Board	TBD	75% Federal 25% Local	Medium/High
HM	Install new storm sewer lines/system in flood prone subdivisions to reduce flooding/drainage problems.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	High/Medium
HM	Increase pump capacity at the wastewater treatment facility pump station to maximize the operating reliability of the station, increase capacity and improve flow during heavy rain/flood events.	F, SS, SWS	MP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Medium/High
LL	Secure agreement with neighboring water system(s) to provide an alternate/backup drinking water supply to the Village.	DR, F	RA	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	Village	Low/High
HL	Construct service line from neighboring water system(s) to the Village's existing drinking water distribution network to provide the Village with a backup water supply.	DR, F	SP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	High/High
LM	Conduct sewer line reconnaissance study to identify locations where storm water infiltrates the lines.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	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 94
(Sheet 3 of 5)
Meredosia 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	Repair/reline sewer line sections where storm water infiltration is occurring to prevent sewage backups.	F, SS, SWS	SP	Eliminates	Small	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	High/High
HM	Retrofit an existing building and/or design and construct a new building to serve as a storm safe shelter(s) (built to high wind standards and equipped with an emergency backup generator and air conditioning units) that can also serve as a community heating/cooling center for residents.	EH, EQ, F, SS, SWS, T	SP	Reduces	Large	2	n/a	n/a	Village Board	TBD	75% Federal 25% Local	High/High
HM	Purchase and install roof and parapet anchoring systems at municipal buildings to protect them from high wind damage.	SS, T	SP	Reduces	Small	2, 3, 5	n/a	Yes	Village Board	TBD	75% Federal 25% Local	Medium/Medium
HM	Purchase NOAA weather radios and distribute to Village residents.	EH, EQ, F, SS, SWS, T	MP	Reduces	Small	2	n/a	n/a	Village Board	TBD	TBD	Low/High
HM	Purchase and install a weather station to provide City employees/emergency responders with real-time weather information.	EH, F, SS, SWS, T	MP	Reduces	Small	2	n/a	n/a	Village Board	TBD	TBD	Low/Medium
LM	Develop and implement a community outreach program that informs residents about the risks to life and property associated with each type of natural hazard event and the proactive actions that they can take to reduce or eliminate their risk.	DF, EH, EQ, F, SS, SWS, T	PI	Reduces	Large	1, 2	n/a	n/a	Village Board	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 94
(Sheet 4 of 5)
Meredosia 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 sirens.	SS, T	MP	Reduces	Large	2	n/a	n/a	Village Board	TBD	TBD	Medium/High
HM	Purchase and install grounding system at Village Hall/Police Department to protect critical systems and improve the building's ability to survive a lightning strike.	SS	MP	Reduces	Small	2, 3, 5	n/a	Yes	Village Board	TBD	TBD	Medium/High
HM	Insulate standpipe in water tower to guard against freezing.	SWS	MP	Eliminates	Large	2, 3, 5	n/a	Yes	Village Board	TBD	TBD	Medium/High
HM	Bury utility lines to critical facilities to limit service disruptions during natural hazard events.	SS, SWS, T	MP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Medium/High
HM	Install gate valves on sewer services to prevent sewage backups caused by heavy rains/flooding.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	Medium/Medium
HM	Purchase and install automatic emergency backup generator at Village Hall/Police Department to provide uninterrupted power and maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	n/a	Yes	Village Board	TBD	TBD	Low/High
HM	Purchase and install 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	Medium	2, 3, 5	n/a	Yes	Village Board	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 94
(Sheet 5 of 5)
Meredosia 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	Install landscape barriers (living snow fences) along select city-owned streets and roadways to maintain access to critical facilities and ease hazardous driving conditions.	SWS	MP	Reduces	Small	2, 3, 5	n/a	Yes	Village Board	TBD	TBD	Medium/Low
LM	Make the most recent Flood Insurance Rate Maps available at the Village Clerk's Office to assist the public in considering where to construct new buildings. *	F	RA	Reduces	Medium	1, 2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/High
LM	Make Village officials aware of the most recent Flood Insurance Rate Maps and issues related to construction in a floodplain.*	F	RA	Reduces	Medium	1, 2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/High
LM	Make information materials available 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	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 95
(Sheet 1 of 2)
Murrayville 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	Conduct sewer line reconnaissance study to identify locations where storm water infiltrates the lines.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	Ongoing	75% Federal 25% Local	Medium/High
HM	Repair/reline sewer line sections where storm water infiltration is occurring to prevent sewage backups.	F, SS, SWS	SP	Eliminates	Small	2, 3, 5	Yes	Yes	Village Board	Ongoing	75% Federal 25% Local	High/High
HM	Designate the Village Hall as a heating/cooling center and emergency shelter.	EH, EQ, F, SS, SWS, T	MP	Reduces	Large	2	n/a	n/a	Village Board	1-2 years	Village	Low/High
HM	Purchase and install automatic emergency backup generator at the Village Hall (designated heating/cooling center and emergency shelter) to provide uninterrupted power to critical systems during power outages.	EQ, EH, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	n/a	Yes	Village Board	1-2 years	TBD	Low/High
HM	Purchase and install an emergency backup generator with automatic transfer switch at the Sharp Street lift station to maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	Yes	Yes	Village Board	1-5 years	TBD	Low/High
HM	Remove debris and vegetative overgrowth from Little Sandy Creek (within the Village limits) to increase carrying capacity and reduce/prevent flooding problems.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	1-5 years	Village	Low/High
LM	Obtain permit from U.S. Army Corps of Engineers to dredge Little Sandy Creek (within Village limits).	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	1-5 years	Village	Low/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 2)
Murrayville 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	Dredge Little Sandy Creek (within Village limits) to increase carrying capacity and alleviate drainage/flooding issues.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	1-5 years	TBD	High/Medium
HM	Remove debris and vegetative overgrowth from drainage ditch running through the Village to increase carrying capacity and reduce/prevent flooding problems.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	1-5 years	Village	Low/High
HM	Widen/deepen the drainage ditch running through the Village and replace undersized pipe culverts along the length as needed to alleviate flooding/drainage problems.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	1-5 years	TBD	Medium/Medium
LM	Conduct a drainage/hydraulic study to determine the cause(s) and identify the appropriate remedy(s) to alleviate recurring drainage problems within the Village.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	1-2 years	75% Federal 25% Local	Medium/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate recurring drainage problems within the Village.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	High/Medium
HM	Purchase and install additional storm warning sirens as needed.	SS, T	MP	Reduces	Medium	2	n/a	n/a	Village Board	TBD	TBD	Low/High

Acronyms

<u>Hazard(s) to be Mitigated:</u>

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

<u>Type of Mitigation Activity:</u>

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 96
(Sheet 1 of 6)
South Jacksonville 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	Trim trees and remove dead material along street right-of-ways to minimize disruptions to power and communication networks.	SS, SWS, T	MP	Reduces	Large	2, 3, 5	Yes	Yes	Public Works Department	Ongoing	Village	Low/High
LM	Conduct a drainage/hydraulic study to determine the cause(s) and identify the appropriate remedy(s) to alleviate recurring flooding/drainage problems within the Village (within the floodplain and outside of the floodplain).	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Yes	Public Works Department	TBD	75% Federal 25% Local	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate recurring flooding/drainage problems within the Village.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Public Works Department	TBD	75% Federal 25% Local	High/Medium
HM	Purchase and install grounding system at the drinking water treatment facility to protect critical systems and improve the building's ability to survive a lightning strike. The facility has sustained damage from previous lightning strikes.	SS	MP	Reduces	Small	2, 3, 5	n/a	Yes	Public Works Department	TBD	TBD	Medium/High
HM	Purchase and install grounding system at South Main lift station to protect critical systems and improve the lift station's ability to survive a lightning strike.	SS	MP	Reduces	Medium	2, 3, 5	n/a	Yes	Public Works Department	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 96
(Sheet 2 of 6)
South Jacksonville 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 grounding system at Fire Station to protect critical systems and improve the building's ability to survive a lightning strike. The Station has sustained damage from previous lightning strikes.	SS	MP	Reduces	Small	2, 3, 5	n/a	Yes	Fire Department / Emergency Services	TBD	TBD	Medium/High
HM	Purchase and install grounding system at Police Station to protect critical systems and improve the building's ability to survive a lightning strike.	SS	MP	Reduces	Small	2, 3, 5	n/a	Yes	Police Department / Emergency Services	TBD	TBD	Medium/High
HM	Purchase and install grounding system at Village Hall to protect critical systems and improve the building's ability to survive a lightning strike.	SS	MP	Reduces	Small	2, 3, 5	n/a	Yes	Public Works Department / Emergency Services	TBD	TBD	Medium/High
LM	Conduct sewer line reconnaissance study to identify locations where storm water infiltrates the lines.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Yes	Public Works Department	TBD	75% Federal 25% Local	Medium/High
HM	Repair/reline sewer line sections where storm water infiltration is occurring to prevent sewage backups.	F, SS, SWS	SP	Eliminates	Small	2, 3, 5	Yes	Yes	Public Works Department	TBD	75% Federal 25% Local	Medium/High
HM	Raise Southbrooke Road, cut deeper ditches and install culverts to alleviate drainage/flooding problems.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Public Works Department	TBD	TBD	High/Medium
HM	Raise Minor Drive, cut deeper ditches and install culverts to alleviate drainage/flooding problems.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Public Works Department	TBD	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 3 of 6)
South Jacksonville 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	Conduct a feasibility study to determine the appropriateness of retrofitting existing structures or constructing new buildings to serve as community safe shelters (tornado shelters) as well as emergency shelters/heating and cooling centers for Village residents.	DF, EH, EQ, F, SS, SWS, T	S	Reduces	Large	2, 3, 5	n/a	Yes	Public Works Department / Police / Fire / Emergency Services	TBD	TBD	Low/High
HM	Retrofit existing structures and/or design and construct new buildings to serve as community storm safe shelters (built to high wind standards and equipped with an emergency backup generator and air conditioning units) that can also serve as an emergency shelters/heating and cooling centers for Village residents.	EH, EQ, F, SS, SWS, T	SP	Reduces	Large	2	n/a	Yes	Public Works Department / Police / Fire / Emergency Services	TBD	75% Federal 25% Local	High/High
LM	Designate emergency shelters/heating and cooling centers within the Village.	DF, EH, EQ, F, SS, SWS, T	MP	Reduces	Large	2	n/a	n/a	Village Board	TBD	Village	Low/High
HM	Identify and install "hardening" materials (i.e., shatter-proof glass, hail resistant shingles/doors, etc.) at the Village Hall and Fire Station/Police Department to make the buildings resistant to natural hazards.	EQ, SS, T	SP	Reduces	Medium	2, 3, 5	n/a	Yes	Public Works Department / Police / Fire / Emergency Services	TBD	TBD	Medium/High
HM	Upsize culverts at strategic locations within the Village to alleviate overtopping of roadways by flood waters during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Public Works Department	TBD	TBD	Low/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 4 of 6)
South Jacksonville 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	Clean out brush and debris from drainage ditches and culverts to reduce/prevent flooding problems.	F, SS, SWS	MP	Reduces	Medium	2, 3, 5	Yes	Yes	Public Works Department	TBD	Village	Low/High
LM	Conduct a study of the Village's stormwater collection system to identify the improvements needed to better manage stormwater runoff in an effort to alleviate flooding/drainage problems.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Yes	Public Works Department	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate improvements identified in the stormwater collection system study to better manage stormwater runoff in an effort to alleviate flooding/drainage problems.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Public Works Department	TBD	TBD	High/Medium
HM	Purchase and install emergency backup generators with automatic transfer switches at the lift stations within the Village to maintain operations during power outages and prevent sewer backups.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	Yes	Yes	Public Works Department	TBD	TBD	Low/High
HM	Purchase and install automatic emergency backup generator at the Village Hall to provide uninterrupted power and maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	n/a	Yes	Public Works Department/ Emergency Services	TBD	TBD	Low/High
HM	Purchase and install additional storm warning sirens.	SS, T	MP	Reduces	Medium	2	n/a	n/a	Public Works Department/ Emergency Services	TBD	TBD	Low/High

Acronyms

<u>Hazard(s) to be Mitigated:</u>

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

<u>Type of Mitigation Activity:</u>

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 96 (Sheet 5 of 6) South Jacksonville 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	Conduct a study to determine the cause(s) and identify the appropriate remedy(s) to alleviate sewage backups experienced by several property owners during heavy rains.	F, SS, SWS	S	Reduces	Small	2, 3, 5	Yes	Yes	Public Works Department	TBD	TBD	Low/Medium
HM	Implement the appropriate remedy(s) to alleviate sewage backups experienced by several property owners during heavy rains.	F, SS, SWS	RA SP MP	Reduces	Small	2, 3, 5	Yes	Yes	Public Works Department	TBD	TBD	Medium/Medium
HM	Purchase and install a weather station with electronic reporting application to provide Village employees/ emergency responders/residents with real-time weather information via the Village's website.	EH, F, SS, SWS, T	MP	Reduces	Large	1, 2	n/a	n/a	Emergency Services	TBD	TBD	Low/Medium
LL	Secure agreement with neighboring water system(s) to provide an alternate/backup drinking water supply to the Village.	DR, F	RA	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	Village	Low/High
HL	Construct service line from neighboring water system(s) to the Village's existing drinking water distribution network to provide the Village with a backup water supply.	DR, F	SP	Reduces	Large	2, 3, 5	Yes	Yes	Public Works Department	TBD	75% Federal 25% Local	High/High
LM	Construct 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, EH, F, SS, SWS, T	SP	Reduces	Medium	2, 3, 5	Yes	n/a	Public Works Department	TBD	TBD	High/High

Acronyms

<u>Hazard(s) to be Mitigated:</u>

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

<u>Type of Mitigation Activity:</u>

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

Figure 96
(Sheet 6 of 6)
South Jacksonville 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 and implement a community outreach program that informs residents about the risks to life and property associated with each type of natural hazard event and the proactive actions that they can take to reduce or eliminate their risk.	DF, EH, EQ, F, SS, SWS, T	PI	Reduces	Large	1, 2	n/a	n/a	Emergency Services	TBD	TBD	Low/High
LM	Make the most recent Flood Insurance Rate Maps available at the Village Clerk's Office to assist the public in considering where to construct new buildings. *	F	RA	Reduces	Small	1, 2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/High
LM	Make Village officials aware of the most recent Flood Insurance Rate Maps and issues related to construction in a floodplain.*	F	RA	Reduces	Small	1, 2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	Village	Low/High
LM	Make information materials available to the public about the National Flood Insurance Program's voluntary Community Rating System.*	F	PP	Reduces	Small	1, 2, 3, 5, 6, 7	Yes	Yes	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 97
(Sheet 1 of 2)
Woodson 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 emergency backup generator at sanitary lift station to maintain operations during power outages.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	Yes	Yes	Village Board	2 years	TBD	Medium/High
LM	Conduct sewer line reconnaissance study to identify locations where storm water infiltrates the lines.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	Ongoing	75% Federal 25% Local	Medium/High
HM	Repair/reline sewer line sections where storm water infiltration is occurring to prevent sewage backups.	F, SS, SWS	SP	Eliminates	Small	2, 3, 5	Yes	Yes	Village Board	Ongoing	75% Federal 25% Local	High/High
HM	Retrofit Village Hall to include a storm safe room for use by staff and Village residents.	EH, F, SS, SWS, T	SP	Reduces	Large	2, 3	n/a	Yes	Village Board	3 years	75% Federal 25% Local	High/High
LM	Conduct a drainage/hydraulic study to determine the cause(s) and identify the appropriate remedy(s) to alleviate recurring drainage problems within the Village.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	4 years	75% Federal 25% Local	Medium/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate recurring drainage problems within the Village.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	High/Medium
HM	Clean out brush and debris from drainage ditches and culverts to reduce/prevent drainage problems.	F, SS, SWS	MP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	Ongoing	Village	Low/High
HM	Purchase and install storm warning sirens.	SS, 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 97
(Sheet 2 of 2)
Woodson 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 portable pumps for use in removal of excess water during flood events.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Low/Medium
HM	Upsize culverts at strategic locations within the Village to alleviate drainage problems.	F, SS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	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.)
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Type of Mitigation Activity:

RA	Regulatory Activities	S	Studies
SP	Structural Projects	MP	Miscellaneous Projects
PI	Public Involvement	PP	Property Protection

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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 periodically 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. Natural hazards can disrupt public water service and adversely impact the quality of drinking water. In Illinois, flooding is a common natural hazard that poses two district threats to public water supplies: 1) direct damage drinking water treatment facilities, and 2) contamination of lakes and wells that serve as drinking water sources. Drought is another natural hazard which has resulted in water restrictions for Illinois public water supplies. Floods and drought have both directly impacted water supplies in Morgan County recently.

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.

Efforts to provide safe drinking water should extend beyond the adoption of setback zones. High priority should be given to resolving problems which place drinking water supplies on the Illinois Environmental Protection Agency's Restricted Status/Critical Review List. Placement on this list indicates an increased vulnerability for drinking water problems. At the time this Plan was completed there were no water supplies within Morgan County listed on Restricted Status/Critical Review List.

South Jacksonville's public water supply utilizes shallow wells that tap a permeable sand and gravel aquifer to supply drinking water to residents of South Jacksonville, Lynnville and areas served by the West Morgan Water Corporation. South Jacksonville is commended for developing a wellhead protection program, a recharge area management program and a contingency plan. To protect against drought, South Jacksonville should consider developing an agreement with a nearby water supply to provide additional water capacity.

Meredosia obtains all of its raw water from two wells installed in a shallow permeable sand and gravel aquifer. Based on the depth and location of this aquifer, it is considered to be susceptible to contamination. The Village is encouraged to adopt a maximum setback zone for both wells. Over 20 potential sources of groundwater contamination, including below ground and above ground fuel storage tanks, have been identified near these wells. Proper abandonment and, if needed, remediation of these sites is encouraged to prevent contaminants from threatening the water supply.

Jacksonville obtains a portion of its drinking water from a surface water source, Mauvaise Terre Lake. However, the City also utilizes three groundwater wells to offset its susceptibility to drinking water shortages. The City then provides drinking water to Chapin, Franklin and the Murrayville-Woodson Water Commission (which serves both Murrayville and Woodson). Jacksonville has begun taking steps to increase awareness among residents and landowners about practices within the watershed that impact the lake and groundwater.

Jacksonville's drinking water treatment facility has been damaged by flooding on more than one occasion, most recently in 2011. Steps were taken after the 2011 flood to protect the current public water supply and a decision was made to build a new facility outside of the floodplain. The City has purchased the land for the new facility and is in the process of obtaining funding to start construction. Construction should be completed by 2016 and will cost the City between $25 million and $35 million. Improving the resilience of their drinking water treatment facility will help reduce service disruptions to customers.

Emergency Management Plans for Schools. Develop and annually update Emergency Operation Plans for elementary, middle and high schools. These plans should include sections about 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 being offered this year, it is expected to resume in the future.

Stormwater Management to Reduce Flooding Problems. Stormwater management practices should be required for new subdivisions 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.

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 Morgan County residents indicates that the radio, television and newspapers should be utilized to disseminate information.

Drainage and Flooding Problems. Alleviating flooding and drainage problems across the County is a major concern repeatedly expressed throughout the planning process. County and municipal officials are encouraged to work together to find creative solutions that benefit the greatest number of residents.

JURISDICTION-SPECIFIC

County and municipal officials are encouraged to collaborate in their pursuit of the following actions.

Chapin

❖ Repair sewer line sections where storm water infiltration is occurring to prevent sewage backups.

❖ Construct appropriate remedies to alleviate flooding and drainage problems, particularly on the northeast side of the Village.

❖ Secure an agreement with a nearby water supply to provide a backup source of drinking water to improve the Village's resilience to drought.

Franklin

❖ Alleviate drainage issues by renovating the storm water drainage system, replacing existing tiles, constructing new drainage ditches and installing new culverts and inlets.

Jacksonville

❖ Improve the City's resilience to flooding and drainage issues by:
  - elevating flood-prone structures and acquiring properties in flood-prone areas;
  - floodproof the wastewater treatment facility;
  - construct an emergency floodway at Mauvaise Terre Lake to manage excess water during flood events; and
  - repair sewer line sections where storm water infiltration is occurring.

❖ Provide a storm safe shelter that can also be used as a heating/cooling center for City residents.

Meredosia

❖ Projects focused on reducing the Village's vulnerability to flooding should be given the highest priority.

❖ The north levee along the Illinois River should be periodically inspected to minimize the likelihood of a breach and raised, where needed, to prevent overtopping and protect homes and critical facilities from flooding.

Murrayville

❖ Implement remedies to reduce drainage and flooding issues resulting from stormwater runoff by repairing sewer line sections where storm water infiltration is occurring, removing debris and vegetative overgrowth from Little Sandy Creek and the drainage ditches within the Village and widening/deepening drainage ditches and replacing undersized culverts as needed.

South Jacksonville

❖ Purchase and install grounding systems at the Village Hall, drinking water facility, select lift stations and at other critical infrastructure to protect against lightning strikes.

- ❖ Provide storm safe shelters that can also be used as a heating/cooling center for Village residents.
- ❖ Secure an agreement with a nearby water supply to provide a backup source of drinking water to improve the Village's resilience to drought.
- ❖ Determine the appropriate remedies to alleviate sewage backup issues experienced by residents during heavy rain events.

Woodson

- ❖ Retrofit Village Hall to serve as a storm safe shelter for municipal employees and residents.
- ❖ Drainage and flooding issues can be alleviated by renovating the storm water drainage system. Culverts, drainage ditches, and sewer lines are in need of cleaning and repair.

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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 Jacksonville/Morgan 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 Jacksonville/Morgan 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.

<u>Updating</u>

- 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.

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.

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 Jacksonville/Morgan County ESDA. Individuals will be encouraged to provide feedback and submit comments for the Plan update to the Jacksonville/Morgan 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 98 identifies the participating jurisdictions and the date each formally adopted the Plan. Signed copies of the adoption resolutions are located in **Appendix L**.

Figure 98
Plan Adoption Dates

Participating Jurisdiction	Plan Adoption Date
Morgan, County of	05/12/2014
Jacksonville, City of	05/12/2014
Woodson, Village of	06/02/2014
Franklin, Village of	06/04/2014
South Jacksonville, Village of	06/05/2014
Chapin, Village of	06/11/2014
Meredosia, Village of	07/21/2014
Murrayville, Village of	10/07/2014

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8.0 REFERENCES

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COUNTY RESOLUTION AUTHORIZING THE DEVELOPMENT OF THE PLAN

APPENDIX A

RESOLUTION FOR PURSUIT OF THE PREPARATION OF A NATURAL HAZARD MITIGATION PLAN

WHEREAS; Morgan County, Illinois would like to obtain grant money through the Disaster Mitigation Act of 2000, as money is available for Planning and Projects that can reduce or eliminate the damages caused by natural hazards such as rain, snow, wind, ice storms, floods, drought and earthquakes; and

WHEREAS; Morgan County, Illinois must prepare a Natural Hazard Mitigation Plan before money can be released for projects; and

WHEREAS; this plan will include a listing of potential projects that can help reduce the damages caused by these storms; and

WHEREAS; Morgan County will follow the next step in this process, which will be to prepare a grant application through Johnson, Depp & Quisenberry, an environmental and engineering consulting firm, for the preparation of this plan.

NOW THEREFORE, BE IT RESOLVED; that the MORGAN COUNTY BOARD does
hereby pass this resolution to pursue the preparation of a Natural Hazard Mitigation Plan.

Passed this 13th day of December, 2010

Bradley A. Zeller

Bradley A. Zeller, Chairman

Dick Rawlings

Dick Rawlings, Member

Bill Meier

Bill Meier, Member

BZ AYE

DR AYE

BM AYE

Certification: Jill S. Waggener

Jill S. Waggener, County Clerk

PLANNING COMMITTEE MEETING ATTENDANCE SHEETS

APPENDIX B

Attendance Sheet

Morgan & Scott Counties Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

November 13, 2012

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Ron Drake	Village of Manchester
2.	John Calise	Benton & Associates, Inc
3.	Steve Doolin	Village of Glasgow
4.	William Walquist	Scott County 911-Coordinator
5.	Ben Hopkins	Jacksonville Morgan Co ESDA
6.	Steve Turner	Turner Insurance
7.	Darin Gehrke	Woodson
8.	Sam McEvers	Bluffs
9.	Dusty Douglas	Morgan Co. RPC/GIS
10.	Dennis W. Taylor	Ill Rural Electric
11.	Justin Gumbel	Ill Rural Electric
12.	Pat Cooper	Ameren IL
13.	Matt Coultas	Morgan/Scott Co. Highway Dept.
14.	Shawn Artis	Morgan County
15.	Greg Seipel	Prairie Power Inc.
16.	Bob [illegible]	ESDA Jacksonville Morgan
17.	Virgil [illegible]	M-B Scott Co E911
18.	Pam Shireman	Scott Co. Health Dept.

Attendance Sheet

Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Meeting

November 13, 2012

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Greg Lowe	Franklin / Public Rep.
2.	~~Ronnie~~ Lorrie Koch	Scott Co. ESDA
3.	Richard A. Evans	South Jacksonville P.D.
4.	Richard K Smith	Morgan Co H.D
5.	James Bailey	North Scott Fire Dept
6.	Mike Beard	City of Jacksonville
7.	Randy Duvendack	Morgan County Sheriff
8.	Bill Meyer	Morgan County Commission
9.	Bruce Thompson	Farm Bureau
10.	Diane Hoots	State of Ill.
11.	Andy Ezard	City of Jacksonville
12.	Steve Shireman	Scott Co. Health Dept
13.	Greg Michaud	JDQ
14.	Andrea Bostwick	JDQ
15.		
16.		
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18.		

Attendance Sheet

Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Meeting

February 7, 2013

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Gary Marlow	Village of Woodson / Woodson Fire Prot. Dist
2.	[illegible] Fitzsimmons	[illegible]
3.	Steve Shireman	Scott Co Health Dept
4.	Diane Hoots	State of Illinois
5.	Darryl Smith	Village of Franklin
6.	Virgil [illegible]	[illegible] Bluffs Amb. Dist.
7.	[illegible] Rawlings	Morgan County
8.	Steve Turner	Turner Insurance
9.	Matt Coultas	Scott & Morgan Co [illegible]
10.	Randy Duvendack	Morgan Co. Sheriff
11.	Reg Benton	Benton & Assoc
12.	Dave Newman	City of Winchester
13.	Stephen R. Lakin	Village of Murrayville
14.	Andrea Bostwick	IDPH
15.		
16.		
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18.		

Attendance Sheet

Morgan & Scott Counties Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

February 7, 2013

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Greg Michaud	Johnson, Depp & Quisenberry
2.	Ronald Drake	Village of Manchester
3.	Steve Doolin	Village of Glasgow
4.	Sam McEvers	Village of Bluffs
5.	Richard A. Evans	Village of South Jacksonville
6.	Lorrie Koch	Scott County
7.	Beth Hopkins	Jacksonville/Morgan Co ESDA
8.	William Walquist	Scott Co 911
9.	Richard K Smith	Morgan Co H.D.
10.	Dusty Douglas	MCRPC
11.	Arnold DeLong	
12.	Justin Gumbel	Illinois Rural
13.	Darin Gehrke	Village of Woodson
14.	Greg Seipel	Prairie Power Inc.
15.	Shawn Artis	
16.	Keith Hall	City of J'ville
17.	Yuvraj	Ameren.
18.		

Attendance Sheet

Morgan & Scott Counties Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

June 20, 2013

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Ronald A Drake	Village of Manchester IL Scott
2.	Greg Lowe	Public Rep.
3.	James Rausch	Meredosia
4.	James Bailey	North Scott Fire Bluffs
5.	Rex McIntire	City of Winchester
6.	DUSTY DOUGLAS	Morgan Co. RPC
7.	Jon Caldwell	Ameren Illinois
8.	[illegible]	
9.		City of Jville
10.	Katie Gregory	American Red Cross
11.	Lorrie Koch	Scott County ESDA
12.	John Coluss	Benton + Associates Inc
13.	Greg Seipel	Prairie Power Inc.
14.	Matt Coultas	Morgan/Scott Co. Hwy. Dept.
15.		
16.		
17.		
18.		

Attendance Sheet

Morgan & Scott Counties Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

June 20, 2013

	Name (Please Print)	***Representing (Jurisdiction/Organization)***
1.	GREG MICHAUD	JOHNSON, DEPP & QUISENBERRY
2.	Andrea Bostwick	JDQ
3.	Richard A. Evans	South Jacksonville
4.	JOHN Murphy	Village of Murrayville
5.	KEVIN BRALEY	Murrayville
6.	Diane Hoots	State of IL
7.	Steve Turner	Turner Insurance
8.	Bob Fitzsimmons	Morgan ESDA
9.	Blake Roderick	Scott County Farm Bureau
10.	Max Edlen	Village of Bluffs
11.	Abby Burnham	Morgan County ESDA
12.	Bill WALQUIST	SCOTT CO 911
13.	Randy Duvendack	Morgan County Sheriff
14.	Justin Gumbel	Illinois Rural
15.	Virgil Huseman	M-B Amb Dist.
16.	Rhonda Cors	Village of Woodson
17.	Bryce McCormick	Village of Chapin
18.	DICK RAWLINGS	MORGAN Co.

Attendance Sheet

Morgan & Scott Counties Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

October 3, 2013

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Richard A. Evans	South Jacksonville
2.	Diane Hoots	State of IL-OMS
3.	Max L. Edlen	Village of Bluffs
4.	Kevin Braley	Village of Murrayville
5.	James Rausch	Village of Meredosia
6.	Dusty Douglas	MCRPC
7.	Justin Gumbel	IREC
8.	Steve Gilbreth	Benton & Assoc. Inc.
9.	Kelly Hall	City of Jax
10.	Andrea Bostwick	IDOT
11.	Dick Rawlings	Morgan County
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13.		
14.		
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Attendance Sheet

Morgan & Scott Counties Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

October 3, 2013

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Steve Doolin	Village of Glasgow
2.	Greg Michaud	JDQ
3.	Ron Drake	Village of Manchester
4.	Beth Hopkins	Jacksonville Morgan Co ESDA
5.	Rhonda Cors	Woodson
6.	Willie Walgreet	Scott Co 911
7.	Rex McIntire	City of Winchester
8.	Richard K. Smith	Morgan Co Hlth Dept.
9.	Lorrie Kuck	Scott Co. ESDA
10.	John W Watret	Franklin
11.	[illegible]	Morgan ESDA
12.		
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Attendance Sheet

Morgan & Scott Counties Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

February 20, 2014

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Richard A. Evans	South Jacksonville P.D.
2.	Mat R. Edlen	Bluffs
3.	James A. Rausch	Meredosia
4.	Keff Hall	Jax ESDA
5.	Bill Hopkins	
6.	William Walquist	Scott Co 911
7.	Kevin Bradley	Murrayville
8.	Rhonda Cors	Woodson
9.	Virgil Huseman	M. B. Bmb.
10.	Dusty Douglas	Morgan County
11.	Dale Bainter	Morgan County Health Dept.
12.	Dick Rawlings	Morgan County
13.	Bryce McCormick	Village of Chapin
14.	Greg Lowe	Franklin
15.		
16.		
17.		
18.		

Attendance Sheet

Morgan & Scott Counties Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

February 20, 2014

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Greg R. Michaud	IDO
2.	Andrea Bostwick	IDO
3.	Ron Drake	Village of Manchester
4.	Lorrie Koch	Scott Co. ESDA
5.	Steve Shireman	Scott Co Health Dept
6.	Paul Turpin	Village of Franklin
7.	Arnold DeLong	So. Jacksonville
8.	Matt Coultas	Morgan/Scott Co. Highway
9.	Steve Turner	Turner Insurance
10.	Andy Ezard	City of Jacksonville
11.	Shawn Artis	Morgan County
12.	Steve Doolin	Village of Glasgow
13.	Steve Gilbreth	Benton & Assoc.
14.	Bob Fitzsimmons	ESDA
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Planning Committee Meeting Minutes

Appendix C

Meeting Minutes

Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee

November 13, 2012
South Jacksonville Fire Department
South Jacksonville
1:00 p.m.

Committee Members

Ameren
Bluffs, Village of
Cass-Morgan County Farm Bureau
Franklin, Village of
Glasgow, Village of
Illinois Rural Electric
Jacksonville, City of
Manchester, Village of
Mitigation Planning Consultants
  Johnson, Depp & Quisenberry
Morgan County Offices
  Commissioner
  Jacksonville/Morgan County ESDA
  GIS
  Health Department
  Morgan/Scott Highway Depart.
  Regional Planning Commission
  Sheriff
North Scott Fire Protection District
Prairie Power Inc.
Public Representative
  Greg Lowe
Scott County Offices
  911 Dispatch
  Assessment Officer/EDSA
  Health Department
South Jacksonville, Village of
State of Illinois
  Central Management Services
Turner Insurance
Woodson, Village of
General Public
  Benton & Associates, Inc.

Welcome and Introductions

Bob Fitzsimmons, Director of the Jacksonville/Morgan County Emergency Services and Disaster Agency, is serving as the Chairperson of the Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee. He opened the meeting by welcoming attendees.

What Is A Natural Hazard Mitigation Plan and Why Should We Prepare It?

Greg Michaud, of Johnson, Depp & Quisenberry (JDQ), explained why FEMA is seeking mitigation plans from municipalities and counties.

Mitigation refers to projects and activities that can *reduce* or *eliminate* damages from natural hazards. Natural hazards in Illinois primarily include floods, tornadoes, severe summer storms (including thunderstorms, hail, heavy rain and lightning events), severe winter storms (including ice and snow storms), extreme heat, drought, and earthquakes.

Although there is one joint Morgan & Scott Hazard Mitigation Committee, a separate plan will be developed for each county. Both Plans will be aimed at reducing or eliminating damages to human health and property caused by natural hazards.

The two primary reasons for preparing these plans are to: (1) assure that affected municipalities and the county receive the full amount of funding due when federally-declared disasters hit, and (2) become eligible for state/federal hazard mitigation grant money. He noted that the Village of Glasgow is considering projects that involve protecting their public water supply mainline from further storm damage and a storm shelter for residents. Both of these projects are examples of mitigation.

FEMA is encouraging counties throughout the United States to prepare natural hazard mitigation plans. A recent news article described how in 2011 severe storms and other natural hazards in the U.S. resulted in over $52 billion in damages. Of the millions of dollars spent annually on damages caused by natural disasters, FEMA has calculated that for every dollar spent on mitigation, $3 to $4 dollars can be reaped in savings.

Each plan will identify projects and activities to be taken before natural hazards occur.

The Planning Process

Developing mitigation Plans that will be approved by IEMA/FEMA is the overall aim of this planning process. The process to develop these Plans is based on four Committee meetings and a public forum. The following highlights the major activities at each meeting:

1st Committee meeting	Orientation to the Planning Process Begin identifying Critical Facilities & Existing Planning Documents Begin discussing damages from natural hazards
2nd Committee meeting	Discuss the Risk Assessment Approve Mission Statement & Goals
3rd Committee meeting	Begin discussing Mitigation Projects and Activities Review Vulnerability Assessment
4th Committee meeting	Finish discussing Mitigation Projects and Activities Committee reviews and discusses the Draft Plan
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 Plan. Andrea described information needed from committee members about existing planning documents and critical facilities. She distributed two forms to collect this information: 1) ***List of Existing Planning Documents,*** and 2) ***Critical Facilities.***

Completing the ***List of Existing Planning Documents*** will identify Land Use Plans, Flood Ordinances, and related documents used by each participating municipality and the County. If comprehensive municipal plans have been developed, copies of these documents should be sent to Andrea or Greg so that they can be evaluated and described in the Plan.

Critical Facilities in each participating municipality and the County must be identified. Greg noted that the list of critical facilities will be included in Plans submitted to IEMA/FEMA for their review, but removed from the copies made publically available. Both of these forms are due at the next committee meeting.

Other highlights of this discussion include:

- Submitting a list of mitigation projects does not commit any municipality or the County to obligate funds. 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.

- 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. Even if funding appears doubtful, it is better to include a project or activity in the Plan.

Mission Statement & Goals

Andrea described the purpose for a mission statement and goals. She directed attendees to review the draft of a proposed mission statement and goals which is included in the information packets distributed at the beginning of the meeting. 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 this draft at the next meeting.

Since the mission statement and goals are related to natural hazards, Committee members were asked to recount some natural hazards that were particularly vivid.

Greg asked attendees to answer two questions on a distributed form:

1) What is the **most frequently encountered** natural hazard where you live?
2) What natural hazard do you believe **causes the most damage** where you live?

Among the events shared during a group discussion, Committee members mentioned the following:

- ➢ The flash flood on June 18, 2011, that impacted Jacksonville causing damage to the public water supply.
- ➢ A blizzard in February, 2011 closed all major roadways.

- An ice storm in December, 2007, that caused loss of power for 3 days to Bluffs residents, and 5 days without power for Manchester residents.
- A tornado in March, 2006, that hit three counties—Morgan, Scott and Greene. Manchester and Murrayville experienced damages and were without power for 5-6 days because a major transmission line was hit.
- A tornado on Memorial Day, 2004, brought down power lines and caused outages.
- A tornado in 2009 caused power outages in Manchester.
- The ice storms of 1978-1979 left parts of both counties without power for up to 3 ½ weeks.
- A snow storm on the day before Thanksgiving, 2004 that dropped 8-12 inches of heavy snow.
- An ice storm on Good Friday, 1978, that caused extensive tree damage and loss of power.
- A severe winter storm in 1977 where only one lane of US 67 was open between Manchester and Murrayville with viaduct north of Manchester packed full of snow.
- Drought in the summer of 2012 taxed fire fighting capability with numerous grass fires. Morgan County enacted burn bans as well as most of the municipalities. Water use restrictions were enacted in Jacksonville and elsewhere.

Bob Fitzsimmons noted that Morgan County receives more ice storms than any other county in Illinois.

A **Hazard Event Questionnaire** was distributed to the Committee Members to take to their offices and discuss with colleagues. The purpose of this questionnaire is to identify natural hazard events within the participating jurisdictions and try to estimate damages, especially for older events.

Community Participation

In addition to the requirement that members attend Committee meetings to help assure that the Plan can be approved by IEMA and FEMA, Greg added that substitute representatives are acceptable. Two municipal representatives said that they may need to appoint substitute representatives.

What Happens Next?

Risk assessment, goal setting, and the mission statement will be the main topics of the next committee meeting.

A citizen survey was distributed to the Committee members, and they were asked to make copies of this survey available to their constituents who visit government offices. Electronic and paper copies of this survey and a fact sheet titled "Frequently Asked Questions," are available from Andrea.

The second meeting of the Committee was set for:

Thursday, February 7
South Jacksonville Fire Department
1 p.m.

Public Comment

Bob Fitzsimmons thanked committee members for attending. With no further questions, he adjourned the meeting.

Meeting Minutes

Morgan & Scott Counties Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee

February 7, 2013
South Jacksonville Fire Department
South Jacksonville
1:00 p.m.

Committee Members

Ameren
Bluffs, Village of
Franklin, Village of
Glasgow, Village of
Illinois Rural Electric
Jacksonville, City of
Manchester, Village of
Meredosia-Bluffs Ambulance Service
Mitigation Planning Consultants
    Johnson, Depp & Quisenberry
Morgan County Offices
    Commissioner
    Jacksonville/Morgan County ESDA
    GIS
    Health Department
    Regional Planning Commission
    Sheriff
Morgan & Scott Highway Department
Murrayville, Village of
Prairie Power Inc.
Scott County Offices
    Assessor/ESDA
    Health Department
    911 Dispatch
South Jacksonville, Village of
Illinois Central Management Services
Turner Insurance
Winchester, City of
Woodson, Village of
General Public
    Arnold DeLong
    Benton & Associates, Inc.

Welcome and Introductions

Bob Fitzsimmons, Director of the Jacksonville/Morgan County Emergency Services and Disaster Agency, opened the meeting by welcoming attendees.

Handout materials were provided to all attendees.

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 Morgan and Scott Counties. With the completion of the Risk Assessment we now have verifiable information to share.

An overview of the Risk Assessment tables contained in the handout materials was provided. The frequency, magnitude and property damages for each category of natural hazard were described. Morgan and Scott Counties have experienced multiple Federal disaster declarations every decade since the 1970's. Severe storms and flooding have caused the majority of these declarations.

The cumulative documented damages from severe storms and other natural hazards in both counties reveal dollar losses exceeding $176.1 million with at least 296 injuries and 6 deaths. Numerous severe weather events have been verified during every decade since 1950. Results were presented cumulatively for both counties but the records are organized in the handout material by county.

Severe Storms

Severe storms are the most frequently occurring natural hazard in Morgan and Scott Counties. Approximately $17.5 million in damages has resulted from severe thunderstorms, hail, and high wind events since 1956. About five thunderstorms with damaging winds that meet the "severe" criteria are expected to hit Scott and Morgan Counties every year. Cumulatively, at least 150 injuries and 3 fatalities can be attributed to severe storms.

Severe Winter Storms

At least one hundred events involving excessive snow, ice, or extreme cold have been verified since 1951. At least 127 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-1990's.

In Morgan County, the largest 24 hour recorded snowfall is 12 inches which was measured on February 2, 2011 and February 28, 1900.

In Scott County, the largest 24 hour and 48 hour recorded snowfalls is 18 inches which occurred on Feb 1 & 2, 2011.

The largest seasonal snowfall is 54 inches recorded in the winter of 1977-78 based on measurements taken in Jacksonville.

Floods

Floods contributed to most of the Federal disaster declarations. At least 55 floods have been documented since 1993 causing approximately $151.6 million in property and crop damage.

Bob Fitzsimmons pointed out that flood damages would be higher if not for flood mitigation efforts that have already been implemented.

Tornadoes

Since 1955, 42 tornadoes have been verified in both counties (30 in Morgan and 12 in Scott). Property and crop damages combined to reach nearly $7 million. Eighteen injuries and one fatality have been confirmed. Ten of these tornadoes have caused over $100,000 in damages during each event. One tornado, the F2 tornado in Jacksonville on May 29, 2004, caused over $1 million in damages.

In contrast to nearby Logan County, which is located in the "tornado alley" of Illinois, has 59 verified tornadoes with damages exceeded $39.5 million including 75 injuries and 1 fatality. Eleven of their tornadoes caused over $1 million in damages during each event.

The average tornado in Scott County is approximately 6 1/3 miles long and 338 feet wide while in Morgan County the average tornado is approximately 3.8 miles long and 433 feet wide. In comparison, the average tornado in Logan County is approximately 3 miles long and 145 yards wide. Cumulatively in Morgan and Scott Counties, there have been two F3, ten F2, twelve F1, eleven F0, six EF1, and one EF0 tornadoes.

The deadliest tornado in U.S. history is the Tri-State tornado which went through southern Illinois devastating Murphysboro in 1925. Six hundred and ninety-five deaths were confirmed along with an additional 2,027 injuries. The relatively recent tornado that hit Joplin, Missouri, caused approximately 155 deaths.

Extreme Heat

Twenty-five extreme heat events have been reported since 1995. Road buckling and crop damage often occur, but crop damage is usually not measurable unless drought occurs. One death was attributed to these events.

Drought

Three major droughts have occurred during the last three decades—1983, 1988 and 2011/2012. Crop yield reductions were substantial.

	Morgan County		Scott County	
	Corn	Soybeans	Corn	Soybeans
1983	42.1%	31.4%	45.4%	36.4%
1988	37.6%	15.6%	35.6%	9.1%
2012	Deficit yields will be reported when numbers are available			

Dams

There are twenty dams with state permits in the two counties: four are publicly owned and sixteen are privately owned. Only two class I dams (those most likely to cause the most harm) exist: the Mauvaise Terre Lake Dam and the Murrayville-Woodson Lake Dam, both in Morgan County. Neither of these dams have any ongoing structural problems.

Earthquakes

Earthquakes have been felt in the area but no substantive damages have been reported. There are no geologic faults in either 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.

The four page handout titled "**Critical Facilities,**" the one page handout **"List of Existing Planning Documents,"** and the **"Hazard Event Questionnaire"** distributed at the previous Committee meeting were collected from the Committee members.

To help better identify storm damages to critical facilities, Andrea 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 Bostwick 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 to reflect any specific situation in either Morgan or Scott County. No additions were proposed.

Mitigation

Greg reminded Committee Members that the purpose of the next meeting is to bring ideas for mitigation projects.

He referred everyone to the two handouts that list examples of mitigation projects for the County and municipalities. The following categories of projects were described.

Studies may be needed to identify the cause of the problem. 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. Examples of structural projects are included in the handout material.

While lower on the priority scale, but important to prevent damages are ***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 action. 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. Ameren will trim trees along roads and main power lines, but not along the service lines which extend to each residence and business.

Matt Coultas asked if mitigation projects involving local roads could be included or if only federal road projects should be submitted. For the purpose of this Plan, Greg recommended that all road projects be included.

What Happens Next?

The Committee set Thursday, June 20, as the date for its next meeting. The starting time will remain at 1 p.m. and the location remains the same.

Public Comment

With no additional questions or comments, Bob Fitzsimmons adjourned the meeting.

Meeting Minutes

Morgan & Scott Counties Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee

June 20, 2013
South Jacksonville Fire Department
South Jacksonville
1:00 p.m.

Committee Members

Ameren
American Red Cross
Bluffs, Village of
Chapin, Village of
Franklin, Village of
Illinois Central Management Services
Illinois Rural Electric
Jacksonville, City of
Manchester, Village of
Meredosia, Village of
Meredosia-Bluffs Ambulance District
Mitigation Planning Consultants
  Johnson, Depp & Quisenberry
Morgan County Offices
  Commissioner
  Jacksonville/Morgan County ESDA
  Regional Planning Commission
  Sheriff
Morgan & Scott Highway Department
Murrayville, Village of
North Scott Fire Protection District
Prairie Power Inc.
Public Representative:
  Greg Lowe
Scott County Farm Bureau
Scott County Offices
  Assessor/ESDA
  911 Dispatch
South Jacksonville, Village of
Turner Insurance
Winchester, City of
Woodson, Village of
General Public:
  Benton & Associates, Inc.

Welcome and Introductions

Bob Fitzsimmons, Director of the Jacksonville/Morgan County Emergency Services and Disaster Agency, opened the meeting by welcoming attendees. Since there were some new representatives, he asked everyone to introduce themselves. He announced that Morgan and Scott Counties are part of the recent federal declaration triggered by the recent flooding. He urged attendees to participate in an applicant briefing meeting scheduled for Monday, June 24.

Handout materials were provided to all attendees.

Vulnerability Assessment

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. He noted that the recent natural hazard events—flooding in Germany, tornadoes in Oklahoma and Kansas, and the federal declaration for flooding in Illinois—underline the importance of this Committee's work.

Tornadoes

Morgan County

Morgan County is located in the area of Illinois where the most tornadoes occur. Using information about each of the thirty (30) verified tornadoes, damages were calculated based on an "average" tornado. In Morgan 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.

Potential dollar losses for residences and contents would be expected to exceed at least $5 million in any of the participating municipalities. Potential damages in five of the participating municipalities are estimated to exceed $10 million. In the unincorporated areas of the County, damages would range from approximately $382,000 in the lesser populated areas to $849,000 in the more populated areas.

Scott County

Scott County has had fewer verified tornadoes (12) than Morgan County. In Scott County, the average size tornado impacts approximately 0.41 square miles (6 1/3 miles long x 338 feet wide).

Potential dollar losses for residences and contents would be expected to exceed at least $1 million in any of the participating municipalities. In the unincorporated areas of the County, damages would range from approximately $148,000 to $364,000.

Floods

Morgan County

Approximately 10% of the land area in Morgan County is in the floodplain and thus susceptible to flooding from creeks and streams. Chapin, Franklin, Murrayville and Woodson would not experience this kind of riverine flooding since there are no streams or creeks with floodplains within their municipal limits. Using tax assessment values for residential structures from 2011, riverine flood damages were calculated for structures and contents. Potential dollar losses caused by riverine flooding to vulnerable residences within the participating municipalities would be expected to range from approximately $97,000 in South Jacksonville to $4.1 million in Jacksonville. The estimate of projected damages for Meredosia are very close to the dollar figure calculated for Jacksonville.

Flash flooding is harder to calculate, but it has impacted every municipality in Morgan County. In June 2011, Morgan County experienced a major flash flood event that caused over $150 million in damages.

Scott County

Approximately 30% of the land area in Scott County is in the floodplain and thus susceptible to flooding from rivers, creeks and streams. Bluffs has the greatest vulnerability to riverine flooding of the participating municipalities. Potential residential dollar losses caused by riverine flooding in Bluffs is expected to be approximately $437,000.

Flash flooding is harder to calculate, but it has impacted Scott County. The large scale flash flood from June, 2011, resulted in approximately $850,000 in property and crop damages.

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 drought.
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.

In response to a question about disputed floodplain boundaries on the latest Digital Flood Insurance Rate Maps, Greg noted that resolving these disputes is outside the mitigation planning process. Obtaining building elevations may be an activity that municipalities or the counties might want to pursue.

Mitigation Projects

Committee members were asked to submit their Mitigation Projects forms. Andrea Bostwick 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.

Andrea noted that each municipality should have at least one mitigation project in the Plan before it is submitted to IEMA/FEMA. Mitigation projects can be added to the Plan after it is adopted because this Plan is a living document that will be periodically updated.

In response to several related questions, Andrea noted the following: 1) labor provided by others outside of the organization can be used as part of the grant match requirements; 2) projects already completed are not reimbursable, and 3) the specific area within a municipality—i.e. between 2nd Avenue and 5th Avenue—impacted can be provided or omitted when project language is submitted.

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 3
South Jacksonville Fire Department
1 p.m.

Public Comment

Bob Fitzsimmons thanked the Committee members for attending.

With no additional questions or comments, Bob adjourned the meeting.

Meeting Minutes

Morgan & Scott Counties Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee

October 3, 2013
South Jacksonville Fire Department
South Jacksonville
1:00 p.m.

Committee Members

Bluffs, Village of
Franklin, Village of
Glasgow, Village of
Illinois Central Management Services
Illinois Rural Electric
Jacksonville, City of
Manchester, Village of
Meredosia, Village of
Mitigation Planning Consultants
    Johnson, Depp & Quisenberry
Morgan County Offices
    Commissioner
    Health Department
    Jacksonville/Morgan County ESDA
    Regional Planning Commission
Murrayville, Village of
Scott County Offices
    Assessor/ESDA
    911 Dispatch
South Jacksonville, Village of
Winchester, City of
Woodson, Village of
General Public:
    Benton & Associates, Inc.

Welcome and Introductions

Greg Michaud opened the meeting by welcoming attendees.

Handout materials were provided to all attendees.

Mitigation Project Submittal & Action Tables

Before beginning this presentation, Greg Michaud 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. Two hundred and nine 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.

Risk/Vulnerability Assessment

An analysis of potential residential damages to each participating jurisdiction that might be caused by tornado and flood events was presented to the Committee at the previous meeting in June. This information will be included in the Plan.

Differences in severe weather frequency within Illinois were summarized to highlight key concerns for Morgan and Scott County. For example, Morgan County is located in the area of Illinois where the most tornadoes occur. Morgan County has had (30) verified tornadoes. In contrast, the number of tornadoes in Carroll and Jo Daviess Counties combined is less than half the number of tornadoes verified in Morgan County. Scott County, which used to be part of Morgan County, has had fewer verified tornadoes (12) than Morgan County. Approximately 30% of the land area in Scott County is in the floodplain—in contrast to Morgan County where 10% of the land is in the floodplain—and thus flooding may be a larger concern than tornadoes.

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 Jacksonville/Morgan 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.

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 supplied.

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 questions she said that more than one annual update meeting can be held and that there is no set time following the first plan adoption when the first annual update meeting must be held.

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.

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.

After this public forum, there are three important milestones:

1. **Public Comment Period of two weeks for residents** to submit comments before the Plan is submitted to IEMA and FEMA for their approval;
2. **Adopting the Approved Plan** by each participating jurisdiction through a resolution (Attendees were cautioned to not adopt the Plan before FEMA issues "tentative approval"); and
3. **Submitting the resolutions to JDQ** so that each participating jurisdiction is eligible for state/federal funding.

Committee members were asked where copies of the draft Plan should be made available for public comment. Bluffs and Meredosia requested paper copies. Jacksonville, South Jacksonville, Murrayville, Woodson, Morgan and Scott Counties requested electronic copies.

What Happens Next?

The Committee agreed to schedule the next meeting on:

Thursday, February 20
South Jacksonville Fire Department
5 p.m. to 7 p.m.

Public Comment

With no other questions, Bob Fitzsimmons adjourned the meeting.

CITIZEN QUESTIONNAIRE

APPENDIX D

QUESTIONNAIRE

Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Plan

You can help protect lives and property from storm damage in ***Morgan*** County by taking a few moments to complete this questionnaire.

1. Please indicate where you live in Morgan County:

_____ Alexander
_____ Arcadia
_____ Bethel
_____ Chapin
_____ Concord
_____ Franklin
_____ Jacksonville
_____ Literberry
_____ Lynnville
_____ Meredosia
_____ Murrayville
_____ Nortonville
_____ Orleans
_____ Pisgah
_____ Prentice
_____ Rees Station
_____ Sinclair
_____ South Jacksonville
_____ Waverly
_____ Woodson
_____ Unincorporated Morgan County

_____ Other (please specify): ______________________________

2. Please place a check mark next to each of the natural hazards listed below that you have experienced in Morgan 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 Morgan 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.

Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee

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FREQUENTLY ASKED QUESTIONS FACT SHEET

APPENDIX E

Frequently Asked Questions

Morgan & Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee

1) **What are the Morgan & Scott Counties Natural Hazards Mitigation Plans?**
The Morgan & Scott Counties Natural Hazards Mitigation Plans evaluate damage to life and property from storms and other natural hazards in both counties and identify projects and activities that can reduce these damages. The Plans are considered to be multi-jurisdictional because they include 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 are these Plans being developed?**
The Plans fulfill federal planning requirements of Section 104 of the Disaster Mitigation Act of 2000 and the Stafford Act. The Plans provide three key benefits for both Morgan and Scott Counties:
    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 these Plans?**
The Morgan & Scott Counties Natural Hazards Mitigation Planning Committee is preparing the Plans 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 Morgan & Scott Counties 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 either Morgan or Scott Counties. Surveys will be available at participating municipalities and through both Counties to help gather specific information from residents. All of this information will be used to draft the Plans. The draft Plans will be presented in a public forum for further public input.

More information can be obtained by contacting:

Bob Fitzsimmons, Director
Jacksonville/Morgan County Emergency Services & Disaster Agency
200 W. Douglas Ave.
Jacksonville, Illinois 62650
(217) 479-4616
esda@jacksonvilleil.com

PRINT MEDIA OUTLETS SERVING MORGAN & SCOTT COUNTIES AND NEWS ARTICLES

APPENDIX F

Print Media Serving Morgan & Scott Counties

Jacksonville Journal-Courier (daily)
235 W. State St.
Jacksonville, IL 62651
(217) 245-6121
www.myjournalcourier.com

Jacksonville Journal-Courier
November 9, 2012

Morgan, Scott team up on safety plan

BY CODY BOZARTH
JOURNAL-COURIER

Communities throughout Morgan and Scott counties will be working together in the coming months, hoping to uncover better ways to prevent safety hazards during natural disasters.

Known as a Natural Hazard Mitigation Plan, it will contain a comprehensive report on how the area may be impacted by such things as flash flooding and tornados. It will also evaluate ways that infrastructure can be improved to mitigate a major crisis.

The development of this plan is partially a result of a federal requirement that has to be met in order to be eligible for emergency funding in the case of a natural disaster declaration.

Morgan County Emergency Services and Disaster Agency Director Bob Fitzsimmons said

DISASTER, *see Page 7*

DISASTER: It's about sharing resources

Continued from Page 1

communities that adopt the plan will also be eligible for federal funds for emergency prevention projects that might otherwise not be constructed.

Each county will have its own plan, but they are working together to share resources because both are so geographically similar.

"Basically, the same contractor that is doing the plan, and both counties have similar and contiguous borders," Fitzsimmons said. "It makes it easier, for example, if we're down on the Illinois River and we're looking at some kind of mitigating property, we'd both be looking at it at the same time."

The Morgan-Scott Counties Hazard Mitigation Planning Committee includes community representatives as well as technical partners and other stakeholders.

The committee will hold open working sessions to develop a draft plan, allowing any resident to attend and ask questions.

The first meeting will be at 1 p.m. Tuesday at the South Jacksonville Fire Department at 801 Sequoia St.

Currently, the communities of Bluffs,

Each county will have its own plan, but they are working together to share resources ...

Chapin, Franklin, Glasgow, Jacksonville, South Jacksonville, Manchester, Meredosia, Murrayville, Waverly, Winchester and Woodson are expected to participate in developing this plan — each bringing their own concerns to the table.

Fitzsimmons said municipalities that do not participate will have to wait five years before they would be able to participate again.

"It goes back to the amount of funds that have been appropriated for private contractors to come out and develop this plan," he said. "So the funds are not going to be there, and the urge is to have them get involved now and get it on the books."

cbozarth@myjournalcourier.com

Jacksonville Journal-Courier
January 31, 2013

Morgan-Scott hazard committee to prepare mitigation plan

JOURNAL-COURIER

The Morgan-Scott Hazard Mitigation Committee will be meeting several times in the coming months to prepare a mitigation plan to reduce damage caused by natural hazards.

The first meeting between representatives of Morgan and Scott counties and local municipalities will be Feb. 7 at the South Jacksonville Fire Department at 1801 Sequoia St.

The 1 p.m. meetings are open to the public. Bluffs, Chapin, Franklin, Glasgow, Jacksonville, South Jacksonville, Manchester, Meredosia, Murrayville, Waverly, Winchester and Woodson are participating.

"The mitigation plan will supplement the county's disaster plan and will become an additional resource to help county and municipal officials decide what steps to take to prepare for storms and other natural hazards," said Bob Fitzsimmons, Jacksonville/Morgan County Emergency Services & Disaster director. "After this mitigation 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."

Public comments will be used to develop a draft mitigation plan. After the draft mitigation plan is developed, there will be a public forum during which the draft mitigation 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," said Lorrie Koch, Scott County Emergency Services & Disaster director.

Jacksonville/Morgan County ESDA

200 W Douglas Av
Jacksonville, IL 62650
217/479-4616
esda@jacksonvilleil.com

FOR IMMEDIATE RELEASE

Contact: Bob Fitzsimmons
(217)479-4616

Preventing Damages Caused By Natural Disasters

Jacksonville, IL (June 10, 2013)—Steps to prevent injuries and deaths while maintaining vital services for Morgan and Scott County residents when floods and severe storms hit will be discussed when the Morgan-Scott County Natural Hazard Mitigation Planning Committee meets at 1:00 p.m. on June 20, at the South Jacksonville Fire Department. This meeting is open to the public.

This Committee began work in November, 2012, to identify projects and activities that can protect Morgan and Scott County residents and property from storms and other natural disasters. This work is aimed at identifying projects and activities that can be taken before natural disasters occur.

Building storm shelters, resolving drainage problems, retrofitting water supplies and other critical facilities to better withstand natural disasters are a few examples of the kinds of projects that might be included in the plan. Developing public information materials and conducting drainage studies are examples of other activities that might also be included in the Natural Hazard Mitigation Plan.

The municipalities who participate will be eligible for all of the storm damage money for which they are due following a federally declared disaster. In addition, participating jurisdictions also become eligible for federal/state grant money for mitigation projects.

Jacksonville/Morgan County ESDA

200 W Douglas Av
Jacksonville, IL 62650
217/479-4616
esda@jacksonvilleil.com

CONTACT: Bob Fitzsimmons
217/479-4616

Disaster Mitigation Planning Meeting

Jacksonville, IL (SEPTEMBER 23, 2013)— The Morgan-Scott County Natural Hazards Mitigation Planning Committee will meet on October 3 at the South Jacksonville Fire Department on 1810 Sequoia in South Jacksonville. The meeting begins at 1 p.m. and is open to the public.

The focus of the group is to develop a Mitigation Plan to reduce impact from catastrophic events.

Bluffs, Franklin, Glasgow, Jacksonville, South Jacksonville, Manchester, Meredosia, Murrayville, Winchester, and Woodson and others are participating municipalities.

A copy of the draft Plan will be made available for public review.

Interested persons can submit questions and comments to the Committee members or directly to the Jacksonville/Morgan County Emergency Services & Disaster Agency.

Jacksonville Journal-Courier
February 11, 2014

myjournalcourier.com

Morgan, Scott disaster plans being discussed

Journal-Courier

February 11, 2014

A committee thinking of ways to make Morgan and Scott counties safer in the event of a disaster has come up with a few ideas.

Actually, about 210.

The projects and activities are designed to prevent injuries, deaths and property damage from major storms. They will be presented for public comment in the Morgan and Scott Counties Natural Hazards Mitigation Plans.

Both plans will be available for review at the public forum from 5 to 7 p.m. Feb. 20 at the South Jacksonville Fire Department at 1810 Sequoia St.

Members of the Morgan-Scott County Natural Hazards Mitigation Planning Committee will be available to discuss both plans.

“People can come and go at their convenience. If someone only has a few minutes to review a plan, ask a question, or comment, they can easily do so at anytime during the forum,” according to Jacksonville/Morgan County Emergency Services and Disaster Agency Director Bob Fitzsimmons. “Unlike some conventional meetings, there are no formal presentations forcing attendees to wait before they can speak.”

A committee has been conducting working meetings open to the public since November 2012.

“Both counties worked together by sharing resources and expertise in emergency management to develop plans that reflect the specific needs of each participating municipality. Evaluating information about storms and damages was used to develop specific suggestions about potential projects that can reduce harm to people and property,” Scott County Emergency Services and Disaster Agency Director Lorrie Koch said.

Bluffs, Franklin, Glasgow, Jacksonville, South Jacksonville, Manchester, Meredosia, Murrayville, Winchester, and Woodson are participating municipalities. American Red Cross, Ameren, Illinois Rural Electric, North Scott Fire Protection District, Prairie Power Inc., Turner Insurance and the Regional Planning Commission also served on the committee.

A public comment period will remain open until March 6. Comments can be directed to the Jacksonville/Morgan County Emergency Services and Disaster Agency.

Following the public comment period, any revisions needed will be made before both plans are submitted to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for approval.

Link:http://www.myjournalcourier.com/apps/pbcs.dll/article?AID=/20140211/news/302119981/

Appendix F

WLDS
February 11, 2014

Natural Hazards Mitigation Plan open to public comment

By Nick Kovatch on February 10 at 2:13pm

Officials working on projects and activities to prevent injuries, deaths and property damage from major storms want to hear from the public.

Morgan and Scott Counties Natural Hazards Mitigation Plans will be available for review at a public forum on Thursday, February, 20th from 5 p.m. to 7 p.m. at the South Jacksonville Fire Department.

Appendix F

Members from the Morgan-Scott County Natural Hazards Mitigation Planning Committee will be available to discuss both Plans.

Morgan County ESDA Director Bob Fitzsimmons says people can come and go at their convenience. He says the forum is designed to accommodate busy schedules. Fitzsimmons says unlike some conventional meetings, there are no formal presentations forcing attendees to wait before they can speak.

About 210 projects and activities were identified to protect Morgan and Scott County residents and property from storms and other natural disasters.

Lorrie Koch, Scott County ESDA Director, says the Committee has been conducting working meetings open to the public since November, 2012.

"Both counties worked together by sharing resources and expertise in emergency management to develop Plans that reflect the specific needs of each participating municipality," says Koch. "Evaluating information about storms and damages was used to develop specific suggestions about potential projects that can reduce harm to people and property."Bluffs, Franklin, Glasgow, Jacksonville, South Jacksonville, Manchester, Meredosia, Murrayville, Winchester, and Woodson are participating municipalities.

American Red Cross, Ameren, Illinois Rural Electric, North Scott Fire Protection District, Prairie Power Incorporated, Turner Insurance, and the Regional Planning Commission also served on the Committee.

A public comment period will remain open until March 6th. Comments can be directed to Jacksonville/Morgan County ESDA. Following the public comment period, any revisions that are needed will be made before both Plans are submitted to IEMA and FEMA.

Tuesday, February 11 2014, 07:12 PM CST

Morgan And Scott Counties Plan For Weather Disaster

Do you feel safe when severe weather strikes?
Morgan and Scott counties are joining forces to try to reduce or eliminate damage caused by severe weather and both counties have had plenty of experience with that in the past few years.
ABC NewsChannel 20's Lindsey Hess explains the benefits of the two counties teaming up.

We often see local governments and agencies come together in the case of a natural disaster, but this committee is opening the line of communication now to help prevent property damage and deaths when disaster strikes.

Back in 2011, the Jacksonville water treatment plant was flooded after a bout of heavy rains.

Now, Morgan and Scott counties are teaming up forming a committee to make a plan to prevent weather damage like this from happening again.

"We collected from ice storms, to tornadoes, we had a real bad flood. So all these things have come together now to see what we can do to help mitigate this...build a levy, put a new storm sewer in or something like that," said South Jacksonville Police Chief, Richard Evans.

Appendix F

The
committee consists of individuals from Morgan and Scott county communities, emergency officials, the American Red Cross and other organizations.

"They say we all talk, but sometimes we don't and this brought a large group of people together to talk about what their needs are whether it be just in a city a village or even the whole county," Evans said.

And the Morgan and Scott County Natural Hazards Mitigation Plan is something that has never been done before.

"That's
one of the misconceptions about this process. People think well hey we have an emergency response plan. No, this is not emergency response. This is a plan to develop projects before the storms hit," said Greg Michaud, manager of environmental services at Johnson, Depp & Quisenberry in Springfield.

Officials are hoping once the plan is fully developed, the federal government will provide money to help with projects.

"This
is a plan that will go on for years. In other words, when money becomes available from the federal government, they will look at our priority list in each community to see what is needed and see what funding is available," Evans said.

And once the plan comes to fruition, officials say Morgan and Scott counties will be better protected when disaster strikes.

"The
most important thing in this planning process is to protect public health, and protect our roads, and other critical infrastructure," Michaud said.

A public forum is coming up February 20 to get feedback from both Scott and Morgan county residents. It will be held from 5 p.m. to 7 p.m. at the South Jacksonville Fire Department. Evans says working with Scott County has been extremely beneficial because the communities are able to share concerns and ideas. He expects the plan to be completed in the next few months.
In Morgan County, Lindsey Hess, ABC News Channel 20.

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PUBLIC FORUM – PLANNING PROCESS HANDOUT

APPENDIX G

Morgan County Multi-Jurisdictional Natural Hazards Mitigation Plan	Scott County Multi-Jurisdictional Natural Hazards Mitigation Plan

Public Forum – Open House

February 20, 2014
South Jacksonville Fire Department
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 Morgan County and Scott County residents.

Morgan County
Since 1965 Morgan County has experienced 10 federally-declared disasters. Between 2003 and 2012 there have been 43 thunderstorms with damaging winds, 26 severe hail storms, 17 heavy rain events, 14 severe winter storms, 14 flood and flash flood events, 9 tornadoes, 8 lightning strike events, 6 extreme heat events, 3 droughts, 1 extreme cold event and 1 earthquake felt by residents in the County.

Scott County
In Scott County there have been 11 federally-declared disasters since 1965. There have been 27 thunderstorms with damaging winds, 17 heavy rain events, 14 severe winter storms, 14 flood and flash flood events, 12 severe hail storms, 6 extreme heat events, 5 tornadoes, 2 droughts, 1 extreme cold event and 1 earthquake felt by residents in the County between 2003 and 2012.

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 the loss of life and property damage resulting from natural hazards. This process helps a County and the 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 Morgan County and Scott County Multi-Jurisdictional Natural Hazards Mitigation Plans?
Recognizing the benefits that could be gained from preparing natural hazard mitigation plans, the Morgan County and Scott County Boards passed resolutions on December 13, 2010 and December 20, 2010 respectively authorizing the development of separate multi-jurisdictional natural hazard mitigation plans.

Each County then invited all the local government entities within their jurisdictions to participate. The following entities chose to participate in the development of each respective Plan:

Morgan County
- Chapin
- Franklin
- Jacksonville
- Meredosia
- Murrayville
- South Jacksonville
- Woodson

Scott County
- Bluffs
- Glasgow
- Manchester
- Winchester

How were the Plans developed?
The two Plans were developed through the Morgan and Scott Counties Multi-Jurisdictional Natural Hazards Mitigation Planning Committee. The Planning Committee included representatives from each participating jurisdiction, as well as the general public, agriculture, emergency services (Red Cross, fire, 911 and law enforcement), healthcare, GIS, insurance and utilities. The Planning Committee met five times between November 2013 and February 2014.

Which natural hazards are included in the Plans?
After much discussion, the Planning Committee chose to include the following natural hazards in each Plan:

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

What is included in each Plan?
Each Plan is divided into sections that cover the planning process; the risk assessment conducted on each of the previously identified natural hazards; the mitigation strategy, including lists of mitigation actions identified for each participating jurisdiction; recommendations; and plan maintenance and adoption. The majority of each Plan is devoted to the risk assessment.

This risk assessment identifies the natural hazards that pose a threat to each 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 each County as well as the buildings, critical facilities and infrastructure located within each County.

What happens next?
Any comments received at tonight's public forum will be are incorporated into the appropriate Plan before both are 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 Plans, each will be presented to the appropriate County and participating jurisdiction for formal adoption. After the Plans are adopted, each participating jurisdiction can apply for federal mitigation funds and begin implementation of the mitigation actions identified in the Plans.

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PUBLIC FORUM – PLAN COMMENT SHEET

APPENDIX H

MORGAN COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

PUBLIC FORUM – FEBRUARY 20, 2014
COMMENT SHEET

The Morgan 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.)

Please Print Your Name, Address, and Phone Number Below

Name: ______________________ Phone: ______________

Address: ______________________

______________________ Zip Code: ______________

Comments will be accepted until March 7, 2014.

Place
Stamp
Here

Mr. Bob Fitzsimmons, Director
Jacksonville/Morgan County ESDA
200 W. Douglas Ave.
Jacksonville, IL 62650

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HAZARD MITIGATION PLANNING LETTER SENT TO ADJACENT COUNTIES

APPENDIX I

Jacksonville/Morgan County ESDA

200 W Douglas Av
Jacksonville, IL 62650
217/479-4616   Fax: 217/479-4618
email: esda@jacksonvilleil.com

TO: Brown County ESDA (Curt Hannig); Cass County ESDA (Roger Lauder); Greene County ESDA (Cale Hoesman); Macoupin County EMA (James Pitchford); Jersey County (Larry Mead), Pike County EMA (David Greenwood); and Sangamon County EMA (David Butt)

From: Bob Fitzsimmons, Jacksonville/Morgan County ESDA & Lorrie Koch Scott County ESDA

Subject: Hazard Mitigation Planning

Date: February 7, 2014

The purpose of this memorandum is to invite you to attend a planning meeting of the Morgan & Scott Counties Natural Hazard Mitigation Committee. Through this Committee, Natural Hazard Mitigation Plans are being prepared for both counties. Since we share a common border with six other counties, you may have interest or concerns regarding our Plans.

Johnson, Depp & Quisenberry, an emergency management and engineering consulting firm experienced in preparing these plans, is leading our planning process.

The next meeting of the Committee will be:

> **Thursday, February 20**
> South Jacksonville Fire Department
> 1810 Sequoia Street
> South Jacksonville, IL
> **5 p.m.**

Food and beverages will be provided at the meeting. If you plan to attend or have questions, please contact Greg Michaud, our mitigation planning consultant, at 217/529-4534

HAZARD EVENT PHOTOGRAPHS

APPENDIX J

December 8 & 9, 2007 Ice Storm
South Jacksonville, Illinois

Photographs provided by South Jacksonville Police Department

December 8 & 9, 2007 Ice Storm
South Jacksonville, Illinois

Photographs provided by South Jacksonville Police Department

December 8 & 9, 2007 Ice Storm
South Jacksonville, Illinois

Photographs provided by South Jacksonville Police Department

December 8 & 9, 2007 Ice Storm
South Jacksonville, Illinois

Photographs provided by South Jacksonville Police Department

December 8 & 9, 2007 Ice Storm
South Jacksonville, Illinois

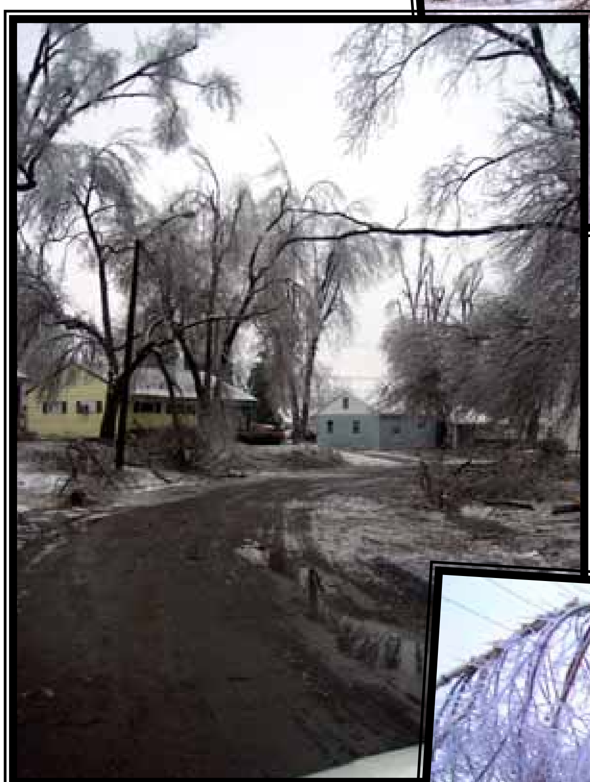
Photographs provided by South Jacksonville Police Department

December 8 & 9, 2007 Ice Storm
South Jacksonville, Illinois

Photographs provided by South Jacksonville Police Department

December 8 & 9, 2007 Ice Storm
South Jacksonville & Jacksonville, Illinois

South Jacksonville



South Jacksonville

Jacksonville

Photographs provided by South Jacksonville Police Department & Steve Turner

1943 Illinois River Flood
Meredosia, Illinois

Photographs provided by Jacksonville/Morgan County ESDA

1943 Illinois River Flood
Meredosia, Illinois

Photographs provided by Jacksonville/Morgan County ESDA

1943 Illinois River Flood
Meredosia, Illinois

Photographs provided by Jacksonville/Morgan County ESDA

September 20, 2009 Flash Flood
South Jacksonville, Illinois

Photographs provided by South Jacksonville Police Department

September 20, 2009 Flash Flood
South Jacksonville, Illinois

Photographs provided by South Jacksonville Police Department

September 20, 2009 Flash Flood
South Jacksonville, Illinois

Photographs provided by South Jacksonville Police Department

June 17 & 18, 2011 Flash Flood
Jacksonville, Illinois

Drinking Water Treatment Facility
flooding at 12 p.m. - June 18th

Drinking Water Treatment Facility
flooding at 3 p.m. - June 18th

Drinking Water Treatment Facility
flooding at 8 p.m. - June 18th

Photographs provided by Steve Turner

June 17 & 18, 2011 Flash Flood
Jacksonville, Illinois

Drinking Water Treatment Facility
flooding at 8:30 a.m. - June 19th

Photographs provided by Steve Turner

June 17 & 18, 2011 Flash Flood
Jacksonville, Illinois

Drinking Water Treatment Facility

Drinking Water Treatment Facility with spillway into Mauvaise Terre Lake in the background

Drinking Water Treatment Facility

Photographs provided by Jacksonville/Morgan County ESDA

June 17 & 18, 2011 Flash Flood
Jacksonville, Illinois

MacMurray College Building

MacMurray College Gymnasium

Photographs provided by Steve Turner

June 17 & 18, 2011 Flash Flood
Jacksonville, Illinois

Emergency responders conducted rescues at Rolling Acres Mobile Estates

Looking east along Morton Ave., the street was closed at Hardin Ave., effectively closing off the City

Flooding along Morton Ave., a major thoroughfare in Jacksonville

Photographs provided by Jacksonville/Morgan County ESDA

May 24, 2004 Tornado
Jacksonville, Illinois

Two church day car vans were picked up and overturned.

A church, motel and adjacent building sustained damage.

Damage to the inside of the church.

Photographs provided by Steve Turner

August 19, 2009 Tornadoes
Unincorporated Morgan County, Illinois

1967 Hughes Road - looking southwest

1992 Hughes Road - looking northeast towards IL Rte. 267 & Hughes Road

1992 Hughes Road - looking northeast towards IL Rte. 267 & Hughes Road

Photographs provided by Jacksonville/Morgan County ESDA

August 19, 2009 Tornadoes
Unincorporated Morgan County, Illinois

455 Leetham Road - looking northwest from the road

455 Leetham Road - looking northwest from the road

455 Leetham Road - southwest corner of the house

Photographs provided by Jacksonville/Morgan County ESDA

August 19, 2009 Tornadoes
Unincorporated Morgan County, Illinois

457 Happy Hollow Road - looking southwest from the road

473 Crow Road - looking north

Photographs provided by Jacksonville/Morgan County ESDA

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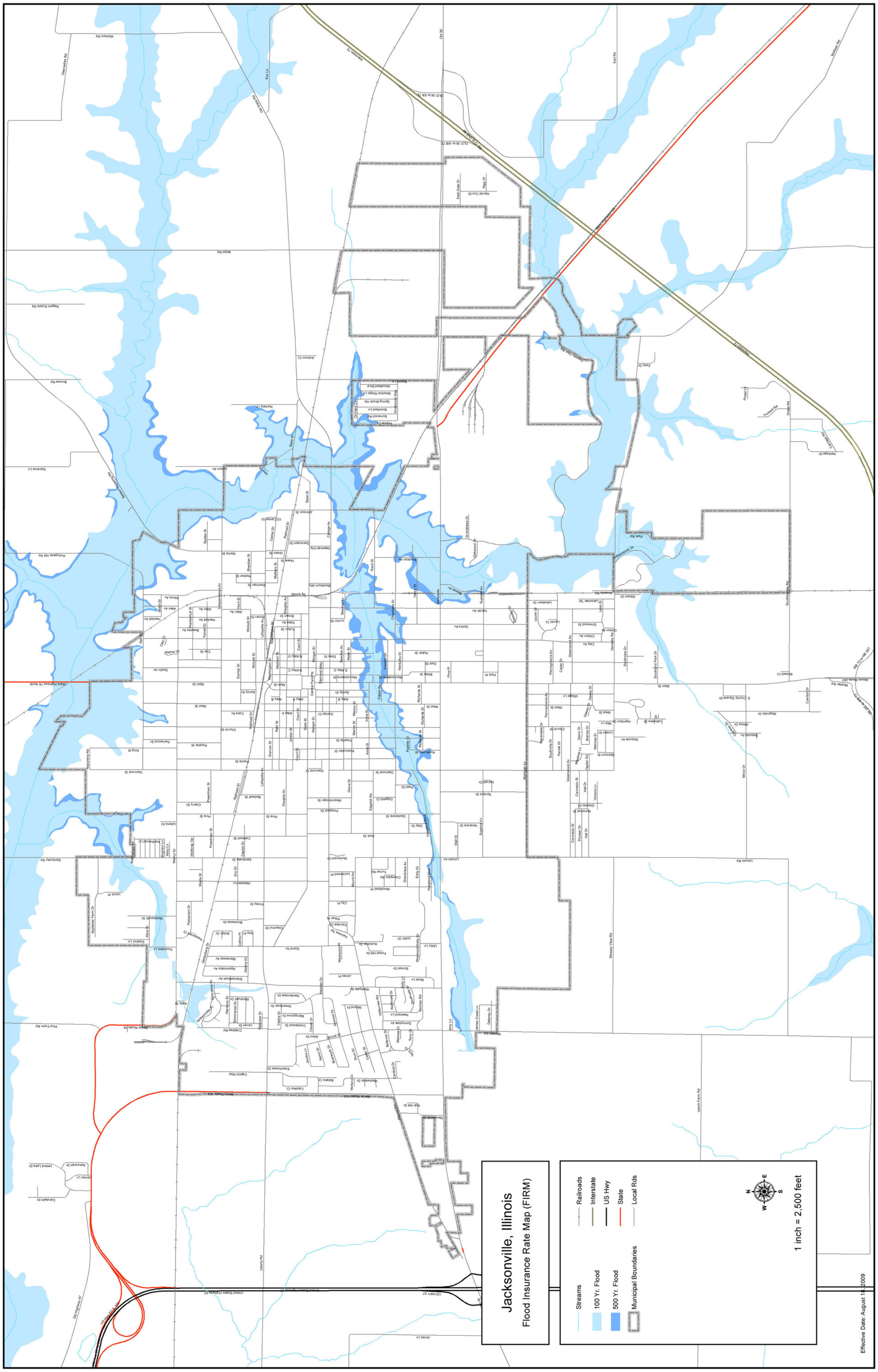
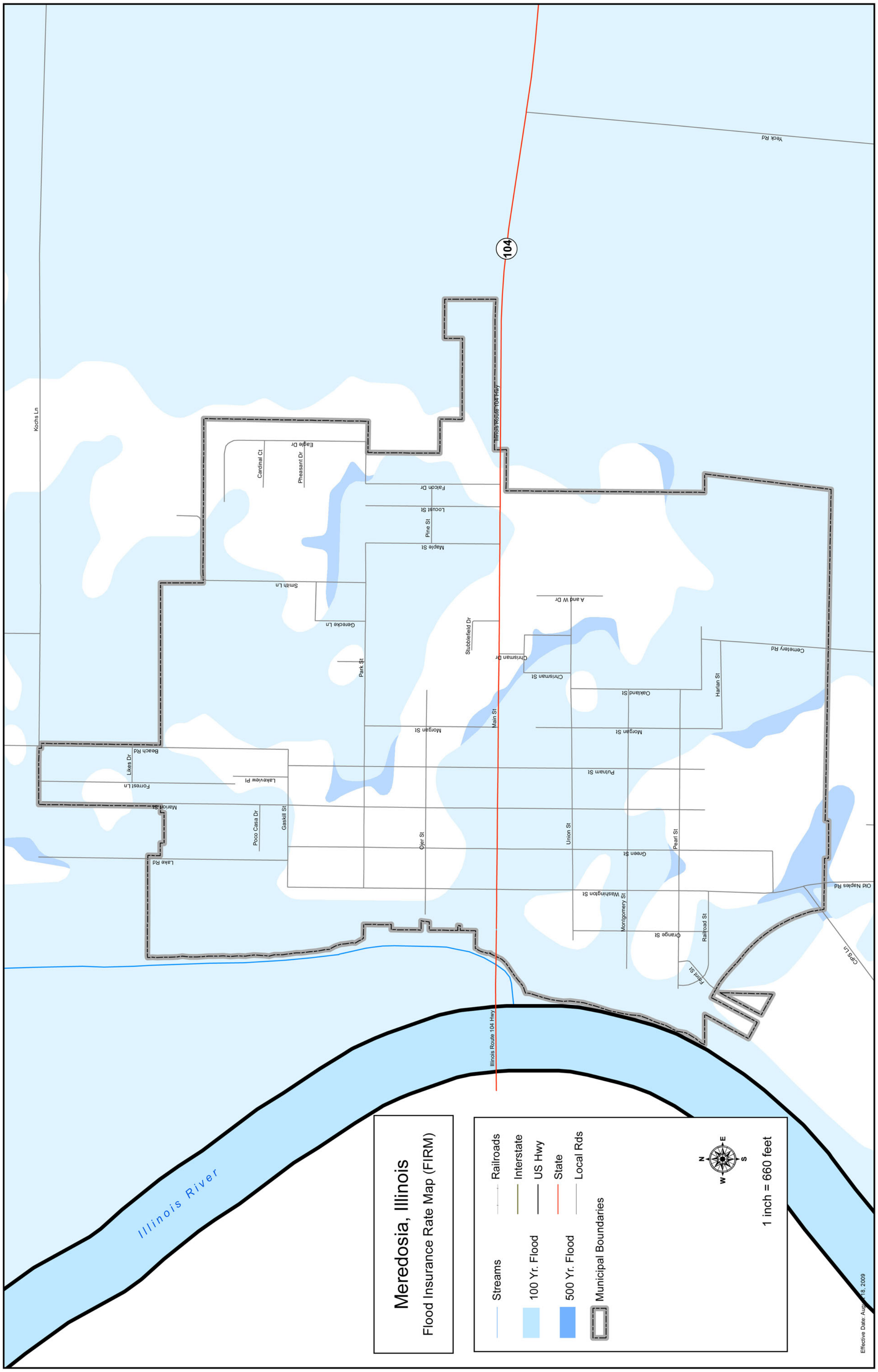
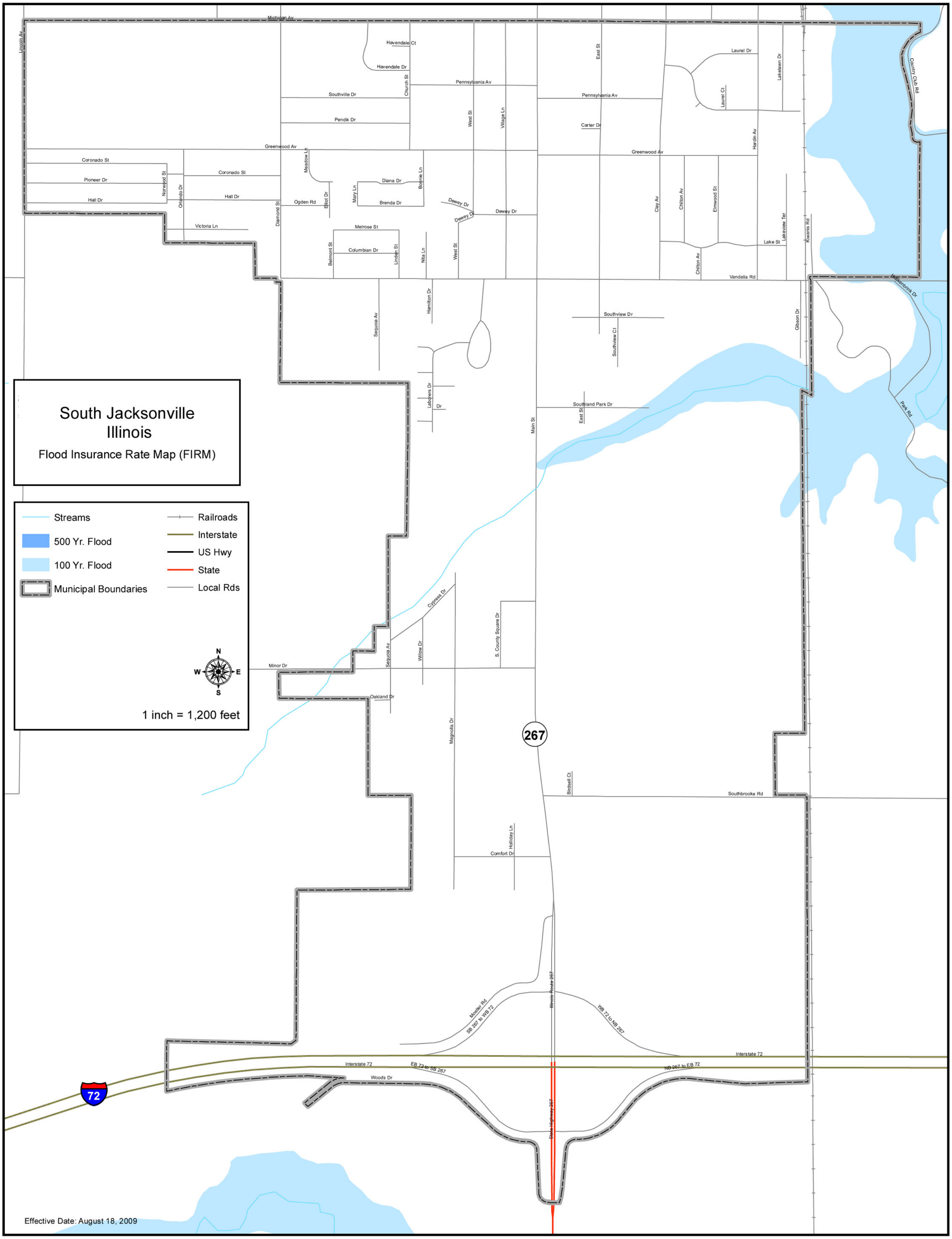
FLOODPLAIN MAPS FOR NFIP-PARTICIPATING MUNICIPALITIES

APPENDIX K


Jacksonville, Illinois
Flood Insurance Rate Map (FIRM)
Streams
100 Yr. Flood
500 Yr. Flood
Municipal Boundaries
Railroads
Interstate
US Hwy
State
Local Rds
1 inch = 2,500 feet
Effective Date: August 18, 2009

Appendix K


Meredosia, Illinois
Flood Insurance Rate Map (FIRM)
Streams
100 Yr. Flood
500 Yr. Flood
Municipal Boundaries
Railroads
Interstate
US Hwy
State
Local Rds
N
E
S
W
1 inch = 660 feet
Illinois River
104
Illinois Route 104 Hwy
Kochs Ln
Yeck Rd
Eagle Dr
Cardinal Ct
Pheasant Dr
Falcon Dr
Locust St
Pine St
Maple St
Smith Ln
Gerecke Ln
Park St
Stubblefield Dr
Chrisman Dr
Chrisman St
A and W Dr
Cemetery Rd
Oakland St
Harlan St
Morgan St
Main St
Beach Rd
Likes Dr
Lakeview Pl
Forrest Ln
Putnam St
Poco Casa Dr
Gaskill St
Dyer St
Union St
Pearl St
Green St
Lake Rd
Washington St
Old Naples Rd
Montgomery St
Orange St
Railroad St
CIPS Ln



South Jacksonville
Illinois
Flood Insurance Rate Map (FIRM)
Streams
500 Yr. Flood
100 Yr. Flood
Municipal Boundaries
Railroads
Interstate
US Hwy
State
Local Rds
N
W
E
S
1 inch = 1,200 feet
Effective Date: August 18, 2009
267
72
Interstate 72
Main St
Minor Dr
Southbrooke Rd
Vandalia Rd
Greenwood Av
Michigan Av

Appendix K

PLAN ADOPTION RESOLUTIONS

APPENDIX L

MORGAN COUNTY, ILLINOIS
Resolution of Adoption
of the
Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, MORGAN COUNTY, 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, MORGAN COUNTY, 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 Morgan 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, MORGAN COUNTY, ILLINOIS has participated in developing the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Morgan County:

NOW THEREFORE, be it resolved that MORGAN COUNTY, ILLINOIS

1. Adopts the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of MORGAN COUNTY, ILLINOIS and
2. Agrees to participate in the annual and 5-year updates to this Plan.

Passed this 12th day of May, 2014.

Bradley A. Zeller, Chairman

Bill Meier, Member

Dick Rawlings, Member

BZ aye
BM aye
DR aye

Certification:
Jill S. Waggener, County Clerk

RESOLUTION NO. 2014-R-075

RESOLUTION ADOPTING THE MORGAN MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN FOR THE CITY OF JACKSONVILLE, ILLINOIS, MORGAN COUNTY

WHEREAS, the City of Jacksonville, 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 City of Jacksonville, 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 Morgan 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 Jacksonville, Illinois has participated in developing the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Morgan County:

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Jacksonville, Illinois, that the City of Jacksonville hereby:

1. Adopts the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of the City of Jacksonville; and

2. Agrees to participate in the annual and 5-year updates to this plan.

PASSED AND APPROVED at a regular meeting of the City Council of the City of Jacksonville, Illinois this 12th day of May, 2014.

Andy Ezard

Andy Ezard, Mayor

ATTEST:

Skip Bradshaw

Skip Bradshaw, City Clerk

Village of Woodson, Illinois
Resolution of Adoption
of the
Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, Village of Woodson 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 Woodson 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 Morgan 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 Woodson has participated in developing the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Morgan County:

NOW THERFORE, be it resolved that the Village of Woodson hereby:

1. Adopts the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of Village of Woodson; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on June 2, 2014

CERTIFIED by Rhonda Cors
Rhonda Cors, Village President

(SEAL)

ATTESTED by Lisa Probst
Lisa Probst, Village Clerk

The Village of Franklin, Illinois
Resolution of Adoption of the
Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, the Village of Franklin 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 Franklin 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 Morgan 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 Franklin has participated in developing the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Morgan County:

NOW THERFORE, be it resolved that the Village of Franklin hereby:

1. Adopts the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of the Village of Franklin; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on 6-4-2014

CERTIFIED by Paul R Turpin, Jr.

Paul R Turpin, Jr.
Village President

(SEAL)

ATTESTED by Carol Seymour

Carol Seymour
Village Clerk

Village of South Jacksonville, Illinois
Resolution Adopting the
Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, the Village of South Jacksonville, 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;

WHEREAS, the Village of South Jacksonville, Illinois desires to prepare and mitigate for such natural hazards;

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;

WHEREAS, the Morgan 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 South Jacksonville, Illinois has participated in developing the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Morgan County.

NOW, THERFORE, be it resolved by the President and Board of Trustees of the Village of South Jacksonville, Morgan County, Illinois as follows:

1. The corporate authorities of the Village of South Jacksonville, Illinois adopt the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of Village of South Jacksonville; and
2. The corporate authorities of the Village of South Jacksonville, Illinois agree to participate in the annual and 5-year updates to the Plan.

Adopted and Approved by the President and Board of Trustees of the Village of South Jacksonville, Morgan County, Illinois, on the 5TH day of June, 2014.

Gordon D. Jumper, Village President

Attested by: Dani Glascock
Dani Glascock, Village Clerk

Village of Chapin, Illinois
Resolution of Adoption
of the
Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, Village of Chapin 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 Chapin 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 Morgan 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 Chapin has participated in developing the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Morgan County:

NOW THERFORE, be it resolved that the Village of Chapin hereby:

1. Adopts the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of Village of Chapin; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on 6-11-14

CERTIFIED by Kenneth L Drake
Kenneth L. Drake
Village President

ATTESTED by Rhea Drake
Rhea Drake
Village Clerk

Resolution # 714

ADOPTING THE MORGAN COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Village of Meredosia recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted multi-hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHERAS, the Village of Meredosia participated jointly in the planning process with the other local units of government within the County to prepare a Multi-Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the Village of Meredosia hereby adopts the Morgan County Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Morgan County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Multi-Hazard Mitigation Plan to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for final review and approval.

ADOPTED THIS 21ST Day of July, 2014.

Village President

Village Council Member

Village Trustee

Village Council Member

Village Council Member

Village Council Member

Attested by: Village Clerk

07/29/2014 13:59 Meredosia Village Hall (FAX)2175841911 P.002/002

Village of Murrayville, Illinois
Resolution of Adoption
Of the
Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan

WHEREAS, the Village of Murrayville 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 Murrayville desires to prepare and mitigate for such natural hazards; and

WHEREAS, under the Disaster Mitigation Act of 2000, the Unites 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 Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan was developed in accordance with the regulations of Disaster Mitigation Act of 2000 and the guidance provided by FEMA; and

WHEREAS, the Village of Murrayville has participated in developing the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan covering member jurisdictions of Morgan County;

NOW THERFORE, be it resolved that the Village of Murrayville Hereby:

1. Adopts the Morgan Multi-Jurisdictional Natural Hazards Mitigation Plan as the official Hazard Mitigation Plan of Village of Murrayville and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on October 7, 2014

CERTIFIED by ____________________
Village President

ATTESTED by Francis Fitzgerald
Village Clerk