Jo Daviess County
Multi-Jurisdictional
All Hazards Mitigation Plan

Participants

Apple Canyon Lake
Apple River, Village of
East Dubuque, City of
Elizabeth, City of
Galena, City of
The Galena Territory
Hanover, Village of
Jo Daviess County
Scales Mound, Village of
Stockton, Village of
Warren, Village of

March 2013

The five year update of this Plan must be completed on or before June 11, 2018.

ACKNOWLEDGEMENTS

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

The Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee included residents who live throughout the County. Their knowledge of the devastation caused by severe weather coupled with their commitment to protecting the lives, property, and welfare of Jo Daviess County residents were important ingredients needed to develop this Plan.

The Jo Daviess County Local Emergency Planning Committee was active in helping to initiate and sustain the planning process. Ron Data, Chuck Pedersen, and Steve Silberman represented the LEPC throughout the planning process as did other LEPC members including Peg Murphy and Matt Calvert from the Jo Daviess County Public Health Department; long-time Jo Daviess County Emergency Management Director Colin Fulrath; Jo Daviess County Sheriff Kevin Turner; Scott Allshouse of the Northwest Illinois Chapter of the American Red Cross; Susan Coers, IEMA Region 2 Regional Coordinator; Jo Daviess County Highway Engineer Steve Keeffer; and Annette McLane, Jo Daviess County Farm Bureau Manager.

Historic photographs emphasize that storm damages are not a recent phenomenon but can be difficult to find. Fortunately an array of historic photographs from the Galena and East Dubuque area were acquired for use in this Plan by Craig Albaugh, Facilities Manager for the City of Galena and Tom Lange, Assistant Chief of the East Dubuque Fire Department and Interim Director of the Jo Daviess County Emergency Management Agency. Historic flood information, news articles, and additional photographs were provided by Madelynn Wilharm of The Galena Territory.

Information to assemble this Plan also came from outside the County. Larry Acker and his family have kept the only source of continuous weather records in Northwest Illinois since 1883. Larry's great grandfather, William Edwin Acker, started keeping records when the Acker Brothers began farming in Polo. Larry lives on this Centennial farm where weather information is supplied to the National Weather Service. Before him, Larry's mother, Helen Johnston Acker, assisted in keeping weather records. The Acker site is the oldest continuous weather data site in Illinois that has not been moved to a different location.

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

JO DAVIESS COUNTY MULTI-JURISDICTIONAL ALL HAZARDS MITIGATION PLAN

JO DAVIESS COUNTY, ILLINOIS

TABLE OF CONTENTS

1.0 INTRODUCTION
- 1.1 PARTICIPATING JURISDICTIONS 1-2
- 1.2 DEMOGRAPHICS 1-2
- 1.3 LAND USE AND DEVELOPMENT TRENDS 1-5

2.0 PLANNING PROCESS
- 2.1 PLANNING COMMITTEE 2-2
- 2.2 PUBLIC INVOLVEMENT 2-5
- 2.3 PARTICIPATION OPPORTUNITIES FOR INTERESTED PARTIES 2-8
- 2.4 INCORPORATING EXISTING PLANNING DOCUMENTS 2-9

3.0 RISK ASSESSMENT
- 3.1 SEVERE STORMS (THUNDERSTORMS, HAIL, LIGHTNING & HEAVY RAIN) 3-2
- 3.2 SEVERE WINTER STORMS (SNOW, ICE & EXTREME COLD) 3-40
- 3.3 FLOODS 3-65
- 3.4 TORNADOES 3-105
- 3.5 DROUGHT 3-124
- 3.6 EXTREME HEAT 3-132
- 3.7 EARTHQUAKES 3-138
- 3.8 DAMS 3-149
- 3.9 MAN-MADE HAZARDS 3-155
  - 3.9.1 Hazardous Substances 3-155
    - 3.9.1.1 Generation 3-156
    - 3.9.1.2 Transportation 3-156
  - 3.9.2 Waste Disposal 3-160
  - 3.9.3 Hazardous Material Incidents 3-160
  - 3.9.4 Waste Remediation 3-162
  - 3.9.5 Terrorism 3-163

4.0 MITIGATION STRATEGY
- 4.1 HAZARD MITIGATION GOALS 4-1
- 4.2 IDENTIFYING, ANALYZING & PRIORITIZING MITIGATION ACTIONS 4-2

4.2.1 Identification and Analysis 4-2
4.2.2 Prioritization 4-3
4.3 IMPLEMENTING MITIGATION ACTIONS 4-4
4.4 MITIGATION STRATEGY RESULTS 4-4

5.0 RECOMMENDATIONS 5-1

6.0 PLAN MAINTENANCE
6.1 MONITORING, EVALUATING & UPDATING THE PLAN 6-1
6.1.1 Monitoring and Evaluating the Plan 6-1
6.1.2 Updating the Plan 6-2
6.2 INCORPORATING THE MITIGATION STRATEGY INTO EXISTING PLANNING MECHANISMS 6-2
6.3 CONTINUED PUBLIC INVOLVEMENT 6-3

7.0 PLAN ADOPTION
7.1 PLAN ADOPTION PROCESS 7-1

8.0 REFERENCES 8-1

APPENDICES

County Resolution Authorizing the Development of the Plan ..... APPENDIX A
Planning Committee Meeting Attendance Sheets ..... APPENDIX B
Planning Committee Meeting Minutes ..... APPENDIX C
Citizen Questionnaire and News Release ..... APPENDIX D
Frequently Asked Questions Fact Sheet ..... APPENDIX E
Media Outlets Serving Jo Daviess County and News Articles ..... APPENDIX F
Public Forum – Planning Process Handout ..... APPENDIX G
Public Forum – Plan Comment Sheet ..... APPENDIX H
Business Community Participation Packet ..... APPENDIX I
Hazard Mitigation Planning Letter Sent to Adjacent Counties ..... APPENDIX J
Historic Natural Hazard Events New Articles ..... APPENDIX K
Floodplain Maps for NFIP-Participating Municipalities ..... APPENDIX L
Historic Flood Photographs ..... APPENDIX M
Plan Adoption Resolutions ..... APPENDIX N

LIST OF FIGURES

Figure 1 Federal Disaster Declarations for Jo Daviess County 1-1
Figure 2 Participating Jurisdictions Represented in the Plan 1-2
Figure 3 Location Map 1-3
Figure 4 Demographic Data by Participating Jurisdiction 1-4
Figure 5 Description of Planning Process 2-1
Figure 6 Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee Member Attendance Record 2-3

LIST OF FIGURES CONTINUED…

Figure 7 Existing Planning Documents by Participating Jurisdiction 2-9
Figure 8 Wind Speed Conversions 3-3
Figure 9 Hail Size Descriptions 3-4
Figure 10 TORRO Hailstorm Intensity Scale 3-5
Figure 11 Severe Storms – Thunderstorm with Damaging Winds Reported in Jo Daviess County 3-15
Figure 12 Severe Storms – Hail Events Reported in Jo Daviess County 3-27
Figure 13 Severe Storms – Lightning Events Reported in Jo Daviess County 3-30
Figure 14 Severe Storms – Heavy Rain Events Reported in Jo Daviess County 3-31
Figure 15 Thunderstorms & High Wind Events by Month 3-7
Figure 16 Thunderstorms & High Wind Events by Hour 3-7
Figure 17 Hail Events by Month 3-8
Figure 18 Hail Events by Hour 3-9
Figure 19 Heavy Rain Events by Month 3-9
Figure 20 Heavy Rain Events by Hour 3-10
Figure 21 Verified Severe Storm Events by Participating Municipality 3-11
Figure 22 Severe Weather Crash Data for Jo Daviess County 3-13
Figure 23 Wind Chill Chart 3-41
Figure 24 Severe Winter Storms - Snow & Ice Events Reported in Jo Daviess County 3-51
Figure 25 Extreme Cold Events Reported in Jo Daviess County 3-63
Figure 26 Severe Winter Storms by Month 3-44
Figure 27 Severe Winter Storms by Hour 3-45
Figure 28 Extreme Cold Events by Month 3-45
Figure 29 Severe Winter Weather Crash Data for Jo Daviess County 3-49
Figure 30 Floodplain Illustration 3-67
Figure 31 Example of a Flood Insurance Rate Map (FIRM) 3-68
Figure 32 General Flood Events Reported in Jo Daviess County 3-90
Figure 33 Flash Flood Events Reported in Jo Daviess County 3-96
Figure 34 Flood Events by Month 3-72
Figure 35 Flood Events by Hour 3-73
Figure 36 Bodies of Water Subject to Flooding in Jo Daviess County 3-74
Figure 37 Floodplain Areas in Jo Daviess County 3-75
Figure 38 NFIP Participating Jurisdictions 3-74
Figure 39 Flood Events by Participating Jurisdiction 3-77
Figure 40 Repetitive Flood Loss Properties 3-82
Figure 41 Existing Residential Buildings Vulnerable to Flooding 3-83
Figure 42 Calculation of Average Assessed Value 3-86
Figure 43 Average Market Value of Housing Units 3-87
Figure 44 *Structure* – Potential Dollar Loss Calculations 3-87
Figure 45 *Content* – Potential Dollar Loss Calculations 3-88
Figure 46 Estimated Potential Dollar Losses to Potentially-Damaged Housing Units from a Riverine Flood Event 3-88
Figure 47 Fujita & Enhanced Fujita Tornado Measurement Scales 3-106
Figure 48 Tornadoes Reported in Jo Daviess County 3-108

LIST OF FIGURES CONTINUED…

Figure 49 Tornadoes by Magnitude 3-107
Figure 50 Tornadoes by Month 3-109
Figure 51 Tornado Touchdowns in Jo Daviess County: 1950 – 2011 3-110
Figure 52 Verified Tornado Touchdowns In or Near Participating Municipalities 3-111
Figure 53 Calculation of Average Housing Unit Density (Housing Units/Square Mile) ... 3-113
Figure 54 Existing Housing Units by Township 3-114
Figure 55 Jo Daviess County Township Boundaries 3-115
Figure 56 Calculation of Potentially-Damaged Existing Housing Units 3-115
Figure 57 Estimated Number of Housing Units by Township Potentially Damaged by a Tornado 3-116
Figure 58 Estimated Number of Housing Units by Municipality Potentially Damaged by a Tornado 3-119
Figure 59 Calculation of Potentially-Damaged Housing Units for Municipalities Covering Less Than One Square Mile 3-120
Figure 60 Calculation of Averaged Assessed Value 3-121
Figure 61 Average Market Value of Housing Units 3-121
Figure 62 *Structure* – Potential Dollar Loss Calculation 3-122
Figure 63 *Content* – Potential Dollar Loss Calculation 3-122
Figure 64 Estimated Potential Dollar Losses to Potentially-Damaged Housing Units from a Tornado 3-123
Figure 65 Palmer Classification System 3-125
Figure 66 Palmer Drought Severity Index Map 3-126
Figure 67 U.S. Drought Monitor – Drought Severity Classifications 3-127
Figure 68 U.S. Drought Monitor Map 3-128
Figure 69 Crop Yield Reductions Due to Drought in Jo Daviess County 3-130
Figure 70 Heat Index 3-133
Figure 71 Relationship between Heat Index and Heat Disorders 3-134
Figure 72 Fault Illustration 3-139
Figure 73 Earthquake Magnitude Classes 3-140
Figure 74 Comparison of Richter Scale and Modified Mercalli Scale 3-141
Figure 75 Approximate Number of Earthquakes Recorded Annually 3-142
Figure 76 Geological Structures in Northern Illinois 3-143
Figure 77 Potential Earthquake Impacts 3-147
Figure 78 Dam Hazard Classification System 3-150
Figure 79 Privately-Owned Classified Dams Located in Jo Daviess County 3-151
Figure 80 Locations of Classified Dams in Jo Daviess County 3-153
Figure 81 Generators of Solid & Liquid Hazardous Substances – 2010 3-156
Figure 82 Roadway Accidents Involving Shipments of Hazardous Products: 2007 - 2011 3-157
Figure 83 Railroad Accident Classification Categories 3-157
Figure 84 Railway Accidents/Incidents Involving Hazardous Substances: 2001 – 2011 ... 3-158
Figure 85 Railway Accidents/Incidents Involving Non-Hazardous Substances: 2001 - 2011 3-159
Figure 86 HazMat Incidents in Jo Daviess County: 2007 – 2011 3-161

LIST OF FIGURES CONTINUED…

Figure 87 Hazard Mitigation Goals 4-1
Figure 88 Mitigation Action Categorization 4-2
Figure 89 Mitigation Action Prioritization Methodology 4-3
Figure 90 Jo Daviess County Hazard Mitigation Actions 4-5
Figure 91 Apple Canyon Lake Hazard Mitigation Actions 4-25
Figure 92 Apple River Hazard Mitigation Actions 4-26
Figure 93 East Dubuque Hazard Mitigation Actions 4-28
Figure 94 Elizabeth Hazard Mitigation Actions 4-30
Figure 95 Galena Hazard Mitigation Actions 4-32
Figure 96 The Galena Territory Hazard Mitigation Actions 4-36
Figure 97 Hanover Hazard Mitigation Actions 4-38
Figure 98 Scales Mound Hazard Mitigation Actions 4-40
Figure 99 Stockton Hazard Mitigation Actions 4-43
Figure 100 Warren Hazard Mitigation Actions 4-47
Figure 101 Plan Adoption Dates 7-1

Researched and written for the Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee
by Greg R. Michaud and Andrea J. Bostwick
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 Jo Daviess County. Since 1965, Jo Daviess County has had 11 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 Jo Daviess County

Declaration #	Year	Type of Natural Hazard(s) Event
194	1965	severe storms, flooding and tornadoes
262	1969	flooding
276	1969	flooding
373	1973	severe storms and flooding
438	1974	severe storms and flooding
871	1990	severe winds, thunderstorms, torrential rains, flooding and tornadoes
997	1993	flooding
1278	1999	torrential rains and flash flooding
1368	2001	flooding
1935	2010	severe storms and torrential rains
1960	2011	severe winter storm

In addition, in the past decade alone, there have been 70 thunderstorms with damaging winds, 44 flood and flash flood events, 36 severe winter storms (snow and ice), 28 heavy rain events, 25 severe hail storms, 5 extreme cold event, 4 lightning strike events, 2 tornadoes, 1 drought and 2 earthquakes 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 and man-made hazards. This process helps the County and participating jurisdictions reduce their risk from natural and man-made 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 an all hazards mitigation plan.

Why prepare an all hazards mitigation plan?

By preparing and adopting an all 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?

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

1.1 PARTICIPATING JURISDICTIONS

Recognizing the benefits that could be gained from preparing an all hazards mitigation plan, the Jo Daviess County Board passed a resolution on April 11, 2011 authorizing the development of the Jo Daviess County Multi-Jurisdictional All 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 Jo Daviess County to participate. **Figure 2** identifies the participating jurisdictions that are represented in the Plan. The Jo Daviess County Emergency Management Agency administered the Plan.

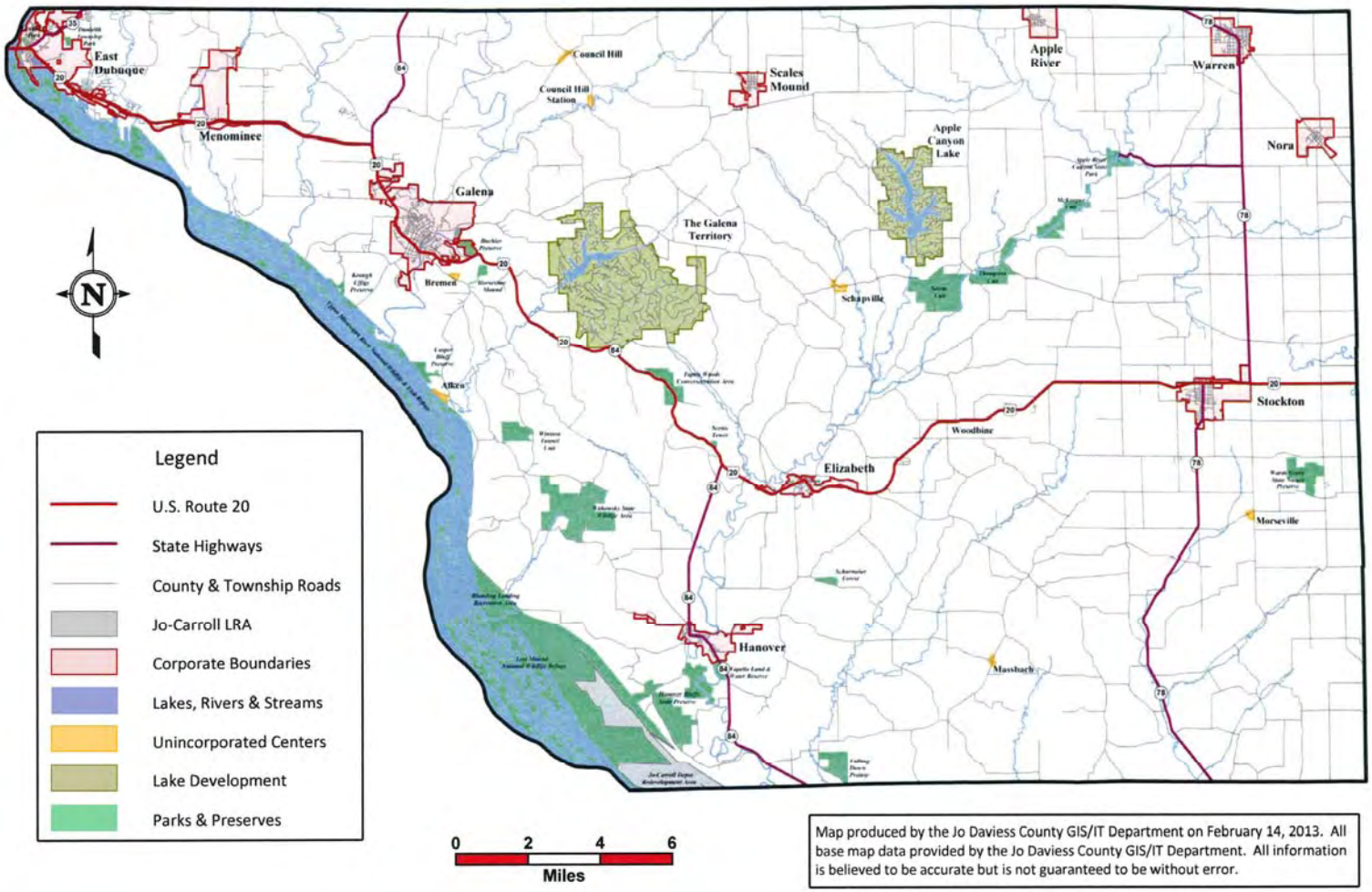
Figure 2
Participating Jurisdictions Represented in the Plan

- Apple Canyon Lake
- Apple River, Village of
- East Dubuque, City of
- Elizabeth, Village of
- Galena, City of
- The Galena Territory
- Hanover, Village of
- Scales Mound, Village of
- Stockton, Village of
- Warren, Village of

1.2 DEMOGRAPHICS

Jo Daviess County is located in the northwest corner of Illinois and covers approximately 619 square miles. **Figure 3** provides a location map of Jo Daviess County and the participating jurisdictions. The topography of the County is unique relative to the rest of Illinois because it is part of the Wisconsin Driftless Region bypassed by continental glaciers during the Ice Age. As a result the terrain is rugged with sharp contrasts and characterized by numerous bluffs, ravines and palisades. Among its elevations are most of the highest points in the State, including Charles Mound, Benton Mound, Scales Mound and Horseshoe Mound.

Figure 3
Location Map



The County bounded to the west by the Mississippi River, to the north by the Illinois/Wisconsin border, to the east by Stephenson County and to the south by Carroll County. The county seat is located in Galena. Agriculture is the major industry of the County followed by tourism services and manufacturing.

According to the 2007 Census of Agriculture, there were 1,016 farms in Jo Daviess County occupying approximately 73% (281,457 acres) of the total acreage in the County. Grain and hay farming and livestock production are the predominant agriculture activities in the County. The major crops include corn, soybeans and hay while the major livestock includes beef and dairy cows and hogs. The County ranks first in the State for hay and oat production and total cattle and calves inventory and fourth in the State for corn for silage production. Jo Daviess ranks in the top 10 Illinois counties for livestock cash receipts and in the top 65 for crop cash receipts.

Tourism services are an area of growth in Jo Daviess County, especially in and around the Galena area. Two of the top three major employers in the County cater to tourists. Manufacturing in the County is primarily located in Stockton, Hanover and Galena where auto parts, auto and appliance controls, and electrical switches are produced and metal engraving takes place. The County also has an active mineral operation, including a number of quarries that provide sand and gravel for building material and crushed rock for roads. Limestone is also used as a source of agricultural lime. Other important industries located in the County include education and retail trade.

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 Jo Daviess County is approximately one-third of the market value.

Figure 4
Demographic Data by Participating Jurisdiction

Participating Jurisdiction	Population (2010)	Projected Population (2020)	Land Area (Sq. Miles) (2010)	Number of Housing Units (2010)	Housing Unit Density (Units per Sq. Mile)	Total Assessed Value of Housing Units (2011)
Jo Daviess County (unincorporated)	11,908	14,667	588.703	7,963	14	$86,819,019
Apple River	366	451	0.793	195	---	$2,847,229
East Dubuque	1,704	2,099	2.810	830	296	$22,911,883
Elizabeth	761	937	0.775	409	---	$9,215,023
Galena	3,429	4,223	4.162	1,960	471	$69,446,933
Hanover	844	1,040	1.053	474	451	$8,335,991
Scales Mound	376	463	0.228	183	---	$4,535,079
Stockton	1,862	2,293	1.596	867	544	$20,842,505
Warren	1,428	1,759	0.967	693	---	$17,439,140

Sources: Berlage, Donna, Jo Daviess County Chief County Assessment Office.
Illinos Department of Commerce and Economic Opportunity, Projection Summary by County.
U. S. Census Bureau, 2010 Census U.S. Gazetteer Files.
U.S. Census Bureau, American FactFinder.

1.3 LAND USE AND DEVELOPMENT TRENDS

Population growth and economic development are two major factors that trigger changes in land use. Jo Daviess County is largely rural with a population that experienced an increase of 1.7% between 2000 and 2010. Since 1970, the County's population has experienced modest increases, except between 1980 and 1990 when the population decreased by 7.8%. Apple River, East Dubuque, Galena, Scales Mound, Stockton and Warren have all experienced modest declines in their populations since 2000, while Elizabeth and Hanover have seen modest increases. While most of the municipalities saw declines in their populations, unincorporated Jo Daviess County saw an increase of 6.7% in its population. This can most likely be attributed to the growth at two residential developments: Apple Canyon Lake and The Galena Territory.

According to the Jo Daviess County Comprehensive Plan, agricultural and rural lands account for 84.2% of the existing land use in the County. This is followed by public open spaces, parks and preservation lands at 7.2%. Agriculture is and will continue to be a vital part of the County's economy.

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

2.0 PLANNING PROCESS

2.0 PLANNING PROCESS

The Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan (the Plan) was developed through the Jo Daviess County Multi-Jurisdictional All 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. (This task incorporates two of FEMA's steps: assessing the hazard and assessing the problem.) In addition, the top five man-made hazards identified by the Committee were profiled.
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. (This task incorporates two of FEMA's steps: adopt the plan and implement, evaluate and revise the plan.)

Plan development was led at the staff level by Tom Lange, the Interim Emergency Management Agency Director. 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 all 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 Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee was formed. The Planning Committee included representatives from each participating jurisdiction, as well as agriculture, education, emergency services (Red Cross, ambulance, fire and law enforcement), GIS, healthcare, and insurance.

Figure 6 details the entities represented on the Planning Committee and the individuals who attended on their behalf. The Planning Committee was chaired by the Jo Daviess County Emergency Management Agency.

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
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee Member Attendance Record

Representing	Name	3/30/2012	6/14/2012	8/30/2012	11/8/2012	3/7/2013
American Red Cross	Allshouse, Scott	X	X	X	X	
Apple Canyon Lake	Gabel, Marc			X	X	
Apple Canyon Lake	Hachmeister, Dave	X	X	X	X	X
Apple Canyon Lake	Richardson, Jim		X			
Apple River, Village of	Maupin, Tim	X	X	X	X	
Apple River, Village of	Stiefel, Margaret	X	X		X	
Apple River, Village of	Toepfer, F. Jane		X	X	X	X
Country Financial Insurance Company	Dittmar, Bob	X		X	X	X
East Dubuque, City of	Barklow, Geoff	X	X	X	X	X
Elizabeth, Village of	Toot, Scott	X	X	X	X	X
Galena, City of	Albaugh, Craig	X	X	X		X
Galena, City of	Kieffer, Nate	X		X		
Galena, City of	Lewis, Andy				X	X
Galena, City of	Rigdon, Jim	X				
Galena, City of	Stewart, Duff					X
Galena Territory Association Inc.	Lubcke, Emily					X
Galena Territory Association Inc.	Oldenburg, Dave		X	X	X	X
Galena Territory Association Inc.	Wilharm, Madelynn		X	X	X	
Hanover, Village of	Schiable, Don		X			X
Hanover, Village of	Temperly, Kay	X		X	X	
Jo Daviess Co. - Administrator	Reimer, Daniel	X	X		X	X
Jo Daviess Co. - Assessment Office	Berlage, Donna	X		X	X	X
Jo Daviess Co. - Board	Behlke, Brandon					X
Jo Daviess Co. - Board	Bingham, William					X
Jo Daviess Co. - Board	Jobgen, Randy					X
Jo Daviess Co. - Board	Schultz, Marvin	X		X	X	
Jo Daviess Co. - Board	Smith, Ron					X
Jo Daviess Co. - Board	Winkelhake, RJ					X
Jo Daviess Co. - Building & Zoning Office	Delvaux, Linda	X	X	X		X
Jo Davies Co. - Clerk & Recorder's Office	Dimke, Jean	X	X			
Jo Daviess Co. - EMA	Lange, Tom	X	X	X	X	X
Jo Daviess Co. - Farm Bureau	McLain, Annette	X	X	X	X	
Jo Daviess Co. - GIS/IT	Gempler, Bret		X			
Jo Daviess Co. - GIS/IT	Kratcha, Joe	X		X		X
Jo Daviess Co. - GIS/IT	Williams, Diane				X	
Jo Daviess Co. - Health Department	Calvert, Matt	X	X	X	X	X
Jo Daviess Co. - Health Department	Lewis, Nancy					X
Jo Daviess Co. - Health Department	Murphy, Peg	X		X	X	X
Jo Daviess Co. - Highway Department	Keeffer, Steve	X	X	X	X	X
Jo Daviess Co. - LEPC	Data, Ron	X	X	X		X
Jo Daviess Co. - LEPC	Pedersen, Charles	X	X	X	X	X
Jo Daviess Co. - LEPC	Roling, Dave		X			
Jo Daviess Co. - LEPC	Silberman, Steve	X	X	X		X
Jo Daviess Co. - Sheriff's Office	Hachmeister, Dave	X	X	X	X	X
Jo Daviess Co. - Sheriff's Office	Moser, Mike		X			X
Jo Daviess Co. - Sheriff's Office	Turner, Kevin	X	X	X	X	X
Johnson, Depp & Quisenberry	Bostwick, Andrea	X	X	X	X	X
Johnson, Depp & Quisenberry	Michaud, Greg	X	X	X	X	X
Public Representative	Fulrath, Colin	X		X		X
Scales Mound, Village of	Foley, Ruth		X	X	X	X
Stockton, Village of	Rice, Steve	X	X	X	X	X
Stephenson Co. - EMA	Baker, Robert			X		
Telegraph Herald	Mandel, Eric		X			
Warren, Village of	Bourquin, Luke	X	X		X	X
Warren, Village of	Brinker, Cindy	X	X	X	X	X
Warren, Village of	Raisbeck, Wayne	X		X	X	X
Weather Reporter	Acker, Larry	X	X	X	X	X
Weather Reporter	Winslow, Cathy		X	X	X	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 Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee is to develop a mitigation plan that can reduce the negative impacts of natural and man-made hazards on citizens, infrastructure, private property and critical facilities."

Planning Committee Meetings

The Planning Committee met five times between March 2012 and March 2013. **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 – March 30, 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 an all hazards mitigation plan is and why one should be prepared. Drafts of the mission statement and mitigation goals were presented. Representatives for the County and the participating jurisdictions were asked to complete the forms entitled "List of Existing Planning Documents" 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 – June 14, 2012

At the second Planning Committee meeting the natural and man-made hazard risk assessment sections 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 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 – August 30, 2012

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. Sections of the Plan focusing on the vulnerability assessment were presented for review.

Fourth Planning Committee Meeting – November 8, 2012

At the fourth meeting the sections of the 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 – March 7, 2013

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 and man-made hazards identified in the Plan. The following public involvement techniques and practices were applied to give the public an opportunity to access information and participate in the dialogue at their level of interest and availability.

Citizen Questionnaire

A citizen questionnaire was created to gather facts and gauge public perceptions about natural hazards. The questionnaire was made available at the offices of participating jurisdictions and on the County's website. A new release was issued in April 2012 informing County and municipal residents how they could provide information on how severe storms have affected their life and property by completing the citizen questionnaire. A copy of the questionnaire and news release are contained in **Appendix D**.

A total of 41 questionnaires were completed and returned to the Planning Committee. The questionnaires were filled out by residents of unincorporated Jo Daviess County as well as all of the participating municipalities. These 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 of countywide sentiment as to the types of projects that are more likely to receive public support. A review of the questionnaires indicated the following:

- Severe storms (thunderstorms, hail, lightning and heavy rain) and severe winter storms have been the most frequently encountered natural hazards in Jo Daviess County. This response is consistent with weather records compile for Jo Daviess County and described in this Plan.
- Electronic media (television, internet and radio) and print media were identified as the most effective ways to disseminate information about natural hazards. Of the electronic media choices, the internet was recognized as the most favored means of dissemination followed closely by television and radio. Fact sheets distributed via mail also received strong support among respondents.
- Five 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 (56%);
  - provide flood or drainage protection (49%) – the respondents who selected this category felt that culverts and drainage ditch maintenance were the most needed activity;
  - install sirens or other alert systems (46%);
  - identify residents with special needs in order to provide assistance during a natural hazard event (44%); and
  - maintain roadway passage during snow storms and heavy rains (41%).

FAQ Fact Sheet

A "Frequently Asked Questions" fact sheet was created to explain what an all hazard mitigation plan is and briefly explain the planning process. The fact sheet was made available at the 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 media outlets prior to each Planning Committee meeting. The releases announced the purpose of the meetings and how the public could become involved in the Plan's development. **Appendix F** contains a list of the media outlets that received the new releases and copies of the news articles that were printed.

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 March 7, 2013, 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 Plan; meet with representatives from the County, the participating local government entities and the Consultant to discuss the Plan; ask any questions; and provide comments on the Plan. Individuals attending the public forum were provided with a two-page handout summarizing the planning process and a comment sheet that could be used to provide feedback on the draft Plan. **Appendices G** and **H** contain copies of these materials.

Public Comment Period

After the public forum, the draft Plan was made available for public review and comment through March 21, 2013 at the Jo Daviess County Courthouse and on the County's website. Residents were encouraged to submit their comments electronically, by mail or through representatives of the Planning Committee.

Results of Public Involvement

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

- *Discovered previously unidentified documentation about natural hazards*. Verifiable hazard event and damage information was obtained from participants that presents a clearer assessment of the extent and magnitude of natural hazards that have impacted the County. This information included damage estimates for thunderstorms with damaging winds, hail and severe winter storms.

  Words alone cannot convey the scope of the damages caused by natural hazard events. In response to a request for pictures, a large number of historic and recent photographs depicting floods, winter storms, and wind and hail damage were provided by committee members. These images are powerful and have been included in an appendix.

- *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 nearly 200 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

Assertive outreach to the business community began early in the planning process. Contact with local chambers of commerce was initiated through telephone calls and direct mail. These contacts clearly described the value of mitigation planning to various kinds of business based on this message: "maintaining business operations after a natural hazard event strikes begins before the hazard hits with mitigation planning." How customers and employees are impacted can make the difference between staying in business and closing.

Information packets were sent to the Chambers of Commerce Elizabeth, Galena, Hanover, Scales Mound, Stockton and Warren and included a letter from Tom Lange, Interim Emergency Management Director, a fact sheet describing the ease and various opportunities for businesses to have input, and an American Red Cross brochure designed specifically for businesses describing how employees, customers, and the business facility can be protected from natural hazard events. **Appendix I** contains copies of these materials.

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 is the dominant business in Jo Daviess County. Virtually every aspect of life in Jo Daviess County is affected by agriculture. Consequently, input was sought from the agricultural community which responded positively to being involved.

Input from the insurance industry was also needed to provide balance and context for discussions on property damages, not only to agriculture, but also to residences. An experienced and well respected local insurance agent represented the insurance industry and his perspectives on storm damages were invaluable to the development of the Plan.

Not-For-Profit Organizations

The Jo Daviess County Local Emergency Planning Committee (LEPC) shared some of the initiative in encouraging both the development of and local participation in this planning process. LEPC members were active in many activities including disseminating information about the need for this Plan, providing facts about storms and damages, obtaining photographs, and securing locations for planning committee meetings. The LEPC also hosted a preliminary meeting to the planning process on January 17, 2012 in Galena. At this meeting the framework for the planning process was described along with an explanation of the various opportunities for public involvement available throughout the process.

The American Red Cross served on the planning committee. The representative, Scott Allshouse, also works with the Salvation Army. He has exceptional experience in mitigation and emergency management in Jo Daviess County and throughout northwestern Illinois. With his background, he was able to provide a considerable amount of input.

The Blackhawk Hills Regional Council, located in adjacent Whiteside County, is a not-for-profit organization that provides community planning, natural resource protection, and grant writing services to northwestern Illinois. Their planning documents provided information useful in the development of this Plan.

Neighboring Counties

The EMA/ESDA offices in neighboring counties have worked cooperatively on various emergency management activities. An announcement was sent to EMA/ESDA offices in all of the neighboring counties inviting participation in the mitigation planning process. **Appendix J** contains a copy of the invitation memo. Robert Baker, Stephenson County EMA Assistant Director attended the August 30, 2012 Planning Committee meeting.

2.4 INCORPORATING EXISTING PLANNING DOCUMENTS

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

Figure 7
Existing Planning Documents by Participating Jurisdiction

Existing Planning Documents	Participating Jurisdiction								
	Jo Daviess County	Apple River	East Dubuque	Elizabeth	Galena	Hanover	Scales Mound	Stockton	Warren
Plans									
Comprehensive Plan	X		X	X	X	X	X	X	
Emergency Management Plan			X	X	X		X	X	X
Land Use Plan	X		X	X	X			X	
Codes & Ordinances									
Building Codes	X			X	X	X	X	X	
Drainage Ordinances			X		X			X	X
Historic Preservation Ordinance					X		X	X	
Subdivision Ordinance(s)	X		X	X	X		X	X	X
Zoning Ordinances	X		X		X	X	X	X	X
Maps									
Existing Land Use Map			X	X	X	X		X	X
Infrastructure Map				X	X	X	X	X	X
Zoning Map	X		X		X	X	X	X	X
Flood-Related									
Flood Ordinance(s)	X		X		X	X		X	
Flood Insurance Rate Maps	X		X		X	X		X	
Repetitive Flood Loss List									
Elevation Certificates for Buildings	X				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 and man-made hazards in order to estimate the potential loss of life, personal injury, economic injury and property damage resulting from natural and man-made hazards. This section summarizes the results of the risk assessment conducted on the natural and man-made hazards that pose a threat to Jo Daviess 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 and man-made hazards that pose a threat to the County and includes a profile of each which identifies past occurrences, the severity or extent of the hazard, and the likelihood of future occurrences. It also provides a vulnerability assessment which identifies the impacts to public health and property, evaluates the assets of the participating jurisdictions (i.e., residential buildings, critical facilities and infrastructure) and estimates the potential impacts each natural and man-made 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 and man-made 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 and man-made hazard events and reviewed information about various natural and man-made hazards. After much discussion, they chose to include the following natural and man-made hazards in this Plan:

- severe storms (thunderstorms, hail, lighting & heavy rain)
- severe winter storms (snow, ice & extreme cold)
- flood
- tornadoes
- drought
- extreme heat
- earthquakes
- dams
- man-made hazards including:
  - hazardous substances (generation & transportation)
  - waste disposal
  - hazardous materials incidents
  - waste remediation
  - terrorism

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 know 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/mothball	2.50 in.	tennis ball
0.75 in.	penny	2.75 in.	baseball
0.88 in.	nickel	3.00 in.	tea cup
1.00 in.	quarter	4.00 in.	grapefruit
1.50 in.	ping pong ball	4.50 in.	softball

Source: NOAA, National Severe Storm Laboratory.

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

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

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

Figure 10
TORRO Hailstorm Intensity Scale

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

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

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

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,

NOAA's 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 of the Quad Cities, Iowa/Illinois is responsible for issuing ***severe thunderstorm watches*** and ***warnings*** for Jo Daviess 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 a severe thunderstorm to develop. The watch will tell individuals when and where a severe thunderstorm is likely to occur.
- **Warning.** A severe thunderstorm warning is issued when severe weather (i.e., hail 1 inch in diameter or greater and/or damaging winds of 58 miles or greater) has been reported by spotters or indicated on radar. Warnings indicate imminent danger to life and property for those who are in the path of the storm.

PROFILING THE HAZARD

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

Figures 11, **12**, **13**, and **14**, located at end of this section, summarize the previous occurrences as well as the extent or magnitude of severe storm events recorded in Jo Daviess 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 Jo Daviess County.

Thunderstorms with Damaging Winds

The National Oceanic and Atmospheric Administration's Storm Events Database has documented 119 reported occurrences of thunderstorms with damaging winds in Jo Daviess County between 1957 and 2011. Of the 119 occurrences, 92 had reported wind speeds of 50 knots or greater. There were 27 occurrences, however, where the wind speed was not recorded.

The highest wind speed recorded in Jo Daviess County occurred at Woodbine and Warren on February 11, 1999 when winds reached 70 knots (81 mph) during a thunderstorm event. The second highest recorded wind speed occurred on May 28, 1998 when wind speeds reached 66 knots (76 mph)

Severe Storms Fast Facts – Jo Daviess County

Number of Thunderstorms with Damaging Winds (1957 – 2011): ***119***

Number of Severe Hail Events (1974 – 2011): ***38***

Number of Heavy Rain Events (1998 – 2011): ***34***

Highest Recorded Wind Speed: ***70 knots (81 mph)***

Largest Hail Recorded: ***2.75 inches in diameter***

Greatest Rainfall Total: ***21.16 inches***

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

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

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

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

Most Likely Time for Severe Hail to Occur: ***Late Afternoon/Evening***

Most Likely Time for Heavy Rain to Occur: ***Afternoon***

during a thunderstorm event that affected the entire County. Thunderstorms with damaging winds have impacted every municipality within the County on multiple occasions.

Figure 15 charts the reported occurrences of thunderstorms with damaging winds by month. Eighty of the 119 events (67%) took place in June, July and August making this the peak period for thunderstorms with damaging winds in Jo Daviess County.

Figure 15
Thunderstorms with Damaging Winds by Month
1957– 2011

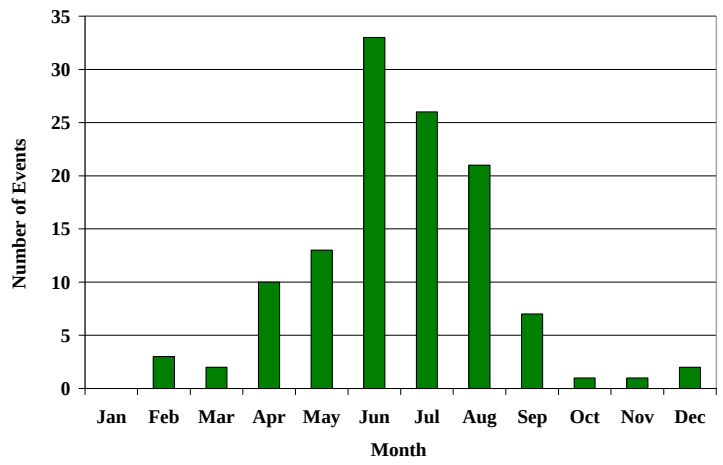
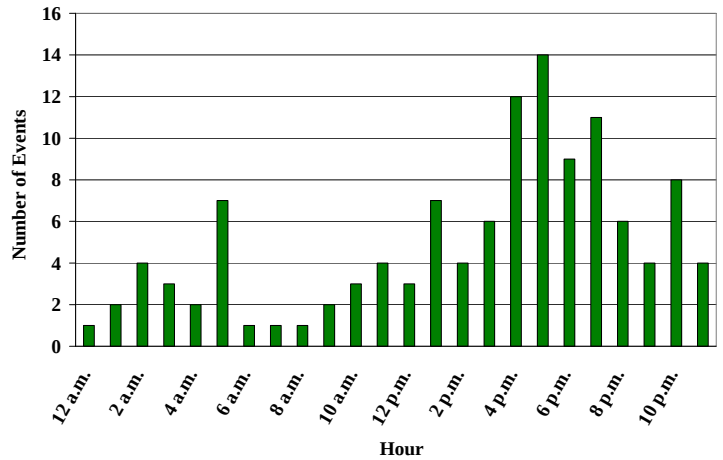


Figure 16 charts the reported occurrences of thunderstorms with damaging winds by hour. Approximately 74% of all thunderstorms with damaging winds occurred during the p.m. hours, with 58 of the events (49%) taking place between 3 p.m. and 9 p.m.

Figure 16
Thunderstorms with Damaging Winds by Hour
1957 – 2011



Hail

The Storm Events Database and Planning Committee member records have documented 38 reported occurrences of severe storms with hail one inch in diameter or greater in Jo Daviess County between 1974 and 2011. Of the 38 occurrences, 25 produced hailstones 1.50 inches or larger in diameter. The largest hail documented in Jo Daviess County measured 2.75 inches in diameter (baseball-sized) and fell on August 19, 1994 in East Dubuque. Hail one inch in diameter or greater has occurred at least once in every participating municipality.

Figure 17 charts the reported occurrences of hail by month. Twenty-nine of the 38 events (76%) took place in May, June, and July. Of the 29 hail events, 15 occurred during July, making this the peak month for hail events in Jo Daviess County.

Figure 17
Hail Events by Month
1974 – 2011

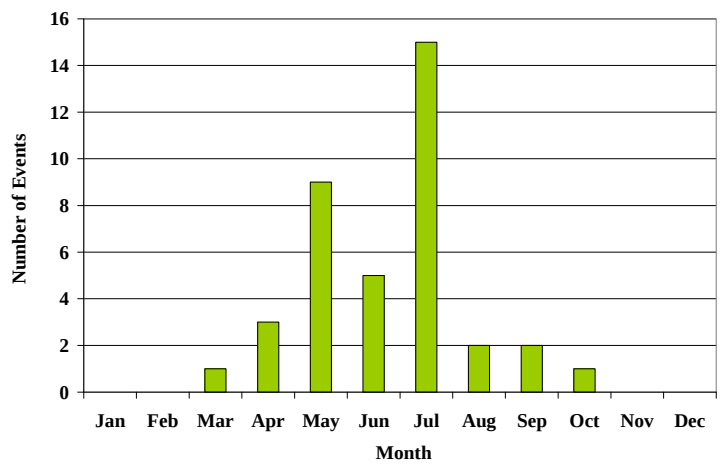


Figure 18 charts the reported occurrences of hail by hour. Of the 38 occurrences, start times were unavailable for only one of the events. Of the remaining 37 hail events with recorded times approximately 89% occurred during the p.m. hours, with 22 of the events (58%) taking place between 5 p.m. and 9 p.m.

Lightning

The Storm Events Database has documented four reported occurrences of lightning strikes in Jo Daviess County between 2002 and 2011. Property damage was sustained during three of the strikes.

Heavy Rain

The Storm Events Database has documented 34 reported occurrences of heavy rain in Jo Daviess County between 1981 and 2011. Seventeen of the heavy rain events with recorded rainfall totals produced at least three inches of rain. During the July 27 and 28, 2011 event, East Dubuque and

Galena received a record 21.16 inches of rain within an 18 hour period. Flash flooding and nuisance street flooding resulted from 22 of the 34 heavy rain events, with three of the events leading to historic flash flooding.

Figure 18
Hail Events by Hour
1974 – 2011

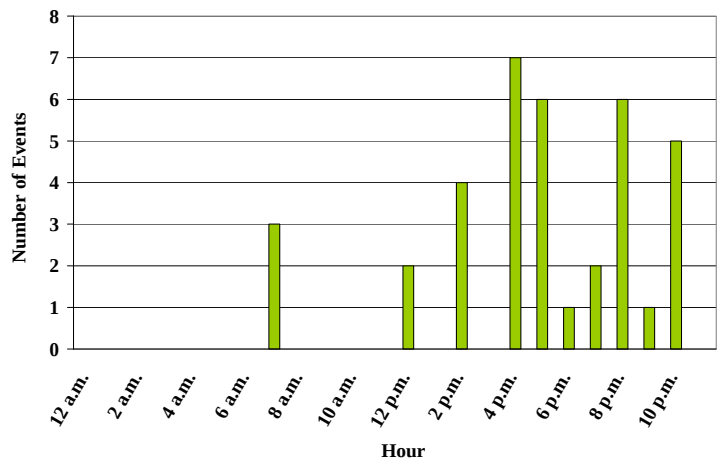


Figure 19 charts the reported occurrences of heavy rain by month. Twenty-two of the 34 events (65%) took place in June, July, and August. Of the 34 heavy rain events, nine occurred during June, making this the peak month for heavy rain in Jo Daviess County.

Figure 19
Heavy Rain Events by Month
1981 – 2011

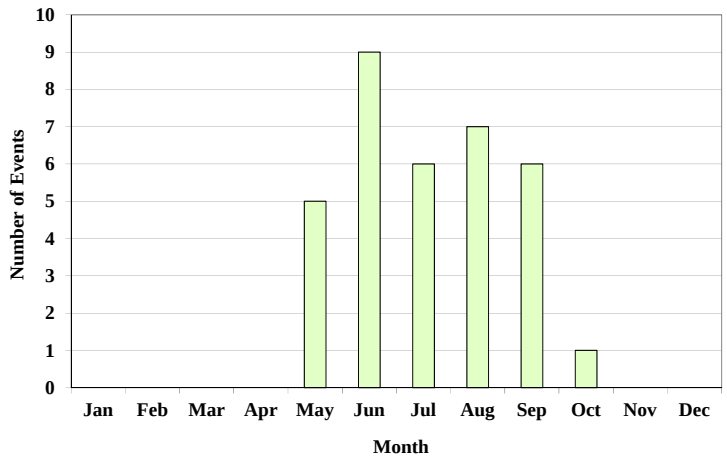
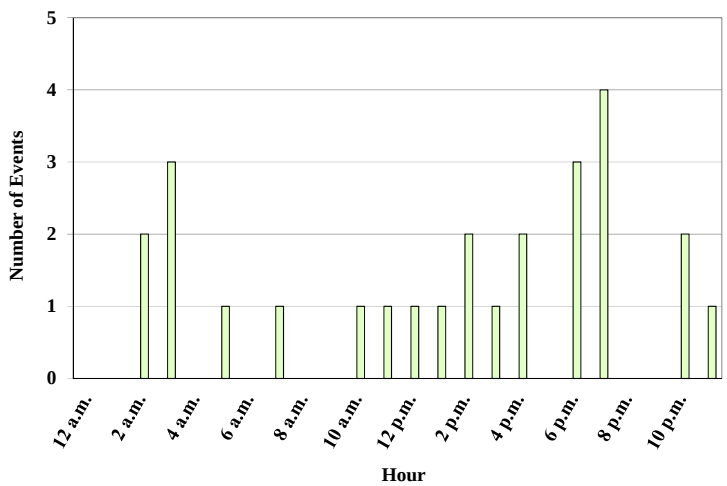


Figure 20 charts the reported occurrences of heavy rain by hour. Of the 34 occurrences, start times were unavailable for eight events. Of the remaining 26 heavy rain events with recorded times, approximately 65% occurred during the p.m. hours, with 14 of the events (54%) taking place between 12 p.m. and 8 p.m.

Figure 20
Heavy Rain Events by Hour
1981 – 2011



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 Jo Daviess County's hazard rating for severe storms as "severe." (IEMA's hazard rating system has five levels: low, guarded, elevated, high and severe.)

What is the probability of future severe storm events occurring?

Jo Daviess County has had 119 verified occurrences of thunderstorms with damaging winds between 1957 and 2011. With 119 occurrences over the past 55 years, Jo Daviess County should expect to experience at least two thunderstorms with damaging winds each year. There were 17 years over the last 55 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 31%.

There have been 38 verified occurrences of hail one inch in diameter or greater between 1974 and 2011. With 38 occurrences over the past 38 years, the County should expect to experience at least one severe storm with hail each year. There were seven years over the last 38 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 18%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to severe storms?

Yes. All of Jo Daviess 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 northwestern Illinois. Since 2001, Jo Daviess County has experienced 70 thunderstorm and high wind events, 28 heavy rain events, 25 severe hail events and four lightning strike events.

A thunderstorm with high winds downed tree limbs on a home in Stockton.

Photograph provided by Steve Rice.

Of the participating municipalities, Galena and Stockton have had more recorded occurrences of thunderstorm with damaging winds than any of the other municipalities while Stockton and East Dubuque have had the highest number of recorded hail events. The difference in the number of events recorded may be due to the fact that these municipalities are among the largest in the County; thus, resulting in more storm reports. **Figure 21** details the number of severe storm events by category for each participating municipality.

Figure 21
Verified Severe Storm Events by Participating Municipality

Participating Municipality	Number of Events			
	Thunderstorm & High Wind	Hail	Lightning	Heavy Rain
Apple River	8	3	0	0*
East Dubuque	10	6	2	1
Elizabeth	9	2	1	2
Galena	36	4	1	6
Hanover	13	3	0	0*
Scales Mound	2	4	0	1
Stockton	23	9	1	6
Warren	10	4	0	1

* 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.

What impacts resulted from the recorded severe storms?

Severe storms as a whole have caused an estimated $1,406,551 in crop damage and $6,698,112 in property damages. No injuries or deaths were reported as a result of any of the recorded events. The following provides a breakdown of impacts by category.

While severe summer storms frequently occur in Jo Daviess County, the number of injuries and deaths is low. The hospital in Galena, as well as hospitals in Freeport (Stephenson County), Dubuque, Iowa, Platteville, Wisconsin and Darlington, Wisconsin 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.

Thunderstorms with Damaging Winds

The data provided by the Storm Events Database and community records indicates that between 1957 and 2011, 45 thunderstorms with damaging winds caused approximately $1,656,929 in property damage and $58,000 in crop damage. Damage information was either unavailable or none was recorded for the remaining 74 reported occurrences. No injuries or deaths were reported as a result of any of the thunderstorms with damaging wind events.

Hail

The data provided by the Storm Events Database and community records indicates that between 1974 and 2011, nine hail events caused approximately $4,754,443 in property damage and $1,348,551 in crop damage. Damage information was either unavailable or none was recorded for the remaining 29 reported occurrences. No injuries or deaths were reported as a result of any of the hail events.

Of the total damages reported, Country Financial records identified $3,065,926 in property damages and $1,342,551 in crop damages sustained when hail measuring between 1.75 inches and 2.50 inches fell in and around Council Hill, Scales Mound, Apple River and Stockton on July 24, 2009. In addition, the Village of Scales Mound identified $200,000 in damages that were sustained just to village property. Hail caused damage to the Village Hall roof as well as the Village chlorination building; pump house; park bandstand and pavilion; and a storage building.

Many crops, including this soybean field, were damaged by hail on July 24, 2009.

Photograph provided by Leroy Getz.

Additionally the City Manager of East Dubuque, Geoff Barklow, identified an unrecorded hail event that caused approximately $1,000,000 in property damages to residential and commercial properties in East Dubuque on August 19, 1994.

Lightning

The data provided by Storm Events Database and from National Weather Service COOP weather observers indicates that between 2002 and 2011, three lightning events caused approximately $14,500 in property damage. Damage information was either unavailable or none was recorded for the remaining event. No injuries or deaths were reported as a result of any of the lightning strike events.

Lightning strikes caused $7,500 in damages to a barn that burnt to the ground outside of Stockton on August 1, 2003; $5,000 in damages to replace a transformer that was struck in the Galena area on August 7, 2007; and $2,000 in damages to telephone line in East Dubuque on August 14, 2007.

Heavy Rain

The data provided by the Storm Events Database and community records indicates that between 1981 and 2011, five heavy rain events caused approximately $272,240 in property damage. Country Financial was responsible for providing damage numbers for four of the five events, including the heavy rain events preceding the historic flash flooding experienced in July of 2010 and 2011. Damage information was either unavailable or none was recorded for the remaining 29 reported occurrences. In addition, no injuries or deaths were reported as a result of these events.

The heavy rain events that preceded the historic flash flooding on July 23 and 24, 2010 caused approximately $113,830 in damages while the heavy rains that preceded the historic July 27 and 28, 2011 flash flooding caused approximately $1151,215 in damages.

In terms of historic heavy rain events, Larry Acker, the official weather observer in northwest Illinois for the National Weather Service, identified a record rainfall event on September 9, 1941, which led to flooding and flood damage. The COOP observer log for Galena confirmed Larry's findings and showed that a total of 5.54 inches of rain fell that day.

What other impacts can result from severe storms?

In Jo Daviess 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 2006 and 2010 indicates that wet road surface conditions were present for 11.9% to 15.1% 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 22** provides a breakdown by year of the number of crashes and corresponding injuries and deaths that occurred when wet road surface conditions were present as well as the total number of crashes that occurred in the County for comparison.

Figure 22
Severe Weather Crash Data for Jo Daviess County

Year	Total # of Crashes	Presence of Wet Road Surface Conditions		
		# of Crashes	# of Injuries	# of Deaths
2006	712	85	23	0
2007	775	92	20	1
2008	768	103	30	0
2009	578	87	35	1
2010	545	79	26	0

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 Jo Daviess County and the participating jurisdictions 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 jurisdictions acknowledged the need for emergency backup generators to allow continued operation of critical facilities such as emergency shelters, drinking water facilities, lift stations and wastewater treatment facilities.

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 Jo Daviess 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, three of the participants 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 77 of the 195 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 Jo Daviess County are vulnerable to damage it is likely that there will be future dollar losses from severe storms.

Figure 11
(Sheet 1 of 12)
Severe Storms – Thunderstorms with Damaging Winds Reported in Jo Daviess County
1957 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
7/12/1957	9:20 a.m.	Galena[^]	n/a	n/a	n/a	n/a	n/a	
5/7/1964	5:40 p.m.	Woodbine[^]	n/a	n/a	n/a	n/a	n/a	
4/11/1965	2:00 p.m.	Stockton[^]	n/a	n/a	n/a	n/a	n/a	
8/15/1966	1:10 p.m.	Warren	n/a	n/a	n/a	n/a	n/a	
7/10/1969	4:30 p.m.	Guilford[^] Galena[^]	n/a	n/a	n/a	n/a	n/a	
6/20/1974	4:34 p.m.	Galena	n/a	n/a	n/a	n/a	n/a	
6/20/1974	4:45 p.m.	Elizabeth	n/a	n/a	n/a	n/a	n/a	
6/20/1974	4:50 p.m.	Warren	n/a	n/a	n/a	n/a	n/a	
11/9/1975	8:10 p.m.	Elizabeth[^] Galena[^]	n/a	n/a	n/a	n/a	n/a	
12/14/1975	5:00 a.m.	Galena	n/a	n/a	n/a	n/a	n/a	
12/14/1975	5:15 a.m.	Warren	n/a	n/a	n/a	n/a	n/a	
4/14/1976	11:45 p.m.	East Dubuque	n/a	n/a	n/a	n/a	n/a	
8/13/1976	10:30 p.m.	East Dubuque	n/a	n/a	n/a	n/a	n/a	
6/5/1977	2:44 a.m.	Galena	50 kts	n/a	n/a	n/a	n/a	
7/16/1977	10:15 p.m.	Galena	52 kts	n/a	n/a	n/a	n/a	
6/16/1978	3:25 p.m.	Apple River	n/a	n/a	n/a	n/a	n/a	
6/17/1978	10:17 a.m.	Scales Mound	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 Jo Daviess County
1957 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
6/2/1980	5:46 p.m.	Galena	52 kts	n/a	n/a	n/a	n/a	
6/27/1980	9:58 p.m.	Hanover	52 kts	n/a	n/a	n/a	n/a	
8/20/1980	6:45 p.m.	Galena	52 kts	n/a	n/a	n/a	n/a	
6/15/1981	7:00 p.m.	Stockton	n/a	n/a	n/a	n/a	n/a	
5/14/1985	6:00 p.m.	Elizabeth[^]	n/a	n/a	n/a	n/a	n/a	
7/9/1985	6:45 p.m.	Hanover	52 kts	n/a	n/a	n/a	n/a	
8/12/1985	9:05 p.m.	Stockton[^]	60 kts	n/a	n/a	n/a	n/a	
9/10/1986	5:45 p.m.	East Dubuque	52 kts	n/a	n/a	n/a	n/a	
8/16/1987	4:45 p.m.	Elizabeth[^]	62 kts	n/a	n/a	n/a	n/a	
5/8/1988	3:22 p.m.	East Dubuque	52 kts	n/a	n/a	n/a	n/a	
5/8/1988	3:30 p.m.	Stockton[^]	n/a	n/a	n/a	n/a	n/a	
5/8/1988	3:39 p.m.	Galena	52 kts	n/a	n/a	n/a	n/a	
6/29/1990	1:20 a.m.	Elizabeth Stockton	n/a	n/a	n/a	n/a	n/a	
8/18/1991	7:59 p.m.	Galena	n/a	n/a	n/a	n/a	n/a	
4/15/1994	10:38 p.m.	East Dubuque Menominee	n/a	n/a	n/a	$5,000	$0	winds damaged porch in East Dubuque and knocked down trees at Menominee
Subtotal:				**0**	**0**	**$5,000**	**$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 Jo Daviess County
1957 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
5/9/1995	5:00 p.m.	Stockton	n/a	n/a	n/a	n/a	n/a	
6/23/1995	4:06 p.m.	Galena	n/a	n/a	n/a	$5,000	$0	winds blew a large tree down
4/5/1997	4:35 p.m.	countywide	52 kts	n/a	n/a	n/a	n/a	widespread tree damage reported across the county
6/21/1997	5:10 a.m.	Apple River	60 kts	n/a	n/a	n/a	n/a	strong winds downed numerous trees, some with diameters up to 12 inches
9/16/1997	5:55 p.m.	East Dubuque	52 kts	n/a	n/a	n/a	n/a	winds blew down trees
9/16/1997	6:10 p.m.	Galena	52 kts	n/a	n/a	n/a	n/a	winds blew down many trees
5/28/1998	7:30 p.m.	countywide	66 kts	n/a	n/a	$2,000	$0	winds produced widespread damage to trees, homes and power lines across the county
6/18/1998	4:45 p.m.	Galena Stockton	n/a	n/a	n/a	$3,000	$0	winds blew down numerous trees
6/28/1998	1:00 a.m.	Galena	n/a	n/a	n/a	$1,000	$0	winds blew down several large tree limbs
8/24/1998	10:58 a.m.	Massbach[^]	56 kts	n/a	n/a	n/a	n/a	
8/24/1998	11:00 a.m.	Hanover	52 kts	n/a	n/a	n/a	n/a	telephone and electric service were out throughout much of the Elizabeth and Hanover areas due to trees falling on utility lines
Subtotal:				**0**	**0**	**$11,000**	**$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 Jo Daviess County
1957 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
2/11/1999	1:22 p.m.	Elizabeth	58 kts	2	0	n/a	n/a	two people were injured when the roof was blown off their home
2/11/1999	1:25 p.m.	Warren Woodbine	70 kts	n/a	n/a	$40,000	$0	strong winds overturned several high profile vehicles , blew down trees and damaged homes and farm buildings
2/11/1999	1:37 p.m.	Stockton	55 kts	1	0	n/a	n/a	a man sustained injuries when the semi he was driving was blown over
5/8/2000	6:50 a.m.	Galena Hanover Warren	n/a	n/a	n/a	$1,000	$0	winds blew down several trees, limbs and power lines throughout the county
7/2/2000	10:00 a.m.	Galena	n/a	n/a	n/a	$1,000	$0	winds blew down a tree and several power lines
9/11/2000	6:30 p.m.	countywide	52 kts	n/a	n/a	n/a	n/a	winds blew down numerous trees
9/7/2001	5:25 p.m.	Galena^	52 kts	n/a	n/a	n/a	n/a	winds damaged farm outbuildings
4/18/2002	8:30 p.m.	Apple River	61 kts	n/a	n/a	n/a	n/a	winds knocked down power lines
8/12/2002	7:10 p.m.	Stockton^	52 kts	n/a	n/a	n/a	n/a	winds blew trees down across US 20
Subtotal:				**3**	**0**	**$42,000**	**$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 Jo Daviess County
1957 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
8/21/2002	5:00 p.m.	Apple River^	57 kts	n/a	n/a	n/a	n/a	winds blew down several large trees, at least 2 feet in diameter, in Apple River Canyon State Park
8/21/2002	9:23 p.m.	countywide	61 kts	n/a	n/a	n/a	n/a	winds blew down numerous trees and power lines throughout the county; the hardest hit area was in Galena on US 20 just north of Chetlain Lane – at the Country Inn & Suites the flagpole and lamps out front were bent, drain pipes were torn off the front of the building, and some first floor entrance doors were torn off their hinges; at the Palace Campground a large tree fell on a vehicle causing extensive damage, a camper was spun around and moved 10 feet and a picnic table near the camper was thrown 200 feet and destroyed
7/5/2003	2:25 a.m.	Stockton	52 kts	n/a	n/a	$50,000	$20,000	winds blew down trees and power lines
Subtotal:				**0**	**0**	**$50,000**	**$20,000**	

^ 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 Jo Daviess County
1957 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
8/20/2003	6:05 p.m.	Stockton[^]	56 kts	n/a	n/a	$5,000	$2,000	
4/16/2004	11:52 p.m.	East Dubuque Galena[^] Menominee[^]	52 kts	n/a	n/a	$70,000	$0	winds uprooted or decapitated numerous trees and damaged or destroyed many buildings (farm and garage)
5/22/2004	2:44 a.m.	Galena[^]	61 kts	n/a	n/a	$3,000	$5,000	
5/22/2004	3:06 a.m.	Elizabeth Hanover	56 kts	n/a	n/a	$0	$2,000	winds blew down two large trees between Hanover and Elizabeth
5/22/2004	3:15 a.m.	Apple River[^]	56 kts	n/a	n/a	$3,000	$0	winds blew down a large cottonwood tree
5/22/2004	9:39 a.m.	Stockton	53 kts	n/a	n/a	$0	$3,000	
7/16/2004	5:35 p.m.	Stockton	52 kts	n/a	n/a	$0	$3,000	
7/20/2004	4:35 p.m.	Galena	57 kts	n/a	n/a	$1,000	$0	winds snapped a 10 inch diameter tree
10/29/2004	9:08 p.m.	Galena[^]	52 kts	n/a	n/a	$1,000	$0	winds leveled a tree along Pilot Knob Road, south of Galena, blocking traffic
3/30/2005	3:03 p.m.	Stockton	53 kts	n/a	n/a	$500	$0	
6/4/2005	11:07 p.m.	Galena	52 kts	n/a	n/a	$4,000	$0	winds caused the power lines at US 20 and Blackjack Road to sag
6/4/2005	11:23 p.m.	Warren	52 kts	n/a	n/a	$5,000	$0	winds blew a large tree down on a house and another on the railroad tracks
6/25/2005	6:18 p.m.	Stockton	52 kts	n/a	n/a	$5,000	$5,000	winds caused power outages
Subtotal:				**0**	**0**	**$97,500**	**$20,000**	

[^] 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 Jo Daviess County
1957 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
7/24/2005	10:15 p.m.	Hanover^	52 kts	n/a	n/a	$1,000	$1,000	winds brought down several 12 inch diameter limbs at a farm
8/18/2005	7:00 a.m.	Warren	52 kts	n/a	n/a	$7,000	$0	winds blew down several large oak trees; one tree came down on a house
6/21/2006	4:54 a.m.	Stockton^	54 kts	n/a	n/a	n/a	n/a	
6/21/2006	4:59 a.m.	Stockton Warren	52 kts	n/a	n/a	$2,000	$0	winds blew trees down and power lines
7/17/2006	7:30 p.m.	Hanover^	52 kts	n/a	n/a	$0	$3,000	winds caused large trees to bend over
7/17/2006	7:33 p.m.	Elizabeth	57 kts	n/a	n/a	$3,000	$7,000	winds blew down trees and corn
7/17/2006	7:34 p.m.	Hanover	57 kts	n/a	n/a	$3,000	$0	wind blew trees down
7/17/2006	7:58 p.m.	Morseville^	61 kts	n/a	n/a	$0	$4,000	
7/17/2006	7:58 p.m.	Massbach^	52 kts	n/a	n/a	$1,000	$3,000	winds blew a tree down on IL 78 at the Jo Daviess/Carroll County line
3/31/2007	5:10 p.m.	Elizabeth Galena Woodbine	52 kts	n/a	n/a	n/a	n/a	winds blew trees down, with some blocking roads
Subtotal:				**0**	**0**	**$17,000**	**$18,000**	

^ 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 Jo Daviess County
1957 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
7/18/2007	6:03 p.m.	Warren^	61 kts	1	0	$25,000	$0	winds blew down trees and power lines, several trees fell onto some houses; one person was transported to a hospital with minor injuries; power and telephone service were knocked out to half the village
8/14/2007	2:55 a.m.	Galena^	56 kts	n/a	n/a	$500	$0	winds blew a tree down across a road
8/22/2007	12:50 a.m.	Galena^	61 kts	n/a	n/a	$10,000	$0	winds blew down branches, some fell onto power lines; the public works department reported two truckloads of branched had been removed
5/25/2008	8:00 p.m.	countywide	61 kts	n/a	n/a	$25,000	$0	winds blew trees down across the entire county
6/6/2008	3:35 a.m.	Nora^	56 kts	n/a	n/a	n/a	n/a	winds blew a tree down across a road
6/7/2008	2:30 p.m.	Hanover^	56 kts	n/a	n/a	n/a	n/a	winds blew trees down across Blackjack Road
6/7/2008	2:47 p.m.	Apple River^ Warren^	56 kts	n/a	n/a	n/a	n/a	winds blew trees down across Stagecoach Trail
6/8/2008	6:55 p.m.	Stockton^	61 kts	n/a	n/a	n/a	n/a	winds blew trees down
6/8/2008	7:06 p.m.	Nora	56 kts	n/a	n/a	n/a	n/a	winds blew a 2 ½ foot diameter tree down
Subtotal:				**1**	**0**	**$60,500**	**$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 Jo Daviess County
1957 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
6/12/2008	1:05 p.m.	Massbach[^]	52 kts	n/a	n/a	n/a	n/a	winds blew down some 2 inch diameter tree branches
6/20/2008	12:53 p.m.	Galena	52 kts	n/a	n/a	n/a	n/a	
6/20/2008	1:06 p.m.	Galena[^]	56 kts	n/a	n/a	n/a	n/a	winds blew a tree down across US 20
7/31/2008	11:00 a.m.	Galena	52 kts	n/a	n/a	n/a	n/a	winds blew a 3 to 4 inch diameter branch down
7/31/2008	11:05 a.m.	Galena	56 kts	n/a	n/a	n/a	n/a	winds blew down some trees and limbs
7/31/2008	11:15 a.m.	Hanover	56 kts	n/a	n/a	n/a	n/a	winds blew down some trees and limbs
8/4/2008	4:30 p.m.	Galena[^]	52 kts	0	0	$5,000	$0	winds ripped the siding off the west side of a residence
8/4/2008	4:42 p.m.	Galena[^]	52 kts	n/a	n/a	n/a	n/a	winds blew down some branches and small trees
8/4/2008	5:10 p.m.	Stockton	61 kts	n/a	n/a	$25,000	$0	winds blew a tree onto a house
8/4/2008	5:28 p.m.	Stockton	56 kts	n/a	n/a	$200	$0	winds blew down some 5 inch diameter tree branches and bent a metal pole supporting a wind sock in half; a metal table was also blown off a deck
6/19/2009	8:09 a.m.	East Dubuque	65 kts	n/a	n/a	$28,654	$0	winds uprooted a tree which fell onto some power lines and caught on fire
Subtotal:				**0**	**0**	**$58,854**	**$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 Jo Daviess County
1957 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
7/24/2009	5:50 p.m.	Guilford[^]	61 kts	n/a	n/a	$150,000	$0	winds blew several trees down in the vicinity of the Galena Territory, one of the trees fell onto a house
7/24/2009	5:55 p.m.	East Dubuque[^]	61 kts	n/a	n/a	$50,000	$0	winds blew down a garage, a boat and truck stored inside the garage were also destroyed
7/24/2009	5:55 p.m.	Galena[^]	61 kts	1	0	$50,000	$0	winds blew a semi truck over onto a car on US 20 near Mount Hope Road, one person was injured; winds also blew several trees down in the area
7/29/2009	7:55 p.m.	Stockton[^]	52 kts	n/a	n/a	n/a	n/a	
8/9/2009	12:52 p.m.	Apple River	56 kts	n/a	n/a	$15,292	$0	winds blew down several 10 to 12 inch diameter tree limbs
4/5/2010	10:08 p.m.	Galena	52 kts	n/a	n/a	n/a	n/a	
4/5/2010	10:10 p.m.	East Dubuque[^]	65 kts	n/a	n/a	n/a	n/a	
Subtotal:				**1**	**0**	**$265,292**	**$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 Jo Daviess County
1957 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
4/5/2010	10:10 p.m.	Galena[^]	61 kts	n/a	n/a	$250,000	$0	wins ripped the roof off of Tri State Screen Printing & Embroidery
4/5/2010	10:25 p.m.	Woodbine	65 kts	n/a	n/a	$500,000	$0	more than half the homes in Woodbine suffered some degree of damage from downed trees and limbs; two park semi-tractor trailers were overturned; some utility poles were snapped near the ground; a garden shed was blown over and other outbuildings were damaged; shingles, sheets of tin roofing and tree debris littered the streets; several homes north of Woodbine near Apple Canyon Lake sustained damage from fallen trees
6/18/2010	12:55 p.m.	Galena	61 kts	n/a	n/a	$44,699	$0	winds blew a tree down onto a house; the local utility company also reported several outages due to trees downed on power lines and trees downed in the right-of-way
6/18/2010	1:05 p.m.	Scales Mound	61 kts	n/a	n/a	$25,000	$0	winds blew the roof off of a house
8/13/2010	3:00 p.m.	Woodbine	52 kts	n/a	n/a	n/a	n/a	winds blew several large tree limbs down
9/12/2010	4:55 p.m.	Hanover[^]	61 kts	n/a	n/a	$1,192	$0	winds blew some large tree branches down
Subtotal:				**0**	**0**	**$820,891**	**$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 Jo Daviess County
1957 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage	Description
9/21/2010	2:30 p.m.	Nora^	52 kts	n/a	n/a	n/a	n/a	
6/8/2011	8:25 p.m.	Hanover^	56 kts	n/a	n/a	n/a	n/a	winds blew a large maple tree down, some lawn furniture was also blown around the yard of the residence
6/8/2011	8:27 p.m.	Hanover^	61 kts	n/a	n/a	n/a	n/a	winds blew numerous trees down
6/8/2011	8:30 p.m.	Stockton	61 kts	n/a	n/a	$68,990	$0	winds caused tree damage and siding damage across the village; one large tree limb fell onto a car
7/11/2011	5:20 a.m.	Apple River	61 kts	n/a	n/a	$158,902	$0	winds blew down several large trees and a metal flag pole; almost every property in the 400 person village suffered some damage
7/11/2011	5:27 a.m.	Morseville^	56 kts	n/a	n/a	n/a	n/a	
7/11/2011	5:27 a.m.	Stockton	56 kts	n/a	n/a	$1,000	$0	winds blew some storm windows into a home; some metal yard furniture was also blown around the yard
7/11/2011	5:35 a.m.	Nora^	61 kts	n/a	n/a	n/a	n/a	winds blew a large tree down; electric poles knocked over along Stagecoach Trail
Subtotals:				**0**	**0**	**$228,892**	**$0**	
GRAND TOTAL:				**5**	**0**	**$1,656,929**	**$58,000**	

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

Sources: Country Financial.
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 Jo Daviess County
1974 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Diameter)	Injuries	Death	Property Damage	Crop Damage	Description
7/13/1974	7:00 p.m.	Warren	2.00 in.	n/a	n/a	n/a	n/a	
6/14/1974	2:00 p.m.	Apple River	1.75 in.	n/a	n/a	n/a	n/a	
6/14/1974	2:30 p.m.	Stockton	1.75 in.	n/a	n/a	n/a	n/a	
7/30/1977	9:00 p.m.	Hanover	1.00 in.	n/a	n/a	n/a	n/a	
8/29/1984	10:35 p.m.	Apple River	1.75 in.	n/a	n/a	n/a	n/a	
7/9/1985	6:45 p.m.	Hanover	1.00 in.	n/a	n/a	n/a	n/a	
4/15/1994	10:40 p.m.	Elizabeth	1.75 in.	n/a	n/a	$5,000	$0	large hail damaged cars and siding
8/19/1994	n/a	East Dubuque	2.75 in.	n/a	n/a	$1,000,000	$0	large hail caused considerable vehicle damage to an auto dealership and caused damage to roofs
5/18/1997	5:50 p.m.	East Dubuque	1.75 in.	n/a	n/a	n/a	n/a	
6/18/1998	4:50 p.m.	East Dubuque	1.75 in.	n/a	n/a	n/a	n/a	
5/16/1999	8:00 p.m.	East Dubuque	1.75 in.	n/a	n/a	n/a	n/a	
5/11/2000	7:15 a.m.	East Dubuque	1.75 in.	n/a	n/a	n/a	n/a	
5/11/2000	7:55 a.m.	Warren	1.75 in.	n/a	n/a	n/a	n/a	
10/23/2001	8:27 p.m.	Warren	1.75 in.	n/a	n/a	n/a	n/a	
5/22/2004	10:48 p.m.	Warren[^]	1.00 in.	n/a	n/a	$0	$3,000	
7/20/2004	4:30 p.m.	Galena	1.00 in.	n/a	n/a	$14,000	$0	
Subtotal:				**0**	**0**	**$1,019,000**	**$3,000**	

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

Figure 12
(Sheet 2 of 3)
Severe Storms – Hail Events Reported in Jo Daviess County
1974 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Diameter)	Injuries	Death	Property Damage	Crop Damage	Description
7/20/2004	4:45 p.m.	Galena	2.50 in.	n/a	n/a	$240,000	$0	considerable vehicle damage was reported – an auto dealership had 78 cars with damage and an insurance company had at least 91 auto-related damage claims
3/30/2005	12:00 p.m.	Galena	1.75 in.	n/a	n/a	$10,000	$0	
7/17/2006	7:30 p.m.	Hanover[A]	1.00 in.	n/a	n/a	$2,000	$3,000	
5/25/2008	8:10 p.m.	Scales Mound[A]	1.00 in.	n/a	n/a	n/a	n/a	
5/25/2008	8:45 p.m.	Scales Mound[A]	1.00 in.	n/a	n/a	n/a	n/a	
5/25/2008	8:45 p.m.	Stockton	1.75 in.	n/a	n/a	n/a	n/a	
5/25/2008	8:47 p.m.	Woodbine[A]	1.75 in.	n/a	n/a	n/a	n/a	
6/8/2008	7:55 a.m.	Stockton	1.00 in.	n/a	n/a	n/a	n/a	
6/20/2008	12:40 p.m.	Menominee[A]	1.00 in.	n/a	n/a	n/a	n/a	
7/24/2009	4:35 p.m.	Scales Mound	1.75 in.	n/a	n/a	$3,265,926	$1,342,551	
7/24/2009	4:38 p.m.	Scales Mound[A]	1.75 in.	n/a	n/a			
7/24/2009	4:52 p.m.	Apple River	1.75 in.	n/a	n/a			
7/24/2009	4:58 p.m.	Stockton[A]	2.50 in.	n/a	n/a			
7/24/2009	5:04 p.m.	Stockton[A]	1.75 in.	n/a	n/a			
7/24/2009	5:04 p.m.	Stockton	1.75 in.	n/a	n/a			
7/24/2009	5:07 p.m.	Stockton	2.00 in.	n/a	n/a			
7/24/2009	5:09 p.m.	Stockton[A]	1.75 in.	n/a	n/a			
7/24/2009	5:49 p.m.	Council Hill	1.75 in.	n/a	n/a			
Subtotal:				**0**	**0**	**$3,517,926**	**$1,345,551**	

[A] Hail event verified in the vicinity of this location(s).

Figure 12
(Sheet 3 of 3)
Severe Storms – Hail Events Reported in Jo Daviess County
1974 – 2011

Date(s)	Start Time	Location(s)	Magnitude (Diameter)	Injuries	Death	Property Damage	Crop Damage	Description
4/5/2010	10:08 p.m.	Galena	1.00 in.	n/a	n/a	$103,947	$0	
4/5/2010	10:10 p.m.	East Dubuque	1.25 in.	n/a	n/a			
9/21/2010	2:10 p.m.	Elizabeth	1.00 in.	n/a	n/a	$113,570	$0	
9/21/2010	2:27 p.m.	Stockton	1.25 in.	n/a	n/a			
Subtotal:				**0**	**0**	**$217,517**	**$0**	
GRAND TOTAL:				**0**	**0**	**$4,754,443**	**$1,348,551**	

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

Sources: Country Financial.
East Dubuque City Manager.
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee Member responses to Jo Daviess County All Hazard Events Questionnaire.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

Figure 13
Severe Storms – Lightning Events Reported in Jo Daviess County
2002 – 2011

Date(s)	Start Time	Location(s)	Injuries	Death	Property Damage	Crop Damage	Description
8/22/2002	n/a	Stockton^	n/a	n/a	n/a	n/a	lightning struck a tree according to the COOP observer in Stockton
8/1/2003	12:40 a.m.	Stockton^	n/a	n/a	$7,500	$0	lightning struck a barn which caught on fire and burned to the ground in southeast Jo Daviess County; while there were cattle in the barn, they were successfully evacuated and no injuries occurred
8/7/2007	4:00 a.m.	East Dubuque Galena Elizabeth	n/a	n/a	$5,000	$0	lightning caused power outages across part of the county; a transformer was struck by lightning and had to be replaced
8/14/2007	4:00 a.m.	East Dubuque	n/a	n/a	$2,000	$0	a lightning strike caused telephone problems for the East Dubuque area
GRAND TOTAL:			**0**	**0**	**$14,500**	**$0**	

^ Lightning 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.

Figure 14
(Sheet 1 of 9)
Severe Storms – Heavy Rain Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Crop Damage	Description
6/12/1981 thru 6/13/1981	n/a	countywide	1.60 – 2.45	n/a	n/a	n/a	n/a	COOP observer in Galena measured 2.45 inches of rain while the observer in Stockton measured 1.60 inches; minimal property damage was done to the marina at The Galena Territory
9/9/1986 thru 9/10/1986	n/a	countywide	1.70 – 2.78	n/a	n/a	n/a	n/a	COOP observer in Galena measured a total of 2.78 inches of rain and indicated that 2 inches fell as very heavy rain between 2 p.m. and 5 p.m. on the 9th; observer in Stockton measured 1.70 inches of rain
9/20/1986 thru 9/21/1986	n/a	countywide	2.62 – 3.64	n/a	n/a	n/a	n/a	COOP observer in Galena measured 3.64 inches of rain while the observer at Stockton measured 2.62 inches
9/24/1986 thru 9/25/1986	n/a	countywide	2.17 – 2.79	n/a	n/a	n/a	n/a	COOP observer in Galena measured 2.79 inches of rain and indicated that US 20 and parts of downtown Galena flooded; observer in Stockton measured 2.17 inches of rain
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Figure 14
(Sheet 2 of 9)
Severe Storms – Heavy Rain Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Crop Damage	Description
8/20/1998	7:30 p.m.	The Galena Territory	3 – 5	n/a	n/a	n/a	n/a	3 to 5 inches of rain fell within a 4 hour period drenching the Small Pox Creek basin and setting off flash flooding; an observer for the Jo Daviess County Extension Service recorded 4.45 inches of rain near Lake Galena
5/16/1999	10:00 p.m.	East Dubuque	5	n/a	n/a	n/a	n/a	5 inches of rain fell within an hour causing flash flooding; this event was part of a federally-declared disaster (Declaration #1278.)
6/3/2002 thru 6/5/2002	n/a	countywide	4.48 – 9	n/a	n/a	n/a	n/a	Galena, Stockton and The Galena Territory all experienced flash flooding as a result of very heavy rains that for the most part fell between late evening on the 3rd and early morning on the 4th; The Galena Territory reported 9 inches of rain while the COOP observers in Galena, Stockton and Elizabeth measured 7.24 inches, 4.86 inches, and 4.48 inches of rain respectively
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Figure 14
(Sheet 3 of 9)
Severe Storms – Heavy Rain Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Crop Damage	Description
8/21/2002 thru 8/22/2002	6:00 p.m.	countywide	10.13 – 11.69	n/a	n/a	n/a	n/a	very heavy rains caused flash flooding at The Galena Territory; COOP observers in Galena and Stockton measured 11.69 inches and 10.13 inches respectively
9/12/2003 thru 9/14/2003	10:00 a.m.	countywide	3.5 – 3.91	n/a	n/a	n/a	n/a	COOP observer in Stockton measured 3.91 inches of rain while the observer in Galena measured 3.81 inches; The Galena Territory reported 3.5 inches
5/22/2004	2:49 a.m.	Galena	1	n/a	n/a	$5,000	$0	1 inch of rain fell in 15 minutes flooding yards
5/23/2004	3:00 a.m.	Galena	1.25	n/a	n/a	n/a	n/a	1.25 inches of rain fell in 30 minutes flooding streets
Subtotal:				**0**	**0**	**$5,000**	**$0**	

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

Figure 14
(Sheet 4 of 9)
Severe Storms – Heavy Rain Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Crop Damage	Description
6/16/2004	2:14 p.m.	Stockton	3	n/a	n/a	n/a	n/a	3 inches of rain fell within a 2 hour period resulting in flash flooding of US 20 east and west of Stockton; the water was 1 to 2 inches deep on US 20 east of Stockton
6/16/2004	2:30 p.m.	countywide	n/a	n/a	n/a	n/a	n/a	heavy rains resulted in water ponding on many roads in the eastern half of the county
6/16/2004	3:50 p.m.	Warren	n/a	n/a	n/a	n/a	n/a	heavy rains resulted flash flooding of IL 78; the water was 5 inches deep across the highway
6/16/2004	6:28 p.m.	Galena	2	n/a	n/a	n/a	n/a	2 inches of rain fell in 90 minutes causing nuisance flooding
7/20/2004	4:15 p.m.	Galena	1.5 – 3	n/a	n/a	n/a	n/a	1.5 to 3 inches of rain fell in 30 minutes flooding streets
7/23/2005	7:00 a.m.	Galena Elizabeth	1.52 – 3.2	n/a	n/a	n/a	n/a	The Galena Territory reported 3.2 inches rain while the COOP observers in Galena and Elizabeth measured 2.28 inches and 1.52 inches respectively
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Figure 14
(Sheet 5 of 9)
Severe Storms – Heavy Rain Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Crop Damage	Description
8/18/2005	n/a	countywide	2.86 – 3.16	n/a	n/a	n/a	n/a	property damage was sustained in Galena and The Galena Territory when very heavy rains led to flash flooding; COOP observer in Elizabeth measured 3.16 inches of rain while the observers in Galena and Stockton measured 2.95 inches and 2.86 inches respectively
8/19/2005 thru 8/20/2005	11:00 p.m.	Stockton	1.54	n/a	n/a	n/a	n/a	COOP observer in Stockton measured 1.54 inches of rain and indicated that 0.60 inches of rain fell within 10 minutes, between 12:30 a.m. and 12:40 a.m.
9/4/2006	11:30 a.m.	Stockton[A]	1.25	n/a	n/a	n/a	n/a	1.25 inches of rain fell in 60 minutes
9/10/2006 thru 9/12/2006	5:30 a.m.	countywide	2.45 – 4.3	n/a	n/a	n/a	n/a	The Galena Territory reported 4.3 inches of rain; COOP observer in Galena measured 3.89 inches while the observers in Stockton and Elizabeth measured 2.88 inches and 2.45 inches respectively
8/7/2007	3:00 a.m.	Stockton[A]	3 – 7	n/a	n/a	n/a	n/a	3 to 7 inches of rain fell during the early morning resulting in flash flooding southeast of Stockton; the waters washed out several county roads
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Figure 14
(Sheet 6 of 9)
Severe Storms – Heavy Rain Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Crop Damage	Description
10/17/2007 thru 10/18/2007	n/a	countywide	1.72 – 3.04	n/a	n/a	n/a	n/a	The Galena Territory measured 3.04 inches of rain; COOP observer in Stockton measured 1.98 inches while the observers in Galena and Elizabeth measured 1.89 inches and 1.72 inches respectively
6/8/2008	7:40 p.m.	countywide	n/a	n/a	n/a	n/a	n/a	heavy rains resulted in flash flooding of Spring Street (US 20) which was closed by law enforcement until the waters receded; COOP observer at Galena measured 3.26 inches of rain while the observers in Stockton and Elizabeth measured 2.95 inches and 2.68 inches respectively; The Galena Territory reported 3.29 inches of rain
6/12/2008 thru 6/13/2008	10:00 p.m.	Elizabeth[^]	n/a	n/a	n/a	n/a	n/a	heavy rains during the evening of the 12th caused a rapid rise of the Apple River which overflowed its banks and covered W. Lone Street west of Elizabeth
7/10/2008	7:14 p.m.	Galena	1	n/a	n/a	n/a	n/a	1 inch of rain fell in 15 minutes causing flash flooding
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Figure 14
(Sheet 7 of 9)
Severe Storms – Heavy Rain Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Crop Damage	Description
8/9/2009	12:00 p.m.	countywide	1.83 – 2.95	n/a	n/a	n/a	n/a	heavy rains led to flash flooding in the northern part of the county near Council Hill, Scales Mound, Apple River and Guilford; The Galena Territory experienced property damage as a result of the flooding; COOP observer in Galena measured 2.95 inches of rain while the observers in Elizabeth and Stockton measured 1.99 inches and 1.83 inches respectively
5/12/2010	n/a	countywide	1.85 – 3.33	n/a	n/a	n/a	n/a	COOP observer in Galena measured 3.33 inches of rain while the observers in Stockton and Elizabeth measured 2.04 inches and 1.85 inches respectively; The Galena Territory reported 3.24 inches
5/26/2010	7:00 p.m.	Scales Mound^ Nora^	n/a	n/a	n/a	n/a	n/a	heavy rains resulted in flash flooding of several rural roads along the Apple River and across areas eastward to the county border
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Figure 14
(Sheet 8 of 9)
Severe Storms – Heavy Rain Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Crop Damage	Description
6/15/2010	1:11 p.m.	Stockton	1.5	n/a	n/a	$2,195	$0	1.5 inches of rain fell in 30 minutes causing flash flooding
7/23/2010	2:15 a.m.	countywide	3 – 9	n/a	n/a	$73,696	$0	3 to 9 inches of rain fell across the county during the late night of the 22nd and through the early morning of the 23rd resulting in flash flooding over much of the county; this event was part of a federally-declared disaster (Declaration #1935.)
7/24/2010	3:15 a.m.	countywide	3 – 5	n/a	n/a	$40,134	$0	an additional 3 to 5 inches of rain fell across the county during the overnight hours of the 23rd and into the early morning of the 24th resulting in flash flooding, especially along the Apple and Galena Rivers; this event was part of a federally-declared disaster (Declaration #1935.)
Subtotal:				**0**	**0**	**$116,025**	**$0**	

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

Figure 14
(Sheet 9 of 9)
Severe Storms – Heavy Rain Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude (inches)	Injuries	Death	Property Damage	Crop Damage	Description
7/27/2011 thru 7/28/2011	6:30 p.m.	countywide	7 – 21.16	n/a	n/a	$151,215	$0	a stationary, back-building storm system stalled over a relatively small area of northeast Iowa and extreme northwest Illinois for 18 hours beginning the evening of the 27th, the system produced torrential rains resulting in flash flooding to an extent never seen before in the county; record rain totals of 7 to 15 inches were experienced over much of the county, with East Dubuque and Galena receiving a record 21.16 inches
8/8/2011	4:05 p.m.	Stockton^	NA	n/a	n/a	n/a	n/a	
Subtotal:				**0**	**0**	**$151,215**	**$0**	
GRAND TOTAL:				**0**	**0**	**$272,240**	**$0**	

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

Sources: Country Financial.
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee Member responses to Jo Daviess County All Hazard Events Questionnaire.
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 23** identifies the formula and calculates the wind chill temperatures for certain air temperatures and wind speeds.

Figure 23
Wind Chill Chart

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

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

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

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

Effective 11/01/01

Source: NOAA, National Weather Service.

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

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

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

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

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 of the Quad Cities, Iowa/Illinois is responsible for issuing ***winter storm watches*** and ***warnings*** for Jo Daviess County depending on the weather conditions. The following provides a brief description of each type of alert.

- **Watch.** Winter storm watches are issued when a significant winter storm may affect the area within 18 to 72 hours. A watch will often be issued when there is still uncertainty about the path and strength of a developing winter storm.

- **Advisories.** Winter advisories are issued for lesser winter weather events that will most likely cause significant inconvenience, 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.

- **Winter Weather Advisory.** A winter weather advisory is issued for:
  - three to five inches of snow;
  - snow with strong winds that reduce visibility to less than ½ mile and cause considerable blowing and drifting;
  - freezing rain/drizzle resulting in less than ¼ inch of ice accumulation;
  - sleet accumulation of less than ½ inch; or
  - a mix of winter precipitation which will produce hazardous conditions.
- **Wind Chill Advisory.** A wind chill advisory is issued when the wind chill values are expected to be between -20°F and -29°F.

➢ **Warnings.** Winter weather warnings are issued for severe winter weather events that can be life threatening. The following warnings will be issued when an event is imminent or already occurring.

- **Winter Storm Warning.** A winter storm warning is issued for:
  - six inches or more of snow within 12 hours;
  - eight inches or more of snow within 24 hours; or
  - ½ inch or more of sleet accumulation is expected.
- **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.
- **Wind Chill Warning.** A wind chill warning is issued when wind chill values are expected to be -30°F or below.

PROFILING THE HAZARD

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

Figures 24 and **25**, located at 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 Jo Daviess County.

Severe Winter Storms

The Storm Events Database and the Illinois State Water Survey have documented 71 reported occurrences of severe winter storms (snow, ice and/or a combination of both) in Jo Daviess County between 1965

Severe Winter Storm Fast Facts – Jo Daviess County

Number of Snow & Ice Events Reported (1965 – 2011): ***71***
Number of Extreme Cold Events Reported (1996 – 2011): ***11***
Maximum One-Day Snow Accumulation: ***18 inches***
Coldest Temperature Recorded in the County: ***-35°F***
Most Likely Month for Snow & Ice Events to Occur: ***December***
Most Likely Month for Extreme Cold Events to Occur: ***January***

and 2011. Of the 71 occurrences, 49 were heavy snow storms or blizzards, three were ice storms and 19 were a combination of freezing rain, sleet, ice and snow.

Since 1994, at least one severe winter storm has occurred each year in Jo Daviess County. Anecdotal information shared by long-time residents suggests that severe winter storms have occurred with similar frequency between 1950 and 1994.

Figure 26 charts the reported occurrences of severe winter storms by month. Forty-seven of the 71 events (66%) took place in December and January. Of the 47 severe winter storm events, 25 occurred in December, making this the peak month for severe winter storms in Jo Daviess County. Two of the December events spanned into January; however, for illustration purposes only the month the event started is graphed.

Figure 26
Severe Winter Storms by Month
1965 – 2011

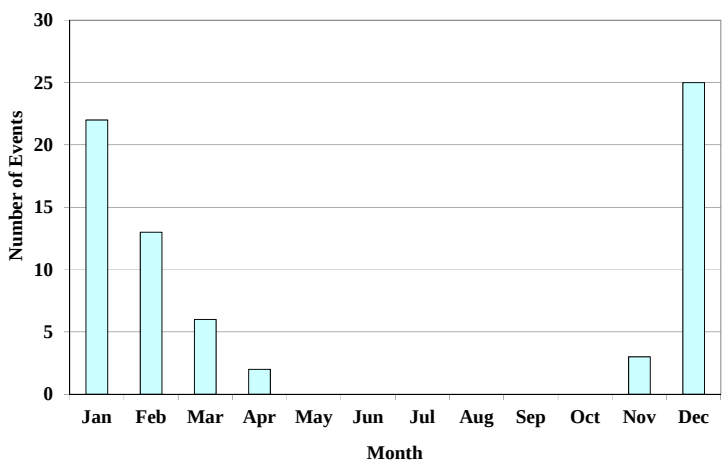
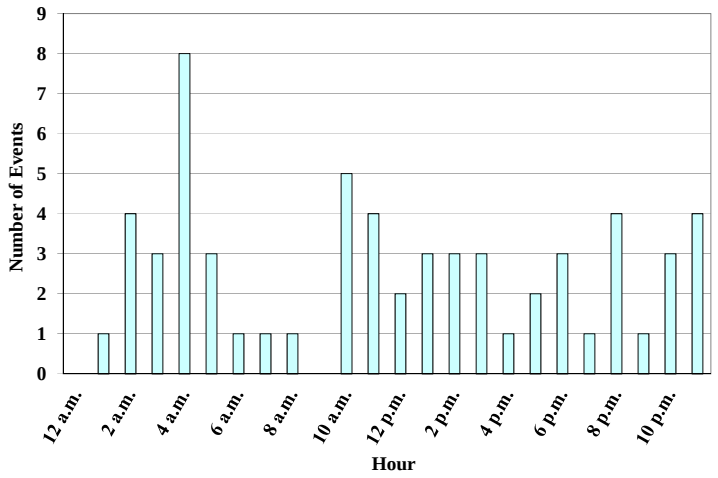


Figure 27 charts the reported occurrences of severe winter storms by hour. Of the 71 occurrences, start times were unavailable for 10 events. Of the remaining 61 severe winter storm events with recorded times, just over half (51%) began during the a.m. hours. Nineteen of the 61 events (31%) began between 1 a.m. and 6 a.m.

According to the Midwestern Regional Climate Center, the maximum one-day snow accumulation total recorded over a 85-year period in Jo Daviess County was 18 inches which occurred on February 19, 1962. The heaviest seasonal snowfall on record for Jo Daviess County is 63.4 inches, which occurred during the winter of 1978-1979. According to Larry Acker, the official weather observer in northwest Illinois for the National Weather Service, the lightest seasonal snowfall on record for Jo Daviess County is 12 inches, which occurred during the winter of 1921-1922.

Figure 27
Severe Winter Storms by Hour
1965 – 2011

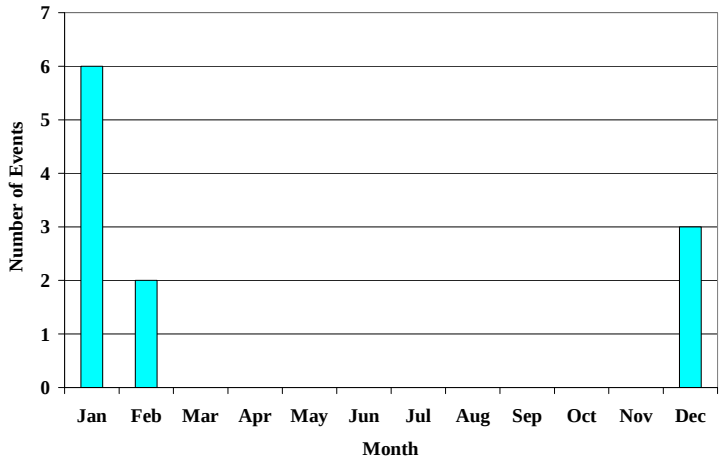


Extreme Cold

The Storm Events Database has documented 11 occurrences of extreme cold (dangerously low temperatures and wind chill values) in Jo Daviess County between 1996 and 2011. Of the 11 occurrences, one preceded and two corresponded with recorded severe winter storms.

Figure 28 charts the reported occurrences of extreme cold events by month. Six of the 11 events (55%) took place in January, with one event spanning between January and February. Approximately 55% of all extreme cold events began during the a.m. hours. The coldest temperature recorded over a 60-year period in Jo Daviess County was -35°F which occurred on February 3, 1996, according to records from the Midwestern Regional Climate Center.

Figure 28
Extreme Cold Events by Month
1996 – 2011



What locations are affected by severe winter storms?

Severe winter storms affect the entire County. All communities in Jo Daviess 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 the Illinois Emergency Management Agency classifies the Jo Daviess County's hazard rating for severe winter storms as "high."

What is the probability of future severe winter storms occurring?

Severe Winter Storms

Jo Daviess County has had 71 verified occurrences of severe winter storms between 1965 and 2011. With 71 occurrences over the past 47 years, Jo Daviess County should expect to experience at least one severe winter storm each year. There were 19 years over the past 47 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 40%. However, the gaps in data between 1967-1977 and 1982-1994 cause a distortion in both these probabilities.

Heavy snow blankets Stockton during the winter of 2009-2010.

Photograph provided by Steve Rice.

If only the events recorded from 1994 to 2011 are analyzed, then there have been 57 verified occurrences of severe winter storms. With 57 events in 18 years, Jo Daviess County should expect to experience at least three severe winter storms each year. There were 15 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 83%. A probability based on 18 years of data may not be as accurate as a probability based on 45 years of data. However, a probability based on the 1994 to 2011 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.

Extreme Cold

The County has had 11 verified occurrences of extreme cold between 1996 and 2011. With 11 occurrences over the past 16 years, the probability or likelihood of an extreme cold event occurring in Jo Daviess County in any given year is 69%. There were three years over the past 16 years where two or more extreme cold events occurred. This indicates that the probability that two or more extreme cold events may occur during any given year with the County is 19%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to severe winter storms?

Yes. All of Jo Daviess County, including the participating jurisdictions, is vulnerable to the dangers presented by severe winter storms. Severe winter storms are among the most frequently

occurring natural hazards in Illinois. There is one official state-designated warming center located at the Illinois Department of Human Services office in Galena.

Since 2001, Jo Daviess County has experienced 36 snow and ice events and five extreme cold events. During eight of those years, the County experienced two or more severe winter storm events. Severe winter storms have immobilized portions of the County, blocking roads, downing power lines, trees and branches causing power outages and property damage and contributing to vehicle accidents. In addition, the County and municipalities must budget for snow removal and de-icing of roads and bridges as well as for roadway repairs.

What impacts resulted from the recorded severe winter storms?

Severe winter storms, including extreme cold, have caused an estimated $72,372 in property damage. In addition to the damages reported by the Storm Events Database and committee members, The Galena Territory reported two events, one ice storm and one extreme cold event, which caused in tens of thousands of dollars in damages. These amounts are not included in **Figures 24** and **25** because a rough dollar estimate was not available. No injuries or deaths were reported as a result of any of the recorded events. The following provides a breakdown of impacts by category.

Main Street – January 18, 1910 Galena, Illinois

Photograph provided by Duff Stewart, City of Galena Building Department.

In comparison, the State of Illinois averages six deaths per year as a result of severe winter storms and 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.

While severe winter storms occur regularly in Jo Daviess 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 a power outage, the risk to public health and safety from severe winter storms is relatively low.

Severe Winter Storms

The data provided by the Storm Events Database and community records indicates that between 1965 and 2011, five severe winter storms caused approximately $72,372 in property damage. Country Financial along with committee members from Stockton and Galena were responsible for providing damage numbers for four of the five events, including the 2011 blizzard. Damage information was either unavailable or none was recorded for the remaining 66 reported

occurrences. No injuries or deaths were reported as a result of any of the severe winter storm events.

Of the total damages reported, Country Financial records identified $19,241 in property damage sustained as a result of the February1 and 2, 2011 blizzard that blanketed the County with 10 to 17 inches of snow. In addition, Stockton and Galena spent $9,500 and $30,000 respectively on emergency protective measures, including snow removal, and to repair storm-related infrastructure damage. This event was part of a federally declared disaster. Most of the roads in the County closed with numerous vehicles stuck in drifts or ditches and area schools were closed and events cancelled for several days as crews struggled to open rural roads and side streets.

Children play on the piles of snow left from the February 2011 blizzard.

Photograph provided by Steve Rice.

Additionally, Madelynn Wilharm of The Galena Territory identified an unrecorded ice storm on January 21 and 22, 1982 that resulted in power outages and frozen pipes in 128 homes in The Galena Territory and caused tens of thousands of dollars in damages. As a result of this event, The Galena Territory Association started the voluntary Heat Light Program in 1984 as one option to monitor homes for furnace failures during the winter season.

One of the most memorable events for committee members was the blizzard of April 1973. According to a news article from the Galena Gazette, snowfall in Jo Daviess County and surrounding areas measured 19.2 inches with snowdrifts of 10 feet or more. Everything in the County came to a standstill for two days. Rural areas were without electricity for several days. To read to Galena Gazette article in its entirety, see **Appendix K**.

Extreme Cold

While the Storm Events Database has no records of property damage associated with any of the 11 reported extreme cold events, committee member records contained information on one of the events. Madelynn Wilharm of The Galena Territory reported that the extreme cold event on December 23 and 24, 2000 caused many homes to freeze in The Galena Territory and resulted tens of thousands of dollars in damages.

What other impacts can result from severe winter storms?

In Jo Daviess 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 2006 and 2010 indicates that treacherous road conditions caused by snow and ice were present for 9.1% to

22.5% 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 as well as the total number of crashes that occurred in the County for comparison.

Figure 29
Severe Winter Weather Crash Data for Jo Daviess County

Year	Total # of Crashes	Presence of Treacherous Road Conditions caused by Snow and Ice		
		# of Crashes	# of Injuries	# of Deaths
2006	716	65	27	0
2007	775	136	25	2
2008	768	173	22	0
2009	578	68	23	1
2010	545	101	31	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 for 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 Jo Daviess County and the participating jurisdictions 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.

Information gathered from Jo Daviess County residents indicates that snow and ice accumulations on communication and power lines as well as key roads presents the greatest vulnerability to infrastructure and critical facilities within the County. Snow and ice accumulations on lines often lead to disruptions in communications and create power outages. Depending on the damage, it can take anywhere from several hours to several days to restore service.

Snow blows across the intersection of S. Rodden Rd. and Black School Rd about 4 miles northwest of Hanover.

Photograph provided Kay Temperly.

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 Jo Daviess 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, three of the participants 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 Jo Daviess 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 Jo Daviess County are vulnerable to damage it is likely that there will be future dollar losses from severe winter storms.

Figure 24
(Sheet 1 of 12)
Severe Winter Storms – Snow & Ice Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
1/21/1965 thru 1/22/1965	n/a	Winter Storm	freezing rain, ice and snow; COOP observer in Stockton measured 1.5 inches of snow and indicated there was sleet and glaze ice on both days	n/a	n/a	n/a
1/12/1966 thru 1/13/1966	n/a	Heavy Snow	8 to 9 inches of snow; COOP observer in Stockton measured 9 inches while the observer in Galena measured 8.3 inches	n/a	n/a	n/a
1/26/1967 thru 1/27/1967	n/a	Winter Storm	14 to 16 inches of snow; high winds produced blizzard conditions and excessive drifting	n/a	n/a	n/a
4/9/1973	n/a	Winter Storm	12 to 19 inches of snow; high winds produced blizzard conditions and drifts of 10 feet or more; traffic was brought to a total stop in the county; power was out for most of the county for 2 to 3 days; the heavy snow caused some roofs to collapse	n/a	n/a	n/a
11/23/1977 thru 11/25/1977	4:00 a.m.	Heavy Snow	4 to 8 inches of snow with a COOP observer measuring 8.5 inches in Galena	n/a	n/a	n/a
12/8/1977 thru 12/9/1977	3:00 a.m.	Winter Storm	4 to 5 inches of snow with a COOP observer in Galena measuring 4 inches of snow and stating that there were strong winds of 20 to 30 mph which caused many roads to be blown shut	n/a	n/a	n/a
12/19/1977 thru 12/21/1977	n/a	Heavy Snow	7 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 24
(Sheet 2 of 12)
Severe Winter Storms – Snow & Ice Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
12/31/1977 thru 1/1/1978	n/a	Heavy Snow	6 inches of snow	n/a	n/a	n/a
12/1/1978 thru 12/3/1978	2:00 a.m.	Winter Storm	6 inches of snow with a COOP observer in Galena measuring 5 inches of snow and indicating that ice pellets and glaze ice were present on the 3rd	n/a	n/a	n/a
12/6/1978 thru 12/8/1978	n/a	Winter Storm	freezing rain, 1 to 3 inches of snow	n/a	n/a	n/a
12/30/1978 thru 1/1/1979	9:00 p.m.	Winter Storm	freezing rain, 7 to 12 inches of snow with a COOP observer in Galena measuring 7.5 inches of snow and indicating that ice pellets and glaze ice were present on the 30th	n/a	n/a	n/a
1/12/1979 thru 1/14/1979	12:00 p.m.	Heavy Snow	14 to 16 inches of snow with a COOP in Galena measuring 14 inches of snow and indicating that there were strong winds that caused drifting on the 14th; a COOP observer in Stockton measured 13 inches of snow	n/a	n/a	n/a
1/3/1982 thru 1/4/1982	8:30 p.m.	Heavy Snow	COOP observer in Galena measured 11 inches of snow and indicated there were ice pellets on the 3rd	n/a	n/a	n/a
1/21/1982 thru 1/22/1982	n/a	Winter Storm	extensive freezing rain and sleet; COOP observer in Galena indicated there were ice pellets and glaze ice on the 22nd; The Galena Territory experienced power outages and frozen pipes in 128 homes	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 24
(Sheet 3 of 12)
Severe Winter Storms – Snow & Ice Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
12/6/1994 thru 12/7/1994	11:00 a.m.	Heavy Snow	6 to 10 inches of snow with COOP observer measuring 12 inches of snow in Galena while the COOP observer in Stockton recorded 8 inches of snow	n/a	n/a	n/a
1/18/1995 thru 1/19/1995	6:00 p.m.	Heavy Snow	10 to 15 inches of snow with a COOP observer measuring 11 inches of snow in Elizabeth while the COOP observer in Stockton recorded 8 inches of snow; strong northwest winds of 20 to 30 mph with gusts of 40 mph caused blowing and drifting and reduced visibility	n/a	n/a	n/a
11/10/1995	4:00 a.m.	Winter Storm	rain, sleet and 1 to 6 inches of snow; icy roads and winds gusting to 30 and 40 mph caused several accidents; hazardous travel conditions postponed high school semifinal football games across the area	n/a	n/a	n/a
11/27/1995	4:00 a.m.	Winter Storm	sleet and 4 to 7 inches of snow; conditions prompted early school closures; roads were slick causing numerous accidents	n/a	n/a	n/a
1/18/1996	4:30 a.m.	Winter Storm	1 to 3 inches of freezing rain, sleet and snow; most schools canceled classes or dismissed early; conditions created icy roads and disrupted electrical power	n/a	n/a	n/a
1/26/1996 thru 1/27/1996	4:00 a.m.	Winter Storm	1 to 3 inches of rain, sleet and snow with COOP observers in Elizabeth, Galena and Stockton measuring between 6.5 and 10 inches of snow; significant travel problems occurred due to a layer of glaze ice which came first and then was covered by snow; strong winds of 20 to 30 mph caused blowing and drifting and limited visibilities	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 24
(Sheet 4 of 12)
Severe Winter Storms – Snow & Ice Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
1/15/1997 thru 1/17/1997	4:00 a.m.	Winter Storm	3 to 7 inches of snow; strong winds of 20 to 25 mph with gusts to 45 mph and sub-zero temperatures produced dangerous wind chills; schools were closed due to icy roads and considerable blowing and drifting; drifting snow in rural areas closed state roads and major highways through much of the weekend	n/a	n/a	n/a
1/24/1997	4:00 a.m.	Winter Storm	freezing drizzle and sleet coated streets and highways followed by 2 to 4 inches of snow; the wintry mix caused very slick roads and exterior surfaces; over 100 vehicle accidents were reported across southeast Iowa and northwestern Illinois	n/a	n/a	n/a
2/3/1997 thru 2/4/1997	8:00 p.m.	Winter Storm	wintry mix of rain, freezing rain, sleet and 2 to 5 inches of snow; slick roads caused school delays and numerous accidents	n/a	n/a	n/a
12/24/1997	11:00 a.m.	Heavy Snow	3 to 6 inches of snow resulted in greatly reduced visibilities, slick roads and numerous accidents; a COOP observer measured 6 inches of snow in Elizabeth	n/a	n/a	n/a
3/8/1998 thru 3/9/1998	12:00 p.m.	Heavy Snow	2 to 6 inches of snow caused numerous road and school closures; the heavy snow coupled with earlier rain and sleet caused extensive power and telephone outages over northern Illinois: a COOP observer in Galena measured 6 inches of snow	n/a	n/a	n/a
12/6/1998	3:00 p.m.	Winter Storm	rain, freezing rain, sleet and 1 to 3 inches of snow; roads became slick and snow-packed resulting in treacherous driving conditions and numerous accidents	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 24
(Sheet 5 of 12)
Severe Winter Storms – Snow & Ice Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
1/1/1999 thru 1/3/1999	5:17 a.m.	Winter Storm	8 to 12 inches of snow with a COOP observer measuring 9.7 inches in Stockton; blowing and drifting was a big problem, with roads and highways quickly becoming snow-packed	n/a	n/a	n/a
3/8/1999	4:00 p.m.	Winter Storm	6 to 8 inches of snow with a COOP observer measuring 8 inches in Stockton; strong winds of 20 to 30 mph with gusts to 40 mph caused blowing and drifting with visibility near zero at times; conditions forced early closings of many area schools, businesses and shopping malls	n/a	n/a	n/a
12/19/1999 thru 12/20/1999	3:00 p.m.	Winter Storm	freezing rain and drizzle mixed with around 1 inch of snow; strong north winds produced some blowing and drifting snow and caused dangerously cold wind chill values between -15°F to -30°F; roads were slick in spots with several accidents reported	n/a	n/a	n/a
1/19/2000	10:00 a.m.	Winter Storm	4 to 8 inches of snow with a COOP observer measuring 6.7 inches in Stockton; strong north winds gusting to 40 mph produced widespread blowing and drifting of snow and dangerously cold wind chill values between -20°F to -30°F; numerous accidents were reported; conditions forced early closure of many schools, businesses and shopping malls	n/a	n/a	n/a
2/17/2000 thru 2/18/2000	7:00 p.m.	Winter Storm	5 to 10 inches of snow with COOP observers in Galena and Stockton measuring between 6 and 7 inches; conditions forced the cancellation of many schools and closed businesses and shopping malls; numerous minor vehicle accidents were reported	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 24
(Sheet 6 of 12)
Severe Winter Storms – Snow & Ice Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
12/10/2000 thru 12/11/2000	10:00 p.m.	Winter Storm	8 to 11 inches of snow with a COOP observer measuring 10 inches in Stockton; strong low pressure center produced wind gusts up to 40 mph which created near blizzard conditions, drifting many area roads shut and producing dangerous wind chill values between -20°F to -40°F; most schools were closed both Monday and Tuesday and many businesses closed early Monday	n/a	n/a	n/a
12/15/2000 thru 12/16/2000	1:00 p.m.	Ice Storm	mix of freezing rain, sleet and some snow with ice accumulations up to ½ inch made for very dangerous driving conditions and numerous reports of accidents and cars in ditches	n/a	n/a	n/a
12/18/2000 thru 12/19/2000	4:00 a.m.	Winter Storm	3 to 5 inches of snow (with isolated areas receiving 6 inches); strong northwest winds of 20 to 30 mph produced considerable blowing and drifting; the strong winds combined with temperatures near zero produced wind chill values as low as -40°F	n/a	n/a	n/a
12/28/2000 thru 12/29/2000	10:00 a.m.	Heavy Snow	4 to 6 inches of snow; numerous weather-related accidents were reported across the area	n/a	n/a	n/a
1/28/2001 thru 1/29/2001	10:00 a.m.	Ice Storm	1 to 2 inches of rain, sleet and 1 to 3 inches of snow with significant ice accumulations; snow and locally heavy rains with the storm contributed to the hazardous road conditions and some flooding of urban streets and rural roads	n/a	n/a	n/a
2/23/2001 thru 2/24/2001	10:30 p.m.	Winter Storm	freezing rain, sleet and snow with ice accumulations ranging from ¼ to 1 inch; travel was quite treacherous and numerous accidents were reported	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 24
(Sheet 7 of 12)
Severe Winter Storms – Snow & Ice Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
1/30/2002 thru 1/31/2002	5:00 a.m.	Winter Storm	freezing rain and sleet with significant ice accumulations of ¼ to ½ inch followed by 7 to 11 inches of snow; the heavy snow and ice caused many schools to close; scattered power outages and tree damage were reported as a result of the ice accumulations many activities were either postponed or cancelled; COOP observers in Galena and Stockton measured around 5 inches of snow	n/a	n/a	n/a
3/1/2002 thru 3/3/2002	5:00 p.m.	Winter Storm	3 to 8 inches of snow with COOP observers in Galena and Stockton measuring between 6 and 8 inches; strong northwest winds caused blowing and drifting and sent wind chill values plummeting below zero; many events were postponed or cancelled	n/a	n/a	n/a
3/4/2003 thru 3/5/2003	1:00 p.m.	Winter Storm	3 to 7 inches of snow with with COOP observers in Galena and Stockton measuring between 6.5 and 6.9 inches	n/a	n/a	n/a
2/3/2004 thru 2/4/2004	5:00 a.m.	Winter Storm	sleet, freezing rain and snow with COOP observer in Galena measuring 4.4 inches and the Galena Territory measuring 5 inches	n/a	n/a	n/a
2/5/2004 thru 2/6/2004	1:30 p.m.	Heavy Snow	COOP observer in Galena measured 5.5 inches of snow while The Galena Territory reported 6.5 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 24
(Sheet 8 of 12)
Severe Winter Storms – Snow & Ice Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
1/5/2005 thru 1/6/2005	6:00 p.m.	Heavy Snow	10 to 15 inches of snow with reports of Galena and Warren receiving 13 inches	n/a	n/a	n/a
1/21/2005 thru 1/22/2005	2:00 p.m.	Heavy Snow	COOP observers in Galena and Stockton measured 7 inches of snow and indicated there were high winds on the 22nd that led to blowing snow and reduced visibilities	n/a	n/a	n/a
3/5/2006	10:00 a.m.	Heavy Snow	4 to 6 inches of snow; several traffic accidents reported across the county	n/a	n/a	$2,000
2/6/2007	7:00 a.m.	Heavy Snow	2 to 5 of snow (with isolated areas receiving 6 inches); Apple River Canyon State Park received 6 inches of snow	n/a	n/a	n/a
2/13/2007	2:00 a.m.	Winter Storm	3 to 6 inches of snow with strong winds gusting to over 40 mph causing considerable blowing and drifting; some roads were drifted shut or were impassable	n/a	n/a	n/a
2/24/2007 thru 2/25/2007	2:00 p.m.	Winter Storm	ice accumulations of around 1inch combined with east winds gusting over 50 mph brought down numerous tree branches and power lines, along with several thousand power poles causing widespread power outages; in addition to the ice, up to 7 inches of snow fell in the northern portion of the region and combined with the strong winds to create blizzard conditions; a COOP observer in Stockton measured 6.9 inches of snow	n/a	n/a	n/a
3/1/2007 thru 3/2/2007	8:00 p.m.	Winter Storm	1 to 3 inches of snow; sustained winds of 35 to 40 mph with gusts of 45 to 50 mph created whiteout conditions; besides the snow, there were locally heavy rains of ¾ to 1.5 inches falling on partially frozen ground which caused significant ponding of water	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$2,000**

Figure 24
(Sheet 9 of 12)
Severe Winter Storms – Snow & Ice Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
4/10/2007 thru 4/11/2007	11:15 p.m.	Heavy Snow	5 to 7 inches of snow	n/a	n/a	n/a
12/1/2007	10:30 a.m.	Winter Storm	ice accumulations of ¼ to ¾ inch combined with winds gusting to 30 to 40 mph knocked down some branches and trees causing scattered power outages; law enforcement reported many cars slid into ditches	n/a	n/a	n/a
12/11/2007	1:30 a.m.	Ice Storm	freezing rain, sleet, snow and ice accumulations of ¼ to 1 inch; the ice knocked down some tree branches and caused scattered power outages	n/a	n/a	n/a
12/22/2007 thru 12/23/2007	6:00 p.m.	Winter Storm	4 inches of snow; strong winds with gusts over 50 mph produced blizzard conditions and led to considerable blowing and drifting; many roads were closed	n/a	n/a	n/a
12/28/2007	6:45 a.m.	Heavy Snow	3 to 6 inches of snow with a band of 6 to 7 inches falling from the Quad Cities to Freeport; The Galena Territory reported 6 inches of snow	n/a	n/a	n/a
1/21/2008 thru 1/22/2008	3:00 a.m.	Heavy Snow	3 to 9 inches of snow with a trained spotter measuring 8 inches southeast of Council Hill	n/a	n/a	n/a
2/5/2008 thru 2/6/2008	2:00 p.m.	Winter Storm	10 to 15 inches of snow with COOP observers in Elizabeth, Galena and Stockton measuring around 13 inches; schools were closed and there were many cars that were stuck in the deep snow or that had slid into ditches	n/a	n/a	$7,700
Subtotal:				**0**	**0**	**$7,700**

Figure 24
(Sheet 10 of 12)
Severe Winter Storms – Snow & Ice Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
2/25/2008 thru 2/26/2008	3:00 p.m.	Winter Storm	6 to 8 inches of snow with a trained spotter measuring 8 inches northeast of Stockton	n/a	n/a	n/a
12/18/2008 thru 12/19/2008	10:00 p.m.	Heavy Snow	6 to 10 inches of snow with a trained spotter measuring 9.5 inches northeast of Stockton	n/a	n/a	n/a
2/20/2009 thru 2/21/2009	11:00 p.m.	Winter Storm	3 to 5 inches of snow; strong northwest winds gusting 35 to 40 mph produced areas of blowing and drifting	n/a	n/a	n/a
1/9/2009 thru 1/10/2009	NA	Heavy Snow	7 to 8 inches of snow with the COOP observer in Elizabeth measuring 8.4 inches while the observers in Galena and Stockton measured 7.8 inches and 7.0 inches respectively; The Galena Territory reported 6 inches of snow	n/a	n/a	n/a
1/13/2009 thru 1/14/2009	NA	Heavy Snow	COOP observer in Galena measured 6 inches of snow while the observers in Elizabeth and Stockton measured 3.8 inches and 3.5 inches respectively; The Galena Territory reported 4.6 inches of snow	n/a	n/a	n/a
12/8/2009 thru 12/9/2009	2:30 a.m.	Winter Storm	10 to 15 inches of snow with a COOP observer measuring 13 inches north of Stockton; this powerful winter storm produced very heavy snowfall, blizzard conditions and bitterly cold temperatures; conditions caused scattered power outages and some tree branches to break; numerous accidents and vehicles sliding into ditches were reported across the region; many schools and businesses were also closed	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 24
(Sheet 11 of 12)
Severe Winter Storms – Snow & Ice Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
12/23/2009	11:00 a.m.	Ice Storm	ice accumulations of ¼ to ½ inch coated trees and power lines but temperatures in the lower 30s kept most roads wet; scattered power outages and some broken tree branches were reported as winds gusted to 35 mph	n/a	n/a	$868
1/6/2010 thru 1/7/2010	8:30 p.m.	Winter Storm	6 to 9 inches of snow with a COOP observer measuring 7.3 inches at Galena	n/a	n/a	n/a
2/7/2010 thru 2/9/2010	11:00 p.m.	Heavy Snow	5 to 9 inches of snow with a trained spotter measuring 6.7 inches southeast of Council Hill	n/a	n/a	$1,280
12/3/2010 thru 12/4/2010	5:30 p.m.	Winter Storm	≥ 6 inches of snow with a COOP observer measuring 9.2 inches near Elizabeth; numerous accidents as well as cars sliding into ditches were reported	n/a	n/a	n/a
12/11/2010 thru 12/12/2010	11:00 p.m.	Winter Storm	1 to 4 inches of snow with strong winds gusting to 40 to 50 mph generated blizzard conditions in some locations	n/a	n/a	$1,783
12/20/2010	11:00 a.m.	Winter Storm	freezing drizzle and snow; COOP observer in Elizabeth measured 4.3 inches of snow while the observers in Galena and Stockton both measured 4 inches; The Galena Territory reported 5.5 inches of snow	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$3,931**

Figure 24
(Sheet 12 of 12)
Severe Winter Storms – Snow & Ice Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
12/24/2010 thru 12/25/2010	3:00 a.m.	Heavy Snow	at least 5 inches of snow in many locations with a COOP observer measuring 5.5 inches in Galena	n/a	n/a	n/a
1/17/2011	2:30 a.m.	Winter Storm	3 to 6 inches of snow with a trained spotter measuring 6 inches near Elizabeth; south winds gusting to around 35 mph produced considerable drifting	n/a	n/a	n/a
2/1/2011 thru 2/2/2011	8:00 a.m.	Winter Storm	10 to 15 inches of snow with COOP observers in Elizabeth, Galena and Stockton measuring between 10.4 and 17 inches; blizzard conditions were widespread with visibilities near zero in heavy snow and winds gusting to over 50 to 60 mph; most roads were closed with numerous vehicles stuck in drifts or sliding into ditches, but no major accidents were reported; many schools and events were cancelled or closed for a couple of days as crews struggled to open rural roads and side streets; this event was part of a federally-declared disaster (Declaration #1960.)	n/a	n/a	$58,741
Subtotal:				**0**	**0**	**$58,741**

GRAND TOTAL:	**0**	**0**	**$72,372**

Sources: Country Financial.
Illinois State Water Survey.
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee Member responses to Jo Daviess County All Hazard Events Questionnaire.
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 25
(Sheet 1 of 2)
Extreme Cold Events Reported in Jo Daviess County
1996 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
1/30/1996 thru 2/4/1996	8:00 p.m.	Extreme Cold	all time record low temperatures from -25°F to -32°F with highs only reaching -10°F to -15°F during the day; the extreme cold caused insulator failures that left thousands without power	n/a	n/a	n/a
1/10/1997 thru 1/12/1997	4:00 a.m.	Extreme Cold	strong winds and single digit temperatures (above and below zero) caused many schools to close on the 10th	n/a	n/a	n/a
1/17/1997 thru 1/19/1997	4:00 a.m.	Extreme Windchill	single digit temperatures (above and below zero) combined with winds ranging from 20 to 25 mph with gusts to 45 mph to create dangerous windchill values	n/a	n/a	n/a
12/16/2000 thru 12/17/2000	2:00 p.m.	Extreme Windchill	dangerously cold wind chill values (-25°F to -50°F) as a strong northwest wind gusting to 35 mph buffeted the area	n/a	n/a	n/a
12/21/2000 thru 12/22/2000	4:00 a.m.	Extreme Windchill	low temperatures (-5°F to -10°F) combined with winds gusting up to 40 mph produced extremely dangerous wind chill values (-40°F to -50°F)	n/a	n/a	n/a
12/23/2000 thru 12/24/2000	10:00 p.m.	Extreme Windchill	frigid arctic air combined with a blustery northwest wind up to 20 mph to produce dangerous wind chill values (-25°F to -45°F); actual temperatures fell to between -5°F to -10°F during the overnight hours; The Galena Territory reported extreme cold and high winds that caused many houses to freeze	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

Figure 25
(Sheet 2 of 2)
Extreme Cold Events Reported in Jo Daviess County
1996 – 2011

Date(s)	Start Time	Event Type	Magnitude	Injuries	Death	Property Damages
2/2/2007 thru 2/5/2007	4:00 a.m.	Extreme Cold/ Windchill	temperatures struggled to reach single digits and teens during the daytime while nighttime temperatures dropped to -15°F to -20°F near US 20; arctic air combined with the low temperatures to produce dangerous wind chill values (-20°F to -40°F)	n/a	n/a	n/a
1/24/2008	4:00 a.m.	Extreme Cold/ Windchill	arctic air and very low temperatures (-15°F to -25°F) produced dangerous wind chill values (-30°F to -35°F) causing some schools to delay start of classes	n/a	n/a	n/a
1/29/2008 thru 1/30/2008	10:00 p.m.	Extreme Cold/ Windchill	northwest winds of 15 to 25 mph combined with low temperatures (-5°F to -10°F) to create dangerous wind chill values (-30°F to -40°F) causing some schools to delay start of classes	n/a	n/a	n/a
2/10/2008	1:00 a.m.	Extreme Cold/ Windchill	northwest wind of 20 to 30 mph with gusts near 45 mph combined with very cold temperatures to create dangerous wind chill values (-30°F to -40°F)	n/a	n/a	n/a
1/14/2009 thru 1/16/2009	10:00 p.m.	Extreme Cold	very low temperatures (-20°F to -40°F)	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**
GRAND TOTAL:				**0**	**0**	**$0**

Sources: Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee Member responses to Jo Daviess County All Hazard Events Questionnaire.
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 Jo Daviess County?

There are two main types of flooding that affect Jo Daviess 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?

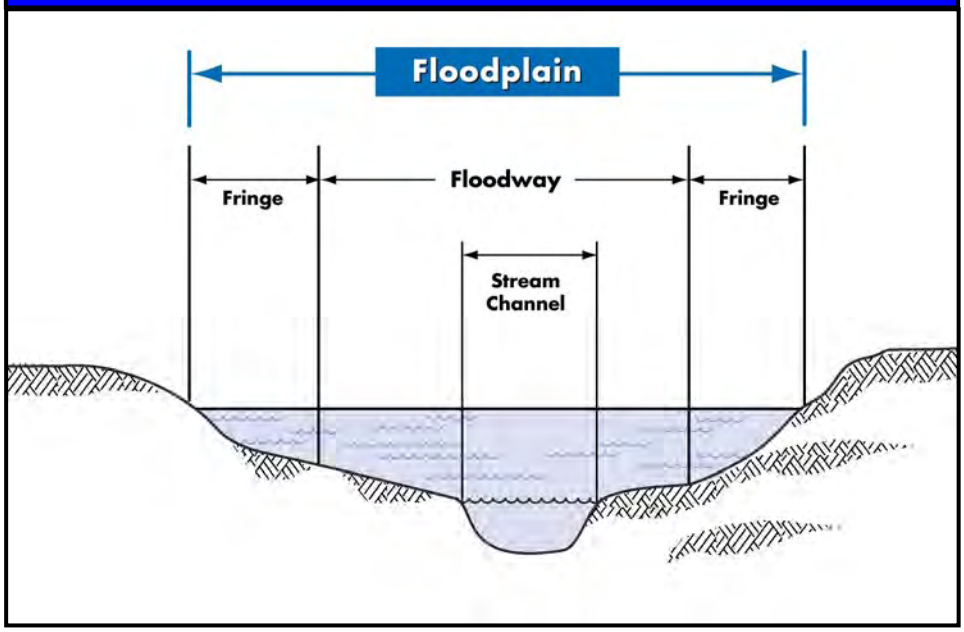
The general definition of a floodplain is any land area susceptible to being inundated or flooded by water from any source (i.e., river, stream, lake, estuary, etc.). This general definition differs slightly from the regulatory definition of a floodplain.

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?

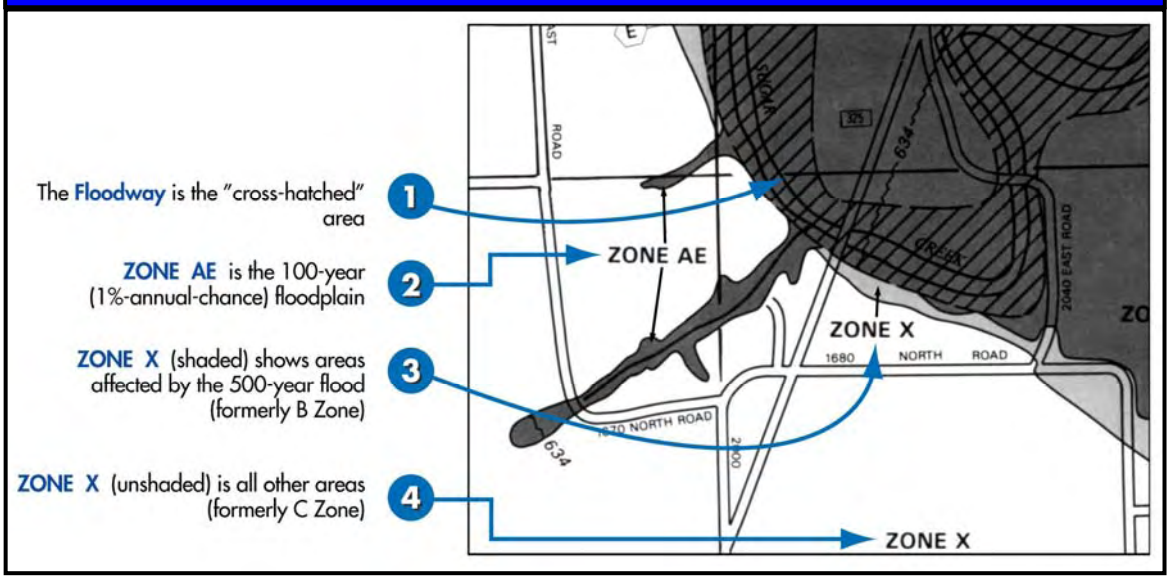
A Special Flood Hazard Area (SFHA) is the base floodplain. As discussed previously, this is the land area that is covered by the floodwaters of the base flood and has a 1% chance of flooding in

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 of the Quad Cities, Iowa/Illinois is responsible for issuing ***flood watches*** and ***warnings*** for Jo Daviess 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.

PROFILING THE HAZARD

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

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

General Floods

The Storm Events Database, U.S. Geological Survey and records of past events from the National Weather Service Weather Forecast Office of the Quad Cities have documented 15 reported occurrences of general flooding in Jo Daviess County between 1965 and 2011.

Flood Fast Facts – Jo Daviess County

Number of General Floods Reported (1965 – 2011): ***15***
Number of Flash Floods Reported (1981 – 2011): ***29***
Record-Setting Mississippi River Flood: ***April 1965***
Most Likely Month for General Floods to Occur: ***April***
Most Likely Time for General Floods to Occur: ***morning***
Most Likely Month for Flash Floods to Occur: ***June***
Most Likely Time for Flash Floods to Occur: ***evening***

Included in these 15 events are several historic Mississippi River floods. Based on historical gage data from the river gage located three miles downstream from Lock and Dam #10 (adjacent to the right abutment of the Canadian Pacific (formerly IC&E) railroad bridge in Dubuque, Iowa), the record setting Mississippi River flood in this area occurred in 1965. On April 26, 1965 the Mississippi River crested at 26.81 feet, more than five feet above major flood stage. The second and third highest crest at this location occurred during 2001 (25.4 feet) and 1993 (23.84 feet), respectively.

Flash Floods

The Storm Events Database and Planning Committee member records have documented 29 reported occurrences of flash flooding in Jo Daviess County between 1981 and 2011. Included in these 29 events is the historic flash flooding of July 27 and 28, 2011. A stationary, back-building storm system stalled over a relatively small area of northeast Iowa and extreme northwest Illinois for 18 hours beginning the evening of the 27th. A total of 7 to 15 inches of rain fell during this time period, causing creeks and streams to rise rapidly and resulting in flash flooding to an extent that had never before been seen in Jo Daviess County. East Dubuque and Galena received a record 21.16 inches. This historic flash flood was preceded almost a year to the day by a set of historic flash floods that occurred on July 23 and 24, 2010.

Figure 34 charts the reported occurrences of general flooding and flash flooding by month. Ten of the 15 general flood events (67%) took place in April and June. Of the 10 events, two began in April, five took place in April, and three took place in June. Two of the April events spanned more than one month, however, for illustration purposes only the month the event started is graphed. In comparison, 19 of the 29 flash flood events (66%) took place in June and August.

Figure 34
Flood Events by Month

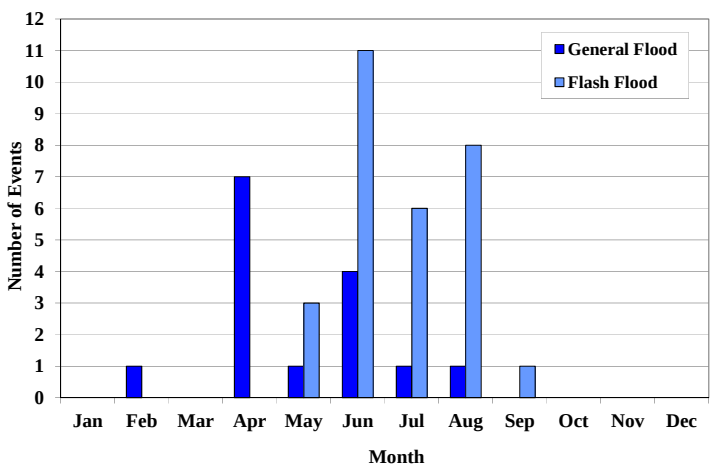
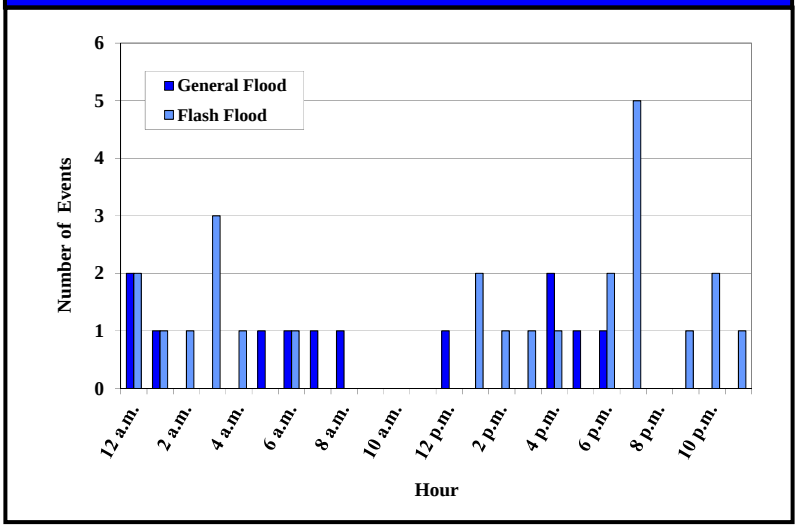


Figure 35 charts the reported occurrences of general flooding and flash flooding by hour. Of the 12 general flood events with recorded times, seven (58%) began during the a.m. hours, with four

of the events beginning between 5 a.m. and 9 a.m. Of the 25 flash flood events with recorded times, 16 (64%) began during the p.m. hours, with seven of the events beginning between 6 p.m. and 8 p.m.

Figure 35
Flood Events by Hour



What locations are affected by floods?

While specific locations are affected by riverine 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. The areas along the Mississippi River, Galena River and Apple River are more susceptible to riverine flooding. Approximately 7.7% of the area in Jo Daviess County is designated as being within the base floodplain and susceptible to riverine floods. The *2010 Illinois Natural Hazard Mitigation Plan* by the Illinois Emergency Management Agency classifies Jo Daviess County's hazard rating for floods as "elevated."

Figure 36 identifies the bodies of water by participating jurisdictions that are known to cause flooding or have the potential to flood. **Figure 37** identifies the floodplains in Jo Daviess County. This figure is based on the DFIRMs for Jo Daviess County that became effective September 17, 2010. While a large portion of the area prone to riverine flooding is in the unincorporated portions of the County, East Dubuque, Galena and Hanover are also susceptible to riverine flooding because of their proximity to floodplains. To view the DFIRMs for the participating municipalities, see **Appendix L**.

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

Yes. Jo Daviess County, East Dubuque, Galena, Hanover and Stockton 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 date of the most recently adopted floodplain zoning ordinance. Apple River, Elizabeth and Warren have no identified flood hazard boundaries within their corporate limits and are not required to participate.

Figure 36
Bodies of Water Subject to Flooding in Jo Daviess County

Participating Jurisdiction	Water Bodies
Apple River	---
East Dubuque	Mississippi River
Elizabeth	---
Galena	Galena River, Hughlett Branch, intermittent Tributary of Galena River, intermittent Tributary of Hughlett Branch
Hanover	Apple River
Jo Daviess County (unincorporatd)	Apple Canyon Lake, Apple River, Apple River South Fork, Apple River West Fork, Birch Branch, Camp Creek, Clear Creek, Coon Creek, Davis Creek, Dixon Creek, Duke Creek, Furnace Creek, Galena River, Galena River East Fork, Hammond Branch, Hells Branch, Hughlett Branch, Irish Hollow Creek, Kentucky Creek, Lake Galena, Lawhorn Creek, Lilly Branch, Little Rush Creek, Little Menominee River, Menominee River, Mill Creek, Mississippi River, Mud Run, Muddy Plum River, Plum River, Plum River Middle Fork, Plum River North Fork, Rindesbacher Creek, Rush Creek, Sinsinawa River, Scrub Creek, Small Pox Creek, Wise Lake, Wolf Creek, Yellow Creek, Yonkers Lake
Scales Mound	---
Stockton	---
Warren	---

Source: FEMA DFIRMs.

Figure 38
NFIP Participating Jurisdictions

Participating Jurisdictions	Participation Date	Current Effective FIRM Date	CRS Participation	Most Recently Adopted Floodplain Zoning Ordinance
Jo Daviess County	1/18/1984	9/17/2010	No	9/2010
East Dubuque	10/18/1983	9/17/2010	No	2/2011
Galena	7/20/1973	9/17/2010	No	8/2010
Hanover	5/4/1989	9/17/2010	No	8/2010
Stockton	2/18/2011	9/17/2010 (NSFHA)	No	1/2011

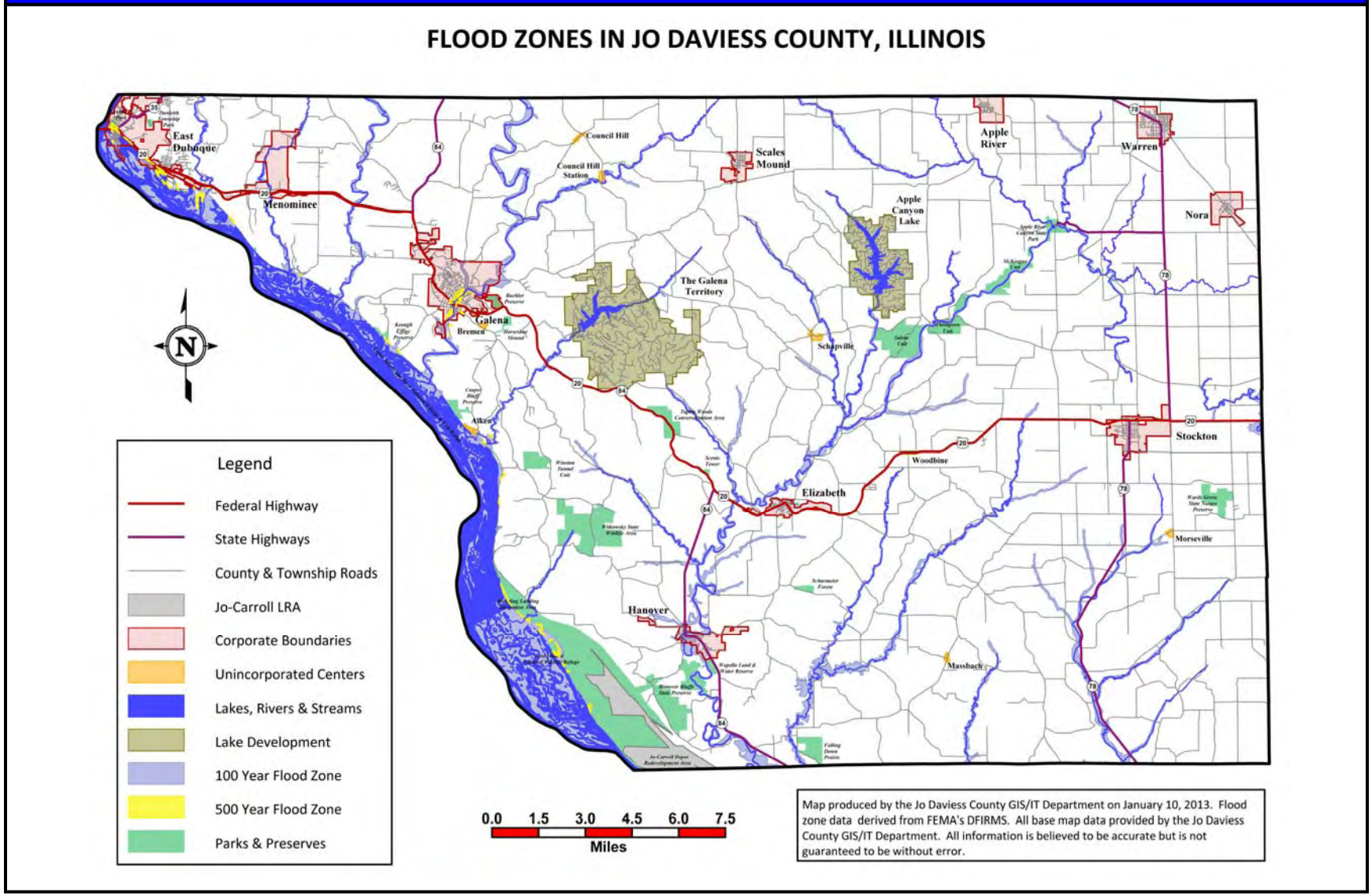
Source: FEMA, Community Status Book.

What is the probability of future flood events occurring?

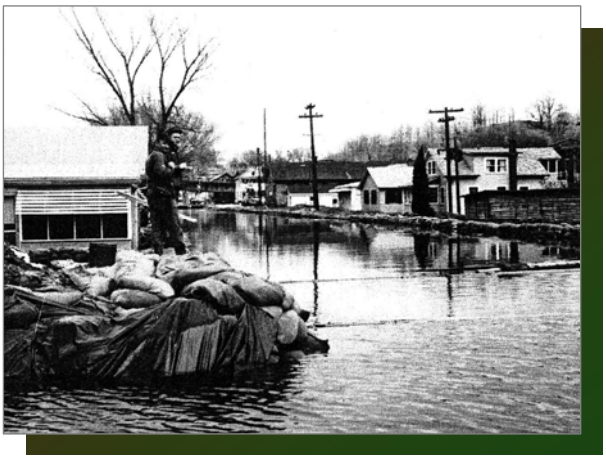
General Flood Events

Jo Daviess County has had 15 verified occurrences of general flooding between 1965 and 2011. With 15 occurrences over the past 51 years, the probability or likelihood of a flood event occurring in Jo Daviess County in any given year is 29%. There were three years over the past 51 years where two or more general flood events occurred. This indicates that the probability that more than one general flood event may occur during any given year within the County is 6%. However, the gaps in flood data between 1965 and 1997 cause a distortion in both these probabilities.

Figure 37
Floodplain Areas in Jo Daviess County



If only the events recorded by the Storm Events Database are analyzed, then there have been 12 verified occurrences of general flooding between 1997 and 2011. With 12 events in 15 years, the probability or likelihood of a flood event occurring in Jo Daviess County in any given year is 80%. There were four years over the past 15 years where two or more general flood events occurred. This indicates that the probability that more than one general flood event may occur during any given year within the County is 27%. A probability based on 15 years of data may not be as accurate as a probability based on 51 years of data. However, a probability based on the 1997-2011 data may provide a more reliable representation of the threat the County faces from flooding than a probability calculated from a longer time frame with gaps.

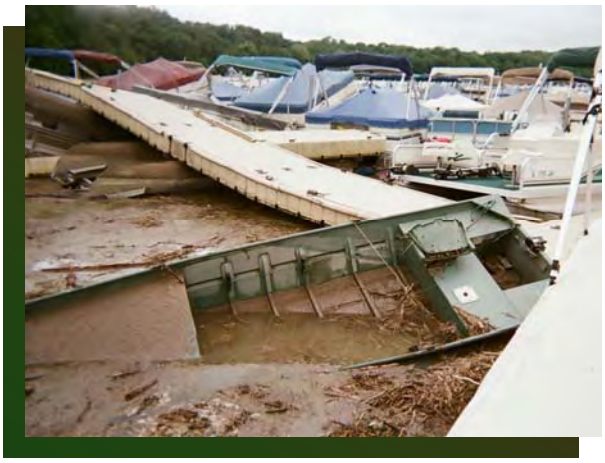


The Mississippi River flooded portions of East Dubuque during the 1965 flood.

Photograph provided by Harold Lange.

Flash Flood Events

The County has experienced 29 verified occurrences of flash flooding between 1981 and 2011. With 29 occurrences over the past 31 years, the probability or likelihood of a flood event occurring in Jo Daviess County in any given year is 94%. There were six years over the past 31 years where two or more flash flood events occurred. This indicates that the probability that two or more flash flood events may occur during any given year with the County is 19%. However, the gaps in flood data between 1981 and 1998 cause a distortion in both these probabilities.



Boat and dock damage sustained at The Galena Territory marina during the August 9, 2009 flash flood event.

Photograph provided by Madelynn Wilharm.

If only the events recorded between 1998 and 2011 are analyzed, then there have been 27 verified occurrences of flash flooding. With 27 events in 14 years, Jo Daviess County should expect to experience around two flash flood events each year. There were six years over the past 14 years where two or more general flood events occurred. This indicates that the probability that more than one flash flood event may occur during any given year within the County is 43%. A probability based on 14 years of data may not be as accurate as a probability based on 31 years of data. However, a probability based on the 1998-2011 data may provide a more reliable representation of the threat the County faces from flooding than a probability calculated from a longer time frame with gaps.

ASSESSING VULNERABILITY

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

Are the participating jurisdictions vulnerable to flooding?

Yes. Jo Daviess County, including the participating jurisdictions, is vulnerable to the dangers presented by flooding. Precipitation levels and topography that includes the Mississippi 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 recorded flood and flash flood events by participating jurisdiction.

Figure 39
Flood Events by Participating Jurisdiction

Participating Jurisdiction	Flood Events		Flash Flood Events	
	Number	Year	Number	Year
Countywide	5	1997, 1997, 1999, 2000, 2004,	3	2010, 2010, 2011
Western Portion of the County	8	1965, 1973, 1993, 2001, 2003, 2008, 2008, 2011	0	---
Unincorp. Areas	1	2000	3	2009, 2009, 2010
Apple Canyon Lake	0	---	0	---
Apple River	0	---	1	2009*
East Dubuque	0	---	1	1999
Elizabeth	1	2000*	1	2008*
Galena	1	1998	9	1986, 2002, 2002*, 2004, 2004, 2004, 2005, 2008, 2008
The Galena Territory	0	---	7	1981, 1986, 1998, 2002, 2002, 2005, 2009
Hanover	0	---	0	---
Scales Mound	0	---	2	2009*, 2010*
Stockton	0	---	6	2002, 2002, 2002*, 2004*, 2007*, 2010
Warren	0	---	2	2004, 2007*

* Flooding occurred in the vicinity of this location.

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

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

What impacts resulted from the recorded floods?

Floods as a whole have caused an estimated $179,667 in crop damage and $14,226,196 in property damages. In comparison, the State of Illinois has averaged an estimated $257 million annually in property damage losses from flooding since 1983, making flooding the single most financially damaging weather hazard in Illinois. The following provides a breakdown of impacts by category.

Two deaths were reported in Jo Daviess County as a result of the July 2011 flash flood event. In comparison, Illinois averages four deaths per year from flooding. While both general and flash flooding evens 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 general flooding is seen as relatively low. However, two-thirds of the recorded flood events were a result of flash 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.

Flood of June 23, 1892, South Main Street – Galena, Illinois

Photograph provided by Duff Stewart, City of Galena Building Department.

Words alone cannot fully convey the scope of the damages caused by floods in Jo Daviess County. Select photographs provided by Planning Committee members are located throughout this section and additional photographs of historic flood events are located in **Appendix M**.

General Floods

The data provided by the Storm Events Database, the Illinois Emergency Management Agency and U.S. Geological Survey records indicate that between 1965 and 2011, three general flood events caused approximately $2,231,042 in property damage. Two of the three events with damage estimates were part of federally-declared disasters. Damage information was either unavailable or none was recorded for the remaining 12 events. No injuries or deaths were reported as a result of any of the recorded general flood events.

While no damage information was available for the 1965 Mississippi River flood of record, information was available for the 1993 and 2001 floods, which resulted the third and second highest crests respectively at the river gauge just north of East Dubuque.

The 1993 flood resulted from higher than average precipitation through the spring and summer that caused the Mississippi River to overflow its banks. The subsequent flooding caused a minimum of $1,354,479 in property damages in Jo Daviess County and was covered under Presidential Disaster Declaration 997.

The City of Galena had to close their floodgates during the flood of 1993.

Photograph by Ron Toepfer.

The April 2001 flood was caused by rapid snow melt coupled with severe thunderstorms that produced near recording flooding along the Mississippi River. In Jo Daviess County, a minimum of $626,563 in property damages was identified and the event was included in Presidential Disaster Declaration 1368.

In terms of historic flood events, Larry Acker, the official weather observer in northwest Illinois for the National Weather Service, identified a record rainfall event on September 9, 1941 that led to flooding and flood damage. The COOP observer log for Galena confirmed Larry's findings and showed that a total of 5.54 inches of rain fell that day. In addition to Larry's information, Madelynn Wilharm was able to locate a news article from the Galena Daily Gazette dated February 27, 1937 which detailed notable flood events in Galena between 1870 and 1937. To view a copy of this article, please see **Appendix K**.

Flash Floods

The data provided by the Storm Events Database, the Illinois Emergency Management Agency and community records indicate that between 1981 and 2011, 14 flash flood events caused approximately$179,667 in crop damage and $11,995,154 in property damages. Damage information was either unavailable or none was recorded for the remaining 15 events. Two deaths were reported as a result of the historic July 2011 flash flood event. These individuals were killed in separate incidents involving vehicles that became surrounded and carried away by floodwaters in unincorporated Jo Daviess County southeast of Galena.

Park Avenue in Galena was among one of the many streets covered with water during the July 2011 flash flood event.

Photo taken by Celestine Ruffini.

Included in the property damage figures is the historic flash flooding event of July 27 and 28, 2011. While this event did not meet the threshold for a Presidentially declared disaster, it did cause significant and devastating damage across the entire County. A total of 7 to 15 inches of rain fell over extreme northwest Illinois over an 18-hour period causing flash flooding to an extent that had never been seen before in Jo Daviess County. East Dubuque and Galena received a record 21.16 inches of rain. The property damage estimates for this event alone totaled $8,375,854. Photographs depicting the property damages sustained during this

event can be found in **Appendix M**. The following provides a breakdown by jurisdiction of the infrastructure and critical facilities property damages reported by committee members:

In East Dubuque, the force of flood waters from the July 2011 flash flood event broke up the pavement on several streets.

Photo provided by Tom Lange.

- The City of East Dubuque estimated that approximately $2.1 million in property damages was sustained by the City and its residents, including broken street pavement from the rushing waters and damage to the DeSoto Street bridge abutments;
- The Village of Elizabeth's wastewater treatment plant sustained $50,000 in damages;
- The City of Galena incurred $1,104,075 in cleanup costs and damages to public property, including: $17,500 in debris removal; $161,335 in damages to roads and bridges; $1,500 to close the flood gates; $173,740 in damages to public works equipment; $28,000 in damages to utility systems; $667,000 in damages to parks and recreation areas, including the repair to the Grant Park hillside and recreation trail; and $55,000 in damages city buildings;
- The Village of Hanover incurred over $100,000 in damages when flood waters infiltrated buildings and the sewage treatment lagoon;
- The Village of Scales Mound estimated that approximately $10,000 in property damages was sustained by the Village and its residents, including flooding of the Village Hall;
- The Village of Stockton spent $12,400 on emergency protective measures, debris removal, and repairs to roads and bridges;
- The Galena Territory sustained approximately $900,000 in damages to trails, boat docks and pen, the beach and pavilion, tennis courts, swimming pool, riding center, roads and abutments and the Lake Galena discharge channel; and
- Apple Canyon Lake Marina concessions sustained $12,000 in damages.

The other historic event included in the property damage figures is the July 23 and 24, 2010 flash flooding that occurred across much of the County. This event preceded the flash flooding of July 2011 almost to the day. A total of 6 to 14 inches of heavy rain fell over a 48-hour period causing streams and rivers, including the Apple River and the Galena River, to rise rapidly, resulting in extensive flash flooding. This event covered multiple counties and was included in Presidential Disaster Declaration #1935. The property damage estimates from this event totaled $2,510,000. **Appendix M** contains photographs of the property damages sustained during this event. The following provides a breakdown by jurisdiction of the infrastructure and critical facilities property damages reported by committee members:

- The Village of Hanover incurred over $100,000 in damages when flood waters infiltrated buildings and the sewage treatment lagoon;

- The Village of Scales Mound indicated that the entire village experienced flooding including village properties, businesses and residents and resulted in approximately $100,000 in damages;
- The Village of Stockton spent $345,000 on emergency protective measures, debris removal, repairs to roads and bridges and replacement of two electric motors at the waste water treatment facility;
- The Galena Territory sustained approximately $400,000 in damages to trails, boat docks and pens, fitness center, swimming pool, equipment building and Marina Road; and
- Apple Canyon Lake incurred $65,000 in damages to its trail system and marina concessions.

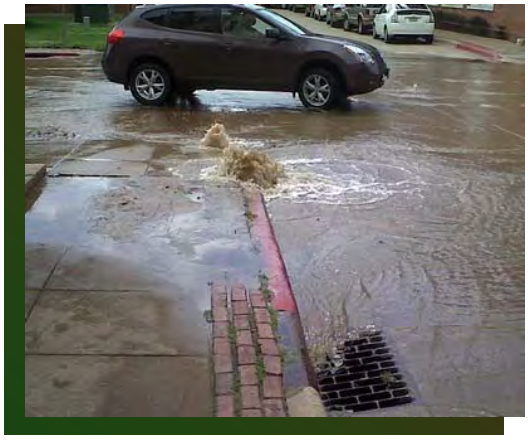
Flash flooding in July 2010 caused the Apple River to overflow its banks and flood portions of Hanover.

Photograph provided by Kay Temperly.

In addition, to these historic flash flood events, Madelynn Wilharm identified four unrecorded events that resulted in an estimated $886,300 in damages to property owned by The Galena Territory. She was also able to supplement property damage estimates for four other recorded flash flood events.

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.



Water bubbles up from a drain at the intersection of Hill and Commerce Streets in Galena on July 24, 2010 as a result of a flash flood event.

Photograph taken by Joe Kratcha.

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 Jo Daviess County?

Yes. There are 13 repetitive flood loss properties located within Jo Daviess County. There are 10 single family dwellings and one non-residential structure located in East Dubuque and one single family dwelling and one non-residential structure located in unincorporated Jo Daviess 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 48 flood insurance claim payments totaling $617,081.44 for the 13 repetitive flood loss structures/properties located in Jo Daviess 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	
East Dubuque	Single Family	5	$36,168.24	$8,280.50	$44,448.74
East Dubuque	Single Family	8	$61,867.27	$7,317.40	$69,184.67
East Dubuque	Single Family	4	$20,450.02	$24,364.20	$44,814.22
East Dubuque	Non-Residential	4	$79,108.08	$5,000	$84,108.08
East Dubuque	Single Family	4	$36,563.56	$16,341.70	$52,905.26
East Dubuque	Single Family	2	$39,570.55	$5,122.40	$44,692.95
East Dubuque	Single Family	2	$2,047.30	$0	$2,047.30
East Dubuque	Single Family	3	$10,246.89	$0	$10,246.89
East Dubuque	Single Family	2	$6,475.73	$564.40	$7,040.13
East Dubuque	Single Family	2	$10,858.17	$0	$10,858.17
East Dubuque	Single Family	2	$10,236.55	$0	$10,236.55
Unincorp. Jo Daviess Co.	Non-Residential	8	$120,720.27	$69,003.40	$189,723.67
Unincorp. Jo Daviess Co.	Single Family	2	$31,595.71	$15,189.10	$46,784.81
Totals:		**48**	**$465,908.34**	**$151,183.10**	**$617,091.44**

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 buildings by participating jurisdiction located within the base floodplain and vulnerable to flooding. These counts were prepared by the Jo Daviess County Geographic Information System (GIS) and Information Technology (IT) Department.

Figure 41
Existing Residential Buildings Vulnerable to Flooding

Participating Jurisdiction	Residential Buildings
Jo Daviess County (unincorporated)	151
Apple River	0
East Dubuque	289
Elizabeth	0
Galena	74
Hanover	0
Scales Mound	0
Stockton	0
Warren	0

Source: Jo Daviess County GIS & IT Department.

The only municipalities with specific infrastructure and critical facilities located within or adjacent to the floodplain are East Dubuque and Galena. In East Dubuque, the wastewater treatment facility, drinking water facility, two drinking water wells, fire station and police station are all located within either the base floodplain or the 500-year floodplain and vulnerable to flooding. These facilities have experienced repeated flooding issues. In Galena, the city hall and police station, while protected by a levee system, are still located in the 500-year floodplain and are vulnerable to flooding.

Portions of the Georgetown Road bridge were swept away during the flash flood event of July 2010.

Photograph provided by Robert Dittmar.

In general, roadways, culverts and bridges are vulnerable to all forms of flooding. Floodwaters can weaken infrastructure and cause washouts and collapses. Buried power and communication lines are also vulnerable to flooding. Water can infiltrate the lines and cause disruptions.

While only 7.7% of the land area in Jo Daviess County lies within the base floodplain and is susceptible to riverine flooding (mostly in the western portions of the County); 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.

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. In terms of riverine flooding, the vulnerability of future buildings, infrastructure and critical facilities located within NFIP-participating jurisdictions (Jo Daviess County, East Dubuque, Galena, Hanover and Stockton) 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 aren't built in flood-prone areas or are elevated or protected to the base flood elevation.

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 Jo Daviess 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 the:

- 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 flooding 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 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 the number of structures impacted is generally the same from event to event.

Scope of the Flood Event

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

Assumption #2

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

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 rivers and creeks with base floodplains would overflow their banks, and
- the base floodplains of each river 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:

- Apple River, Elizabeth, Scales Mound, Stockton and Warren would not experience any flooding since there are no rivers or creeks with base floodplains located within their municipal limits;
- The Mississippi River would overflow its banks and flood the southwestern portions of East Dubuque;
- The Galena River, Hughlett Branch and an intermittent tributary of Hughlett Branch would overflow their banks and flood portions of Galena; and
- The Apple River would overflow its banks and flood portions of Hanover.

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 Jo Daviess County GIS & IT Department.

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.

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

- East Dubuque has 289 residential buildings; and
- Galena has 74 residential buildings.

Even though there are base floodplains associated with the Apple River in Hanover, there are no existing residential buildings located within them.

Value of Potentially-Damaged Housing Units

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

Assumption #4

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

To determine the average market value, the average assessed value must first be calculated. The average assessed value is determined by taking the total assessed value of 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 Jo Daviess County Chief County Assessment Office.

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) Apple River: $2,847,229 ÷ 195 housing units = $14,601.17

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

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%

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	Average Market Value
Apple River	$2,847,229	195	$14,601.17	$43,804
East Dubuque	$22,911,883	830	$27,604.68	$82,814
Elizabeth	$9,215,023	409	$22,530.62	$67,592
Galena	$69,446,933	1,960	$35,432.11	$106,296
Hanover	$8,335,991	474	$17,586.48	$52,759
Scales Mound	$4,535,079	183	$24,781.85	$74,346
Stockton	$20,842,505	867	$24,039.80	$72,119
Warren	$17,439,140	693	$25,164.70	$75,494

Source: Berlage, Donna, Jo Daviess County Chief County Assessment Office.

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

East Dubuque: $82,814 x 20% = $16,562.80 per unit

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

East Dubuque: $16,562.80 per unit x 289 housing units = $4,786,649

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.

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

½ (Average Market Value Per Housing Unit) x Percent Damage = Average Content Damage

East Dubuque: ½ ($82,814) x 30% = $12,422.10 per Unit

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

East Dubuque: $12,422.10 x 289 housing units = $3,589,987

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

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

Participating Jurisdiction	Average Market Value	Potentially-Damage Housing Units	Potential Dollar Losses		Total Potential Dollar Losses
			Structure	Content	
Apple River	$43,804	0	$ 0	$ 0	$ 0
East Dubuque	$82,814	289	$4,786,649	$3,589,987	$8,376,636
Elizabeth	$67,592	0	$ 0	$ 0	$ 0
Galena	$106,296	74	$1,573,181	$1,179,886	$2,753,067
Hanover	$52,759	0	$ 0	$ 0	$ 0
Scales Mound	$74,346	0	$ 0	$ 0	$ 0
Stockton	$72,119	0	$ 0	$ 0	$ 0
Warren	$75,494	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 $2.7 million to $8.3 million. There are six 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 can not 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 East Dubuque, the wastewater treatment facility, drinking water facility, fire station and police station are all located within the floodplain and have experienced repeated flooding issues. The potential dollar loss to relocate these facilities will be several million dollars, respectively. In addition, the city's two drinking water wells are also located within the floodplain.

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. Within the last three years, Jo Daviess County has experienced several large-scale flash flood events. The two events that occurred in July 2010 impacted the entire County and caused approximately $1.7 million in recorded damages. The July 2011 event was extraordinary in magnitude and resulted in approximately $7.3 million in recorded damages, impacting many of the participating jurisdictions within the County.

These recent 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 6)
General Flood Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages
4/25/1965	n/a	western portion of the county	Heavy rains fell across much of the northern Mississippi River region in early to mid-April. The rain, coupled with snowmelt and the still frozen ground led to flooding of many rivers, including the Mississippi. In Galena, the US 20 bridge was sandbagged and the flood gates were closed. The railroad at the depot was closed. Water and Commerce Streets were flooded in addition to multiple buildings. The Mississippi River crested at 26.81 feet on April 26 at the river gage located 3 miles downstream from Lock and Dam #11, adjacent to the right abutment of the Canadian Pacific (formerly IC&E) railroad bridge in Dubuque, IA. This was the record crest for this gage, which still stands today. This event was part of a federally-declared disaster (Declaration #194.) Flood stage at this location is 17.0 feet and major flood stage is 21.5 feet. Alert stage for the East Dubuque levee is 18.4 feet, at 20.0 feet most houses on the riverside of the levee are in the water, at 22.6 feet water affects the Midtown Marina facilities and parking lot and at 25.0 feet the wastewater treatment plant is affected and the BNSF railroad tracks near Lock and Dam #11 are inundated.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

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

Figure 32
(Sheet 2 of 6)
General Flood Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages
4/26/1973	n/a	western portion of the county	Higher-than-average precipitation in March and early April led to flooding along the Mississippi River. The Mississippi River crested at 21.85 feet on March 23 at the river gage located 3 miles downstream from Lock and Dam #11, adjacent to the right abutment of the Canadian Pacific (formerly IC&E) railroad bridge in Dubuque, IA. This event was part of a federally-declared disaster (Declaration #373.) Flood stage at this location is 17.0 feet and major flood stage is 21.5 feet. At 17.5 feet floodwaters affect Basten Road; at 20.0 feet most houses on the riverside of the levee are in the water and at 21.5 water affects several homes in the Frentress Lake area.	n/a	n/a	n/a
4/13/1993 thru 10/22/1993	n/a	western 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 Mississippi River to overflow its banks. The Mississippi River crested at 23.84 feet on July 1 at the river gage located 3 miles downstream from Lock and Dam #11, adjacent to the right abutment of the Canadian Pacific (formerly IC&E) railroad bridge in Dubuque, IA. This was the third highest crest at this gage. This event was part of a federally-declared disaster (Declaration #997.) Flood stage at this location is 17.0 feet and major flood stage is 21.5 feet. At 17.5 feet floodwaters affect Basten Road; at 20.0 feet most houses on the riverside of the levee are in the water, at 21.5 water affects several homes in the Frentress Lake area and at 22.6 feet water affects the Midtown Marina facilities and parking lot.	n/a	n/a	$1,354,479
Subtotal:				**0**	**0**	**$1,354,479**

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

Figure 32
(Sheet 3 of 6)
General Flood Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages
2/20/1997 thru 2/24/1997	4:00 p.m.	countywide	2 to 4 inches of rain fell on partially frozen soils. Flooding was exacerbated by rivers/streams already high from recent snowmelt.	n/a	n/a	n/a
4/8/1997 thru 4/30/1997	6:00 a.m.	countywide	Spring snowmelt from heavy snow cover across the upper basin brought significant flooding to portions of the Mississippi River. The Mississippi River crested at 22.8 feet on April 16 at the river gage located 3 miles downstream from Lock and Dam #11, adjacent to the right abutment of the Canadian Pacific (formerly IC&E) railroad bridge in Dubuque, IA. This was the fifth highest crest at this gage. Flood stage at this location is 17.0 feet and major flood stage is 21.5 feet. At 17.5 feet floodwaters affect Basten Road; at 20.0 feet most houses on the riverside of the levee are in the water, at 21.5 water affects several homes in the Frentress Lake area and at 22.6 feet water affects the Midtown Marina facilities and parking lot.	n/a	n/a	n/a
8/20/1998	6:52 p.m.	Galena	3 to 5 inches of rain caused minor urban flooding in and around Galena.	n/a	n/a	n/a
7/23/1999	4:00 p.m.	countywide	3 to 4 inches of rain produced urban and small stream flooding.	n/a	n/a	n/a
6/2/2000 thru 6/28/2000	8:30 a.m.	countywide	An unusually wet month with northwest Illinois averaging 2 to 4 inches above normal on rainfall led to flooding within the county.	n/a	n/a	n/a
6/13/2000	5:20 a.m.	Woodbine^ Elizabeth^	Heavy rain fell on already saturated ground resulting in US 20 being covered in water up to a foot deep between Woodbine and Elizabeth.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

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

Figure 32
(Sheet 4 of 6)
General Flood Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages
4/14/2001 thru 5/30/2001	5:00 p.m.	western portion of the county	Several severe thunderstorm systems coupled with prolonged, abnormally warm conditions resulted in rapid snow melt and produced near record flooding along the Mississippi River. The Mississippi River crested at 25.4 feet on May 21 at the river gage located 3 miles downstream from Lock and Dam #11, adjacent to the right abutment of the Canadian Pacific (formerly IC&E) railroad bridge in Dubuque, IA. This was the second highest crest at this gage. This event was part of a federally-declared disaster (Declaration #1368.) Flood stage at this location is 17.0 feet and major flood stage is 21.5 feet. At 17.5 feet floodwaters affect Basten Road; at 20.0 feet most houses on the riverside of the levee are in the water, at 22.6 feet water affects the Midtown Marina facilities and parking lot and at 25.0 feet the wastewater treatment plant is affected and the BNSF railroad tracks near Lock and Dam #11 are inundated.	n/a	n/a	$626,563
5/20/2003 thru 5/28/2003	1:03 a.m.	western portion of the county	A series of heavy rain producing systems at the beginning of May caused the Mississippi River to go above flood stage beginning around the 20th. It fell below flood stage by the 28th. Most of the flooding was considered minor.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$626,563**

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

Figure 32
(Sheet 5 of 6)
General Flood Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages
6/16/2004 thru 6/24/2004	12:24 p.m.	countywide	The Mississippi River crested at 18.65 feet on June 18 at the river gage located 3 miles downstream from Lock and Dam #11, adjacent to the right abutment of the Canadian Pacific (formerly IC&E) railroad bridge in Dubuque, IA. Flood stage at this location is 17.0 feet and moderate flood stage is 18.0 feet. At 17.0 feet water affects homes in Shore Acres, at 17.5 feet floodwaters affect Basten Road and at 18.0 homes and businesses on Harbor Drive are impacted. Alert stage for the East Dubuque levee is 18.4 feet.	n/a	n/a	n/a
4/1/2008 thru 4/30/2008	12:00 a.m.	western portion of the county	Major to record flooding occurred during April as a result of a series of moderate to record high rainfall events. The flood event affected the Mississippi River as well as many of its tributaries. All forecast points on the Mississippi River from Dubuque to Keokuk topped flood stage.	n/a	n/a	n/a
6/1/2008 thru 6/30/2008	12:00 a.m.	western portion of the county	Major to record flooding occurred during June with most forecast points above the flood stage for the majority of the month. The flooding during June was more prolific and severe than the flooding in April. The Mississippi River was most affected downstream of New Boston Lock and Dam #17. The Mississippi River crested at 20.55 feet on June 13 at the river gage located 3 miles downstream from Lock and Dam #11, adjacent to the right abutment of the Canadian Pacific (formerly IC&E) railroad bridge in Dubuque, IA. Flood stage at this location is 17.0 feet with moderate flood stage at 18.0 feet and major flood stage at 21.5 feet. At 17.5 feet floodwaters affect Basten Road, at 18.0 homes and businesses on Harbor Drive are impacted and at 20.0 feet most houses on the riverside of the levee are in the water.	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$0**

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

Figure 32
(Sheet 6 of 6)
General Flood Events Reported in Jo Daviess County
1965 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages
4/13/2011 thru 4/22/2011	7:00 a.m.	western portion of the county	Water from snowmelt in the upper Midwest moved south through the Mississippi River basin causing major flooding along the Mississippi River. The snow-melt flood crest reached Dubuque, IA on April 19th. The Mississippi River crested at 22.82 feet on April 19th at the at the river gage located 3 miles downstream from Lock and Dam #11, adjacent to the right abutment of the Canadian Pacific (formerly IC&E) railroad bridge in Dubuque, IA. Flood stage at this location is 17.0 feet and major flood stage is 21.5 feet. At 17.5 feet floodwaters affect Basten Road; at 20.0 feet most houses on the riverside of the levee are in the water, at 21.5 water affects several homes in the Frentress Lake area and at 22.6 feet water affects the Midtown Marina facilities and parking lot.	n/a	n/a	$250,000
Subtotal:				**0**	**0**	**$250,000**

GRAND TOTAL:	**0**	**0**	**$2,231,042**

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

Sources: Illinois Department of Natural Resources, Office of Water Resources.
Illinois Emergency Management Agency.
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee Member responses to Jo Daviess County All Hazard Events Questionnaire.
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.
NOAA, National Weather Service, Weather Forecast Office – Quad Cities, Iowa/Illinois, Past Events.
U.S. Geological Survey.

Figure 33
(Sheet 1 of 9)
Flash Flood Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages	Crop Damages
6/12/1981 thru 6/13/1981	n/a	The Galena Territory	Heavy rains caused flash flooding at The Galena Territory marina but the damage was minimal because there were no boats in the water; COOP observer in Galena measured 2.45 inches of rain	n/a	n/a	n/a	n/a
9/24/1986 thru 9/25/1986	n/a	Galena The Galena Territory	Heavy rains fell on saturated soils resulting in flash flooding in and around Galena and The Galena Territory. US 20 and parts of downtown Galena were reported flooded by the COOP observer in Galena. At The Galena Territory flooding impacted the marina, Miner Rd., and the North Cove and damaged the boat pen and pavilion.	n/a	n/a	$26,300	n/a
8/20/1998	7:30 p.m.	The Galena Territory	3 to 5 inches of heavy rain fell within a 4-hour period drenching the Small Pox Creek basin and setting off flash flooding in The Galena Territory. An observer for the Jo Daviess County Extension Service recorded 4.45" of rain near Lake Galena. ➢ Flood waters poured into the Lake Galena marina causing pilings, tie-downs and docks to break apart. Only minor damage was noted to 11 boats which broke loose and were set adrift in the Lake. Two boats were found adjacent to the Eagle Ridge Resort docks, one small fishing boat was found beneath a pontoon boat and two boats sank.	n/a	n/a	$2,000	$0
Subtotal:				**0**	**0**	**$28,300**	**$0**

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

Figure 33
(Sheet 2 of 9)
Flash Flood Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages	Crop Damages
5/16/1999	10:00 p.m.	East Dubuque	5 inches of rain fell within an hour causing flash flooding in East Dubuque. This event was part of a federally-declared disaster (Declaration #1278.) ➢ Water 2 to 3 feet deep flowed down Wisconsin Ave. which was undergoing construction for a storm drainage system. The water carried away construction materials including concrete pipes and left 10 to 15-foot crevices in the road. ➢ Basements of many businesses were filled with water and about 100 homes in portions of the lower flats were evacuated during the early morning hours. ➢ Water washed away more than a dozen cars, including one truck which was pushed into a train bridge forcing a fast-water rescue of its driver and passenger. ➢ Bridges along several roads were under water.	n/a	n/a	n/a	n/a
6/3/2002 thru 6/4/2002	11:30 p.m.	Galena	4.5 inches of rain fell within two hours causing flash flooding in Galena. ➢ Recreation Park was completely under water. ➢ Floodgates closed with snowplows due to debris over Main Street. Several streets washed out in spots and many streets were covered with debris. Hughlett Branch flooded. ➢ Several homes with basements flooded and were surrounded by nearly 2 feet of water.	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 9)
Flash Flood Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages	Crop Damages
6/3/2002 thru 6/4/2002	n/a	The Galena Territory	Thunderstorms that began the evening of the 3rd produced extremely heavy rainfall and resulted in flash flooding. The Galena Territory reported 9 inches of rain. The Marina building, boat docks and pen and the maintenance shop all sustained damage. The plumbing and wiring had to be replaced in the Marina building.	n/a	n/a	$610,000	n/a
6/4/2002	12:00 a.m.	Stockton	1.62 inches of rain fell within an hour causing flash flooding according to the COOP observer in Stockton.	n/a	n/a	n/a	n/a
6/4/2002	4:50 a.m.	Stockton	0.50 inches of rain fell within 10 minutes resulting in additional flash flooding according to the COOP observer in Stockton.	n/a	n/a	n/a	n/a
8/22/2002	12:00 a.m.	Stockton^	Thunderstorms that began during the evening of the 21st produced extremely heavy rainfall and caused flash flooding. Stockton received over 10 inches of rain. A basement of a home north of Stockton flooded.	n/a	n/a	n/a	n/a
8/22/2002	1:35 a.m.	Galena^ The Galena Territory	Thunderstorms that began during the evening of the 21st produced extremely heavy rainfall and caused flash flooding. Galena received 11.69 inches of rain. Rural roads outside of Galena were inundated with water and were impassable. The boat docks and pen were damaged at The Galena Territory.	n/a	n/a	$70,000	n/a
5/23/2004	3:00 a.m.	Galena	1.25 inches of rain fell in 30 minutes flooding streets	n/a	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$680,000**	**$0**

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

Figure 33
(Sheet 4 of 9)
Flash Flood Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages	Crop Damages
6/16/2004	2:30 p.m.	Stockton^	3 inches of rain fell within a 2 hour period resulting in flash flooding of US 20, east and west of Stockton, making the road impassable.	n/a	n/a	$10,000	$4,000
6/16/2004	3:50 p.m.	Warren	Heavy rains resulted in flash flooding of IL 78 in Warren. The water on IL 78 was 5 inches deep.	n/a	n/a	n/a	n/a
6/16/2004	7:10 p.m.	Galena	Heavy rains resulted in flash flooding in and around Galena. Numerous roads were under water with depths ranging from 6 inches to 3 feet. Roads closed included Field Street, Stagecoach Trail Road, and Spring Street (US 20).	n/a	n/a	$10,000	$3,000
7/20/2004	4:35 p.m.	Galena	1.5 to 3 inches of rain fell within ½ hour causing flash flooding in Galena. Due to the topography of the area, flash flooding began 20 minutes after the downpour started. Water 12 inches deep or better ran down many of the streets in and near the downtown area. Many of the streets were impassable. A sheriff's deputy reported pushing water with his 4x4 when he left for home between 5:30 p.m. and 6:00 p.m.	n/a	n/a	$20,000	$0
8/18/2005	6:40 a.m.	Galena The Galena Territory	3.25 to 3.3 inches of rain fell within two hours. In Galena the rain caused ponding in backyards, flooding of a nearby golf course and soil erosion on nearby hills. The COOP observer in Galena noted that a tree limb was down on US 20. At The Galena Territory, flash flooding damaged the fish cleaning station, tennis courts, maintenance storage building and LP tanks.	n/a	n/a	$10,000	n/a
7/18/2007	6:45 p.m.	Warren^	Heavy rains resulted in flash flooding near Warren. Winslow Road just southeast of Warren was covered by flood waters.	n/a	n/a	n/a	n/a
Subtotal:				**0**	**0**	**$50,000**	**$7,000**

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

Figure 33
(Sheet 5 of 9)
Flash Flood Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages	Crop Damages
8/7/2007	3:00 a.m.	Stockton^	3 to 7 inches of rain fell during the early morning hours of the 7th resulting in flash flooding southeast of Stockton. The flood waters washed out several county roads.	n/a	n/a	$1,000	$0
6/8/2008	7:40 p.m.	Galena	Heavy rains resulted in flash flooding of Spring Street (US 20) in Galena. The street was closed by law enforcement officials until the flood waters receded.	n/a	n/a	n/a	n/a
6/12/2008 thru 6/13/2008	10:00 p.m.	Elizabeth^	Heavy rains caused the rapid rise of the Apple River during the late evening of the 12th. The river overflowed its banks and covered W. Lone Street about two miles west of Elizabeth. The flood waters began to recede around mid-morning on the 13th.	n/a	n/a	n/a	n/a
7/10/2008	7:14 p.m.	Galena	1 inch of rain fell with 15 minutes causing flash flooding in Galena.	n/a	n/a	n/a	n/a
8/9/2009	1:15 p.m.	Council Hill^ Scales Mound^ Apple River^	Heavy rains caused flash flooding in the northern part of Jo Daviess County. Some roads and culverts near Scales Mound were washed out and Small Pox Creek overflowed its banks forcing the closure of several roads.	n/a	n/a	$100,000	$0
8/9/2009	9:45 p.m.	Guilford^	Heavy rains resulted in flash flooding of some roads in the vicinity of Guilford (near the Galena Territory) during late evening.	n/a	n/a	n/a	n/a
8/9/2009	n/a	The Galena Territory	Heavy rains caused flash flooding at The Galena Territory damaging the boat docks and pen, tennis courts and pavilion.	n/a	n/a	$250,000	n/a
Subtotal:				**0**	**0**	**$351,000**	**$0**

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

Figure 33
(Sheet 6 of 9)
Flash Flood Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages	Crop Damages
5/26/2010	7:00 p.m.	Scales Mound^ Nora^	Heavy rains resulted in flash flooding of several rural roads along the Apple River and across areas eastward to the county border. Flood waters affected E. Hoffman, Goosehollow, Becker and Apple River Roads. In addition, the intersection of W. Gerbick Road and N. County Divide Road was under water.	n/a	n/a	n/a	n/a
6/15/2010	1:11 p.m.	Stockton	1.5 inches of rain fell within ½ hour causing flash flooding in Stockton.	n/a	n/a	n/a	n/a
7/23/2010	2:15 a.m.	countywide	3 to 9 inches of heavy rain fell across the county during the late night of the 22nd and through the early morning of the 23rd resulting in flash flooding over much of the county. The Apple River overflowed its banks. This event was part of a federally-declared disaster (Declaration #1935.) ➢ At 3:15 a.m. flood waters were over US 20 near Galena and Illinois Route 35 near East Dubuque. ➢ In Elizabeth, water was flowing out of manhole covers. Several roads, including Lone Street and Apple River Road, were closed due to flooding. At 9:40 a.m. water rescues were in progress. ➢ At The Galena Territory trails were washed out and the boat docks and pen, fitness center, swimming pool, equipment building and Marina Dr. sustained damage ➢ At Apple Canyon Lake the trail system and marina concessions sustained damage.	0	0	$1,465,000	n/a
Subtotal:				**0**	**0**	**$1,465,000**	**$0**

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

Figure 33
(Sheet 7 of 9)
Flash Flood Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages	Crop Damages
7/24/2010	3:15 a.m.	countywide	A second round of storms caused an additional 3 to 5 inches of heavy rain to fall across the county during the overnight hours of the 23rd and into the early morning of the 24th resulting in additional flash flooding, especially along the Apple and Galena Rivers. This event was part of a federally-declared disaster (Declaration #1935.) ➢ Near Elizabeth, major flooding was observed along the Apple River, where the river level was just below the bridge deck of US 20. About 3 miles southeast of Elizabeth a bridge was washed out by flood waters near Little Rush Creek and Bethel Road. ➢ In Stockton, a grocery store was flooded with 3 inches of water. ➢ In Galena, the flood gates were closed around 5:00 a.m. The Galena River crested about 3 feet high in front of the gates. ➢ In Scales Mound, flood waters damaged businesses and residential and Village properties. The basement of the Village Hall was flooded. ➢ In Hanover, flood waters infiltrated buildings and the sewage lagoon. ➢ Water rescues of stranded motorists were performed near Galena, Stockton and Scales Mound between 4:00 am and 6:30 a.m.	0	0	$1,045,000	$167,538
Subtotal:				**0**	**0**	**$1,045,000**	**$167,538**

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

Figure 33
(Sheet 8 of 9)
Flash Flood Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages	Crop Damages
7/27/2011 thru 7/28/2011	6:30 p.m.	countywide	A stationary, back-building storm system stalled over a relatively small area of northeast Iowa and extreme northwest Illinois for 18 hours beginning the evening of the 27th. This system produced torrential rains resulting in flash flooding to an extent that had never been seen before in the county. Record rain totals of 7 to 15 inches were experienced over much of the county, with East Dubuque and Galena receiving a record 21.16 inches. The excessive rainfall caused the the Mississippi River at Dubuque, IA to rise about 4 feet in 12 hours. ➢ Numerous roads, shoulders, culverts and bridges throughout the county and in many of the municipalities suffered major damage from washouts and excessive erosion. ➢ Two individuals died in separate incidents involving vehicles that were surrounded and carried away by flood waters in unincorporated Jo Daviess County southeast of Galena. ➢ In East Dubuque, the rushing water broke apart the pavement of several streets. Neighbors estimated 4 to 5 feet of water rushed down Wisconsin Ave. into the flats area where dozens of residents had to be evacuated. The rushing waters swept cars away, including an East Dubuque Police Department squad car. *NARRATIVE CONTINUED ON NEXT SHEET*	0	2	$8,375,854	$5,129
Subtotal:				**0**	**2**	**$8,375,854**	**$5,129**

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

Figure 33
(Sheet 9 of 9)
Flash Flood Events Reported in Jo Daviess County
1981 – 2011

Date(s)	Start Time	Location(s)	Magnitude	Injuries	Death	Property Damages	Crop Damages
7/27/2011 thru 7/28/2011	6:30 p.m.	countywide	*NARRATIVE CONTINUED FROM PREVIOUSE SHEET* ➢ In Galena, the Public Safety Building as well as most of the downtown experienced major flooding. Part of the Grant Park sign on the hillside was washed away and in some places the top layer of the bike trails was washed away. In other places entire culverts were destroyed. ➢ At The Galena Territory trials were washed out and damage was sustained by boats, the boat docks and pen, beach and pavilion, tennis courts, riding center, swimming pool, Marina Dr., Thunder Bay Rd. abutment and the Lake Galena discharge channel. ➢ At Apple Canyon Lake the marina concessions sustained damage. ➢ At Scales Mound, flood waters covered roadways and flooded businesses and residential and Village properties. ➢ In Hanover, flood waters infiltrated buildings and the sewage lagoon. ➢ In Elizabeth, flood waters damaged the wastewater treatment plant.	---	---	---	---
GRAND TOTAL:				**0**	**2**	**$11,995,154**	**$179,667**

Sources: Country Financial.
Galena Gazette.
Illinois Emergency Management Agency.
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee Member responses to Jo Daviess County All Hazard Events Questionnaire.
KWQC TV 6 News NBC.
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.
Telegraph Herald.

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 of the Quad Cities, Iowa/Illinois is responsible for issuing ***tornado watches*** and ***warnings*** for Jo Daviess 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 tornadoes and severe thunderstorms to develop in the next 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 spotted or indicated by radar. Warnings 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 summarizes the previous occurrences as well as the extent or magnitude of tornado events recorded in Jo Daviess County. The Storm Events Database and Planning Committee member records have documented 10 occurrences of tornadoes in Jo Daviess County between 1950 and 2011. In comparison, there have been 2,047 tornadoes statewide between 1950 and November 30, 2009.

Tornado Fast Facts – Jo Daviess County

Number of Tornadoes Reported (1950 – 2011): ***10***
Highest F-Scale Rating Recorded: ***F2***
Most Likely Month for Tornadoes to Occur: ***June***
Most Likely Time for Tornadoes to Occur: ***Afternoon***
Average Length of a Tornado: ***2.7 miles***
Average Width of a Tornado: ***156 yards***
Average Damage Pathway of a Tornado: ***0.24 sq. mi.***
Longest Tornado: ***7.7 miles***
Widest Tornado: ***500 yards***

Figure 49 charts the reported occurrences of tornadoes by magnitude. Of the tornadoes with recorded magnitudes, two were classified as F2 tornadoes, two were classified as F1 tornadoes, three were classified as F0 tornadoes and two were classified as EF0 tornadoes. These ten tornadoes were produced by eight separate weather events. There were two weather events where two tornadoes were produced.

Figure 49
Tornadoes by Magnitude
1950 – 2011

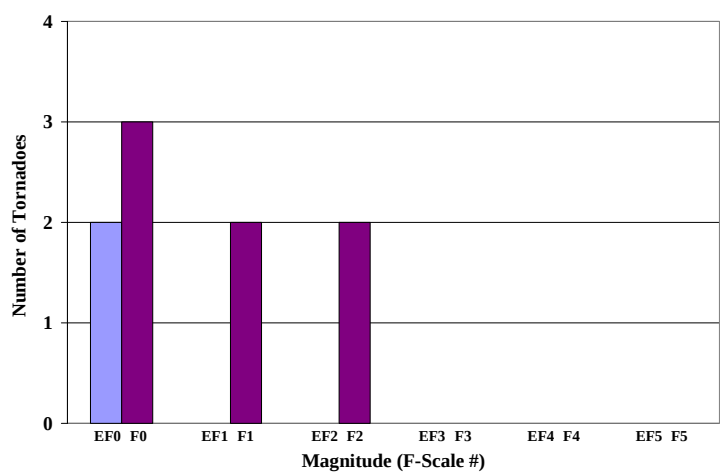


Figure 48
Tornadoes Reported in Jo Daviess County
1950 – 2011

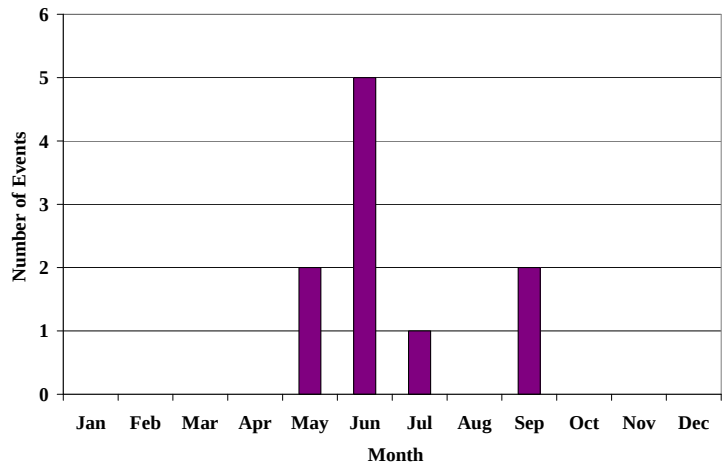
Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage
5/16/1956	5:30 p.m.	Stockton[^]	F1	3.3	80	0	0	$25,000	$0
7/9/1966	11:45 a.m.	East Dubuque	F1	1.9	400	0	0	$250,000	$0
6/11/1967	12:20 p.m.	Woodbine[^] Nora[^]	F2	4.3	500	0	0	$250,000	$0
9/9/1970	6:40 p.m.	Galena[^]	F2	7.7	70	0	0	$300	$0
6/20/1974	4:45 p.m.	Warren	F0	n/a	n/a	0	0	$0	$0
6/20/1974	5:30 p.m.	Hanover	n/a	n/a	n/a	0	0	$0	$0
9/20/1993	4:00 p.m.	Stockton	F0	0.3	20	0	0	$0	$0
5/16/1999	8:00 p.m.	Menominee[^]	F0	0.1	10	0	0	$0	$0
6/1/2007	1:38 p.m.	Hanover[^]	EF0	n/a	n/a	0	0	$0	$0
6/1/2007	2:15 p.m.	Scales Mound[^]	EF0	1.0	10	0	0	$0	$0
Subtotal:						**0**	**0**	**$525,300**	**$0**
GRAND TOTAL:						**0**	**0**	**$525,300**	**$0**

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

Sources: Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee Member responses to Jo Daviess County All Hazard Events Questionnaire.
NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database.

Figure 50 charts the reported tornadoes in Jo Daviess County by month. Nine of the 10 tornadoes (89%) took place between May and July. Of the 10 tornadoes, five occurred during June. In comparison, 1,355 of the 2,047 tornadoes (66%) recorded in Illinois since 1950 took place between April and June.

Figure 50
Tornadoes by Month
1950 – 2011



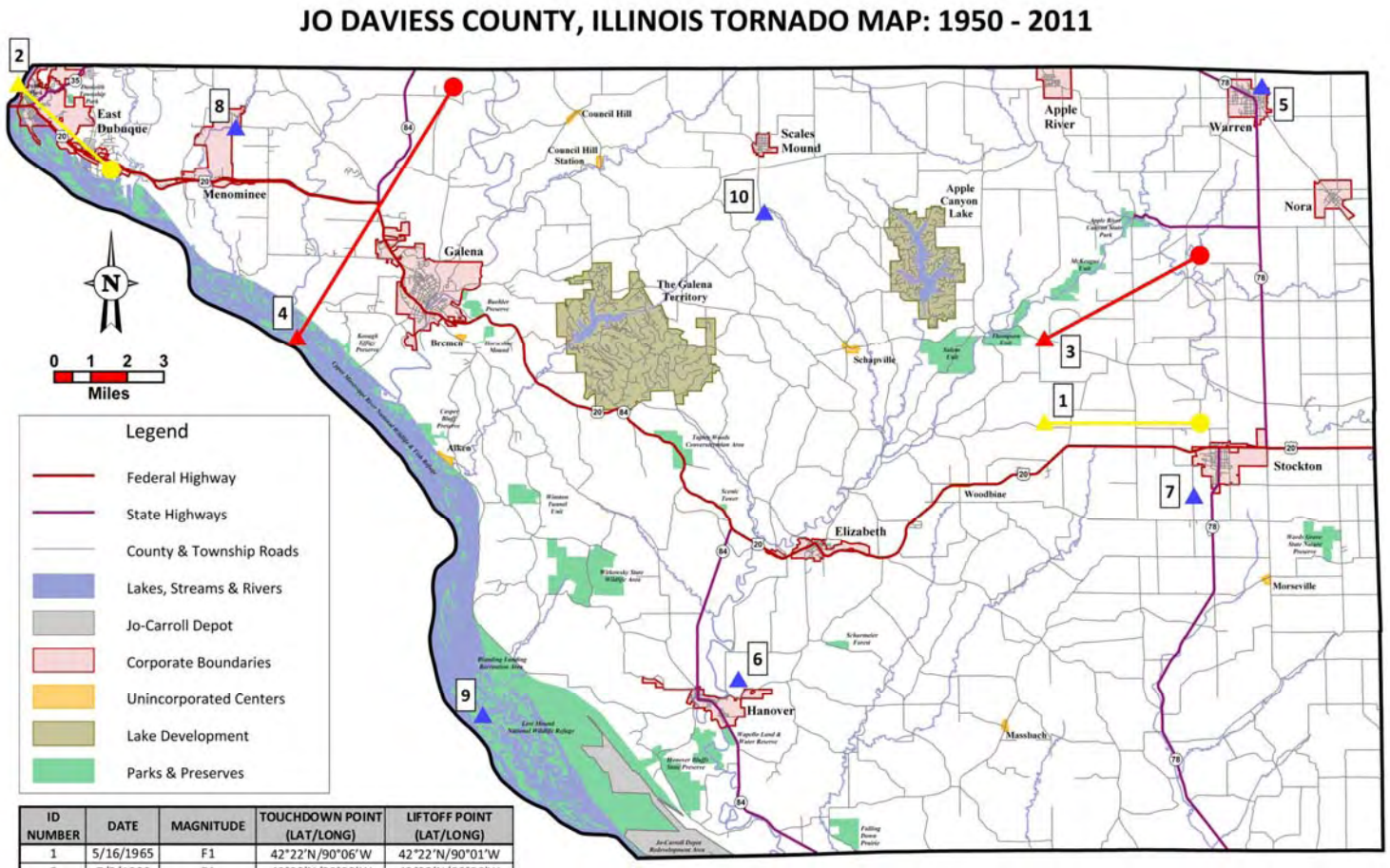
Nine of the 10 tornadoes (89%) occurred during the p.m. hours, with five of the tornadoes taking place between 4 p.m. and 7 p.m. In comparison, more than half of all Illinois tornadoes occur between 3 p.m. and 7 p.m.

The tornadoes that have touched down in Jo Daviess County have varied from 0.1 miles to 7.7 miles in length and from 10 yards to 500 yards in width. The average length of a tornado in Jo Daviess County is 2.7 miles and the average width is 156 yards (0.09 miles).

Figure 51 shows the pathway of each reported tornado. Records indicate that most of these tornadoes generally moved 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 Jo Daviess County, the average damage pathway or area impacted for a tornado is 0.24 square miles.

The longest tornado recorded in Jo Daviess County occurred on September 9, 1970. This F2 tornado touched down approximately three miles southwest of Galena and traveled northeast for 7.7 miles, dissipating five miles north-northeast of Galena. The damage pathway of this tornado covered approximately 0.3 square miles.

Figure 51
Tornado Touchdowns in Jo Daviess County: 1950 – 2011



ID NUMBER	DATE	MAGNITUDE	TOUCHDOWN POINT (LAT/LONG)	LIFTOFF POINT (LAT/LONG)
1	5/16/1965	F1	42°22'N/90°06'W	42°22'N/90°01'W
2	7/9/1966	F1	42°30'N/90°39'W	42°28'N/90°36'W
3	6/11/1967	F2	42°24'N/90°06'W	42°26'N/90°01'W
4	9/9/1970	F2	42°24'N/90°30'W	42°30'N/90°25'W
5	6/20/1974	F0	42°30'N/89°59'W	---
6	6/20/1974	NA	Hanover	---
7	9/20/1993	F0	Stockton	---
8	5/16/1999	F0	42°29'N/90°32'W	42°29'N/90°32'W
9	6/1/2007	F0	42°15'N/90°24'W	---
10	6/1/2007	F0	42°27'N/90°15'W	---

The widest tornado recorded in Jo Daviess County occurred on June 11, 1967. This F2 tornado, measuring 500 yards wide, touched down approximately four and one-half miles northeast of Woodbine and traveled northeast for approximately 4.3 miles, dissipating three and one-half miles southwest of Nora. The damage pathway of this tornado covered approximately 1.2 square miles.

What locations are affected by tornadoes?

Tornadoes have the potential to affect the entire County. Five of the participating municipalities, East Dubuque, Galena, Hanover, Stockton and Warren, have had reported occurrences of tornadoes in or near their locations. The *2010 Illinois Natural Hazard Mitigation Plan* prepared by the Illinois Emergency Management Agency classifies Jo Daviess County's hazard rating for tornadoes as "guarded."

What is the probability of future tornadoes occurring?

Jo Daviess County has had 10 verified occurrences of tornadoes between 1950 and 2011. With 10 tornadoes over the past 62 years, the probability or likelihood that a tornado will touchdown somewhere in the County in any given year is 16%. There were only two years over the last 62 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 3%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to tornadoes?

Yes. All of Jo Daviess County is vulnerable to the dangers presented by tornadoes. According to the Storm Events Database, a majority of the tornadoes have touched down in the western portion of the County. Only East Dubuque, Hanover, Stockton and Warren have had tornadoes either touch down or pass through their municipal limits. **Figure 52** lists the verified tornadoes that have touched down in or near each participating municipality.

Figure 52
Verified Tornado Touchdowns In or Near Participating Municipalities

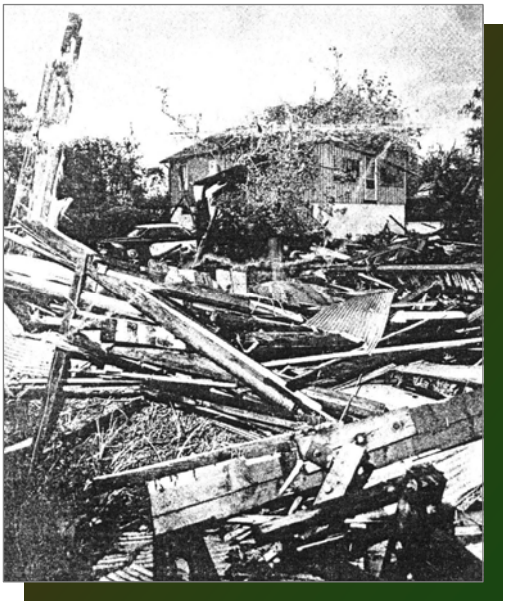
Participating Municipality	Number of Verified Tornadoes	Year Tornado Touchdown
Apple River	0	
East Dubuque	1	1966*
Elizabeth	0	
Galena	1	1970
Hanover	2	1974*, 2007
Scales Mound	1	2007
Stockton	2	1956, 1993*
Warren	1	1974*

* Tornado touched down or passed through the municipality.

What impacts resulted from the recorded tornadoes?

According to the data provided by the Storm Events Database and community records, four tornadoes have caused approximately $525,300 in property damage between 1950 and 2011 in Jo Daviess County. There were two occurrences where property damages totaled at least $250,000. Property damage information was either unavailable or none was recorded for six of the events. There were no injuries or fatalities associated with any of the recorded tornadoes.

While the Storm Events Database did not contain any detailed damage information on any of the events, a committee member was able to locate a news article on the F1 tornado that touched down in East Dubuque on July 9, 1966. The Dubuque Telegraph Herald article is short, but states that the tornado skipped over parts of Dubuque, Iowa knocking down tress and utility poles before crossing the Mississippi River and slamming into East Dubuque. The tornado touched down near the East Dubuque Boat Harbor and destroyed the south half of the harbor and damaged many homes. To view the article, see **Appendix K**.



An F1 tornado touched down in East Dubuque on July 9, 1966 destroying the south half of the harbor and damaging many homes.

Photograph included in Dubuque Telegraph Herald article provided by Harold Lange.

The recorded tornadoes have historically touched down in rural areas away from concentrated populations. This coupled with the relatively small number of recorded tornadoes has contributed to the low number of injuries and deaths. In comparison, Illinois averages four tornado fatalities annually; however, this number varies widely from year to year.

A County's vulnerability to injuries and fatalities is also influenced by access to adequate health care for those injured following an event. Assuming that the hospital in Galena is not directly impacted by a tornado, it is equipped to provide continuous care to those injured during an event. There are also nearby hospitals in Freeport (Stephenson County), Dubuque, Iowa, Platteville, Wisconsin and Darlington, Wisconsin that are equipped to provide care to any persons injured.

If the abovementioned factors (location, number of events, and proximity of health care facilities) as well as the historically small impact are taken into consideration, the risk to public health and safety from tornadoes is relatively low. However, if a tornado were to touchdown in any of the municipalities, the risk or vulnerability for that location would be elevated to high.

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 plants, 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.

While some buildings adjacent to a tornado's path may remain standing with little or no damage, all are vulnerable to damage from flying debris. It is common for flying debris to cause damage to roofs, siding and windows. In addition, mobile homes, homes on crawlspaces and buildings with large spans (i.e., schools, barns, airport hangers, factories, etc.) are more likely to suffer damage. Most workplaces and many residential units do not provide sufficient protection from tornadoes. The damages sustained by infrastructure and critical facilities during a tornado are similar to those experienced during a severe storm. There is a high probability that power, communication and transportation will be disrupted in and around the affected area.

Assessing the Vulnerability of Existing Residential Structures

One way to 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 the County. A quick and simple method for accomplishing this is to calculate the average housing unit density in the County. This can be done by taking the number of housing units in the County and dividing that by the land area in the County. **Figure 53** calculates the average housing unit density in Jo Daviess County. The result suggests that there is an average of 23 housing units per square mile.

Figure53 Calculation of Average Housing Unit Density
Total Housing Units ÷ Land Area = Average Housing Unit Density (Rounded Up to the Nearest Whole Number) Jo Daviess County: 13,574 housing units ÷ 601 square miles = 23 housing units/square mile

While this method provides an adequate assessment of the number of housing units that may be potentially damaged in a densely populated county, it does not provide a realistic assessment for those counties with large, sparsely populated rural areas such as Jo Daviess County.

In Jo Daviess County, as well as many other northwestern Illinois counties, differences in housing density must be considered when assessing the vulnerability of existing residential buildings to tornado damage. Approximately 69% of all housing units are located in seven of the County's 23 townships (Dunleith, East Galena, Guilford, Stockton, Thompson, Warren and West Galena) while 70% of all mobile homes are located in five of the 23 townships (Dunleith, Hanover, Nora, Rice and Stockton.) **Figure 54** provides a breakdown of housing units by township and **Figure 55** shows the township boundaries. Tornado damage to buildings (especially mobile homes), infrastructure and critical facilities in these more densely populated townships is likely to be greater than in the rest of the County.

Figure 54
Existing Housing Units by Township

Township	Total Housing Units (2010)	Mobile Homes (2000)*	Land Area (Sq. Miles) (2010)	Average Housing Unit Density (Units/Sq. Mile) (Rounded Up)
Apple River	257	25	18.467	14
Berreman	73	6	17.943	5
Council Hill	82	10	16.396	6
Derinda	176	0	36.959	5
Dunleith	1,713	189	9.451	182
East Galena	917	18	23.224	40
Elizabeth	579	17	36.880	16
Guilford	1,972	9	37.151	54
Hanover	689	70	52.103	14
Menominee	419	19	27.996	15
Nora	168	52	25.336	7
Pleasant Valley	157	13	36.661	5
Rawlins	189	12	11.725	17
Rice	268	85	24.401	11
Rush	188	17	36.802	6
Scales Mound	286	6	18.709	16
Stockton	1,141	106	37.008	31
Thompson	1,036	4	36.153	29
Vinegar Hill	143	0	13.899	11
Wards Grove	103	11	17.894	6
Warren	770	29	19.701	40
West Galena	1,849	10	9.497	195
Woodbine	399	13	36.741	11
Jo Daviess County	13,574	721	601.087	23

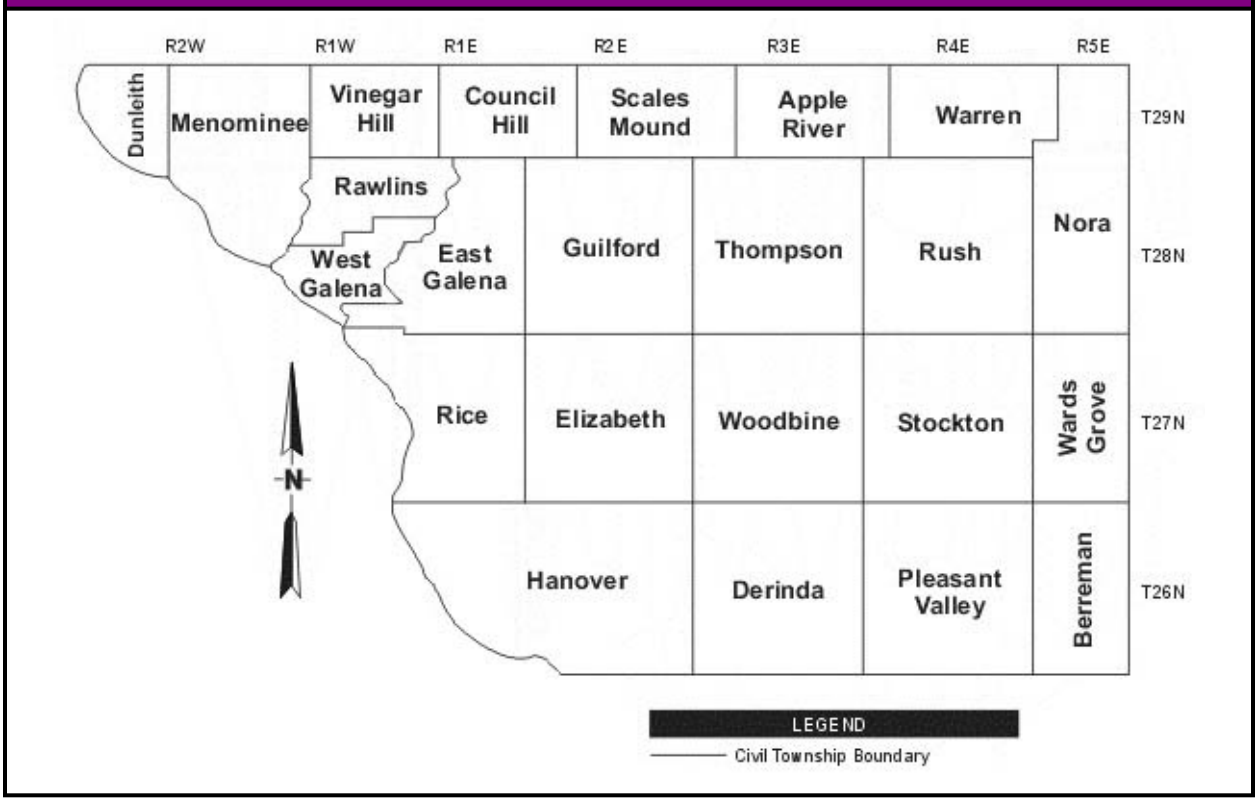
* At the time this Plan was submitted for approval, the U.S. Census Bureau had not released the DP-4 data tables for geographic type: county subdivisions (i.e., townships.). It was decided that the 2000 census data would be used in its place instead of estimates.

Source U.S. Census Bureau.

To more accurately assess the vulnerability to existing residential housing units in Jo Daviess County, the average housing unit density for each township was calculated. **Figure 54** illustrates the substantial differences in housing unit density between the various townships. By comparing the average county housing unit density to the average township housing unit densities, the shortcomings of using a countywide average for counties such as Jo Daviess becomes apparent.

For 16 of the 23 townships, the average county housing unit density is greater (in some cases considerably greater) than the average township housing unit densities. In addition, the average county housing unit density is considerably less than the housing unit densities calculated for the seven most populated townships.

Figure 55
Jo Daviess County Township Boundaries



Source: Illinois Secretary of State.

With the housing unit density calculated, it is relatively simple to provide an estimate of the number of existing housing units that could be potentially damaged by a tornado in Jo Daviess County. This can be done by taking the average housing unit density and multiplying that by the average area impacted by a tornado. The average area impacted by a tornado in Jo Daviess County is 0.24 square miles. This average is based on 60 years of recorded tornado events in the County. **Figure 56** provides a sample calculation.

Figure 56
Calculation of Potentially-Damaged Existing Housing Units

Average Housing Unit Density x Average Area Impacted = Potentially-Damaged Housing Units (Rounded Up to the Nearest Whole Number)

Dunleith Township: 182 housing units/sq. mile x 0.24 sq. miles = 44 housing units

Figure 57 provides a breakdown of the number of potentially-damaged housing units by township. It is important to note that for the three townships with the highest housing unit densities, the potential damage estimates would only be reached if a tornado's pathway included the major municipality or unincorporated community within the township. If the tornado

pathway remained in the rural portion of the township, then the number of potentially-damaged housing units would be considerably lower.

Figure 57
Estimated Number of Housing Units by Township Potentially Damaged by a Tornado

Township	Average Housing Unit Density (Units/Sq. Mile)	Potentially-Damaged Housing Units (Units/0.24 Sq. Mile) (Rounded Up)
Apple River	14	4
Berreman	5	2
Council Hill	6	2
Derinda	5	2
Dunleith	182	44
East Galena	40	10
Elizabeth	16	4
Guilford	54	13
Hanover	14	4
Menominee	15	4
Nora	7	2
Pleasant Valley	5	2
Rawlins	17	5
Rice	11	3
Rush	6	2
Scales Mound	16	4
Stockton	31	8
Thompson	29	7
Vinegar Hill	11	3
Wards Grove	6	2
Warren	40	10
West Galena	195	47
Woodbine	11	3
Jo Daviess County	23	6

Jo Daviess County ranks among the bottom 25 counties in Illinois in terms of tornado frequency. This fact suggests that the overall risk posed by tornadoes in Jo Daviess County is medium to low. While frequency is important, other factors must be examined when assessing vulnerability.

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 relatively low. While the risk to the County is relatively 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 (Jo Daviess County, Elizabeth, Galena, Hanover, Scales Mound and Stockton) have building codes in place that will likely lessen the vulnerability of new buildings and critical facilities to damage from tornadoes, three of the municipalities do not.

Infrastructure such as new communication and power lines also will continue to be vulnerable to tornadoes. 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 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 historical occurrences of tornadoes in Jo Daviess County.

The purpose of providing a rough estimate is to help residents and municipal 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 in each of the municipalities.

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

- area impacted by the tornado;
- position of the area impacted;
- method used to estimate 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.

Size of the Area Impacted

Assumption #1

Size of Area Impacted = 0.24 sq. miles

The first step towards calculating the potential dollar losses to vulnerable residential structures is to determine the size of the area impacted by the tornado. While the largest or most destructive tornado recorded could be used for this scenario, it was decided that the area impacted would be based on the average length and width of the recorded tornadoes in the County. In Jo Daviess County, the average length is 2.66 miles, the average width is 0.09 miles (approximately 155 yards) and the average area is 0.24 square miles. The average area offers a reasonable alternative to the worst case scenario and is more likely to recur.

Position of the Area Impacted

To estimate the number of vulnerable residential structures or potentially-damaged housing units, the average area impacted must be positioned with the boundaries of each municipality. There are two ways this can be done.

Assumption #2

The entire area impacted by the tornado falls within the limits of each municipality.

- *Method #1*. The first method involves creating an outline of the average area impacted and overlaying it on top of a map of each municipality. If any portion of the average area impacted falls outside of the corporate limits of the municipality due its size or shape, then additional calculations would be required.

  This method is more precise; however, it requires future updates of the Plan to place the outline in the same position previously used in order for the results to be consistent and comparable since changing the placement of the overlay on the municipal maps may produce differences in the number of potentially-damaged housing units.

- *Method #2*. The second method requires no positioning of an impact area outline or calculations and just assumes that the entire average area impacted would fall within the municipal limits. As a result, the average area impact measurement previously identified in Assumption #1 is used for all the municipalities to estimate the number of potentially-damaged housing units.

  This method is quicker, easier to duplicate and is 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.

Both methods were applied to select municipalities within Jo Daviess County and the areas compared. While the two methods did produce different results, the differences were not significant. Therefore, it was decided that the second method would be used since it is quick and much easier to duplicate.

Method Used to Estimate Potentially-Damaged Housing Units

To estimate the number of potentially-damaged housing unit for this scenario, a decision must first be made on the method used to count the units. There are two ways this can be done.

Assumption #3

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

- *Method #1*. The first method involves overlaying the average area impacted on top of a map of each municipality and then counting the number of housing units that are located within *both* the area impacted and the municipal limits. This approach has its drawbacks – it is time consuming and changes in the position of the overlay can and will produce different estimates.

❖ *Method #2*. The second method uses the average housing unit density for each municipality to estimate the number of potentially-damaged housing units. The average housing unit density can be calculated by taking the number of housing units within a municipality and dividing that number by the land area in the municipality. **Figure 53** provides a sample calculation.

This method is most useful for municipalities with housing unit densities that are relatively constant and do not substantially change between the edges and center of town. In large urban areas where there are substantial differences in housing unit densities (i.e., Chicago and the collar counties) this method has the potential to either over or under estimate the number of potentially-damaged housing units depending on the placement of the average impact area.

It was decided that the second method would be used to help estimate the number of potentially-damaged housing units because it is quick and much easier to duplicate. **Figure 58** provides the average housing unit density for each participating municipality. The average housing unit density was not calculated for those municipalities that cover less than one square mile.

Figure 58
Estimated Number of Housing Units by Municipality
Potentially Damaged by a Tornado

Participating Municipality	Total Housing Units (2010)	Land Area (Sq. Miles) (2010)	Average Housing Unit Density (Units/Sq. Mile) (Rounded Up)	Potentially-Damaged Housing Units (Units/0.24 Sq. Miles) (Rounded Up)
Apple River	195	0.793	---	60
East Dubuque	830	2.810	296	72
Elizabeth	409	0.775	---	127
Galena	1,960	4.162	471	114
Hanover	474	1.053	451	109
Scales Mound	183	0.228	---	183
Stockton	867	1.596	544	131
Warren	693	0.967	---	172
Unincorporated County	7,963	588.703	14	4
County*	13,574	601.089	23	6
County†	4,176	428.902	10	3

* Uses the average county housing unit density (23 housing units per square mile)
† Uses the average housing unit density for the 16 least populated townships (10 housing units per square mile)
Source: U. S. Census Bureau.

With the average housing unit density calculated, the number of potentially-damaged housing units can be estimated. As described in **Figure 56**, this is done by taking the average housing unit density for each municipality and multiplying that by the average area impacted (0.24 square miles). **Figure 58** provides a breakdown of the number of potentially-damaged housing units by municipality.

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 in the municipality is at least one square mile and as a result under estimates the number of potentially-damaged housing units.

To calculate the number of potentially-damaged housing units for these municipalities, start by taking the average area impacted and divide that by the land area in the municipality to get the impacted land area within the municipality. The percent of impacted land area is then multiplied by the total number of housing units in the municipality. **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

Apple River: 0.24 sq. mile ÷ 0.793 sq. miles = 0.302648

Impacted Land Area x Total Housing Units = Potentially-Damaged Housing Units (Rounded Up to the Nearest Whole Number)

Apple River: 0.302648 x 195 housing units = 60 housing units

Value of Potentially-Damaged Housing Units

Now that the number of potentially-damaged housing units has been estimated, the monetary value of the units must 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 in each municipality will be used to calculate the potential dollar losses.

Assumption #4

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

To determine the average market value, the average assessed value must first be calculated. The average assessed value is determined by taking the total assessed value of non-farm buildings within a municipality and dividing that number by the total number of housing units in the municipality. **Figure 60** provides a sample calculation of the average assessed value for housing units within a municipality. The total assessed value is based on 2011 tax assessment information provided by the Jo Daviess County Chief County Assessment Office.

To determine the average market value, the average assessed value is multiplied by three (the assessed value of a structure in Jo Daviess County is approximately one-third of the market value). **Figure 61** provides the average assessed value and average market value for each participating municipality. For comparison, the average assessed value and average market value for unincorporated Jo Daviess County as well as the entire County were also calculated.

Figure 60
Calculation of Average Assessed Value

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

Apple River: $2,847,229 ÷ 195 housing units = $14,601.17

Figure 61
Average Market Value of Housing Units

Participating Jurisdiction	Total Assessed Value of Non-Farm Buildings (2011)	Total Housing Units (2010)	Average Assessed Value	Average Market Value
Apple River	$2,847,229	195	$14,601.17	$43,804
East Dubuque	$22,911,883	830	$27,604.68	$82,814
Elizabeth	$9,215,023	409	$22,530.62	$67,592
Galena	$69,446,933	1,960	$35,432.11	$106,296
Hanover	$8,335,991	474	$17,586.48	$52,759
Scales Mound	$4,535,079	183	$24,781.85	$74,346
Stockton	$20,842,505	867	$24,039.80	$72,119
Warren	$17,439,140	693	$25,164.70	$75,494
Unincorporated County	$86,819,019	7,963	$10,902.80	$32,708
County	$242,392,802	13,574	$17,857.14	$53,571

Source: Berlage, Donna, Jo Daviess County Chief County Assessment Office.

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 content during the tornado. For this scenario, the expected percent damage sustained by the structure and its contents is 100%; in other words, all of the potentially-damaged housing units would be completely destroyed. While it is highly unlikely that each and every housing unit would sustain the maximum percent damage, identifying and calculating different degrees of damage within the average area impacted gets complex and provides an additional complication when updating the Plan.

Assumption #5

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

Structural Damage = 100%
Content Damage = 100%

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. The average structural damage per unit is then multiplied by the number of potentially-damaged housing units. **Figure 62** provides a sample calculation.

Figure 62 ***Structure* – Potential Dollar Loss Calculations**
Average Market Value per Housing Unit x Percent Damage = Average Structural Damage Apple River: $43,804 x 100% = $43,804 per Unit Average Structural Damage x Number of Potentially-Damaged Housing Units = Potential Dollar Losses – Structure (Rounded to the Nearest Dollar) Apple River: $43,804 x 60 housing units = $2,628,240

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. The average content value per unit is then multiplied by the number of potentially-damaged housing units. **Figure 63** provides a sample calculation.

Figure 63 ***Content* – Potential Dollar Loss Calculations**
½ (Average Market Value of a Housing Unit) x Percent Damage = Average Content Damage Apple River: ½ ($43,804) x 100% = $21,902 per Unit Average Content Damage x Number of Potentially-Damaged Housing Units = Potential Dollar Losses – Content (Rounded to the Nearest Dollar) Apple River: $21,902 x 60 housing units = $1,314,120

Finally the ***total potential dollar losses*** may be calculated by adding together the potential dollar losses to the structure and content. **Figure 64** gives a breakdown of the total potential dollar losses by municipality.

For comparison, an estimate of the potential dollar losses from tornadoes within the entire County, unincorporated Jo Daviess County, and the 16 least populated townships was also calculated. If the average county housing unit density of 23 housing units per square mile is used, then the total number of housing units potentially-damaged would be four. However, as discussed earlier, the average county housing unit density does not take into consideration the differences in housing density in the County. If an average housing unit density is calculated for the 16 least populated townships (4,176 housing units divided by 428.902 square miles equals approximately 10 housing units per square mile), then the total number of housing units damaged is reduced to three. While the difference in the number of potentially-damaged housing units is

not substantial, it still makes a difference in the total potential dollar losses estimated for the County.

Figure 64
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	
Apple River	$43,804	60	$2,628,240	$1,314,120	$3,942,360
East Dubuque	$82,814	72	$5,962,608	$2,981,304	$8,943,912
Elizabeth	$67,592	127	$8,584,184	$4,292,092	$12,876,276
Galena	$106,296	114	$12,117,744	$6,058,872	$18,176,616
Hanover	$52,759	109	$5,750,731	$2,875,366	$8,626,097
Scales Mound	$74,346	183	$13,605,318	$6,802,659	$20,407,977
Stockton	$72,119	131	$9,447,589	$4,723,795	$14,171,384
Warren	$75,494	172	$12,984,968	$6,492,484	$19,477,452
Unincorporated County	$32,708	4	$130,832	$65,416	$196,248
County*	$53,571	6	$321,426	$160,713	$482,139
County†	$53,571	3	$160,713	$80,357	$241,070

* Uses the average county housing unit density (23 housing units per square mile)
† Uses the average housing unit density for the 16 least populated townships (10 housing units per square mile)

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 an average tornado in Jo Daviess County would be expected to ***exceed at least $3 million*** in any of the participating municipalities.

3.5 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, the National Oceanic and Atmospheric Administration 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 65** shows the classification system utilized by the PDSI.

Figure 65
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.

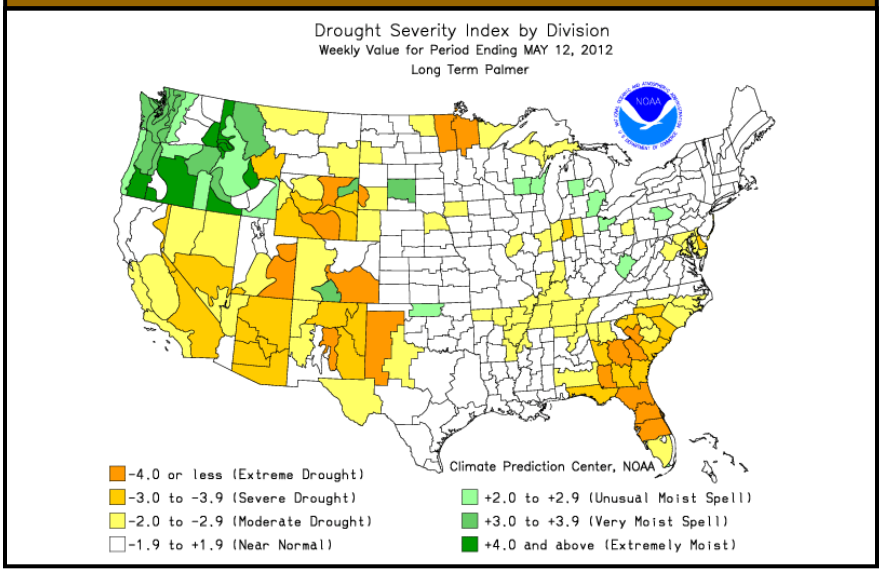
The PDSI has been useful as a drought monitoring tool and many federal and state agencies rely on it to trigger drought relief programs. It provides a standardized method to measure moisture conditions so that comparisons can be made between various locations and times. The PDSI is most useful when working 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 66** shows an example of this map.

Figure 66
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, the National Oceanic and Atmospheric Administration 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 67** provides a brief description of each category.

Figure 67
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.

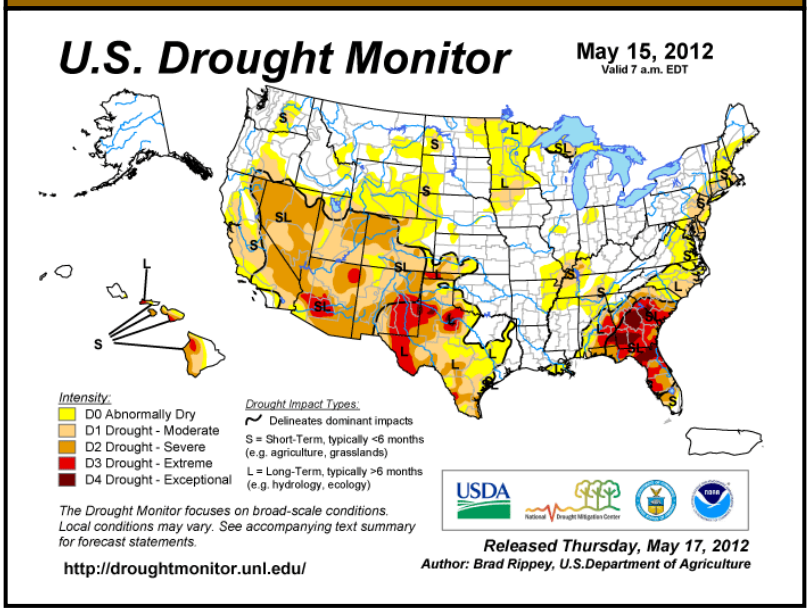
The drought intensity categories are based on five key indicators and numerous supplementary indictors. The five key indicators include the Palmer Drought Severity Index, Climate Prediction Center's Soil Moisture Model (percentiles), United States Geological Survey Weekly Streamflow (percentiles), Standardized 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 68** 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 68
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?

According to the Storm Events Database, the Illinois State Water Survey and the Illinois Emergency Management Agency, there have been three reported drought events in Jo Daviess County between 1983 and 2011. 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 Jo Daviess County) were impacted by drought conditions, although none of the counties were proclaimed state disaster areas.
- In 2005-2006, drought conditions impacted much of the state, including Jo Daviess County. A dry winter and spring developed into full blown drought conditions by the middle of June. By late July much of the state was declared an agricultural disaster area by the USDA. Northern Illinois was classified as "D3" or in extreme drought for most of the summer, all of the fall and part of the winter of 2005-2006. The dry conditions reached a historic level of severity in some parts of Illinois and ranked as one of the three most severe droughts in Illinois based on 112 years of data.

For the 1988 and 2005-2006 events, lower than normal precipitation levels were recorded between April and June and unusually dry weather conditions persisted throughout the summer months.

The Illinois State Water Survey records indicate that droughts also occurred in the region in 1931, 1934 and 1936; however, the extent to which Jo Daviess County was impacted was unavailable.

What locations are affected by drought?

Drought events affect the entire County. All communities in Jo Daviess County have been affected by drought. Droughts, like extreme heat and severe winter storms, tend to impact large areas, extending beyond county boundaries. The *2010 Illinois Natural Hazard Mitigation Plan* classifies Jo Daviess County's hazard rating for drought as "high."

What is the probability of future drought events occurring?

Jo Daviess County has experienced three droughts between 1983 and 2011. With three occurrences over 29 years, the probability or likelihood that Jo Daviess County may experience a drought in any given year is 10%. However, if earlier recorded droughts are factored in, then the probability that Jo Daviess County may experience a drought in any given year decreases slightly to 7%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to drought?

Yes. All of Jo Daviess 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?

Comprehensive damage information was either unavailable or none was reported for any of the three recorded events. Disaster relief payment information was only available for one of the recorded events. Landowners and farmers in Illinois were paid in excess of $382 million in disaster relief payments for the 1988 drought.

No injuries or deaths were reported as a result of any of the recorded drought events in Jo Daviess County. Consequently, 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. Even though no drought-related impact information was provided for Jo Daviess County, information gathered from County residents indicates the impacts experienced during the recorded drought events were similar to those seen statewide.

Crop Yield Reductions

Agriculture is the major industry in Jo Daviess County. According to the 2007 Census of Agriculture, there were 1,016 farms in Jo Daviess County occupying 281,457 acres. Farm land

accounts for approximately 73% of all the land in Jo Daviess County. Of the 281,457 acres of farm land, approximately 70% or 196,027 acres of this land was in crop production. Less than one percent of this land is irrigated.

Crop sales accounted for $72,830,000 in revenue while livestock sales accounted for $63,822,000. Jo Daviess County ranks in the top 10 Illinois counties for livestock cash receipts and in the top 45 counties for crop cash receipts. A severe drought would have a 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 and 2005 droughts. **Figure 69** illustrates the reduction in yields seen for corn and soybeans during the three recorded drought events.

Figure 69
Crop Yield Reductions Due To Drought in Jo Daviess County

Year	Corn		Soybeans	
	Yield (bushel)	% Reduction from Previous Year	Yield (bushel)	% Reduction from Previous Year
1982	120	---	38	---
1983	**79**	**34%**	38	---
1984	118	---	**33.5**	**12%**
1987	118	---	44	---
1988	**52**	**56%**	**28**	**36%**
1989	123	---	40.5	---
2004	177	---	52	---
2005	**165**	**7%**	53	---
2006	166	---	54	---

Source: United States Department of Agriculture, National Agricultural Statistics Service.

Records obtained from the United States Department of Agriculture's National Agricultural Statistics Service show that the 1983 drought resulted in corn yield reductions of 34% and soybeans yield reductions of 12% while the 1988 drought resulted in corn yield reductions of 56% and soybean yield reductions of 36%. In 2005, the drought caused just a 7% reduction in corn yields and no reduction in soybean yields.

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. However, in Jo Daviess County, ***none of the participating municipalities rely on surface water sources*** for their drinking water supplies. All obtain water from relatively deep underground wells. As a result, they are less susceptible to drinking water shortages, although a prolonged drought or a series of droughts in close succession do have the potential to impact water levels in aquifers used for providing drinking water wells that primarily serve farms.

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

No. In general, existing buildings, infrastructure and critical facilities located in Jo Daviess County and the participating jurisdictions are not vulnerable to drought. As with extreme heat events, droughts typically do not cause damage to buildings, infrastructure or critical facilities. The true 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 damage caused to roadways. 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 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.).

3.6 EXTREME HEAT

IDENTIFYING THE HAZARD

What is the definition of extreme heat?

Extreme heat is characterized by temperatures that hover 10 degrees or more above the average high temperature of a region for a prolonged period of time (several days to several weeks) and is often accompanied by high humidity. In comparison, a heat wave is generally defined as a prolonged period of excessive heat and humidity. While there is no universally agreed upon definition of a heat wave, for most the United States the "standard" definition is a period of three or more consecutive days of highs reaching at least 90°F.

Extreme heat events are usually a result of both high temperatures and high relative humidity. (Relative humidity refers to the amount of moisture in the air.) The higher the relative humidity or the more moisture in the air, the less likely that evaporation will take place. This becomes significant when high relative humidity is coupled with soaring temperatures.

On hot days the human body relies on the evaporation of perspiration or sweat to cool and regulate the body's internal temperature. Sweating does nothing to cool the body unless the water is removed by evaporation. When the relative humidity is high, then the evaporation process is hindered, robbing the body of its ability to cool itself.

On average, more than 1,000 people die each year in the United States from extreme heat. In fact, extreme heat claims more lives each year than floods, lightning, tornadoes and hurricanes combined.

What is the Heat Index?

In an effort to raise the public's awareness of the hazards of extreme heat, the National Weather Service devised the "Heat Index". The Heat Index, sometimes referred to as the "apparent temperature", is a measure of how hot it feels when relative humidity is added to the actual air temperature. **Figure 70** shows the Heat Index as it corresponds to various air temperatures and relative humidity.

As an example, if the air temperature is 96°F and the relative humidity is 65%, then the Heat Index would be 121°F. It should be noted that the Heat Index values were devised for shady, light wind conditions. Exposure to full sunshine can increase Heat Index values by up to 15°F. Also strong winds, particularly with very hot, very dry air, can be extremely hazardous. When the Heat Index reaches 105°F or greater, there is an increased likelihood that continued exposure and/or physical activity will lead to individuals developing severe heat disorders.

What are heat disorders?

Heat disorders are a group of illnesses caused by prolonged exposure to hot temperatures and are characterized by the body's inability to shed excess heat. These disorders develop when the heat gain exceeds the level the body can remove or if the body cannot compensate for fluids and salt lost through perspiration. In either case the body loses its ability to regulate its internal

temperature. All heat disorders share one common feature: the individual has been overexposed to heat, or over exercised for their age and physical condition on a hot day. The following describes the symptoms associated with the different heat disorders.

Figure 70
Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	126	130					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Source: NOAA, National Weather Service.

- **Sunburn.** Sunburn is characterized by redness and pain of skin exposed too long to the sun without proper protection. In severe cases it can cause swelling, blisters, fever and headaches. It can significantly retard the skin's ability to shed excess heat.
- **Heat Cramps.** Heat cramps are characterized by heavy sweating and painful spasms, usually in the muscles of the legs and possibly the abdomen. The loss of fluid through perspiration leaves the body dehydrated resulting in muscle cramps. This is usually the first sign that the body is experiencing trouble dealing with heat.
- **Heat Exhaustion.** Heat exhaustion is characterized by heavy sweating, weakness, nausea, exhaustion, dizziness and faintness. Breathing may become rapid and shallow and the pulse thready (weak). The skin may appear cool, moist and pale. Blood flow to the skin increases, causing blood flow to decrease to the vital organs. This results in a mild form of shock. If not treated, the victim's condition will worsen.
- **Heat Stroke (Sunstroke).** Heat stroke is a life-threatening condition characterized by a high body temperature (106°F or higher). The skin appears to be dry and flushed with very little perspiration present. The individual may become mentally confused and

aggressive. The pulse is rapid and strong. There is a possibility that the individual will faint or slip into unconsciousness. If the body is not cooled quickly, then brain damage and death may result.

Studies indicate that, all things being equal, the severity of heat disorders tend to increase with age. Heat cramps in a 17-year-old may be heat exhaustion in someone 40 and heat stroke in a person over 60. Elderly persons, small children, chronic invalids, those on certain medications and persons with weight or alcohol problems are particularly susceptible to heat reactions.

Figure71 below indicates the heat index at which individuals, particularly those in higher risk groups, might experience heat-related disorders. Generally, when the heat index is expected to exceed 105°F, the National Weather Service will initiate extreme or excessive heat alert procedures.

Figure 71
Relationship between Heat Index and Heat Disorders

Heat Index (°F)	Heat Disorders
80°F – 90°F	Fatigue is possible with prolonged exposure and/or physical activity
90°F – 105°F	Heat cramps, heat exhaustion and heat stroke possible with prolonged exposure and/or physical activity
105°F – 130°F	Heat cramps, heat exhaustion and heat stroke likely; heat stroke possible with prolonged exposure and/or physical activity
130°F or Higher	Heat stroke highly likely with continued exposure

Source: NOAA, Heat Wave: A Major Summer Killer.

What is an excessive heat alert?

An excessive heat alert is an advisory or warning issued by the National Weather Service when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines the type of alert issued. There are four types of alerts that can be issued for an extreme heat event. The following provides a brief description of each type of alert based on the ***excessive heat advisory/warning criteria*** established by National Weather Service Weather Forecast Office of the Quad Cities, Iowa/Illinois. The Quad Cities office is responsible for issuing alerts for Jo Daviess 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 12 to 28 hours.
- **Advisory.** An excessive heat advisory is issued when the heat index is expected to equal or exceed 100°F.
- **Warning.** An excessive heat warning is issued when the 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 *or* the heat index is expected to equal or exceed 100°F for four consecutive days.

PROFILING THE HAZARD

When have extreme heat events occurred previously? What is the extent of these events?

According to the Storm Events Database, there have only been two recorded extreme heat events in Jo Daviess County between 1997 and 2011. The following provides a summary of these previous occurrences as well as the extent or severity of each event.

- The first recorded extreme heat event took place between July 25, 1997 and July 27, 1997 when high humidity and temperatures combined to produce excessive heat index values reaching 105°F to 110°F across northwestern Illinois.
- The second extreme heat event took place between July 19, 1999 and July 31, 1999 when a strong ridge of high pressure over the central United States produced very hot and humid conditions. Temperatures around the 100°F mark combined with dew points in the 70s to produce heat index values between 105°F and 125°F across the region.

The Midwestern Regional Climate Center maintains historical weather records including temperature extremes for the three listed monitoring stations in Jo Daviess County: Elizabeth, Galena and Stockton. According to the available historical data, the highest recorded temperature at the Elizabeth station was 102°F on August 18, 1988, while the highest recorded temperature at the Galena station was 108°F on July 24, 1901. The highest temperature recorded at the Stockton monitoring station was 99°F on July 1, 1963. This temperature was reached again in June and August of 1988.

In terms of historic extreme heat events, Larry Acker, the official weather observer in northwest Illinois for the National Weather Service, identified July 1936 as the hottest July on record. Larry's information indicated that the average high for the month was 96.5°F and that there were eight consecutive days of record heat from July 7th through the 14th.

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 Jo Daviess County's hazard rating for extreme heat as "elevated."

What is the probability of future extreme heat events occurring?

Jo Daviess County has only experienced two verified extreme heat events between 1997 and 2011. With two occurrences over the past 15 years, the probability or likelihood that the County may experience an extreme heat event in any given year is 13%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to extreme heat?

Yes. All of Jo Daviess County is vulnerable to extreme heat. The County has experienced two recorded extreme heat events over the past 15 years. There is one official state-designated cooling center located at the Illinois Department of Human Services office in Galena.

What impacts resulted from the recorded extreme heat events?

Information on property and crop damage was either unavailable or none was recorded for the two events. In addition, there were no heat-related injuries or deaths recorded in Jo Daviess County for either event. 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. During the two recorded events the heat indices were sufficiently high 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 Jo Daviess 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 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 Jo Daviess County, extreme heat should not impact municipal water supplies since none obtain their water from surface water bodies.

Are existing buildings, infrastructure and critical facilities vulnerable to extreme heat?

No. In general, existing buildings, infrastructure and critical facilities located in Jo Daviess County and the participating jurisdictions 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 by an event. While uncommon, extreme heat events have been known to contribute to damage caused to roadways within Jo Daviess 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 Jo Daviess 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 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 damage.

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, Jo Daviess 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.

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?

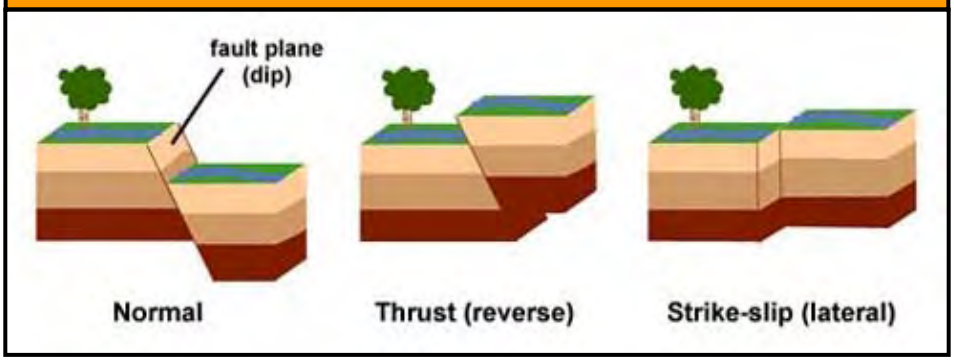
A fault is a fracture or zone of fractures in the earth's crust between two blocks of rock. They may range in length from a few millimeters to thousands of kilometers. Many faults form along tectonic plate boundaries.

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 72** provides an illustration of each type of fault.

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.

Figure 72
Fault Illustration



Source: U. S. Geological Survey.

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 73** 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 73
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 74** 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 74
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.

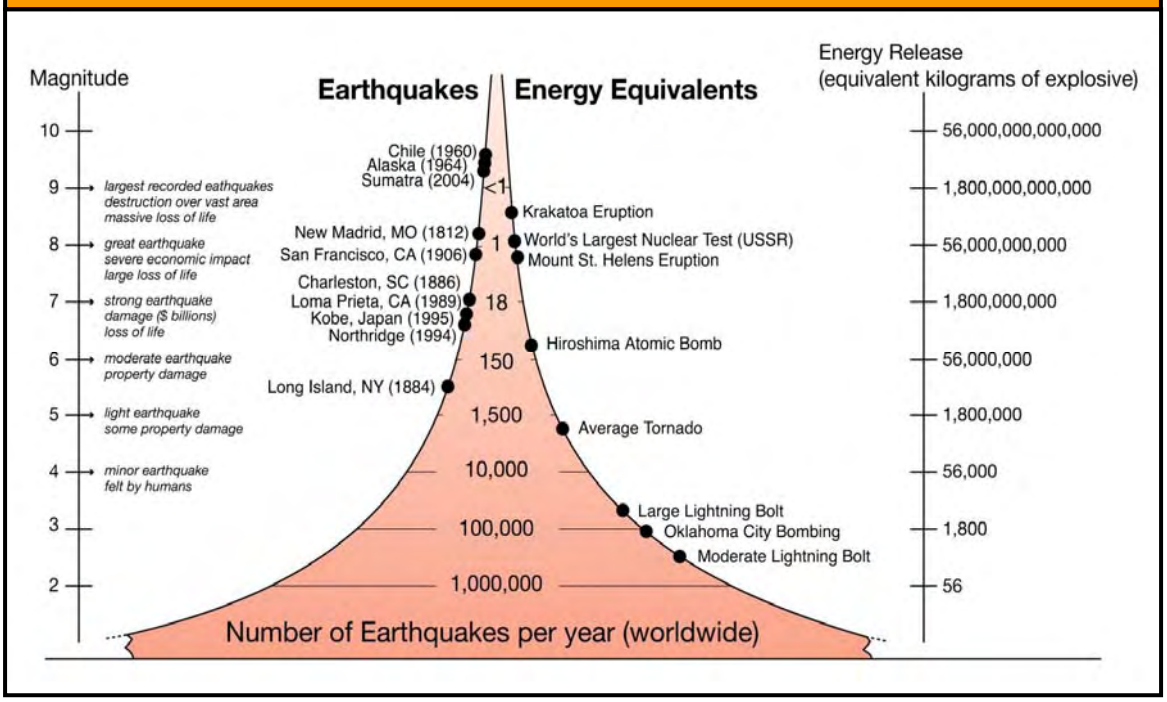
While most earthquakes occur along plate boundaries some are known to occur within the interior of a plate. (As the plates continue to move and plate boundaries change over time,

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 75** 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 75
Approximate Number of Earthquakes Recorded Annually



Source: Incorporated Research Institutions for Seismology.

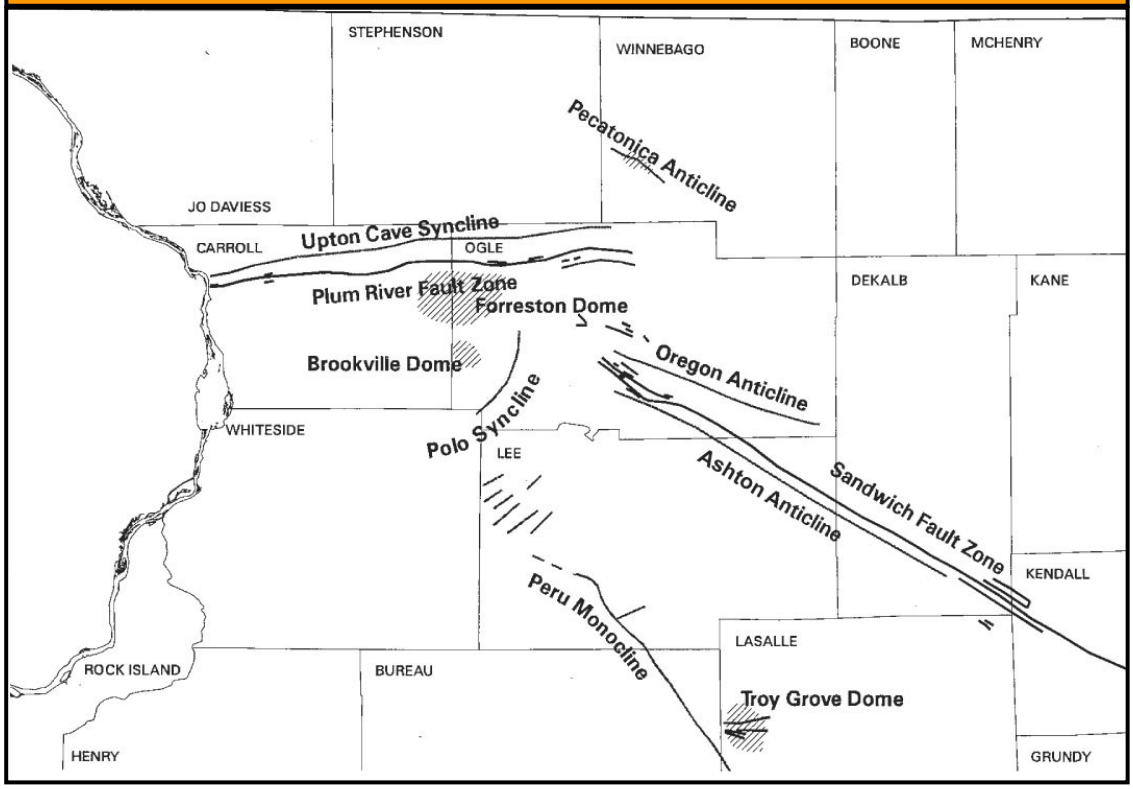
PROFILING THE HAZARD

Are there any fault zones located within the County?

No. However, there are two known fault zones in the region, the Plum River Fault Zone and the Sandwich Fault Zone. The Plum River Fault Zone is 112 miles long and trends slightly northeast across eastern Iowa and northwestern Illinois, from Linn, Iowa to Ogle County, Illinois. It varies in width from a few hundred feet to approximately 3,900 feet. The Sandwich Fault Zone is the largest fault zone in northern Illinois. It is approximately 85 miles long and runs northwest/southeast across

northern Illinois, from central Ogle County to southern Will County. It varies in width from ½ mile to 2 miles. **Figure 76** illustrates the location of both fault zones.

Figure 76
Geological Structures in Northern Illinois



Source: Illinois State Geological Survey.

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

According to the Illinois State Geological Survey's *Northern Illinois Earthquakes* fact sheet and the *Earthquakes in Northern Illinois: 1795 – 2012* map, no earthquakes have originated in Jo Daviess 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.

Northern Illinois

Two earthquakes have originated in nearby Carroll and Stephenson Counties. The Illinois State Geological Survey (ISGS) estimated both earthquakes to be magnitude 3.1. The Carroll County earthquake occurred on January 23, 1928 while the Stephenson County earthquake occurred November 28, 1907. No damage information was available for either event.

In addition to these two events, there have been approximately two dozen other earthquakes that have occurred in northern Illinois in the last century, though none of them were greater than a magnitude 5.1. These earthquakes generally caused minor damage within 10 to 20 miles of the

epicenter and were felt over several counties. Earthquakes greater than a magnitude 5 are generally not expected in this region.

The most recent earthquake to take place in northern Illinois occurred on January 30, 2012. The epicenter was located just east of McHenry in unincorporated McHenry County and was felt in eastern McHenry County and western Lake County. The preliminary U.S. Geological Survey report lists this event as a magnitude 3.1 earthquake, while the ISGS's *Earthquakes in Northern Illinois: 1795 – 2012* map lists it as a magnitude 2.4 earthquake. No structural damage was reported.

There have been several other recent earthquakes that have taken place in northern Illinois.

- On February 10, 2010, a magnitude 3.8 earthquake took place approximately two miles northeast of Virgil in Kane County. This earthquake was felt over much of Illinois, Indiana and central and southern Wisconsin. Some minor structural damage was reported.
- A magnitude 4.2 earthquake took place on June 28, 2004 approximately eight miles northwest of Ottawa in La Salle County. Ground shaking was felt over six states.
- On September 2, 1999, an earthquake was reported in northern Illinois near Dixon in Lee County. Ground shaking was felt over several counties. The earthquake was originally assessed as a magnitude 3.5; however, ISGS recently re-evaluated the data and determined this event was actually a magnitude 3.7 earthquake.

The September 2, 1999 earthquake occurred in roughly the same vicinity as a September 15, 1972 earthquake which took place near Amboy in Lee County. Minor structural damage, such as cracks in chimneys and plaster, was reported. Ground shaking was felt over most of northern Illinois. The earthquake was originally assessed as magnitude 4.5; however, ISGS recently re-evaluated this event and determined that it was a magnitude 4.4 earthquake.

The largest earthquake to take place in northern Illinois in the past several hundred years occurred on May 26, 1909. The exact location of this magnitude 5.1 earthquake isn't known, but the greatest damage occurred in and near Aurora where many chimneys fell and gas lines were ruptured. Minor structural damage was reported across northern and central Illinois and southern Wisconsin. Ground shaking was felt over seven states.

Southern Illinois

Jo Daviess County has 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 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 affect the entire County. Earthquakes, like drought and extreme heat, impact large areas, extending beyond county boundaries. Jo Daviess County's proximity to two earthquake fault zones (the Plum River and the Sandwich) 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 Jo Daviess County's hazard rating for earthquakes as "guarded."

What is the probability of future earthquake events occurring?

As with flooding, calculating the probability of future earthquakes changes depending on the magnitude of the event. According to the ISGS, Illinois is expected to experience a magnitude 3.0 earthquake every year, a magnitude 4.0 earthquake every four years and a magnitude 5.0 earthquake every 20 years. The likelihood of an earthquake with a magnitude of 6.3 or greater occurring somewhere in the central United States within the next 50 years is between 86% and 97%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to earthquakes?

Yes. All of Jo Daviess 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, exists to a lesser degree in the unglaciated portion of Jo Daviess County and northwest Illinois. In these areas the bedrock is closer to the surface and the depth of the glacial soils is not the same as exists elsewhere in Illinois and the lower Midwestern states.

The infrequency of major earthquakes, coupled with relatively low magnitude/intensity past events, has led the public to perceive that Jo Daviess County is not vulnerable to damaging earthquakes. This perception has allowed the County and participating jurisdictions to develop largely without regard to earthquake safety.

What impacts resulted from the recorded earthquake events?

While Jo Daviess County residents felt the earthquakes that occurred in northern Illinois in 2010, 2004, 1999, 1972 and 1909, no damages or injuries were reported. Given the magnitude of the great earthquakes of 1811 and 1812, it is almost certain that individuals in what is now Jo Daviess County felt those quakes; however historical records do not indicate the intensity or impacts that these quakes had on the County. If another earthquake the magnitude of those recorded in 1811 and 1812 occurs again along the New Madrid seismic zone, the damage that will be experienced in northern Illinois is not expected to be substantial.

The risk or vulnerability to public health and safety from an earthquake is dependent on the intensity and location of the event. As mentioned previously, earthquakes greater than a magnitude 5 are generally not expected in this region. This, coupled with the fact that no earthquakes have been associated with the Plum River Fault Zone in over 200 years, decreases the likelihood that an earthquake originating along the fault will cause significant damage in Jo Daviess County. As a result the risk or vulnerability to public health and safety is considered to be low. Even if another minor earthquake were to take place in either Carroll County or Stephenson County, the risk or vulnerability to the public health and safety of residents in Jo Daviess County is still considered to be low.

What other impacts can result from earthquakes?

Earthquakes can impact human life, health and public safety. **Figure 77** details the potential impacts that may be experienced by the County should a magnitude 6.0 or greater earthquake occur in the region.

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

Yes. All existing buildings, infrastructure and critical facilities located in Jo Daviess County and the participating jurisdictions 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. Wood buildings with proper foundation ties have rarely collapsed in earthquakes.

Figure 77
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 U.S. Route 20 and IL Routes 84 and 78 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., northern Illinois) • Depending on the seasonal conditions present, more displacements may be expected as those who may have enough water and food supplies seek alternate shelter due to temperature extremes that make their current housing uninhabitable

Depending on the intensity of the earthquake, building damage in Jo Daviess 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 to high.

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

Yes. All future buildings, infrastructure and critical facilities located in Jo Daviess County and the participating jurisdictions are vulnerable to damage from earthquakes. While six of the participating jurisdictions including the County 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 Jo Daviess 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 78** 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 78
Dam Hazard Classification System

Class	Description
Class I	Dams located where failure has a high probability of causing loss of life or substantial economic loss downstream (i.e., a dam located where its failure may cause additional damage to such structures as a home, a hospital, a nursing home, a highly travelled roadway, a shopping center or similar type facilities where people are normally present downstream of the dam).
Class II	Dams located where failure has a moderate probability of causing loss of life or may cause substantial economic loss downstream (i.e., a dam located where its failure may cause additional damage to such structures as a water treatment facility, a sewage treatment facility, a power substation, a city park, a U.S. Route or Illinois Route highway, a railroad or similar type facilities where people are downstream of the dam for only a portion of the day or on a more sporadic basis).
Class III	Dams located where failure has a low probability of causing loss of life, where there are no permanent structures for human habitation, or minimal economic loss downstream (i.e., a dam located where its failure may cause additional damage to agricultural fields, timber areas, township roads or similar type areas where people seldom are present and where there are few structures).

Source: Illinois Administrative Code.

Are there any classified dams owned by any of the participating jurisdictions?

No. There are no publicly-owned dams within Jo Daviess County.

Are there any privately-owned classified dams within the County?

Yes. There are seven privately-owned classified dams located within Jo Daviess County. **Figure 79** provides a brief description of each dam. One of the Class I dams and three of the Class III dams are located in the Galena Territory. The Galena Territory is a 6,800 acre planned residential and recreational community which includes the Eagle Ridge Resort and Spa in unincorporated Jo Daviess County southeast of Galena. Amenities include the lake, golf courses, the Eagle Ridge Resort and Spa, tennis courts, swimming pool, hot air balloon rides, horseback riding, restaurants and trails.

The other Class I dam is located at Apple Canyon Lake. Apple Canyon Lake, a 480 acre lake, is the focal point of a private resort community in unincorporated Jo Daviess County midway between the villages of Woodbine and Apple River. Amenities include the lake with marina and swim beach, campgrounds, swimming pool, golf course, tennis court, restaurant and trails.

Figure 79
Privately-Owned Classified Dams Located in Jo Daviess County

Name	Owner	Type	Purpose	Completion Date	Classification
Apple Canyon Lake Dam	Apple Canyon Lake Property Owners Assoc.	Earth & Rock	Recreation	1978	Class I
Small Pox Creek Dam (Lake Galena Dam)	Galena Territory Assoc.	Earth & Rock	Recreation	1974	Class I
Eagle Ridge East Pond Dam	Eagle Ridge Resort & Spa	Earth	Recreation	1996	Class III
Eagle Ridge West Pond Dam	Eagle Ridge Resort & Spa	Earth	Recreation	1997	Class III
Fitzgerald Lake Dam/East	Private	Earth	Recreation, Fire Protection, Stock, or Small Fish Pond	1965	Class III
Fitzgerald Lake West Dam	Private	Earth	Recreation, Fire Protection, Stock, or Small Fish Pond	1965	Class III
Lake Galena Sedimentation Pond Dam	Galena Territory Assoc.	Earth	Debris Control	1989	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 Jo Daviess County.

What locations are affected by dam failure?

Dam failures have the potential to affect unincorporated portions of Jo Daviess County, including the private recreational communities of Apple Canyon Lake and the Galena Territory. **Figure 80** shows the locations of the classified dams in Jo Daviess 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 and No. While The Galena Territory, Apple Canyon Lake and portions of unincorporated Jo Daviess County are vulnerable to the dangers presented by dam failures, none of the other participating jurisdictions are considered vulnerable.

What impacts resulted from the recorded dam failures?

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

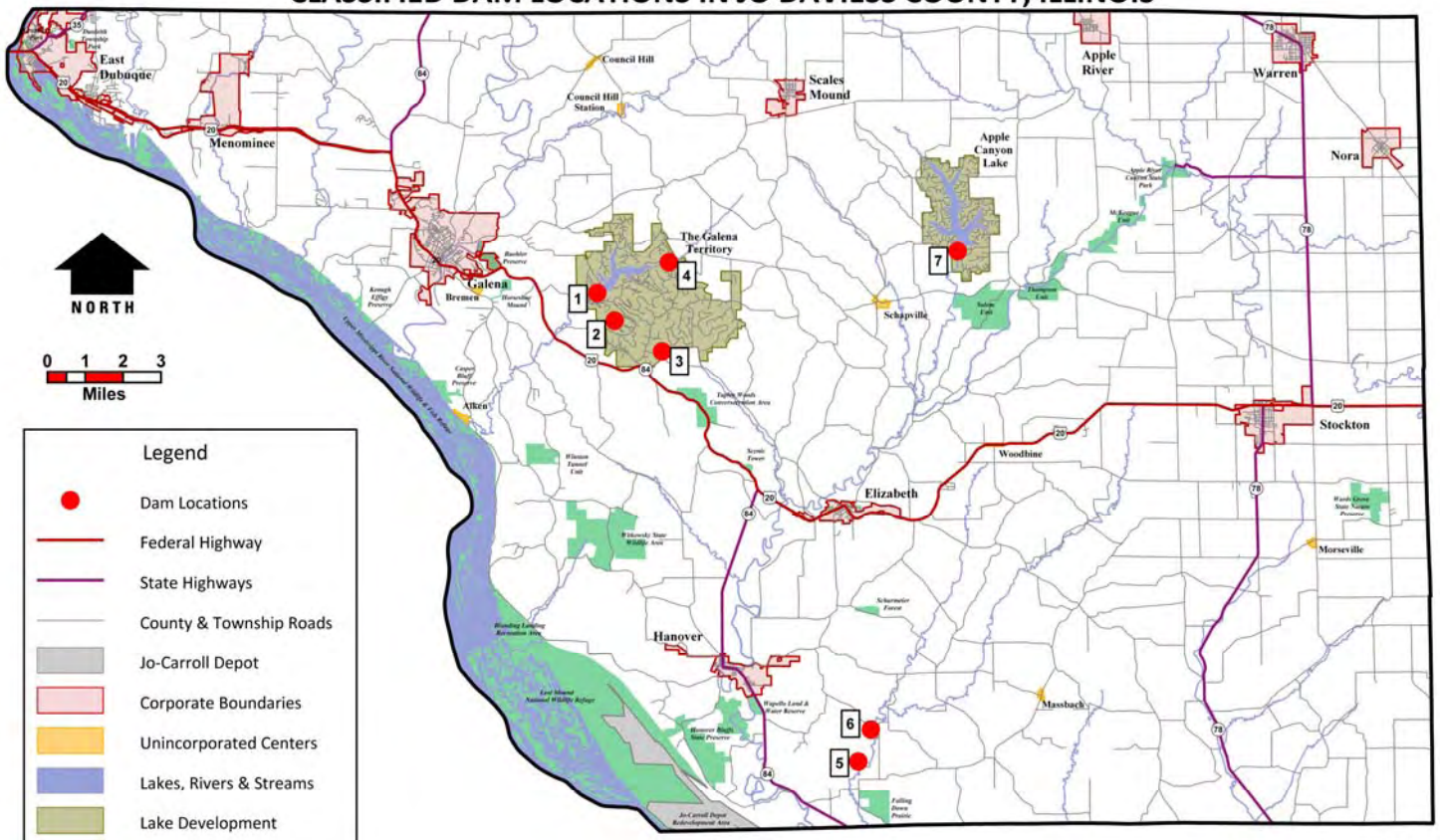
What other impacts can result from dam failures?

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.

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 be 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.

Figure 80
Locations of Classified Dams in Jo Daviess County



Map produced by the Jo Daviess County GIS/IT Department on January 2, 2013. Classified dam locations derived from the Illinois Department of Natural Resources. All base map data provided by Jo Daviess County. All information is believed to be accurate but is not guaranteed to be without error.

ID	Dam Name	Latitude	Longitude
1	Smallpox Creek Dam (Lake Galena Dam)	42 24′ 00″N	90 21′ 00″W
2	Eagle Ridge East Pond Dam	42 23′ 21″N	90 20′ 21″W
3	Eagle Ridge West Pond Dam	42 22′ 40″N	90 19′ 00″W
4	Lake Galena Sedimentation Pond Dam	42 24′ 44″N	90 18′ 49″W
5	Fitzgerald Lake West Dam	42 13′ 15″N	90 12′ 55″W
6	Fitzgerald Lake Dam/East	42 14′ 09″N	90 12′ 36″W
7	Apple Canyon Lake Dam	42 24′ 58″N	90 09′ 51″W

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

Yes. The Emergency Action Plan for the Apple Canyon Lake Dam identifies 25 structures (primarily residences) and the Village of Elizabeth's wastewater treatment facility as vulnerable to a dam failure. The Emergency Action Plan for the Small Pox Creek Dam identifies 22 dwellings (primarily residences); 52 property parcels; the wastewater treatment facility at The Galena Territory; Utilities, Inc.; eight roads, including US 20; and the BNSF railroad as vulnerable to a dam failure.

Information was unavailable on the number and type of structures vulnerable to a dam failure for the remaining dams; although a visual inspection of the area surrounding several of the dams indicates that there are buildings and infrastructures that could be vulnerable to a failure.

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 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 critical facilities.

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 to buildings, infrastructure and critical facilities from a dam failure is relatively low. However, the risk for the Apple Canyon Lake Dam and the Small Pox Creek Dam may be elevated to medium/high since a failure of either dam would most likely impact critical facilities such as wastewater treatment facilities, potentially impacting a number of individuals.

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 one of the classified dams 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 Jo Daviess County sufficient information was not available to prepare a reasonable estimate of future potential dollar losses to vulnerable structure from dam failures.

3.9 MAN-MADE HAZARDS

While the process to develop this Plan focused on natural hazards, the Planning Committee recognized that man-made hazards can also pose risks to public health and property. The extent and magnitude of the impacts that result from man-made hazard events can be influenced by natural hazard events. For example, severe winter storms can cause accidents involving trucks transporting hazardous substances. These accidents may lead to the release of these substances which can result in injury and potential contamination of the natural environment.

Consequently, the Planning Committee decided to profile the more prominent man-made hazards in Jo Daviess County. The man-made hazards assessed in this Plan include:

- Hazardous Substances
  - Generation
  - Transportation
- Waste Disposal
- Hazardous Material Incidents
- Waste Remediation
- Terrorism

3.9.1 Hazardous Substances

Hazardous substances broadly include any flammable, explosive, biological, chemical, or physical material that has the potential to harm public health or the environment. For the purposed of this Plan, the term hazardous substance includes hazardous product and hazardous waste. A hazardous waste is defined as the byproduct of a manufacturing process that is either listed or has the characteristics of ignitability, corrosivity, reactivity or toxicity and cannot be reused. A hazardous product is all other hazardous material.

Hazardous substances can pose a public health threat to individuals at their workplace and where they reside. The type and quantity of the substance, the pathway of exposure (inhalation, ingestion, dermal, etc.), and the frequency of exposure are factors that will determine the degree of adverse health effects experienced by individuals. Impacts can range from minor, short-term health issues to chronic, long-term illnesses.

In addition to impacting public health, hazardous substances can also cause damage to buildings, infrastructure and the environment. Accidents involving hazardous substances can range from minor (scarring on building floors and walls) to catastrophic (i.e., destruction of entire buildings, structural damage to roadways, etc.) and lead to injuries and death. The number of accidents involving hazardous substances in Illinois and across the Nation every year underscores the need for trained and equipped emergency responders to minimize damages.

Since 1970, significant changes have occurred in regards to how hazardous substances are transported and disposed. Comprehensive regulations and improved safety and industrial hygiene practices have reduced the frequency of incidents involving hazardous substances. Based on the small number of facilities in Jo Daviess County that generate and use hazardous substances, the population size, transportation patterns, and land use, the probability of a release occurring in Jo Daviess County should remain relatively low compared to other counties in Illinois. The relatively low numbers of transportation accidents should not diminish municipal or county commitment to emergency management.

The following subsections identify the general pathways – generation and transportation – by which hazardous substances pose a risk to public health and the environment in Jo Daviess County.

3.9.1.1 Generation

Jo Daviess County has several sites that generate hazardous substances as a result of their operations according to the Illinois Environmental Protection Agency (IEPA). **Figure 81** identifies the hazardous substance generators located in Jo Daviess County.

Figure 81
Generators of Solid & Liquid Hazardous Substances – 2010

Name	Hazardous Substances Generated	Amount Generated (Pounds)
East Dubuque		
Rentech Energy Midwest Corp. (16675 US 20)	ammonia	605,022
	formaldehyde	18,528
	methanol	44,705
	nitrate compounds	13,481
	nitric acid	350
	Total:	*682,086*
Galena		
Lemfco Inc. (100 S. Commerce St.)	lead	688
	manganese	9,723
	Total:	*10,411*
Hanover		
Intensys Controls (107 N. Washington St.)	copper compounds	37,143
	lead compounds	2
	Total:	*37,145*
Stockton		
Dura Automotive Systems (301 S. Simmons St.)	manganese	162,936
Stockton Cheese Inc. (300 W. Railroad Ave.)	nitric compounds	11,394
	nitric acid	154,967
	Total:	*166,361*

Source: U.S. Environmental Protection Agency, TRI Explorer, Releases: Facility Report.

3.9.1.2 Transportation

Roadways

Illinois has the nation's third largest highway system with over 139,000 miles of highways, streets, and roads and over 26,400 bridges. Most of the vehicle traffic in Jo Daviess County is carried on US Route 20 which connects Jo Daviess County to Rockford and Chicago to the east and Dubuque, Iowa to the west. State Routes 78 and 84 carry smaller quantities of traffic north and south and connect to US Route 20. While this modern roadway system provides convenience and efficiency for commuters, it also aids in-state and intra-state commerce which includes the transportation of hazardous substances.

Roadway accident records involving the shipment hazardous wastes and products in Jo Daviess County from 2007 through 2011 were obtained from the IEPA and the Illinois Emergency Management Agency. There were two recorded accidents during this time period, all involving product. **Figure 82** provides information on these accidents.

Figure 82
Roadway Accidents Involving Shipments of Hazardous Products: 2007 – 2011

Date	Location	Hazardous Product Released
6/13/2007	E. Winslow Road – Nora	diesel fuel
5/19/2010	Montgomery Drive – East Dubuque	hydraulic fluid

Railways

Illinois' rail system is the country's second largest, with the Chicago and East St. Louis terminals being two of the nation's busiest. In Jo Daviess County there are two rail lines – Burlington Northern and Santa Fe and Canadian National. The Burlington Northern and Santa Fe rail line enters the County at the northwestern tip and extends south along the western edge of the county, passing through East Dubuque and Galena, before entering Carroll County. The Canadian National operates a main rail line from Chicago to the west which crosses the northern part of Jo Daviess County, passing through Warren, Apple River, Scales Mound before reaching Galena and tying into the Burlington Northern and Santa Fe rail line.

Since 2000, hazardous substances moving through Illinois have accounted for between 6 and 10 percent of the total freight traffic. Annual tonnage of hazardous substances moving through Illinois has varied in recent years between 30 million tons to 47 million tons. In comparison, the Association of American Railroads estimates that approximately six percent of all rail traffic in the United States involves the movement of hazardous substances.

The Illinois Commerce Commission (ICC) is required to maintain records on railway accidents which involve hazardous substances. Their records are divided into three categories. These three categories are described in **Figure 83**.

Figure 83
Railroad Accident Classification Categories

Category	Description
A	railroad derailments resulting in the release of the hazards substance(s) being transported
B	railroad derailments where hazards substance(s) were being transported but no release occurred
C	releases of hazardous substance(s)s from railroad equipment occurred, however no railroad derailment was involved

Since 2000, there has been no rail accidents involving hazardous substances in Jo Daviess County according to the ICC; however IEMA records indicate that there have been three rail accidents involving other substances. In comparison, ICC records indicate that since 2001 the annual number of railway accidents in Illinois involving hazardous substances has ranged between 35 and 113. **Figure 84** provides a breakdown by category of the railway accidents/incidents involving hazardous substances that have occurred in Jo Daviess County as well as Illinois.

Figure 84
Railway Accidents/Incidents Involving Hazardous Substances: 2001 – 2011

Year	Category	Accident/Incident Location			
		Illinois	Jo Daviess County	Cook & Collar Counties	All Other Counties
2001	A	4	0	1	3
	B	13	0	3	10
	C	65	0	36	29
2002	A	13	0	7	6
	B	6	0	1	5
	C	73	0	44	29
2003	A	4	0	1	3
	B	7	0	2	5
	C	73	0	46	27
2004	A	16	0	6	10
	B	4	0	2	2
	C	57	0	30	27
2005	A	11	0	4	7
	B	8	0	3	5
	C	57	0	29	28
2006	A	6	0	1	5
	B	12	0	6	6
	C	95	0	58	37
2007	A	7	0	5	2
	B	10	0	8	2
	C	81	0	46	35
2008	A	7	0	4	3
	B	4	0	2	2
	C	62	0	38	24
2009	A	5	0	1	4
	B	5	0	3	2
	C	25	0	14	11
2010	A	3	0	2	1
	B	20	0	17	3
	C	80	0	42	38
2011	A	8	0	1	7
	B	10	0	9	1
	C	60	0	33	27

A review of IEMA hazmat incidents for this same time period identified three (3) rail incidents occurred in Jo Daviess County involving other substances. **Figure 85** provides information on these rail incidents.

Figure 85
Railway Accidents/Incidents involving
Non-Hazardous Substances: 2001 – 2011

Date	Location	Hazardous Substance Released
12/25/2010	Menominee	refrigerated liquid
12/6/2011	Menominee	frozen food
12/6/2011	East Dubuque	diesel fuel

The top 20 hazardous substances moved by rail through Illinois include: sodium hydroxide, petroleum gases (liquefied), sulfuric acid, anhydrous ammonia, chlorine, sulfur, vinyl chloride, propane, fuel oil, denatured alcohol, methanol, gasoline, phosphoric acid, hydrochloric acid, styrene monomer, carbon dioxide (refrigerated liquid), ammonium nitrate, sodium chlorate, and diesel fuel.

Pipelines

Energy gases (natural gas and liquefied petroleum gas), petroleum liquids (crude oil and gasoline) and liquid and gas products used in industrial processes are carried in above-ground and buried pipelines across Illinois. In Jo Daviess County, there are three pipelines that carry energy gases and two pipelines that carry petroleum liquids.

While there have been no recorded pipeline incidents in Jo Daviess County, there were three high profiled incidents across the Nation in 2010 that have raised public concerns about our aging pipeline infrastructure. The following provides a brief description of each incident.

- On September 9, 2010, a 30-inch high pressure natural gas pipeline ruptured in the San Francisco suburb of San Bruno, California that resulted in an explosion that killed eight people, destroyed over 30 homes and damaged an entire neighborhood.
- On July 26, 2010 a 30-inch liquid product pipeline rupture near Marshall, Michigan and released at least 840,000 gallons of oil into a creek that leads to the Kalamazoo River, a tributary of Lake Michigan.
- Soon afterward on September 9, 2010, another pipeline release received national attention. A 34-inch liquid product pipeline in the Chicago Suburb of Romeoville, Illinois released over 360,000 gallons of crude oil that flowed through sewers and into a retention pond narrowly avoiding the Des Plaines River. This release triggered numerous odor complaints from residents in the adjacent municipalities of Lemont and Bolingbrook.

Continual monitoring and maintenance of these pipelines is necessary to prevent malfunctions from corrosion, aging, or other factors that could lead to a release. In addition, to normal wear and tear experienced by pipelines, the possibility of sabotage and seismic activity triggering a release must be considered when considering emergency response scenarios.

3.9.2 Waste Disposal

Solid Waste

Waste disposal has caused surface water and ground water contamination in Illinois and across the Nation. Beginning in the late 1970s substantial regulatory changes strengthened the design, operating, and monitoring requirements for landfills where the majority of waste is disposed. These regulatory changes have helped reduce the public health threat posed by landfills. Although the rise in recycling activity has reduced the amount of waste disposed, the majority of solid waste (waste generated in households) continues to be disposed of in landfills. In 2010, 43 landfills were operating in Illinois; however, three of these landfills have closed.

According to the 24th Annual Landfill Capacity Report, there are no landfills currently operating in Jo Daviess County.

There are currently four Illinois landfills that serve Jo Daviess and the adjacent counties. All four of these landfills are rated in the top ten landfills in Illinois based on the amount of waste accepted for disposal. These landfills are Veolia ES Orchard Hills Landfill Inc. (formerly BFI) in Davis Junction (Ogle Co.); Winnebago Landfill in Rockford (Winnebago Co.); Prairie Hill RDF in Morrison (Whiteside Co.); and Lee County Landfill in Dixon (Lee Co.). At the present rate that solid waste is being generated, the IEPA estimates that there is sufficient capacity to meet the disposal needs of this region for approximately 14 years, if not longer.

Hazardous Waste

There are currently no off-site hazardous waste disposal facilities located in Jo Daviess County. Furthermore, there are no on-site hazardous waste treatment or disposal operations located in the County.

3.9.3 Hazardous Material Incidents

Hazardous materials, also known as hazardous substances, broadly include any flammable, explosive, biological, chemical, or physical material that has the potential to harm public health or the environment. A hazardous material or HazMat incident refers to any accident involving the release of hazardous substances. These accidents can take place where the substances are used, generated or stored or while they are being transported. In addition, HazMat incidents also include the release of hazardous substances, such as fuel, used to operate vehicles. These releases can be the result of an accident or a leak. **Figure 86** provides information on the HazMat incidents recorded in Jo Daviess County.

Between 2007 and 2011, there were 37 HazMat incidents recorded in Jo Daviess County. Of the 37 incidents, two involved roadway accidents, and three involved railway accidents. Many of the incidents recorded in Jo Daviess County are similar to those reported in other rural counties in that they commonly involve agricultural chemicals, fuel and oil. Taking the middle year (2009) of the time period studied reveals that there were six HazMat incidents recorded in Jo Daviess County. In comparison, 1,162 incidents were recorded in 2009 for the entire state. A majority of these incidents occurred in Cook and the collar counties.

Figure 86
HazMat Incidents in Jo Daviess County: 2007 – 2011

Date	Location	Hazardous Substances Released
2007		
2/2/2007	Galena	Oil
3/14/2007	Scales Mound	Soybean oil
3/28/2007	East Dubuque	Nitric acid
6/13/2007	Nora	Diesel fuel ^
9/5/2007	Warren	Mercury
9/6/2007	Galena	Gasoline
2008		
2/4/2008	Stockton	Phosphoric Acid
2/14/2008	Warren	Gasoline
7/7/2008	Warren	Gasoline
7/29/2008	East Dubuque*	Annhydrous Ammonia
11/16/2008	Elizabeth*	Annhydrous Ammonia
2009		
2/28/2009	Scales Mound*	Diesel Fuel
3/2/2009	Scales Mound*	Diesel Fuel
4/29/2009	East Dubuque*	Annhydrous Ammonia
9/26/2009	East Dubuque*	Annhydrous Ammonia
10/19/2009	East Dubuque*	Annhydrous Ammonia
11/30/2009	Galena	Diesel Fuel
2010		
5/4/2010	East Dubuque*	Annhydrous Ammonia
5/19/2010	East Dubuque*	Hydraulic Fluid ^
6/19/2010	East Dubuque	Formaldehyde
9/17/2010	Apple River	Sodium Hypochlorite
10/1/2010	Nora*	Silage Leachate
10/27/2010	East Dubuque*	Annhydrous Ammonia
11/3/2010	East Dubuque*	Annhydrous Ammonia
12/25/2010	Menominee*	Refrigerated Liquid (CO2) †
2011		
2/23/2011	Stockton	Gasoline
4/13/2011	East Dubuque*	Annhydrous Ammonia
7/22/2011	East Dubuque*	Annhydrous Ammonia
7/22/2011	Elizabeth	Mineral Oil
10/18/2011	East of Plum River	Fuel Oil
11/10/2011	East Dubuque*	Annhydrous Ammonia
11/16/2011	East Dubuque*	Annhydrous Ammonia
11/29/2011	Elizabeth	Transformer Oil
12/6/2011	Menominee*	Frozen Food †
12/6/2011	East Dubuque*	Diesel Fuel †
12/8/2011	East Dubuque*	Annhydrous Ammonia
12/12/2011	East Dubuque*	Annhydrouns Ammonia

* Incident verified in the vicinity of this location.

^ Incident involved the transportation of a hazardous substance by road. See *Section 3.9.1.2 – Transportation: Roadways* for more information.

† Incident involved transportation of a hazardous substance by rail. See *Section 3.9.1.2 – Transportation: Railways* for more information.

HazMat incidents in Illinois and across the Nation have resulted in serious injuries, evacuation of nearby residents, and environmental degradation requiring emergency cleanup actions. In Jo Daviess County, no reported injuries requiring hospitalization were reported as the result of separate HazMat incidents between 2007 and 2011. None of the recorded incidents caused severe, widespread damages or resulted in evacuation.

Based on the recorded incidents, Jo Daviess County experienced an average of 7 HazMat incidents annually. Based on the use of hazardous substances in agribusiness, the number of facilities that handle hazardous substances within the County, and the transportation of hazardous substances via roadways, pipeline and railways, HazMat incidents are likely to continue to take place. Although these incidents should not be expected to occur with the same frequency experienced in more industrialized and urbanized areas of Illinois, constant vigilance, proper training and equipment, and prompt response are needed to minimize the potential impacts of each incident.

3.9.4 Waste Remediation

Hazardous waste remediation in Illinois is primarily handled through two programs: the federal Superfund program and the state Site Remediation Program. Sites that pose the largest threat to public health and the environment are typically found in the Superfund program. Most other hazardous waste sites are handled through the Site Remediation Program.

Superfund(CERLCA) Program/National Priorities List

Since the advent of the national Superfund program in 1981, there have been 52 Superfund sites in Illinois. There is ***one Superfund site in Jo Daviess County***; however there are ***no additional candidate sites*** awaiting proposal to the National Priorities List.

In September 2012 the Bautsch-Gray Mine site was added to the Superfund program National Priorities List. The Bautsch-Gray Mine site consists of the remnants of an abandoned lead-zinc mine and milling operation located approximately 4 miles south of Galena off of Blackjack Road in Rice Township. The site contains a 40-acre mine tailings pile, a 4.8 acre surface impoundment and 4.9 acres of contaminated soil. Currently the property encompassed by the Mine site is owned by three separate entities.

There were two separate mines operated at the site. The Mineral Point Zinc Company began operating the Gray Mine in 1927 and continued until the 1940s. In 1946, Tri-State Zinc began operating at the Bautsch Mine. From 1969 until 1979, Eagle Picher operated both mines. No mining activities have occurred on the property since 1979. A mill formerly located at the site processed rock from both mines. The mill was used to crush and grind rock and separate usable lead and zinc ore. The leftover rock, referred to as mine tailings, began to accumulate on the site in the late 1940s. A large berm composed of mine tailings parallels Blackjack Road.

Over time erosion of the tailings pile has resulted in the migration of contaminated mine tailings toward Blackjack Road. In 2000 and 2001, IEPA assessed the site and confirmed that waste piles at the mine property contained elevated levels of lead, zinc, arsenic and cadmium. Additional investigations showed a surface water impoundment; two residential properties; the most shallow bedrock aquifer which provides drinking water to most of the area residents;

roadside ditches; a wetland and Small Pox Creek had been impacted by the migration of the contaminated tailings.

During a storm in August 2009, heavy rain carried tailings from the main waste pile across Blackjack Road onto residential property. Soil samples taken by the IEPA after the storm found high levels of lead on and around the site and at the residential property. Subsequently, IEPA requested assistance from the U.S. Environmental Protection Agency (USEPA). An emergency remediation action funded through the Superfund Program commenced in September 2010 to remove contaminated soil from the residential property and to install fours stormwater retention ponds to slow the flow of stormwater across the property during heavy rains.

In addition, contouring and landscaping activities were conducted in 2012 on the tailings area to ensure proper drainage, reduce dust and the movement of the tailings into Small Pox Creek. Topsoil and biosolids were also added to the mine tailings to make it suitable for growing grasses and other plants.

Illinois Site Remediation Program (non-Superfund)
Sites that do not qualify for the federal Superfund program, but where hazardous waste exists that poses a risk to public health and the environment, are regulated through the Illinois Site Remediation Program (SRP). Since the mid-1980s, remediation activities have been conducted and monitored at nearly 4,000 sites in Illinois. When inspections and sampling results indicate that remediation objectives have been achieved, the IEPA issues a No Further Remediation (NFR) Letter to the property owner. This letter describes what remediation activities have been taken and whether any portion of the property, based on future property use, might need additional remediation.

There are ***no SRP sites*** in Jo Daviess County.

Leaking Underground Storage Tank Program
Petroleum products leaking from underground storage tanks are regulated through the Leaking Underground Storage Tank program. This program began in the late 1980s as a result of the threats posed by vapors in homes and businesses, contaminated groundwater, and contaminated soil. In Illinois over 14,500 acres of soil contaminated by leaking underground tanks have been remediated since 1988.

In Jo Daviess County there are ***85 cases involving remediation of leaks and contaminated soil*** through this program. Fifty-six of these sites have received No Further Remediation (NFR) Letters. All but four of the remaining sites have submitted reports describing the extent of the leak and remediation activities taken to date. Some of these sites await further action by the site owners. Two sites have received a "high priority classification" with one of them receiving an NFR Letter while the remediation has been virtually completed at the other site.

3.9.5 Terrorism

Terrorism has different definitions across the globe. For the purpose of this Plan, terrorism will be defined as any event that includes ***violent acts*** which ***threaten or harm lives, health or***

property conducted by ***domestic or foreign*** individuals or groups a***imed at civilians, the federal government or symbolic locations*** intended to ***cause widespread fear***.

The attack on the World Trade Center and the Pentagon on September 11, 2001 by foreign terrorists galvanized national action against terrorism and resulted in the creation of the United States Department of Homeland Security. While the number of terrorist activities garnering national attention in the U.S. has been relatively small, approximately 80,000 terrorist events have occurred worldwide between 1970 and 2007 according to the National Consortium for the Study of Terrorism and Responses to Terrorism . During this same time span, the Consortium documented 1,347 terrorist events within the U.S. The greatest number of these events occurred in New York (266), Miami (70), San Francisco (66), Washington (59) and Los Angeles (54). There are approximately 40 terrorist groups have been documented as operating within the U.S.

Acts of terrorism have resulted in deaths and injuries as a result of kidnappings, hijackings, bombings, and the use of chemical and biological weapons. The Global Terrorism Database has documented 18 fatalities and 44 injuries attributed to terrorism in the United States since 2000. The attack on the World Trade Center and the Pentagon on September 11, 2001 resulted in nearly 3,000 additional deaths and an estimated 12,000 injuries.

The Federal Bureau of Investigation's (FBI) provides supporting documentation on domestic terrorist attacks between 1970 and 2005 in a series of reports on terrorism. These reports provide a chronological summary of terrorist incidents in the United States with detailed information on attacks between 1980 and 2005. During this time period 192 incidents were documented within the United States. Five of these incidents occurred in Illinois; four in the Chicago area and one downstate.

In the past several years there have been other terrorism incidents in Illinois that have received media coverage. In 2001, a suspected terrorist with possible ties to al-Qaeda was apprehended after engaging in communication and fiscal activities in support of terrorism in the Peoria and Macomb areas. Most recently a single individual from Macon County sought to carry out his anger at the federal government by detonating a van filled with explosive outside of the Federal Courthouse in Springfield on September 24, 2009. This attempt was thwarted by the FBI.

It is impossible to predict with any reasonable degree of accuracy how many terrorism events might be expected to occur in Jo Daviess County or elsewhere in Illinois. Although targets for terrorist activity are more likely centered in larger urban areas, recruitment, training and other support activities, such as the one described above, are as likely to occur in rural areas as in urban areas. The economic resources available to some terrorist groups coupled with the combination of global tensions, economic uncertainty and frustration towards government appear to have recently raised the frequency of attempts. Enhanced efforts by law enforcement officials and civilian vigilance for unusual activity or behavior will be needed to repel terrorists whether they are domestic or foreign in origin.

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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 March 30, 2012. 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 June 14, 2012 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 hazards (natural and man-made) they face and the ways they can protect themselves, their homes, and their businesses from those hazards.
Goal 2	Protect the lives, health, and safety of the people and animals in the County from the dangers of natural and man-made hazards.
Goal 3	Protect existing infrastructure and design new infrastructure (roads, bridges, levees, utilities, water supplies, sanitary sewer systems, etc.) to be resilient to the impacts of natural and man-made hazards.
Goal 4	Incorporate natural and man-made 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 and man-made hazards.
Goal 8	Protect historic, cultural, and natural resources from the effects of natural and man-made 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 Jo Daviess County, East Dubuque, Galena, Hanover and Stockton 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.

Figure 89
Mitigation Action Prioritization Methodology

		Hazard	
		Most Significant Hazard **(M)** (i.e., severe storms, severe winter storms, floods, tornadoes)	Less Significant Hazard **(L)** (i.e., drought, extreme heat, earthquakes, dam failures)
Mitigation Action	Mitigation Action with the Potential to Virtually Eliminate or Significantly Reduce Impacts **(H)**	**HM** mitigation action will virtually eliminate damages and/or significantly reduce the probability of deaths and injuries from the most significant hazards	**HL** mitigation action will virtually eliminate damages and/or significantly reduce the probability of deaths and injuries from less significant hazards
	Mitigation Action with the Potential to Reduce Impacts **(L)**	**LM** mitigation action has the potential to reduce damages, deaths and/or injuries from the most significant hazards	**LL** mitigation action has the potential to reduce damages, deaths and/or injuries from less significant hazards

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 **100** summarize the results of the mitigation strategy. The mitigation actions identified are arranged by participating jurisdiction.

Figure 90
(Sheet 1 of 20)
Jo Daviess 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				
Building & Zoning Office												
LM	Make the most recent Flood Insurance Rate Maps available at the Building & Zoning Office to assist the public in considering where to construct new buildings and make County Officials aware of these maps and issues related to construction in a floodplain.*	F	RA	Reduces	Large	1, 6, 7	Yes	Yes	Building & Zoning Office	1 year	County	Low/High
LM	Make information materials available to the public about the National Flood Insurance Program's voluntary Community Rating System.*	F	PP	Reduces	Large	1, 6, 7	Yes	Yes	Building & Zoning Office	1 year	County	Low/High
EMA												
LM	Conduct county-wide hazardous substances commodity flow analysis.	MMH	S	Reduces	Medium	2, 3, 5	Yes	Yes	EMA^	1 year	75% Federal 25% Local	Low/Medium
Sheriff's Office												
HM	Retrofit the Sheriff's Conference Room to serve as an Emergency Operations Center during hazard events.	DF, EH, EQ, F, MMH, SS, SWS, T	MP	Reduces	Large	2, 3, 5	NA	NA	Sheriff's Office	TBD	TBD	Low/High
HM	Purchase and install storm warning sirens at strategic locations in unincorporated Jo Daviess County.	SS, T	MP	Reduces	Medium	2	NA	NA	Sheriff's Office	TBD	TBD	Medium/High

^ The Jo Daviess County EMA will partner with the LEPC on this project.

* Mitigation action to ensure continued compliance with NFIP.

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 20)
Jo Daviess 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				
Sheriff's Office Continued…												
HM	Purchase and install emergency backup generators at County buildings to provide uninterrupted power during outages.	EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	NA	Yes	Sheriff's Office	TBD	TBD	Low/High
HM	Purchase a reverse 911 telephone warning system to notify residents/ responders of emergency information.	DF, EH, EQ, F, MMH, SS, SWS, T	MP	Reduces	Large	2	NA	NA	Sheriff's Office	TBD	TBD	Medium/High
Highway Department												
LM	Conduct hydrologic/hydraulic study to determine the cause and suggest appropriate solutions to address recurring drainage and flooding issues at various locations, including but not limited to Willow Road, Bethel Road Bridge over Rush Creek and Center Road Bridge over Lawhorn Creek.	F, SS, SWS	S	Reduces	Small	2, 3, 5	Yes	Yes	Highway Department	TBD	TBD	Low/Medium
HM	Select, design and construct appropriate remedy to alleviate recurring drainage and flooding issues at various locations, including but not limited to Willow Road, Bethel Road Bridge over Rush Creek and Center Road Bridge over Lawhorn Creek.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Highway Department	TBD	TBD	High/Medium
HM	Upsize culvert near 1540 S. Massbach Road to alleviate roadway damage caused by water overtopping the road during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Highway Department	TBD	TBD	Low/Medium

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 20)
Jo Daviess 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				
Berreman Township												
HM	Install riprap at Fitzsimmons Road Bridge over Davis Creek south of 9458 S. Fitzsimmons Road to protect the bridge channel from scour and erosion caused by swiftly moving water.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Install riprap at S. Town Hall Road Bridge over the Plum River to protect the bridge channel from scour and erosion caused by swiftly moving water.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Upsize culvert between 13300 E. Crab Creek Road and Loran Road to alleviate recurring drainage issues.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to address recurring roadway flooding issues between 11221 S. Skunk Hollow Road and 11301 S. Skunk Hollow Road caused by an unnamed creek that runs parallel to the road.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct appropriate remedy to alleviate recurring flooding issues between 11221 S. Skunk Hollow Road and 11301 S. Skunk Hollow Road caused by an unnamed creek that runs parallel to the road.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium

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 4 of 20)
Jo Daviess 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				
Derinda Township												
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy(s) to address recurring roadway flooding issues caused by Rush Creek and Little Rush Creek at multiple locations along Creek Road.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to address recurring roadway flooding issues caused by Rush Creek and Little Rush Creek at multiple locations along Creek Road.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to address recurring roadway flooding issues on Gamble Hill Road at the Rush Creek Bridge.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct appropriate remedy to address recurring roadway flooding issues on Gamble Hill Road at the Rush Creek Bridge.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to address the repeated loss of roadway surface (aggregate) on the steep hill near 700 E. Heer Road that occurs during heavy rains.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium

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 5 of 20)
Jo Daviess 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				
Derinda Township Continued…												
HM	Select, design and construct appropriate remedy to address the loss of roadway surface (aggregate) on the steep hill near 700 E. Heer Road that occurs during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
East Galena Township												
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to address the repeated loss of roadway surface (aggregate) on the steep hill between 5901 N. Bowden Road and 7964 N. Bowden Road that occurs during heavy rains.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct appropriate remedy to address the loss of roadway surface (aggregate) on the steep hill between 5901 N. Bowden Road and 7964 N. Bowden Road that occurs during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
HM	Upsize culvert on Glen Hollow Road near Small Pox Creek to alleviate roadway damage caused by water overtopping the road during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium

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 6 of 20)
Jo Daviess 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				
Elizabeth Township												
HM	Upsize Rodden Road culvert just north of the intersection of Rodden Road and Saw Mill Road to alleviate roadway damage caused by water overtopping the road during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium
HM	Upsize culvert near 3241 Westin Road to alleviate roadway damage caused by water overtopping the road during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium
HM	Upsize Cooper Road culvert near the intersection of Cooper Road and Westin Road to alleviate roadway damage caused by water overtopping the road during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to alleviate roadway damage caused by floodwaters from the Apple River overtopping Lone Street near its intersection with US Route 20.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy to alleviate roadway damage caused by floodwaters from the Apple River overtopping Lone Street near its intersection with US Route 20.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium

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 7 of 20)
Jo Daviess 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				
Elizabeth Township Continued…												
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to alleviate roadway damage caused by floodwaters from the Apple River overtopping Longhollow Road near its intersection with US Route 20.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy to alleviate roadway damage caused by floodwaters from the Apple River overtopping Longhollow Road near its intersection with US Route 20.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
Guilford Township												
HM	Install riprap at Cording Road Bridge over Small Pox Creek to protect the bridge channel from scour and erosion caused by swiftly moving water.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium
HM	Install riprap at W. Gilford Road Bridge over Small Pox Creek near 4075 W. Gilford Road to protect the bridge channel from scour and erosion caused by swiftly moving water.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium
HM	Upsize culvert near 4691 N. Mill Creek Road to alleviate roadway damage caused by water overtopping the road during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium

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 8 of 20)
Jo Daviess 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				
Guilford Township Continued…												
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to address the large outlet scour hole compromising the concrete end section of the Thunder Bay Road culvert near the intersection of Thunder Bay Road and Guilford Road.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct appropriate remedy to address the large outlet scour hole compromising the concrete end section of the Thunder Bay Road culvert near the intersection of Thunder Bay Road and Guilford Road.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
HM	Install riprap at Menzmer Road Bridge near 160 E. Menzmer Road to protect the bridge channel from scour and erosion caused by swiftly moving water.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium
HM	Install riprap at N. Mill Creek Road Bridge over Mill Creek near 4283 N. Mill Creek Road to protect the bridge channel from scour and erosion caused by swiftly moving water.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium

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 9 of 20)
Jo Daviess 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				
Hanover Township												
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to address recurring roadway flooding issues caused by the Apple River at the Elizabeth Hanover Road Bridge near the intersection of Elizabeth Hanover Road and Steele Road.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct appropriate remedy to address recurring roadway flooding issues caused by the Apple River at the Elizabeth Hanover Road Bridge near the intersection of Elizabeth Hanover Road and Steele Road.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy(s) to address recurring roadway flooding at multiple locations along Steele Road.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to address recurring roadway flooding at multiple locations along Steele Road.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to address recurring roadway flooding at Whitton Road Bridge over the Apple River.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium

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 10 of 20)
Jo Daviess 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				
Hanover Township Continued…												
HM	Select, design and construct the appropriate remedy to address recurring roadway flooding at Whitton Road Bridge over the Apple River.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to address recurring roadway flooding at Crazy Hollow Road Bridge over the Apple River.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy to address recurring roadway flooding at Crazy Hollow Road Bridge over the Apple River.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy(s) to alleviate roadway damage caused by recurring roadway flooding at multiple locations along Blanding Road.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate roadway damage caused by recurring roadway flooding at multiple locations along Blanding Road.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium

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 11 of 20)
Jo Daviess 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				
Hanover Township Continued…												
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to address recurring roadway flooding at Rush Road Bridge over Rush Creek.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy to address recurring roadway flooding at Rush Road Bridge over Rush Creek.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
Menominee Township												
HM	Upsize Station Road culvert between 14677 W. Station Road and 15002 W. Station Road to alleviate roadway damage caused by water overtopping the road during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium

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 12 of 20)
Jo Daviess 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				
Nora Township												
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to alleviate roadway damage caused by floodwaters from tributaries of Yellow Creek overtopping the roadway at the Howardsville Road Bridge near the intersection of Howardsville Road and Mammoser Road.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate roadway damage caused by floodwaters from tributaries of Yellow Creek overtopping the roadway at the Howardsville Road Bridge near the intersection of Howardsville Road and Mammoser Road.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium

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 13 of 20)
Jo Daviess 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				
Pleasant Valley Township												
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy(s) to alleviate roadway damage caused by frequent flooding at various locations, including but not limited to Fitzsimmons Road, Brunner Road, Knapp Road, Groezinger Road, Elmoville Road and Good Hope Road.	F, SS	S	Reduces	Medium	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate roadway damage caused by frequent flooding at various locations, including but not limited to Fitzsimmons Road, Brunner Road, Knapp Road, Groezinger Road, Elmoville Road and Good Hope Road.	F, SS	SP	Reduces	Medium	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium

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 14 of 20)
Jo Daviess 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				
Rice Township												
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy(s) to alleviate roadway damage caused by Mississippi River flooding at multiple locations along River Road.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate roadway damage caused by Mississippi River flooding at multiple locations along River Road.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
Rush Township												
HM	Upsize culverts at multiple locations along Haas Road to alleviate overtopping of the road by floodwaters from a nearby meandering stream.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to alleviate roadway damage caused by water overtopping the road during heavy rains at the Stockton Road Bridge over the South Fork of the Apple River.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium

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 15 of 20)
Jo Daviess 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				
Rush Township Continued…												
HM	Select, design and construct the appropriate remedy to alleviate roadway damage caused by water overtopping the road during heavy rains at the Stockton Road Bridge over the South Fork of the Apple River.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
HM	Upsize culverts at multiple locations along Mud Road to alleviate overtopping of the road by floodwaters from nearby streams.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium
Stockton Township												
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy(s) to alleviate bridge and culvert damage caused by frequent flooding at various locations, including but not limited to Airport Road, Schueller Road, Morseville Road and Parker Road.	F, SS	S	Reduces	Medium	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate bridge and culvert damage caused by frequent flooding at various locations, including but not limited to Airport Road, Schueller Road, Morseville Road and Parker Road.	F, SS	SP	Reduces	Medium	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium

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 16 of 20)
Jo Daviess 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				
Thompson Township												
HM	Upsize Mill Creek Road culvert near 2341 N. Mill Creek Road to alleviate roadway damage caused by water overtopping the road during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy(s) to address recurring roadway flooding from the Apple River at multiple locations along Townsend Road.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to address recurring roadway flooding from the Apple River at multiple locations along Townsend Road.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium

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 17 of 20)
Jo Daviess 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				
Woodbine Township												
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to alleviate roadway damage caused by floodwaters from Rush Creek overtopping Rush Creek Road between 5396 E. Rush Creek Road and 4684 E. Rush Creek Road.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy to alleviate roadway damage caused by floodwaters from Rush Creek overtopping Rush Creek Road between 5396 E. Rush Creek Road and 4684 E. Rush Creek Road.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
HM	Upsize Read Road culvert over Little Rush Creek to alleviate roadway damage caused by water overtopping the road during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to alleviate roadway damage caused by flooding at Grebner Road Bridge over the Apple River.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy to alleviate roadway damage caused by flooding at Grebner Road Bridge over the Apple River.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium

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 18 of 20)
Jo Daviess 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				
Woodbine Township Continued…												
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to alleviate roadway damage caused by flooding at Grebner Road Bridge over Hells Branch.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy to alleviate roadway damage caused by flooding at Grebner Road Bridge over Hells Branch.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy(s) to alleviate roadway damage caused by flooding from the Apple River at multiple locations along Apple River Road.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate roadway damage caused by flooding from the Apple River at multiple locations along Apple River Road.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy(s) to alleviate roadway damage caused when water runs down Fahrion Road at various locations (i.e., cut sections) during heavy rains.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium

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 19 of 20)
Jo Daviess 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				
Woodbine Township Continued…												
HM	Select, design and construct the appropriate remedy(s) to alleviate roadway damage caused when water runs down Fahrion Road at various locations (i.e., cut sections) during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy(s) to alleviate roadway damage caused when water runs down Vel Terra Road at various locations (i.e., cut sections) during heavy rains.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate roadway damage caused when water runs down Vel Terra Road at various locations (i.e., cut sections) during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
HM	Upsize Eden Road culvert near 3834 S. Eden Road to alleviate roadway damage caused by water overtopping the road during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Medium/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy(s) to alleviate roadway damage caused when water runs down Center Road at various locations (i.e., cut sections) during heavy rains.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium

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 20 of 20)
Jo Daviess 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				
Woodbine Township Continued…												
HM	Select, design and construct the appropriate remedy(s) to alleviate roadway damage caused when water runs down Center Road at various locations (i.e., cut sections) during heavy rains.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to alleviate roadway damage caused by flooding at Grebner Road Bridge over Mill Creek.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	Low/Medium
HM	Select, design and construct the appropriate remedy to alleviate roadway damage caused by flooding at Grebner Road Bridge over Mill Creek.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Township	TBD	TBD	High/Medium

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 91
Apple Canyon Lake 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 an automated telephone warning system (reverse 911) to notify residences of emergency information.	DF, EH, EQ, F, SS, SWS, T	MP	Reduces	Large	2	NA	NA	County^	TBD	TBD	Medium/High
HM	Purchase and install an emergency backup generator at the Clubhouse (a fire district-designated emergency shelter) to provide uninterrupted power during power outages.	DF, EQ, EH, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	NA	Yes	County^	TBD	TBD	Medium/High

^ The Apple Canyon Lake Property Owners Association will partner with Jo Daviess County on this project.

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
(Sheet 1 of 2)
Apple River 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 siren.	SS, T	MP	Reduces	Large	2, 3, 5	NA	NA	Village	TBD	TBD	Medium/High
LM	Conduct a comprehensive drainage study to determine the cause(s) and identify the appropriate remedy(s) to alleviated recurring drainage issues at various locations within the Village.	F, SS, SWS	S	Reduces	Large	2, 3, 5	Yes	Yes	Village	TBD	75% Federal 25% Local	Medium/Medium
HM	Select, design and construct the appropriate remedy(s) to alleviate recurring drainage issues at various locations within the Village.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village	TBD	75% Federal 25% Local	High/Medium
HM	Purchase a portable emergency backup generator for use at the drinking water wells and lift station to provide continued service during prolonged power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	Yes	Yes	Village	TBD	TBD	Low/High
HM	Purchase and install electric hookups (pigtails) at drinking water wells and lift station for use with portable emergency backup generator to provide continued service during prolonged power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	Yes	Yes	Village	TBD	TBD	Low/High
HM	Designate Park House and Events Center as heating/cooling centers.	EH, SWS	MP	Reduces	Medium	2	NA	NA	Village	TBD	Village	Low/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	MMH	Man-Made Hazard
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 92
(Sheet 2 of 2)
Apple River 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	Extend the depth of the existing drinking water(s) to ensure the Village's water supply is resistant to drought.	DR, MMH	MP	Reduces	Large	2, 3, 5	NA	Yes	Village	TBD	75% Federal 25% Local	High/High
HM	Construct a new drinking water tower to serve as a backup in case the main tower is damaged by a natural hazard event.	EQ, MMH, SS, T	MP	Reduces	Large	2, 3, 5	Yes	NA	Village	TBD	TBD	High/High
HM	Replace aging sanitary and drinking water lines to prevent storm water infiltration and increase resilience to contraction and expansion of surrounding soils.	DR, F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village	TBD	75% Federal 25% Local	High/High
LM	Conduct feasibility study to determine the appropriateness of constructing a second railroad crossing. The Village is divided in half by the Canadian National Railroad and there is only one north/south road, Prospect Street, which connects the two sides of the Village. The current at-grade crossing is interrupted by daily train service which can impede response by emergency services and has the potential to be blocked by a train derailment.	EQ, MMH, SS, SWS, T	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village	TBD	TBD	Medium/High

Acronyms

Hazard(s) to be Mitigated:

DF	Dam Failure	MMH	Man-Made Hazard
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 93
(Sheet 1 of 2)
East Dubuque 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 damage to 3rd Street drainage ditch sustained during repeated flash flood events.	F, SS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	City Council	TBD	TBD	Medium/High
HM	Modify/replace 3rd Street drainage ditch to address recurring flood issues.	F, SS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	City Council	TBD	75% Federal 25% Local	High/High
HM	Install riprap at 3rd Street drainage ditch from the floodgates to the Mississippi River to protect the entrance from erosion.	F, SS	SP	Reduces	Medium	2, 3, 5	NA	Yes	City Council	TBD	TBD	Medium/High
HM	Replace DeSoto Street bridge over the 3rd Street drainage ditch. The bridge has been closed since July, 2011 due to damage sustained during repeated flash flooding events which have undermined the bridge abutments.	F, SS	SP	Reduces	Small	2, 3, 5	Yes	Yes	City Council	TBD	TBD	High/Medium
LM	Update existing drainage study.	F, SS	S	Reduces	Medium	2, 3, 5	Yes	Yes	City Council	TBD	75% Federal 25% Local	Low/High
LM	Conduct storm drain inlet survey (including video reconnaissance) to identify locations where sediment has built up reducing intake/carrying capacity.	F, SS	S	Reduces	Large	2, 3, 5	Yes	Yes	City Council	TBD	TBD	Low/High
HM	Clean sediment out of storm drain inlets to maximize intake capacity.	F, SS	MP	Reduces	Medium	2, 3, 5	Yes	Yes	City Council	TBD	City	Low/High
HM	Floodproof wastewater treatment plant, 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	SP	Reduces	Large	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 2 of 2)
East Dubuque Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Construct retention basins along Illinois Route 35 to manage stormwater runoff and reduce the likelihood of flooding.	F, SS	SP	Reduces	Medium	2, ,3, 5	Yes	Yes	City Council	TBD	75% Federal 25% Local	Medium/High
HM	Design and construct storm shelters with emergency backup generators at strategic locations within the City to service displaced residents.	SS, SWS, T	SP	Reduces	Medium	2	NA	NA	City Council	TBD	75% Federal 25% Local	High/High
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 and make City Officials aware of these maps and issues related to construction in a floodplain.*	F	RA	Reduces	Medium	1, 6, 7	Yes	Yes	City Council	1 year	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	Medium	1, 6, 7	Yes	Yes	City Council	1 year	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 2)
Elizabeth 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	Distribute flyer with information explaining fire whistle/siren signals.	SS, T	MP	Reduces	Large	2	NA	NA	Village Board	Ongoing	Village	Low/High
HM	Purchase and install an emergency backup generator at Village Hall/Police Station to provide uninterrupted power during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	NA	Yes	Village Board	3 years	TBD	Low/High
HM	Construct a dike/levee around the wastewater treatment plant to protect it from flood events.	F, SS	SP	Reduces	Large	2, 3, 5	NA	Yes	Village Board	10 years	TBD	Medium/High
HM	Clean debris/obstructions out of storm drains to maximize intake capacity.	F, SS	MP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	Ongoing	Village	Low/Medium
HM	Replace aging water lines to prevent storm water infiltration and increase resilience to contraction and expansion of surrounding soils.	DR, F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	Ongoing	75% Federal 25% Local	High/High
HM	Replace and relocate water mains under US Route 20 to increase resilience to contraction and expansion of surrounding soils and to reduce traffic disruptions when maintenance and repairs are conducted. US Route 20 is the main east-west route through Jo Daviess County and when a 6 inch main recently burst, the highway had to be shutdown to perform the repairs, causing adverse travel for the nearly 5,350 vehicles and 900 trucks that travel through Elizabeth each day.	DR, F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	10 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 94
(Sheet 2 of 2)
Elizabeth 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 damaged storm drains to optimize performance of system.	F, SS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	Ongoing	TBD	Low/Medium
HM	Designate Village Hall gymnasium as a storm shelter and heating/cooling center.	EH, F, SS, SWS, T	MP	Reduces	Large	2	NA	NA	Village Board	1 year	Village	Low/High
HM	Retrofit the Village Hall gymnasium (to wind and seismic standards and equipped with an emergency backup generator, air conditioning units and upgraded bathroom and shower facilities) to serve as a storm safe shelter and heating/cooling center for residents.	EH, F, SS, SWS, T	SP	Reduces	Large	2, 3	NA	Yes	Village Board	10 years	75% Federal 25% Local	High/High
LM	Adopt new building codes to improve building safety.	EQ, F, SS, SWS, T	RA	Reduces	Medium	2, 3, 4, 7	Yes	NA	Village Board	10 years	Village	Low/High
HM	Purchase an automated telephone warning system (reverse 911) to notify residences of emergency information.	EH, EQ, F, MMH, SS, SWS, T	MP	Reduces	Large	2	NA	NA	Village Board	TBD	TBD	Medium/High
HM	Purchase and install new storm siren by water tower at US Route 20 and East Street.	SS, T	MP	Reduces	Medium	2	NA	NA	Village Board	5 years	TBD	Medium/High
HM	Insulate water tower to guard against freezing. The Village only has one water tower and it has experienced recurring freezing issues during extremely cold weather.	SWS	MP	Eliminates	Large	2, 3, 5	Yes	Yes	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 95
(Sheet 1 of 4)
Galena 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				
City												
HM	Repair or replace Bench Street/ Franklin Street storm sewer intake.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	City	2 years	75% Federal 25% Local	Low/Medium
HM	Relocate sludge building and maintenance garage out of Galena River floodplain.	F, SS	PP	Eliminates	Small	2, 3, 5	Yes	NA	City	5 years	75% Federal 25% Local	High/High
HM	Replace storm sewer flap gates in levee along the Galena River.	F, SS	SP	Reduces	Medium	2, 3, 5	NA	Yes	City	2 years	75% Federal 25% Local	Low/Medium
LM	Prepare emergency operations plan for the City.	EH, EQ, F, SS, SWS, T	S	Reduces	Large	2, 3, 4, 5, 8	Yes	Yes	City	2 years	TBD	Low/High
LM	Conduct preliminary engineering study for a new crossing of the Galena River. The Galena River runs through Galena dividing the city and right now there is only one crossing of the Galena River within the municipal limits.	F, SS	S	Reduces	Medium	2, 3, 5	Yes	Yes	City	10 years	TBD	Medium/High
HM	Design and construct a new crossing of the Galena River.	F, SS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	City	10 years	TBD	High/High
HM	Install riprap along the Galena River to protect the banks and bike trail from erosion.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	City	2 years	TBD	Medium/Medium
HM	Install diversion sewer system at Franklin Street and US Route 20 (extension of new combined sewer line from industrial complex) to increase carrying capacity and alleviate basement flooding of homes along Franklin Street.	F, SS	SP	Reduces	Small	2, 3, 5	Yes	Yes	City	2 years	75% Federal 25% Local	High/High

Acronyms

Hazard(s) to be Mitigated:

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

Type of Mitigation Activity:

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

Figure 95
(Sheet 2 of 4)
Galena 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				
City Continued…												
HM	Upgrade downtown area storm pump station.	F, SS	MP	Reduces	Medium	2, 3, 5	NA	Yes	City	1 year	TBD	Medium/High
HM	Purchase NOAA weather radios for city employees.	EH, F, SS, SWS, T	MP	Reduces	Small	2, 3, 5	NA	NA	City	2 years	TBD	Low/Medium
HM	Perform upgrades to storm sewer system.	F, SS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	City	3 years	75% Federal 25% Local	Medium/High
HM	Construct stormwater detention basins to manage stormwater runoff and reduce the likelihood of flooding.	F, SS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	City	5 years	75% Federal 25% Local	Medium/High
HM	Purchase emergency backup generator to provide power to the drinking water well house during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	Yes	Yes	City	5 years	TBD	Low/High
HM	Purchase and install an emergency backup generator at City Hall to provide uninterrupted power during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	NA	Yes	City	5 years	TBD	Low/High
HM	Trim trees and remove dead material to minimize disruptions to electrical power and communication networks.	SS, SWS, T	MP	Reduces	Large	2, 3, 5	Yes	Yes	City	2 years	City	Low/High
HM	Conduct sewer line reconnaissance study to identify locations where storm water infiltrates the sanitary sewer lines.	F, SS	S	Reduces	Medium	2, 3, 5	Yes	Yes	City	2 years	75% Federal 25% Local	Low/High
HM	Repair sewer line sections where storm water infiltration is occurring to prevent sewage backups.	F, SS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	City	2 years	75% Federal 25% Local	High/High
HM	Purchase and install storm sirens.	SS, T	MP	Reduces	Large	2	NA	NA	City	3 years	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 95
(Sheet 3 of 4)
Galena 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				
City Continued…												
HM	Designate gymnasium or auditorium at local school as a storm shelter.	F, SS, SWS, T	MP	Reduces	Medium	2	NA	NA	City	1 year	City	Low/High
HM	Purchase a stand alone server with software to backup the City's computer files.	EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5, 8	NA	NA	City	2 years	TBD	Low/High
HM	Purchase and install an automated telephone warning system (reverse 911) to notify residents/responder of emergency information.	EH, EQ, F, MMH, SS, SWS, T	MP	Reduces	Large	2	NA	NA	City	2 years	TBD	Medium/High
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 and make City Officials aware of these maps and issues related to construction in a floodplain.*	F	RA	Reduces	Medium	1, 6, 7	Yes	Yes	City Council	1 year	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	Medium	1, 6, 7	Yes	Yes	City Council	1 year	City	Low/High
Police Department												
HM	Purchase and install an emergency backup generator at the Police Department to provide uninterrupted power during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	NA	Yes	City	3 years	TBD	Low/High
HM	Purchase a portable emergency backup generator with lighting system for use during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 5	NA	Yes	Police Department	3 years	TBD	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 4 of 4)
Galena 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				
Fire Department												
HM	Acquire/build new storage shed outside the Galena River floodplain to store equipment used during natural hazard events.	F, SS	PP	Eliminates	Small	2, 3, 5	Yes	NA	Fire Department	5 years	75% Federal 25% Local	Low/High
HM	Retrofit/update emergency dispatch center at fire house to include additional telephone lines and computer accessibility.	EH, EQ, F, SS, SWS, T	MP	Reduces	Medium	2	NA	NA	Fire Department	3 years	TBD	Medium/High

Acronyms

Hazard(s) to be Mitigated:

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

Type of Mitigation Activity:

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

Figure 96
(Sheet 1 of 2)
The Galena Territory Association Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Construct dike along Marina Drive from Territory Drive to the Lake Galena shoreline to protect the road and the structures on the north side of the road from flooding associated with Small Pox Creek. The existing dredge pond and boat pen will be relocated.	F, SS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	County^	Ongoing	75% Federal 25% Local	High/Medium
HM	Relocate the fishing pier and dock which can accommodate 250 boats; excavate the existing beach and construct a berm along No Name Creek from the pavilion to the shoreline to reduce the property damage sustained during flood events.	F, SS	MP	Reduces	Medium	2, 3	Yes	NA	County^	TBD	TBD	High/Medium
HM	Construct a Class III Dam in the Small Pox Creek watershed between Rawlins Road and Cording Road to manage stormwater; reduce the volume and velocity of water entering Lake Galena; and alleviate recurring flood impacts experienced by The Galena Territory, unincorporated Guilford and its associated businesses (including a limestone quarry, storage facility, junk yard and several farms), and West Guilford Road, a well-traveled roadway in the area.	F, SS	SP	Reduces	Medium	2, 3, 5, 6, 8	Yes	Yes	County^	TBD	TBD	High/High

^ The Galena Territory Association will partner with Jo Daviess County on this project.

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 2)
The Galena Territory Association Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Construct a rain garden below the third tier of the Owner's Club parking lot to reduce the runoff which flows into the East Golf tributary	F, SS	SP	Reduces	Small	2, 3, 5, 6	NA	Yes	County^	TBD	TBD	Medium/Medium
HM	Construct a detention pond north of the second green of the East Golf Course to slow the volume and velocity of the water entering Small Pox Creek from the East Golf tributary.	F, SS	SP	Reduces	Small	2, 3, 5, 6	NA	NA	County^	TBD	75% Federal 25% Local	Medium/Medium
HM	Install a series of weirs in Cogan Creek from Cogan Road to Small Pox Creek to control the volume and velocity of the water entering the creek.	F, SS	SP	Reduces	Small	2, 3 5, 6	NA	NA	County^	TBD	75% Federal 25% Local	Medium/Medium
HM	Construct a Class III Dam between Guilford Road and the Miner Road Quarry to manage stormwater and reduce the volume and velocity of water from Miner Creek entering Lake Galena.	F, SS	SP	Reduces	Small	2, 3, 5, 6, 8	Yes	Yes	County^	TBD	TBD	High/High
HM	Purchase and install an emergency backup generator at the Owner's Club (a designated Red Cross Disaster Center) to provide uninterrupted power during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	NA	Yes	County^	TBD	TBD	Medium/High

^ The Galena Territory Association will partner with Jo Daviess County on this project.

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)
Hanover 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	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	Medium/High
HM	Repair sewer line sections where storm water infiltration is occurring to prevent sewage backups.	F, SS	SP	Eliminates	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	High/High
LM	Conduct hydrologic/hydraulic study to determine the appropriate remedy to address recurring roadway flooding issues along Fulton Road.	F, SS	S	Reduces	Small	2, 3, 5	NA	Yes	Village Board	TBD	TBD	Medium/High
HM	Select, design and construct appropriate remedy to address recurring roadway flooding issues along Fulton Road.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Village Board	TBD	TBD	High/High
HM	Elevate or relocate Village maintenance garage on Fillmore Street out of the Apple River floodplain.	F, SS	PP	Eliminates	Small	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	High/High
HM	Construct a dike/levee around the wastewater treatment lagoon to address recurring flooding issues.	F, SS	SP	Reduces	Large	2, 3, 5	NA	Yes	Village Board	TBD	TBD	High/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 2 of 2)
Hanover 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 additional storm warning siren	SS, T	MP	Reduces	Medium	2	NA	NA	Village Board	TBD	TBD	Medium/High
HM	Purchase an automated telephone warning system (reverse 911) to notify residents of emergency information.	EH, EQ, F, MMH, SS, SWS, T	MP	Reduces	Large	2	NA	NA	Village Board	TBD	TBD	Medium/High
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 and make City Officials aware of these maps and issues related to construction in a floodplain.*	F	RA	Reduces	Medium	1, 6, 7	Yes	Yes	Village Board	1 year	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, 6, 7	Yes	Yes	Village Board	1 year	Village	Low/High

* Mitigation action to ensure continued compliance with NFIP.

Acronyms

Hazard(s) to be Mitigated:

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

Type of Mitigation Activity:

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

Figure 98
(Sheet 1 of 3)
Scales Mound 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	Bury electric utility lines to limit service disruptions during natural hazard events.	SS, SWS, T	MP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	3 years	TBD	High/High
HM	Designate the Scales Mound School as an emergency/storm shelter and heating/cooling center.	EH, EQ, F, SS, SWS, T	MP	Reduces	Large	2	NA	NA	Village Board	1 year	Village	Low/High
HM	Purchase and install an automatic emergency backup generator at the drinking water treatment facility to maintain operations during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	Yes	Yes	Village Board	1 year	TBD	Low/High
HM	Purchase and install an automatic emergency backup generator at the wastewater treatment facility to maintain operations during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	Yes	Yes	Village Board	1 year	TBD	Low/High
HM	Purchase and install an automatic emergency backup generator at the designated emergency/storm shelter and heating/cooling center to provide uninterrupted power during power outages	EH, EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	Yes	Yes	Village Board	1 year	TBD	Low/High
LM	Conduct drainage study to identify the appropriate remedies to alleviate recurring drainage problems within the Village, including but not limited to South Ave. & Franklin St., South Ave. & Main St., Clark Ave, Provost Ave., Jackson St., and Washington St. between North Ave. & Schuyler Ave.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	3 years	75% Federal 25% Local	Medium/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 98
(Sheet 2 of 3)
Scales Mound 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	Select, design and construct the appropriate drainage remedy(s) to alleviate recurring drainage problems within the Village, including but not limited to South Ave. & Franklin St., South Ave. & Main St., Clark Ave, Provost Ave., and Jackson St., and Washington St. between North Ave. & Schuyler Ave.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	Ongoing	75% Federal 25% Local	High/High
LM	Conduct feasibility study to determine the appropriateness of constructing a second railroad crossing. The Village is divided in half by the Canadian National Railroad and there is only one north/south road, Franklin Street, which connects the two sides of the Village. The current at-grade crossing is interrupted by daily train service which can impede response by emergency services and has the potential to be blocked by a train derailment.	EQ, MMH, SS, SWS, T	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	3 years	TBD	Medium/High
HM	Design and construct a new multi-use emergency operations center.	EQ, F, MMH, SS, SWS, T	MP	Reduces	Large	2, 3, 5	Yes	NA	Village Board	5 years	TBD	High/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 98
(Sheet 3 of 3)
Scales Mound 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 damaged storm drains as needed to alleviate drainage problems and optimize the performance of the system.	F, SS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	Ongoing	TBD	Low/High
HM	Replace aging storm sewer lines at all intersections to alleviate recurring ponding of water on the roadways.	F, SS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	2 years	75% Federal 25% Local	High/High
HM	Construct equipment storage building to protect Village maintenance equipment from severe weather events.	EQ, F, SS, SWS, T	MP	Reduces	Small	5	Yes	NA	Village Board	3 years	TBD	Medium/Medium
LM	Conduct sewer line reconnaissance study to identify locations where storm water infiltrates the lines.	F, SS	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	5 years	75% Federal 25% Local	Medium/High
HM	Repair sewer line sections where storm water infiltration is occurring to prevent sewage backups.	F, SS	SP	Eliminates	Small	2, 3, 5	Yes	Yes	Village Board	Ongoing	75% Federal 25% Local	High/High
HM	Upgrade aging wastewater treatment facility.	F, SS	SP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	5 years	75% Federal 25% Local	High/High
HM	Trim trees and remove dead material to minimize disruptions to electrical power and communication networks.	SS, SWS, T	MP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	Ongoing	Village	Low/High
HM	Purchase an automated telephone warning system (reverse 911) to notify residents of emergency information.	EH, EQ, F, MMH, SS, SWS, T	MP	Reduces	Large	2	NA	NA	Village Board	TBD	TBD	Medium/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 99
(Sheet 1 of 4)
Stockton 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	Acquire land and construct a retention basin west of Eugene Street to manage stormwater runoff and reduce the likelihood of flooding along Eugene Street and Hubert Street.	F, SS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	Medium/High
HM	Upgrade storm sewer line for 2,200 feet from N. Simmons Street (north of E. High Street) to Yellow Creek.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Village Board	TBD	75% Federal 25% Local	Medium/High
HM	Upgrade storm sewer to a 48-inch or greater diameter line for 1,100 from S. Hudson Street along E. Queen Street to a tributary of Yellow Creek.	F, SS	SP	Reduces	Medium	2, 3, 5	NA	Yes	Village Board	TBD	75% Federal 25% Local	High/High
HM	Replace Carpenter Street bridge to increase flow capacity and alleviate drainage issues.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Village Board	TBD	TBD	High/Medium
HM	Replace stone culvert under old railroad tracks with a larger culvert to increase carrying capacity and alleviate drainage issues.	F, SS	SP	Reduces	Small	2, 5	NA	Yes	Village Board	TBD	TBD	Medium/Medium
HM	Clean out brush and debris from tributary of Yellow Creek to reduce/prevent flooding issues.	F, SS	MP	Reduces	Small	2, 3, 5	NA	Yes	Village Board	TBD	Village	Low/High
HM	Reshape/straighten tributary of Yellow Creek between E. Queen Ave. and E. Carpenter Ave. to alleviate flooding issues.	F, SS	MP	Reduces	Small	2, 3, 5, 6	NA	Yes	Village Board	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 99
(Sheet 2 of 4)
Stockton 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 300 feet of storm sewer with 48-inch or greater diameter line on S. Park Road north of W. North Ave.	F, SS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	High/High
HM	Extend storm sewer 300 feet with a 48-inch or greater diameter line on S. Park Road north of W. Prairie Ave.	F, SS	SP	Reduces	Medium	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	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	Medium/High
HM	Repair sewer line sections where storm water infiltration is occurring to prevent sewage backups.	F, SS	SP	Eliminates	Small	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	High/High
LM	Conduct sewer line reconnaissance study to identify cross connections, failures, and determine pipe sizes in order to maximize flow and prevent sewer backups.	F, SS	S	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	Medium/High
LM	Map the storm sewer system within the Village to create an accurate, up-to-date diagram to be used to identify areas that experience drainage and flooding issues.	F, SS	MP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Medium/High
HM	Purchase and install an emergency backup generator with automatic transfer switch at the Cherry Street sanitary lift station to avoid bypass pumping and maintain operations during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	Yes	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 99
(Sheet 3 of 4)
Stockton 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 new pumps for the Cherry Street sanitary lift station to maximize pumping capacity and alleviate recurring flooding issues and sewer backups.	F, SS	MP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	Low/High
HM	Upgrade bypass lift station at the wastewater treatment facility to alleviate recurring flooding issues.	F, SS	SP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	Medium/High
HM	Clean out and repair the overflow lagoon at the wastewater treatment facility to increase capacity and alleviate recurring flooding issues and sewer backups.	F, SS	SP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Medium/High
LM	Purchase video reconnaissance equipment for use in identifying locations where sediment and debris have built up in storm and sanitary sewer lines leading to a reduction in intake/carrying capacity.	F, SS	MP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Low/Medium
HM	Purchase jetting and vacuuming equipment for use in cleaning sediment and debris from storm and sanitary sewer lines to increase intake/ carrying capacity.	F, SS	MP	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.)
EQ	Earthquake	T	Tornado

Type of Mitigation Activity:

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

Figure 99
(Sheet 4 of 4)
Stockton Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
LM	Make the most recent Flood Insurance Rate Maps available at the City Clerk's Office to assist the public in considering where to construct new buildings and make City Officials aware of these maps and issues related to construction in a floodplain.*	F	RA	Reduces	Medium	1, 6, 7	Yes	Yes	Village Board	1 year	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, 6, 7	Yes	Yes	Village Board	1 year	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 100
(Sheet 1 of 3)
Warren Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and install emergency backup generator for use at Village Hall to provide uninterrupted power during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	NA	Yes	Village Board	TBD	TBD	Low/High
HM	Purchase and install emergency backup generator for use at the Police Department to provide uninterrupted power during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	NA	Yes	Village Board	TBD	TBD	Low/High
HM	Purchase a portable emergency backup generator for use at a designated emergency/storm shelter to provide uninterrupted power during power outages	EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Low/High
HM	Purchase a portable emergency backup generator to provide power to the drinking water wells during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Low/High
HM	Purchase a portable emergency backup generator to provide power to the wastewater treatment plant and lift stations during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Low/High
HM	Purchase a portable emergency backup generator to provide power to pumps during power outages.	F, SS, SWS	MP	Eliminates	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Low/High
HM	Map and create a digital data set of the utilities within the Village for use with GIS.	EQ, F, MMH, SS, SWS, T	MP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Medium/Medium

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 100
(Sheet 2 of 3)
Warren 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	Refurbish/rehabilitate original water tower to provide additional capacity and serve as an auxiliary water supply during natural hazard events.	EQ, F, SS, SWS, T	MP	Reduces	Medium	2, 3, 5	NA	Yes	Village Board	TBD	TBD	High/Medium
HM	Purchase trailers with covers to transport portable pumps and protect them from the elements while in use.	F, SS	MP	Reduces	Small	2, 3, 5	NA	Yes	Village Board	TBD	TBD	Low/Medium
LM	Conduct sewer line reconnaissance study to identify locations where storm water infiltrates the lines.	F, SS	S	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	Medium/High
HM	Repair sewer line sections where storm water infiltration is occurring to prevent sewage backups.	F, SS	SP	Eliminates	Small	2, 3, 5	Yes	Yes	Village Board	TBD	75% Federal 25% Local	High/High
HM	Purchase and install storm siren.	SS, T	MP	Reduces	Medium	2	NA	NA	Village Board	TBD	TBD	Low/High
HM	Replace Bellevue Ave. bridge over small creek to increase flow capacity and alleviate drainage issues.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Village Board	TBD	TBD	High/Medium
HM	Purchase and install an automated all call telephone warning system (reverse 911) to notify residents/responder of emergency information.	EH, EQ, F, MMH, SS, SWS, T	MP	Reduces	Large	2	NA	NA	Village Board	TBD	TBD	High/High
HM	Rehabilitate Well #2.	F, SS, SWS	MP	Reduces	Medium	3, 5	NA	Yes	Village Board	TBD	TBD	High/High
LM	Prepare emergency operations plan for the Village.	EH, EQ, F, SS, SWS, T	S	Reduces	Large	2, 3, 4, 5, 8	Yes	Yes	Village Board	TBD	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 100
(Sheet 3 of 3)
Warren 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	Designate Village Hall, Community House, and Warren Ambulance Building as heating/cooling centers.	EH, SWS	MP	Reduces	Medium	2	NA	NA	Village Board	TBD	Village	Low/High
HM	Trim trees and remove dead material to minimize disruptions to electrical power and communications networks.	SS, SWS, T	MP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	TBD	Village	Low/High
HM	Replace existing storm basins and construct new basins to increase capacity and alleviate drainage and flooding issues.	F, SS	SP	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

5.0 RECOMMENDATIONS

5.0 RECOMMENDATIONS

The following recommendations came about as a result of the mitigation 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. Efforts to provide safe drinking water should focus on resolving problems which have resulted in Elizabeth, Galena and Scales Mound being placed on the Illinois Environmental Protection Agency's Restricted Status/Critical Review List. Placement on this list indicates an increased vulnerability for drinking water problems.

To reduce a water supply's vulnerability to man-made contaminants, maximum setback zones around drinking water wells should be adopted. These setback zones offer an additional level of protection for a community's water supply. Both Galena and Hanover have adopted maximum setbacks zones. It is recommended that the other participating municipalities consider adopting setback zones as well.

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 Issues. Stormwater management practices should be required for new subdivisions and other larger development projects, including commercial and industrial, to reduce flooding issues 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 Jo Daviess County residents indicates that the internet, television and radio should be utilized to disseminate information.

Hazardous Substances. Knowing where hazardous substances are generated, stored and handled can be useful to reduce the impacts that occur as a result of an accident. This All Hazards Mitigation Plan identified the larger facilities throughout the County that generate

hazardous substances along with the type and quantity found at each location. Fire departments, other first responders, and planners will find this information useful.

The types of chemicals transported through the County and the routes taken to move these chemicals would supplement information already gathered about stationary sources. Gathering this kind of information can be done through a Commodity Flow Study funded through the Illinois Emergency Management Agency.

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

JURISDICTION-SPECIFIC

Apple River
Upgrades to the wastewater treatment system will improve community resilience to drainage issues triggered by heavy rain and floods events.

East Dubuque
Mitigation projects that work to reduce East Dubuque's vulnerability to flooding should be given the highest priority among the mitigation projects listed for City.

Elizabeth
Insulating the water tower and correcting low water system pressure issues are improvements that the Village should implement to prevent all residents from experiencing problems related to fire protection, water quality and an adequate drinking water supply. Low water system pressure makes the system more susceptible to contaminants entering the drinking water.

Galena
A priority should be placed on constructing additional stormwater detention basins in the City to help combat drainage and flooding issues. This type of project provides a high benefit at a relatively low cost.

The Galena Territory
A high priority should be placed on projects that help to reduce the Territory's vulnerability to flooding. Such projects include construction of detention ponds, weirs and even small dams.

Hanover
Constructing a dike/levee around the Village's wastewater treatment lagoon will reduce its vulnerability to flooding and protect the health and safety of area residents.

Scales Mound
A high priority should be placed on repairing and replacing the aging storm sewer lines to reduce the magnitude and scope of the drainage issue experienced within the Village. A drainage study is also recommended to identify additional causes of drainage and flooding issues.

Warren

Community water supply improvements, such as refurbishing the original water tower, can help protect against severe drought while assuring that there is a sufficient supply of water available to fight fires.

Wastewater treatment system improvements should also receive attention to avoid higher maintenance costs in the future.

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 Jo Daviess County Emergency Management Agency (EMA). 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 Jo Daviess County EMA will be responsible for monitoring the status of the mitigation actions identified in the Plan and providing the Illinois Emergency Management Agency (IEMA) with an annual progress report. It will be the responsibility of each participating jurisdiction to provide a progress report on the status of their mitigation actions at each Subcommittee meeting.

Monitoring & Evaluating

- A Plan Maintenance Subcommittee will be formed to monitor and evaluate the Plan.
- The Plan will be monitored and evaluated on an ***annual basis***.
- Each participating jurisdiction will be responsible for providing an annual progress report on the status of their mitigation actions.
- New mitigation actions can be added by participating jurisdictions during the annual evaluation.

The Plan Maintenance Subcommittee will also evaluate the Plan on an annual basis to determine the effectiveness of the planning process and the implemented mitigation actions. In addition, the Subcommittee will decide whether any changes need to be made. As part of the evaluation of the planning process, the Subcommittee will review the goals to determine whether they are still relevant or if new goals need to be added; assess whether other natural hazards need to be addressed or included in the Plan and review any

new hazard data that may affect the Risk Assessment portion of the Plan. The Subcommittee will also evaluate whether other County departments should be invited to participate.

In terms of evaluating the effectiveness of the mitigation actions that have been implemented, the Subcommittee will assess whether a project is on time, in line with the budget and moving ahead as planned; whether the project achieved the goals outlined and had the intended result; and whether losses were avoided as a result of the project. In addition, each of the participating jurisdictions will be given an opportunity to add new mitigation actions to the Plan and modify or discontinue mitigation actions already identified. In some cases a project may need to be removed from the list of mitigation actions because of unforeseen problems with implementation.

6.1.2 Updating the Plan

The Plan must be updated within five years of the date the first participating jurisdiction adopts the Plan. (This date can be found in Section 7, Plan Adoption.) This ensures that all the participating jurisdictions will remain eligible to receive federal grant money to implement those mitigation actions identified in this Plan.

It will be the responsibility of the Plan Maintenance Subcommittee to update the Plan. The update will incorporate all of the information gathered and changes proposed at the previous annual monitoring and evaluation meetings. In addition, any government entity that did not take part in the original planning process that now wishes to participate may be added. It will be the responsibility of these entities to provide all of the information needed to be integrated into the Plan.

Updating

- The Plan Maintenance Subcommittee will be responsible for updating the Plan.
- The Plan ***must be updated within 5 years*** of the date the first participating jurisdiction adopts the Plan.
- Any government entities that did not take part in the original planning process but who now wish to participate may do so.
- Once the updated Plan has received FEMA/IEMA approval, each participating jurisdiction ***must re-adopt the Plan*** to remain eligible to receive federal grant money.

A public forum will be held to present the updated Plan to the public for review and comment. The comments received at the public forum will be reviewed and incorporated into the updated Plan. The Subcommittee will then present the updated Plan to the participating jurisdictions for approval.

Once the Subcommittee has received approval from all of the participating jurisdictions, it will submit the updated Plan to 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 Jo Daviess County EMA Office. Individuals will be encouraged to provide feedback and submit comments for the Plan update to the Jo Daviess County EMA Director.

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 101 identifies the participating jurisdictions and the date each formally adopted the Plan. Signed copies of the adoption resolutions are located in **Appendix N**.

Figure 101
Plan Adoption Dates

Participating Jurisdiction	Plan Adoption Date
Stockton, Village of	06/11/2013
East Dubuque, City of	06/17/2013
Elizabeth, City of	06/19/2013
Galena Territory Association	06/22/2013
Warren, Village of	06/24/2013
Hanover, Village of	06/26/2013
Apple River, Village of	07/01/2013
Jo Daviess County	07/09/2013
Galena, City of	08/12/2013
Scales Mound, Village of	08/26/2013
Apple Canyon Lake Association	09/21/2013

8.0 REFERENCES

8.0 REFERENCES

Provided below is a listing, by section, of the resources utilized to create this document.

1.0 INTRODUCTION

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3.0 RISK ASSESSMENT

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COUNTY RESOLUTION AUTHORIZING THE DEVELOPMENT OF THE PLAN

APPENDIX A

R2011-_6_____

JO DAVIESS COUNTY, ILLINOIS

A RESOLUTION

TO PURSUE THE PREPARATION OF A

NATURAL HAZARD MITIGATION PLAN

WHEREAS; Jo Daviess 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; Jo Daviess 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; Jo Daviess 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 JO DAVIESS COUNTY BOARD does Hereby pass this resolution to pursue the preparation of a Natural Hazard Mitigation Plan.

PASSED, APPROVED AND ADOPTED by the Jo Daviess County Board on this 11th day of April, 2011.

Ayes: 16 Nays: 0
Absent: 1 Abstained: 0

Marvin Schultz, Chairperson
Jo Daviess County Board

Attest: Jean Dimke
Jean Dimke
Jo Daviess County Clerk

PLANNING COMMITTEE MEETING ATTENDANCE SHEETS

APPENDIX B

Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

March 30, 2012

Name (Please Print)	Representing (Jurisdiction/Organization)
1. GREG MICHAUD	Johnson, Dapp & QUISENBERRY
2. Tim Maupin	Apple River Village
3. MARGARET STIEGEL	Apple River
4. Scott Allshouse	Red Cross
5. Robert A. Dittmar	Country Insurance
6. MATT CAWEM	Jo DAVIESS COUNTY ENVIRONMENTAL HEALTH
7. KEVIN TURNER	JDC SHERIFFS OFC
8. DAVE HACHMEISTER	"
9. DAN REIMER	JDC COUNTY ADMINISTRATOR
10. Jean Demke	JDC Clerk/Recorder
11. Craig Albaugh	City of Galena Facility Manager
12. Marvin Schultz	Jo Daviess County Board
13. BRYAN PURCHES	I.E.M.A.
14. Donna Berlage	Jo Daviess County Assessor
15. STEVE KLEEFFER	Jo DAVIESS COUNTY ENGINEER
16. Annette McClure	JoDaviess County Farm Bureau
17. Larry Acker	3F Forecasts for the NWS
18. [illegible]	Jo Daviess Co.

Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

March 30, 2012

Name (Please Print)	Representing (Jurisdiction/Organization)
1. CHARLES PEDERSEN	LEPC
2. [illegible]	LEPC / Jo Daviess County Health Dept.
3. Kay J. Semperly	Village of Hanover
4. Tom Large	Jo Daviess Co EMA/LEPC
5. COLIN FULRATH	JO DAVIESS CO EMA RETIRED
6. Scott Todd	Village of Elizabeth.
7. RON DATA	LEPC/MDED
8. NATE KLEFFEN	CITY OF GALENA
9. Steven A. Rice	Village of Stockton
10. GEOFF BARKLOW	CITY OF EAST DUBUQUE
11. Jim Rigdon	City of Galena
12. JOE KRATCHA	JO DAVIESS COUNTY GIS/IT DEPT
13. Wayne Raisbeck	Village of Warren
14. Cindy Brinker	Village of Warren (Clerk)
15. LUCAS BOUSQUIN	Village of Warren
16. Steve Silberman	LEPC
17. Andrea Bostwick	JDEA
18.	

Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

June 14, 2012

Name (Please Print)	Representing (Jurisdiction/Organization)
1. Ruth Foley	Village of Scales Mound
2. Steven A. Rice	Village of Stockton
3. Scott Allshouse	Red Cross
4. F. Jane Toepfer	Apple River, IL
5. RON DATA	LEPC
6. Mendelyn Wilson	GTA
7. STEVE KEFFER	Jo Daviess Co Highway
8. DAVE HACHMEISTER	JDC SHERIFF'S OFFICE
9. Mike Mosal	" "
10. Amy McGan	JDC Farm Bureau
11. Jim RICHARDSON	Adolf Canyon Lake
12. Jean Dinke	JDC Clerk/Recorder
13. Cindy Brinkman	V of Warren
14. Lucas Bourquin	V of Warren
15. Tim Troyel	
16. Eric Mandel	Telegraph Herald
17. Andrea Bostwick	JDQ
18. GREG MICHAUD	JDQ

Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

June 14, 2012

Name (Please Print)	Representing (Jurisdiction/Organization)
1. Chuck Pedersen	LEPC
2. Tom Lange	Jo Emergency Management
3. Scott Voot	Elizabeth
4. Don Scheible	Hanover IC
5. Tim Maupin	Apple River
6. Cathy Winslow	Galena - NWS
7. MARGARET SHIEFEL	APPLE RIVER
8. Larry Aden	Polo, IL. JF Forecasts NWS
9. [illegible]	Jo Daviess Co. BHZ
10. Bret Gempler	Jo Daviess Co. GIS
11. GEOFF BARKLOW	EAST DUBUQUE
12. DAVE ROLING	JoDaviess LEPC
13. DAN REIMER	JO DAVIESS CO.
14. STEVE SILBERMAN	LEPC JO DAVIESS
15. DAVID OLDENBURG	GALENA TERRITORY ASSOC. INC
16. MATT CALVERT	JO DAVIESS CO. HEALTH DEPT.
17. KEVIN TURNER	JoDaviess Co. SHERIFFS OFC.
18. Craig Albaugh	City of Galena

Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

August 30, 2012

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	MARC GABEL	APPLE CANYON LAKE
2.	ROW DATA	LEPC
3.	Randall Shaw	Eliz Fire
4.	Robert A. Dittmar	Country Financial INS.
5.	Donna Berlage	Jo Daviess Co CCAO
6.	JOE KRATCHA	JO DAVIESS COUNTY GIS/IT DEPT.
7.	Steven A. Rice	Village of Stockton
8.	Sandra Fox	254 W Maple, Stockton
9.	STEVE KEEFER	Jo Daviess County Hwy.
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Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

August 30, 2012

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Kay J. Tenperly	VILLAGE OF HANOVER
2.	Charles Reber	GALENA LEPC
3.	Steve Silberman	Hanover, Jo Daviess LEPC
4.	Wayne Raisbeck	Village of Warren
5.	COLLIN FULRATH	HANOVER FIRE / HAZMAT TEAM
6.	GEOFF BARKLOW	EAST DUBUQUE
7.	Marvin Schultz	JO DAVIESS COUNTY
8.	Ruth Foley	Village of Scales Mound
9.	Peggy [illegible]	Jo Daviess County Health Dept
10.	F. Jane Toepfer	Trustee - Apple River
11.	Scott Toot	Village of Elizabeth
12.	DAVE HACHMEISTER	J.D.C.S.O.
13.	NATE KIEFFER	CITY OF GALENA
14.	Kevin Cuyler	JDCSO
15.	Merrillam Wilson	GTA
16.	[illegible]	GTA
17.	ROBERT BAKER	STEPHENSON CO EMA
18.	Tom Large	Jo Daviess EMA

Appendix B

Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

August 30, 2012

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Cindy Brinker	Village of Warren
2.	Tim Maupin	Village of Apple River
3.	Larry Acker	NWS
4.	MATT CALVERT	JDCHD
5.	Cathy Winslow	NWS Coop Observer
6.	Craig Albaugh	City of Galena
7.	Annette McLane	JoDaviess Farm Bureau
8.	Linda Delvoux	Jo Daviess
9.	Scott Allshouse	Red Cross
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Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

November 8, 2012

Name (Please Print)	Representing (Jurisdiction/Organization)
1. KEVIN TURNER	JDCSO
2. GEOFF BARKLOW	E. DUBUQUE
3. Ruth Isley	S. Mound
4. Scott Foot	EC. Zabetz
5. Peggy Murray	Jo Daviess CHD
6. [illegible]	JDC ADMIN
7. [illegible]	JDC EMA
8. Cathy Winslow	NWS Coop Observer
9. DIANE WILLIAMS	GIS
10. Marvin Schultz	Jo Daviess County
11. Steven A. Rice	Stockton
12. Larry Acker	Polo, IL.
13. STEVE KEEFFER	GALENA, IL
14. Scott Allshouse	Red Cross
15. GREG MICHAUD	JDQ
16. Andrea Bostwick	JDQ
17.	
18.	

Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

November 8, 2012

Name (Please Print)	Representing (Jurisdiction/Organization)
1. [illegible]	Apple River
2. Tim Maupin	Apple River
3. [illegible] McPeak	Elizabeth
4. [illegible]	Country Ins
5 [illegible]	LEPC
6. [illegible]	Warren
7. Andy Brinker	Warren
8. [illegible]	Warren
9. [illegible]	ACL.
10. Ray Semperly	Hanover
11. Andy Lewis	City of Galena.
12. [illegible]	Apple River
13. D. HACHMEISTER	JDCSO
14. [illegible]	GTA
15. David Oldenburg	GTA
16. MATT CALVERT	JDCHD
17. Donna Berlage	Assessment Office
18.	

Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

March 7, 2013

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Tom Lange	Jo Daviess Co EMA
2.	COLIN FULRATH	JO DAVIESS CO. LEPC
3.	Doug Siegert	Rentech Nitrogen
4.	KEVIN W TURNER	JDC SHERIFFS OFC
5.	Cathy Winslow	Galena – NWS Coop Obs
6.	TED FORSBERG	
7.	Charles Peck	GALENA LEPC
8.	F. Tom Taylor	Apple River
9.	Daniel Atkinson	Jo Daviess County
10.	Duff Stewart	CITY OF GALENA
11.	Steve Silberman	self Hanover, IL
12.	DAVID O'Keefe	Galena, Terrytory
13.	Steven A. Rice	Village of Stockton
14.	JOHN CLEEK	MEDICAL RESERVE CORP - JO DAVIESS COUNTY
15.	Emily Lubelee	Gal Territory
16.	RJ Winkelmke	JTA JDC B.
17.	NANCY LEWIS	JDC Health Dept
18.	JOE KEATCHA	JDC GIS/IT

Appendix B

Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

March 7, 2013

Name (Please Print)	Representing (Jurisdiction/Organization)
1. GREG MICHALIO	Johnson, Depp & Quisenberry
2. Andrea Bostwick	Johnson Depp & Quisenberry
3. Larry Acker	NWS
4. Ron Data	LEPC
5. Scott Tuck	Village of Elizabeth
6. RON SMITH	JO DAVIESS COUNTY BOARD CHAIR
7. Linda Delvaux	Jo Daviess County
8. DAN GUZZLE	Rentech Nitrogen
9. GEOFF BARKLOW	CITY OF EAST DUBUQUE
10. Craig Albaugh	City of Galena
11. ANDY LEWIS	" " "
12. Wayne Raisbeck	Village of Warren
13. Cindy Brinker	" " "
14. Ruth Foley	Village of Scales Mound
15. Don Schaubb	Village of Hanover
16. DAVE HACHMEISTER	JDCSO
17. Mike Mosar	"
18. Robert A. Dittman	Country Insurance
DAVE HACHMEISTER	APPLE CANYON LAKE

Appendix B

Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

March 7, 2013

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	Randy Johgen	County Board
2.	[illegible]	Jo Daviess County Health Department
3.	STEVE KIEFFER	Jo Daviess County Highway
4.	Lucas Bourquin	Village of Warren
5.	Sam Bernstein	
6.	MATT CAUVEN	
7.	Braden Behlke	Jo Daviess County Board
8.		
9.		
10.		
11.		
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17.		
18.		

Attendance Sheet

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

March 7, 2013

	Name (Please Print)	Representing (Jurisdiction/Organization)
1.	SUSAN UPMANN	Apple River
2.	BILL BINGHAM	GALENA JD Co Dist'y
3.	Donna Berlage	JoDaviess County
4.		
5.		
6.		
7.		
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PLANNING COMMITTEE MEETING MINUTES

APPENDIX C

Meeting Minutes

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

March 30, 2012
Jo Daviess County Public Health Department
West U.S. 20, Galena
9:00 a.m.

Committee Members:

American Red Cross
Apple River, Village of
Country Financial Insurance Co.
East Dubuque, City of
Elizabeth, Village of
Galena, City of
Hanover, Village of
Jo Daviess Farm Bureau
Jo Daviess County Offices:
- Administrator
- Assessor
- Board
- Building & Zoning
- Clerk & Recorder
- Emergency Management
- GIS/IT
- Public Health
- Highways
- Sheriff

Illinois Emergency Management Agency
Jo Daviess County Local Emergency Planning Committee
Mitigation Planning Consultants
- Johnson, Depp & Quisenberry

Public Representatives:
- Colin Fulrath
- 3F Forecasters, Polo, IL

Stockton, Village of
Warren, Village of

Welcome and Introductions

Tom Lange, Chairman of the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee, welcomed attendees. He thanked attendees for agreeing to serve on this Committee and he asked the Committee members to introduce themselves by providing their name and who they represent.

Binders and handout materials were distributed to each member.

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

Greg Michaud, Johnson, Depp & Quisenberry, began the presentation by describing the difference between an emergency response plan and a hazard mitigation plan. Mitigation refers to projects and activities that can be conducted before a disaster occurs to reduce or eliminate damages.

In 2011, the United States experienced $52 billion in severe storm damages. As damages from severe storms and other natural hazards continue to rise, the Federal Emergency Management Agency (FEMA) is encouraging counties throughout the United States to prepare natural hazard

mitigation plans. Natural hazard refers to floods, tornadoes, severe summer storms (including thunderstorms, hail and lightning events), severe winter storms (including ice and snow storms), extreme heat, drought, earthquakes, and dam failures.

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.

The Jo Daviess County Multi-Jurisdictional Natural Hazards Mitigation Plan (the Plan) will help make Jo Daviess County and the participating municipalities eligible for storm damage money after a natural disaster in addition to providing grant money for projects to reduce or eliminate storm damage prior to a natural disaster. Another reason to prepare this Plan is to help improve cooperation between various offices. The Plan will include projects that the participating municipalities and county are considering. Including projects in the Plan is not an obligation or commitment. 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.

The Planning Process

Five meetings of the committee will be held to develop this Plan. Each meeting is anticipated to take approximately one hour. Greg provided the following overview of the planning process.

The purpose of the Committee meetings is to develop a Plan that can be adopted by the County and each participating municipality. Specific activities for the Committee meetings include:

Meeting/Activity	Purpose & Objectives
1st Committee Meeting	Mission, Goals & Objectives Critical Infrastructure Identification Planning Document Identification Committee Member Storm Survey Risk Assessment Subcommittee Formed
2nd Committee Meeting	Risk Assessment Discussion Prioritization (Categorization) Strategy & Subcommittee Formed Mitigation Introduction
3rd Committee Meeting	Vulnerability Assessment Mitigation Projects/Activities
4th Committee Meeting	Mitigation Projects/Activities Public Forum Discussion
Public Forum	Annual Update & Five Year Renewal Commendation Ceremony Public Comments & Questions Start of Two Week Public Comment Period

Natural hazards that should be evaluated during development of the Jo Daviess County Plan include floods, severe "summer" storms, tornados, severe snow and ice storms, drought, extreme heat, and earthquakes. Other hazards may be added pending the results of the Risk Assessment. In response to a question, it was noted that man-made hazards can also be included. A brief discussion of the Committee indicates that dam failures, hazmat incidents, and chemical use/ transportation should be included in the Plan, but not nuclear power facility incidents.

Andrea Bostwick, JDQ, is a certified risk assessor who will work with Greg to prepare the Risk Assessment. Critical facilities for each participating municipality and the County must be identified. Andrea distributed the Critical Facilities form for each municipality and the County to be completed and returned no later than the next Committee meeting.

Andrea also distributed the List of Existing Planning Documents form. This list includes Land Use Plans, Flood Ordinances, and related documents. If comprehensive municipal plans have been developed, copies these of these documents should be sent to Andrea or Greg so that these documents can be evaluated and described in the Plan.

After the fifth Committee meeting, the Plan will be presented to IEMA/FEMA for their approval. The County and each participating municipality must adopt the approved Plan to become eligible for funding to implement the mitigation projects identified in the Plan.

Mission Statement & Goals

A draft of a proposed mission statement and goals was distributed. 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. Among the events described by Committee members were the following:

- A record 21.16 inch rainfall in East Dubuque and Galena caused major flooding damaging generators, the Public Safety Building in Galena, and washing out roads on the bluff, among other damages on July 27, 2011. Two deaths occurred in Jo Daviess County and heavy rain amounts extended into the adjacent counties.
- A severe snow storm on February 1, 2011 dropped 14 inches of snow causing closure of US 20 and IL 78 along with numerous county and township roads throughout the county.
- On July 24, 2010, hail damages occurred from East Dubuque, Menominee to Stockton and caused crop and roof damage along with prolonged power outages.
- Hail storm on August 19, 1995 caused damage in East Dubuque.
- Severe thunderstorm in May, 1999, that resulted in 5 inches of rain in less than one hour in East Dubuque. Concrete pipes were carried by floodwaters away from areas where road construction was occurring.

- Countywide snow storm on April 9, 1973 resulted in power loss for two to three days for many persons and also caused some roofs to collapse.
- On July 27, 1993 flooding occurred in East Dubuque.
- Loss of power occurred in Hanover in 1973 due to a tornado. Some residents were without power for a month.

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. He pointed out that a mayor who wants to participate may not be able to attend because of other obligations; however, a substitute representative can be designated to participate in the Committee meetings.

What Happens Next?

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

Committee members were asked to complete a survey contained in their meeting materials before they left. Paper copies of a citizen survey and a fact sheet titled "Frequently Asked Questions," are available for participating municipalities to make available to the public from their offices. The Committee also decided to make this survey available on the county website.

The second meeting of the Committee was set for June 14th at 1 p.m. at the County Public Health Department.

Public Comment

Larry Acker, 4 F Forecasting, in Polo, Illinois brought recent weather records that he offered for use in developing the Plan.

With no further comments or questions, Tom Lange adjourned the meeting.

Meeting Minutes

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

June 14, 2012
Jo Daviess County Public Health Department
West U.S. 20, Galena
1:00 p.m.

Committee Members:

Apple Canyon Lake
American Red Cross
Apple River, Village of
East Dubuque, City of
Elizabeth, Village of
Galena, City of
Galena Territory Association
Hanover, Village of
Jo Daviess Farm Bureau
Jo Daviess County Government
- Administrator
- Building & Zoning
- Clerk/Recorder
- Emergency Management
- GIS/IT
- Public Health
- Highways
- Sheriff

Local Emergency Planning Committee
Mitigation Planning Consultants
- Johnson, Depp & Quisenberry

Scales Mound, Village of
Stockton, Village of
Warren, Village of
General Public
- 3F Forecasters, Polo, IL
- NWS Coop Observer, Galena
- Telegraph Herald

Welcome and Introductions

Committee Chairman Tom Lange welcomed members to the second committee meeting.

Risk Assessment

Greg Michaud began the presentation by noting that the information discussed at this meeting will provide participants with solid documentation about the frequency and severity of natural hazards in Jo Daviess County. Over $14.2 million in damages have resulted from 297 severe storms and natural hazards verified in Jo Daviess County since 1950. Jo Daviess County has had eleven Federal disaster declarations since 1965, the majority due to flooding.

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.

<u>Severe Storms</u>

Severe storms are the most frequently occurring natural hazard in Jo Daviess County with 184 verified events. Over $6.5 million in damages has resulted from severe thunderstorms with

damaging winds, hail, lightning and heavy rain. At least 139 injuries and two fatalities can be attributed to severe storms.

Severe Winter Storms

Seventy-Two (72) events involving excessive snow, ice, or extreme cold have been verified since 1995. At least 128 injuries and 3 fatalities can be attributed to severe winter storms.

Floods

Floods have caused the most damage in Jo Daviess County despite not being among the top two most frequently occurring natural hazards. Floods contributed to ten of the eleven Federal disaster declarations. At least 38 floods have been documented since 1965 causing at least $11.4 million in property and crop ($180,000) damage, and two fatalities.

Tornadoes

Since 1950, nine tornadoes have been verified in Jo Daviess County. In comparison, Illinois has averaged 36 tornadoes per year. Tornadoes have caused at least $525,300 in damages in Jo Daviess County. No injuries or fatalities have been verified as a result of tornadoes.

The average tornado in Jo Daviess County is approximately 156 yards wide and nearly 3 miles long. There have been two F2, two F1 and five F and FO tornadoes. The longest tornado in the county was approximately seven miles long which began near the Mississippi River southwest of Galena and moved northwest near the Wisconsin border.

Extreme Heat

Two extreme heat events have been reported, one in 1997 and the other in 1999. Road buckling and crop damage often occur, but crop damage is usually not measurable unless drought occurs.

Drought

Three major droughts have occurred during the last three decades—1983, 1988 and 2005. Following each drought, crop yield reductions were substantial.

Year	Corn	Soybeans
1983	- 34%	00%
1988	- 56%	- 36%
2005	- 07%	00%

Earthquakes

Jo Daviess County lies in the immediate vicinity of three faults but none of these are active. In the last two decades, four earthquakes were felt in northern Illinois, but no effects were noticed in Jo Daviess County.

Since this Committee decided to include man-made hazards in their mitigation plan, a summary of these hazards was provided next.

Dams

Seven permitted dams exist in Jo Daviess County. Two of these dams are considered Class I dams, which means that a breach of these dams could impact homes and critical infrastructure. While no breach or other problems have been verified at any of the seven dams, they are all nearing an age when problems are more likely to occur.

Generation, Transportation, and Remediation of Hazardous Substances

Five generators were identified: one in East Dubuque, one Galena, one in Hanover, and two in Stockton. Currently, there are no legal actions against any of these generators relating to their generation or handling of hazardous substances.

During the past five years, only two minor incidents involving hazardous substances occurred in the county. Neither accident resulted in substantive harm to public health or the environment. Both incidents involved roadway transit.

Rail transit was reviewed for a ten year period. No rail accidents occurred involving hazardous substances.

Five pipelines carrying petroleum or natural gas cross the County. No releases have been verified at any of these pipelines.

Remediation of hazardous substances and petroleum in Illinois is primarily conducted through: Superfund (for the sites posing the greatest danger to public health or the environment), the Site Remediation Program (SRP), and the Leaking Underground Storage Tank Program (LUST). There are no Superfund or SRP sites in the County. An emergency action was conducted last year at the Bautsch-Gray mine near Galena.

Eighty-five LUST actions have occurred in the County. Remediation has been completed or is nearly complete at all but four of these sites. None of the remaining four sites are classified as "high priority."

HazMat Incidents

A HazMat incident refers to an emergency response to either a facility or site, such as a roadway release, where hazardous substances were released. Thirty-seven incidents have been documented between 2007 and 2011. This number of incidents is relatively low for a rural Illinois county. Nearly half of these incidents occurred at one facility. None of these releases resulted in injuries, fatalities, or severe damage to the environment.

Waste Disposal

Northwestern Illinois is served by four of the larger landfills in Illinois. There are no solid (household) or hazardous waste landfills in the County.

Terrorism

While isolated incidents classified as domestic acts of terrorism have occurred in rural Illinois, no incidents have been verified in the County.

Greg commended participants by observing that this is the first committee who submitted all of their "***Critical Facilities***" and ***"List of Existing Planning Documents"*** before the second planning meeting.

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 facilities 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 Jo Daviess County. No additions were proposed.

Mitigation

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

He referred everyone to the examples of mitigation projects for the County and municipalities included in the handout material. He cautioned attendees that if they are in doubt as to whether a project should be included on their list, it is usually best to include the project. Only projects listed in the Plan will be eligible for IEMA/FEMA funding.

While ***structural projects*** typically are the most frequently mentioned category of mitigation projects, other categories should be considered. The following provides a brief description of other categories.

Public information/education activities are useful to alert people about how to protect themselves and their property.

Studies may be needed to identify the cause of the problem. Apple River representatives identified culvert and drainage problems in their municipality. Drainage problems are fairly common, but the cause is not always readily apparent. Sometimes removing sediment and debris from existing culverts will be sufficient to correct a drainage problem. In other cases, regular maintenance may not be enough. Changes in nearby land use may necessitate the need for larger culverts or construction of retention basins to handle excess storm water runoff. Since 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 particular situation.

Regulatory measures such as the use of zoning, permits and codes to control development in susceptible areas and to provide the kind of buildings that will be more protective of residents should be considered.

When assembling lists of mitigation projects and activities, the focus should be on ***long-term permanent solutions and studies.*** In response to a question from the Highway Department, Greg explained projects tied solely to normal maintenance—in contrast to projects aimed at mitigating natural hazards—would not be eligible for IEMA/FEMA funding. In response to a question about whether funding could be sought for projects already completed, Greg said that IEMA/FEMA does not reimburse for completed projects.

Listing projects does not obligate any jurisdiction. Stimulating discussion about mitigation and developing a plan that can help reduce the damages caused by these hazards is the ultimate goal.

What Happens Next?

Committee members were asked to consider how much time they might need to assemble their lists of mitigation projects and activities before choosing a date for their next Committee meeting. The Committee chose Thursday, August 30, for their next meeting. The location for the next meeting will be the Community Center in Elizabeth.

Public Comment

No additional questions or comments were raised and the meeting was adjourned.

Meeting Minutes

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

August 30, 2012
Elizabeth Community Center
U.S. Route 20, Elizabeth
1:00 p.m.

Committee Members:

American Red Cross
Apple Canyon Lake
Apple River, Village of
Country Financial
East Dubuque, City of
Elizabeth, Village of
Galena, City of
Galena Territory Association Inc.
Hanover, Village of
Jo Daviess Farm Bureau
Jo Daviess County Government
- Assessor
- Board
- Building & Zoning
- Emergency Management Agency
- GIS/IT
- Health Dept.
- Highway Dept.
- Sheriff

Local Emergency Planning Committee
Mitigation Planning Consultants
- Johnson, Depp & Quisenberry

Public Representatives
- Colin Fulrath
- 3 F Forecasters

Scales Mound, Village of
Stockton, Village of
Warren, Village of
General Public
- NWS Coop Observer, Galena
- Stephenson County EMA
- Elizabeth Resident
- Stockton Resident

Welcome and Introductions

Tom Lange, Chairman of the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee, welcomed attendees. Robert Baker, Stephenson County EMA, was a special guest at today's meeting as part of an invitation to adjacent counties. Materials were distributed to each member.

Review of Meeting Minutes

For the sake of expediting the meeting, Committee members will provide any changes to Andrea Bostwick or Greg Michaud before leaving.

Critical Facilities and the Vulnerability Assessment

Greg provided a brief recap to help re-orient Committee members as to what has been accomplished and what will be covered at this meeting. He noted that the Committee has accomplished all of its objectives up to this point and are ahead of schedule.

Greg asked the Committee to provide information on damages to critical facilities through the form, "**Damages To Critical Facilities**," which was distributed at the previous Committee meeting.

To illustrate the differences in vulnerability across Jo Daviess County, potential damages to each participating municipality caused by floods and tornadoes were presented. Flood damage estimates were based on riverine flooding. Using tax assessment values for residential structures from 2011, damages to include structures and contents were calculated. Potential dollar losses caused by riverine flooding to vulnerable residences within the participating municipalities would be expected to range from approximately $2.7 million in Galena to $8.3 million in East Dubuque.

Flash flooding is harder to calculate, but it has impacted every municipality in Jo Daviess County. To illustrate the wider range of damages caused by flash flooding in the county and to compare these damages to riverine flooding, flash flooding caused approximately $7.3 million in damages in July 2011, but in July, 2010 resulted in approximately $1.7 million in damages.

While tornadoes occur less frequently than flooding in Jo Daviess County, the dollar damages can be larger. Damages were based on an "average" tornado for Jo Daviess County by taking tornado impact information for the past 60 years. Housing densities were calculated from U.S. Census Bureau information for each of the participating jurisdictions.

Potential dollar losses for residences and contents are among the municipalities are estimated to range between $3.9 million to approximately $20 million. Potential dollar losses caused by an average tornado in Jo Daviess County would be expected to range between $200,000 in the lighter populated townships to nearly $500,000 in the heavier populated townships.

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.

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.

A tornado shelter was used as an example by Andrea to show how a typical project is prioritized and entered into the Plan on a Mitigation Table. Since the Plum River Fault Zone is located in adjacent Carroll County, she used an example for a shelter that would be built to be less vulnerable to seismic activity. 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 categorized under the heading of the participating jurisdiction in the Plan. For example, readers interested in reading the mitigation projects for Apple River will be able to view all of the Apple River mitigation projects under the heading of Apple River Hazard Mitigation Action.

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.

What Happens Next?

Meeting Schedule: Committee members were asked how much time they might need to assemble their lists of mitigation projects so that the next Committee meeting could be scheduled after these lists are received. After a short discussion, the Committee agreed to schedule the next meeting on:

Thursday, November 8th
Elizabeth Community Center
1 p.m.

Public Comment

With no additional questions or comments, Chairman Lange adjourned the meeting.

Meeting Minutes

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee Meeting

November 8, 2012
Elizabeth Community Center
U.S. Route 20, Elizabeth
1:00 p.m.

Committee Members

American Red Cross
Apple Canyon Lake
Apple River, Village of
Country Financial
East Dubuque, City of
Elizabeth, Village of
Galena, City of
The Galena Territory Association
Hanover, Village of
Jo Daviess Farm Bureau
Jo Daviess County Government
- Administrato
- Assessor
- Board
- Emergency Management
- GIS/IT
- Highways
- Public Health Dept.
- Sheriff

Local Emergency Planning Committee
Mitigation Planning Consultants
- Johnson, Depp & Quisenberry

Public Representatives
- 3 F Forecasters

Scales Mound, Village of
Stockton, Village of
Warren, Village of
General Public
- NWS Coop Observer, Galena

Welcome and Introductions

Tom Lange welcomed attendees before turning the meeting over to Greg Michaud and Andrea Bostwick.

Materials were distributed to each member at the registration table.

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. Approximately 195 projects and activities were described and prioritized in the Action Tables. He noted that the mitigation projects reflected thoughtful input from everyone involved.

Committee members were provided approximately 20 minutes during the meeting to review the Action Tables containing the descriptions of mitigation projects and activities. Andrea and Greg moved throughout the room to discuss questions with each member.

This review and discussion prompted several jurisdictions to inquire about potential additions to their lists. Greg noted that only mitigation, not emergency response actions were included. He added that any additions or clarifications should be submitted to Andrea by the beginning of December.

Risk/Vulnerability Assessment

An analysis of potential residential damages to each participating jurisdiction that might be caused by a tornado was provided for the Committee's review at the previous committee meeting. Greg noted that while the dollar estimates may seem at first glance to be high, they are consistent with damage claims seen by insurance experts as well as with tornado damages experienced in rural counties.

A similar analysis for flood damage estimates will also be included in the Plan. Greg asked the Committee if they had any questions about these analyses.

Plan Maintenance and Update

Andrea detailed the Plan maintenance and update commitments that are described in the Plan.

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.

Andrea noted that Tom Lange will be responsible for conducting annual update meetings consisting of a subset of the Mitigation Committee. Participants will be asked if they want to submit new mitigation projects. They will also be asked about the status of each project listed in the Plan. 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.

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.

What Happens Next?

The final Committee meeting will be conducted in the early evening as an open-house style public forum where the draft Plan will be presented for review and comment. Contrary to conventional public meetings, at an open-house style public forum the public can come and go at their convenience.

The Committee agreed to schedule the public forum on:

> **Thursday, February 21**
> **4 p.m. to 6 p.m.**
> **Location to be determined in Galena (Committee members will receive an e-mail next week confirming the location.)**

After this public forum, there are three important milestones:

1. **Submitting the Plan. A two week public comment period will follow the Public Forum.** The Plan will be submitted to IEMA and FEMA for their approval;
2. **Adopting the Approved Plan.** After the Plan is approved by IEMA and FEMA, each participating jurisdiction will need to approve the Plan through a resolution.
3. **Submitting the adoption resolutions to JDQ.** Each participating jurisdiction should submit their adoption resolution to Andrea. She will attach the resolutions to the "final" Plan so that each participating jurisdiction will be eligible for state/federal funding.

A summary of available grants will be prepared and sent to Tom Lange to help everyone know which grants to pursue. Tom announced that he will distribute this summary to each Committee member.

Photos of snow events and drought are still needed. Photos can be submitted to Andrea or Greg electronically.

Public Comment

No additional questions or comments arose so Chairman Tom Lange adjourned the meeting.

CITIZEN QUESTIONNAIRE AND NEWS RELEASE

APPENDIX D

QUESTIONNAIRE

Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan

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

1. Please indicate where you live in Jo Daviess County:

_____ Apple River
_____ Blanding
_____ Council Hill
_____ Derinda Center
_____ East Dubuque
_____ Elizabeth
_____ Galena
_____ Hanover
_____ Massbach
_____ Menominee
_____ Nora
_____ Pleasant Valley
_____ Plum River
_____ Scales Mound
_____ Schapville
_____ Stockton
_____ Warren
_____ Woodbine
_____ Unincorporated Jo Daviess County

_____ Other (please specify): _____

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

Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee

OFFICE OF THE SHERIFF
JO DAVIESS COUNTY

KEVIN W. TURNER
Sheriff

David P. Hachmeister
Chief Deputy

FOR IMMEDIATE RELEASE

Contact: Tom Lange
815/942-6941

Residents Input on Hazard Mitigation Plan

GALENA, IL (April 16, 2012)—Residents of Jo Daviess County can provide information on how severe storms have affected their life and property. This information will be added to the Jo Daviess County Natural Hazard Mitigation Plan. This Plan will identify the impact of storms, other natural hazards including some man-made hazards throughout the county.

"Since this Plan will contain lists of potential projects to reduce damages caused by storms, decision-makers at the county and municipal level can use information provided by residents to help make informed decisions. The planning process to develop this plan is designed to solicit public input before the plan is completed. After the plan is finished, it will be submitted to the state and federal emergency management agencies for approval," said Tom Lange, Jo Daviess County Interim Emergency Services and Disaster Coordinator.

The fastest way to provide this information is through the county website (www.jodaviess.org) by following these steps:

Step One. On the county website homepage, an image of a tornado appears in the upper right corner of the user's screen. Clicking on this image will take residents to a web page titled ***"Jo Daviess County Multi-Jurisdictional Mitigation Plan."***

Step Two: Clicking on ***"Complete the Online Questionnaire"*** allows residents to submit responses.

Step Three: Respond to questions. Use the drop down boxes to help answer some of these questions.

Paper copies of this questionnaire are also available through each participating municipality or the County ESDA office in Galena. Apple River, East Dubuque, Elizabeth, Galena, Hanover, Stockton and Warren are participating municipalities.

"Residents who live in unincorporated Jo Daviess County and municipalities who are not participating are also encouraged to provide input," added Lange.

Completing this survey is one way that residents can participate in the development of the Natural Hazard Mitigation Plan. Other ways to participate include:

- Talk to members of the Hazard Mitigation Committee (see attached list)
- Attend a public forum on the draft plan that will be scheduled later this year
- Provide comment during the two week public comment period that will immediately follow the public forum
- Attend working sessions of the Hazard Mitigation Committee.

"This mitigation plan will serve as a roadmap to help municipalities and the county better protect all of us from the damages caused by severe storms and other natural hazards," concluded Lange.

END

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OFFICE OF THE SHERIFF
JO DAVIESS COUNTY

KEVIN W. TURNER
Sheriff

David P. Hachmeister
Chief Deputy

Committee Members
Natural Hazard Mitigation Committee
Jo Daviess County

AGRICULTURE

Jo Daviess County Farm Bureau
Annette McLain

American Red Cross
Scott Allshouse
Northwest Illinois Red Cross

JO DAVIESS COUNTY

Administrator
Daniel Reimer

Assessor
Donna Berlage

Board
Marvin Schultz

Building & Zoning
Linda Delvaux

County Clerk & Recorder
Jean Dimke

EMA Coordinator
Tom Lange

Geographic Information System
Joe Kratcha

Health Department
Peg Murphy
Matt Calvert, Environmental Health

Highway Department & Floodplain Management
Steve Keeffer

Sheriff's Office
Sheriff Kevin Turner
Chief Deputy Dave Hachmeister

Local Emergency Planning Committee
Chuck Pedersen
Ron Data
Steve Silbermen

IL Central Management Services
Diane Hoots

IL Emergency Management Agency
Sue Coers, Regional Manager
Ron Davis, State Hazard Mitigation Officer
Bryan Purchis, Mitigation Section

INSURANCE

Country Companies
Bob Dittmar

Apple River
Tim Maupin
Margaret Stiefel

Elizabeth
Scott Toot

Galena
Mark Moran
Craig Albaugh
Nate Kieffer
Jim Rigdon

Hanover
Don Schiable
Kay Temperly

East Dubuque
Geoff Barklow

Stockton
Steve Rice

Warren
Luke Bourquin
Wayne Raisbach

Local Weather/Crop Reporter
Leroy Getz

Area Weather Recorder
Larry Acker

General Public
Colin Fulrath

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FREQUENTLY ASKED QUESTIONS FACT SHEET

APPENDIX E

Frequently Asked Questions

Jo Daviess County Multi-Jurisdictional
All Hazards Mitigation Planning Committee

1) What is the Jo Daviess County All Hazard Mitigation Plan?
The Jo Daviess County All Hazard Mitigation Plan evaluates damage to life and property from storms and other natural hazards, including man-made hazards, in this county and identifies projects and activities that can reduce these damages. The Plan is considered to be multi-jurisdictional because it includes municipalities and institutions who want to participate.

2) What is hazard mitigation?
Hazard mitigation is any action taken to reduce or eliminate long-term risk to life and property from a natural or man-made hazard.

3) Why is this Plan being developed?
The Plan fulfills federal planning requirements of Section 104 of the Disaster Mitigation Act of 2000 and the Stafford Act. Three key benefits this plan will provide Jo Daviess County are:

a) Funding following declared disasters.
b) Funding for mitigation projects and activities before disasters occur.
c) Increased awareness about natural and man-made hazards and closer cooperation among the various organizations and political jurisdictions involved with emergency planning and response.

4) Who is developing this Plan?
The Jo Daviess County All Hazards Mitigation Planning Committee is preparing the Plan with assistance from technical experts in emergency planning, environmental matters, and infrastructure. The Committee includes members from agriculture, business and economic development, emergency services, municipal, county and state government, health care, insurance, law enforcement, and institutions such as the American Red Cross.

5) How can I participate?
You are invited to attend public meetings of the Jo Daviess County All Hazards Mitigation Planning Committee. In addition you are encouraged to provide photographs, other documentation, and anecdotal information about damages you experienced with natural and man-made hazards in Jo Daviess County. Surveys will be available at participating municipalities and through Jo Daviess County to help gather specific information from residents. All of this information will be used to draft the Plan. The draft Plan will be presented in a public forum for further public input.

More information can be obtained by contacting:

Tom Lange, Interim Emergency Management Director
Jo Daviess County Emergency Management Agency
330 N. Bench St.
Galena, Illinois 61036
Telephone: (815) 777-2141

MEDIA OUTLETS SERVING JO DAVIESS COUNTY AND NEWS ARTICLES

APPENDIX F

Media Outlets Serving Jo Daviess County

Print Media

The Apple Core
Dubuque Telegraph Herald
East Dubuque Register
Freeport Focus
Freeport Journal Standard
Galena Gazette
The Gazette
Monroe Times
Rockford Register Star
Sauk Valley Newspapers
The Scoop Today
Village Voices
Warren Flash

Radio Stations

KCLN (1390 AM)
KDTH (1370 AM)
WDBQ (1490 AM)
WEKZ (1260 AM)
WFRL (1570 AM)
WROK (1440 AM)
KLYV (105.3 FM)
KXGE (102.3 FM)
WCCI (100.3 FM)
WFPS (92.1 FM)
WJOD (103.3 FM)

Television Stations

KCRG (ABC Affiliate – Cedar Rapids, IA)
KGAN (CBS Affiliate – Cedar Rapids, IA)
KWWL (NBC Affiliate – Cedar Rapids, IA)
WTVO (ABC Affiliate – Rockford, IL)
WIFR (CBS Affiliate – Rockford, IL)
WREX (NBC Affiliate – Rockford, IL)
WQAD (ABC Affiliate – Quad Cities, IL/IA)
WHBF (CBS Affiliate – Quad Cities, IL/IA)
KWQC (NBC Affiliate – Quad Cities, IL/IA)

JOURNALSTANDARD.com

The Freeport Journal Standard
March 27, 2012

Jo Daviess County to create hazard plan

Document will address flood damage and more

By Travis Morse
The Journal-Standard
Posted Mar 27, 2012 @ 09:11 PM

Business News

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Bank Fees Up Again, Despite Government Intervention

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Business roundtable in Freeport fuels discussion - Freeport, IL - The Journal-Standard

From the Web

Dad Accused of Beating Daughter's 'Molester' to Death Is No Hero (CafeMom)

New CBO numbers on Obamacare (Bankrate.com)

Father Kills Man Sexually Abusing his 4-Year-Old Daughter (itsybitsysteps)

Sponsored content What's this?

Freeport, Ill. — Thanks to a major federal grant, Jo Daviess County will soon develop an "All Hazard Mitigation Plan" that should go a long way toward helping reduce the damage caused by floods, snow storms, and other natural disasters, said County Sheriff Kevin Turner.

"It's going to help us identify the hazards throughout the county," Turner said, adding that flooding in particular has been a "huge" issue in Jo Daviess County. "We've had two 500-year floods in the last two years."

The county-wide hazard plan will identify activities and projects to reduce damage caused by natural hazards, states a Jo Daviess County Sheriff's Office news release. The effort to create this document is being funded by a $70,000 grant from the Federal Emergency Management Agency (FEMA). Jo Daviess County emergency officials are also working with the Illinois EMA on this project, Turner said.

Organizers say the effort is still in the preliminary stages, so it's not yet clear what damage prevention projects will be included in the plan.

All Jo Daviess County municipalities have been invited to participate in the planning process. The communities of Apple River, East Dubuque, Elizabeth, Galena, Hanover, Scales Mound, Stockton, and Warren have already committed to take part, and there is still time for other municipalities to join. According to the news release, the hazard plan will be a "living" document, meaning that it will be updated annually so that additional projects can be added. Even so, municipalities that do not participate during the plan's formation will have to wait five years before they can take part again, the release states.

"Developing this plan will help us be better prepared before storms hit," said Tom Lange, Jo Daviess County's emergency services and disaster coordinator, in the release. "The focus of this plan is to reduce the harm to property and residents. ... The county and each participating municipality who adopts the plan will become eligible for federal funds for projects that might not otherwise be constructed."

Jo Daviess County currently has an emergency response plan, and the proposed mitigation plan will complement the response plan, Lange said in the release.

Committee Formed

To create the plan, a Jo Daviess County Hazard Mitigation Planning Committee has been formed that includes as its members representatives from participating municipalities, technical partners, and other stakeholders. The first meeting of this group will be Friday morning and it will be open to committee members and other local officials involved in the project, Turner said.

Future meetings of the committee will be open to the public since these will be "working sessions" designed to gather and discuss information to be used in the plan's creation, the news release states.

A firm deadline has not yet been set for completing the plan. For more information on this project, contact Tom Lange at (815) 777-2141.

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Appendix F

The Galena Gazzette
March 28, 2012

County begins work on natural disaster plan

JO DAVIESS COUNTY–Jo Daviess County will begin preparing a county wide plan that will identify activities and projects to reduce the damage caused by natural hazards such as floods, severe thunderstorms, snowstorms and ice storms, among other natural and man-made hazards. The plan is called an "All Hazard Mitigation Plan" and will be funded through a grant from the Federal Emergency Management Agency (FEMA).

Jo Daviess County is vulnerable to severe storms and flooding. Since 1965, Jo Daviess County has had 13 federal-declared disasters with flooding occurring during nine of these disasters. These disasters occurred in 1965, twice in 1969, 1973, 1974, 1990, 1993, 1999, 2001, 2005, 2008, 2010 and 2011.

All Jo Daviess County municipalities are welcome to participate in this planning process. Apple River, East Dubuque, Elizabeth, Galena, Hanover, Scales Mound, Stockton and Warren have already committed to participate. There is still time for other municipalities to join the process.

This is a "living plan" which will be updated annually, allowing participants to add projects to the plan; however, municipalities that do not participate during the formation of the plan must wait five years before having the opportunity to participate again.

"Developing this plan will help us be better prepared before storms hit," said Tom Lange, Jo Daviess County Emergency Services & Disaster coordinator. "The focus of this plan is to reduce the harm to property and residents. We have an emergency response plan. The mitigation plan we want to prepare is aimed at prevention so it will complement our response plan. The county and each participating municipality who adopts the plan will become eligible for federal funds for projects that might not otherwise be constructed."

A Jo Daviess County Hazard Mitigation Planning Committee has been created with representatives from each participating municipality, along with technical partners and other stakeholders. Meetings of this committee will be conducted as working sessions so that any interested resident can attend and ask questions. The purpose of these working sessions is to gather and discuss information that will be used to prepare this plan.

The first meeting of this committee will be held on Friday, March 30 at the Jo Daviess County Public Health Department on U.S. 20 West in Galena beginning at 9 a.m.

The committee will meet periodically through the next several months to develop a draft plan. Jo Daviess County residents are welcome to attend every meeting.

"Typically plans are developed and then the public is asked to comment. With this Hazard Mitigation Plan, input from the public will be gathered before and during its development. We will also hold a public forum after the plan is drafted, but our focus will be to gather input before the draft is completed," said Lange.

With questions, call Lange at 815-777-2141.

The Telegraph Herald
March 28, 2012

Jo Daviess County prepares for the worst

Hazard mitigation plan will seek ways to reduce the impact of disasters.

BY JIM WINTER
TH assistant city editor
jwinter@wcinet.com

GALENA, Ill. — Jo Daviess County and its municipalities are coming together to prepare a countywide hazard mitigation plan.

The plan is meant to identify projects and activities to reduce damages caused by natural hazards. It will also allow municipalities access to funds that will allow for mitigation work, assure the county and participating municipalities will get funds when a federal disaster is declared, and possibly lead to more collaboration between municipalities.

"Developing this plan will help us be better prepared when storms hit," said Tom Lange, coordinator for the Jo Daviess County Emergency Management Agency. "The focus of this plan is to reduce harm to property and residents."

The county already has an emergency response plan. The mitigation plan is more about prevention. Since 1965, the county has had 13 federally declared disasters with flooding occurring during nine of those disasters.

One of the communities hardest hit during those disasters, especially last July when record rainfall and flash flooding hit the tri-states, is East Dubuque. The city, along with Apple River, Elizabeth, Galena, Hanover, Scales Mound, Stockton and Warren, have committed to participate in creation of the plan.

"The city would like to do more mitigation, buying out of flooded homes, but to do that we need funds, and this is one way to have access to those funds," said Geoff Barklow, East Dubuque's city manager.

Greg Michaud, manager of the Environmental Services Department at Johnson, Depp and Quisenberry, is leading the formation of the plan.

"By going through this process of having a plan, the county and all participating municipalities will be guaranteed to get all the federal money they have coming to them when there's a federal disaster declared," Michaud said.

Michaud said a third benefit of a mitigation plan has nothing to do with money.

"When these municipalities start to see they may have the same problems, there is more of a spirit of collaboration," Michaud said. "It does nurture collaboration at the county and city level."

The county has created a Hazard Mitigation Planning Committee that will meet five times over the next 12 to 14 months. Representatives from each participating municipality, as well as technical partners and other stakeholders, will be at the working sessions, where residents can attend and ask questions.

After the planning meetings, a public forum will be held before the plan is submitted to the state and federal emergency management agencies for approval.

"This is a historic first for the county," Michaud said. "This will be a road map for future generations to reduce and prevent damage."

first meeting

The Jo Daviess County Hazard Mitigation Planning Committee will meet at 9 a.m. Friday, March 30, at the county Health Department, 9483 U.S. 20, Galena.

The Freeport Journal Standard
June 8, 2012

JOURNALSTANDARD.com

Jo Daviess County moves forward on hazard plan

Public input sought on project

By Travis Morse
The Journal-Standard
Posted Jun 08, 2012 @ 10:02 PM

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St. John Church 'open and affirming' - Freeport, IL - The Journal-Standard

From the Web

4 reasons for multiple savings accounts (Bankrate.com)

Dad Accused of Beating Daughter's 'Molester' to Death Is No Hero (CafeMom)

The Average Teacher's Salary in Alaska (eHow)

Sponsored content What's this?

Freeport, Ill. — Jo Daviess County officials continue to make progress on the creation of an "All Hazard Mitigation Plan," and a public meeting set for June 14 will hopefully answer some key questions about the project, organizers said.

The county-wide hazard plan will identify activities and projects to reduce damage caused by natural disasters such as floods and snowstorms. The effort to create this document is being funded by a $70,000 grant from the Federal Emergency Management Agency (FEMA).

"It's very important," said Chief Deputy David Hachmeister of the Jo Daviess County Sheriff's Office. "The project is ongoing and it looks like we'll have a pretty good handle on it by the end of the summer. ... It's right on target."

A public meeting on the project has been set for 1 p.m. on Thursday, June 14, at the Jo Daviess County Public Health Department facility on U.S. 20 in Galena. It will feature members of the county's Hazard Mitigation Committee, which is meeting regularly over the next several months to prepare the plan.

According to a sheriff's office news release, a number of important questions will be addressed at the June 14 meeting. They include: how vulnerable are Jo Daviess County residents to severe storms, what are the most frequently occurring natural hazards in the county, and how much damage do storms and other natural hazards (like droughts) cause.

All Jo Daviess County municipalities have been invited to participate in the planning process. So far, Apple River, East Dubuque, Elizabeth, Galena, Hanover, Stockton, and Warren have committed to taking part. However, there is still time for other municipalities to join the effort.

"The plan should become our best resource to help county and municipal officials decide what steps to take to prepare for storms and other natural hazards," said Tom Lange, chairman of the Hazard Mitigation Committee, in the news release. "After this plan is completed, comprehensive information will be available in one document to help guide those who are making decisions about how to better protect residents."

Possible Projects

Many projects designed to reduce storm damage will likely be outlined in the plan. Some examples of possible projects include: developing public information materials; building storm shelters; and designing roads, bridges, water supplies, and other services to better withstand natural disasters, the release states.

Public input will be sought throughout this process. Jo Daviess County residents can make comments on the project at Hazard Mitigation Committee meetings or by submitting questions to their municipal or county representatives, the release states.

A firm deadline has not yet been set for completing the plan. For more information on the project, contact Tom Lange at (815) 777-2141.

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Appendix F

The Telegraph Herald
June 9, 2012

Jo Daviess County will discuss hazard mitigation

TELEGRAPH HERALD | Posted: Saturday, June 9, 2012 12:00 am

GALENA, Ill. -- Representatives from Jo Daviess County and local municipalities will meet next week to discuss a plan to prevent damages caused by natural disasters.

The meeting will be held at 1 p.m. Thursday, June 14, at the Jo Daviess County Public Health Department on U.S. 20 in Galena.

The Galena Gazette
June 13, 2012

The Gazette, Galena, Illinois, Wednesday, June 13, 2012 **Page 13B**

Hazard mitigation meets June 14

GALENA–The heavy rains and severe storms encountered in Jo Daviess County the past two years raise important questions. How vulnerable are Jo Daviess County residents to these storms? What are the most frequently occurring natural hazards in the county? These questions and other related issues will be discussed when representatives from Jo Daviess County and local municipalities meet Thursday, June 14 at the Jo Daviess County Health Department on U.S. 20 in Galena. This group, the Jo Daviess County Hazard Mitigation Committee, will meet through the next several months to prepare the plan to reduce damages caused by natural hazards. The committee meeting begins at 1 p.m. and all meetings are open to the public.

The Galena Gazette
August 29, 2012

Page 10A The Gazette, Galena, Illinois, Wednesday, August 29, 2012

Committee works to prevent damage caused as a result of natural disasters

JO DAVIESS COUNTY–Steps to prevent injuries and deaths while maintaining vital services for Jo Daviess County residents when floods and severe storms hit will be discussed when the Jo Daviess County Natural Hazard Mitigation Planning Committee meets at 1 p.m. on Aug. 30 at the Elizabeth Community Center in Elizabeth. Committee meetings are open to the public.

The committee began work in March to prepare a plan that will identify projects and activities to protect Jo Daviess County residents and property from storms and other natural disasters. This plan, unlike all other emergency plans, is aimed at identifying projects and activities that can be taken before these disaster occur.

"Other emergency plans are directed at responding after a storm or natural disaster hits. This is the first time in Jo Daviess County that we are looking at actions that can reduce or eliminate damages caused by specific types of storms and other natural disasters," said Tom Lange, committee chairperson.

Apple River, East Dubuque, Elizabeth, Galena, Hanover, Stockton and Warren are participating along with The Galena Territory.

Building storm shelters, resolving drainage, 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 on 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.

"Develop a plan that is approved by the Federal Emergency Management Agency will help all the participating jurisdictions become eligible for state and federal grant money," added Lange.

The Galena Gazette
October 24, 2012

County's natural hazards mitigation group meets

JO DAVIESS COUNTY–Projects and activities to protect residents and property from storms and other hazards will be discussed at the Jo Daviess County Natural Hazards Mitigation Planning Committee meeting on Nov. 8 at the Elizabeth Community Center in Elizabeth. The meeting begins at 1 p.m. and is open to the public.

Apple River, East Dubuque, Elizabeth, Galena, Hanover, Stockton and Warren are participating along with the Galena Territory, Apple Canyon Lake, the American Red Cross and Country Financial Insurance among others.

"Severe storms frequently cause damage to buildings, crops, road and other critical infrastructure in this area and across Illinois," according to Tom Lange, Jo Daviess County emergency services and disaster agency. "Since 1960, Jo Daviess County has experienced at least two federal declared disasters every decade except for the 1980s. Severe thunderstorms and severe winter storms have been most frequently occurring natural disasters in the county but floods have caused the most damage."

Jo Daviess County has an emergency response plan but not a mitigation plan. "Emergency response plans prescribe what actions should be taken after a storm hits, this mitigation plan identifies actions that should be taken before a storm occurs," added Lange.

While the public has provided input on portions of the plan, the entire plan will be presented for public review and comment before it is submitted to the state and federal government for approval.

A public forum will be conducted next year to review the plan and ask questions of committee members. A two-week comment period will be established to accommodate persons who are unable to attend the forum.

"In addition, a copy of the draft plan will be placed on the county website for residents to view," said Dan Reimer, county administrator. "We want to make is as easy as possible for all residents to view this draft plan so that they can read about what type of storm damage reduction projects are being considered," he added.

Interested persons can submit questions and comments to the committee members of directly to the Jo Daviess County Emergency Services Disaster agency.

The Telegraph Herald
February 9, 2013

Jo Daviess County seeking comments on hazard mitigation plan

TELEGRAPH HERALD | Posted: Saturday, February 9, 2013 3:34 pm

GALENA, Ill. — Jo Daviess County's Natural Hazards Mitigation Plan will be available for review at a public forum from 4 to 6 p.m. Thursday, Feb. 21 at Turner Hall, at the corner of Bench and Hill streets in Galena.

Members of the county's Natural Hazards Mitigation Planning Committee will be available to discuss the plan, which includes projects and activities to prevent injuries, deaths and property damage from major storms.

Nearly 200 projects and activities were identified to protect county residents and property from natural disasters. This plan is aimed to identifying projects and activities to be done before a natural disaster occurs. The committee has been conducting work meetings open to the public since March 2012.

Plan participants include the communities of Apple River, East Dubuque, Elizabeth, Galena, Hanover, Stockton and Warren, along with the Galena Territories, Apple Canyon Lake and the American Red Cross, among others.

A public comment period will remain open until Thursday, March 7. Comments can be directed to Todd Lange, committee chairman, at 815-777-2141. Following the comment period, any needed revisions will be made before the plan is submitted to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for approval.

Each participating jurisdiction must adopt the plan to become eligible for project funds distributed by the state and federal emergency management agencies.

The Telegraph Herald
February 20, 2013

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Jo Daviess public forum postponed

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Posted: Wednesday, February 20, 2013 6:55 pm

TELEGRAPH HERALD |

GALENA, Ill. — A public forum scheduled for Thursday on Jo Daviess County's Natural Hazards Mitigation Plan has been postponed due to impending inclement weather.

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Appendix F

The Telegraph Herald
February 26, 2013

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Galena: Forum on hazard mitigation scheduled

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Posted: Tuesday, February 26, 2013 12:00 am | Updated: 6:48 am, Tue Feb 26, 2013.

TELEGRAPH HERALD |

A public forum on Jo Daviess County's Natural Hazards Mitigation Plan has been rescheduled for 4 to 6 p.m. Thursday, March 7, at Turner Hall. The forum was first scheduled for last Thursday but was postponed due to the forecast of winter weather.

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Appendix F

OFFICE OF THE SHERIFF
JO DAVIESS COUNTY

KEVIN W. TURNER
Sheriff

David P. Hachmeister
Chief Deputy

FOR IMMEDIATE RELEASE
February 25, 2013

JO DAVIESS COUNTY EMERGENCY MANAGEMENT
Contact: Tom Lange
815-777-2141

Public Forum on Plan to Reduce Storm Damages

Galena, IL (February 25, 2013)--Projects and activities to prevent injuries, deaths and property damage from major storms will be presented for public comment in the Jo Daviess County Natural Hazards Mitigation Plan. The Plan will be available for review at a public forum on March 7 from 4 p.m. to 6 p.m. at Turner Hall, on the corner of Bench and Hill Street in Galena. Members from the Jo Daviess County Natural Hazards Mitigation Planning Committee will be available to discuss this Plan. This event was rescheduled from February 21.

"Persons can come and go at their convenience to review the plan and comment. If someone only has a few minutes to review the plan, ask a question, or make a comment, they can easily do so at anytime during the forum. This forum is designed to accommodate busy schedules. Unlike conventional meetings, there are no formal presentations forcing attendees to wait before providing input," according to Tom Lange, Jo Daviess County Hazard Mitigation Committee Chairperson.

Nearly 200 projects and activities were identified to protect Jo Daviess County residents and property from storms and other natural disasters. This plan, unlike all other emergency plans, is aimed at identifying projects and activities that can be taken before a natural disaster occurs. This Committee has been conducting working meetings open to the public since March, 2012.

"We have received public input to develop this Plan since we began meeting early last year. This input has included photographs and insurance claims about damages caused by storm events as well as suggestions about potential projects that could reduce harm to people and property. This forum is an opportunity to see the entire draft plan," added Lange.

Apple River, East Dubuque, Elizabeth, Galena, Hanover, Stockton, and Warren are participating along with the Galena Territories, Apple Canyon Lake, the American Red Cross and Country Financial insurance among others.

A public comment period will remain open until March 21. Comments can be directed to the Jo Daviess County Emergency Services and Disaster Agency. Following the public comment period, any revisions that are needed will be made before the Plan is submitted to the Illinois Emergency Management Agency and the Federal Emergency Management Agency for approval.

Each participating jurisdiction must adopt the plan to become eligible for project funds distributed by the state and federal emergency management agencies.

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PUBLIC FORUM – PLANNING PROCESS HANDOUT

APPENDIX G

JO DAVIESS COUNTY MULTI-JURISDICTIONAL ALL HAZARDS MITIGATION PLAN

PUBLIC FORUM – OPEN HOUSE

MARCH 7, 2013
TURNER HALL, GALENA
4:00 P.M. – 6:00 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 Jo Daviess County residents. Since 1965, Jo Daviess County has had 11 federally-declared disasters.

In addition, between 2001 and 2011 there have been 70 thunderstorms with damaging winds, 44 flood and flash flood events, 36 severe winter storms (snow and ice), 28 heavy rain events, 25 severe hail storms, 5 extreme cold event, 4 lightning strike events, 2 tornadoes, 1 drought and 2 earthquakes felt by residents in the County. While natural hazards cannot be avoided, their impacts can be reduced through effective hazard mitigation planning.

What is hazard mitigation planning?

Hazard mitigation planning is the process of determining how to reduce or eliminate the loss of life and property damage resulting from natural and man-made hazards. This process helps the County and participating jurisdictions 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 an all hazards mitigation plan.

Why prepare an all hazards mitigation plan?

By preparing and adopting an all 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 Jo Daviess County Multi-Jurisdiction All Hazards Mitigation Plan?

Recognizing the benefits that could be gained from preparing an all hazards mitigation plan, the Jo Daviess County Board passed a resolution on April 11, 2011 authorizing the development of the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan. The County then invited all the local government entities within Jo Daviess County to participate. The following jurisdictions chose to participate in the Plan's development:

- Apple Canyon Lake
- Apple River
- East Dubuque
- Elizabeth
- Galena
- The Galena Territory
- Hanover
- Scales Mound
- Stockton
- Warren

JO DAVIESS COUNTY MULTI-JURISDICTIONAL ALL HAZARDS MITIGATION PLAN

How was the Plan developed?

The Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan was developed through the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Planning Committee. The Planning Committee included representatives from each participating jurisdiction, the general public as well as agriculture, business, emergency services (Red Cross, ambulance, fire and law enforcement), healthcare, GIS and insurance. The Planning Committee met five times between March 2012 and March 2013.

Which natural and man-made hazards are included in the Plan?

After much discussion, the Planning Committee chose to include the following natural and man-made hazards in this Plan:

- severe storms (thunderstorms, hail, lighting & heavy rain)
- severe winter storms (snow, ice & extreme cold)
- flood
- tornadoes
- drought
- extreme heat
- earthquakes
- dams
- man-made hazards including:
  - hazardous substances (generation & transportation)
  - waste disposal
  - hazardous materials incidents
  - waste remediation
  - terrorism

What is included in the Plan?

The Plan is divided into sections that cover the planning process; the risk assessment conducted on each of the previously identified natural and man-made hazards; the mitigation strategy, including lists of mitigation actions identified for each participating jurisdiction; recommendations; and plan maintenance and adoption. The majority of the Plan is devoted to the risk assessment.

This risk assessment identifies the natural and man-made hazards that pose a threat to the County and includes a profile of each natural hazard which describes the location and severity of past occurrences, reported damages to public health and property, and the likelihood of future occurrences. It also provides a vulnerability assessment that evaluates the assets of the participating jurisdictions (i.e., residential buildings, critical facilities and infrastructure) and estimates the potential impacts each natural and man-made hazard would have on the health and safety of the residents of Jo Daviess County as well as the buildings, critical facilities and infrastructure located within the County.

What happens next?

Any comments received at tonight's public forum will be are incorporated into the Plan before it is submitted to the Illinois Emergency Management Agency (IEMA) and the Federal Emergency Management Agency (FEMA) for review. Once IEMA and FEMA have reviewed and approved the Plan, it will be presented to the County and each participating jurisdiction for formal adoption. After adopting the Plan, each participating jurisdiction can apply for federal mitigation funds and begin implementation of the mitigation actions identified in the Plan.

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PUBLIC FORUM – PLAN COMMENT SHEET

APPENDIX H

JO DAVIESS COUNTY MULTI-JURISDICTIONAL ALL HAZARDS MITIGATION PLAN

PUBLIC FORUM – MARCH 7, 2013
COMMENT SHEET

The Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan evaluates damage to life and property from natural and man-made 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 21, 2013.

Place
Stamp
Here

Mr. Tom Lange
Jo Daviess County EMA
330 N. Bench St.
Galena, IL 61036

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BUSINESS COMMUNITY PARTICIPATION PACKET

APPENDIX I

Chambers of Commerce Hazard Information Mailing

The following materials (letter, FAQ and brochure) were sent to each of the chambers of commerce located in Jo Daviess County. The letter was personalized to each chamber; however for documentation purposes only an example copy of the letter is attached. The following chambers received a copy of the materials.

- Elizabeth
- Galena
- Hanover
- Scales Mound
- Stockton
- Warren

OFFICE OF THE SHERIFF
JO DAVIESS COUNTY

KEVIN W. TURNER
Sheriff

David P. Hachmeister
Chief Deputy

Example Letter

July 17, 2012

Christina Sutter, President
Warren Chamber of Commerce
P.O. Box 691
Warren, IL 61087

Dear Ms. Sutter:

Maintaining business operations after a natural disaster strikes, such as a flood, snow storm, or tornado, can be vital to customers and employees. In some instances, the ability to recover quickly can make the difference between staying in business or closing.

Jo Daviess County is developing a plan, called the Jo Daviess County Natural Hazard Mitigation Plan, to prevent and reduce damages caused by natural and man-made disasters. As part of this planning process, I am contacting you to inform you that your Chamber and businesses throughout Jo Daviess County will have the opportunity to review and comment on this draft plan. A public forum will be held and a two week public comment period will begin the evening of the forum. The Plan will be available on the County website for review and comment and at the offices of municipalities participating in the planning process.

Enclosed is a brochure about how businesses can prepare for disasters and a fact sheet that provides more information about the Jo Daviess County Natural Hazard Mitigation Plan.

If you or your members have questions about this planning process, feel free to contact me.

Sincerely,

Tom Lange
Coordinator
Jo Daviess County ESDA

"Honor, Duty and Integrity"

330 N. Bench Street, Galena, IL 61036 * (815) 777-2141 or (800) 373-7838 * FAX: (815) 777-9284 * www.jodaviess.org

Jo Daviess County All Hazard Mitigation Plan
Frequently Asked Questions

1. **What is the Jo Daviess County All Hazard Mitigation Plan?**
   The Jo Daviess County All Hazard Mitigation Plan evaluates damage to life and property from storms and other natural hazards, including man-made hazards, in this county and identifies projects and activities that can reduce these damages. The Plan is considered to be multi-jurisdictional because it includes municipalities and other public organizations, such as schools, who want to participate.

2. **What is hazard mitigation?**
   Hazard mitigation is any action taken to ***reduce or eliminate long-term risk*** to ***life*** and ***property*** from a natural or man-made hazard.

3. **Why is this Plan being developed?**
   The Plan fulfills federal planning requirements of Section 104 of the Disaster Mitigation Act of 2000 and the Stafford Act. Three key benefits this plan will provide Jo Daviess County are:
   1) Increased awareness about the risks and closer cooperation among various organizations to take steps that can reduce damages from natural and man-made hazards.
   2) Funding following declared disasters
   3) Funding for mitigation projects and activities before disasters occur

4. **Who is developing this Plan?**
   The Jo Daviess County Hazard Mitigation Committee is preparing the Plan with assistance from technical experts in emergency planning, environmental matters, and infrastructure. The Committee includes members from agriculture, business and economic development, emergency services, municipal, county and state government, health care, insurance, and law enforcement.

5. **How can I participate?**
   You are invited to attend public meetings of the Jo Daviess County Hazard Mitigation Committee. In addition you are encouraged to provide photographs, other documentation, and anecdotal information about damages you experienced with natural and man-made hazards in Jo Daviess County. Surveys will be available at participating municipalities and through Jo Daviess County to help gather specific information from residents. All of this information will be used to draft the Plan. The draft Plan will be presented in a public forum for further public input.

More information can be obtained by contacting:

Tom Lange, Coordinator
Jo Daviess County Emergency Management Agency
Phone: 815/777-2141 or 563/543-0246 E-Mail: tlange@jodaviess.org

Why bother?
Disasters don't happen here.

Even if you think you are not in a disaster-prone area, something like a chemical tanker truck overturning can prevent you and your employees from getting to your facility.

Even if a flood doesn't put your business under water, customers and supplies may not be able to get to you.

Power outages, brown-outs or surges can affect your daily business operations.

Many disasters, like wind storms, tornadoes and earthquakes, can strike quickly and with little or no warning.

What can I do?

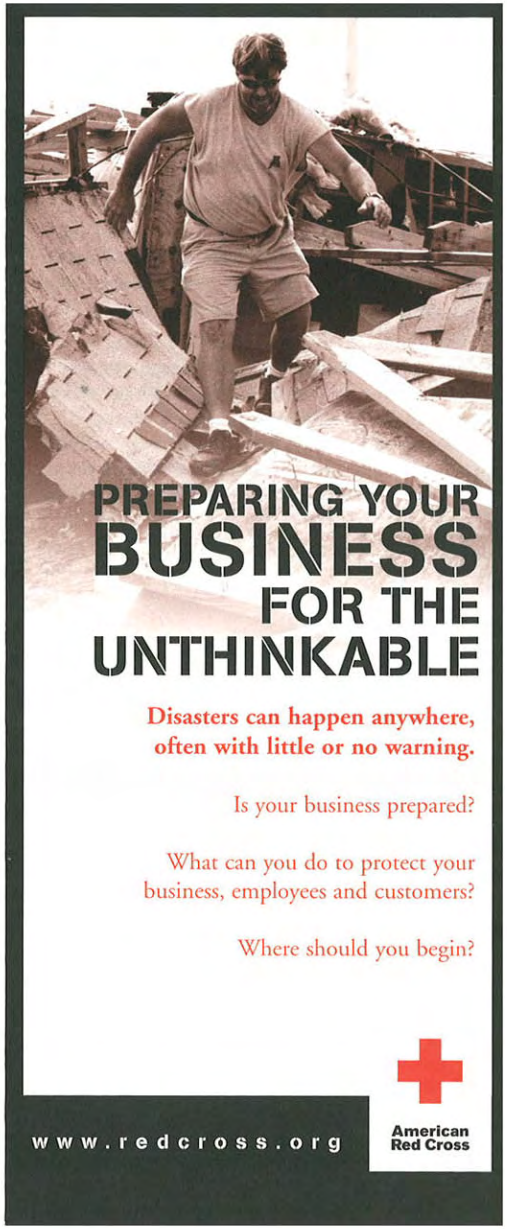
Find out which natural and technological hazards can happen in your area.

Get information about how to prepare your employees and clients to respond to possible hazards and provide help. Disaster safety information and CPR/first aid training are available from your local Red Cross chapter. Get more information at **www.redcross.org.**

Network with others who have or need to develop risk or contingency management plans.

Attend seminars and get information from local risk management associations or chapters.

ARC 1235
April 2001



Disaster Recovery Begins Before a Disaster

No business should risk operating without a disaster plan. While reports vary, as many as 40 percent of small businesses do not reopen after a major disaster like a flood, tornado or earthquake. These shuttered businesses were unprepared for a disaster; they had no plan or backup systems.

When you start to develop your disaster plan, consider three subjects: human resources, physical resources and business continuity. Think about how a disaster could affect your employees, customers and workplace. Think about how you could continue doing business if the area around your facility is closed or streets are impassable. Think about what you would need to serve your customers even if your facility is closed.

Develop a Plan

Start building your plan now.
Here are some suggestions your may want to consider:

- Keep phone lists of your key employees and customers with you, and provide copies to key staff members.
- If you have a voice mail system at your office, designate one remote number on which you can record messages for employees. Provide the number to all employees.
- Arrange for programmable call forwarding for your main business line(s). Then, if you can't get to the office, you can call in and reprogram the phones to ring elsewhere.
- If you may not be able to get to your business quickly after an emergency, leave keys and alarm code(s) with a trusted employee or friend who is closer.
- Install emergency lights that turn on when the power goes out. They are inexpensive and widely available at building supply retailers.
- Back up computer data frequently throughout the business day. Keep a backup tape off site.
- Use UL-listed surge protectors and battery backup systems. They will add protection for sensitive equipment and help prevent a computer crash if the power goes out.
- Purchase a NOAA Weather Radio with a tone alert feature. Keep it on and when the warning signal sounds, listen for information about possible severe weather and protective actions to take.
- Stock a minimum supply of the goods, materials and equipment you would need for business continuity.
- Consult with your insurance agent about special precautions to take for disasters that may directly impact your business. Remember, most policies do not cover earthquake and flood damage. Protect valuable property and equipment with special riders. Discuss business continuity insurance with your agent.
- Keep emergency supplies handy, including—
  - Flashlights with extra batteries.
  - First aid kit.
  - Tools.
  - Food and water for employees and customers to use during a period of unexpected confinement at your business, such as if a tanker truck overturned nearby and authorities told everyone in the area to stay put for an extended period.

For more information on suggested disaster supplies, see **http://www.redcross.org/services/disaster/beprepared/supplies.html.**

Reduce Potential Damage

Prevent or reduce disaster damage in your facility by taking precautions, such as—

- Bolting tall bookcases or display cases to wall studs.
- Protecting breakable objects by securing them to a stand or shelf using hook-and-loop fasteners.
- Moving to lower shelves large objects that could fall and break or injure someone.
- Installing latches to keep drawers and cabinets from flying open and dumping their contents.
- Using closed screw eyes and wire to securely attach framed pictures and mirrors to walls.
- Using plumber's tape or strap iron to wrap around a hot water heater to secure it to wall studs.

You should also consider having a professional install—

- Flexible connectors to appliances and equipment fueled by natural gas.
- Shutters that you can close to protect windows from damage caused by debris blown by a hurricane, tornado or severe storm.
- Automatic fire sprinklers.

Protect Your Employees, Customers and Business

Designate one employee from each work shift to be the safety coordinator. This person will make all decisions relating to employee and customer safety and to the safety of the business itself. Safety coordinators should know how to contact the owner or operator at all times.

Everyone in your facility should know how to prepare for a disaster and what to do if a disaster occurs. Contact your local Red Cross chapter for specific information about how to stay safe in a tornado, earthquake, fire, flood, hurricane or other hazard.

You may also want to get a copy of the *Emergency Management Guide for Business and Industry* from your Red Cross chapter or **http://www.redcross.org/services/disaster/beprepared.**

Another source of useful information is *Open for Business*, a booklet developed by the Institute for Business and Home Safety and the Small Business Administration. It is available at **http://www.ibhs.org.**

www.redcross.org

HAZARD MITIGATION PLANNING LETTER SENT TO ADJACENT COUNTIES

APPENDIX J

OFFICE OF THE SHERIFF
JO DAVIESS COUNTY

KEVIN W. TURNER
Sheriff

David P. Hachmeister
Chief Deputy

To: Carroll County (Greg Miller); Stephenson County (Bob Baker), Grant County WI (Steve Braun), Dubuque County IA (Tom Berger)

From: Tom Lange, Jo Daviess County Natural Hazard Mitigation Committee Chairperson

Subject: Natural Hazard Mitigation Planning

Date: July 10, 2012

The purpose of this memorandum is to invite you to attend a planning meeting of the Jo Daviess County Natural Hazards Mitigation Committee. This committee is preparing a countywide Natural Hazards Mitigation Plan. Since we share a common border, there may be issues and concerns you have regarding this Plan.

Johnson, Depp & Quisenberry, and environmental and engineering consulting firm experienced in preparing these plans, is leading our planning process.

The next meeting of the Committee will be:

Thursday, August 30
Elizabeth Community Center
US 20 West
Elizabeth, IL
1 p.m. to 2 p.m.

The Committee meetings are open to the public.

If you have questions or comments on our mitigation planning effort, or if you would like to participate, please feel free to contact me. You may also contact Greg Michaud, our mitigation planning consultant, at 217/529-4534

"Honor, Duty and Integrity"

330 N. Bench Street, Galena, IL 61036 * (815) 777-2141 or (800) 373-7838 * FAX: (815) 777-9284 * www.jodaviess.org

HISTORIC NATURAL HAZARD EVENTS
NEW ARTICLES

APPENDIX K

Galena Gazette - Thursday, April 12, 1973

Travelers wait out blizzard in motels, farm homes, schools

April snow storm immobilizes county

Residents of northwestern Illinois Wednesday were finishing up the strenuous task of shoveling their way out of April's surprise blizzard . . . the worst storm in years in the area.

Motorists found U. S. Highway 20 clear from Stockton through East Dubuque . . . with piles of snow nearly 10 feet high bordering the roadway, reminders of what had occurred at the week's start.

Mail deliveries were arriving at city and village post offices . . . delivery trucks were making their usual rounds . . . plants and offices closed Monday and Tuesday were back on schedule . . . motels, hotels and homes where many had taken refuge from snow and howling winds were back to normal.

Work was continuing Wednesday on clearing of secondary roads throughout Jo Daviess County, and officials said most should be passable by Thursday.

Snow began to fall Sunday and by Monday morning had reached blizzard proportions. Early mail deliveries, store and newspaper deliveries were made early Monday . . . then everything came to a standstill.

Highway, road and street crews went to work as soon as they could get their equipment out and began the long process . . . still continuing . . . of clearing away tons of snow.

Snowfall in Jo Daviess County and surrounding areas measured 19.2 inches . . . with snowdrifts of 10 feet or more built by gusting winds.

Rural areas were without electricity from 10 a.m. Monday until 2:30 p.m. Tuesday, leaving hundreds of customers in the Hanover-Elizabeth-Scales Mound-Apple River area without power.

Charles Youtzy, Elizabeth, manager of the Jo Daviess-Carroll Rural Electric Co-operative, said strong winds snapped a 69,000-volt transmission line from Dairyland Power Cooperative, Cassville, Wis., cutting off service to areas of Green County, Wis., and Jo Daviess.

Interstate Power Company manager Harold Muchow reported that the crews were able to get to most of the problems caused by high winds.

Some outage was reported for the hill area in Galena and six customers in Derinda were left without power for a period of time. The crews used snowmobiles to get the power back on by Tuesday in that area and also were attempting to restore power to some Rodden customers.

Snowmobiles were pressed into service early in the storm . . . about 30 answered a call for assistance from the Jo Daviess County sheriff's department.

"I can't begin to express our appreciation for the job done by snowmobile operators, all over the county, throughout the storm," County Sheriff Marlo Specht said Wednesday.

"Day and night, they patroled highways and county roads, took stranded motorists to motels and worked with the REA."

"We want to stress our appreciation to the volunteer fire departments throughout the county for use of their radio communications systems and their facilities," Specht said.

"Our thanks go, also, to the citizens of the county for their cooperation . . . and their patience!"

"The most fortunate thing," the sheriff said, "is that, to the best of our knowledge, we did not have a single fatality in the county as a result of the storm."

On Tuesday, helicopters from the Illinois Department of Transportation at Elgin arrived to patrol the area, make hospital trips and work with the REA.

Schools throughout the county were closed all day Monday and Tuesday, and several remained closed on Wednesday. Public meetings and church events, were cancelled throughout the area.

In review, here are highlights of the storm:

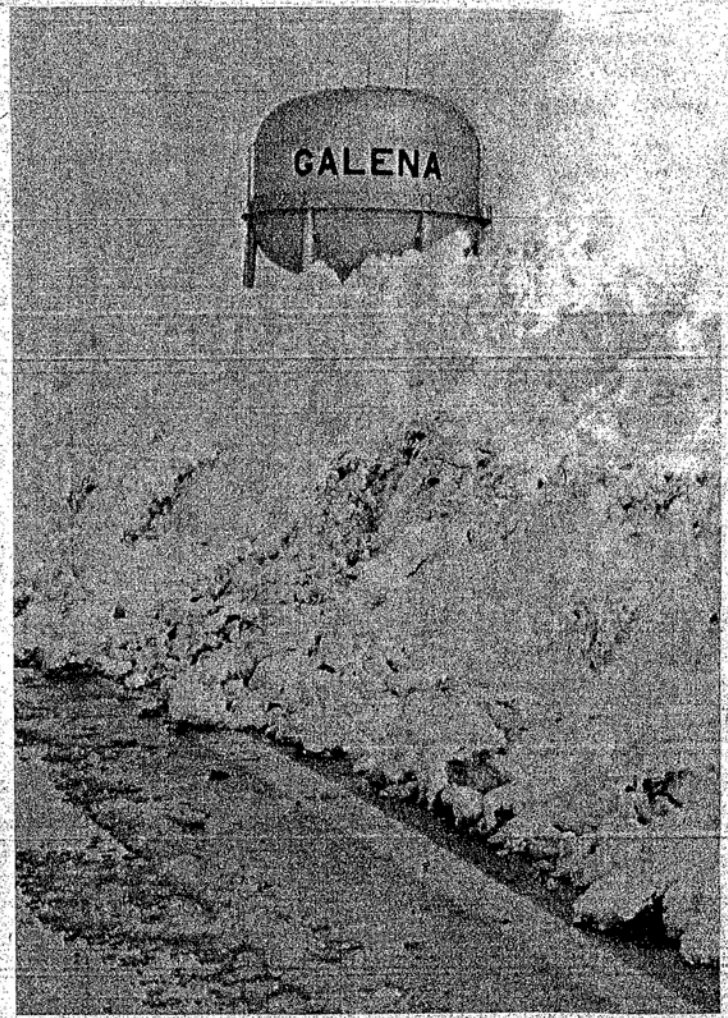
Problems in the Galena area also left many stranded.

Grant Hills Motel had 25 people stranded on Sunday evening with the last person arriving at 9:00 p.m. One young married couple had travelled from Massachusetts enroute to Chestnut Mountain on their honeymoon but were unable to make it the final 10 miles. Those stranded came from Chicago, Oak Park, Freeport, and Waterloo, Ia., in addition to other locations. Mrs. Archie Jackson served breakfast, lunch, and a buffet dinner after the sheriff's patrol

(Continued To Page 13)

★THE★GALENA★GAZETTE★
& ADVERTISER
founded 1834
A HISTORIC WEEKLY NEWSPAPER . . . PROMOTING THE PRESENT . . . BUILDING THE FUTURE . . . HONORING THE PAST
VOL. 137 NO. 15
Copy 15¢
Galena, Illinois, Thursday, April 12, 1973
Three Sections - 34 Pages

School Election Saturday April 14



Drifts

Snow drifts, plus snow piled along the road's edge by work crews, almost hid Galena's water tower from view during the blizzard.

Appendix K

Article Provided by Madelynn Wilharm

Galena Daily Gazette - February 27, 1937

BIG GALENA FLOODS OF THE PAST

Articles taken from The Galena Gazette Files

In perusal of the Gazette files the following flood facts have been compiled as a comparison of floods of other days. In these many years the contour of the river has been changed by nature and by man:

Taking data and information from the files of the Galena Gazette, the first flood of much importance was in 1870 of which we gathered the following information:

April 18, 1870

Galena river has reached magnificent proportions and "still she rises." The highest water ever known here by the present generation was in June, 1869, The point of the highest water at that time was scratched on lamp posts and buildings in several places near the river. The water at this writing lacks only three inches of being up to the old mark which indicated the highest rise ever known. There is no doubt that it will be beaten this time by several inches, and the great flood of April, 1870 will be remembered for a generation to come as the highest rise known within the memory of man. About all the manufacturing portion of Galena is under water. At Barrow's Flouring Mill the water is nearly up to the second floor; eight inches deep in the saloon of the De Soto House. (Note: This was located on Commerce street.)

April 19

The river is now two or three inches higher than it has ever been known by the present generation. While many people have been driven from their places of business, no serious damage has been done, so far as can be seen, although the foundation of many buildings must be more or less injured by the water.

April 20

The water rose about three inches last night. From 7 o'clock this morning until noon it advanced one inch, and since noon has been at a stand still.

April 22

The river has at last come to a standstill beyond a question. It rose about a quarter of an inch this forenoon, and for the last five or six hours has remained stationary.

April 23

The water came to a standstill about noon yesterday and from that time till this morning not the slightest change could be perceived. At 9 o'clock this morning by careful measuring it was ascertained that the water had commenced to recede, and up to this writing (4 p. m.) it had declined ¾ of an inch. It is falling very rapidly above, and by tomorrow we may expect a decided decline. There has been a good deal of disagreement among our older citizens relative to the height of the present rise as compared with those of former times. Some maintain that the water was never higher before, while others deny the assertion. Of course, none of these parties intentionally misrepresent the facts. Nearly all our streets downtown have been raised considerably within the last 25 years and hence it is difficult to ascertain the exact height comparatively by noting what streets the water flooded. We place much reliance upon the statements of those whose comfort and financial interests have been affected by the high waters, for these parties measure very carefully, and watch closely the movements of the water. In the house of Mr. M. Y. Johnson, on the east side the water now stands on the floor 14 inches deep. (Note: This property was located between the Illinois Central depot and the Burlington railroad tracks at the foot of Bouthillier street. This building was razed quite a number of years ago.) In 1859 the water stood on the same floor only to the depth of two inches. These two are the only instances in which water has ever entered the house, and it was built in 1836. We have this statement from Mrs. Wight, who has lived in the house ever since it was built.

Tuesday, June 22, 1880

The rise in the Galena river since Sunday morning has been materially affected by the upper Wisconsin storm, and the great bulk of the water having come down, not over an inch more need be expected. The water last night raised 3½ inches and about 2 inches since 7 o'clock this morning. It is now 7 inches above the high water mark of 1870. Every building is flooded from the Hornung house of Commerce street, including the Custom house and C. J. Claussen's Grocery Store, and from the corner of Commerce street on the east of the thoroughfare to the river and as far as the Market House Square, including the livery stables of J. O. Calderwood and Comstock and Hunkins. The Market House is entirely surrounded by water and a great pool lies in front of the Lawrence Hotel.

June 23

The flood of 1828 has never been surpassed in this section since that year. Indisputable evidence substantiating his statement has been furnished us by Capt. Harris and John Lorrain, Esq., who paid a visit to Harris Slough this forenoon, and consulted a well preserved mark which shows the height which the flood of 1828 actually reached. It consists of a root house built by Capt. Harris in 1824 out of an Indian mound. During the flood water came up even with the door and measurment from the door sill to the present water level showed that the flood of 1828 was 29 inches higher than it is now. In 1823 a steamboat ran up to Bates' furnace one mile from the slough, in Harris West Diggings, and took a load of 1,000 pigs of lead. If the railroad tracks and houses are built above Capt. Harris' mark of 1823 they will in all human probability never be surrounded or damaged by floods.

April 24, 1892

GALENA A DELUGED CITY? Water reaches 2 feet 11 inches higher than in 1880. Two bridges swept away.

The rise advanced a surprising degree until the high water mark of 1880 was buried. Then it was that the business men became serious and summoned all available aid and made ready for the flood. At 9 o'clock, 6 hours after the commencement of the raise, the water reached the unheard of and most remarkable stage of 2 feet 11 inches over and above the highest water ever known in Galena. Commerce street was nothing short of a booming river with a velocity of ten miles an hour. Nothing could withstand its force, and sidewalks, platforms, wood piles and everything shot down into the main body of the river. The flood was not confined to back streets but three blocks of Main street was under 2 or 3 feet of water. Never in the history of Galena did water flood Main street until last night. The loss to the city is great. The damage to streets, sidewalks, bridges, etc., will make the loss $10,000, which is a mild estimate.

Mayburn's Grocery and Provision Store was covered with 18 inches of water.

Gibson's harness shop was also flooded.

Armbruster & Ross had 18 inches of water.

Siever's establishment under 2 feet and 6 inches of water.

Flick Sisters' millinery establishment, 18 inches of water.

Hurst's clothing store 18 inches on floor.

Nack's boot and shoe store, 1 foot of water.

Sander's confectionary store, 18 inches of water.

Henning's establishment under 12 inches of water.

The European Hotel completely inundated with water varying from 18 inches to 3 feet.

H. Miller, the butcher, at corner of Green and Commerce streets, 3 feet and 6 inches of water.

Coatsworth Jewelry Store, 12 inches.

The lumber companies sustained a loss of about $13,000. The Illinois Central switch bridge went out with 7 cars on it, dumping them in the river. Next in line was the Green street bridge and it soon floated down the river against the Burlington railroad bridge which withstood the impact.

May 25, 1896

Repetition of the Cataclysm of 1892. Water touches Main street. Great loss of property and one case of drowning. All railroad traffic stopped.

Galena river swollen by terrific rain into a mighty stream. Scenes and incidents of the deluge.

The loss of property in the city will foot up to $100,000. Only one fatality, that of Mrs. Strickland, under peculiarly sad circumstances: in her home on Gear street. Such a storm Galena has never experienced. For two hours it rained unabated. Then there was a lull for a few minutes followed by another burst of rain. The highest point attained by the waters, gauged by Main street, was above the level of the gutters. In one respect the storm was much worse than that of four years ago, that being the damage it caused the streets and private residences above danger from the river flood. On the west side of Franklin street, Gear and Spring streets and on the east side of Jackson street and Bouthillier street, were filled with raging rivers in which the life of a man foolhardy enough to attempt to cross would not be worth the fate of a chip in the roaring water. Cellars were flooded and in many cases the floors of residences were inundated to the ruin of carpets.

March 27, 1916.

Most disastrous flood in the history of Galena. Heavy rains in Galena and North causes river to leave banks and overflow principal streets of city Sunday night. Water is highest recorded locally. No loss of life occurred in Galena.

Continuous hard rains north of Galena for the past two or three days caused the Galena river to swell and spread out over surrounding territory until for a while it seemed as though it would sweep every building on Main street, but to the relief of every one the water became at a standstill shortly after 9 o'clock and began to recede shortly thereafter until this morning there was nothing of the flood left but the terrible destruction that it left in its path and mud several feet in depth. Both sides of Main street from P. H. Nelson's garage on North Main street to the Grant Hotel on South Main street were covered with from one to three feet of water. There was a short dry space from the Grant Hotel to the Stroebel residence on Riverside Drive. There the water was a foot or so deep on the sidewalks.

Note.

Water in the lobby and work room of the post office yesterday was two feet deep.

In the area where the flood covered Main street, perhaps Kitto's drug store, Webb Binninger's and Strohmeyer's shoe stores, the First State Bank, and the White & Stephan store, fared the lightest on account of being built on higher foundations. All cellars were filled.

The east and west approaches of the Meeker street bridge over the river were washed away.

The heaviest sufferers of Galena institutions is the Iron Works where nothing was spared as water covered the floor of the machine shop.

About 400 feet of track was washed out on the North Western between Galena and Benton.

The Gas company was inconvenienced by water filling up the drips and many people on Main street were with out gas this morning.

1937

The flood of the past week has been recorded and has the record of being the highest and most disastrous ever visiting Galena. Other floods have been recorded in the Gazette files but only those of importance have been given recognition in this article.

Ask the Gazette about their local and classified combination when advertising something to sell or social function. It will be worth your while.

Subcribe for The Gazette.

BUY NOW - - BUY IN GALENA

Now is the time for all citizens of Galena with the interest of their community at heart to patronize local business. Probably never before was there greater need that your home town merchant should receive your whole hearted cooperation.

Many folks will remember the Liberty Loan Drive when it was essential that we buy government bonds in order to provide funds for the protection of our country. Many will remember the slogan "Buy until it Hurts." That is the slogan all good Galena citizens should adopt for themselves at this time. Buy until it hurts and buy from your local merchants, who are your neighbors, your fellow towns people, and who need your friendly support now more than ever.

For your own protection, for the protection of Galena, (and if you love this good old town of Galena as many of us do) you will realize the urgent need at this time to revive business, to put money into circulation. For the circulation of money is the life blood of business, and without business Galena will fade into oblivion or become just another cross road village.

Do you want this to happen to Galena, or are you going to come forward like true sons and daughters of this grand old city, with its rich history and fame that extends around the world? Then rally to the support of your merchants to instill new blood into local business with your dollars and your

---

CLASSIFIED ADVERTISING

MALE HELP WANTED

SALESMAN WANTED by well known oil company. Experience unnecessary. No investment required. Immediate steady income for man with car. Write P. T. Webster, 676 Standard Bldg., Cleveland, Ohio.

Odd friendships among animals. A page of photographs of unusual comradeships that show there's much of the human in beasts and birds. See The AMERICAN WEEKLY, the magazine distributed with NEXT SUNDAY'S CHICAGO HERALD AND EXAMINER.

FOR RENT

The Gas Office from Main to Commerce steet.

Inquire E. Jeffrey

STANLEY

TO-NITE LAST TIMES 7 and 9

Adults 25c; Children 10c

ZANE GREY'S

Hilarious Action Romance

"ARIZONA MAHONEY"

with

Joe COOK—Buster GRABBE

Also Comedy—Cartoon—Sportreel

SUNDAY AND MONDAY

2 MATINEES SUN. 1 and 3

Adults 25c; Children 10c

Most Thrilling Adventure Romance Ever Filmed!

"GOD'S COUNTRY AND THE WOMAN"

JAMES OLIVER CURWOOD'S

Robust Novel of the Northwoods in Beautiful TECHNICOLOR

with

George BRENT—Beverly ROBERTS

Barton McLANE—Robert BARRATT

Roscoe ATES—El BRENDEL

—PLUS EXTRA—

VINCENT LOPEZ and Orchestra

Cartoon and Newsreel

Article provided by Madelynn Wilharm

Dubuque Telegraph Herald

The roof of the East Dubuque Boat Harbor is shown in the photo at left littered in the yard of a home in Shore Acres that is itself damaged by fallen trees. The confirmed tornado skipped over parts of Dubuque knocking down trees and utility poles before it crossed the Mississippi River and slammed into East Dubuque. The twister dipped to the ground near the East Dubuque Boat Harbor and destroyed the south half of the harbor and damaged many homes.

(Telegraph-Herald Photos)

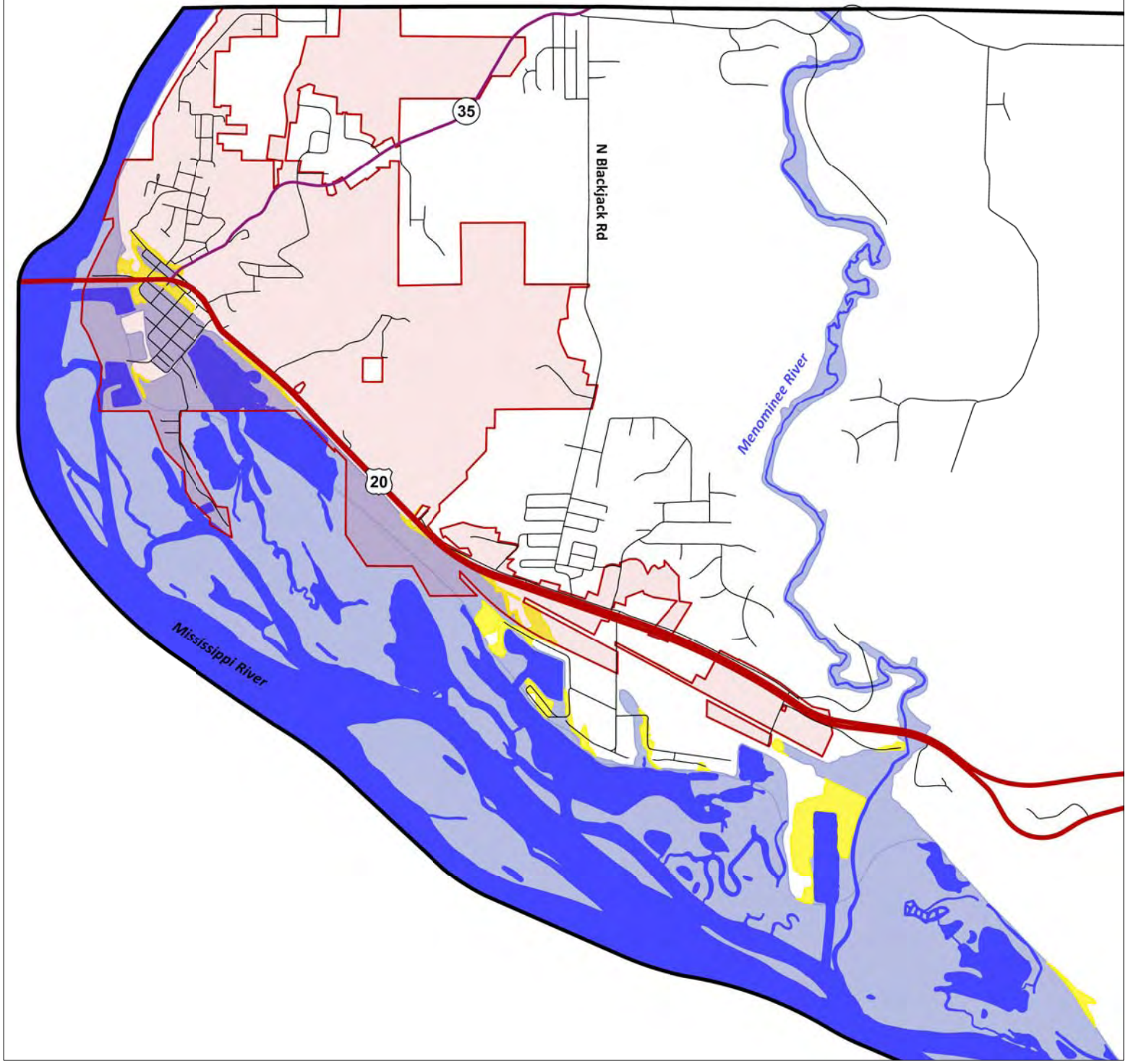
1966

Article provided by Harold Lange

FLOODPLAIN MAPS FOR NFIP-PARTICIPATING MUNICIPALITIES

APPENDIX L

FLOOD ZONES IN THE CITY OF EAST DUBUQUE, JO DAVIESS COUNTY, IL



NORTH

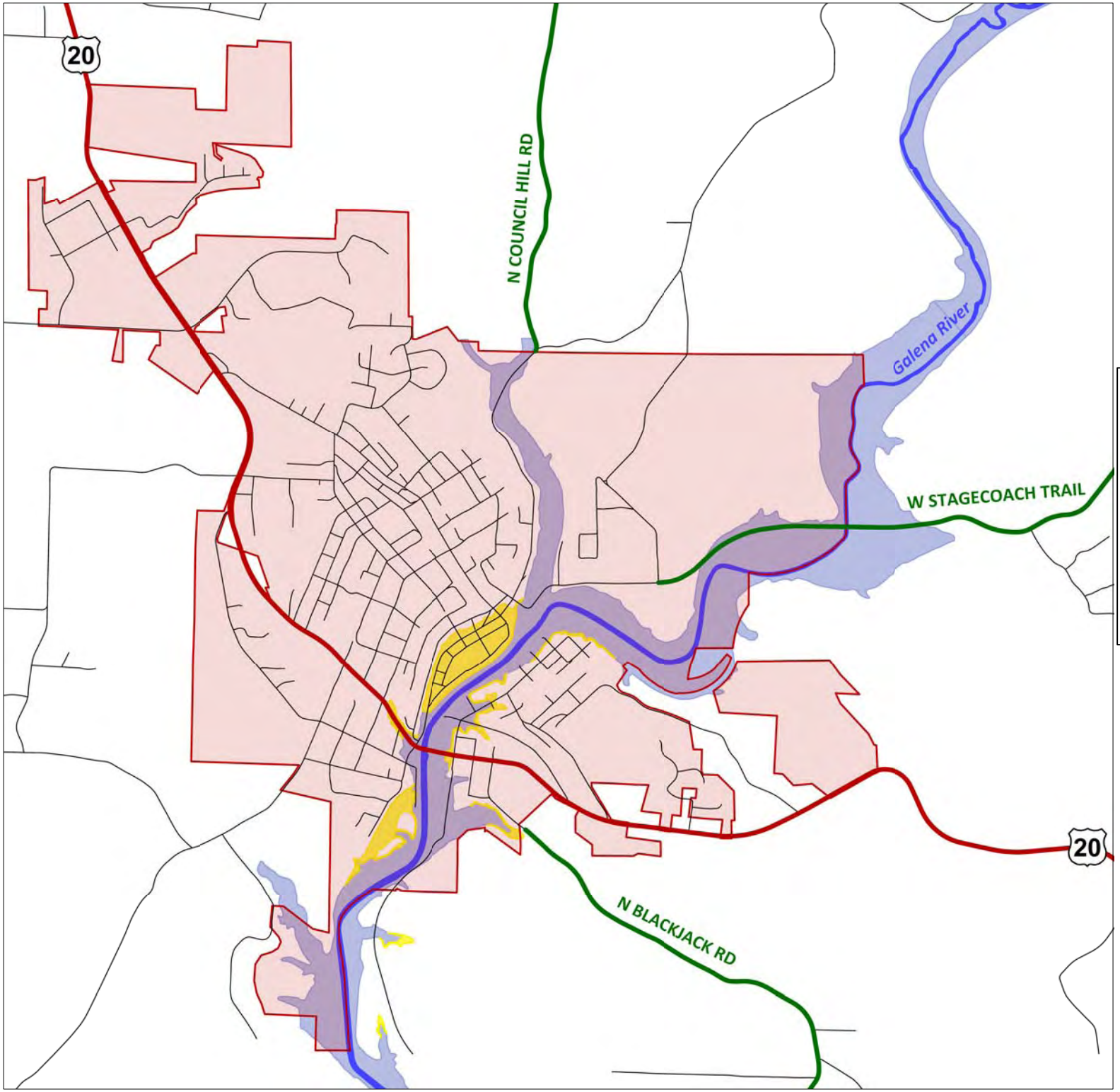
Legend

- Jo Daviess County Boundary
- U.S. Highway 20
- State Highways
- Township Roads/City Streets
- City of East Dubuque Corporate Limits
- Rivers and Streams
- 100 Year Flood Zone
- 500 Year Flood Zone

0.00 0.25 0.50 0.75 1.00
Miles

Map produced by the Jo Daviess County GIS/IT Department on January 15, 2013. Flood zone data derived from FEMA's DFIRMS. All base map data provided by the Jo Daviess County GIS/IT Department. All information is believed to be accurate but is not guaranteed to be without error.

FLOOD ZONES IN THE CITY OF GALENA, JO DAVIESS COUNTY, IL



NORTH

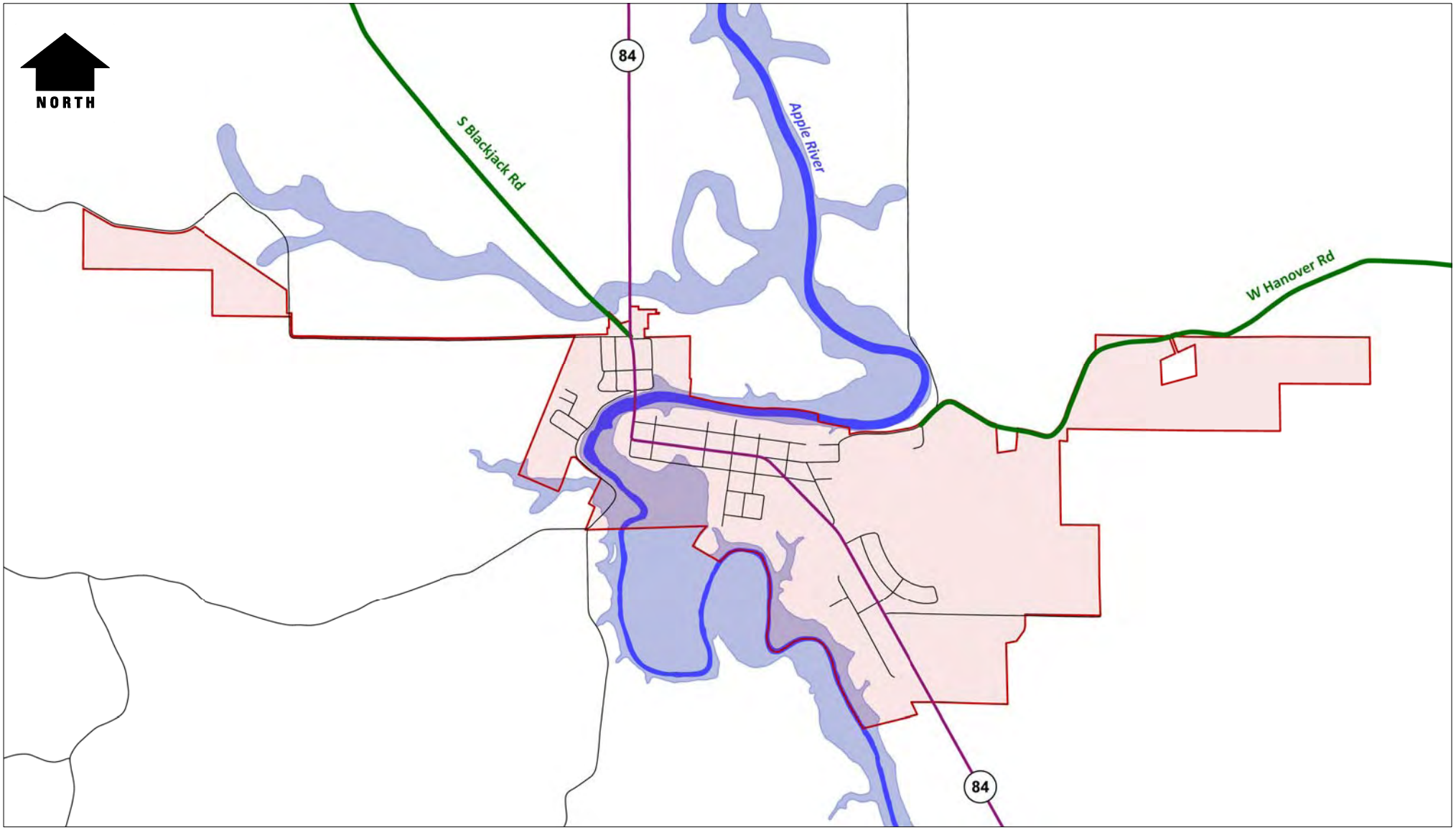
Legend

- U.S. Highway 20
- County Highways
- Township Roads/City Streets
- City of Galena Corporate Limits
- Galena River
- 100 Year Flood Zone
- 500 Year Flood Zone

0.00 0.25 0.50 0.75
Miles

Map produced by the Jo Daviess County GIS/IT Department on January 15, 2013. Flood zone data derived from FEMA's DFIRMS. All base map data provided by the Jo Daviess County GIS/IT Department. All information is believed to be accurate but is not guaranteed to be without error.

FLOOD ZONES IN THE VILLAGE OF HANOVER, JO DAVIESS COUNTY, IL



Legend

- Township Roads/Village Streets
- County Highways
- State Highway 84
- Village of Hanover Corporate Limits
- Apple River
- 100 Year Flood Zone
- 500 Year Flood Zone

0.00 0.25 0.50 0.75 1.00
Miles

Map produced by the Jo Daviess County GIS/IT Department on January 15, 2013. Flood zone data derived from FEMA's DFIRMS. All base map data provided by the Jo Daviess County GIS/IT Department. All information is believed to be accurate but is not guaranteed to be without error.

HISTORIC FLOOD PHOTOGRAPHS

APPENDIX M

July 23, 1892 Flood - Galena, Illinois

High-water mark under window of C.B. & W. R. R. Depot
where Green St. Bridge stood

North Main Street

Photographs provided by Duff Stewart, City of Galena Building Department

July 23, 1892 Flood - Galena, Illinois

South Main Street

Photographs provided by Duff Stewart, City of Galena Building Department

1911 Flood - Galena, Illinois

Corner of Main and Washington Street

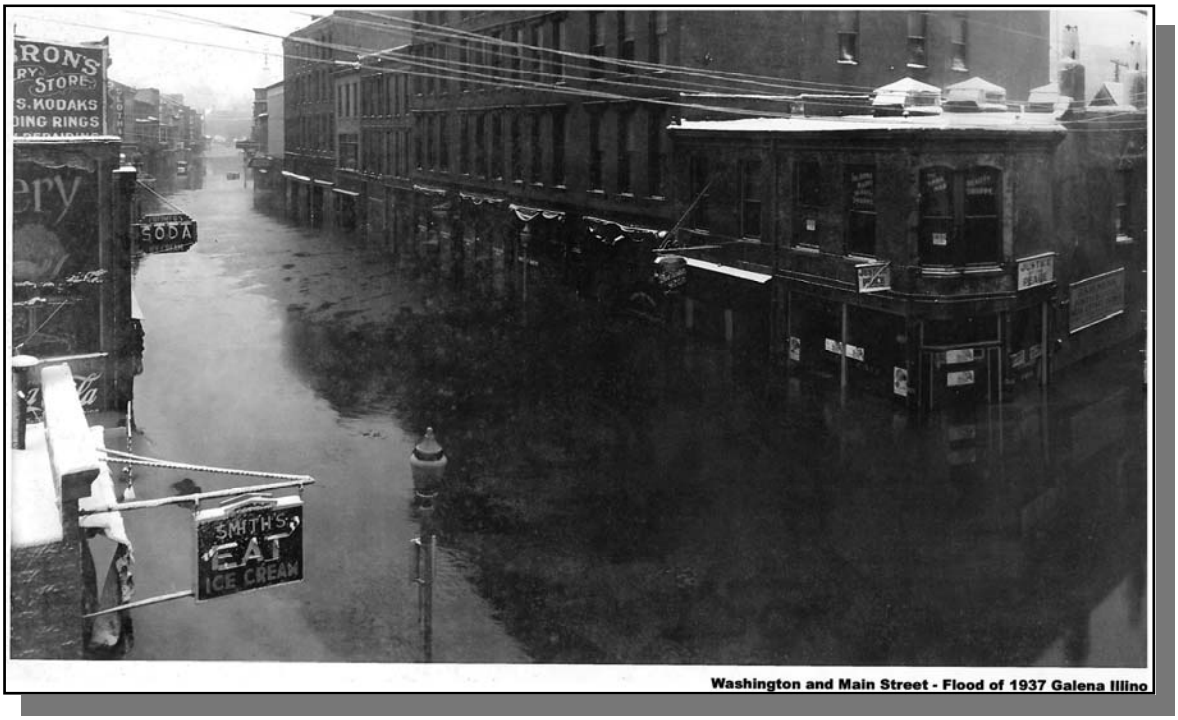
Photograph provided by Duff Stewart, City of Galena Building Department

1919 Flood - East Dubuque, Illinois

Photograph provided by Harold Lange.

1937 Flood - Galena, Illinois

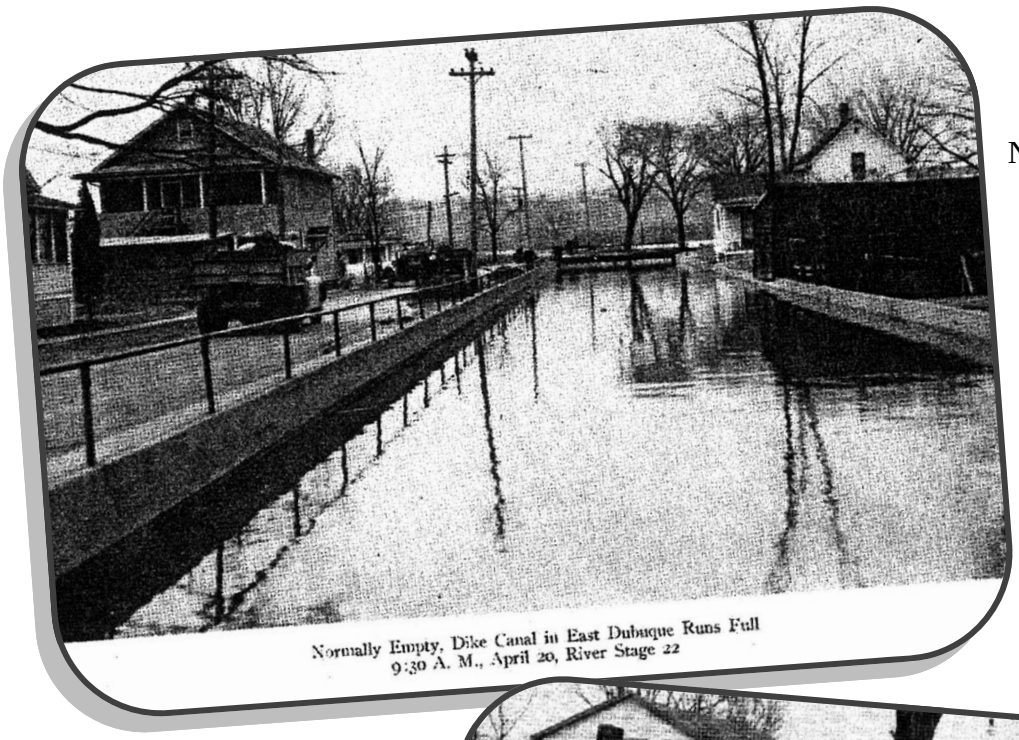
North Main Street



Washington and Main Streets

Photographs provided by Duff Stewart, City of Galena Building Department

1952 Flood - East Dubuque, Illinois



Normally Empty, Dike Canal in East Dubuque Runs Full

9:30 A. M., April 20
River Stage 22

The Dike Holds Firm in East Dubuque

3 P. M., April 22
River Stage 22. 7

Photographs provided by Harold Lange

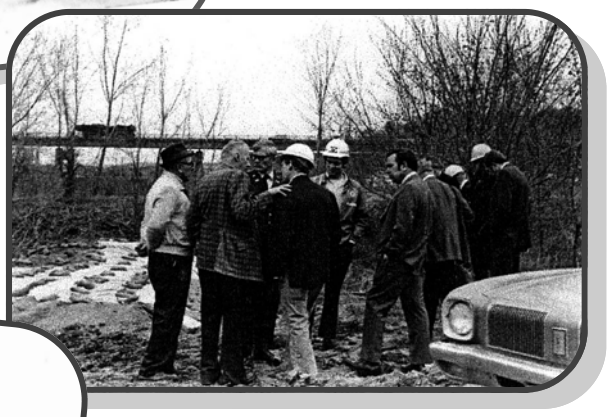
1952 Flood - East Dubuque, Illinois

A Flooded Home
in East Dubuque
April 23, 1952,
River Stage 22.4

The East Dubuque Canal
Runs Full
April 23, 1952
River Stage 22.4

Photographs provided by Harold Lange

1965 Flood - East Dubuque, Illinois



Photographs provided by Dale Lange and Harold Lange

January 1973 Flood - East Dubuque, Illinois

Photographs provided by Dale Lange

1993 Flood - Galena, Illinois

Photographs taken by Ron Toepfer

June 3, 2002 Flash Flood - The Galena Territory, Illinois

Pontoon Boat Caught on Spillway

Boats, Docks and Debris Washed into the North Cove

Boat and Dock Damage

Photographs provided by Madelynn Wilharm

June 3, 2002 Flash Flood - The Galena Territory, Illinois

Dock and Boat Damage

Washout at North Cove Feeder Creek and Cameron Road

Photographs provided by Madelynn Wilharm

June 3, 2002 Flash Flood - The Galena Territory, Illinois

Shenandoah Drive Roadway Damage

Shenandoah Riding Center Erosion

Shenandoah Riding Center Pasture

Photographs provided by Madelynn Wilharm

June 3, 2002 Flash Flood - The Galena Territory, Illinois

Trail Crossing Washout

Debris Line from Flooding on Trail

Debris Line in Plum Cove

Photographs provided by Madelynn Wilharm

June 3, 2002 Flash Flood - The Galena Territory, Illinois

Marina Bridge Damage

Footbridge Across Small Pox Creek at Trail 4

Photographs provided by Madelynn Wilharm

August 1, 2005 Flash Flood - The Galena Territory, Illinois

Spillway from Thunder Bay Road

Looking Down Marina Drive
from Territory Drive

Small Pox Creek East
of Territory Drive

Photographs provided by Madelynn Wilharm

August 9, 2009 Flash Flood - The Galena Territory, Illinois

Boat and Dock Damage

Debris and Damage In the Marina

Boat Damage in the Marina

Photographs provided by Madelynn Wilharm

August 9, 2009 Flash Flood - The Galena Territory, Illinois

Crushed Boats

Marina Damage

Marina Beach Flooding

Photographs provided by Madelynn Wilharm

August 9, 2009 Flash Flood - The Galena Territory, Illinois

Marina Drive Flooding

Small Pox Creek at Thunder Bay Road
Road Closed due to Storm

Small Pox Creek Shoreline

Photographs provided by Madelynn Wilharm

August 9, 2009 Flash Flood - The Galena Territory, Illinois

Small Pox Creek East of Marina Drive

View from Path Leading to Fishing Area at Thunder Bay Falls Park

Trail Repaired at Thunder Bay Falls Park

Photographs provided by Madelynn Wilharm

August 9, 2009 Flash Flood - The Galena Territory, Illinois

Weir Damage in North Cove

Trail Damage in North Cove

Damage to Trail at Belden School Lane

Photographs provided by Madelynn Wilharm

August 9, 2009 Flash Flood - The Galena Territory, Illinois

Small Pox Creek Trail 4 Crossing

Small Pox Creek Trail 5 Washout

Gabion Baskets Undercut
Along Trail 6

Photographs provided by Madelynn Wilharm

August 9, 2009 Flash Flood - The Galena Territory, Illinois

Damage to Trail 6 at No Name Creek

Damage to No Name Creek at Trail 6

Damage on Trail 6A

Photographs provided by Madelynn Wilharm

August 9, 2009 Flash Flood - The Galena Territory, Illinois

Flooding on Trail 6A

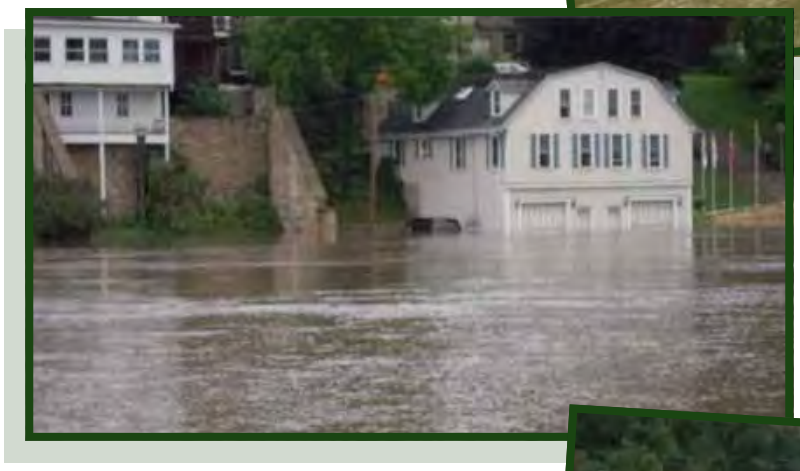
Washout on Trail 6A

Photographs provided by Madelynn Wilharm

July 23 & 24, 2010 Flash Flood
Apple River, Illinois

Photographs provided by F. Jane Toepfer

July 23 & 24, 2010 Flash Flood
Galena, Illinois



The Galena River overflowed its banks, flooding South Main Street just south of the flood gates to the downtown area

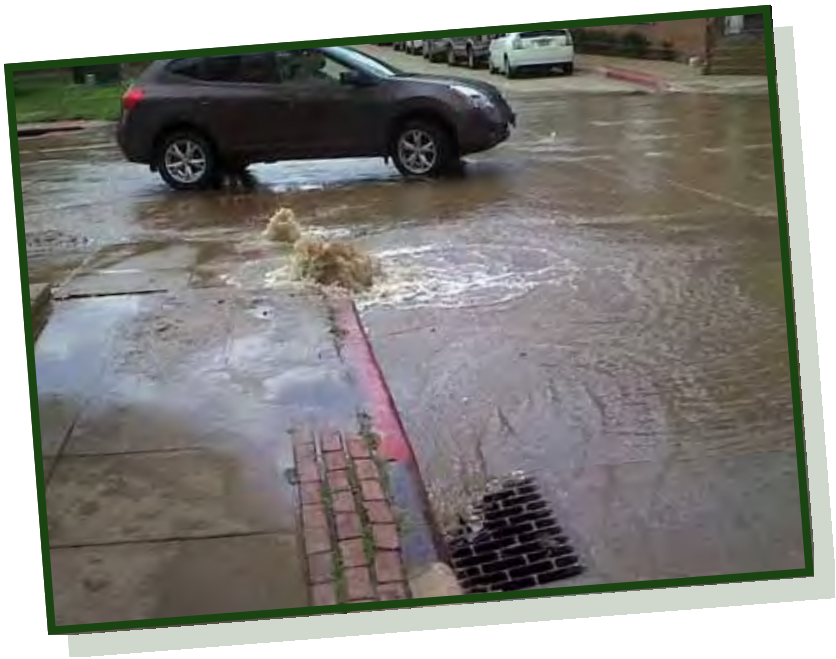
Photographs contributed by Jeanette Dahlquist and Joe Kratcha

July 23 & 24, 2010 Flash Flood
Galena, Illinois

Hughlett Branch overflowed its banks, flooding Claude and Meeker Streets just north of the downtown

Photographs contributed by Donna Berlage and Joe Kratcha

July 23 & 24, 2010 Flash Flood
Galena, Illinois



Water bubbles up from a drain at the intersection of Hill and Commerce Streets

Photographs contributed by Joe Kratcha

July 23 & 24, 2010 Flash Flood
The Galena Territory, Illinois

Boat Damaged by Debris in the Marina

Boat Pen Damage

Looking from the Beach to the Marina

Photographs provided by Madelynn Wilharm

July 23 & 24, 2010 Flash Flood
The Galena Territory, Illinois

Flooding on Marina Drive

Flood Damage to Marina Drive

Flood Damage to Territory Drive

Photographs provided by Madelynn Wilharm

July 23 & 24, 2010 Flash Flood
The Galena Territory, Illinois

Flooding of Road to Miner Road Quarry

Flood Damage at Powderhorn Gap-
Heatherdowns Lane Trail Crossing

Culvert Overwhelmed by Water at Trail 6A

Photographs provided by Madelynn Wilharm

July 23 & 24, 2010 Flash Flood
The Galena Territory, Illinois

Flooding on Trail 6A

Flood Damage at Intersection
of Trails 2 and 4

Photographs provided by Madelynn Wilharm

July 23 & 24, 2010 Flash Flood
The Galena Territory, Illinois

Flood Damage to Trail at Thunder Bay Falls Park

Photographs provided by Madelynn Wilharm

July 23 & 24, 2010 Flash Flood
Hanover, Illinois

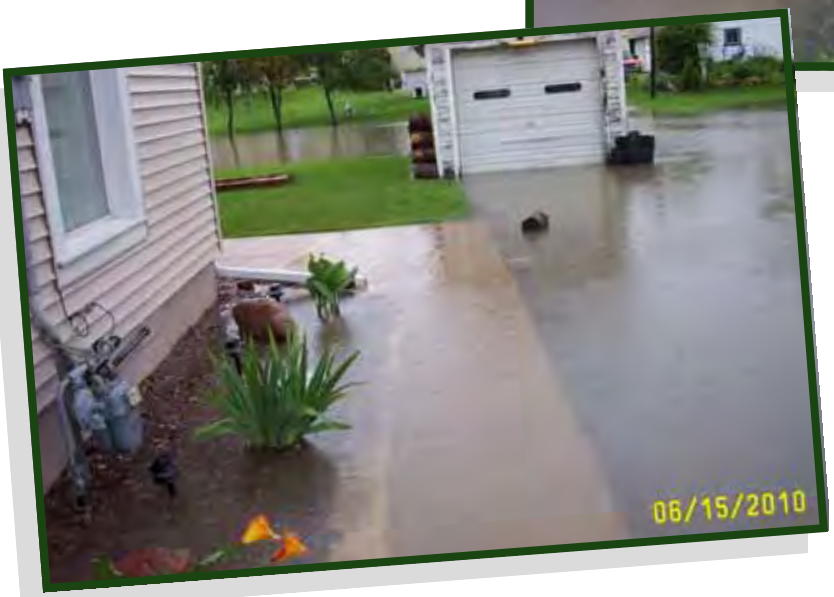
The Apple River overflowed its banks, flooding portions of Hanover including the sewage treatment lagoon on the south side of the Village

(aerial photographs taken looking west)

Photographs provided by Kay Temperly

July 23 & 24, 2010 Flash Flood
Stockton, Illinois

Flooding in Residential Neighborhood



Photographs provided by Steve Rice

July 23 & 24, 2010 Flash Flood
Stockton, Illinois

Flooding in Residential Neighborhood

Roadway Damage Caused by Flooding

Photographs provided by Steve Rice

July 23 & 24, 2010 Flash Flood
Stockton, Illinois

Roadway Damage Caused by Flooding

Photographs provided by Steve Rice

July 23 & 24, 2010 Flash Flood
Stockton, Illinois

Roadway Damage Caused by Flooding

Photographs provided by Steve Rice

July 23 & 24, 2010 Flash Flood
Stockton, Illinois

Roadway Damage Caused by Flooding

Photographs provided by Steve Rice

July 23 & 24, 2010 Flash Flood
Stockton, Illinois

Roadway Damage in Front of
Wastewater Treatment Facility

Debris Line from Flooding on Fence
at Wastewater Treatment Facility

Photographs provided by Steve Rice

July 23 & 24, 2010 Flash Flood
Stockton, Illinois

Debris Line from Flooding on Fence
at Wastewater Treatment Facility

Fence Damage Caused by Flooding adjacent
to the Wastewater Treatment Facility

Photographs provided by Steve Rice

July 23 & 24, 2010 Flash Flood
Stockton, Illinois

Flooding at Wastewater Treatment Facility

Photographs provided by Steve Rice

July 23 & 24, 2010 Flash Flood
Stockton, Illinois

Flooding at Wastewater Treatment Facility

Photographs provided by Steve Rice

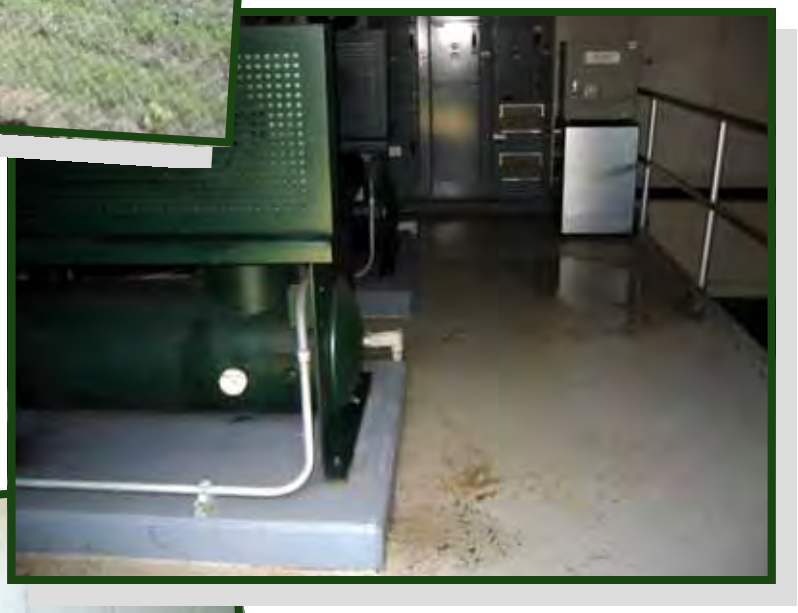
July 23 & 24, 2010 Flash Flood
Stockton, Illinois

Flooding at Wastewater Treatment Facility

Photographs provided by Steve Rice

July 23 & 24, 2010 Flash Flood
Stockton, Illinois

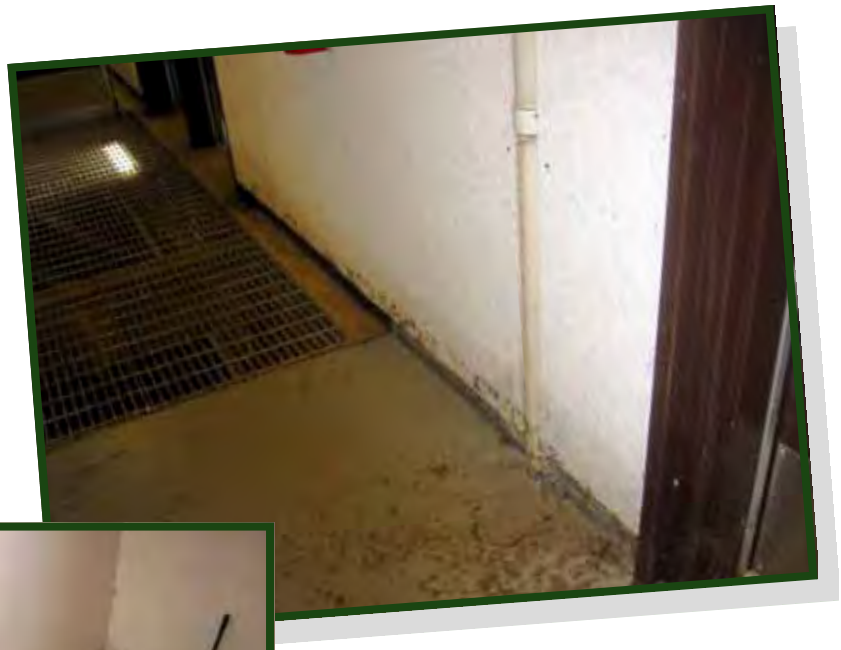
Crop Damage in Field Adjacent to Wastewater Treatment Facility

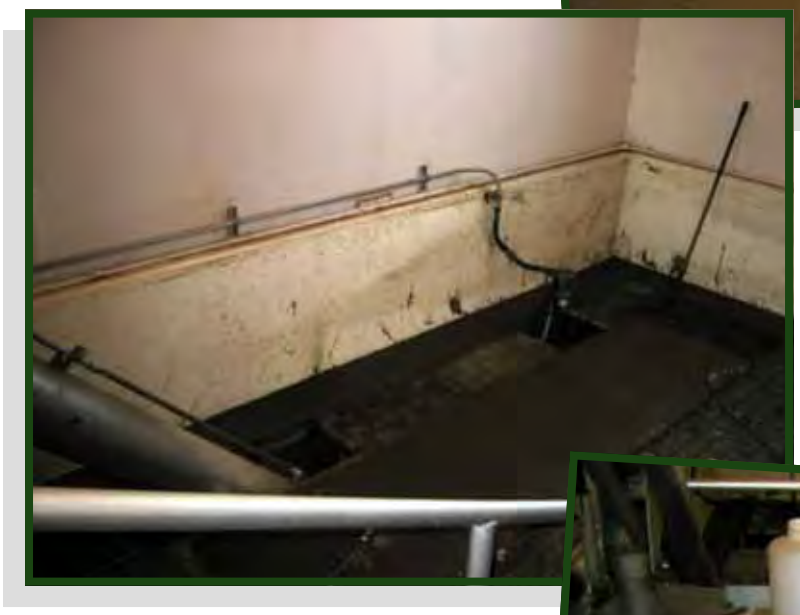


Flooding Inside Wastewater Treatment Facility

Photographs provided by Steve Rice

July 23 & 24, 2010 Flash Flood
Stockton, Illinois





Flooding Inside Wastewater Treatment Facility

Photographs provided by Steve Rice

July 23 & 24, 2010 Flash Flood
Unincorporated Jo Daviess County, Illinois

Debris lodged in guardrail along Apple River Road

Flood damage to bridge on Bethel Road

Flood damage to bridge on Bethel Road

Photographs Contributed by Donna Berlage and Jim Goken

July 23 & 24, 2010 Flash Flood
Unincorporated Jo Daviess County, Illinois

Flood Damage to Upman Road
in Rush Township

Flood Damage to Upman Road
in Rush Township

Flood Damage to Carr Road
In Scales Mound Township

Photographs contributed by Jim Goken

July 23 & 24, 2010 Flash Flood
Unincorporated Jo Daviess County, Illinois

Flood Damage to Georgetown Road Bridge over Apple River northwest of Elizabeth

Photographs provided by Robert Dittmar

July 23 & 24, 2010 Flash Flood
Unincorporated Jo Daviess County, Illinois

Flood Damage to Georgetown Road Bridge over Apple River northwest of Elizabeth

Photographs provided by Robert Dittmar

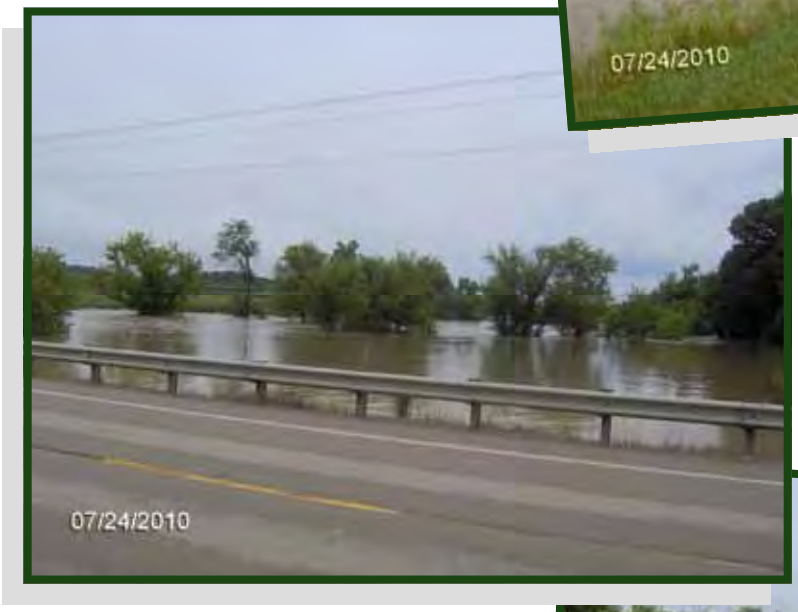
July 23 & 24, 2010 Flash Flood
Unincorporated Jo Daviess County, Illinois

Remains of the Georgetown Road Bridge

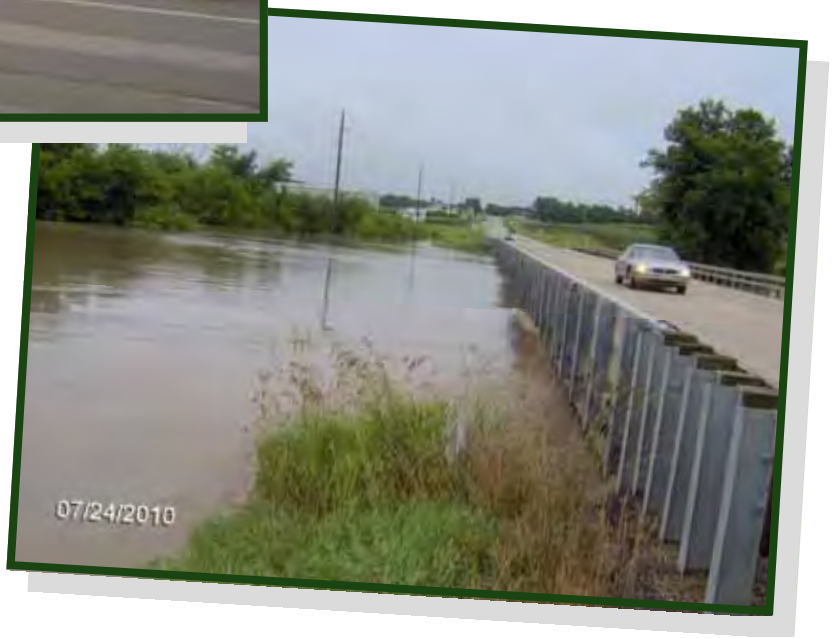
Flooding in rural Jo Daviess County

Photographs courtesy of Robert Dittmar and Steve Keeffer

July 23 & 24, 2010 Flash Flood
Unincorporated Jo Daviess County, Illinois

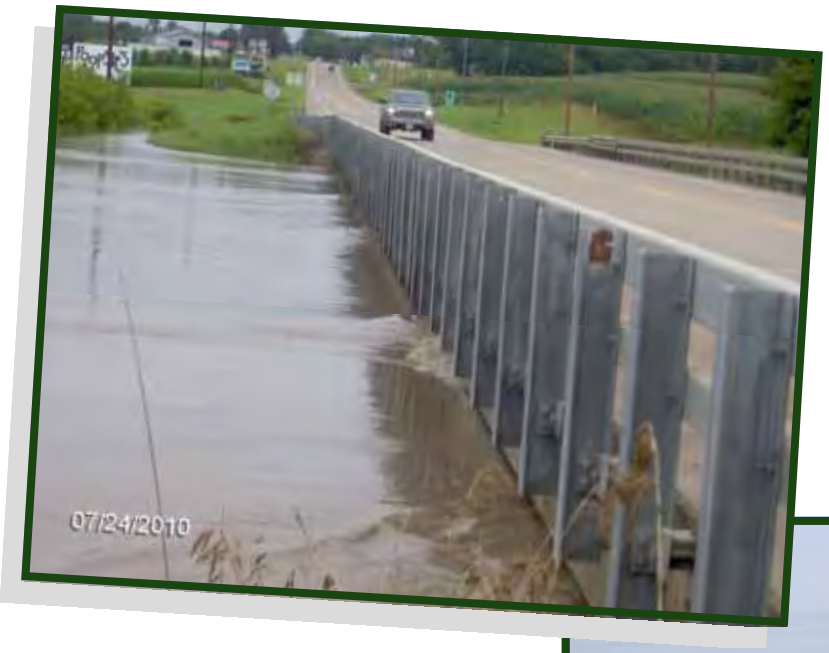


US Route 20 bridge over the Apple River west of Elizabeth

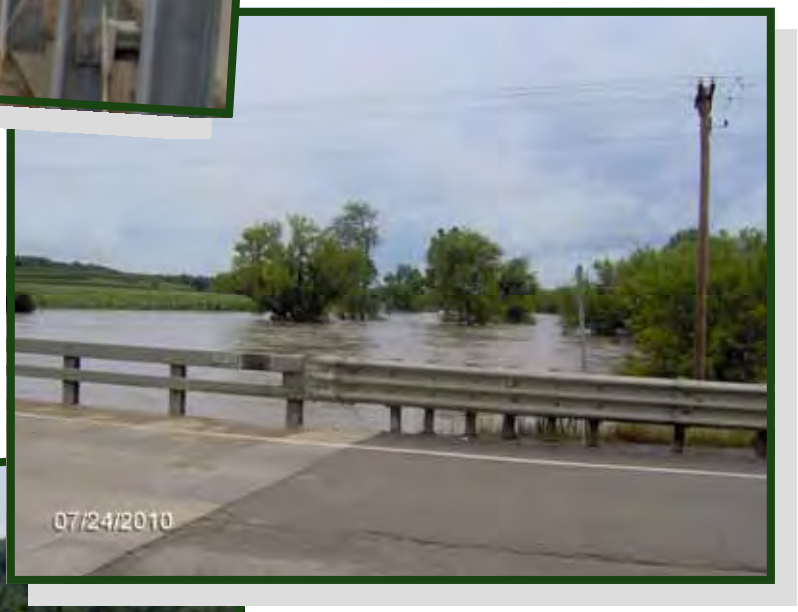


Photographs provided by Robert Dittmar

July 23 & 24, 2010 Flash Flood
Unincorporated Jo Daviess County, Illinois



US Route 20 bridge over the Apple River west of Elizabeth



US Route 20 bridge over the Apple River west of Elizabeth

Flooding in rural Jo Daviess County

Photographs courtesy of Robert Dittmar and Steve Keeffer

July 23 & 24, 2010 Flash Flood
Unincorporated Jo Daviess County, Illinois

Flooding in rural Jo Daviess County

Photographs provided by Robert Dittmar

July 23 & 24, 2010 Flash Flood
Unincorporated Jo Daviess County, Illinois

Flooding in rural Jo Daviess County

Flooding in rural Jo Daviess County

South Elizabeth-Scales Mound Road
over the Apple River west of Elizabeth

Photographs provided by Robert Dittmar

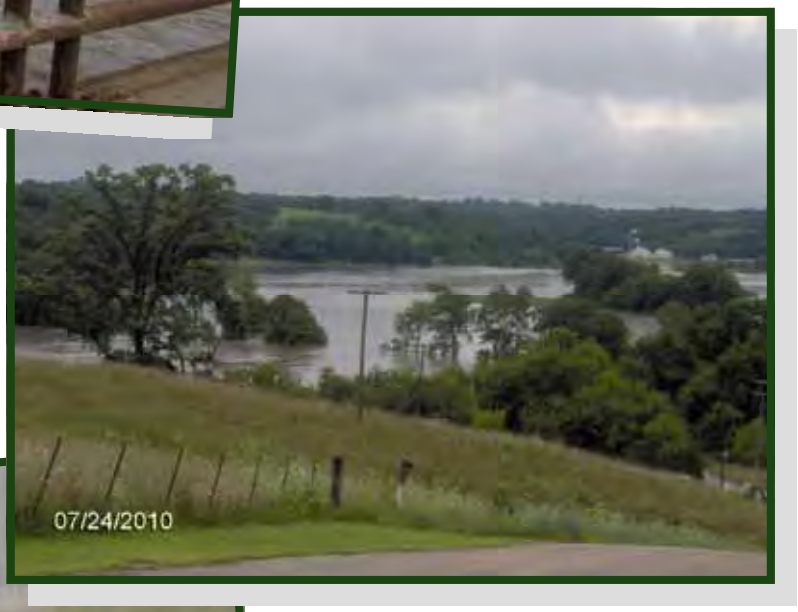
July 23 & 24, 2010 Flash Flood
Unincorporated Jo Daviess County, Illinois

South Elizabeth-Scales Mound Road
over the Apple River west of Elizabeth

Photographs provided by Robert Dittmar

July 23 & 24, 2010 Flash Flood
Unincorporated Jo Daviess County, Illinois

South Elizabeth-Scales Mound Road over the Apple River west of Elizabeth

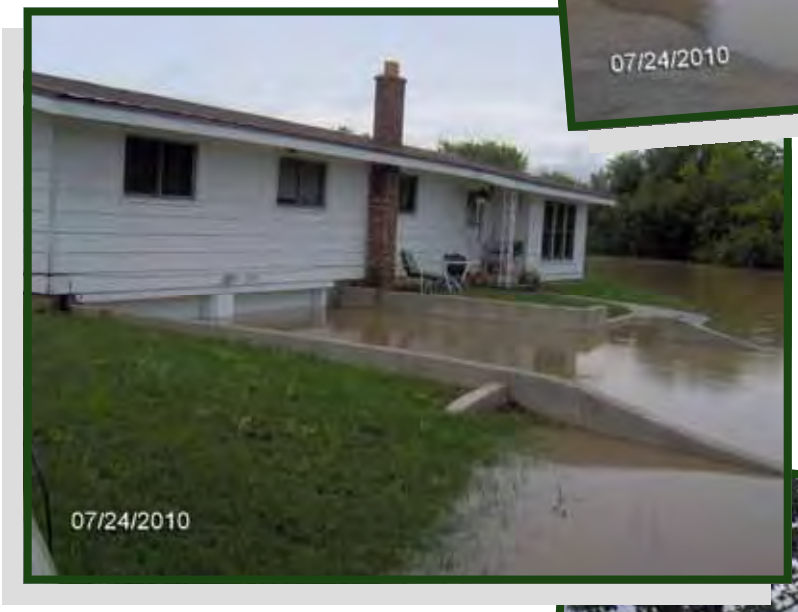


Flooding in rural Jo Daviess County

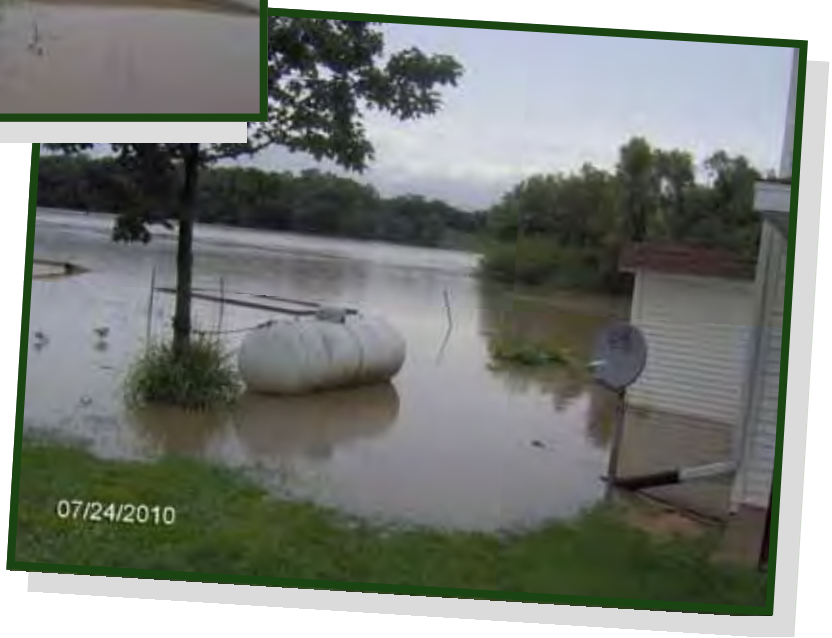
Roadway flooding in rural Jo Daviess County

Photographs provided by Robert Dittmar

July 23 & 24, 2010 Flash Flood
Unincorporated Jo Daviess County, Illinois



Residential flooding in rural
Jo Daviess County



Photographs provided by Robert Dittmar

July 27 & 28, 2011 Flash Flood
East Dubuque, Illinois

Fire Station No. 2 impacted by flood waters

Flooding of businesses and residential neighborhoods

Photographs provided by Tom Lange

July 27 & 28, 2011 Flash Flood
East Dubuque, Illinois

Flooding of residential neighborhoods

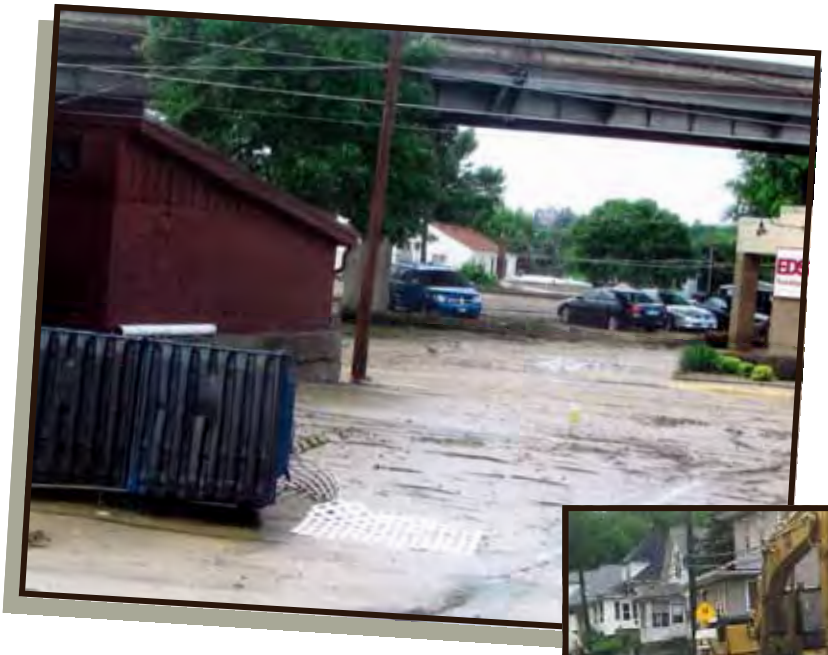
Photographs provided by Colin Fultrath and Tom Lange

July 27 & 28, 2011 Flash Flood
East Dubuque, Illinois

Mud and debris coat city streets

Photographs provided by Tom Lange

July 27 & 28, 2011 Flash Flood
East Dubuque, Illinois



Mud and debris coat city streets

Flood damage to street

Flood damage to street

Photographs provided by Tom Lange

July 27 & 28, 2011 Flash Flood
East Dubuque, Illinois

Flood waters broke up and undermined pavement

Photographs provided by Colin Fulrath and Tom Lange

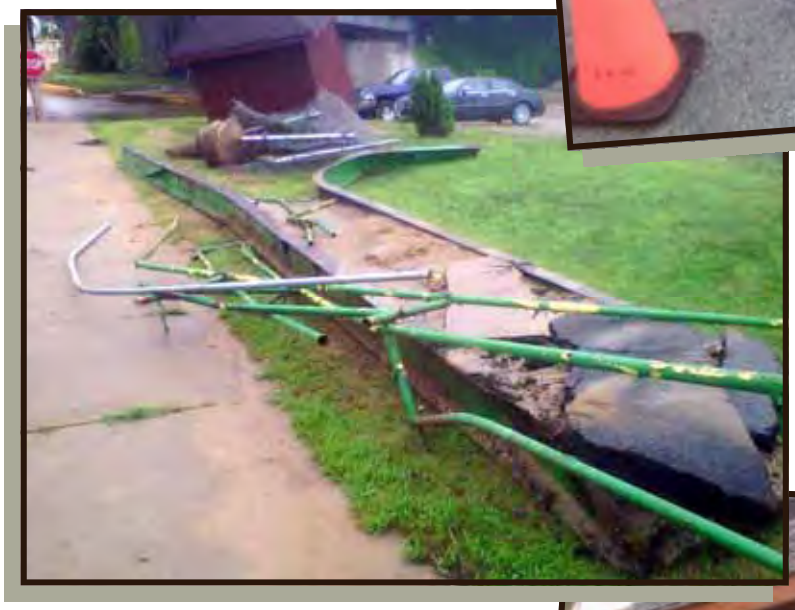
July 27 & 28, 2011 Flash Flood
East Dubuque, Illinois

Flood damage to streets

Photographs provided by Tom Lange

July 27 & 28, 2011 Flash Flood
East Dubuque, Illinois

Flood damage to street



Tourist Information Center
damaged by flood waters

Photographs provided by Tom Lange

July 27 & 28, 2011 Flash Flood
East Dubuque, Illinois

Cars swept into drainage ditch by flood waters

Photographs provided by Colin Fulrath

July 27 & 28, 2011 Flash Flood
East Dubuque, Illinois

Flood damage to John F. Kennedy Road just west of East Dubuque

Photographs courtesy of Tom Lange and Steve Rutz

July 27 & 28, 2011 Flash Flood
East Dubuque, Illinois

Flood damage to a roadway just outside of East Dubuque

Flood damage to Tomahawk Lane just west of East Dubuque

Photographs courtesy of Tom Lange and Steve Rutz

July 27 & 28, 2011 Flash Flood
Galena, Illinois

Flooding of the Galena River

Photographs provided by Colin Fulrath

July 27 & 28, 2011 Flash Flood
Galena, Illinois

The Galena River overflowed its banks, flooding South Main Street

Photographs courtesy of Colin Fulrath and Celestino Ruffini

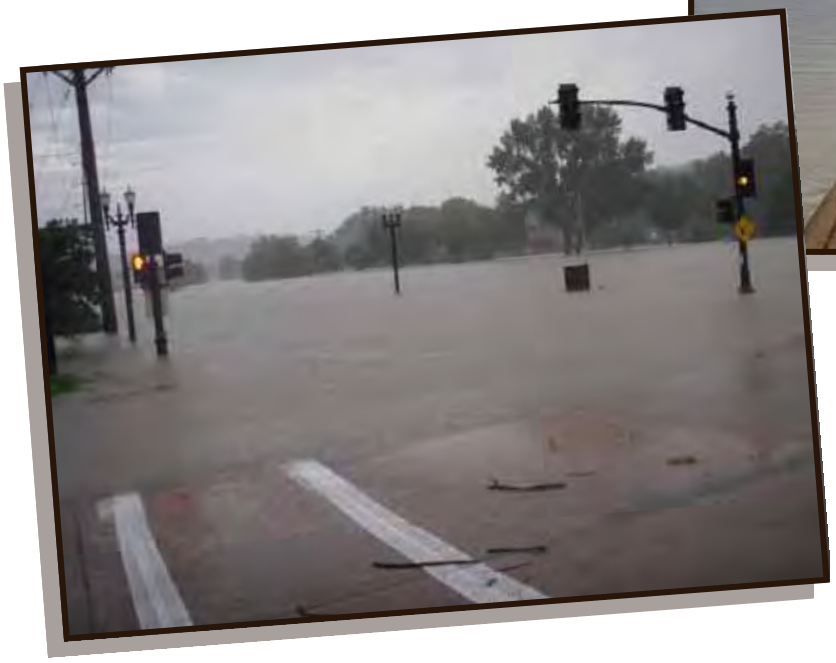
July 27 & 28, 2011 Flash Flood
Galena, Illinois

Flooding along Park Avenue and Johnson Street

Photographs courtesy of Colin Fulrath and Celestino Ruffini

July 27 & 28, 2011 Flash Flood
Galena, Illinois

The Galena River overflowed its banks, flooding many streets in the downtown area



Photographs courtesy of Laura Edmonds and Colin Fulrath

July 27 & 28, 2011 Flash Flood
Galena, Illinois

Excessive rain caused a mudslide that damaged the Grant Park sign and flooded the train tracks and walking path along the Galena River

Photographs courtesy of Laura Edmonds and Colin Fulrath

July 27 & 28, 2011 Flash Flood
Galena, Illinois

Flooding along Green Street and Commerce Street in downtown Galena

Hughlett Branch overflows its banks, flooding Meeker and Claude Streets

Photographs courtesy of Laura Edmonds and Colin Fulrath

July 27 & 28, 2011 Flash Flood
The Galena Territory, Illinois

Flood damage to Thunder Bay Road
near the Lake Galena Spillway

Photographs courtesy of Tom Benson, Colin Fulrath and Madelynn Wilharm

July 27 & 28, 2011 Flash Flood
The Galena Territory, Illinois

Flood damage to Thunder Bay Road taken from Lake Galena looking southwest

Flood damage to Marina Driver

Sedimentation control weir at Territory Drive

Photographs provided by Madelynn Wilharm

July 27 & 28, 2011 Flash Flood
The Galena Territory, Illinois

Debris washed into the Small Pox Creek floodplain

Debris line on lakeshore

Debris removed from the lakeshore in October 2011

Photographs provided by Madelynn Wilharm

July 27 & 28, 2011 Flash Flood
The Galena Territory, Illinois

Dock damage

Flooding at the swimming pool

Damage to pontoon boat

Photographs provided by Madelynn Wilharm

July 27 & 28, 2011 Flash Flood
The Galena Territory, Illinois

Damage to Marina Bridge

Trail damage

Trail washout at Powderhorn Gap

Photographs provided by Madelynn Wilharm

July 27 & 28, 2011 Flash Flood
The Galena Territory, Illinois

Flood damage to Trail 2 at
Deer Hollow Creek

Flood damage to Trail 2 at
Deer Hollow Creek

Trail 2 crossing washout

Photographs provided by Madelynn Wilharm

July 27 & 28, 2011 Flash Flood
The Galena Territory, Illinois

Flood damage to Trail 2B

Bridge damage on Trail 5

Flood damage to Trail 5 at
Small Pox Creek

Photographs provided by Madelynn Wilharm

July 27 & 28, 2011 Flash Flood
Hanover, Illinois

Water laps at the underside of the Illinois Rte. 84 bridge over the Apple River

Flood waters from the Apple River partially surround the Invensys Appliance Control Building

Photographs courtesy of Quentin Petraitis

July 27 & 28, 2011 Flash Flood
Unincorporated Jo Daviess County, Illinois

Flood damage to Chetlain Lane in
Rawlins Township west of Galena

Photographs courtesy of Chris Ward

July 27 & 28, 2011 Flash Flood
Unincorporated Jo Daviess County, Illinois

Flood damage to Blackjack Road near Small Pox Creek in Rice Township southeast of Galena

Photographs courtesy of Donna Berlage, Laura Edmonds and Colin Fulrath

July 27 & 28, 2011 Flash Flood
Unincorporated Jo Daviess County, Illinois

Flood damage to Blackjack Road near Small Pox Creek in Rice Township southeast of Galena

Flood damage to Blackjack Road

Flood damage to Blackjack Road near the Bautsch-Gray Mine in Rice Township southeast of Galena

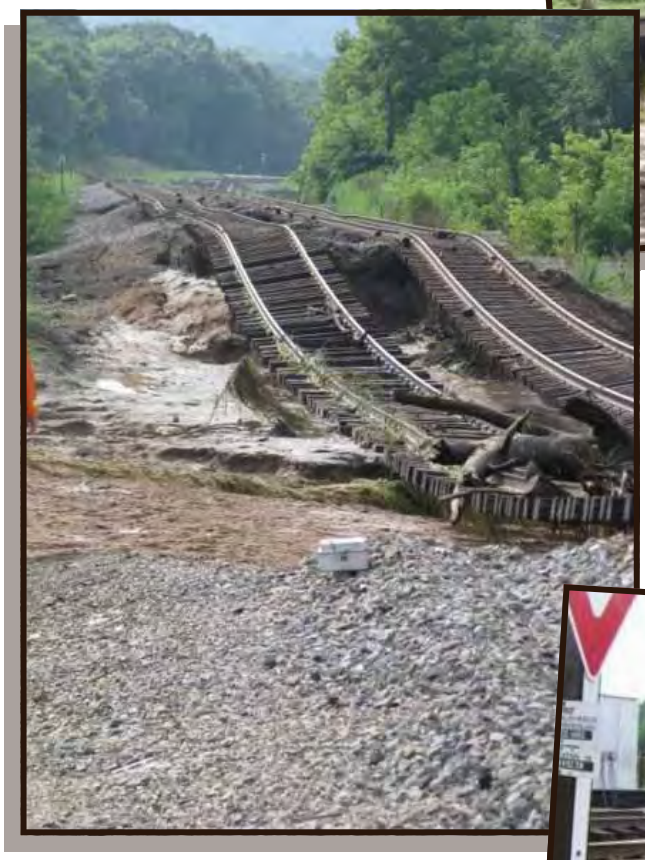
Photographs courtesy of Laura Edmonds and Quentin Petraitis

July 27 & 28, 2011 Flash Flood
Unincorporated Jo Daviess County, Illinois

Flood damage to BNSF railroad tracks along South River Road in Rice Township near Aiken

Photographs courtesy of Donna Berlage and Colin Fulrath

July 27 & 28, 2011 Flash Flood
Unincorporated Jo Daviess County, Illinois



Flood damage to BNSF railroad tracks along South River Road in Rice Township near Aiken

Photographs courtesy of Donna Berlage and Laura Edmonds

July 27 & 28, 2011 Flash Flood
Unincorporated Jo Daviess County, Illinois

Flood damage to BNSF railroad tracks caused a train derailment in Hanover Township near Hanover

Photographs courtesy of Marcie Wiley

July 27 & 28, 2011 Flash Flood
Unincorporated Jo Daviess County, Illinois

Flood damage to South Bethel Road bridge approach over the Plum River near Illinois Rte. 78 in Pleasant Township south of Stockton

Photographs courtesy of Steve Keeffer

PLAN ADOPTION RESOLUTIONS

APPENDIX N

Resolution # 13 - 06

Stockton Illinois

Resolution of Adoption
of the
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan

WHEREAS, the Village of Stockton is subject to natural and man-made 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 Stockton desires to prepare and mitigate for such natural and man-made 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 Jo Daviess County Multi-Jurisdictional All 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 Stockton has participated in developing the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan covering member jurisdictions of Jo Daviess County:

NOW THERFORE, be it resolved that the Village of Stockton hereby:

1. Adopts the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan as the official Hazard Mitigation Plan of the Village of Stockton; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on June 11, 2013

CERTIFIED by Rodney A. Brandt
Rodney A. Brandt
Village President

ATTESTED by Gayle Lingle
Gayle Lingle
Deputy Clerk

(SEAL)

VILLAGE OF STOCKTON
VILLAGE
SEAL
JO DAVIESS CO., ILL.

RESOLUTION No. 13-0613

City of East Dubuque, Illinois
Resolution of Adoption
of the
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan

WHEREAS, the City of East Dubuque is subject to natural and man-made 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 East Dubuque desires to prepare and mitigate for such natural and man-made 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 Jo Daviess County Multi-Jurisdictional All 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 East Dubuque has participated in developing the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan covering member jurisdictions of Jo Daviess County:

NOW THERFORE, be it resolved that the City of East Dubuque hereby:

1. Adopts the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan as the official Hazard Mitigation Plan of City of East Dubuque; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on June 17, 2013

CERTIFIED by George Young
George Young, Mayor

ATTESTED by Darlene Kuhle
Darlene Kuhle, City Clerk

Village of Elizabeth, Illinois
Resolution of Adoption
of the
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan

WHEREAS, the Village of Elizabeth is subject to natural and man-made 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 Elizabeth desires to prepare and mitigate for such natural and man-made 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 Jo Daviess County Multi-Jurisdictional All 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 Elizabeth has participated in developing the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan covering member jurisdictions of Jo Daviess County:

NOW THERFORE, be it resolved that the Village of Elizabeth hereby:

1. Adopts the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan as the official Hazard Mitigation Plan of the Village of Elizabeth, and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on June 19, 2013

CERTIFIED by _____ (SEAL)
Michael Dittmar Village
President

ATTESTED by Barbara Brown
Barbara Brown Village
Clerk

THE GALENA TERRITORY ASSOCIATION, Illinois
Resolution of Adoption
of the
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan

WHEREAS, THE GALENA TERRITORY ASSOCIATION is subject to natural and man-made hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, THE GALENA TERRITORY ASSOCIATION desires to prepare and mitigate for such natural and man-made 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 Jo Daviess County Multi-Jurisdictional All 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 GALENA TERRITORY ASSOCIATION has participated in developing the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan covering member jurisdictions of Jo Daviess County:

NOW THERFORE, be it resolved that THE GALENA TERRITORY ASSOCIATION hereby:

1. Adopts the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan as the official Hazard Mitigation Plan of THE GALENA TERRITORY ASSOCIATION; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on June 22, 2013

CERTIFIED by R. J. Winklehake,President

ATTESTED by Kathy Oczak, Secretary

Village of Warren, Illinois
Resolution of Adoption
of the
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan

WHEREAS, the Village of Warren is subject to natural and man-made 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 Warren desires to prepare and mitigate for such natural and man-made 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 Jo Daviess County Multi-Jurisdictional All 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 Warren has participated in developing the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan covering member jurisdictions of Jo Daviess County:

NOW THERFORE, be it resolved that the Village of Warren hereby:

1. Adopts the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan as the official Hazard Mitigation Plan of the Village of Warren; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on June 24, 2013

CERTIFIED by Wayne Gustin

ATTESTED by Cynthia Brinker

Village of Hanover, Illinois
Resolution of Adoption
of the
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan

WHEREAS, the Village of Hanover is subject to natural and man-made 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 Hanover desires to prepare and mitigate for such natural and man-made 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 Jo Daviess County Multi-Jurisdictional All 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 Hanover has participated in developing the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan covering member jurisdictions of Jo Daviess County:

NOW THERFORE, be it resolved that the Village of Hanover hereby:

1. Adopts the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan as the official Hazard Mitigation Plan of the Village of Hanover; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on June 26th, 2013

CERTIFIED by Donald E. Schaible
Donald E. Schaible,
Village President

SEAL

ATTESTED by Susan Fulton
Susan Fulton, Clerk

Village of Apple River, Illinois
Resolution of Adoption
of the
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan

WHEREAS, Village of Apple River is subject to natural and man-made 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 Apple River desires to prepare and mitigate for such natural and man-made 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 Jo Daviess County Multi-Jurisdictional All 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 Apple River has participated in developing the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan covering member jurisdictions of Jo Daviess County:

NOW THERFORE, be it resolved that the Village of Apple River hereby:

1. Adopts the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan as the official Hazard Mitigation Plan of Village of Apple River; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on July 1, 2013

CERTIFIED by Gerald F. Kent Jr
Gerald F. Kent, Jr
President

ATTESTED by Lindsay K. Kent
Lindsay K. Kent
Village Clerk

R2013 - 20
Jo Daviess County, Illinois
Resolution of Adoption
of the
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan

WHEREAS, Jo Daviess County is subject to natural and man-made hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, Jo Daviess County desires to prepare and mitigate for such natural and man-made 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 Jo Daviess County Multi-Jurisdictional All 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, Jo Daviess County has participated in developing the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan covering member jurisdictions of Jo Daviess County:

NOW THERFORE, be it resolved that the Jo Daviess County hereby:

1. Adopts the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan as the official Hazard Mitigation Plan of Jo Daviess County; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on July 9, 2013

CERTIFIED by Ronald Smith
Ronald Smith
County Board Chairman

ATTESTED by Jean Dimke
Jean Dimke
County Clerk

Resolution R-13-06

A RESOLUTION ADOPTING THE
JO DAVIESS COUNTY MULTI-JURISDICTIONAL ALL HAZARDS MITIGATION PLAN

WHEREAS, Galena and Jo Daviess County are subject to natural and man-made hazards including floods, tornadoes, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, Galena and Jo Daviess County desire to prepare and mitigate for such natural and man-made 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 Jo Daviess County Multi-Jurisdictional All 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 Galena has participated in developing the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan covering member jurisdictions of Jo Daviess County:

THERFORE BE IT RESOLVED, that the Mayor and City Council of the City of Galena, Illinois hereby:

1. Adopt the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan as the official Hazard Mitigation Plan of the City of Galena; and
2. Agrees to participate in the annual and 5-year updates to this Plan.

Passed and approved this 12th day of August, 2013.

AYES: Fach, Greene, Kieffer, Lincoln, Painter, Bernstein, Renner

NAYS: None

Terry J. Renner

Terry Renner, Mayor

ATTEST:

Mary Beth Hyde

Mary Beth Hyde, City Clerk

VILLAGE OF SCALES MOUND, Illinois
Resolution of Adoption
of the
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan

WHEREAS, the Village of Scales Mound, Illinois is subject to natural and man-made 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 Scales Mound, Illinois desires to prepare and mitigate for such natural and man-made 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 Jo Daviess County Multi-Jurisdictional All 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 Scales Mound, Illinois has participated in developing the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan covering member jurisdictions of Jo Daviess County:

NOW THERFORE, be it resolved that the Village of Scales Mound, Illinois hereby:

1. Adopts the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan as the official Hazard Mitigation Plan of the Village of Scales Mound, Illinois and
2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on August 26, 2013

CERTIFIED by _____
James C. Davis, Village President

ATTESTED by Margaret M. Townsend
Margaret M. Townsend, Village Clerk

Apple Canyon Lake Property Owners Association (ACLPOA)
Jo Daviess County, Illinois
Resolution of Adoption
of the
Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan

WHERAS, ACLPOA is subject to natural and man-made hazards including floods, tornados, severe winter storms, severe thunderstorms, and drought among others, that pose risks to public health and property; and

WHEREAS, ACLPOA desires to prepare and mitigate for such natural and man-made 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

WHERAS, ACLPOA has participated in developing the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan covering member jurisdictions of Jo Daviess County;

NOW THEREFORE, be it resolved that the ACLPOA hereby:

1. Adopts the Jo Daviess County Multi-Jurisdictional All Hazards Mitigation Plan as the official Hazard Mitigation Plan of ACLPOA; and

2. Agrees to participate in the annual and 5-year updates to this Plan.

ADOPTED on September 21, 2013

CERTIFIED by Debra McNamee
Debra McNamee
ACLPOA Board President

ATTESTED by _____
Josh Cocagne
ACLPOA Corporate Secretary