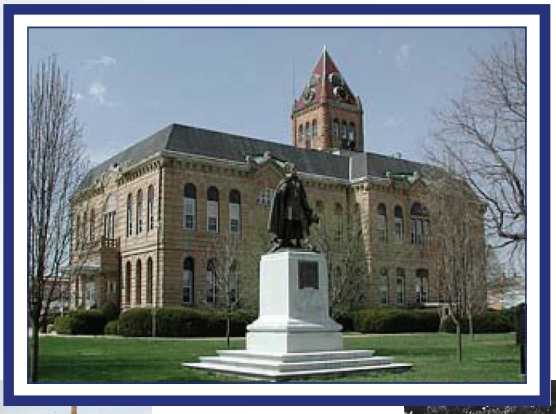
Greene County Multi-Jurisdictional Natural Hazards Mitigation Plan



Participants

Bluffdale Drainage & Levee District
Carrollton, City of
Carrollton Fire Protection District
Eldred, Village of
Eldred Drainage & Levee District
Greene County
Greenfield, City of
Hillview, Village of
Hillview Drainage & Levee District
Keach Drainage & Levee District
Roodhouse, City of
White Hall, City of
Wilmington (Patterson), Village of

September 2011

The five year update of this Plan must be completed on or before (Date).

ACKNOWLEDGEMENTS

Assembling material for this Plan would not have been possible without the involvement of the Greene County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee. Extra special contributions came from Julie Rhoads, Dale Sorrells, Terry Walters, David Roe and Mike Cavanaugh.

Dollar losses caused by storms are frequently difficult, if not impossible, to calculate for a variety of reasons. Consequently, the dollar losses reported in newspapers are typically less than the actual losses that were accrued. Julie Rhoads' experience and research into recent storm damage claims in Greene County helped provide better estimates of the magnitude of dollar losses. In addition, Julie's research uncovered photographs of storm damage. The dollar losses and photographs were not readily available from other sources.

Photographs often convey more information in a concise manner than words. Including photographs improves the appearance and content of a plan. Dale Sorrells' provided photographs of storms and storm damages from his personal collection. Dale's photography skills make his photos stand out from storm photos seen in other counties.

Information on historic weather events in a county are often very hard to locate. Just identifying the date of an occurrence is difficult, let alone finding information on damages and dollar losses. Terry Walters was able to provide detailed information and photographs of several historic flood events that have helped to provide a better perspective of the losses suffered by the County due to flooding.

With a public service career that involved work with the Greene County Emergency Services and Disaster Agency and the Greene County Sheriff's Office, David Roe had accumulated useful information and additional photographs of storm damages that he shared for use in this Plan.

Contributions also came from persons outside of the Planning Committee. Mike Cavanaugh, West Central Development Council, provided the latest copy of the Comprehensive Economic Development Strategy and answered questions needed to put some of the finishing touches on this Plan.

Cumulatively all of these contributions have elevated the quality and appearance of this, the first Greene County Multi-Jurisdiction Natural Hazards Mitigation Plan.

GREENE COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

GREENE COUNTY, ILLINOIS

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

1.0 INTRODUCTION

1.0 INTRODUCTION

Each year natural hazards (i.e., severe thunderstorms, tornadoes, severe winter storms, flooding, etc.) cause damage to property and threaten the lives and health of the residents of Greene County. Since 1965, Greene County has had 12 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 Greene County

Declaration #	Year	Type of Natural Hazard(s) Event
373	1973	severe storms and flooding
583	1979	severe storms and flooding
674	1982	severe storms (torrential rains), severe winds and flooding
684	1983	tornadoes, thunderstorms, flash flooding and unseasonable freezing temperatures
735	1985	severe storms (excessive rainfall), ice jams and flooding
997	1993	flooding
1025	1994	thunderstorms (torrential rains) and flash flooding
1053	1995	tornadoes, severe storms (thunderstorms, torrential rains), severe winds and flash flooding
1416	2002	tornadoes, severe storms (excessive rainfall) and flooding
1633	2006	tornadoes and severe storms
1771	2008	severe storms and flooding
1800	2008	severe storms and flooding

In addition, in the past decade alone, there have been over 66 severe storms (thunderstorms, high winds, hail, lightning strikes, heavy rain etc.), 20 severe winter storms, 19 extreme heat events, nine flood and flash flood events, five tornadoes, one extreme cold event, one drought and one earthquake felt by residents in the County.

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

What is hazard mitigation planning?

Hazard mitigation planning is the process of determining how to reduce or eliminate the loss of life and property damage resulting from natural hazards. This process helps the County and participating jurisdictions reduce their risk from natural hazards by identifying vulnerabilities and developing mitigation actions to lessen and sometimes even eliminate the effects of a hazard. The results of this process are documented in a natural hazards mitigation plan.

Why prepare an all hazards mitigation plan?

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

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

How is this plan different from other emergency plans?

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

1.1 PARTICIPATING JURISDICTIONS

Recognizing the benefits that could be gained from preparing a natural hazards mitigation plan, the Greene County Board passed a resolution on May 13, 2009 authorizing the development of the Greene County Multi-Jurisdictional Natural Hazards Mitigation Plan (hereto referred to as the Plan). **Appendix A** contains a copy of the resolution. The County then invited all the local government entities within Greene County to participate. **Figure 2** identifies the participating jurisdictions that are represented in the Plan. The Greene County Highway Department administered the Plan.

Figure 2
Participating Jurisdictions Represented in the Plan

Bluffdale Drainage & Levee District	Hillview, Village of
Carrollton, City of	Hillview Drainage & Levee District
Carrollton Fire Protection District	Keach Drainage & Levee District
Eldred, Village of	Roodhouse, City of
Eldred Drainage & Levee District	White Hall, City of
Greenfield, City of	Wilmington (Patterson), Village of

1.2 DEMOGRAPHICS

Greene County is located in west-central Illinois and covers approximately 546 square miles. The topography is generally level to gently sloping with the Illinois River forming the western boundary of the County. The County seat is located in Carrollton. Agriculture is the main enterprise in the County. According to the 2007 Census of Agriculture, there were 600 farms in Greene County occupying approximately 78% (273,088 acres) of the total acreage in the County. The major crops include corn, soybeans, and wheat, while the major livestock includes hogs and cattle. Greene County ranks in the top 20 Illinois counties for livestock cash receipts and in the

top 60 counties for crop cash receipts. Several small industries are located in Greene County; however, businesses that serve agriculture employ the greatest number of people within County. Limestone quarries located in the western part of the County provide crushed rock for roads and more finely ground material for application on fields.

Figure 3 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 Greene County is approximately one-third of the market value.

Figure 3
Demographic Data by Participating Jurisdiction

Participating Jurisdiction	Population (2000)	Projected Population (2020)	Total Land Area (Sq. Miles)	Number of Housing Units (2000)	Housing Unit Density (Units per Sq. Mile)	Total Assessed Value of Housing Units
Carrollton	2,605	2,624	1.7	1,166	686	$28,995,464
Eldred	211	213	0.1	100	100	$1,667,514
Greene County (unincorporated)	5,624	5,666	537.4	2,289	5	$132,401,628
Greenfield	1,179	1,188	1.8	533	297	$9,879,542
Hillview	179	180	0.9	71	71	$737,213
Roodhouse	2,214	2,231	1.1	916	833	$12,224,653
White Hall	2,629	2,649	2.6	1,213	467	$19,583,894
Wilmington (Patterson)	120	121	0.8	44	44	$457,166

Sources: Banghart, Deborah. Greene County Clerk. "Greene County." Email to Greg R. Michaud. March 21, 2011.
Illinois Department of Commerce and Economic Opportunity, Census 2000 Data for Illinois, 2010.
Illinois Department of Commerce and Economic Opportunity, Population Projects, Project Summary by County, 2010.
U. S. Census Bureau, Geography, Census 2000 U.S. Gazetteer Files – Counties & Places, 2010.

1.3 LAND USE AND DEVELOPMENT TRENDS

Population growth and economic development are two major factors that trigger changes in land use. Greene County is largely rural with a population that has been declining since 1900. Between 1900 and 2000, the population of Greene County decreased by approximately 37%, from 23,402 to 14,761. All of the participating municipalities have experienced either a decline in population or little to no growth since 1990 with one exception. Between 1990 and 2000, Carrollton experienced an increase of 4% as its population grew from 2,507 to 2,605. The Department of Commerce and Economic Opportunity projected Greene County's population to decrease by roughly 1% between 2000 and 2010, but increase by approximately 1.5% between 2010 and 2020.

Land use in Greene County is primarily agricultural. As discussed in the previous section, approximately 78% of the land area within the County is used as farmland. Agriculture is and will continue to be the leading employment sector for Greene County residents and a vital part of the County's economy.

There are no large-scale economic development initiatives underway in the County. Development in Greene County and adjacent counties is primarily small scale and includes small business start-ups and commercial base expansions, according to the West Central Development Council. 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 Greene County Multi-Jurisdictional Natural Hazards Mitigation Plan (the Plan) was developed through the Greene County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee (Planning Committee). The Plan was prepared to comply with the Disaster Mitigation Act of 2000 and incorporates the Federal Emergency Management Agency's (FEMA) 10 step planning process approach. **Figure 4** provides a brief description of the process utilized to prepare this Plan.

Figure 4
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 incorporated two of FEMA's steps: assessing the hazard and assessing the problem.)
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. Any 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 incorporated two of FEMA's steps: adopt the plan and implement, evaluate and revise the plan.)

Plan development was led at the staff level by David Marth, the County Engineer for the Greene County Highway Department. Johnson, Depp & Quisenberry, an environmental and engineering consulting firm, with experience in hazard mitigation, risk assessment and public involvement, was employed to guide the County and participating jurisdictions through the planning process.

Participation in the planning process, especially by the County and local government representatives, was crucial to the development of the Plan. To ensure that all participating

jurisdictions took part in the planning process, participation requirements were established. Each participating jurisdiction agreed to satisfy the following requirements in order to be included in the Plan. All of the participating jurisdictions met the participation requirements.

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

2.1 PLANNING COMMITTEE

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

Figure 5 details the entities represented on the Planning Committee and the individuals who attended on their behalf. The Planning Committee was chaired by the Greene County Highway Department.

Additional technical expertise was provided by Terry Walters of the Greene County Soil and Water Conservation District, 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.

Two subcommittees were formed to help with the development of the risk assessment and the mitigation strategy. Members of the subcommittees were provided information in advance of the Planning Committee to obtain their input. Once their input was incorporated, the appropriate sections of the Plan were presented to the entire Planning Committee for discussion and comment. All communication with the subcommittees was handled via email and phone conferences.

Figure 5
Greene County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee Member Attendance Record

Representing	Name	5/18/2010	8/5/2010	12/9/2010	6/9/2011	8/18/2011
Ameren	Cooper, Pat				X	
	Smith, Brady	X	X			
Bluffdale Drainage & Levee District	York, Jeff	X				
	York, Kellie		X		X	
Carrollton	Gross, Terry	X			X	X
Carrollton CUSD #1	Pressler, Beth					X
Carrollton Fire Protection District	Banghart, Jim		X			
	Schild, BJ	X	X		X	X
Eldred	Schild, John				X	X
Eldred Drainage & Levee District	Schild, BJ	X	X		X	X
Greene County Ambulance	Campbell, Deb	X	X	X		X
Greene Co. - Board	Longmeyer, Maxine	X				
	Nord, Joe	X	X	X		X
	Roberts, Don	X				
	Strang, Mark				X	
Greene Co. - Clerk	Banghart, Deborah	X				X
Greene Co. - ESDA	Roe, David	X				
Greene Co. - GIS/Tax Assessor	Waldheuser, Jill	X	X	X		
Greene Co. - Health Dept.	Flowers, Ruth Ann	X		X	X	X
	Thornton, Sue	X		X	X	X
Greene Co. - Highway Dept.	Marth, David	X	X	X	X	X
Greene Co. - Sheriff	Graham, Rick	X				
Greene Co. - Sheriff's Dept./ESDA	Hoesman, Cale			X	X	X
Greene Co. - Treasurer	Ballard, Kirby	X		X	X	
Green County Farm Bureau	Painter, Mike	X	X	X		X
Greene County Rural Water	Rives, Charlie	X				
	Varble, Mary Kay	X				
Greenfield	Newton, Richard		X	X	X	X
Hillview	Bugg, Connie	X				
	Bugg, Dwayne		X		X	X
Hillview Drainage & Levee District	York, Jeff	X				
	York, Kellie		X		X	
Illinois Rural Electric Coop	Coultas, Ron	X				
Keach Drainage & Levee District	York, Jeff	X				
	York, Kellie		X		X	
Roodhouse	Goodman, Vernon		X			
	Janvrin, John					X
Roodhouse Fire Prtotection District	Killion, Liz	X				
Soil & Water Conservation Service	Walters, Terry	X	X	X		X
White Hall	Coultas, Luke					X
	McMillen, Rob		X			
	Wallis, Jack				X	
Wilmington (Patterson)	Ford, Chris					X
	Sorrells, Dale	X	X	X	X	
Whitworth, Horn & Goeten Insurance	Rhoads, Julie	X	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 Greene County Multi-Jurisdictional Natural Hazards Mitigation Plan Committee is to develop a mitigation plan that can reduce the negative impacts of natural hazards on citizens, infrastructure, private property and critical facilities."

Planning Committee Meetings

The Planning Committee met five times between May, 2010 and August, 2011. **Figure 5** identifies the representatives present at each meeting. **Appendices B** and **C** contain copies of the sign-in sheets and meeting minutes for each meeting. The purpose of each meeting, including the topics discussed, is provided below.

First Planning Committee Meeting – May 18, 2010

The purpose of this meeting was to explain the planning process to the Planning Committee members and give them a brief overview on what a natural hazard 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 Documents Relevant to the Natural Hazard Mitigation Plan" and "Critical Facilities" and return them at the next meeting. Copies of the citizen questionnaire were also distributed.

Second Planning Committee Meeting – August 5, 2010

At the second Planning Committee meeting the natural hazard risk assessment section was presented for review. Committee members were asked to think about whether any critical facilities have been damaged by a natural hazard event within their jurisdiction. he 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 Hazard Data Collection" and "Natural Hazard Mitigation Plan Projects" and return them at the next meeting.

Third Planning Committee Meeting – December 9, 2010

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.

Fourth Planning Committee Meeting – June 9, 2011

At the fourth meeting the sections of the Plan focusing on the vulnerability assessment, 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 – August 18, 2011
The purpose of the fifth Planning Committee meeting was to provide the public an opportunity to provide comments on the draft Plan.

2.2 PUBLIC INVOLVEMENT

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

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

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

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

A total of 24 questionnaires were completed and returned to the Planning Committee. The questionnaires were filled out by residents of unincorporated Greene County as well as seven of the eight participating municipalities. While fewer questionnaires were returned than has been experienced using similar techniques with virtually the same survey in other counties, the responses should provide useful information to decision-makers as they deliberate how best to disseminate information about natural hazards and how residents can protect themselves and their property. Additionally, these results provide an indication of county-wide 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 and severe winter storms have been the most frequently encountered natural hazard in Greene County. This response is consistent with weather records compiled for Greene County and described in this Plan.
- Electronic (radio, television and internet) 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. Fact

sheets distributed via mail and through the public health department also received strong support among respondents.

- Four categories of mitigation projects and activities were felt to be most needed. The categories are identified as follows and include the percentage of support received from respondents.
  - maintaining power during storms (67%);
  - providing flood or drainage protection (67%), the respondents who selected this category felt that culvert and drainage ditch maintenance and dam or levee construction/maintenance were the most needed activities;
  - maintaining roadway passage (58%); and
  - public information materials (50%).

  The next closest category was sirens or other alert systems which received 38% of the respondents support.

FAQ Fact Sheet

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

News Releases

News releases were prepared and submitted to local print media prior to each Planning Committee meeting. The releases announced the purpose of the meetings and how the public could become involved in the Plan's development. **Appendix F** contains a list of the newspapers that received the new releases and copies of the news articles that were printed. No newspaper articles were printed for the August 18, 2011 public forum even though a news release was issued. A copy of the official news release is included in place of a newspaper article for this meeting.

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 August 18, 2011, 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 September 2, 2011 at the Greene County Clerk's Office, the libraries in Carrollton, Greenfield, Roodhouse and White Hall and the Village Halls in Eldred and Hillview. 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 impact the County. This information includes details about floods and lightning strikes not available from state and federal databases.
- *Obtained critical facilities damage information.* Data collection surveys soliciting information about critical facilities damaged by severe storms and other natural hazards were used to supplement information obtained from government files. This information was used in the preparation of the vulnerability assessment.
- *Increased awareness of hazard events that impact the County.* Understanding how mitigation actions can reduce risk helped generate potential projects at the local level not previously considered.

2.3 PARTICIPATION OPPORTUNITIES FOR INTERESTED PARTIES

Neighboring communities, agencies, businesses, academia, not-for-profits and other interested parties were given several opportunities to participate in the planning process. Examples include: sending out letters to adjacent counties informing them of Greene County's intention to prepare a natural hazard mitigation plan and extending an invitation to attend Planning Committee meetings (see **Appendix I** for a copy of the letter); directly inviting communities, agencies, businesses, and others to serve on the Planning Committee; and through the many public involvement activities listed previously.

To improve participation among the business community, representatives from those segments of the business community who have the most interest in natural hazard mitigation were invited to serve on the Planning Committee. With agriculture and its support businesses being the dominant business in Greene County as well as touching every aspect of life and defining the character and heritage of the area, it was important to include the agricultural community in the planning process. It was decided that this segment should be represented by two entities, the

Greene County Farm Bureau and the Greene County Soil and Water Conservation District. Both representatives had extensive experience and connections with the various sub-segments of agriculture.

Input from the insurance industry was also needed to provide balance and context for discussion regarding property damages, not only to agriculture, but also to other segments of the business community as well as residential property damages. A local insurance agent represented the insurance industry and was able to provide additional information regarding storm damages. Utility companies serving the area were also invited to participate in the planning process. Representatives from Ameren, Illinois Rural Electric Coop and Greene County Rural Water were able to provide additional information on damages to critical utilities within the County.

Although not part of the Committee, additional information about the needs of existing and potential businesses was solicited from two sources: the Greene County Economic Development Council and the West Central Development Council, Inc. The Greene County Economic Development Council participated by providing information related to the business development they have created between Roodhouse and White Hall. Information about the planning process and storm mitigation was shared with the Council. The West Central Development Council, Inc. shared information about specific business needs in each municipality and identified areas of anticipated business growth by sector and region.

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 6** summarizes the availability of existing planning documents by participating jurisdiction. These documents were reviewed and incorporated into the Plan whenever applicable. At the time this Plan was prepared, none of the participating government entities had approved comprehensive plans.

Greene County is part of an economic development district comprised of Calhoun, Christian, Jersey, Macoupin, Montgomery and Shelby Counties. The most recent comprehensive economic development strategy report (August 2009 – September 2010) prepared for these counties by the West Central Development Council, Inc. was evaluated to identify mutually supporting goals and objectives.

Figure 6
Existing Planning Documents by Participating Jurisdiction

Existing Planning Documents	Participating Jurisdiction							
	Carrollton	Eldred	Greene County	Greenfield	Hillview	Roodhouse	White Hall	Wilmington (Patterson)
Plans								
Comprehensive Plan								
Emergency Management Plan		X	X					
Land Use Plan						X		
Codes & Ordinances								
Building Codes						X		
Drainage Ordinances						X		
Historic Preservation Ordinance						X		
Subdivision Ordinance(s)	X		X	X		X		
Zoning Ordinances	X							
Maps								
Existing Land Use Map	X					X		
Infrastructure Map				X	X		X	
Zoning Map	X							
Flood-Related								
Flood Ordinance(s)	X		X	X	X			
Flood Insurance Rate Maps	X		X	X	X			
Repetitive Flood Loss List								
Elevation Certificates for Buildings								

3.0 RISK ASSESSMENT

3.0 RISK ASSESSMENT

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

This risk assessment identifies the natural hazards that pose a threat to the County and includes a profile of each which 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 hazard would have on the health and safety of the residents of Greene County as well as the buildings, critical facilities and infrastructure located within the County. Where applicable, the differences in vulnerability between participating jurisdictions are described.

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

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

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 Weather Service (NWS) defines a "severe storm" as any thunderstorm that produces one or more of the following elements:

- 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. For the purposes of this report, tornadoes and flooding are categorized as separate hazards and are not discussed under severe storms.

Thunderstorms affect relatively small areas when compared to winter storms or hurricanes. The typical thunderstorm is approximately 15 miles in diameter and lasts an average of 30 minutes at a single location. They may occur singly, in clusters or in lines. Despite their size, all thunderstorms are dangerous and capable of threatening life and property. Thunderstorms can bring heavy rain, damaging winds, hail, lightning and tornadoes. 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 a term used to define any wind produced by a thunderstorm that is not associated with rotation. Straight-line winds are responsible for most thunderstorm wind damage. There are several types of straight-line winds including downdrafts, downbursts and microbursts. Straight-line wind speeds can exceed 87 knots (100 mph) 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 7** shows conversions from knots to miles per hour for various wind speeds.

Figure 7
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 and how is it formed?

Hail is precipitation in the form of spherical or irregular-shaped pellets of ice. It forms within a thunderstorm when strong rising currents of air (updrafts) carry raindrops into extremely cold areas of the atmosphere where freezing occurs. As the hail grows in size they become heavier and begin to fall. Depending on the strength of the updraft, the hail may be caught up and re-circulated through the storm clouds many times. Eventually the hail becomes too heavy to be supported by the thunderstorm's updrafts and falls to the ground. The size of an individual hailstone depends on how many times it is drawn back up into the upper levels of the storm cloud before finally falling to the ground.

In the United States, hail annually causes more than $1 billion in damage to property and crops. It damages buildings and homes by perforating holes in roofs and shingles, breaking windows and denting siding and damages automobiles by denting panels and breaking windows. Hail rarely causes any deaths; however, several dozen people are injured each year in the United States.

How are hail events measured?

The magnitude or severity 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 8** provides descriptions for various hail sizes.

Figure 8
Hail Size Descriptions

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

Source: NOAA, Storm Prediction Center, Converting Traditional Hail Size Descriptions Table.

Hail size can vary widely. Hailstones may be as small as ¼ inch in diameter (pea-sized) or, under extreme circumstances, as large as 4 ½ inches in diameter (softball-sized). Typically hail that is 1 inch in diameter (quarter size) or larger is considered severe.

Hail events 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 9** 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 9
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 / marble	slight general damage to plants, crops
H2	Significant	10-20 mm	0.4" – 0.8"	dime / penny	significant damage to fruit, crops, vegetation
H3	Severe	20-30 mm	0.8" – 1.2"	nickel / quarter	severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-40 mm	1.0" – 1.6"	half dollar / ping pong ball	widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50 mm	1.2" – 2.0"	golf ball	wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60 mm	1.6" – 2.4"	golf ball / egg	bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-75 mm	2.0" – 3.0"	egg / tennis ball	severe roof damage, risk of serious injuries
H8	Destructive	60-90 mm	2.4" – 3.5"	tennis ball / tea cup	severe damage to aircraft bodywork
H9	Super Hailstorms	75-100 mm	3.0" – 4.0"	tea cup / grapefruit	extensive structural damage, risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	> 100 mm	> 4.0"	softball	extensive structural damage, risk of severe or even fatal injuries to persons caught in the open

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

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

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

What is lightning?

Lightning, a component of all thunderstorms, is an electrical discharge that results from the buildup of charged ions. 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 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 80 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 in St. Louis, Missouri is responsible for issuing severe thunderstorm watches or warnings for Greene County depending on the weather conditions. The following provides a brief description of each type of alert.

- **Severe Thunderstorm 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.
- **Severe Thunderstorm Warning.** A severe thunderstorm warning is issued when severe weather (hail 1 inch in diameter or greater and/or winds which equal or exceed 58 mph) has been reported by spotters or indicated by 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?

Tables 1, 2, 3 and **4** summarize the previous occurrences as well as the extent or magnitude of severe storms in Greene County. The severe storm events are separated into four categories: thunderstorm and high wind events, hail events, lightning events and heavy rain events. Severe storms are the most frequently occurring natural hazard in Greene County.

THUNDERSTORMS AND HIGH WINDS

The National Oceanic and Atmospheric Administration's Storm Events Database and community records show 76 reported occurrences of thunderstorms and high winds in Greene County between 1955 and 2010. Of the 76 reported occurrences, 45 had wind speeds of 50 knots or greater. There were, however, 26 reported occurrences of thunderstorms and high winds where the wind speed was not recorded.

Thunderstorms with high winds have impacted every municipality within the County on multiple occasions. While there are no official recorded events in Table 1 for Wilmington (Patterson), there are multiple verified events that impacted the entire county. **Figures 10** and **11** chart the reported occurrences of thunderstorm and high wind events by month and hour. Of the 76 events, 60 took place between April and August, making this the peak period for thunderstorms and high winds in Greene County. Approximately 72% of all thunderstorm and high wind events with recorded times occurred during the p.m. hours, with a majority (69%) of those events taking place between 4 p.m. and 9 p.m.

Figure 10
Greene County Thunderstorm & High Wind Events by Month – 1955 through 2010

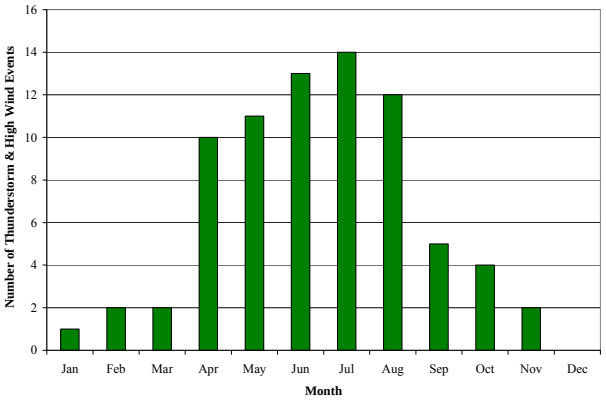
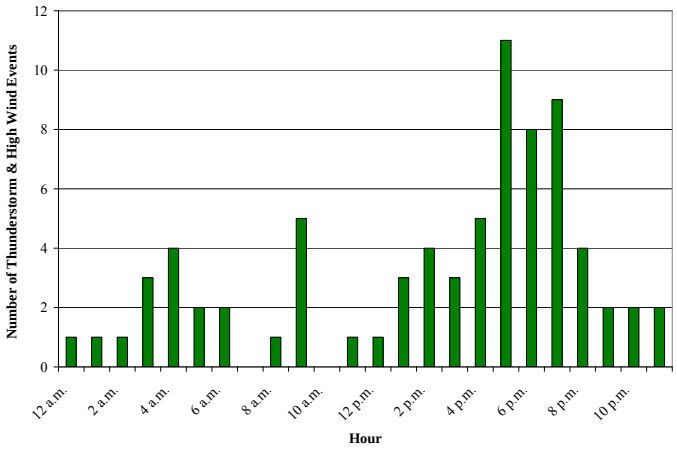


Figure 11
Greene County Thunderstorm & High Wind Events by Hour – 1955 through 2010



NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center. Storm Events Database. Illinois: Greene County. 2011.

HAIL

The Storm Events Database and community records show 25 reported occurrences of hail one inch in diameter or greater in Greene County between 1963 and 2010. Of the 25 reported occurrences, 12 produced hailstones 1.50 inches or larger in diameter. The largest hail recorded in Greene County measured 2.50 inches in diameter (tennis ball size) and fell on May 9, 2003 in White Hall.

Figures 12 and **13** chart the reported occurrences of hail by month and hour. Nineteen of the 25 events took place between April and May, making this the peak period for hail events in Greene County. Approximately 92% of all hail events with recorded times occurred during the p.m. hours, with a majority (68%) of those events taking place between 12 p.m. and 5 p.m.

Figure 12
Greene County Hail Events by Month 1963 through 2010

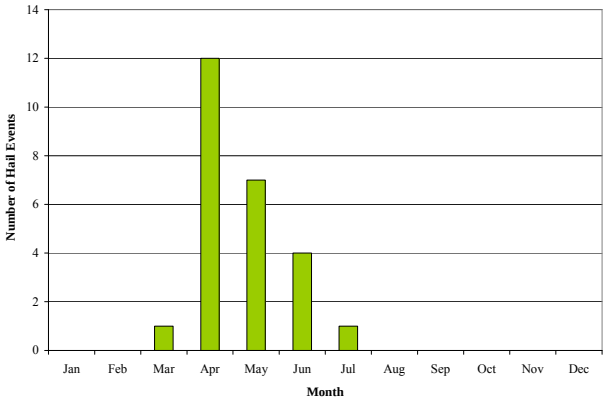
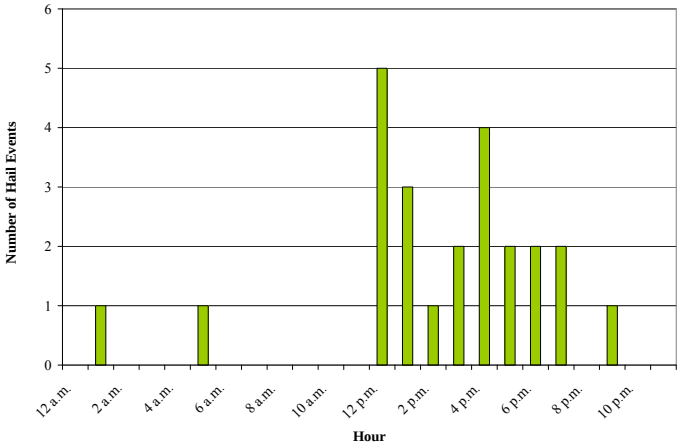


Figure 13
Greene County Hail Events by Hour 1963 through 2010



NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center. Storm Events Database. Illinois: Greene County. 2011.

LIGHTNING

The Storm Events Database and community records show 10 reported occurrences of lightning strikes in Greene County between 2000 and 2010. Property damage was sustained during all 10 events.

HEAVY RAIN

The Storm Events Database and community records show three reported occurrences of heavy rain in Greene County between 2002 and 2010. While the magnitude of the May 29, 2002 event was unavailable, it appears that no flooding was reported as a result of this event. Between two inches and five inches of rain fell on November 17, 2003, while between three inches and six inches of rain fell on January 5, 2005. No flooding was reported as a result of either event.

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

What is the probability of future severe storm events occurring?

Greene County has had 76 verified occurrences of thunderstorms and high wind events between 1955 and 2010. With 76 occurrences over the past 56 years, Greene County should expect to experience at least one thunderstorm and high wind event each year. There were 10 years over the last 56 years where multiple (three or more) thunderstorm and high wind events occurred. This indicates that the probability that multiple thunderstorm and high wind events may occur during any given year within Greene County is 18%.

There have been 25 verified occurrences of hail between 1963 and 2010. With 25 occurrences over the past 48 years, the probability or likelihood of a hail event occurring somewhere in Greene County in any give year is 52%. There were four years over the last 48 years where two or more hail events occurred. This indicates that the probability that more than one hail event may occur during any given year within the County is 8%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to severe storms?

Yes. All of Greene County is vulnerable to the dangers presented by severe storms due to the topography of the region and its location in relation to the movement of weather fronts across central and southwestern Illinois. Since 2000, Greene County has experienced 37 thunderstorm and high wind events, 16 hail events, 10 lightning strike events and three heavy rain events.

Of the participating municipalities, Carrollton has had substantially more recorded occurrences of thunderstorm and high wind events than any of the other municipalities while White Hall and Greenfield have had the greatest 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 14** details the number of thunderstorm and high wind events and hail events by participating municipality.

Figure 14
Verified Thunderstorm & High Wind Events and Hail Events by Participating Municipality

Participating Municipality	Number of Verified Thunderstorm & High Wind Events	Number of Verified Hail Events
Carrollton	26	4
Eldred	4	0
Greenfield	10	6
Hillview	5	1
Roodhouse	12	4
White Hall	13	8
Wilmington (Patterson)	0*	1

* While no verified thunderstorm and high wind events were recorded for this municipality, there have been multiple verified thunderstorm and high wind events that have impacted the entire County.

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center. Storm Events Database. Illinois: Greene County. 2011.

Campbell, Deborah. Boyd Healthcare Services. "RE: Greene Co. Hazard Mitigation Plan – Damage to Critical Facilities." Email to Andrea J. Bostwick. April 12, 2011.

What impacts resulted from the recorded severe storms?

Severe storms as a whole have caused an estimated $2,000 in crop damage and $1,924,053 in property damages and resulted in four injuries. The following provides a breakdown of impacts by category.

While severe summer storms frequently occur in Greene County, the number of injuries and deaths is relatively low. The hospital in Carrollton is equipped an emergency generator to provide continuous care to those injured during a severe storm. Consequently, the risk or vulnerability to public health and safety from severe storms is low.

THUNDERSTORMS AND HIGH WINDS

The data provided by the Storm Events Database and community records indicates that between 1955 and 2010, eight thunderstorm & high wind events caused approximately $478,500 in property damage and $2,000 in crop damage. Of the $480,500 in damages reported, the Storm Events Database records identified $409,000 in property and $2,000 in crop damage for six of the eight events. It should be noted, however, that the property damage total of $400,000 for the high wind event on April 18, 1995 represents losses sustained by 16 counties (including Greene County). A breakdown by county of this total was not available. The remaining $67,500 in property damages was provided by Planning Committee members and represents damages sustained during two separate events to critical facilities in Carrollton and White Hall. Damage

information was either unavailable or none was recorded for the remaining 68 reported occurrences.

In addition to the property damage figures provided above, the City of Roodhouse estimated that thunderstorm and high wind events have caused approximately $5,010,000 in property damage to the City's water treatment plant and storm sewer system. This additional property damage was not included in Table 1 because specific dates for the events were not available. This information indicates that the total property damage figure for thunderstorm and high wind events in Greene County is closer to $5,488,500.

The Storm Events Database records report three injuries as a result of a single thunderstorm and high wind event which occurred on July 2, 1992. No detailed information is available for this incident.

HAIL

The data provided by the Storm Events Database and community records indicates that between 1963 and 2010, three hail events caused approximately $1,316,930 in property damage. Of the $1,316,930 in damages reported, the Storm Events Database records identified $1,050,000 in damages sustained in Carrollton and Greenfield when hail measuring 1.75 inches in diameter (golf ball size) fell on April 24, 2002. The remaining property damage totals were provided by Planning Committee members and represent $100,000 in damages sustained by Boyd Hospital in Carrollton during a hail event on May 8, 1988 and an additional $166,930 in damages sustained in Greenfield as a result of the April 24, 2002 hail event mentioned previously. Damage information was either unavailable or none was recorded for the remaining 22 reported occurrences.

One inch diameter or larger hail has been reported on multiple occasions during each of the previous three decades in Greene County.

In addition to the property damages reported by the Storm Events Database and community records, local insurance records indicate that an additional $192,577 in damages can be attributed to the April 24, 2002 hail event. These additional property damages are not included in Table 1 because specific locations could not be identified, although most are believed to be located in unincorporated Greene County.

The Storm Events Database records report one injury as a result of a hail event which occurred on May 25, 1989. No detailed information is available for this incident.

LIGHTNING

The data provided by community records indicates that between 2003 and 2010, 10 lightning events caused approximately $112,296 in property damage. All of the property damage reported as a result of lightning strikes was provided by Planning Committee members and represents damages sustained by critical facilities in Carrollton, White Hall and unincorporated Greene

County. Critical facilities that were damaged included the Greene County Courthouse, the water and wastewater treatment plants in Carrollton, the police department and water treatment plant in White Hall, and a water line in Athensville Township. There were no reported lightning strike events recorded for Greene County by the Storm Events Database.

No injuries or deaths were reported as a result of any of the lightning strike events.

HEAVY RAIN

The data provided by the Storm Events Database and community records indicates that between 2002 and 2010, one heavy rain event caused approximately $16,327 in property damage. The $16,327 was provided by a Planning Committee member and represents property damages sustained to a water main south of Carrollton during a heavy rain event on May 29, 2002. Damage information was either unavailable or none was recorded for the remaining two reported occurrences. In addition, no injuries or deaths were reported as a result of these events.

What other impacts can result from severe storms?

While only four injuries were reported by the Storm Events Database for the severe storm events in Greene County, severe storms do have the ability to impact health and safety. Severe storms have caused multiple injuries and deaths elsewhere in Illinois.

In Greene County, vehicle accidents are the largest risk to health and safety from severe storms. 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 2005 and 2009 indicates that wet road surface conditions were present for 8.1% to 14.0% of all crashes recorded annually in Greene 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 15** provides a breakdown by year of the number of crashes and corresponding injuries and deaths that occurred when treacherous road conditions caused by wet road surface conditions were present as well as the total number of crashes that occurred in the County for comparison.

Figure 15
Severe Weather Crash Data for Greene County

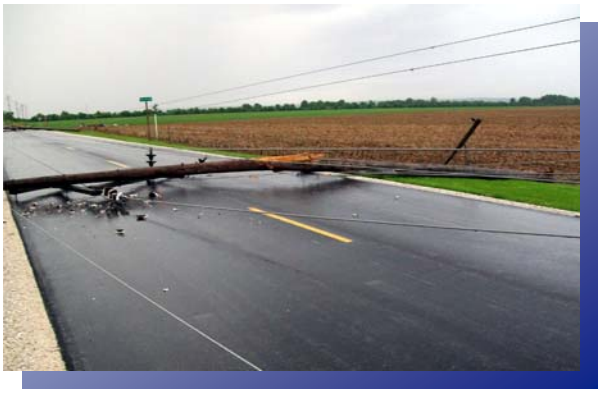
Year	Total # of Crashes	Presence of Wet Road Surface Conditions		
		# of Crashes	# of Injuries	# of Deaths
2005	329	28	9	0
2006	405	39	8	0
2007	385	31	7	0
2008	353	37	10	1
2009	264	37	11	0

Source: Illinois Department of Transportation, Illinois Crash Data, County Crash Summaries: Greene County, 2005-2009.

Severe storms are unique in that they can pose several different health and safety hazards during a single event. Individuals who are outdoors during a severe storm are at risk of being struck by lightning, hit by flying debris and hailstones and if the conditions are just right, caught in flash flooding.

Are existing buildings, infrastructure and critical facilities vulnerable to severe storms?
Yes. All existing buildings, infrastructure and critical facilities located in Greene 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.



A recent thunderstorm with high winds damaged utility poles and electrical lines along the Hillview Blacktop.

Photo Provided by Pat Cooper, Ameren Illinois

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 and towers, lift stations, and communication towers.

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 Greene 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. Only one of the participating jurisdictions, Roodhouse, has building codes in place that will likely help lessen the vulnerability of new buildings and critical facilities to damage from severe storms. Infrastructure such as new communication and power lines also will continue to be vulnerable to severe storms. 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. There is very little that can be done to totally eliminate the vulnerability of new critical facilities.

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 22 of the 114 recorded events listing property damage numbers for severe storms, there is no way to accurately estimate future potential dollar losses. Since all structures within Greene County are vulnerable to damage it is likely that there will be future dollar losses to severe storms.

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 blizzard conditions with blinding wind-driven snow, sleet and/or ice and extreme cold that lasts several days. The amount and extent 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. The following provides a brief description of each type.

- **Blizzards.** Blizzards are characterized by low temperatures and strong winds of at least 35 miles per hour. In addition to extreme temperatures and life-threatening wind chills, a blizzard is also characterized by falling or blowing snow that reduces visibility to ¼ mile or less for at least three hours. They are by far the most dangerous of all winter storms.
- **Heavy Snow Storms.** A heavy snow storm is any winter storm that produces six inches or more of snow within a 48 hour period or less.
- **Ice Storms.** Ice storms occur when precipitation (i.e., freezing rain, sleet, etc.) falls to the ground and freezes immediately on impact. Generally in Illinois an ice storm is considered severe if there is an accumulation of ¼ inch or more of freezing rain or ½ inch or more of sleet.

While severe winter storms are often accompanied by extreme cold (i.e., low temperatures and wind chills), the National Weather Service does not use it to implicitly define a severe winter storm. However, for the purposes of this report, extreme cold is discussed under severe winter storms since it has the ability to cause property damage, injuries and even death (whether or not it is accompanied by freezing rain, sleet or snow).

What is snow and how is it formed?

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 and how is it formed?

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 that is wedged between two masses of colder 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 and how is it formed?

Freezing rain is precipitation that falls in the form of rain, but freezes into a glaze upon contact with the ground or other hard surfaces. The rain is formed when snowflakes completely melt while falling through a layer of warmer air situated between two masses of colder air. The rain

drops do not have time to refreeze before they reach the ground because the layer of cold air just above the surface is thin. The rain drops do become supercooled as they pass through this layer of colder air and instantly refreeze upon contact with anything that is at or below 32°F (i.e., the ground, trees, power lines, etc.).

What is the Wind Chill Index?

The Wind Chill Index is a measure of the rate of heat loss from exposed skin caused by the combined effects of wind and cold. 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. Exposures to extreme wind chills can be life threatening. **Figure 16** shows the Wind Chill Index as it corresponds to various temperatures and wind speeds. As an example, if the air temperature is 5°F and the wind speed is 10 miles per hour, then the wind chill would be -10°F. As wind chills edge toward -19°F and below, there is an increased likelihood that continued exposure will lead to individuals developing cold-related illnesses.

Figure 16
Wind Chill Index Chart

Temperature (°F)

Wind (mph)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81

Frostbite Times

30 minutes 10 minutes 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.615T - 35.75(V^{0.16}) + 0.4275(V^{0.16})$$

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

Source: National Weather Service

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

Frostbite and hypothermia are both cold-related illnesses that result when individuals are exposed to extreme temperatures and wind chills, in many cases, as a result of severe winter storms. The following describes 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 begins to lose heat faster than it can produce it. As a result, the body's temperature begins to fall. If an individual's body temperature falls below 95°F, then hypothermia has set in and immediate medical attention should be sought. Hypothermia is characterized by uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness and exhaustion. Left untreated, hypothermia will lead to death. Hypothermia occurs most commonly at very cold temperatures, but can occur at cool temperatures (above 40°F) if an individual isn't properly clothed or becomes chilled.

Are alerts issued for severe winter storms?

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

- **Advisories.** Winter advisories are issued for lesser winter weather events that while presenting an inconvenience, do not pose an immediate threat of death, injury or significant property damage. 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 average snowfall of 3 to 5 inches, sleet accumulations of less than ½ inch, or a combination of winter precipitation which will produce hazardous conditions. An advisory can be issues for lesser amounts of snow if the timing of the event creates hazardous conditions.
  - **Freezing Rain Advisory.** A freezing rain advisory is issued when light freezing rain will produce less than ¼ inch ice accumulation.
  - **Wind Chill Advisory.** A wind chill advisory is issued when the wind chill values are expected to be between -15°F and -24°F.
- **Winter Storm Watch.** A winter storm watch is issued when the risk of severe winter weather, such as heavy snow and/or ice, has increase significantly and there is a strong possibility that conditions will reach warning criteria for an area within the next 12 to 48 hours.
- **Warnings.** Winter weather warnings are issued for events that can be life threatening. The following warnings will be issued when an event is occurring, is imminent, or has a high probability of occurring.
  - **Blizzard Warning.** A blizzard warning is issued when sustained winds or frequent gusts greater than or equal to 35 mph are accompanied by falling and/or blowing 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 is expected to produce ¼ inch or more of ice accumulation.
  - **Winter Storm Warning.** A winter storm warning is issued when 6 inches or more of snow is expected, ½ inch or more of sleet accumulations are expected or a combination of winter precipitation will produce life threatening conditions.

- **Wind Chill Warning.** A wind chill warning is issued when wind chill values are expected to be -25°F or below.

If an event is expected to produce only one type of precipitation, say snow, then the warning or advisory will be specific: Heavy Snow Warning or Snow Advisory. If a mixture of precipitation types is expected, say snow and sleet, then the generic Winter Storm Warning or Winter Weather Advisory will be used.

PROFILING THE HAZARD

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

Tables 5 and **6** summarize the previous occurrences as well as the extent or magnitude of severe winter storm events in Greene County. The severe winter storm events are separated into two categories: snow and ice events and extreme cold events.

SNOW AND ICE

The Storm Events Database identified 30 reported occurrences of severe snow and ice events in Greene County between 1995 and 2010, making this one of the more frequently occurring hazards. Of the 30 reported occurrences, there were 18 severe snow events, six severe ice and sleet events and six events that were a combination of severe freezing rain, ice, sleet and snow.

A severe winter storm in Patterson covers critical infrastructure such as a fire hydrant under a layer of snow.

Photo by Dale Sorrells

Since 1995, at least one severe snow and/or ice event has been recorded each year in Greene County with the exception of two years (1996 and 2009.) Anecdotal information shared by long-time residents suggests that severe snow and ice events have occurred with similar frequency between 1950 and 1994. In comparison, Illinois has averaged at least two snow events annually between 1900 and 2000 where six inches or more of snow falls within a 48 hour period.

Figures 17 and **18** chart the reported occurrences of severe snow and ice events by month and hour. Twenty-two of the 30 events took place in December and January. Two of the 30 events spanned two months, one crossed from November into December and the other crossed January into February. An equal number of the snow and ice events with recorded times began during the a.m. and p.m. hours.

According to the Midwestern Regional Climate Center, over the last 110 years the maximum one-day accumulation of snow recorded in Greene County first occurred on March 19, 1906 when 14 inches of snow fell.

EXTREME COLD

The Storm Events Database identified one reported occurrence of extreme cold (i.e., low temperatures and wind chills) in Greene County between 2000 and 2010. The one reported occurrence began at 8 a.m. on December 16, 2000 and lasted through December 17, 2000. The occurrence did not correspond with a recorded severe snow and/or ice event, although it did follow several days after a severe snow event. According to the Midwestern Regional Climate Center, the coldest temperature recorded in Greene County over the last 110 years was -26°F on January 7, 1912.

Figure 17
Greene County Snow & Ice Events
by Month – 1995 through 2010

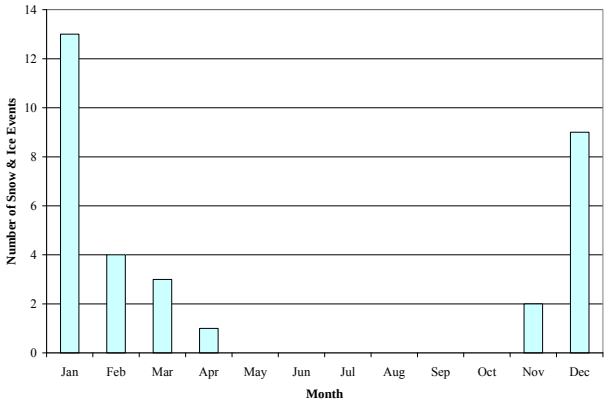
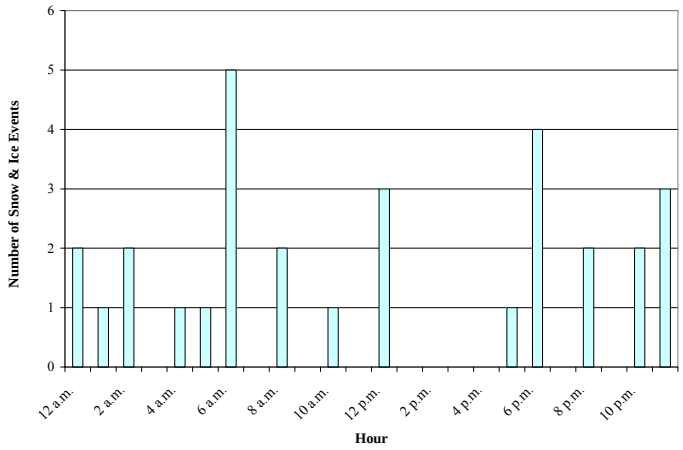


Figure 18
Greene County Snow & Ice Events
by Hour – 1995 through 2010



NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database, Illinois, Greene County, 2011.

What locations are affected by severe winter storms?

Severe winter storms affect the entire County. All communities in Greene County have been affected by severe winter storms. The *2010 Illinois Natural Hazard Mitigation Plan* prepared by the Illinois Emergency Management Agency classifies Greene County's hazard rating for severe winter storms as "high."

What is the probability of future severe winter storms occurring?

Greene County has had 30 verified occurrences of severe snow and ice events between 1995 and 2010. With 30 occurrences over the past 16 years, Greene County may experience at least one to two severe winter storms each year. There were eight years over the past 16 years where two or more severe snow and ice events occurred. This indicates that the probability that more than one snow and ice event may occur during any given year within the County is 50%.

There has been only one verified extreme cold event between 2000 and 2010. With one occurrence over the past 11 years, the probability or likelihood that an extreme cold event will occur in any given year is 9%. This probability or likelihood may change with better recordkeeping practices and the accumulation of more data.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to severe winter storms?

Yes. All of Greene 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 in Greene County at the Illinois Department of Human Services Office in Carrollton.

Since 2000, Greene County has experienced 20 snow and ice events and one extreme cold event. During five of those years, the County experienced two or more 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?

Of the 30 reported occurrences of severe winter storms, damages were only recorded for two events. On January 6 1995, a weak winter storm brought sleet and freezing rain into the region causing a glaze ice event. Approximately $4,500 in property damage was reported as a result of this event. This total represents losses sustained by eight counties (including Greene County). A breakdown by county for this total was not available. The second event, an ice storm, began on December 8, 2007 and lasted through December 12, 2007. This storm caused $1,228 in property damage to a Carrollton public water facility building.

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

One death was reported as a result of the December 8, 2005 winter storm event. It should be noted, however, that this event covered 16 counties (including Greene County) and information was not available on the location of the severe winter storm-related fatality. In comparison, Illinois averages six deaths per year as a result of severe winter storms.

While severe winter storms occur regularly in Greene 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.

What other impacts can result from severe winter storms?

While only one death was reported by the Storm Events Database for the recorded severe winter storm events in Greene County, severe winter storms do have the ability to impact health and safety.

In Greene 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 2005 and 2009 indicates that treacherous road conditions caused by snow and ice were present for 2.0% to 9.4% of all crashes recorded annually in the County. **Figure 19** 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 19
Severe Winter Weather Crash Data for Greene County

Year	Total # of Crashes	Presence of Treacherous Road Conditions caused by Snow and Ice		
		# of Crashes	# of Injuries	# of Deaths
2005	329	31	8	0
2006	405	8	1	0
2007	385	21	6	0
2008	353	32	15	6
2009	264	21	11	0

Source: Illinois Department of Transportation, Illinois Crash Data, County Crash Summaries, Greene County, 2005-2009.

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 Greene 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 Greene 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 communication and power lines often lead to disruptions in communication and create power outages. Depending on the damage, it can take anywhere from several hours to several days to restore service.

In addition to affecting communication and power lines, snow and ice accumulations on state and local roads hampers travel and can cause dangerous driving conditions. Blowing and drifting snow can lead to road closures and increases the risk of automobile accidents. Even small accumulations of ice can be extremely dangerous to motorists since bridges and overpasses freeze before other surfaces. When transportation is disrupted, schools close, emergency and medical services are delayed, some businesses close and government services can be affected. When a severe winter storm hits there is also an increase in cost to the County and municipalities for snow removal and de-icing. Road resurfacing and pothole repairs are additional costs incurred each year as a result of severe winter storms.

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

Based on the frequency with which severe winter storms occur in Greene 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. Only one of the participating jurisdictions, Roodhouse, has building codes in place that will likely help lessen the vulnerability of new buildings and critical facilities to damage from severe winter storms. 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 Greene 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. Since all structures within Greene County are vulnerable to damage it is likely that there will be future dollar losses to severe winter storms.

3.3 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 several days to several weeks. In comparison, a heat wave is generally defined as a period of at least three consecutive days above 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 1,500 people die in the United States each year from extreme heat. This number is greater than the 30-year mean annual number of deaths due to tornadoes, hurricanes, floods and lightning combined. In an effort to raise the public's awareness of the hazards of extreme heat, the National Weather Service has devised the "Heat Index".

What is the Heat Index?

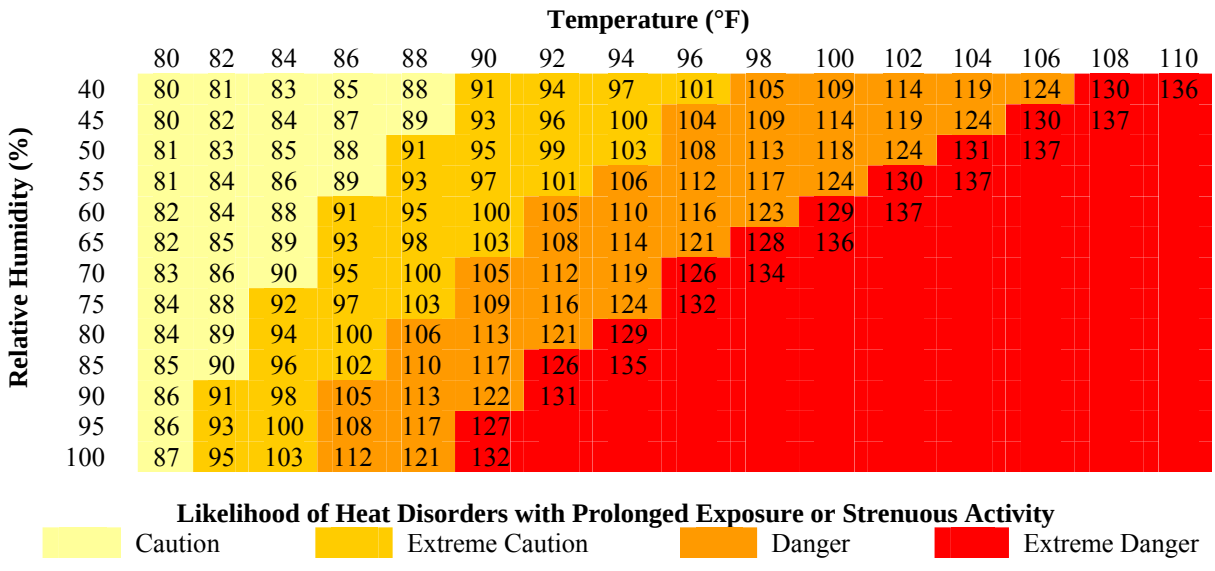
The Heat Index, sometimes referred to as the "apparent temperature", is a measure of how hot it feels when relative humidity is added to the actual air temperature. **Figure 20** shows the Heat Index as it corresponds to various air temperatures and relative humidity. As an example, if the air temperature 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.

- **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.

Figure 20
Heat Index Chart



Source: National Weather Service

- **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 life-threatening condition characterized by a high body temperature (106°F or higher). The skin appears to be dry and flushed with very little perspiration present. The individual may become mentally confused and aggressive. The pulse is rapid and strong. There is a possibility that the individual will faint or slip into unconsciousness. If the body is not cooled quickly, then brain damage and death may result.

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

Figure 21 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 21
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" brochure.

What is an excessive heat alert?

An excessive heat alert is an advisory or warning issued by the National Weather Service when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines the type of alert issued. There are four types of alerts that can be issued for an extreme heat event. The following provides a brief description of each type of alert based on the excessive heat advisory/warning criteria established by National Weather Service Weather Forecast Office in St. Louis, Missouri. The St. Louis office is responsible for issuing alerts for Greene County.

- **Excessive Heat 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.
- **Excessive Heat Watch.** An excessive heat watch is issued when conditions are favorable for an excessive heat event to occur within the next 12 to 48 hours.
- **Excessive Heat Advisory.** An excessive heat advisory is issued when the heat index is expected to reach 105°F, or when the heat index will range from 100°F to 104°F for at least four consecutive days.
- **Excessive Heat Warning.** An excessive heat warning is issued when the heat index is expected to equal or exceed 110°F for two consecutive days or when the heat index will be around 105°F for at least four consecutive days.

PROFILING THE HAZARD

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

Table 6 summarizes the previous occurrences as well as the extent or severity of extreme heat events in Greene County. The Storm Events Database records show 23 reported extreme heat events in Greene County between 1995 and 2010. All of the extreme heat events recorded occurred in June, July and August, with 16 of the 23 events taking place in July. Three of the 20 events spanned between July and August.

Extreme heat events recorded within the County have lasted from one day to two weeks. There were six years where two or more extreme heat events were recorded. The highest heat index recorded between 1995 and 2010 occurred in July, 1995 when the combination of relative humidity and temperature pushed the heat index up to approximately 120°F. According to the Midwestern Regional Climate Center, the highest temperature recorded in Greene County over the last 110 years was 113°F on July 20, 1934 at the White Hall monitoring station.

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 Greene County's hazard rating for extreme heat as "high."

What is the probability of future extreme heat events occurring?

Greene County has experienced 23 verified extreme heat events between 1995 and 2010. With 23 occurrences over the past 16 years, Greene County may experience at least one extreme heat event each year.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to extreme heat?

Yes. All of Greene County is vulnerable to extreme heat. Extreme heat events were recorded in 11 of the past 16 years. There is one official state-designated cooling center located in Greene County at the Illinois Department of Human Services Office in Carrollton.

What impacts resulted from the recorded extreme heat events?

Of the 23 reported occurrences, property damages were only recorded for two events and crop damages were only recorded for three events. The July 11, 1995 to July 17, 1995 extreme heat event caused $50,000 in property damage (primarily to roads) and $200,000 in crop damage. The July 28, 1995 to July 31, 1995 extreme heat event caused $5,000 in property damage and $10,000 in crop damage while the August 9, 1995 to August 24, 1995 extreme heat event caused $200,000 in crop damage. The property and crop damage totals detailed above represent losses sustained by 21 counties (including Greene County). A breakdown by county was not available.

Heat-related injuries and deaths were reported for eight of the recorded extreme heat events; however, none occurred in Greene County. The data provided by the Storm Event Database for extreme heat events covers multiple counties. All of the heat-related injuries and deaths took place in St. Clair and Madison Counties (St. Louis metropolitan area). While heat-related injuries and deaths were only reported for eight of the recorded extreme heat events, the heat indices were sufficiently high for all 23 events to produce heat cramps or heat exhaustion with the possibility of heat stroke in cases of prolonged exposure or physical activity.

No other injuries or deaths from extreme heat have been reported in Greene County. This does not mean, however, that none have 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. However, even if injuries and death due to extreme heat are under reported in Greene County, the risk or vulnerability to public

health and safety from extreme heat 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.

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.

Other impacts of extreme heat include early school dismissals and school closings. Of the 23 reported occurrences, early dismissals were recorded for two events and school closings were recorded for one event. The August 15, 2003 to August 21, 2003 event caused prompted early dismissals at some schools and closings at others, while the August 5, 2007 to August 16, 2007 event prompted only early school dismissals.

What other impacts can result from extreme heat events?

Extreme heat events can also lead to an increase in water usage and may result in municipalities imposing water use restrictions when water is obtained from lakes or rivers. In Greene County, extreme heat should not impact municipal water supplies with the exception of Greenfield, which obtains its water from Greenfield Lake.

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

No. In general, existing buildings, infrastructure and critical facilities located in Greene County and the participating jurisdictions are not vulnerable to extreme heat events. Unlike other natural hazards such as floods, earthquakes or tornadoes, extreme heat events in typically do not cause damage to buildings, infrastructure or critical facilities. The true concern is for the health and safety of those living in the County.

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 Greene 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 Greene 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, especially vulnerable populations such as the elderly, infants, young children and those with medical conditions.

Unlike other counties within the region, Greene 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 because air-conditioning units, fans and cooling centers are unavailable.

3.4 FLOOD

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 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.

What types of floods occur in Greene County?

Floods can be classified under two categories: flash floods and general floods. Flash floods are usually produced when heavy localized precipitation falls over an area in a short amount of time. 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. There is generally very little, if any, warning associated with flash floods.

In Greene County, general flooding can fall into two subcategories: river floods and area or overland floods. River floods are generally caused by a gradual increase in the water levels of a river or creek. These floods occur when winter or spring rains, coupled with melting snow, fill river basins with too much water too quickly or when torrential rains associated with a storm system enter the area. Low lying areas near rivers, streams, lakes and reservoirs are susceptible to this type of flooding. Area or overland floods occur outside a defined stream or river and are generally the result of previous precipitation events that have left the ground saturated. Additional rainfall leads to surface runoff which causes ponding to occur in low-lying areas such as open fields.

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.

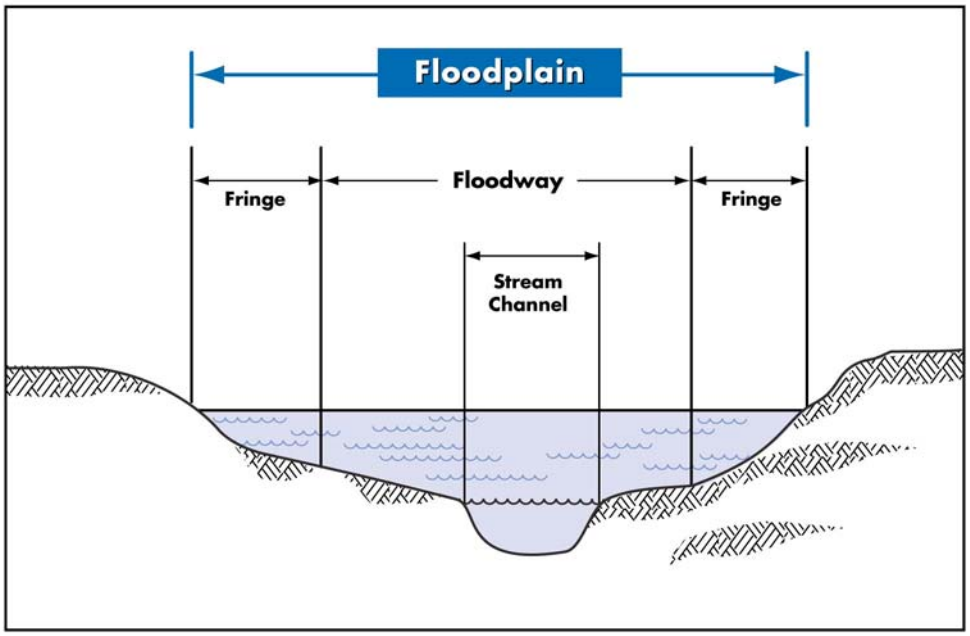
What is a floodplain?

There are several ways to define the term "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 floodplain is the land area that is subject to a 1% or greater chance of flooding in any given year. It is also known as the 100-year floodplain. This definition is utilized by FEMA to administer the National Flood Insurance Program and by the State of Illinois to regulate construction activities within a floodplain. Regulating floodplains is important because when individuals build within a floodplain, property damage and even loss of life can occur. It is this second definition that is generally most familiar to people and the one that will be used from this point forward in the Plan.

A regulatory floodplain is divided into two parts: the floodway and the flood fringe. **Figure 22** illustrates the various components of a regulatory floodplain.

Figure 22
Floodplain Illustration



Source: Illinois Department of Natural Resources, Office of Water Resources, "Floodplain Management in Illinois: Quick Guide," 2001.

The floodway is the channel of a river or other watercourse and the adjacent land area 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 floodwater downstream and is usually the area where water velocities and forces are the greatest. 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 regulatory floodplain, outside of the floodway, that is subject to shallow inundation and low velocity flows or standing water. 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. However, any development will require protection

from the floodwaters through the elevation of the buildings above the base flood or by flood-proofing buildings so that water can not enter the structures.

What is a base flood?

A base flood refers to any flood having a 1% chance of being equaled or exceeded in any given year. It is also known as the 100-year flood or the one percent chance flood. The base flood has been adopted by the National Flood Insurance Program as the basis for mapping, insurance rating and regulating new construction.

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. This type of flood is generally deeper than a 100-year flood and covers a greater amount of area; however, it is statistically less likely to occur.

What is the National Flood Insurance Program?

The National Flood Insurance Program (NFIP) is a federal program administered by FEMA enabling property owners in participating communities to purchase insurance protection against losses from flooding. It was established by the U.S. Congress 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. This approach did not reduce losses, nor did it discourage unwise development practices. In the face of mounting 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 (regulatory floodplain), then the government will make flood insurance available within the community as a financial protection against flood losses.

However, if a community chooses not to participate, then flood insurance under the NFIP will not be made available within that community. (Flood insurance can still be obtained through a private insurance broker, but the premiums are likely to be higher.) In addition, federal agencies would be prohibited from approving any financial assistance for acquisition or construction purposes within Special Flood Hazard Areas (42 U.S.C. 4106). For example, this would prohibit loans guaranteed by the Department of Veteran Affairs, insured by the Federal Housing Administration or secured by Rural Housing Services. Also, if a presidentially-declared disaster occurs as a result of flooding in a non-participating community, no federal financial assistance can be provided for the permanent repair or reconstruction of insurable buildings within Special Flood Hazard Areas.

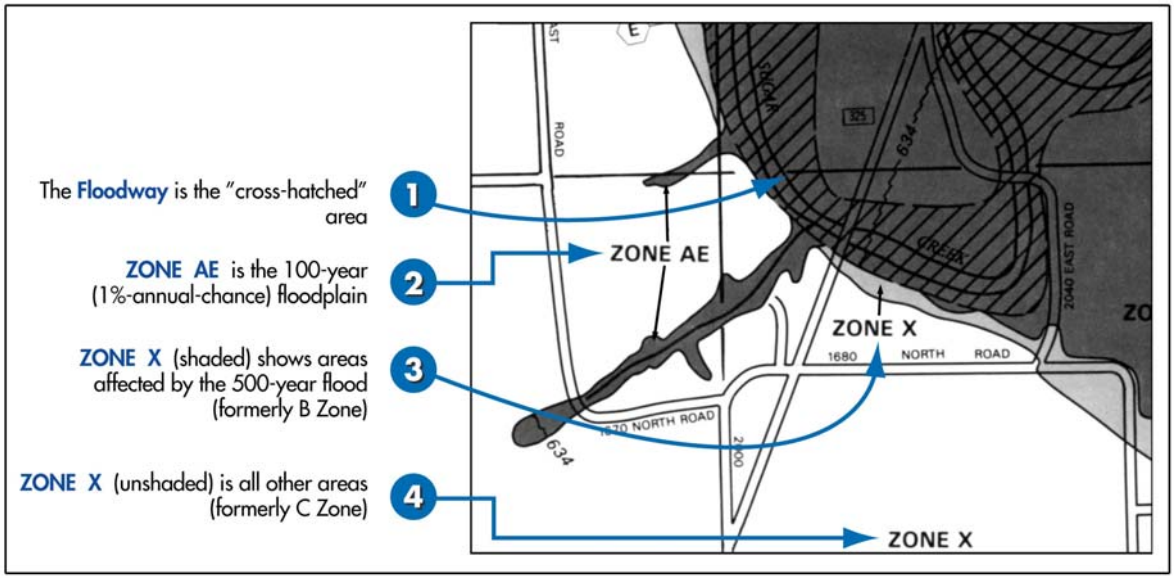
What is a Special Flood Hazard Area?

A Special Flood Hazard Area (SFHA) is the floodplain area that is subject to a 1% or greater chance of flooding in any given year. (This area is also referred to as a regulatory floodplain as discussed previously.) The term SFHA is most commonly used when referring to the Flood Insurance Rate Maps (FIRM) produced by FEMA. Special Flood Hazard Areas are delineated on the Flood Insurance Rate Maps and may be designated as Zones A, AO, AH, A1-30, AR, AE or A99.

What are Flood Insurance Rate Maps?

Flood Insurance Rate Maps (FIRMs) are maps that identify flood hazard areas as well as risk premium zones within 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 23** shows an example of a FIRM.

Figure 23
Example of a Flood Insurance Rate Map (FIRM)



Source: Illinois Department of Natural Resources, Office of Water Resources, "Floodplain Management in Illinois: Quick Guide," 2001.

A FIRM will generally show 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 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 a Special Flood Hazard Area (SFHA) or regulatory floodplain, is defined as the floodplain area that is subject to a 1% or greater 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. In communities that participate in the NFIP, structures located within Zone X (shaded) are not required to purchase flood insurance, but 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 at a low risk for flooding. In communities that participate in the NFIP, structures located with Zone X (unshaded) are not required to purchase flood insurance, but it is made available to all property owners and renters.

What is a Repetitive Loss Structure or Property?

The Federal Emergency Management Agency 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. 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 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. CRS discounts on flood insurance premiums range from 5% up to 45%. Those discounts provide an incentive for new flood mitigation, planning and preparedness activities that can help save lives and property in the event of a flood.

Are alerts issued for flooding?

Yes. The National Weather Service Weather Forecast Office in St. Louis, Missouri is responsible for issuing flood watches or warnings for Greene County depending on the weather conditions. The following provides a brief description of each type of alert.

- **Flash Flood / Flood 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.
- **Flash Flood / Flood 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?

Table 7 summarizes the previous occurrences as well as the extent or magnitude of the flood events in Greene County. The Illinois State Water Survey and the Storm Events Database identified 12 flooding and flash flooding events in Greene County between 1993 and 2010. Eight of the 12 events were caused by flash flooding.

Included in these 12 events is the historic 1993 flood on the Mississippi River. Very frequent, heavy rainfall across the upper Midwest from April through August, coupled with high soil moisture levels led to record-breaking flooding along the Mississippi, Missouri and lower reaches of the Illinois Rivers. The western portion of Greene County was inundated with flood waters as a result of this event. On August 3, 1999, the Illinois River at Hardin crested at the record level of 42.4 feet (flood stage for the Illinois River at Hardin is 25 feet.)

Figures 24 and **25** chart the reported occurrences of flooding and flash flooding by month and hour. Eight of the 12 events took place in May, with three of the events beginning or occurring in April. Two of the 12 events spanned more than one month; however, for illustration purposes only the month the event started was graphed. Approximately 55% of all flood and flash flood events with recorded times began during the p.m. hours.

What locations are affected by floods?

While specific locations are affected by river flooding, many areas of the County can be impacted by overland and flash flooding because of flat to gently sloping topography and seasonally high water table of the area. The areas between the Illinois River and the levees in the western portion of the county are very susceptible to flooding. Approximately 20% of the area in Greene County is designated as being within the regulatory floodplain and susceptible to river

floods. The *2010 Illinois Natural Hazard Mitigation Plan* prepared by the Illinois Emergency Management Agency classifies Greene County's hazard rating for floods as "high."

Figure 24
Greene County Flood & Flash Flood Events
by Month – 1993 through 2010

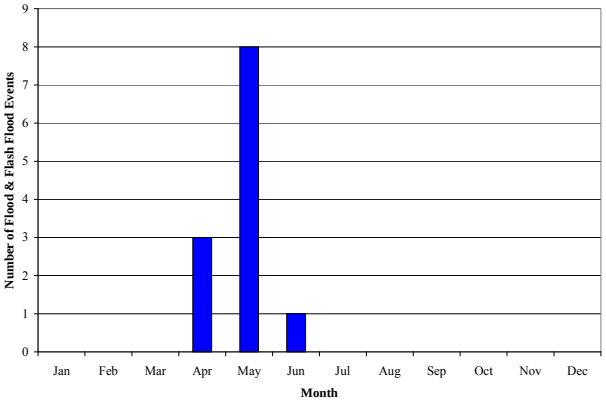
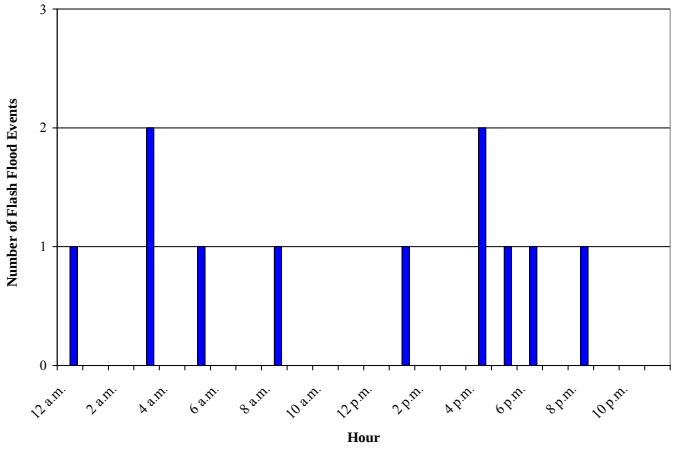


Figure 25
Greene County Flood & Flash Flood Events
by Hour – 1993 through 2010



NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database, Illinois, Greene County, 2010.

A large portion of the area prone to river flooding is unincorporated, although Carrollton, Eldred, Greenfield and Hillview are also susceptible to river flooding because of their proximity to floodplains. **Appendix J** contains the Digital Flood Insurance Rate Maps (DFIRMs) for Greene County and the participating municipalities that became effective on April 2, 2009. **Figure 26** identifies the bodies of water by participating municipality that have FEMA-designated Special Flood Hazard Areas and are known to cause flooding.

Figure 26
Bodies of Water Subject to Flooding

Participating Jurisdiction	Water Bodies
Carrollton	Coates Creek, Link Branch
Eldred	Hurricane Creek South
Greenfield	Rubicon Creek, Greenfield City Lake
Hillview	Hurricane Creek
Roodhouse	Seminary Creek
White Hall	Crooked Creek, unnamed tributary of Seminary Creek
Wilmington (Patterson)	---
Unincorporated Greene County	Apple Creek, Bear Creek, Bests Pond, Birch Creek, Boyer Creek, Brushy Lake, Bucks Branch, Cole Branch, Cole Creek, Crooked Run, Drapper Branch, Fox Branch, Hodges Creek, Horseshoe Lake, Hurricane Creek, Illinois River, Joes Creek, Kersey Creek, Lands Branch, Lime Branch, Link Branch, Little Bear Creek, Little Bear Rough, Long Branch, Macoupin Creek, Marks Creek, Negro Lick, Round Lake, Rubicon Creek, Sand Creek, Seminary Creek, Taylor Creek, Trimley Creek, Turkey Creek, Whitaker Creek, Wines Branch, Wolf Run, White Hall Reservoir

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

Yes. Greene County, Carrollton, Eldred, Greenfield and Hillview all participate in the NFIP. **Figure 27** provides additional information about each jurisdiction, including the date each participant joined the NFIP and the date of the most recently adopted floodplain zoning ordinance. Roodhouse, White Hall and Wilmington (Patterson) have no identified flood hazard boundaries within their corporate limits and are not required to participate.

Figure 27
NFIP Participating Communities

Participating Jurisdictions	Participation Date	Current Effective FIRM Date	CRS Participation	Most Recently Adopted Floodplain Zoning Ordinance
Greene County	8/5/1985	4/2/2009	No	2009
Carrollton	4/2/2009	4/2/2009	No	2008
Eldred	6/15/1981	4/2/2009	No	2011*
Greenfield	6/17/1986	4/2/2009	No	2009
Hillview	1/31/1994	4/2/2009	No	2008

* IDNR records indicate the Village of Eldred adopted a new floodplain ordinance in accordance with the release of the new FIRMs in 2009. However, the adoption of the ordinance could not be verified by the current administration. Consequently, the Village agreed to re-adopt the floodplain ordinance in the fall of 2011.

Sources: FEMA, National Flood Program, Community Status Book Report – Illinois, August 4, 2011.

What is the probability of future flood events occurring?

Greene County has had 12 verified occurrences of flooding between 1993 and 2010. With 12 occurrences over the past 18 years, the probability or likelihood of a flood event occurring somewhere in Greene County in any give year is 67%. There were two years over the past 18 years where two or more flood events occurred. This indicates that the probability that more than one flood event may occur during any given year within the County is 11%.

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. Greene County, including the participating jurisdictions, is vulnerable to the dangers presented by flooding. Precipitation levels, high seasonal water table, and topography that includes the Illinois River and its associated watersheds are factors that cumulatively make virtually the entire County susceptible to some form of flooding. Flooding occurs along the floodplains of all the rivers and streams within the County as well as outside of the floodplains in low-lying areas where drainage problems occur due to culvert or drainage ditches that need improvement or proper maintenance. Vulnerability to Illinois River floodwaters is reduced by seven levees. See Section 3.7 Levees for more information.

A majority of flooding events recorded in the County are related to flash flooding. Of the eight flash flood events reported by the Storm Events Database, seven were identified as occurring countywide. The eighth event took place on May 10, 2007 in Carrollton when approximately three inches of rain fell within three hours and caused localized flash flooding in and around the area. The remaining flood events are a result of river flooding along the Illinois River. In each case the agricultural areas in the western portion of the County were inundated by flood waters. The 1993 flood not only inundated the agricultural areas, but also impacted Hillview and Eldred.

Floodwaters cover a road in Hillview. The Village has experienced multiple river and flash flood events throughout the last century.

Photo provided by David Roe

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?

Of the 12 reported flood and flash flood events, damages totaling $31,161,835 were recorded for three of the events. Damage information was either unavailable or none was recorded for the rest of the reported occurrences. 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 first event with recorded damage totals is the 1993 flood on the Mississippi River, covered under Presidential Disaster Declaration 997. The Presidential Disaster Declaration lists April 13, 1993 as the start date of the incident period for this event. In Greene County, a minimum of $4,156,835 in damages was identified. The flood waters inundated Hillview, causing considerable damage, rendering the public water supply inoperable, and forcing the evacuation of many Village residents. Flood waters also caused damage to Eldred and Carrollton's public water supplies.

The second event occurred on April 14, 1994 and was included in Presidential Disaster Declaration 1025. Flash flooding was experienced across the County causing $5,000 in property damage. Water flowed over numerous county roads and many smaller creeks came out of their banks.

The third event began on May 9, 1995 and was included in Presidential Disaster Declaration 1053. Multiple days of heavy rain across the region caused the Mississippi and Illinois Rivers to

rise and overflow their banks. While neither river matched the flood crests reached during the 1993 flood, the Illinois River at Hardin did record its 3rd highest crest of 36.70 feet on May 29, 1995. Approximately $15 million in property damage and $12 million in crop damage were recorded as a result of this event. These totals represent losses sustained by 10 counties (including Greene County.) A breakdown by county of dollar losses was not available.

In addition to the property damages reported by the Illinois State Water Survey and the Storm Events Database, the Planning Committee members were asked to provide property damage estimates for any critical facilities damaged by flooding within their jurisdictions. White Hall reported that flooding caused $12,000 in property damage to the City's wastewater treatment plant in March, 2009. These additional property damages are not included in Table 7 because the specific date for the event was not available.

Local roads have experienced road bed erosion and overtopping at several locations through the County. These impacts are caused by floodwater from Apple, Hurricane and Macoupin Creeks and inadequately sized culverts.

No injuries or deaths were reported as a result of any of the recorded flood events in Greene County. In comparison, Illinois averages four deaths per year from flooding.

Even though 20% of the area within the County lies in a floodplain, the number of injuries and deaths is very low. As a result, the risk or vulnerability to public health and safety from general flooding is seen as relatively low. However, a majority of 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.

What impacts have resulted from historic floods?

Records and photographs obtained from the Greene County Soil and Water Conservation District indicate that the Village of Hillview has repeatedly dealt with flooding issues associated with Hurricane Creek, a tributary of the Illinois River. Photographs taken as far back as 1926 show the streets of Hillview inundated with flood waters. Records indicate that Hillview flooded in 1943, 1946, 1947, 1957 and 1961. The following provides a brief account of the 1957 and 1961 floods.

The final resting place of the G. M. & O. Railroad Depot following the June 14, 1957 flash flood in Hillview.

Photo provided by the Greene County SWCD

On June 14, 1957, a little over four inches of rain fell within a two hour period across northern Greene County, impacting Hillview, White Hall and Roodhouse. This flash flood event forced a break in the levee along Hurricane Creek in Hillview, flooding the village with five feet of swirling water and displacing the Gulf, Mobile and Ohio (G.M. & O.) Railroad Depot from its foundation. The Depot came to rest in the middle of Main Street, nearly two blocks away from its original

location. In White Hall a small creek ran over its banks causing some damage to several trailers and in Roodhouse water backed up from a railroad culvert and flooded six homes.

Overall, this flood event caused approximately $246,462 in property and crop damages. A total of $16,909 was spent cleaning up the debris deposited by the flood waters and fixing the roads and bridges in and around Hillview. One local Hillview business estimated that they lost $2,028 in merchandise due to the flooding. The American Red Cross spent $13,302, $811 and $412 providing 43 families with food, clothing and maintenance in Hillview, White Hall and Roodhouse, respectively. The Hillview Drainage and Levee District spent $9,000 to pump excess water and $4,000 to fix damage to drainage ditches from debris and slides. Approximately 5,000 acres of corn and soybeans were submerged for between two and eight days. The District estimated the total crop loss at $200,000.

On May 18, 1943 at 12:30 a.m. flood waters from Hurricane Creek began running over the G.M. & O. Railroad washing out the railroad bed foundation.

Photo provided by Greene County SWCD

Beginning the evening of August 9, 1961, approximately six inches of rain fell within a four to six hour period in Hillview. This flash flood event caused flood waters from Hurricane Creek to wash over the G.M. & O. railroad tracks at 1:30 a.m. on August 10, 1961 and at 2:00 a.m. the levee along the Creek broke, flooding the lower portion of Hillview under about four feet of water. The main line of the G.M. & O. railroad was completely washed out. Correspondence from the Hillview Village Clerk indicates that the main line was still not operational as of August 23, 1961. The American Red Cross reported nine dwellings with major damage, 24 dwellings with minor damage and one public building with major damage.

Overall, this flood event caused approximately $318,951 in property and crop damages. According to the Hillview Village Clerk approximately $10,000 in damage was done to streets, culverts, bridges and road ditches in and around the village and approximately $34,550 in damage was done to personal property and real estate. A total of $9,051 was spent by the American Red Cross assisting 32 families with food, clothing, and maintenance, building and repairs, household furnishings and medical and nursing care as well as mass care for 50 disaster sufferers and emergency workers.

The Hillview Drainage and Levee District spent $5,000 to pump out excess water and estimated that $2,500 in damages had been done to the drainage ditches from the deposit of sediment and debris and slides. Approximately 2,500 acres were impacted, causing an estimated $120,000 in crop loss. The Hartwell Drainage and Levee District, just south of the Hillview Drainage and Levee District, spent $3,000 to pump excess water and estimated that $3,000 in damages had been done to drainage ditches in the District. Approximately 2,930 acres were impacted, resulting in an estimate $131,850 in crop loss. According to newspaper accounts and records from the American Red Cross there were no injuries or deaths as a result of this event.

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.

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.

This photograph taken in 1926 is the earliest recorded documentation of flood waters impacting the Village of Hillview.

Photo provided by the Greene County SWCD

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

Yes. Only one repetitive flood loss property is located within Greene County. There is a single family dwelling located in the southeastern corner of unincorporated Greene County. As described previously, FEMA defines a "repetitive loss structure" 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. This property has had three flood insurance claim payments totaling $34,712.59 ($29,043.80 for structure and $5,668.79 for content.) The exact location and/or addresses of the insured properties are not included in this Plan to protect the owners' privacy.

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

Yes. **Figure 28** identifies the existing residential buildings by participating jurisdictions that are located within the floodplain and vulnerable to flooding. This estimate was prepared by the consultant using the current DFIRMs. Aside from key roads and bridges, the only other infrastructure and critical facilities that are vulnerable to flooding are the wastewater treatment facility in Greenfield, the Village Hall in Hillview and two power substations in unincorporated Greene County near Hillview. The community water supply, including the water treatment plant

and storage tank, for the Village of Hillview was moved out of the floodplain after the 1993, substantially reducing its vulnerability. Flooding still poses a hazard to the distribution lines within the Village.

Figure 28
Existing Residential Buildings Vulnerable to Flooding in Greene County

Participating Jurisdiction	Residential Buildings
Carrollton	23
Eldred	41
Greenfield	0
Hillview	33
Roodhouse	0
White Hall	0
Wilmington (Patterson)	0
Unincorporated Greene County	34

Source: FEMA, National Flood Insurance Program, Flood Insurance Rate Maps, Greene County, Illinois, April 2, 2009.

While 20% of the area in Greene County is designated as being within the regulatory floodplain and susceptible to river floods, almost the entire County is vulnerable to flash floods. A majority of the buildings, and virtually all infrastructure and critical facilities that may be impacted by flooding are located outside of the regulatory floodplain.

Structural damage, such as cracks forming in foundations, can 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. Infrastructure and critical facilities are also vulnerable to flooding. Roadways, culverts and bridges can be weakened by floodwaters and have been known to collapse under the weight of a vehicle. Buried power and communication lines are also vulnerable to flooding. Water can get into the lines and cause disruptions in power and communications.

A flood event in the northeastern portion of Greene County caused structural damage to the basement of a residence.

Photo provided by David Roe

Based on 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 regulatory floodplain, the vulnerability of buildings, infrastructure and critical facilities to flooding varies from medium to high.

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

Yes and No. All of the participating jurisdictions that are subject to flooding (Carrollton, Eldred, Hillview, Greenfield and unincorporated Greene County) take part in the National Flood Insurance Program (NFIP) and have adopted floodplain ordinances. Enforcement of these ordinances provides protection to any new building, infrastructure or critical facility built within a flood-prone area.

While new buildings, infrastructure and critical facilities should be protected from river flooding, they will still be vulnerable to flash flooding depending on the amount of precipitation that is received, the topography and land use changes.

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

Residential

The first step in determining potential dollar losses to vulnerable structures is to estimate the number of existing vulnerable buildings. As discussed previously, the consultant prepared this estimate using the current DFIRMs for Greene County. **Figure 29** lists the estimated number of vulnerable buildings by participating jurisdiction.

Figure 29
Potential Dollar Losses to Vulnerable Residential Buildings from a Single Flood Event*

Participating Jurisdiction	Estimated Number of Vulnerable Residential Buildings	Average Assessed Value	Average Market Value	Potential Dollar Losses		Total Potential Dollar Losses
				Housing Unit	Content	
Carrollton	23	$24,867	$74,601	$343,165	$514,747	$857,912
Eldred	41	$16,675	$50,025	$410,205	$615,308	$1,025,513
Greenfield	0	$18,536	$55,506	$ 0	$ 0	$ 0
Hillview	33	$10,383	$31,149	$205,583	$308,375	$513,958
Roodhouse	0	$13,346	$40,038	$ 0	$ 0	$ 0
White Hall	0	$16,145	$48,435	$ 0	$ 0	$ 0
Wilmington (Patterson)	0	$10,390	$31,170	$ 0	$ 0	$ 0
Unincorporated Greene County	34	$57,843	$173,529	$1,179,997	$1,769,996	$2,949,993

* For the purposes of this scenario, it is assumed the vulnerable residential buildings are one or two story homes with basements that are flooded with two feet of water.

Sources: Banghart, Deborah. Greene County Clerk. "Greene County." Email to Greg R. Michaud. March 21, 2011. FEMA, National Flood Insurance Program, Flood Insurance Rate Maps, Greene County, Illinois, April 2, 2009.

In order to begin calculating the total potential dollar losses to vulnerable residential buildings, the average assessed value must be determined. The average assessed value for each municipality was calculated from the 2010 tax assessment information provided by the Greene County Clerk. The average assessed value was then multiplied by three to determine the average market value (the assessed value of a structure in Greene County is approximately one-third of

the market value). The average market value was then used to calculate the damage or potential dollar loss to both the vulnerable housing units and their contents.

When comparing the average assessed value of a residential property in unincorporated Greene County to the average assessed value of a residential property in any of the participating municipalities, there is a substantial difference. This difference is attributed to several factors including larger parcel sizes and the inclusion of outbuildings (i.e., sheds, barns, etc.) in the averaged assessed value. In addition, there has been a recent trend towards building new, larger residences in unincorporated areas of the County.

To determine the potential dollar losses to the ***structure of the vulnerable housing units***, start by taking the average market value and multiplying by the percent damage. For the purposes of this scenario, let's assume that the vulnerable residential buildings are one or two story homes with basements that are flooded with two feet of water. Based on FEMA guidance, the expected damage to the structure of the vulnerable housing units would be 20%. After calculating the average structural damage number, multiply it by the number of vulnerable housing units. **Figure 30** provides a sample calculation of potential dollar loss to the structure of vulnerable housing units.

Figure 30
Calculation of Potential Dollar Loss to the Structure of Vulnerable Housing Units

Step 1:
Average Market Value ($) x Percent Damage (%) = Average Structural Damage ($)
Carrollton Example: $74,601 x 20% = $14,920.20

Step 2:
Average Structural Damage ($) x Number of Vulnerable Housing Units =
Total Structural Damages to the Vulnerable Housing Units within a Jurisdiction
(Rounded to the Nearest Dollar)
Carrollton Example: $14,920.20 x 23 housing units = $343,165

Next, calculate the potential dollar losses to the ***content of the vulnerable housing units***. This is determined in the same manner as the potential dollar losses to the vulnerable housing units. Take the average market value and multiply by the percent damage. Using the same assumption as above, the FEMA guidance estimates that the expected damage to the content of the vulnerable housing units would be 30%. After determining the average content damage number, multiply it by the number of vulnerable housing units. **Figure 31** provides a sample calculation of potential dollar loss to the content of vulnerable housing units.

Finally, the total potential dollar losses may be calculated by adding together the potential dollar losses to the vulnerable housing units and the potential dollar losses to the content of the vulnerable housing units. **Figure 29** provides an estimate of the total potential dollar losses by participating jurisdiction.

Figure 31
Calculation of Potential Dollar Loss to the Content of Vulnerable Housing Units

Step 1:
Average Market Value ($) x Percent Damage (%) = Average Content Damage ($)
Carrollton Example: $74,601 x 30% = $22,380.30

Step 2:
Average Content Damage ($) x Number of Vulnerable Housing Units =
Total Content Damages to the Vulnerable Housing Units within a Jurisdiction
(Rounded to the Nearest Dollar)
Carrollton Example: $22,380.30 x 23 housing units = $514,747

This assessment illustrates why potential residential dollar losses should be considered when participating jurisdictions are deciding which mitigation projects to pursue. Potential dollar losses caused by flooding to vulnerable residences within the participating municipalities would be expected to range from $500,000 to $3 million. There are four participating municipalities in this scenario who do not have any residences considered vulnerable to flooding.

Infrastructure & Critical Facilities

The wastewater treatment facility located in Greenfield is within the floodplain and has the potential to be impacted by a flood event, although it has never flooded. The Village Hall in Hillview is also located within the floodplain and has experienced repeated flooding issues. In addition, there are two power substations located along the Illinois River Road (CH 400 E) north and west of Hillview that are located within the floodplain that have the potential to be impacted by a flood event. No other above-ground infrastructure or critical facilities within the participating jurisdictions, other than key roads and bridges, were identified as being vulnerable to flooding.

Considerations

The calculations presented above are meant to provide the reader with a sense of the scope or magnitude of a large flood event in dollars. These calculations do not address the physical damages sustained by businesses or other infrastructure, such as roads and bridges. These calculations also do not address the monetary impacts to businesses who cannot operate or lose goods through the failure of crucial services (i.e., power, drinking water and sewer). While average dollar amounts can not be supplied for these items at this time, they should be taken into account when officials discuss the overall impacts that a large-scale flood event would have on their jurisdiction.

3.5 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.

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.

How are tornadoes rated?

Tornadoes are rated using the Fujita Scale, which measures the intensity of a tornado based on its wind speed and the damage sustained by structures and vegetation. The Fujita Scale identifies six different categories of tornadoes, F0 through F5. **Figure 32** gives a brief description of each category.

Figure 32
Fujita Tornado Measurement Scale

Category (F-Scale #)	Intensity Phase / Wind Speed	Description
F0	Gale Tornado 40 – 72 mph	Light damage – some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; damage to sign boards
F1	Moderate Tornado 73 – 112 mph	Moderate damage – peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads
F2	Significant Tornado 113 – 157 mph	Considerable damage – roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated
F3	Severe Tornado 158 – 206 mph	Severe damage – roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown
F4	Devastating Tornado 207 – 260 mph	Devastating damage – well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated
F5	Incredible Tornado 261 – 318 mph	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: FEMA "State and Local Mitigation Planning How-To Guide: Understanding Your Risks", August 2001.

On February 1, 2007 use of the original Fujita Scale was discontinued in favor of the Enhanced Fujita Scale. The Enhanced Fujita Scale continues to use the F0 through F5 categories, but is based on additional damage indicators and revised wind speeds. **Figure 33** depicts the Enhanced Fujita Scale. While the Enhanced Fujita Scale is currently in use, the historical data presented in this report is based on the original Fujita Scale.

Figure 33
Enhanced Fujita Tornado Measurement Scale

Category (EF Scale #)	Wind Speed
EF0	65 – 85 mph
EF1	86 – 110 mph
EF2	111 – 135 mph
EF3	136 – 165 mph
EF4	166 – 200 mph
EF5	Over 200 mph

Source: NOAA, Storm Prediction Center, Online Tornado FAQ: Frequently Asked Questions about Tornadoes.

Are alerts issued for tornadoes?

Yes. The National Weather Service Weather Forecast Office in St. Louis, Missouri is responsible for issuing tornado watches or warnings for Greene County depending on the weather conditions. The following provides a brief description of each type of alert.

- **Tornado 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.
- **Tornado 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?

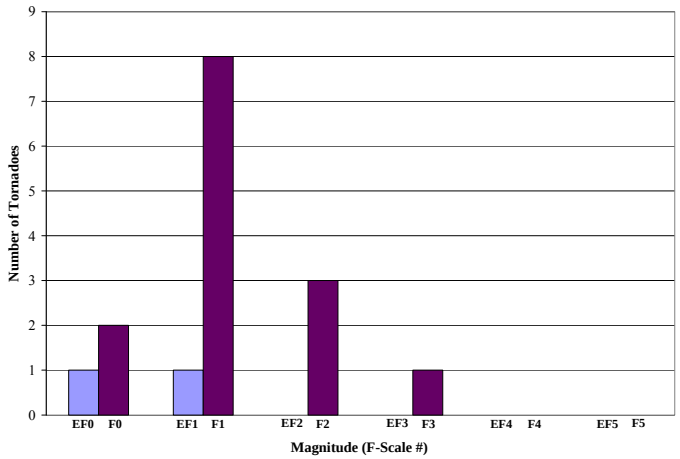
Table 8 summarizes the previous occurrences as well as the extent or magnitude of tornado events recorded in Greene County. The Tornado Climatology Listing from the National Weather Service Weather Forecast Office in St. Louis, Missouri and the Storm Events Database records show 16 reported occurrences of tornadoes in Greene County between 1952 and 2010. In comparison, Illinois has averaged 37 tornadoes annually since 1950. Tornadoes have occurred every decade in Greene County since the 1950s.

A tree fell on this residence in Hillview as a result of an F2 tornado that ripped through the area on March 12, 2006.

Photo provided by Dale Sorrells

Figure 34 charts the reported occurrences of tornadoes by magnitude. Of the 16 reported occurrences, one was classified as an F3 tornado, three were classified as F2 tornadoes, eight were classified as F1 tornadoes, two were classified as F0 tornadoes, one was classified as an EF1 tornado and one was classified as an EF0 tornado. These 16 reported tornadoes were produced by 15 separate weather events. There was one single weather event where two or more tornadoes were produced.

Figure 34
Greene County Tornadoes by Magnitude
1952 through 2010



NOAA, NESDIS, National Climatic Data Center, Storm Events Database, Illinois, Greene County, 2010.
NWS, Weather Forecast Office St. Louis, Missouri, Tornado Climatology Listing, Greene County, Illinois, 2011.

Figures 35 and **36** chart the reported occurrences of tornadoes by month and hour. Eleven of the 16 events took place in March, April and May. In comparison, approximately 66% of all tornadoes occurrences statewide took place in April, May and June. Approximately 87% of all the recorded tornadoes occurred during the p.m. hours, with nine of the 16 events taking place between 4 p.m. and 8 p.m.

Figure 35
Greene County Tornadoes by Month
1952 through 2010

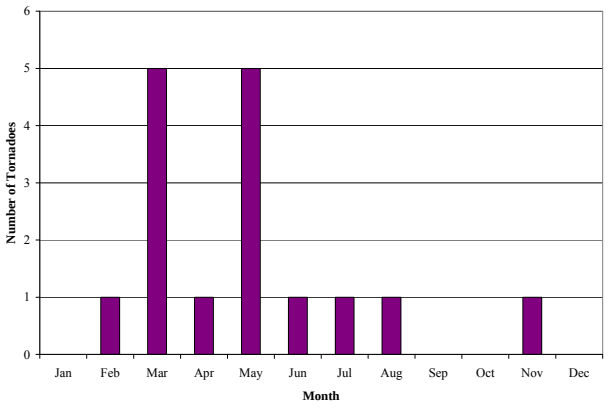
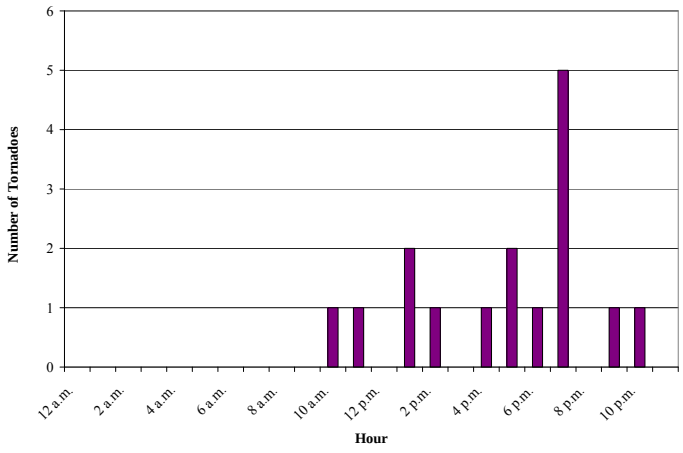


Figure 36
Greene County Tornadoes by Hour
1952 through 2010



NOAA, NESDIS, National Climatic Data Center, Storm Events Database, Illinois, Greene County, 2010.
NWS, Weather Forecast Office St. Louis, Missouri, Tornado Climatology Listing, Greene County, Illinois, 2011.

The recorded tornadoes varied in length from 0.1 miles to 15.9 miles and in width from 10 yards to 352 yards. The average length of a tornado in Greene County is 5.25 miles, the average width is 100 yards and the average damage pathway is approximately 0.30 square miles. The longest tornado recorded in Greene County occurred on June 6, 1960. This F1 tornado touched down at the Greene County Fairgrounds outside of Carrollton and traveled northwest for 43.5 miles, (approximately 14 miles within Greene County) before dissipating northwest of Chatham in Sangamon County. The damage pathway of this tornado within Greene County covered approximately 0.45 square miles.

The widest tornado recorded for Greene County occurred on March 8, 2009. The EF1 tornado touched down in the northeast corner of the County, approximately 3.5 miles northwest of Athensville and traveled northeast for 5 miles before dissipating northeast of Athensville. The damage pathway of this tornado covered approximately 1 square mile.

What locations are affected by tornadoes?

Tornadoes have the potential to affect the entire County. The *2010 Illinois Natural Hazard Mitigation Plan* prepared by the Illinois Emergency Management Agency classifies Greene County's hazard rating for tornadoes as "elevated."

All of the participating municipalities have had reported occurrences of tornadoes in or near their locations. **Figure 37** shows the pathway each reported tornado took. 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.

On May 1, 1983, the only F3 tornado ever recorded in Greene County tore through the southeastern portion of Greenfield causing extensive damage.

Photo provided by Richard Newton

What is the probability of future tornadoes occurring?

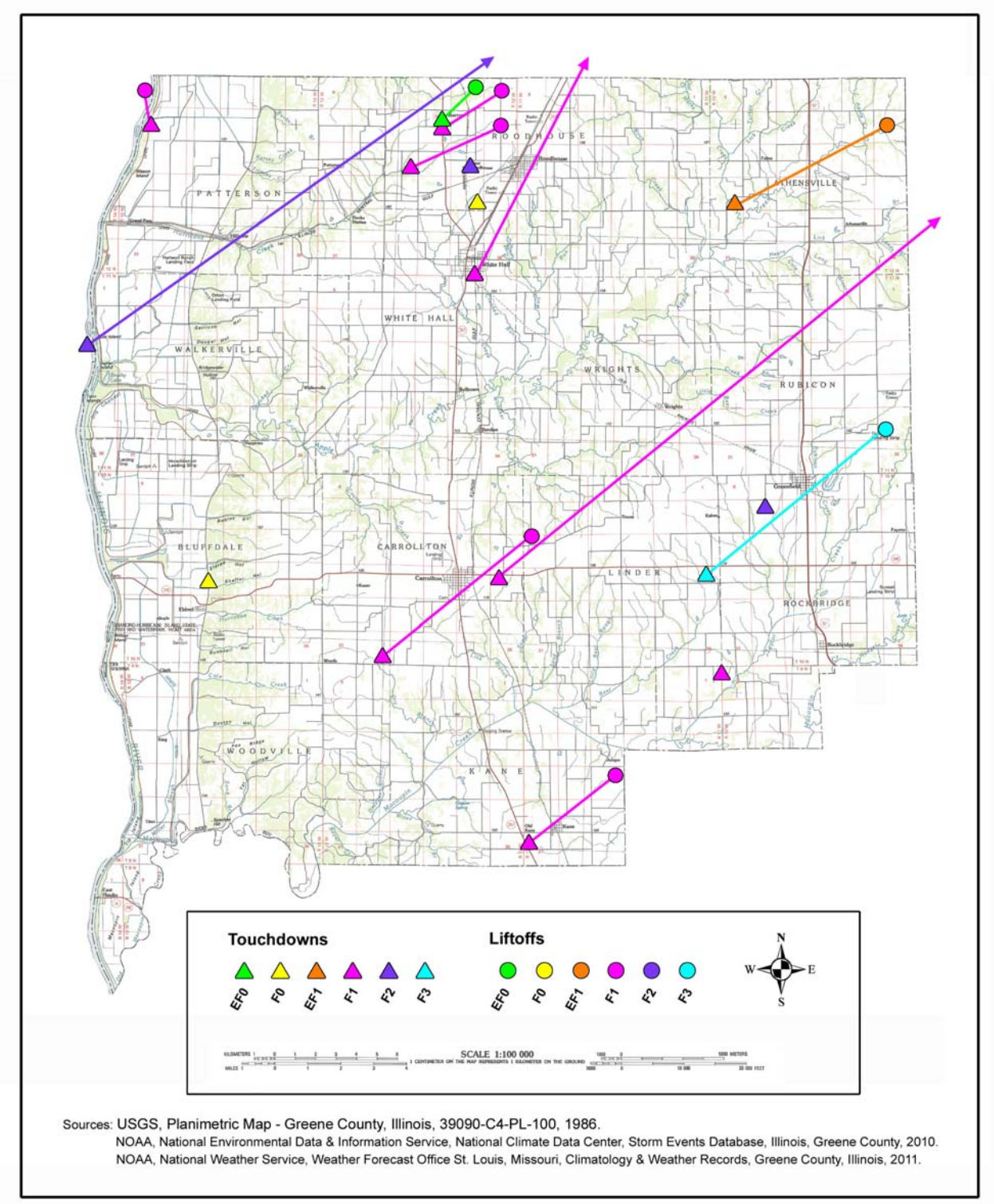
Greene County has had 16 verified occurrences of tornadoes between 1952 and 2010. With 16 occurrences over the past 60 years, the probability or likelihood of a tornado hitting somewhere in the County in any given year is 27%. There were four years over the last 60 years where more than one tornado occurred. This indicates that the probability that more than one tornado may occur during any given year within Greene County is 7%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to tornadoes?

Yes. All of Greene County is vulnerable to the dangers presented by tornadoes. Municipalities located in the north-central portions of the County have experienced more tornadoes and appear to be more vulnerable than those located in the eastern portions of the County. **Figure 38** lists the verified tornadoes that have touched down in or near each participating municipality.

Figure 37
Tornado Touchdowns in Greene County: 1952 – 2010



Sources: USGS, Planimetric Map - Greene County, Illinois, 39090-C4-PL-100, 1986.
NOAA, National Environmental Data & Information Service, National Climate Data Center, Storm Events Database, Illinois, Greene County, 2010.
NOAA, National Weather Service, Weather Forecast Office St. Louis, Missouri, Climatology & Weather Records, Greene County, Illinois, 2011.

Figure 38
Verified Tornado Touchdowns by Participating Municipality

Participating Municipality	Number of Verified Tornadoes	Year Tornado Touchdown
Carrollton	2	1960, 1962
Eldred	1	1960
Greenfield	2	1983,1988
Hillview	2	1999, 2006
Roodhouse	4	1975, 1995 (2), 2009
White Hall	1	1995
Wilmington (Patterson)	1	2006

Source: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database, Illinois, Greene County, 2010.

What impacts resulted from the recorded tornadoes?

The data provided by the Tornado Climatology Listing and the Storm Events Database indicates that between 1952 and 2010, tornadoes caused approximately $3,397,200 in property damage and $2,200 in crop damage. Property damages for four of the occurrences totaled $250,000 or more. It should be noted that the property damage total of $250,000 reported for the tornado event on May 6, 1960 represents losses sustained in four counties (including Greene County). A breakdown by county was not available. There were, however, five occurrences where the amount of the property damage was not reported, however damage to machine sheds, silos, homes and a church occurred.

The May 1, 1983 F3 tornado that ripped through Greenfield caused approximately $2.5 million in damages and injured 15 individuals.

Photo provided by Richard Newton

Eighteen injuries were reported as a result of three separate incidents between 1952 and 2010. In comparison, Illinois averages approximately four tornado fatalities annually; however, this number varies widely from year to year. Detailed information was not available for any of the incidents in the County.

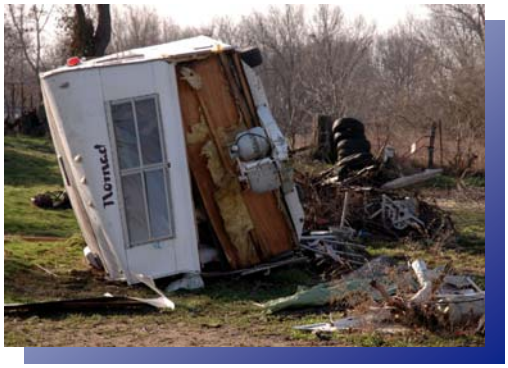
While more injuries have been attributed to tornadoes in Greene County than to all the other natural hazards combined, the numbers are still low. The recorded tornadoes have historically touched in rural areas away from concentrated populations. Assuming that the hospital in Carrollton is not directly impacted by a tornado event, it has an emergency generator and is equipped to provide continuous care to those injured during a tornado. As a result, the risk or vulnerability to public health and safety has been 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 and antenna and 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 an extended period of time).

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

Yes. All existing buildings, infrastructure and critical facilities located in Greene County and the participating jurisdictions are vulnerable to damage from tornadoes. Buildings, infrastructure and critical facilities located aboveground in the path of a tornado are the most vulnerable and 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 caused by 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. Several of the participating jurisdictions have indicated a need for tornado safe shelters.



Damage sustained to a mobile home in Patterson from an F2 tornado that moved through the area on March 12, 2006.

Photo provided by Dale Sorrells

As with severe storms, infrastructure and critical facilities tend to be just as vulnerable to tornadoes as buildings. 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.

A simple way to assess the vulnerability of buildings is to determine the average housing unit density within the County. This can be done by taking the number of housing units within the County (6,332) and dividing that number by the total land area of the County (546.3 square miles). The result suggests that there is an average of 12 housing units per square mile in Greene County. While this method provides an adequate assessment of the buildings 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 Greene County.

In Greene County, and many other west-central Illinois counties, differences in housing density must be considered when assessing the vulnerability of buildings to tornado damage. Approximately 72% of all housing units within the County are located in four of the County's 13 townships (Carrollton, Rockbridge, Roodhouse and White Hall). **Figure 39** provides a breakdown of housing units by township. Consequently, tornado damage to buildings, infrastructure and critical facilities in these more densely populated townships is likely to be

greater than in the rest of Greene County. In addition, over half of the mobile home units (which are more vulnerable to tornadoes) within the County are located in these four townships.

Figure 39
Potential Tornado Damage to Housing Units in Greene County by Township

Township	Land Area (Sq. Miles)	Total Number of Housing Units (2000)	Number of Mobile Homes (2000)	Housing Unit Density (Units per Sq. Mile)	Number of Potentially Damaged Housing Units (Units per 0.30 Sq. Mile Area)
Athensville	35.7	169	14	5	2
Bluffdale	45.5	251	29	6	2
Carrollton	44.6	1,376	99	31	10
Kane	49.0	404	57	9	3
Linder	34.6	131	16	4	2
Patterson	47.7	280	39	6	2
Rockbridge	47.8	755	119	16	5
Roodhouse	39.6	1,066	165	27	9
Rubicon	35.8	150	16	5	2
Walkerville	39.6	104	30	3	1
White Hall	42.1	1,369	111	33	10
Woodville	48.3	125	12	3	1
Wrights	36.0	152	24	5	2

Sources: Illinois Department of Commerce and Economic Opportunity, Census 2000 Data for Illinois.
U. S. Census Bureau, Geography, Census 2000 U.S. Gazetteer Files – County Subdivisions, 2010.

To more accurately assess building vulnerability in Greene County, the average housing unit density for each township was calculated. **Figure 39** illustrates the substantial differences in housing unit density between the various townships in the County. By comparing the average county housing unit density calculated above (12 housing units per square mile) to the township housing unit densities listed in **Figure 39**, the shortcomings of using a countywide average housing unit density for counties such as Greene become apparent. For nine of the 13 townships, the average county housing unit density is greater (in most cases considerably) than the density numbers calculated for the townships. Furthermore, the average county housing unit density is considerably less than the housing unit densities calculated for the four most populated townships.

Since the housing unit density has been calculated for each township, it is relatively simple to provide an estimate of the number of housing units that could potentially be damaged by a tornado in Greene County. This can be done by taking the housing unit density for each township and multiplying that by the land area impacted by a tornado. For this scenario a land area of 0.30 square miles was chosen, the average damage pathway recorded for a tornado in Greene County. **Figure 39** provides a breakdown of the number of potentially damaged housing units by township.

It is important to note that for the four townships with the greatest number of total housing units, the potential damage estimates would only be reached if a tornado's pathway included the major

municipality 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.

Greene County ranks among the top 70 counties in Illinois in terms of tornado frequency. This fact suggests that the overall risk posed by tornadoes in Greene County is medium. 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. Only one of the participating jurisdictions, Roodhouse, has building codes in place that will likely help lessen the vulnerability of new buildings and critical facilities to damage from tornadoes. 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 structures located within each participating municipality can be calculated if several assumptions are made. These assumptions represent a probable scenario based on the reported historical occurrences of tornadoes in Greene 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 the County.

Step 1: Determining the Number of Impacted Housing Units

First, an estimate of the number of residential housing units impacted by a tornado needs to be calculated. In order to accomplish this, the size of the impacted area must be determined. While the worst tornado recorded in Greene County could be used to estimate the area impacted; it was decided that the area impacted should be based on an average of the tornadoes that have been recorded in the County. The average area impacted by a tornado in Greene County was calculated and found to cover approximately 0.30 square miles. This approach offers a reasonable alternative to using the worst tornado since the size and area impacted by the average of the recorded tornadoes is more likely to recur. In many cases potential damage estimates are ignored when the scenario is extreme or when the estimates appear to overstate the damages.

There are two ways in which the average area impacted by a tornado can be used to help determine the estimated number of impacted housing units. The first method involves overlaying the average tornado on a map of each municipality to determine whether the average impacted area would fall within the municipal limits. If the area impacted is less than the

average because of the size and shape of the municipality, then additional calculations would be required to determine what portion of the average area would fall within the municipality. Once the portion within the municipality is calculated, then that area would be used to help estimate the number of impacted housing units. This method is more precise; however, it requires that future updates to the Plan use the exact same layouts of the average tornado for each municipality since changes may produce differences in the number of impacted housing units.

The second method assumes that the entire average impacted area would fall within the municipal limits; therefore, no additional calculations would be necessary in order to determine the number of impacted housing units. This method is quicker and easier and is more likely to produce consistent results when the Plan is updated. There is, however, a greater likelihood that the number of impacted housing units will be overestimated for those municipalities that occupy less than one square mile or have irregular shaped boundaries.

Both methods were applied to selected municipalities within Greene 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.

Next, the issue of housing density must be examined. While the number of impacted housing units could be determined by overlaying the average impacted area on a municipality and then physically counting the number of housing units within the area, this approach is time consuming and will provide a different estimate depending on the layout of the average impacted area. A more practical approach is to use the average housing unity density to help calculate the number of impacted housing units. The use of this approach is appropriate, in part, because the housing unit densities within the municipalities in Greene County do not substantially change between the center of the municipality and the edges. This is not true for all municipalities in Illinois, especially those in and around Chicago.

To determine the average housing unit density for a municipality, the number of housing units within the municipality is divided by the land area occupied by the municipality. **Figure 40** provides the average housing unit density for each participating municipality. Now that both the area impacted and average housing unit densities have been determined, the number of impacted residential buildings can be calculated. This is done by taking the average housing unit density for each participating municipality and multiplying that by the land area impacted (0.30 square miles). **Figure 40** provides a breakdown of the number of impacted housing units by municipality.

Step 2: Determining Potential Dollar Losses to Impacted Housing Units

Once the number of impacted housing units has been determined, the potential dollar losses can be estimated. In order to determine the potential dollar losses, the average assessed value must first be determined for each municipality. The average assessed value for each municipality was calculated from the 2010 tax assessment information provided by the Greene County Clerk. The average assessed value is important because it establishes the average market value which will be used to estimate the potential dollar losses. To determine the average market value for each municipality, the average assessed value for that jurisdiction is multiplied by three (the assessed

value of a structure in Greene County is approximately one-third of the market value). **Figure 41** provides the average assessed value and average market value for each participating municipality.

Figure 40
Estimated Number of Municipal Residential Housing Units Impacted by a Tornado

Participating Municipality	Land Area (Sq. Miles)	Number of Housing Units (2000)	Housing Unit Density (Units per Sq. Mile)	Housing Units Impacted (Units per 0.30 Sq. Miles)
Carrollton	1.7	1,166	686	206
Eldred	0.1	100	100	100
Greenfield	1.8	533	297	90
Hillview	0.9	71	71	22
Roodhouse	1.1	916	833	250
White Hall	2.6	1,213	467	141
Wilmington (Patterson)	0.8	44	44	14

Sources: Illinois Department of Commerce and Economic Opportunity, Census 2000 Data for Illinois, 2010.
U. S. Census Bureau, Geography, Census 2000 U.S. Gazetteer Files – Counties & Places, 2010.

When comparing the average assessed value of a residential property in unincorporated Greene County to the average assessed value of a residential property in any of the participating municipalities, there is a substantial difference. This difference is attributed to several factors including larger parcel sizes and the inclusion of outbuildings (i.e., sheds, barns, etc.) in the averaged assessed value. In addition, there has been a recent trend towards building new, larger residences in unincorporated areas of the County.

Next, the potential dollar loss estimates must be calculated for both the damage done to the housing unit and the contents. To determine the potential dollar losses to the housing units, start by taking the average market value and multiplying that by the percent damage. For the purposes of this scenario, it is assumed that the expected damage to the housing units is 100%; in other words, the housing units are completely destroyed. While it is unlikely that each and every housing unit would sustain the maximum percent damage, this assumption represents the worst case for each jurisdiction.

The potential dollar losses to the content of the housing units must be estimated next. Based on FEMA guidance, it is assumed that the value of a residential housing unit's content is approximately 50% of its market value. Therefore, to determine the potential dollar losses to the content, start by taking half of the average market value and multiply by the percent damage. As with the potential dollar losses to structures, it is assumed that the expected damage to the content is 100% (the content is completely destroyed). Then multiply the average market value number by the number of impacted housing units to calculate the estimated content damage.

Figure 41
Estimated Potential Dollar Losses to Impacted Residential Housing Units from a Tornado

Participating Jurisdiction	Housing Units Impacted	Average Assessed Value	Average Market Value	Potential Dollar Losses		Total Potential Dollar Losses
				Housing Unit	Content	
Carrollton	206	$24,867	$74,601	$15,367,806	$7,683,903	$23,051,709
Eldred	100	$16,675	$50,025	$5,002,500	$2,501,250	$7,503,750
Greenfield	90	$18,536	$55,506	$4,995,540	$2,497,770	$7,493,310
Hillview	22	$10,383	$31,149	$4,099,152	$342,639	$4,441,791
Roodhouse	250	$13,346	$40,038	$10,009,500	$5,004,750	$15,014,250
White Hall	141	$16,145	$48,435	$6,829,335	$3,414,668	$10,244,003
Wilmington (Patterson)	14	$10,390	$31,170	$436,380	$218,190	$654,570
County*	4	$32,525	$97,575	$390,300	$195,150	$585,450
County†	2	$32,525	$97,575	$195,150	$97,575	$292,725

* Uses the generic average housing unit density (12 housing units per square mile)
† Uses the average housing unit density for the 9 least populated townships (5 housing units per square mile)

Source: Banghart, Deborah. Greene County Clerk. "Greene County." Email to Greg R. Michaud. March 21, 2011.

Finally, the total potential dollar losses may be calculated by adding together the potential dollar losses to the impacted housing units and the potential dollar losses to the content of the impacted housing units. **Figure 41** lists the total potential dollar losses by municipality.

To provide an estimate of potential dollar losses from tornadoes within the County, it becomes necessary to revisit the issue of average housing unit density discussed previously. If the generic average housing unit density of 12 housing units per square mile is used for the County and it is assumed that the tornado impacts a 0.30 square mile area, then the total number of housing units impacted would be four. However, as discussed earlier, the average housing unit density for the County does not take into consideration the differences in housing density in the County. If an average housing unit density is calculated for the nine least populated townships (1,766 housing units divided by 372.2 square miles equals approximately five housing units per square mile) and multiplied by the area impacted by the tornado (0.30 square miles), then the total number of housing units impacted is reduced to two. This difference in housing units leads to a substantial difference in the total potential dollar losses estimated for the County.

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 Greene County would be expected to exceed at least $4 million in any of the participating municipalities, with the exception of Wilmington (Patterson).

3.6 DROUGHT

IDENTIFYING THE HAZARD

What is the definition of a drought?

While there is no universally accepted definition of drought, it can generally be defined as a period of unusually persistent dry weather that continues long enough to cause serious problems such as crop damage and/or water supply shortages. A drought may also be defined as the cumulative deficit of precipitation relative to what is normal for a region over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group or environmental sector.

There are four types of drought. They are differentiated based on the use and need for water. The following provides a brief description of each type.

- **Meteorological Drought.** Meteorological drought is a period of well-below-average precipitation that spans a few months to a few years. It can be identified by a shortfall in precipitation. Due to climate differences, what might be considered a drought in one location of the country may not be in another location.
- **Agricultural Drought.** An agricultural drought is a period when soil moisture no longer meets the needs of a particular crop to germinate and grow. It can be identified by a deficit in soil moisture.
- **Hydrological Drought.** Hydrological drought is a period when surface and subsurface water supplies (i.e., streams, lakes, aquifers, etc.) drop below normal levels. It can be identified by a deficit in surface and groundwater.
- **Socioeconomic Drought.** Socioeconomic drought is a period when water shortages begin to affect people. In this case, there is not enough water to meet human and environmental needs.

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. It is generally difficult to pinpoint the beginning and the end of a drought. Because the impacts of a drought accumulate slowly at first, a drought may not be recognized until it has become well established. Even during a drought there may be one or two months with above average precipitation totals. These wet months do not necessarily signal the end of a drought and generally do not have a major impact on moisture deficits. Droughts can be short, lasting just a few months, or they can persist for several years before regional climate conditions return to normal. While drought conditions can occur at any time throughout the year, the most apparent time is during the summer months. Nationally, drought impacts often exceed $1 billion due in part to the sheer size of the areas affected.

How are droughts measured?

There are several quantitative measures (indices) that have been developed to measure drought in the United States. How these indices measure drought depends on the discipline affected (i.e., agriculture, hydrology, meteorology, etc.) and the region being considered. Although none of the major indices are inherently superior to the rest, some are better suited than others for certain uses.

Two of the indices highlighted in this plan are: the Palmer Drought Severity Index (PDSI) and the U.S. Drought Monitor. The PDSI was the first comprehensive drought index developed in the United States and is still in use today. It is designed to indicate when weather conditions have been abnormally dry or wet and provides a standardized method of identifying and comparing drought conditions regardless of time or location.

The U.S. Drought Monitor is a relatively new index that combines quantitative measures with input from experts in the field. It is designed to provide the general public, media, government officials and others with an easily understandable "big picture" overview of drought conditions across the United States. In the last several years, 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 utilized 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 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.

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 42** shows the classification system utilized by the Palmer Drought Severity Index.

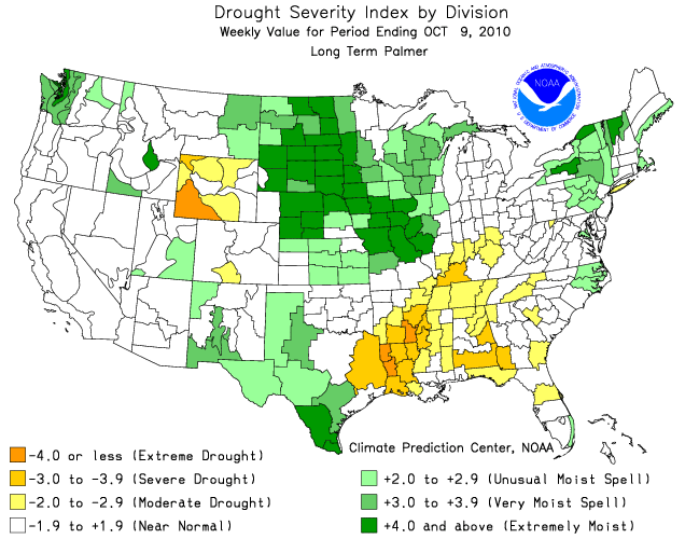
Calculations of the PDSI are made for 350 climate divisions in the United States and Puerto Rico. PDSI values have typically been calculated on a monthly basis. The National Climate Data Center has records on the monthly PDSI values for every climate division in the United States dating back to 1895.

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 43** shows an example of this map.

Figure 42 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, University of Nebraska – Lincoln, "What is Drought? – Drought Indices," Dr. Michael J. Hayes, Climate Impacts Specialist, 2006.

Figure 43
Palmer Drought Severity Index Map



Source: National Oceanic and Atmospheric Administration, Climate Prediction Center, Drought Monitoring.

U.S. Drought Monitor

A relatively new tool 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 44** provides a brief description of each category.

Figure 44
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

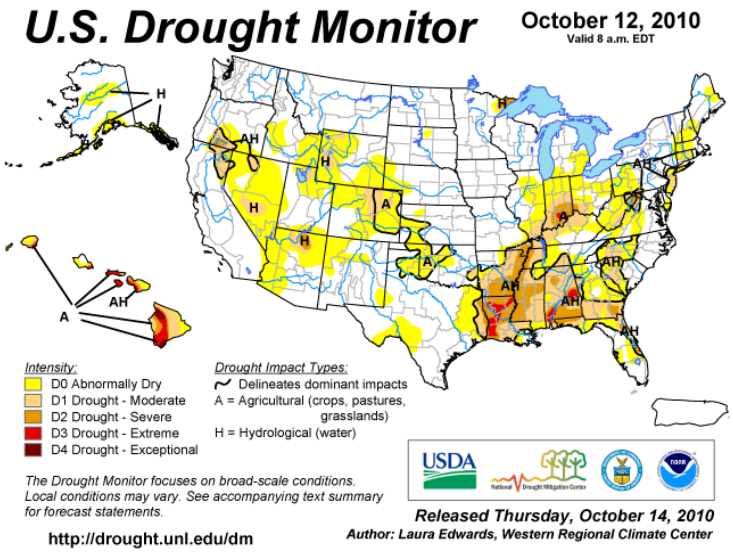
Source: National Integrated Drought Information System, U.S. Drought Portal, "Drought Monitor: State-of-the-Art Blend of Science and Subjectivity," U.S. Drought Monitor, January 2008.

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 45** shows an example of the U.S. Drought Monitor weekly map. A summary also accompanies the map outlining the general conditions by regions.

Figure 45
U.S. Drought Monitor Map



Source: Drought Monitor, National Drought Mitigation Center, U.S. Drought Monitor.

The U.S. Drought Monitor is designed to provide a general and up-to-date overview of current drought conditions. It is not designed to depict local conditions. As a result, there could be water shortages or crop failures within areas not designated as drought, just as there could locations with adequate water supplies in an area designated as D3 or D4.

PROFILING THE HAZARD

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

The following summarizes the previous occurrences as well as the extent or severity of the drought events in Greene County. Information obtained from the Storm Events Database and the Illinois Emergency Management Agency show three reported drought events in Greene County between 1983 and 2010.

- 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 the counties in Illinois (including Greene County) were impacted by drought conditions, although none of the counties were proclaimed state disaster areas. Disaster relief payments exceeding $382 million were paid to landowners and farmers as a result of this drought.
- In 2005, drought conditions impacted much of the state, including Greene County. 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 each event 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, 1936 and 1954; however, the extent to which Greene County was impacted was unavailable.

What locations are affected by drought?

Drought events affect the entire County. All communities in Greene 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 Greene County's hazard rating for drought as "guarded."

What is the probability of future drought events occurring?

Greene County has experienced three droughts between 1983 and 2010. With three occurrences over 28 years, the probability or likelihood that the County may experience a drought in any given year is 11%. However, if earlier recorded droughts are factored in, then the probability that Greene County may experience a drought in any given year decreases slightly to 8%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to drought?

Yes. All of Greene County is vulnerable to drought. Neither the amount nor distribution of precipitation, soil types, topography, or water table conditions provides protection for any area within Greene 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 Greene 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 Greene 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 main enterprise in Greene County. According to the 2007 Census of Agriculture, there were 600 farms in Greene County occupying 273,088 acres. Farm land accounts for approximately 78% of all the land in Greene County. Of the 273,088 acres of farm land, approximately 79% or 214,838 acres of this land was in crop production. Less than two percent of this land is irrigated.

Crop sales accounted for $85,650,000 in revenue while livestock sales accounted for $49,894,000. Greene County ranks in the top 20 Illinois counties for livestock cash receipts and in the top 60 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 46** illustrates the reduction in yields seen for corn and soybeans during the three recorded drought events. 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 48% and soybeans yield reductions of 38%. In 1983, 64 bushels per acre were harvested for corn and 24 bushels per acre for soybean, in contrast to 122 bushels per acre of corn and 38.5 bushels per acre of soybean the previous year.

Figure 46
Crop Yield Reductions Due To Drought in Greene County

Year	Corn		Soybeans	
	Yield (bushel)	% Reduction from Previous Year	Yield (bushel)	% Reduction from Previous Year
1982	122	---	38.5	---
1983	**64**	**48%**	**24**	**38%**
1987	137	---	38	---
1988	**96**	**30%**	**29.5**	**22%**
2004	179	---	52	---
2005	**136**	**24%**	**43**	**17%**
2006	137	---	45	---

Source: United States Department of Agriculture, National Agricultural Statistics Service, Quick Stats – Crops, Greene County, Illinois, 2011.

Corn yield reductions were 30% and soybean yield reductions were 22% as a result of the 1988 drought when only 96 bushels per acre of corn and 29.5 bushels per acre of soybeans were harvested in contrast to 137 bushels per acre of corn and 38 bushels per acre of soybeans harvested the previous year. The 2005 drought caused a 24% yield reduction in corn and 17% yield reduction in soybeans for 2005. In 2005, 136 bushels per acre of corn and 43 bushels per acre of soybeans were harvested in contrast to 179 bushels per acre of corn and 52 bushels per acre of soybeans harvested the previous year. While 2006 yields for both corn and soybeans were slightly greater than 2005 yields, they had not rebounded to pre-drought levels.

Drinking Water Shortages

While most drinking water supplies in Greene County obtain water from deep underground wells, Greenfield relies on Greenfield Lake, a surface water source as its drinking water supply. As a result, the water supply for Greenfield is more vulnerable to shortages as a result of a prolonged drought or a series of droughts in close succession. Those municipalities that obtain water from deep underground wells are less vulnerable 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. In addition to impacting drinking water supplies, drought can also impact recreational activities. Low water levels can adversely affect fishing and boating activities on lakes and ponds.

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

No. In general, existing buildings, infrastructure and critical facilities located in Greene 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 yield and the potential impacts to drinking water supplies. With no comprehensive damage information available for previous occurrences there is no way to accurately estimate future potential dollar losses. However, since a major portion of the County is involved in farming activities, it is likely that there will be future dollar losses to drought. In addition, reduced water levels and the water conservation measures that typically accompany a drought will most likely impact businesses and industries that are water-dependent (i.e., car washes, landscapers etc.).

3.7 LEVEES

IDENTIFYING THE HAZARD

What is the definition of a levee?

In general, the U.S. Army Corps of Engineers (USACE or the Corps) defines a "levee" as an earthen embankment, floodwall or structure along a water course whose purpose is flood risk reduction or water conveyance. Levees are typically not designed to hold back water for extended periods of time, rather they are meant to provide temporary flood protection from seasonal high water, precipitation and other weather events. While levees reduce the risk from a flooding event, they do not eliminate it. There is always the chance a flood will exceed the capacity of a levee, no matter how well it is built.

The Mississippi and Illinois River valleys were largely transformed from permanent, seasonal wetlands to highly productive agricultural lands by the construction of levees and the organization of drainage districts between 1879 and 1916.

What is the definition of a breach?

A breach is a rupture, break or gap in a levee which causes previously contained water to flood the land behind a levee. If the levee breach is identified as a "failure breach" then the cause of the breach is known and occurred without overtopping. In order for a breach to be termed a failure breach, an investigation is usually required to determine cause.

What is the definition of overtopping?

Overtopping occurs when the water levels contained by the levee exceed the levee's crest elevation and flood the land behind the levee. The flooding occurs from overflow/overwash (waves) and other sources. In most cases overtopping may damage the levee but not compromise it. If the levee is compromised because of overtopping then it is identified as an "overtopping breach."

What causes a levee breach?

Levee breaches can result from one or more of the following:

- ***erosion of the crown and land-side face of the levee*** caused by overtopping (the higher the velocity of flow over the levee, the more quickly that erosion will occur and cause a failure of the levee);
- ***sand boils and piping*** resulting from the relatively fast passage of flood waters through permeable materials under the base of levee to the land behind the levee (depending on the amount of sand and soil transported by the waters from the base to the surface, the levee may settle unevenly, crack or even completely fail);
- ***seepage and saturation*** (prolonged exposure to water will cause levee materials to become saturated, leading to seepage and sloughing of the soil on land-side face of the levee and resulting in the loss of slope stability and ultimately failure of the levee);
- ***erosion of the river-side slope of the levee*** as a result of wave action caused by wind and/or commercial or recreational vessels over a long period of time (most Illinois levees

are constructed of sand and alluvial materials, both of which are among the easiest materials to erode);

- ***structural failures*** at gates, walls or closure structures;
- ***improper maintenance*** (including failure to maintain gates, walls or closure structures; remove trees; fill in holes created by burrowing animals, etc.); and
- ***earthquakes*** which can cause loss of soil strength and destabilize the levee and foundation materials.

Who is responsible for regulating levees?

This is no single agency with responsibility for levee oversight nationwide. The USACE has specific and limited authorities for approximately 2,000 levees across the country, totally 14,000 miles. While the Corps serves as one of the nation's largest infrastructure stewards, the misperception exists that the USACE has universal responsibility for the nation's levees. There are three different classifications of levees:

- ***Federally Authorized Levees***. A levee typically designed and built by the Corps in cooperation with a local sponsor, then turned over to the local sponsor (i.e. drainage district) to operate, maintain, repair and replace the levee.
- ***Non-Federally Authorized Levees***. A levee designed and built by a non-federal agency, which is responsible for the operation, maintenance, repair and replacement of the levee.
- ***Private or Corporate-Owned Levees***. A levee designed and built by a private citizen, company or other public entity, which is responsible for the operation, maintenance, repair and replacement of the levee. The Corps has no responsibility for this type of levee.

What is a drainage district?

A drainage district is a local unit of government formed by area landowners to "…construct, maintain or repair drains or levees or to engage in other drainage or levee work for agricultural, sanitary or mining purposes" (70 ILCS 605/3-1). Drainage districts may be organized by petition or referendum and are approved by the circuit court of the county in which the greater part of the district lies. Each district is governed by three drainage commissioners. The drainage commissioners may be any adult who resides in Illinois and owns land within the district's boundaries. Commissioners are either appointed by the county or elected. Drainage districts are funded through assessments. Each benefited landowner in a district is assessed a fee for the maintenance and upkeep of the district. Under the Illinois Drainage Code, a district which is organized to maintain levees shall include the term "drainage and levee district" in its name.

Are there any drainage districts in Greene County?

Yes. There are seven drainage and levee districts located in Greene County. **Figure 47** provides information on each district including the year organized, acres of land protected, length of levee, etc.

Figure 47
Drainage and Levee Districts Located in Greene County

Drainage & Levee District	Levee Type	Year Organized	Land Protected (Acres)	Length of Levee (Miles)	Landowners Protected	Level of Protection
Bluffdale Farms	Non-Federal	NA	1,000	4	12	20 Year
Eldred-Spankey	Federal	1909	11,300	23.3	65	20 Year
Hartwell	Federal	1904	8,900	12.2	36	20 Year
Hillview*	Federal	1906	12,900	12.8	66	20 Year
Keach	Federal	1903	8,400	12.4	34	25 Year
Nutwood^	Federal	1906	11,300	12.3	294	20 Year
Schafer-Farrow†	Non-Federal/ Private	NA	800	NA	2	NA

* The District extends between Greene and Scott Counties

^ The District extends between Greene and Jersey Counties with virtually all of the protected landowners and most of the levee located in Jersey County

† Documentation obtained from the St. Louis District's Public Affairs Office jointly lists these two levees. However, the Schafer Levee is a non-federal levee that has been incorporated and is recognized by the Corps as a Drainage & Levee District. It protects 100 acres, is 1.6 miles long and is listed as providing 12 Year protection. The Farrow Levee is a private levee that is not incorporated and is not recognized by the Corps. It appears to protect 700 acres; however, its length is unknown. According to local sources it provides critical protection to the Village of Eldred and Illinois Route 108.

Sources: Illinois State Water Survey, "The 1993 Flood on the Mississippi River in Illinois," Miscellaneous Publication 151, 1994.
Peterson, Mike. Public Affairs Office. U.S. Army Corps of Engineers, St. Louis District. Telephone Interview with Greg Michaud regarding Levees in Greene County. August 5, 2011.
U.S. Army Corps of Engineers, St. Louis District, "Levee Summit: State of Illinois, Illinois River Levees," Map.
Walters, Terry. Resource Conservationist. Greene County Soil and Water Conservation District. Telephone Interview with Andrea Bostwick regarding Shafer & Farrow Levees in Greene County. August 15, 2011.

PROFILING THE HAZARD

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

The following summarizes the previous occurrences as well as the extent or magnitude of levee breaches in Greene County. Information obtained from the Greene County Soil and Water Conservation District and the Illinois State Water Survey identified three levee breach events in Greene County between 1957 and 2010.

- On June 14, 1957 a little over four inches of rain fell within a two hour period across northern Greene County. This flash flood event caused a breach in the Hillview Levee along Hurricane Creek in Hillview, flooding the village under a deluge of five feet of swirling water.
- Beginning the evening of August 9, 1961, approximately six inches of rain fell within a four to six hour period in Hillview. This flash flood event caused flood waters from Hurricane Creek to breach the south portion of the Hillview Levee 2:00 a.m. on August 10, 1961, flooding the lower portion of Hillview under about four feet of water.

- In 1993 very frequent, heavy rainfall across the upper Midwest from April through August, coupled with high soil moisture levels led to record-breaking flooding along the Mississippi, Missouri and lower reaches of the Illinois Rivers. The shear volume of water coupled with the length of the event caused many levees all along these rivers to fail. On July 18, 1993 the Nutwood Levee experienced an overtopping breach, flooding 11,000 acres of farmland. Then on August 1, 1993 the Eldred, Hartwell and Hillview levees all experienced overtopping breaches, collectively flooding 29,400 acres of farmland.

The records obtained from the Greene County Soil and Water Conservation District indicate that overtopping or levee breaches may also have occurred in Hillview along the Hillview Levee in 1926, 1943 and 1946; however, the extent to which the village was impacted was unavailable.

What locations are affected by levee breaches?

Levee breaches have the potential to affect Hillview, Eldred and unincorporated portions of western Greene County. **Figure 48** shows the locations of the levees in Greene County.

What is the probability of future levee breach events occurring?

It is difficult to specifically establish the probability of future levee breaches given the current records available. The probability depends not only on whether a breach has occurred previously, but also on the age and current conditions of the levee and whether proper maintenance continues. The 1993 flood event that caused four levees to be breached in Greene County was an extraordinary event which is not likely to occur on a regular basis. Therefore, the probability of future breaches within Greene County is estimated to be relatively low.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to levee breaches?

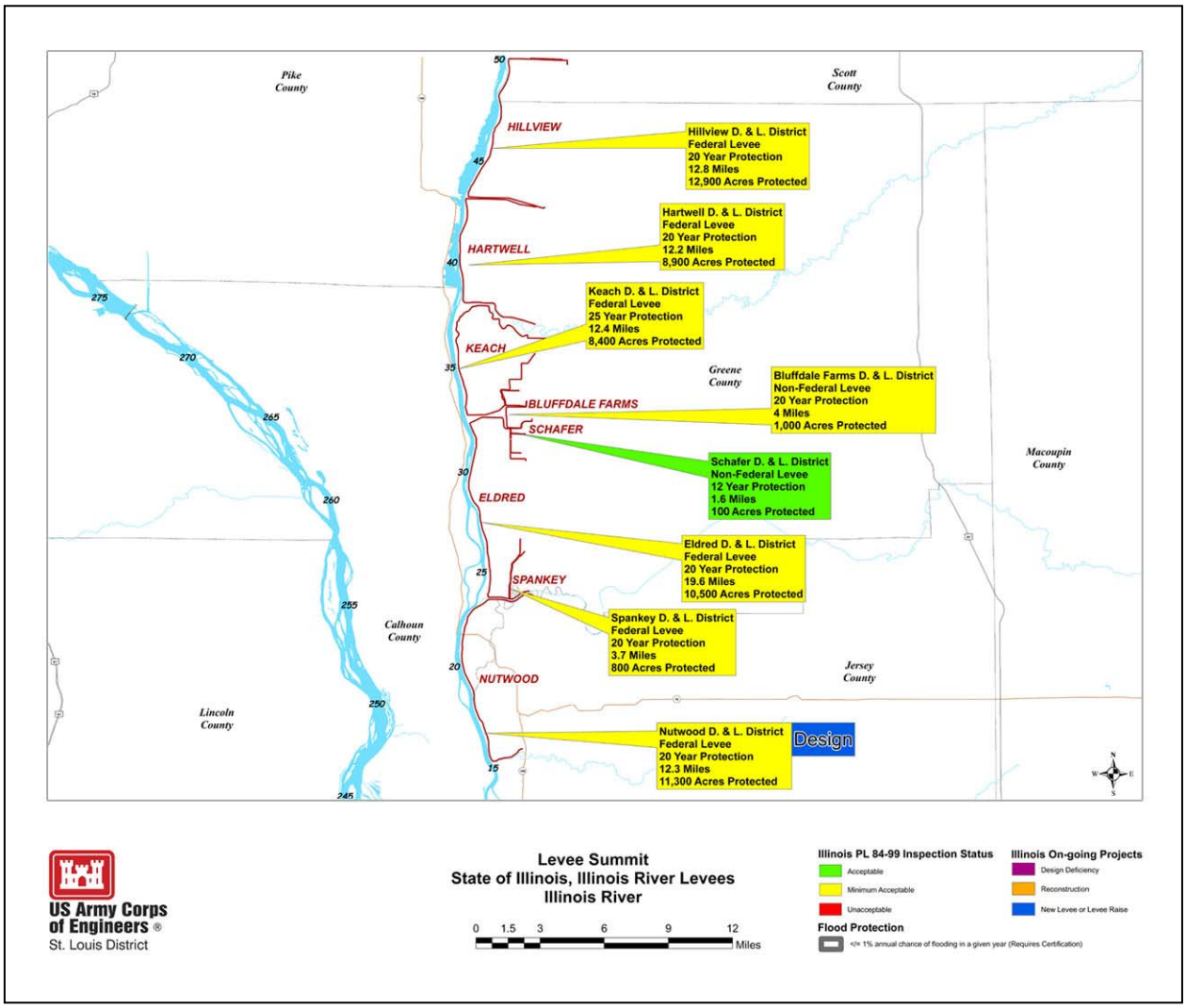
Yes and No. While Hillview, Eldred and unincorporated portions of western Greene County are vulnerable to the dangers presented by levee breaches, none of the rest of the County or participating municipalities are vulnerable.

What impacts resulted from the recorded levee breaches?

As discussed in Section 3.4 Flood, the June 14, 1957 levee breach and associated flooding caused approximately $246,462 in property and crop damages and washed the Gulf, Mobile and Ohio (G.M. & O.) Railroad Depot from its foundation. A total of $16,909 was spent cleaning up the debris deposited by the flood waters and fixing the roads and bridges in and around Hillview. The American Red Cross spent $13,302 providing families in Hillview with food, clothing and maintenance. The Hillview Drainage and Levee District spent $9,000 to pump excess water and $4,000 to fix damage to drainage ditches from debris and slides. Approximately 5,000 acres of corn and soybeans were inundated by flood waters, causing an estimated $200,000 in crop loss.

The August 10, 1961 levee breach and associated flooding caused approximately $318,951 in property and crop damages and washed out the main line of the G.M. & O. railroad. The American Red Cross reported nine dwellings with major damage, 24 dwellings with minor damage and one public building with major damage. According to the Hillview Village Clerk

Figure 48
Locations of Drainage and Levee Districts in Greene County



approximately $10,000 in damage was done to streets, culverts, bridges and road ditches in and around the village and approximately $34,550 in damage was done to personal property and real estate. A total of $9,051 was spent by the American Red Cross assisting 32 families with food, clothing, and maintenance, building and repairs, household furnishings and medical and nursing care as well as mass care for 50 disaster sufferers and emergency workers.

The Hillview Drainage and Levee District spent $5,000 to pump out excess water and estimated that $2,500 in damages had been done to the drainage ditches from the deposit of sediment and debris and slides. Approximately 2,500 acres were impacted, causing an estimated $120,000 in crop loss. The Hartwell Drainage and Levee District, just south of the Hillview Drainage and Levee District, spent $3,000 to pump excess water and estimated that $3,000 in damages had been done to drainage ditches in the District. Approximately 2,930 acres were impacted, resulting in an estimate $131,850 in crop loss.

The 1993 flood and levee breaches on the Mississippi River, covered under Presidential Disaster Declaration 997, caused a minimum of $4,156,835 in damages to Greene County. The Eldred and Hartwell levee breaches were directly responsible for damaging 18 residences and nine farmsteads. Flooding also impacted the public water supply in Eldred. The Hillview levee breach was directly responsible for flooding 38 residences, three businesses and two churches. In addition the water treatment plant was flooded to a depth of five feet, causing the water storage tanks to float from their moorings.

No injuries or deaths were reported as a result of any of the recorded levee breaches in Greene County.

What other impacts can result from levee breaches?

Aside from causing damage to property, floodwaters released due to a levee breach also pose biological and chemical risks to public health. Flooding can force untreated sewage to mix with floodwaters. The polluted floodwaters then transport the biological contaminants into buildings and basements and onto 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 resulting from a levee breach can also cause chemical contaminants such as gasoline and oil to enter the floodwaters if underground storage tanks or pipelines crack and begin leaking during an event. Depending on the time of year, floodwaters also may carry away agricultural chemicals that have been applied to farm fields.

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

Yes. Buildings, infrastructure and critical facilities located within the drainage and levee districts are vulnerable to levee breaches as evidenced by the 1993 flood. However, most of the area within the districts is farmland with only a few residences and farmsteads. **Figure 49** identifies the existing residential buildings by participating jurisdictions that are vulnerable to a levee breach. This estimate was prepared by the consultant using the current DFIRMs and information obtained from the Greene County Soil and Water Conservation District.

The only municipalities with vulnerable buildings are Hillview and Eldred. A breach of the Hillview Levee along Hurricane Creek would likely flood most of the village, including 23 residential structures not in the floodplain. Aside from key roads and bridges, the only other infrastructure and critical facilities that are vulnerable to a levee breach are the community water supplies in Hillview and Eldred, the Village Hall in Hillview and two power substations in unincorporated Greene County near Hillview. While the community water supply in Hillview was moved out of the floodplain after the 1993 flood, substantially reducing its vulnerability, flooding from a levee breach still poses a hazard to the distribution lines within the Village.

Figure 49
Existing Residential Buildings Vulnerable to Levee Breaches in Greene County

Participating Jurisdiction	Residential Buildings
Carrollton	0
Eldred	41
Greenfield	0
Hillview	56
Roodhouse	0
White Hall	0
Wilmington (Patterson)	0
Unincorporated Greene County	31

Sources: FEMA, National Flood Insurance Program, Flood Insurance Rate Maps, Greene County, Illinois, April 2, 2009.
Walters, Terry. Resource Conservationist. Greene County Soil and Water Conservation District. Telephone Interview with Greg Michaud regarding structures vulnerable to levee breaches in Greene County. August 15, 2011.

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

Yes. The western edge of Greene County including Eldred and Hillview are located in the floodplain of the Illinois River. The County, Eldred and Hillview participate in the National Flood Insurance Program (NFIP) and have adopted floodplain ordinances which, if adhered to, should provide protection to any new buildings, and most infrastructure including critical facilities that might be built within a flood-prone area. However, a rapid release of water from a levee breach could easily impact structures built to withstand a base flood event.

What are the potential dollar losses to vulnerable structures from levee breaches?

Unlike some other hazards, there are no standard loss estimation models or methodologies for levee breaches. Although most of the repetitive loss structures in the Illinois River floodplain in Greene County have been purchased by FEMA and many of the small farms that previously occupied the area have been purchased as part of a larger farm operation, there are still substantial potential dollar losses to vulnerable structures.

Residential

Figure 50 lists the estimated number of vulnerable buildings by participating jurisdiction previously identified and provides an estimate of the potential dollar losses to vulnerable residential buildings from a levee breach by participating jurisdiction. The calculations for potential dollar losses from levee breaches are based on 2010 tax assessment information and apply the formulas and assumptions described in the vulnerability subsection of Section 3.4 Flood.

Potential dollar losses caused by a levee breach to vulnerable residences within the participating jurisdictions would be expected to range from $870,000 to $2.6 million. If multiple levees were breached, over $4.5 million in potential dollar losses could result. There are five participating municipalities in this scenario who do not have any residences considered vulnerable to levee breaches.

Figure 50
Potential Dollar Losses to Vulnerable Residential Buildings from a Levee Breach

Participating Jurisdiction	Estimated Number of Vulnerable Residential Buildings	Average Assessed Value	Average Market Value	Potential Dollar Losses		Total Potential Dollar Losses
				Housing Unit	Content	
Carrollton	0	$24,867	$74,601	$ 0	$ 0	$ 0
Eldred	41	$16,675	$50,025	$410,205	$615,308	$1,025,513
Greenfield	0	$18,536	$55,506	$ 0	$ 0	$ 0
Hillview	56	$10,383	$31,149	$348,869	$523,303	$872,172
Roodhouse	0	$13,346	$40,038	$ 0	$ 0	$ 0
White Hall	0	$16,145	$48,435	$ 0	$ 0	$ 0
Wilmington (Patterson)	0	$10,390	$31,170	$ 0	$ 0	$ 0
Unincorporated Greene County	31	$57,843	$173,529	$1,075,880	$1,613,820	$2,689,700

Sources: Banghart, Deborah. Greene County Clerk. "Greene County." Email to Greg R. Michaud. March 21, 2011.
FEMA, National Flood Insurance Program, Flood Insurance Rate Maps, Greene County, Illinois, April 2, 2009.
Walters, Terry. Resource Conservationist. Greene County Soil and Water Conservation District. Telephone Interview with Greg Michaud regarding structures vulnerable to levee breaches in Greene County. August 15, 2011.

Infrastructure & Critical Facilities

The only other infrastructure and critical facilities that are vulnerable to a levee breach are the community water supplies in Hillview and Eldred, the Village Hall in Hillview and two power substations in unincorporated Greene County near Hillview. Damages to these vulnerable structures, when added to the estimated residential losses, could easily push the total potential dollar losses over $5 million. No other above-ground infrastructure or critical facilities within the participating jurisdictions, other than key roads and bridges, were identified as being vulnerable to a levee breach.

Considerations

The calculations presented above are meant to provide the reader with a sense of the scope or magnitude of a levee breach event in dollars. These calculations do not address the physical damages sustained by businesses or other infrastructure, such as roads and bridges. These calculations also do not address the monetary impacts to businesses who cannot operate or lose goods through the failure of crucial services (i.e., power, drinking water and sewer). While average dollar amounts can not be supplied for these items at this time, they should be taken into account when officials discuss the overall impacts that a large-scale levee breach event would have on their jurisdiction.

3.8 EARTHQUAKE

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.

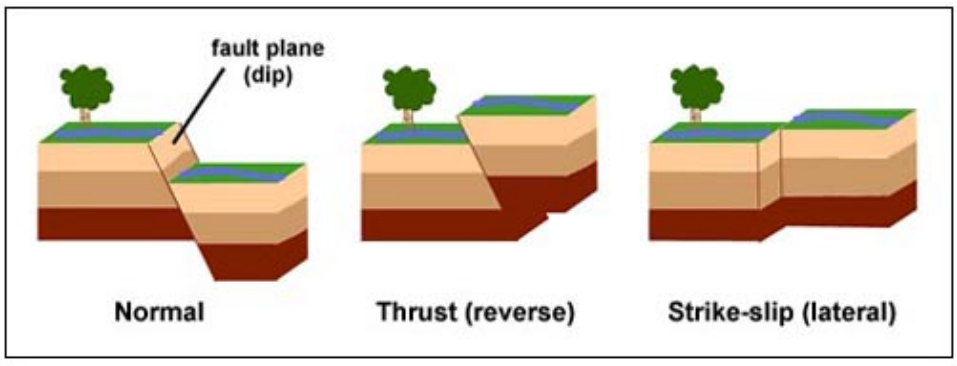
The destruction caused by an earthquake may range from light to catastrophic depending on a number of factors including the magnitude of the earthquake, the distance from the epicenter, the local geologic conditions as well as construction standards and time of day (i.e., rush hour). Earthquake damage 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.

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

Figure 51
Fault Illustration



Source: U. S. Geological Survey, Earthquake Hazards Program, "Visual Glossary – 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.

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 52** 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 52
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: U.S. Geological Survey, Earthquake Hazards Program, "What are the earthquake magnitude classes?" FAQ – Measuring Earthquakes.

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 53** 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.

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.

Figure 53
Comparison of Richter Scale and Modified Mercalli Scale

Richter Scale	Modified Mercalli Scale		Level of Damage
≤ 4.3	I-IV	Instrumental to Moderate	No damage.
4.4 – 4.8	V	Rather Strong	Damage negligible. Small, unstable objects displaced or upset; some dishes and glassware broken.
4.9 – 5.4	VI	Strong	Damage slight. Windows, dishes, glassware broken. Furniture moved or overturned. Weak plaster and masonry cracked.
5.5 – 6.1	VII	Very Strong	Damage slight-moderate in well-built structures; considerable in poorly-built structures. Furniture and weak chimneys broken. Masonry damaged. Loose bricks, tiles, plaster and stones will fall.
6.2 – 6.5	VIII	Destructive	Structure damage considerable, particularly to poorly built structures. Chimneys, monuments, towers, elevated tanks may fail. Frame houses moved. Trees damaged. Cracks in wet ground and steep slopes.
6.6 – 6.9	IX	Ruinous	Structural damage severe; some will collapse. General damage to foundations. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground; liquefaction.
7.0 – 7.3	X	Disastrous	Most masonry and frame structures/foundations destroyed. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Sand and mud shifting on beaches and flat land.
7.4 – 8.1	XI	Very Disastrous	Few or no masonry structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Rails bent. Widespread earth slumps and landslides.
> 8.1	XII	Catastrophic	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted.

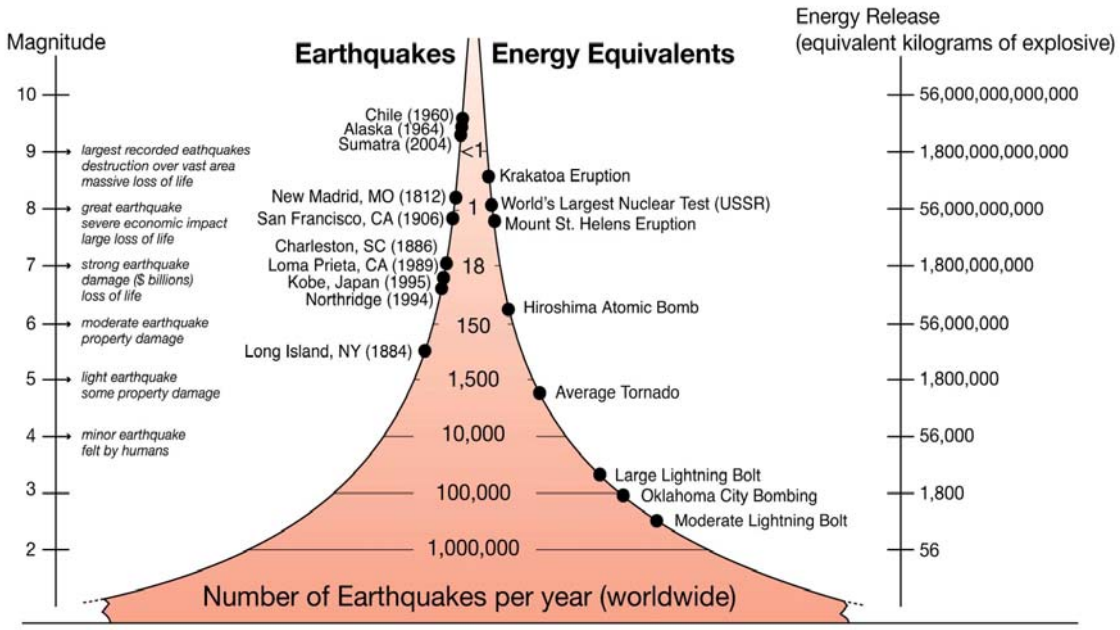
Source: FEMA for Kids: The Disaster Area – Intensity Scales, "Earthquakes – The Modified Mercalli Scale & The Richter Scale."

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 54** 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 54
Approximate Number of Earthquakes Recorded Annually



Source: "How Often Do Earthquakes Occur?," Education and Outreach Series Guide No. 3, Incorporated Research Institutions for Seismology.

PROFILING THE HAZARD

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

According to the Illinois State Geological Survey's *Earthquakes of Illinois: 1795 – 2010* map, no earthquakes have originated in Greene County during the last 200 years. While no earthquakes have originated in the County, residents in recent years have felt ground shaking caused by several earthquakes that have originated outside the County. On April 18, 2008, a magnitude 5.2 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.

On June 10, 1987 another magnitude 5.2 earthquake was reported 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 5.3 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.

Several smaller earthquakes have also occurred in the St. Louis area over the last century. On June 30, 1953 a magnitude 4.1 earthquake was reported in southwestern Illinois near Roxana in Madison County. Minor structural damage such as cracks in concrete-block foundations and plaster were reported. Ground shaking was felt in Illinois and eastern Missouri. On November 23, 1939 a magnitude 4.9 earthquake was reported near Renault in Monroe County. No damage was reported, but ground shaking was felt over most of Illinois, Missouri and parts of eight other states in the central United States.

One of the most seismically active areas of the United States east of the Rockies occurs 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. Since 1974 more than 4,000 earthquakes have been recorded within this seismic zone, most of which were too small to be felt.

Two of the three largest earthquakes ever recorded within the continental United States took place along the New Madrid seismic zone in 1811 and 1812 with magnitudes of 8.1 and 8.0 respectively. These great earthquakes, centered near the town of New Madrid, Missouri, devastated 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. Houses throughout the region experienced varying degrees of damage, approximately 150,000 acres trees were snapped, split or uprooted and the town of New Madrid, Missouri was abandoned temporarily.

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. Greene County's proximity to two earthquake fault zones (the New Madrid and the Wabash Valley) makes all of Greene County likely to be affected by a major earthquake. The *2010 Illinois Natural Hazard Mitigation Plan* classifies Greene County's hazard rating for earthquakes as "elevated."

What is the probability of future earthquake events occurring?

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

While the great earthquakes of 1811 and 1812 do not occur often along the New Madrid fault, they are not isolated events. In recent decades, scientists have collected evidence that earthquakes similar in size and location to those felt in 1811 and 1812 have occurred several times before within the central Mississippi Valley around 1450 A.D., 900 A.D. and 2350 B.C.

The general consensus among scientists is that earthquakes similar to the 1811-1812 earthquakes are expected to recur on average every 500 years. The United States Geological Survey and the Center for Earthquake Research and Information at the University of Memphis estimate that for a 50-year period the probability of a repeat of the 1811-1812 earthquakes is between 7% and 10% and the probability of an earthquake with a magnitude of 6.0 or larger is between 25% and 40%.

ASSESSING VULNERABILITY

Are the participating jurisdictions vulnerable to earthquakes?

Yes. All of Greene County is vulnerable to earthquakes. The unique geological formations topped with glacial drift soils found in the central United States conduct an earthquake's energy farther than in other parts of the Nation. Consequently, earthquakes that originate in the Midwest tend to be felt at greater distances than earthquakes with similar magnitudes that originate on the West Coast. This vulnerability, found throughout most of Illinois and all of Greene County, is compounded by relatively high water tables within the region. When earthquake shaking mixes the groundwater and soil, ground support is further weakened thus adding to the potential structural damages experienced by buildings, roads, bridges, electrical lines and natural gas pipelines.

The *Projected Earthquake Intensities Map* prepared by the Missouri State Emergency Management Agency predicts that if a magnitude 6.7 earthquake were to take place anywhere along the New Madrid seismic zone, then the highest projected intensity felt in Greene County would be a VI on the Modified Mercalli Intensity Scale. If a magnitude 8.6 earthquake were to occur, then the highest projected intensity felt would be a VIII on the Modified Mercalli Intensity Scale.

The infrequency of major earthquakes, coupled with relatively low magnitude/intensity past events, has led the public to perceive that Greene 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 residents of Greene County felt the earthquakes that occurred in 2008, 1987 and 1968, no damages were reported as a result of these events. Given the magnitude of the great earthquakes of 1811 and 1812, it is almost certain that individuals in what is now Greene County felt those quakes; however historical records do not indicate the intensity or impacts that these quakes had on the County.

The risk or vulnerability to public health and safety from an earthquake is dependent on the intensity of the event. Since there are no known faults in Greene County, the likelihood that an earthquake will originate in the County is very small, decreasing the chances for catastrophic damages. Any impacts that are felt by Greene County residents will most likely originate from outside of the County, either from the Wabash Valley or New Madrid faults. As a result, the risk or vulnerability to public health and safety from a moderate earthquake such as the one that occurred on April 18, 2008 is low. However, if a great earthquake similar to those experienced

in 1811 and 1812 were to occur, then the risk or vulnerability to public health and safety would be elevated to medium/high.

What other impacts can result from earthquakes?

Earthquakes can impact human life, health and public safety. **Figure 55** details the potential impacts that may be experienced by the County should a magnitude 6.0 or greater earthquake occur in the region. If an earthquake similar to the 1811-1812 New Madrid earthquakes were to recur today, the effects would be devastating. The central Mississippi Valley is home to millions of people, including the populations of large cities, such as St. Louis and Memphis. There would be widespread loss of life and billions of dollars in property damage.

Figure 55
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 67 (especially if the quake originates along the New Madrid fault) as residents move north 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 Greene County health facilities (especially if the quake originates along the New Madrid fault) 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., southern 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.

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

Yes. All existing buildings, infrastructure and critical facilities located in Greene 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.

Depending on the intensity of the earthquake, building damage in Greene 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 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 high.

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

Yes. All future buildings, infrastructure and critical facilities located in Greene County and the participating jurisdictions are vulnerable to damage from earthquakes. While Roodhouse has 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 Greene County. Sufficient information was not available to make useful predictions regarding potential earthquake damage through the use of computer modeling. Since all structures within Greene 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 develop mitigation projects that could provide wide ranging benefits for reducing the impacts or damages associated with earthquakes.

3.9 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, with the last update occurring in 2009.) Ninety-four percent of the dams in Illinois 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. Dam failures can result from natural events such as earthquakes or landslides, human-induced events such as improper maintenance, or a combination of both. In the event of a dam failure, the people, property and infrastructure downstream could be subject to devastating damage.

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" failures and "sunny day" failures. A "flood" 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.

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 56** 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 56
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. Title 17: Conservation. Chapter I: Department of Natural Resources. Subchapter h: Water Resources. Part 3702: Construction and Maintenance of Dams. Section 3702.30 Applicability.

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

Yes, Greenfield, Roodhouse and White Hall all own classified dams. **Figure 57** provides a brief description of each dam.

Figure 57
Publicly-Owned Classified Dams Located in Greene County

Name	Owner	Type	Purpose	Completion Date	Classification
Greenfield City Lake Dam	Greenfield	Earth	Water Supply	1959	Class II
White Hall Reservoir Dam	White Hall	Earth	Recreation	1952	Class II
Roodhouse Lake Dam	Roodhouse	Earth	Recreation	1974	Class III

Sources: Illinois Department of Natural Resources, Office of Water Resources, Classified Dams in Greene County, July 15, 2010.
U.S. Army Corps of Engineers, National Inventory of Dams Interactive Report, Illinois, Greene County, August 3, 2011.

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

Yes. There are five privately-owned classified dams located within Greene County. **Figure 58** provides a brief description of each dam.

Figure 58
Privately-Owned Classified Dams Located in Greene County

Name	Owner	Type	Purpose	Completion Date	Classification
Bests Pond Dam	Private	Earth	Fire Protection, Stock, or Small Fish Pond	1971	Class III
Coles Lake Dam	Private	Earth	Fire Protection, Stock, or Small Fish Pond	1923	Class III
Fitzjarrell Lake Dam	Private	Earth	Recreation	1998	Class III
Shady Eighty Acres Lake Dam	Private	Earth	Recreation	1966	Class III
Woodbine Country Club Lake Dam	Woodbine Country Club	Earth	Recreation	1926	Class III

Sources: Illinois Department of Natural Resources, Office of Water Resources, Classified Dams in Greene County, July 15, 2010.
U.S. Army Corps of Engineers, National Inventory of Dams Interactive Report, Illinois, Greene County, August 3, 2011.

PROFILING THE HAZARD

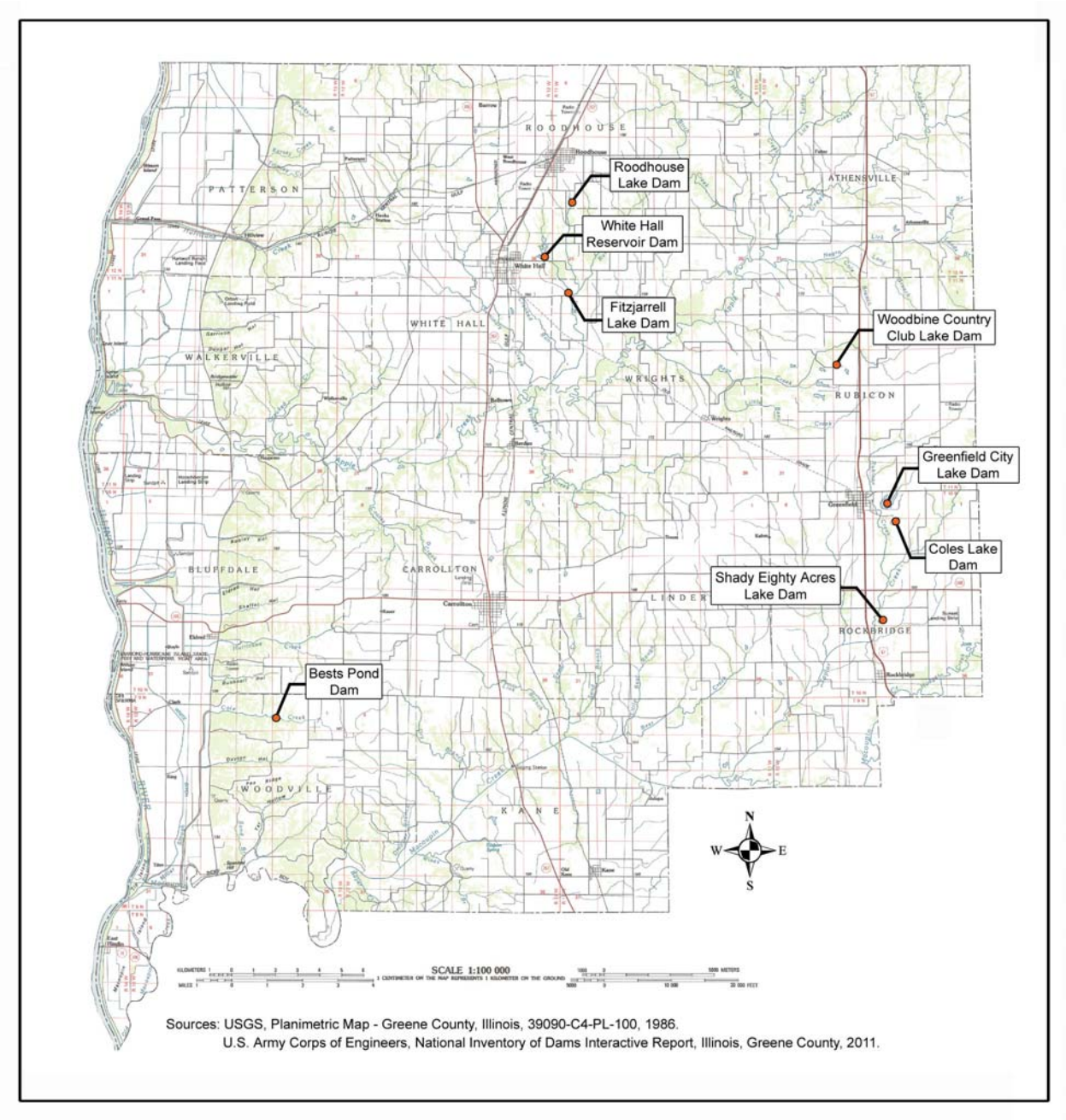
When have dam failures occurred previously? What is the extent of these previous dam failures?

There have been no recorded dam failures in Greene County.

What locations are affected by dam failure?

Dam failures have the potential to affect Greenfield, White Hall and unincorporated portions of Greene County. **Figure 59** shows the locations of publicly and privately-owned classified dams in Greene County.

Figure 59
Locations of Publicly and Privately-Owned Classified Dams in Greene 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. Greenfield, White Hall and portions of unincorporated Greene County are vulnerable to the dangers presented by dam failures; however, none of the other participating municipalities are vulnerable. While Greenfield and White Hall are vulnerable, most residents would not be impacted by a dam failure.

What impacts resulted from the recorded dam failures?

Since there have been no recorded dam failures in Greene 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 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 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.

The risk or vulnerability to public health and safety from a dam failure is dependent on several factors including the severity of the event, the capacity of the reservoir and the extent and type of development and infrastructure located downstream. Based on the locations, size and classification of the dams located in Greene County, the risk from a dam failure is low to medium.

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

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

there is a full or partial dam failure, all of the vulnerable buildings, infrastructure and critical facilities may be inundated by water and structural damage may result. Because none of the reservoirs 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 critical facility.

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.

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 Greene County, sufficient information was not available to prepare a reasonable estimate of future potential dollar losses to vulnerable structure from dam failures.

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 May 18, 2010 meeting. Members were asked to review the list before the next meeting and consider whether any changes needed to be made or if additional goals should be included. At the Planning Committee's August 5, 2010 meeting, the group discussed the preliminary list of hazard mitigation goals and made minor revisions to Goals 2 and 3. **Figure 60** identifies the eight hazard mitigation goals approved by the Planning Committee.

Figure 60
Hazard Mitigation Goals

Goal 1	Educate people about the natural hazards they face and the ways they can protect themselves, their homes, and their businesses from those hazards.
Goal 2	Protect the crops and lives, health, and safety of the people and animals in the County from the dangers of natural hazards.
Goal 3	Protect existing infrastructure (including levees) and design new infrastructure (roads, bridges, levees, utilities, water supplies, sanitary sewer systems, etc.) to be resilient to the impacts of natural hazards.
Goal 4	Incorporate natural hazard mitigation into community plans and regulations.
Goal 5	Place a priority on protecting public services, including critical facilities, utilities, roads and schools.
Goal 6	Preserve and protect the rivers and floodplains in our County.
Goal 7	Ensure that new developments do not create new exposures to damage from natural hazards.
Goal 8	Protect historic, cultural, and natural resources from the effects of natural hazards.

4.2 IDENTIFYING, ANALYZING & PRIORITIZING MITIGATION ACTIONS

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

4.2.1 Identification and Analysis

After developing hazard mitigation goals and reviewing the results of the risk assessment, Committee members representing the County and participating jurisdictions 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 Greene County, Carrollton, Eldred, Greenfield and Hillview were asked to pay special attention to identifying mitigation actions that ensure their continued compliance with the National Flood Insurance Program.

The compiled lists were reviewed to assure the appropriateness and suitability of each mitigation action. 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 61** identifies each category and provides a brief description.

Figure 61
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 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 62** identifies and describes the four-tiered prioritization method adopted by the Committee. The method 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 62
Mitigation Action Prioritization Methodology

		Hazard	
		Most Significant Hazard **(M)** (i.e., severe storms, severe winter storms, extreme heat, floods)	Less Significant Hazard **(L)** (i.e., tornadoes, drought, earthquakes, dam failures)
Mitigation Action	Mitigation Action with the Potential to Virtually Eliminate or Significantly Reduce Impacts **(H)**	**HM** mitigation action will virtually eliminate damages and/or significantly reduce the probability of 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 previously, 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 63 through **75** summarize the results of the mitigation strategy. The mitigation actions identified are arranged by participating jurisdiction.

Figure 63
Greene 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				
Greene County – General												
HM	Purchase and install an emergency backup generator at the Greene County Courthouse.	EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5, 8	NA	Yes	Greene County	TBD	TBD	Low/High
HM	Construct a new Greene County Public Health Department building with a tornado safe emergency storm shelter that can also serve as a heating/cooling center.	EH, F, SS, SWS, T	SP	Reduces	Medium	2, 3, 5	NA	Yes	Greene County	TBD	75% Federal 25% Local	High/High
LM	Make the most recent Flood Insurance Rate Maps available at the County Clerk's Office to assist the public in considering where to construct new buildings and make County Officials aware of these maps and issues related to construction in a floodplain.*	F	RA	Reduces	Medium	1, 6, 7	Yes	Yes	Greene County	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	Medium	1, 6, 7	Yes	Yes	Greene County	1 year	County	Low/High
LM	Obtain permit from the U.S. Army Corp. of Engineers to dredge Hurricane Creek.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Greene County	TBD	County	Low/High
HM	Dredge Hurricane Creek from Hillview to the Illinois River to prevent repeated flooding of the Village (residents & buildings), County Highway 10 and thousands of acres of agricultural property.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Greene County	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 63
Greene County Hazard Mitigation Actions Continued…

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				
Greene County Highway Department												
HM	Purchase and install an emergency backup generator at the Greene County Highway Department.	EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	NA	Yes	Greene County	TBD	TBD	Low/High
HM	Elevate a two-mile section of County Highway 9 to raise the roadway out of the floodplain to prevent recurring flooding which causes traffic disruptions.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	NA	Yes	Greene County	TBD	75% Federal 25% Local	High/High
HM	Elevate approximately one mile of County Highway 10 within the Village limits to maintain access to Hillview for emergency services vehicles during a flood.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Greene County	TBD	75% Federal 25% Local	High/High
Athensville Township												
HM	Implement streambank stabilization measures on Lick Creek to prevent water overtopping and road bed erosion of Township Road 17.	F, SS	PP	Reduces	Small	2, 3, 5	NA	Yes	Athensville Township	TBD	75% Federal 25% Local	Low/Medium
HM	Implement streambank stabilization measures on Apple Creek to prevent water overtopping and road bed erosion of Township Road 266.	F, SS	PP	Reduces	Small	2, 3, 5	NA	Yes	Athensville Township	TBD	75% Federal 25% Local	Low/Medium
HM	Upsize culverts on Township Road 304 A, approximately ½ mile north of the County Road 2 intersection, to increase capacity and alleviate flooding.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Athensville Township	TBD	75% Federal 25% Local	Medium/Medium
HM	Upsize culverts on Township Road 53 A, approximately ¼ mile east of the Township Road 266 intersection, to increase capacity and alleviate flooding.	F, SS	SP	Reduces	Small	2, 3, 5	NA	Yes	Athensville Township	TBD	75% Federal 25% Local	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 63
Greene County Hazard Mitigation Actions Continued…

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				
Woodville Township												
HM	Purchase a portable emergency backup generator for use during power outages.	F, SS, SWS	MP	Eliminates	Small	2, 3, 5	Yes	Yes	Woodville Township	TBD	TBD	Low/High
HM	Upgrade size of drainage pipes along various roads including, but not limited to Angle, Sprinot, Drainer Roads within Woodville Township to increase capacity and alleviate flooding.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	Yes	Yes	Woodville Township	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 64
Bluffdale Drainage & Levee District Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and strategically install flood pumps within the Levee District to assist in removing excess water during flood events.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	TBD	TBD	Medium/High
HM	Remove brush and debris from tributary waterways (Apple Creek, Muddy Monday Creek, Creek at Logan Hollow) within Levee District to reduce/prevent flooding problems.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	Ongoing	Levee District	Low/High
HM	Dredge sediment from tributary waterways (Apple Creek, Muddy Monday Creek, Creek at Logan Hollow) within Levee District to reduce/prevent flood problems.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	TBD	TBD	High/High
HM	Purchase new higher efficiency drainage pumps with greater capacities to replace existing drainage pumps that struggle to handle the high river stage water volumes.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	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 65
Carrollton Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Retrofit City Hall to include a storm shelter safe room/shelter that can also serve as a warming center.	F, SS, SWS, T	SP	Reduces	Large	2, 3, 5	NA	Yes	City Board	2 years	75% Federal 25% Local	Medium/High
HM	Purchase and install an emergency backup generator at City Hall to provide uninterrupted power to the storm/bad weather shelter.	F, SS, SWS, T	MP	Eliminates	Large	2, 3, 5	NA	Yes	City Board	2 years	TBD	Low/High
HM	Purchase a portable emergency backup generator for use during power outages.	EQ, F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	Yes	Yes	City Board	2 years	TBD	Low/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	City Board	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	Eliminates	Medium	2, 3, 5	Yes	Yes	City Board	2 years	75% Federal 25% Local	High/High
HM	Clean and replace undersized culverts and replace storm drains as Phase I of the City's drainage improvement project.	F, SS, SWS	MP	Reduces	Medium	2, 3, 5	Yes	Yes	City Board	1 year	City	Low/High
LM	Drill an additional drinking water well to supplement the existing public water supply during a drought.	DR	MP	Reduces	Large	2, 3, 5	NA	NA	City Board	Ongoing	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 65
Carrollton Hazard Mitigation Actions Continued…

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	City Board	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 Board	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 66
Carrollton Fire Protection District Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and install emergency backup generators at the three fire stations in Carrollton, Eldred and Kane to provide uninterrupted power to the warning sirens as well as the stations themselves.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Large	2,3, 5	NA	Yes	Fire Protection District	2 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 67
Eldred 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 new Village Hall with a 200-person capacity tornado safe shelter that can also serve as a heating/cooling center.	EH, F, SS, SWS, T	SP	Reduces	Large	2, 3, 5	Yes	NA	Village	3-5 years	75% Federal 25% Local	High/High
HM	Install an emergency backup generator at the Eldred Baptist Church to serve as a heating/cooling center and emergency shelter location in the aftermath of a hazard event.	EH, EQ, F, SS, SWS, T	MP	Eliminates	Medium	2, 3, 5	NA	Yes	Village	1-2 years	TBD	Low/High
HM	Purchase new snow removal equipment.	SWS	MP	Reduces	Medium	2, 3, 5	Yes	Yes	Village	1-2 years	Village	Low/High
LM	Make the most recent Flood Insurance Rate Maps available at the Village Clerk's Office to assist the public in considering where to construct new buildings and make Village Officials aware of these maps and issues related to construction in a floodplain.*	F	RA	Reduces	Large	1, 6, 7	Yes	Yes	Village	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	Large	1, 6, 7	Yes	Yes	Village	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 68
Eldred Drainage & Levee District Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase a portable emergency backup generator for use during power outages.	F, SS, SWS	MP	Eliminates	Small	2, 3, 5	Yes	Yes	Levee District	Ongoing	TBD	Low/High
HM	Clean brush and debris from drainage ditches within Levee District to reduce/prevent flooding problems.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	Ongoing	Levee District	Low/High
HM	Purchase higher efficiency flood pumps for removal of excess water during flooding.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	Ongoing	TBD	Medium/High
HM	Repair/reinforce sections of the levee as necessary to ensure its structural integrity.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	Ongoing	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 69
Greenfield 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	City Board	Ongoing	75% Federal 25% Local	Medium/High
HM	Clean brush and debris from drainage ditches and culverts in Greenfield to reduce flooding/drainage problems.	F, SS, SWS	MP	Reduces	Medium	2, 3, 5	Yes	Yes	City Board	Ongoing	City	Low/High
HM	Identify special needs residents and coordinate with local organizations to provide assistance during and after a hazard event.	EH, EQ, F, SS, SWS, T	PI	Reduces	Small	1, 2	NA	NA	City Board	Ongoing	City	Low/High
HM	Develop a Memorandum of Agreement with local churches designating them as heating/cooling centers and emergency shelters for Greenfield residents.	EH, EQ, F, SS, SWS, T	RA	Reduces	Medium	2	NA	NA	City Board	TBD	City	Low/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 Board	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 Board	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 70
Hillview 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	Upsize culverts within the Village to increase capacity and alleviate street flooding.	F, SS, SWS	SP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	1 year	75% Federal 25% Local	Medium/High
LM	Obtain permit from the U.S. Army Corp. of Engineers to dredge Hurricane Creek.	F, SS, SWS	MP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	1 year	Village	Low/High
HM	Dredge Hurricane Creek from the Village limits to the Illinois River.	F, SS, SWS	MP	Reduces	Large	2, 3, 5	Yes	Yes	Village Board	1 year	75% Federal 25% Local	High/High
HM	Purchase NOAA weather radios and distribute to Village residents.	F, SS, SWS, T	MP	Reduces	Large	2	NA	NA	Village Board	TBD	TBD	Low/High
HM	Purchase a portable emergency backup generator to run pumps during power outages.	F, SS, SWS, T	MP	Eliminates	Small	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	Low/High
HM	Construct new levee on the east side of the Village to prevent flooding of County Highway 10.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	Village Board	TBD	TBD	High/High
LM	Conduct floodplain elevation study of Hurricane Creek within Hillview to establish an elevation grid of the Village for permitting purposes.	F, SS, SWS	S	Reduces	Medium	2, 3, 5, 6, 7	Yes	Yes	Village Board	TBD	75% Federal 25% Local	Medium/High
LM	Make the most recent Flood Insurance Rate Maps available at the Village Clerk's Office to assist the public in considering where to construct new buildings and make Village Officials aware of these maps and issues related to construction in a floodplain.*	F	RA	Reduces	Large	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	Large	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 71
Hillview Drainage & Levee District Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and strategically install flood pumps within the Levee District to assist in removing excess water during flood events.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	TBD	TBD	Medium/High
HM	Remove brush and debris from tributary waterways (Apple Creek, Muddy Monday Creek, Creek at Logan Hollow) within Levee District to reduce/prevent flooding problems.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	Ongoing	Levee District	Low/High
HM	Dredge sediment from tributary waterways (Apple Creek, Muddy Monday Creek, Creek at Logan Hollow) within Levee District to reduce/prevent flood problems.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	TBD	TBD	High/High
HM	Purchase new higher efficiency drainage pumps with greater capacities to replace existing drainage pumps that struggle to handle the high river stage water volumes.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	TBD	TBD	Medium/High
HM	Purchase a trash rack cleaner to remove debris collected by trash racks at pump house intakes.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	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 72
Keach Drainage & Levee District Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Purchase and strategically install flood pumps within the Levee District to assist in removing excess water during flood events.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	TBD	TBD	Medium/High
HM	Remove brush and debris from tributary waterways (Apple Creek, Muddy Monday Creek, Creek at Logan Hollow) within Levee District to reduce/prevent flooding problems.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	Ongoing	Levee District	Low/High
HM	Dredge sediment from tributary waterways (Apple Creek, Muddy Monday Creek, Creek at Logan Hollow) within Levee District to reduce/prevent flood problems.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	TBD	TBD	High/High
HM	Purchase new higher efficiency drainage pumps with greater capacities to replace existing drainage pumps that struggle to handle the high river stage water volumes.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	TBD	TBD	Medium/High
HM	Purchase a trash rack cleaner to remove debris collected by trash racks at pump house intakes.	F, SS, SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	Levee District	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 73
Roodhouse Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
LM	Develop public information materials for natural hazards that inform residents about the risks to life and property associated with each hazard and the proactive actions that they can take to reduce or eliminate their risk.	DF, EH, EQ, F, SS, SWS, T	PI	Reduces	Large	1, 2	Yes	Yes	City	2 years	75% Federal 25% Local	Low/High
HM	Identify and create a volunteer network to assist special needs residents during a natural hazard event.	EH, EQ, F, SS, SWS, T	PI	Reduces	Small	1, 2	NA	NA	City / Police Department	1 year	City	Low/High
HM	Designate a heating/cooling within Roodhouse for use by city residents.	EH, SWS	MP	Reduces	Medium	2	NA	NA	City	1 year	City	Low/High
HM	Retrofit existing City Hall to serve as a tornado safe emergency shelter.	F, SS, T	SP	Reduces	Medium	2, 3, 5	NA	Yes	City	3 years	75% Federal 25% Local	Medium/High
HM	Purchase and install landscape barriers to mitigate blizzard conditions from impairing travel along critical roads used by emergency services.	SWS	MP	Reduces	Small	2, 3, 5	Yes	Yes	City / Public Works Dept.	1 year	75% Federal 25% Local	Low/Medium

Acronyms

Hazard(s) to be Mitigated:

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

Type of Mitigation Activity:

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

Figure 74
White Hall Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Degree of Mitigation	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)	Cost/Benefit Analysis
							New	Existing				
HM	Retrofit the Police Department to include a community tornado safe shelter.	SS, T	SP	Reduces	Medium	2, 3, 5	NA	Yes	City / Police Department	3 years	75% Federal 25% Local	High/High
LM	Conduct sewer line reconnaissance study to identify locations where storm water infiltrates the line.	F, SS	S	Reduces	Medium	2, 3, 5	Yes	Yes	City / Public Works Dept.	2 years	75% Federal 25% Local	Medium/High
HM	Repair sewer line sections where storm water infiltration is occurring to prevent sewage backup into residential basements.	F, SS	SP	Eliminates	Medium	2, 3, 5	Yes	Yes	City / Public Works Dept.	5 years	75% Federal 25% Local	Medium/High
LM	Conduct drainage study to identify the appropriate drainage remedy to alleviate recurring flooding of village streets.	F, SS, SWS	S	Reduces	Medium	2, 3, 5	Yes	Yes	City / Road Department	2 years	75% Federal 25% Local	Medium/High
HM	Select, design and construct the appropriate drainage remedy to alleviate recurring flooding of village streets.	F, SS, SWS	SP	Reduces	Medium	2, 3, 5	Yes	Yes	City / Road Department	5 years	75% Federal 25% Local	Medium/High
LM	Conduct study of West Lincoln Street bridge to identify the appropriate remedy to alleviate recurring flooding over the bridge.	F, SS, SWS	S	Reduces	Small	2, 3, 5	Yes	Yes	City / Road Department	TBD	75% Federal 25% Local	Medium/High
HM	Select, design and construct the appropriate remedy to alleviate the recurring flooding problems associated with the West Lincoln Street bridge.	F, SS, SWS	SP	Reduces	Small	2, 3, 5	Yes	Yes	City / Road Department	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 75
Wilmington (Patterson) 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 a heating/cooling center within Wilmington (Patterson) for use by village residents.	EH, SWS	MP	Reduces	Medium	2	NA	NA	Village	TBD	City	Low/High
HM	Purchase and install storm siren.	SS, T	MP	Reduces	Large	2	NA	NA	Village	TBD	TBD	Medium/High
HM	Explore the use of an automated telephone system to notify residents of impending natural hazards events.	SS, T	S	Reduces	Large	2	NA	NA	Village	TBD	City	Low/High
HM	Design and construct a tornado safe shelter with emergency backup generator that can also be used as a heating/cooling center for village residents.	EH, F, SS, SWS, T	SP	Reduces	Large	2	NA	NA	Village	TBD	75% Federal 25% Local	High/High
HM	Purchase NOAA weather radios and distribute to Village residents.	F, SS, SWS, T	MP	Reduces	Large	2	NA	NA	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

5.0 RECOMMENDATIONS

5.0 RECOMMENDATIONS

The following recommendations came about as a result of the planning process. These recommendations should be reviewed and discussed periodically by the professional staff and elected officials of each participating jurisdiction to determine if appropriate 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.
- Alleviating flooding and drainage issues across the County is a major concern repeatedly expressed throughout the planning process. County and municipal officials are encouraged to collaborate in their pursuit of the following actions:
  - Conduct steps to increase water carrying capacity of Hurricane Creek from the Hillview area to the Illinois River. One or more of these steps will likely require cooperation from the Kansas City Southern Railroad and the United States Army Corps of Engineers.
  - Remove log jams and take action to remove additional blockages of Apple Creek from the Macoupin – Greene County line to the Illinois River.
  - Implement streambank erosion control measures on Macoupin, Apple, and Hurricane Creeks. These measures will help reduce flooding, overtopping of township roads and damage to roadbeds.
- Reduce the vulnerability of rural residents from drought by installing additional drinking water lines to serve those residents who are on private wells.

JURISDICTION-SPECIFIC

<u>Carrollton</u>

- To reduce sewage backups into residences, rehabilitate sewer lines to eliminate stormwater infiltration.

<u>Hillview</u>

- Support drainage projects that can reduce problems along and in the vicinity of Hurricane Creek.

<u>Greenfield</u>

- Since the City relies on a surface water source to provide residents with a sufficient quantity of safe drinking water, the capacity of their surface water impoundment should be monitored closely and necessary steps taken to assure that adequate capacity exists to deal with any future drought conditions. Installation of drinking water wells might be

considered as a supplement so that there is enough water to meet fire protection and drinking water needs.

Roodhouse

- Protecting municipal employees from tornadoes and maintaining municipal services immediately following a tornado can be advanced by retrofitting City Hall to serve as an emergency shelter and work center.

White Hall

- Continue work with the Soil & Water Conservation District on an erosion control projects designed to reduce drainage and sheet run-off problems with the City.

6.0 PLAN MAINTENANCE

6.0 PLAN MAINTENANCE

This section outlines the Federal Emergency Management Agency (FEMA) requirements for maintaining and updating the Plan. 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 will help to ensure that the Plan remains an effective and relevant document. Provided below is detailed discussion of the plan maintenance approach.

6.1 MONITORING, EVALUATING & UPDATING THE PLAN

Establishing a method and schedule for monitoring, evaluating and updating the Plan allows the participating jurisdictions to review the plan, the planning process and the results of the implemented mitigation actions and make changes as necessary.

6.1.1 Monitoring and Evaluating the Plan

The Plan will be monitored and evaluated by the Plan Maintenance Subcommittee on an annual basis. The Plan Maintenance Subcommittee will include key members of the Planning Committee (i.e., representatives from each of the participating County entities as well as representatives from each of the local government entities). The Subcommittee will be chaired by the Greene County Emergency Services and Disaster Agency. 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 entities for their review and use in the Plan update.

The Greene County Emergency Services and Disaster Agency will be responsible for monitoring the status of mitigation actions identified in the Plan. It will be the responsibility of each participating government entity to provide the Emergency Services and Disaster Agency with an annual progress report at the Subcommittee meetings detailing the status of their identified mitigation actions.

The Plan Maintenance Subcommittee will also evaluate the Plan on an annual basis to determine the effectiveness of both the planning process and the mitigation actions implemented and to assess whether any changes need to be made. As part of the evaluation, 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 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 government entities 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 government entity adopts the Plan. This ensures that all the participating government entities 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 non-participating government entity that wishes to participate may be added during the update. These entities will be responsible for providing all of the information needed to be integrated into the Plan. A public forum will be held to present the updated Plan to the public for review and comment. The comments received at public forum will be reviewed and incorporated into the updated Plan.

The Subcommittee will then present the updated Plan to the participating government entities for approval. Once the Subcommittee has received approval from all of the participating entities, it will submit the updated Plan to the Illinois Emergency Management Agency and FEMA for review. ***Once the updated Plan has received approval, FEMA requires that each of the participating government entities 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, programs, policies/ordinances and maps that will supplement or help support mitigation planning efforts. **Figure 6** identifies the existing planning mechanism available by jurisdiction. It will be the responsibility of each participating government entity to incorporate, where applicable, the mitigation strategy and other information contained in the Plan into the planning mechanisms identified for their jurisdiction. At the time this Plan was prepared, none of the participating government entities had approved comprehensive plans.

6.3 CONTINUED PUBLIC INVOLVEMENT

The County and participating government entities 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 Greene County Clerk's Office. Individuals will be encouraged to provide feedback and submit comments for the Plan update to the Greene County Emergency Services and Disaster Agency.

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 formal adoption of the approved Plan by each participating jurisdiction. Each entity 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 each of the participating jurisdictions could formally adopt the Plan, the County had to submit it to the Illinois Emergency Management Agency (IEMA) and the Federal Emergency Management Agency (FEMA) for their review and approval. After receiving IEMA and FEMA approval, Greene County forwarded the Plan to each participating jurisdiction for formal adoption. Signed copies of these resolutions are located in **Appendix K**. **Figure 76** identifies the participating jurisdictions and the date each formally adopted the Plan.

Figure 76
Multi-Jurisdictional Plan Adoption Dates

Participating Jurisdiction	Adoption Date
Greene County	
Bluffdale Drainage & Levee District	
Carrollton	
Carrollton Fire Protection District	
Eldred	
Eldred Drainage & Levee District	
Greenfield	
Hillview	
Hillview Drainage & Levee District	
Keach Drainage & Levee District	
Roodhouse	
White Hall	
Wilmington (Patterson)	

8.0 REFERENCES

8.0 REFERENCES

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

1.0 INTRODUCTION

1. Federal Emergency Management Agency. Getting Started: Building Support for Mitigation Planning. FEMA 386-1. September 2002.
2. Federal Emergency Management Agency. "Illinois." Declared Disasters and Emergencies – Disaster Database Search. 1965 – 2010. <http://www.fema.gov/femaNews/disasterSearch.do?action=Reset>.

1.2 Demographics

1. Banghart, Deborah. Greene County Clerk. "Greene County." Email to Greg R. Michaud. 21 March 2011.
2. Illinois Department of Commerce and Economic Opportunity. Census 2000 Data for Illinois. 2 February 2011 <http://www.ildceo.net/dceo/Bureaus/Facts_Figures/Illinois_Census_Data/2000_Census_Data.htm>.
3. Illinois Department of Commerce and Economic Opportunity. "Projection Summary by County." Facts & Figures: Population Projections. 2 February 2011 <http://www2.illinoisbiz.biz/popProj/reference/Projections_County_Summary.xls>
4. United States Census Bureau. Geography. "Counties." Census 2000 U.S. Gazetteer Files. 17 June 2010 <http://www.census.gov/geo/www/gazetteer/places2k.html>.
5. United States Census Bureau. Geography. "Places." Census 2000 U.S. Gazetteer Files. 17 June 2010 <http://www.census.gov/geo/www/gazetteer/places2k.html>.
6. United States Department of Agriculture. National Agricultural Statistics Service. "County Profile: Greene County, Illinois." 2007 Census of Agriculture. 28 March 2011 <http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Illinois/cp17061.pdf>.
7. United States Department of Agriculture. Natural Resources Conservation Service. Soil Survey of Greene County, Illinois. 1974. 28 March 2011 <http://soildatamart.nrcs.usda.gov/manuscripts/IL061/0/Greene_IL.pdf>.

1.3 Land Use and Development Trends

1. United States Census Bureau. 1990 Census. Selected Historical Decennial Census Population and Housing Counts. Counties, States, United States: 1900 to 1990: Population Census Counts. Illinois. "Illinois: Population of Counties by Decennial Census: 1900 to 1990." 1995. 30 March 2011 <http://www.census.gov/population/www/censusdata/cencounts/files/il190090.txt>.
2. United States Census Bureau. American FactFinder. Decennial Census Data Sets. 1990 Census. "1990 Summary Tape File 1 (STF-1) – 100-Percent data: Detailed Tables." 30 March 2011 <http://factfinder.census.gov/servlet/DTGeoSearchByListServlet?ds_name=DEC_1990_STF1_&_lang=en&_ts=319550047750>.

3. West Central Development Council, Inc. Annual Comprehensive Economic Development Strategy Report: Strategic Planning for the Economic Development District Comprised of Calhoun, Christian, Greene, Jersey, Macoupin, Montgomery, and Shelby Counties. August 2009 – September 2010.

2.0 PLANNING PROCESS

1. Federal Emergency Management Agency. Local Multi-Hazard Mitigation Planning Guidance. 1 July 2008.

3.0 RISK ASSESSMENT

1. Changnon, Stanley A., et al. Climate Atlas of Illinois. Champaign, Illinois: Illinois State Water Survey, 2004.
2. Federal Emergency Management Agency. Understanding Your Risks: Identifying Hazards and Estimating Losses. FEMA 386-2. August 2001.
3. Illinois Department of Transportation. Division of Traffic Safety. "County Crash Summaries: Greene County." Illinois Crash Data. 28 March 2011 <http://www.dot.state.il.us/ trafficsafety/summaries.html>.
4. Illinois Emergency Management Agency. 2010 Illinois Natural Hazard Mitigation Plan. October 2010. 13 October 2010 <http://iema.illinois.gov/iema/ planning/Documents/Plan_IllMitigationPlan.pdf>.
5. Midwestern Regional Climate Center. "Illinois Temperature Extremes." Annual Temperature Extremes for the Continental United States Database. 7 February 2011 <http://mcc.sws.uiuc.edu/climate_midwest/ extremes/il.extremetemps.txt>.
6. National Oceanic and Atmospheric Administration. National Environmental Satellite, Data, and Information Service. National Climate Data Center. "Greene County, Illinois." Storm Events Database. 1950 – 2010. <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>.
7. United States Census Bureau. Geography. "County Subdivisions." Census 2000 U.S. Gazetteer Files. 7 July 2010 <http://www.census.gov/geo/www/gazetteer/ places2k.html>.

3.1 Severe Storms (Thunderstorms, Hail, Lightning & Heavy Rain)

1. National Oceanic and Atmospheric Administration. National Severe Storms Laboratory. Frequently Asked Questions About Thunderstorms… 13 August 2009 <http://www.nssl. noaa.gov/faq/faq_tst.php>.
2. National Oceanic and Atmospheric Administration. National Severe Storms Laboratory. "Damage and Impacts." A Severe Weather Primer: Questions and Answers about Lightning. 17 June 2009 <http://www.nssl.noaa.gov/primer/lightning/ ltg_damage.html>.
3. National Oceanic and Atmospheric Administration. National Severe Storms Laboratory. "Damaging Winds Basics." A Severe Weather Primer: Questions and

Answers about Damaging Winds. 17 June 2009 <http://www.nssl.noaa.gov/primer/ wind/ wind_basics.html>.

4. National Oceanic and Atmospheric Administration. National Severe Storms Laboratory. "Frequently Asked Questions About Hail." A Severe Weather Primer: Questions and Answers about Hail. 4 June 2009 <http://www.nssl.noaa.gov/primer/ hail/ hail_faq.shtml>.
5. National Oceanic and Atmospheric Administration. National Severe Storms Laboratory. "Thunderstorm Basics." A Severe Weather Primer: Questions and Answers about Thunderstorms. 12 August 2009 <http://www.nssl.noaa.gov/primer/ tstorm/ tst_basics.html>.
6. National Oceanic and Atmospheric Administration. National Severe Storms Laboratory. "Understanding Damages and Impacts." A Severe Weather Primer: Questions and Answers about Hail. 13 August 2009 <http://www.nssl.noaa.gov/ primer/hail/hail_damage.html>.
7. National Oceanic and Atmospheric Administration. NOAAWatch – NOAA's All Hazard Monitor. Severe Weather. 10 June 2009 <http://www.noaawatch.gov/ themes/severe.php>.
8. National Oceanic and Atmospheric Administration. Southern Region Headquarters. "Beaufort Wind Scale." JetStream – Online School for Weather. 10 March 2010 <http://www.srh.noaa.gov/jetstream/ocean/beaufort_max.htm#beaufort>.
9. National Oceanic and Atmospheric Administration. Storm Prediction Center. Converting Traditional Hail Size Descriptions. Table. 4 June 2009 <http://www.spc.noaa.gov/misc/tables/hailsize.htm>.
10. National Oceanic and Atmospheric Administration. Storm Prediction Center. "How does the National Weather Service (NWS) define a severe thunderstorm?" Frequently Asked Questions (FAQ). Updated 16 July 2008. 4 June 2009 <http://www.spc.ncep.noaa.gov/faq/>.
11. National Weather Service. "Beaufort Scale." National Weather Service Glossary. 10 March 2010 <http://www.nws.noaa.gov/glossary/index.php?letter=b>.
12. National Weather Service. "Hail." National Weather Service Glossary. 12 August 2009 <http://www.nws.noaa.gov/glossary/index.php?letter=h>.
13. National Weather Service. "Knot." National Weather Service Glossary. 12 August 2009 <http://www.nws.noaa.gov/glossary/index.php?letter=k>.
14. National Weather Service. Forecast Office – Twin Cities, Minnesota. Thunderstorms, Hail, Wind and Lightning. 13 August 2009 <http://www.crh.noaa.gov/mpx/ ?n=swawpns1>.
15. The Tornado and Storm Research Organisation. Hail Scale. 26 January 2010 <http://www.torro.org.uk/site/hscale.php>.
16. World Meteorological Organization. Publication No. 306 – Manual on Codes. Volume I.1 – Part A. Section E: Beaufort Scale of Wind. 10 March 2010

<www.wmo.int/pages/prog/www/WMOCodes/Manual/Volume-I-selection/ Sel11.pdf>.

3.2 Severe Winter Storms (Snow & Ice)

1. American Red Cross. Why Talk about Winter Storms? 11 August 2009 <http://www.redcross.org/www-files/Documents/pdf/Preparedness/AreYouReady/ WinterStorm.pdf>.
2. Centers for Disease Control and Prevention. Winter Weather FAQs. 3 December 2004. 22 June 2009 <http://www.bt.cdc.gov/disasters/winter/faq.asp>.
3. Illinois Emergency Management Agency. "Severe Winter Storms." 2010 Illinois Natural Hazard Mitigation Plan. October 2010. Page III-74. 13 October 2010 <http://iema.illinois.gov/iema/planning/Documents/Plan_IllMitigationPlan.pdf>.
4. Illinois Emergency Management Agency. Winter Storms. 4 June 2009 <http://www.state.il.us/iema/planning/HazardInfo.asp#Winter>.
5. Illinois State Climatologist Office. Glossary of Winter Terms. 11 August 2009 <http://www.isws.illinois.edu/atmos/statecli/Winter/glossary.htm>.
6. Midwestern Regional Climate Center. "Historical Climate Data: Snowfall Summary – Station: 119241 White Hall 1 E, IL." Climate Summaries Database. 7 February 2011 <http://mcc.sws.uiuc.edu/climate_midwest/historical/snow/il/119241_ ssum.html>.
7. National Oceanic and Atmospheric Administration. National Severe Storms Laboratory. "Winter Weather Basics" A Severe Weather Primer: Questions and Answers about Winter Weather. 23 June 2009 <http://www.nssl.noaa.gov/ primer/winter/ ww_basics.html>.
8. National Oceanic and Atmospheric Administration. NOAAWatch – NOAA's All Hazard Monitor. Winter Weather. 5 June 2009 <http://www.noaawatch.gov/themes/ winter.php>.
9. National Weather Service. "Freezing Rain." National Weather Service Glossary. 11 August 2009 <http://www.nws.noaa.gov/glossary/index.php?letter=r>.
10. National Weather Service. "Sleet." National Weather Service Glossary. 11 August 2009 <http://www.nws.noaa.gov/glossary/index.php?letter=s>.
11. National Weather Service. "Snow." National Weather Service Glossary. 11 August 2009 <http://www.nws.noaa.gov/glossary/index.php?letter=s>.
12. National Weather Service. Forecast Office – Omaha/Valley, Nebraska. Frostbite and Hypothermia. 22 June 2009 <http://www.crh.noaa.gov/oax/safety/frostbite.php>.
13. National Weather Service. Forecast Office – St. Louis, Missouri. "NWS St. Louis Winter Weather Products." Missouri Winter Weather Awareness Day. 19 November 2008. 22 June 2009 <http://www.crh.noaa.gov/lsx/?n=winterday or http://www.crh.noaa.gov/ Image/lsx/wcm/Winter2008/NWS_products.pdf>.
14. National Weather Service. Forecast Office – St. Louis, Missouri. "Wind Chill." Missouri Winter Weather Awareness Day. 19 November 2008. 11 August 2009 <

http://www.crh.noaa.gov/lsx/?n=winterday or http://www.crh.noaa.gov/Image/lsx/wcm/Winter2008/Wind_Chill.pdf>.

15. National Weather Service. Forecast Office – St. Louis, Missouri. "Winter Weather Products and Procedures." Missouri Winter Weather Awareness Day. 17 November 2004. 22 June 2009 <http://www.crh.noaa.gov/lsx/vortex/winterwx_aware.php or http://www.crh.noaa.gov/lsx/vortex/winter04.pdf>.
16. National Weather Service. Office of Climate, Water and Weather Services. All About Winter Storms. 4 June 2009 <http://www.nws.noaa.gov/om/brochures/wintstm.htm>.
17. National Weather Service. Office of Climate, Water and Weather Services. NWS Windchill Chart. Chart. 1 November 2001. 22 June 2009 <http://www.nws.noaa.gov/om/windchill/>.
18. National Weather Service. Office of Climate, Water and Weather Services. Windchill Terms and Definitions. 22 June 2009 <http://www.weather.gov/om/windchill/ windchillglossary.shtml>.

3.3 Extreme Heat

1. Federal Emergency Management Agency. Are You Ready? Extreme Heat. 11 June 2009 <http://www.fema.gov/areyouready/heat.shtm>.
2. Federal Emergency Management Agency. Backgrounder: Extreme Heat. 10 August 2009 <http://www.fema.gov/hazard/heat/background.shtm>.
3. National Oceanic and Atmospheric Administration. Heat Wave: A Major Summer Killer. Brochure. 5 June 2009 <http://www.nws.noaa.gov/om/brochures/heatwave.pdf>.
4. National Oceanic and Atmospheric Administration. NOAAWatch – NOAA's All Hazard Monitor. Excessive Heat. 5 June 2009 <http://www.noaawatch.gov/themes/heat.php>.
5. National Weather Service. Forecast Office – Paducah, Kentucky. Public Information Statement: First Heat Wave of the Summer Ending Today. 26 June 2009. 10 August 2009 <http://www.crh.noaa.gov/news/display_cmsstory.php?wfo=pah&storyid=28987&source=2>.
6. National Weather Service. Forecast Office – St. Louis Missouri. Missouri Summer Weather Safety Week Booklet: June 21 – 27, 2009. 15 June 2009 <http://www.crh.noaa.gov/lsx/?n=summerweathersafetyweek>.
7. National Weather Service. Office of Climate, Water and Weather Services. NOAA's National Weather Service Heat Index. 11 August 2009 <http://www.weather.gov/om/heat/index.shtml>.
8. North Carolina Cooperative Extension. Heat Stress Disorders. 11 June 2009 <http://www.ces.ncsu.edu/disaster/factsheets/pdf/heatstress.pdf>.

3.4 Flood

1. Federal Emergency Management Agency. Answers to Questions About the NFIP: Introduction to the NFIP. May 2006. 30 June 2009 <http://www.fema.gov/business/nfip/intnfip.shtm>.
2. Federal Emergency Management Agency. National Flood Insurance Program. Flood Insurance Rate Maps. Greene County, Illinois and Unincorporated Areas. Panels 0025 through 0425. 2 April 2009.
3. Federal Emergency Management Agency. National Flood Program. Community Status Book Report: Illinois. 4 August 2011 <http://www.fema.gov/cis/IL.pdf>.
4. Federal Emergency Management Agency. Definitions of FEMA Flood Zone Designations. 9 July 2009 <http://msc.fema.gov/webapp/wcs/stores/servlet/info?storeId=10001&catalogId=10001&langId=-1&content=floodZones&title=FEMA Flood Zone Designations>.
5. Federal Emergency Management Agency. Disaster Information: Flood. 11 June 2009 <http://www.fema.gov/hazard/flood/index.shtm>.
6. Federal Emergency Management Agency. Flood Insurance Rate Maps (FIRMs). 8 July 2009 <http://www.fema.gov/hazard/map/firm.shtm>.
7. Federal Emergency Management Agency. Flood Insurance Rate Map Tutorial. 8 July 2009 <http://www.fema.gov/media/fhm/firm/ot_firm.htm>.
8. Federal Emergency Management Agency. Flood Zones: NFIP Policy Index. 9 July 2009 <http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/flood_zones.shtm>.
9. Federal Emergency Management Agency. Risk Management Series: Design Guide for Improving Critical Facility Safety from Flooding and High Winds – Providing Protection to People and Buildings. FEMA 543. January 2007. 7 August 2009 <http://www.fema.gov/library/viewRecord.do?id=2441>.
10. Federal Emergency Management Agency. National Flood Insurance Program. "Community Rating System (CRS)." Glossary. 19 October 2009 < http://www.floodsmart.gov/floodsmart/pages/ glossary_A-I.jsp>.
11. Federal Emergency Management Agency. National Flood Insurance Program. "Flood." Glossary. 10 June 2009 <http://www.floodsmart.gov/floodsmart/pages/glossary_A-I.jsp>.
12. Federal Emergency Management Agency. National Flood Insurance Program. "Flood Zones." Frequently Asked Questions. 1 July 2009 <http://www.floodsmart.gov/floodsmart/pages/faqs_flood.jsp>.
13. Federal Emergency Management Agency. National Flood Insurance Program. Talking Points: Repetitive Loss. March 2007. 22 January 2010 <http://www.floodsmart.gov/toolkits/flood/downloads/TPsRepetitiveLoss-OT2007.pdf>.
14. Federal Emergency Management Agency. National Flood Insurance Program. Flood Insurance Library. "Repetitive Loss Structure." Definitions. 22 January 2010 <http://www.fema.gov/business/nfip/19def2.shtm>.

15. Harris County Flood Control District – Harris County, Texas. Flood Insurance Rate Maps. 1 July 2009 < http://www.hcfcd.org/firms.html>.

16. Illinois Administrative Code. Title 17: Conservation. Chapter I: Department of Natural Resources. Subchapter h: Water Resources. Part 3706: Regulation of Construction within Flood Plains. 1 July 2009 <http://dnr.state.il.us/OWR/resman/ Downloads/3706RULE.pdf>.

17. Illinois Department of Natural Resources. Office of Water Resources. 100-Year Floodplain in Illinois. Map. 6 August 2009. 17 May 2010 <http://dnr.state.il.us/ owr/images/ GIS/floodzone09.pdf>.

18. Illinois Department of Natural Resources. Office of Water Resources. Quick Guide to Floodplain Management in Illinois. 2001. 1 July 2009 <http://www.dnr.state.il.us/owr/resman/Downloads/IL%20FPM%20Quick%20Guide.pdf>.

19. Illinois State Water Survey. The 1993 Flood on the Mississippi River in Illinois. By Nani G. Bhowmik, et al. Miscellaneous Publication 151. 1994. 4 August 2011 <http://iledi.org/ppa/docs/00/00/00/00/09/19/20061005222801_ISWSMP-151.pdf>.

20. Louisiana State University – Louisiana Sea Grant Law & Policy Program. Louisiana State University Agriculture Center. Glossary of Frequently Used FEMA/NFIP Terms-Acronyms. 1 July 2009 <http://www.laseagrant.org/pdfs/FEMA_ Glossary.pdf>.

21. National Oceanic and Atmospheric Administration. National Severe Storms Laboratory. "Flood Basics." A Severe Weather Primer: Questions and Answers about Floods. 10 June 2009 <http://www.nssl.noaa.gov/primer/flood/fld_ basics.html>.

22. National Oceanic and Atmospheric Administration. National Severe Storms Laboratory. "Understanding Damage and Impacts." A Severe Weather Primer: Questions and Answers about Floods. 30 June 2009 <http://www.nssl.noaa.gov/ primer/flood/ fld_damage.html>.

23. National Oceanic and Atmospheric Administration. NOAAWatch – NOAA's All Hazard Monitor. Severe Weather. 30 June 2009 <http://www.noaawatch.gov/ themes/severe.php>.

24. National Weather Service. Advanced Hydrologic Prediction Service. Weather Forecast Office St. Louis, Missouri. North Central River Forecast Center. Illinois River at Hardin. Historical Crests. 4 August 2011 <http://water.weather.gov/ ahps2/hydrograph.php?wfo=lsx&gage=hari2&view=1,1,1,1,1,1,1,1%22>.

25. National Weather Service. Forecast Office – Birmingham, Alabama. "Flood Types." Alabama Severe Weather Awareness Week Booklet. February 2009. 10 June 2009 <http://www.srh.noaa.gov/bmx/aware/swaw_2009/pdfs/Pg13_Flood_Types.pdf>.

26. National Weather Service. Lower Mississippi River Forecast Center. "Types of Flooding." Flood Safety. 10 June 2009 <http://www.srh.noaa.gov/lmrfc/ ?n=floodsafety-lmrfc#types>.

27. Ohio Department of Natural Resources. Division of Water. Floodplain Management. About the Floodplain Program. 1 July 2009 <http://www.dnr.state.oh.us/water/tabid/3506/Default.aspx>.

28. Owen, Jared. Hazard Mitigation Planner. Illinois Emergency Management Agency. "Greene Co. (1993 Flood Damages Greene Co.)" E-mail to Greg R. Michaud. 4 August 2011.

29. Owen, Jared. Hazard Mitigation Planner. Illinois Emergency Management Agency. "Greene.xls. (Repetitive Loss Properties)" E-mail to Greg R. Michaud. 25 February 2011.

3.5 Tornadoes

1. Federal Emergency Management Agency. "Fujita Tornado Measurement Scale." State and Local Mitigation Planning How-To Guide: Understanding Your Risks – Identifying Hazards and Estimating Losses. FEMA 386-2. August 2001. 21 May 2009 <http://www.state.il.us/iema/planning/ Documents/Plan_FEMA_HTG2.pdf>.

2. National Oceanic and Atmospheric Administration. National Environmental Satellite, Data, and Information Service. National Climate Data Center. The Enhanced Fujita Tornado Scale. 12 August 2009 <http://www.ncdc.noaa.gov/oa/satellite/ satelliteseye/educational/fujita.html>.

3. National Oceanic and Atmospheric Administration. National Severe Storms Laboratory. "Understanding Damage and Impacts." A Severe Weather Primer: Questions and Answers about Tornadoes. 12 August 2009 <http://www.nssl.noaa.gov/primer/tornado/tor_damage.html>.

4. National Oceanic and Atmospheric Administration. NOAAWatch – NOAA's All Hazard Monitor. Severe Weather. 10 June 2009 <http://www.noaawatch.gov/themes/severe.php>.

5. National Oceanic and Atmospheric Administration. Storm Prediction Center. The Online Tornado FAQ: Frequently Asked Questions about Tornadoes. By Roger Edwards. 10 June 2009 <http://www.spc.noaa.gov/faq/tornado/>.

6. National Weather Service. Forecast Office – St. Louis, Missouri. Tornado Climatology Listing. 26 June 2009 <http://www.crh.noaa.gov/lsx/?n=montgyil_tor>.

7. National Weather Service. Forecast Office – St. Louis, Missouri. "Tornado Safety." Missouri Severe Weather Awareness Week – March 9 – 13, 2009. 12 August 2009 <http://www.crh.noaa.gov/lsx/?n=severeweek or http://www.crh.noaa.gov/Image/lsx/wcm/Tuesday.pdf>.

3.6 Drought

1. Drought Monitor. National Drought Mitigation Center. U.S. Drought Monitor. Map. 12 October 2010. 18 October 2010 <http://drought.unl.edu/dm/monitor.html>.

2. Illinois State Water Survey. Department of Energy and Natural Resources. The 1988-1989 Drought in Illinois: Causes, Dimensions, and Impacts. Research Report 121. By Peter J. Lamb, Scientific Editor. 1992. 5 November 2009 <http://www.isws.illinois.edu/pubdoc/RR/ISWSRR-121.pdf>.

3. National Integrated Drought Information System. U.S. Drought Portal. "Drought Monitor: State-of-the-Art Blend of Science and Subjectivity." U.S. Drought Monitor. 2 January 2008. 14 July 2009 <http://www.drought.gov/portal/server.pt/gateway/PTARGS_0_2_693_208_0_43/http%3B/drought.unl.edu/dm/classify.htm>.
4. National Integrated Drought Information System. U.S. Drought Portal. "Drought Monitors: U.S. Drought Monitor." Drought Indicators. 14 July 2009 <http://www.drought.gov/portal/server.pt/community/drought_indicators/223/drought_ monitors/261>.
5. National Oceanic and Atmospheric Administration. NOAAWatch – NOAA's All Hazard Monitor. Droughts. 5 June 2009 <http://www.noaawatch.gov/themes/droughts.php>.
6. National Weather Service. National Centers for Environmental Prediction. Climate Prediction Center. Current Palmer Drought Severity Index Map by Climate Divisions. Map. 9 October 2010. 18 October 2010 <http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml>.
7. National Weather Service. National Centers for Environmental Prediction. Climate Prediction Center. Palmer Drought Severity & Crop Moisture Indices Explanation. 14 July 2009 <http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/palmer_drought/wpdanote.shtml>.
8. United States Department of Agriculture. National Agricultural Statistics Service. "U.S. & All State County Data – Crops: Greene County, Illinois." Quick Stats Database. 2 August 2011 <http://www.nass.usda.gov/Data_and_Statistics/Quick_Stats/>.
9. United States Department of Agriculture. National Agricultural Statistics Service. "Table 1. County Summary Highlights: 2007." 2007 Census of Agriculture. Volume 1, Chapter 2. 11 November 2010 <http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Illinois/st17_2_001_001.pdf>.
10. United States Department of Agriculture. National Agricultural Statistics Service. "Table 2. Market Value of Agricultural Products Sold Including Direct Sales: 2007 and 2002." 2007 Census of Agriculture. Volume 1, Chapter 2. 11 November 2010 <http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Illinois/st17_2_002_002.pdf
11. University of Nebraska, Lincoln. National Drought Mitigation Center. "Drought Indices." What is Drought? By Dr. Michael J. Hayes. 2006. 14 July 2009 <http://drought.unl.edu/whatis/indices.htm>.

3.7 Levees

1. Federal Emergency Management Agency. The National Flood Insurance Program and Levees: An Overview Fact Sheet. July 2011.
2. Illinois Association for Floodplain and Stormwater Management. Why the Concern with Levees? They're Safe, Right? By Bryan Martindale and Paul Osman. Fall 2007 Newsletter. 10 August 2011 <www.illinoisfloods.org/documents/IAFSM_Levee%20Article.pdf>.

3. Illinois Association of Drainage Districts. Frequently Asked Questions. 5 August 2011 <http://www.iadd.info/iadd_fall10_006.htm>.

4. Illinois Compiled Statutes. Chapter 70: Special Districts. Act 605: Illinois Drainage Code. 10 August 2011 <http://www.ilga.gov/legislation/ilcs/ilcs5.asp?ActID=869 &ChapterID=15>.

5. Illinois Department of Natural Resources. Office of Water Resources. Draft River Stages in Illinois: Flood and Damage Data. August 2009. 11 August 2011 <http://dnr.state.il.us./owr/Publications/FloodStageBook_Report2009.pdf>.

6. Illinois State Water Survey. The 1993 Flood on the Mississippi River in Illinois. By Nani G. Bhowmik, et al. Miscellaneous Publication 151. 1994. 4 August 2011 <http://iledi.org/ppa/docs/00/00/00/00/09/19/20061005222801_ISWSMP-151.pdf>.

7. Peterson, Mike. U.S. Army Corps of Engineers. St. Louis District. Public Affairs. "Telephone Interview with Greg Michaud regarding Levees in Greene County." 5 August 2011.

8. U.S. Army Corps of Engineers. Rock Island District. Levee Safety Program. Levees. 5 August 2011 <http://www.mvr.usace.army.mil/publicaffairsoffice/ LSP1/LSPLeveeTerms.htm>.

9. U.S. Army Corps of Engineers. Rock Island District. Levee Safety Program. Levees. Levee Terms & Definitions. 5 August 2011 <http://www.mvr.usace.army.mil/ publicaffairsoffice/LSP1/LSPLeveeTerms.htm>.

10. U.S. Army Corps of Engineers. St. Louis District. Levee Summit: State of Illinois, Illinois River Levees. Map. 5 August 2011 <www.mvs.usace.army.mil/pa/IL-LeveeSummit-Maps/IL_Levee_Summit_Illinois_web.pdf>.

11. U.S. Army Corps of Engineers. St. Paul District. Corps Facts: Levee Terms, Definitions. 2009. FS-37. 9 August 2011 < www.mvp.usace.mil/docs/ flood_fight2009/FS-37_leveeterms.pdf>.

12. U.S. Army Corps of Engineers. Levee Safety Program. Engineering Circular Development Workshop: 28-30 June 2011 Levee and Levee Systems Definition. White Paper. 11 May 2011. 9 August 2011 <http://envr.abtassociates.com/ LeveeSafety/docs/WhitePapers_OtherMaterials/WhitePapers_Other_Tab4b_ Leveeand%20LeveeSystemsDefinitions_Davis_Final.pdf>.

13. Walters, Terry. Resource Conservationist. Greene County Soil and Water Conservation District. "Telephone Interview with Andrea Bostwick regarding Schafer and Farrow Levees in Greene County." 15 August 2011.

14. Walters, Terry. Resource Conservationist. Greene County Soil and Water Conservation District. "Telephone Interview with Greg Michaud regarding structures vulnerable to levee breaches in Greene County. 15 August 2011.

3.8 Earthquake

1. Atkinson, William. The Next New Madrid Earthquake: A Survival Guide for the Midwest. Carbondale, Illinois: Southern Illinois University Press, 1989.

2. Federal Emergency Management Agency. FEMA for Kids. "Earthquakes – The Modified Mercalli Scale & The Richter Scale." The Disaster Area: Intensity Scales. 22 July 2009 <http://www.fema.gov/kids/intense.htm>.

3. Illinois State Geological Survey. Earthquakes in Illinois: 1795 – 2010. Map. 18 October 2010 <http://www.isgs.illinois.edu/research/earthquake-hazards/pdf-files/earthquakes-il.pdf>.

4. Illinois State Geological Survey. Handbook of Illinois Stratigraphy. H. B. Willman, et. al. State of Illinois – Department of Registration and Education. Bulletin 95. 1975.

5. Illinois State Geological Survey. "Earthquake Occurrence in Illinois." Earthquake Facts. 1995-3. 11 May 2010 <http://www.isgs.illinois.edu/research/earthquake-hazards/pdf-files/qk-fct-occur.pdf>.

6. Illinois State Geological Survey. "Wabash Valley Earthquakes: A Dozen Moderate Quakes in a Century." Earthquake Facts. 1996-1. 31 August 2009 <http://www.isgs.illinois.edu/research/earthquake-hazards/pdf-files/eq-fct-wabash.pdf>.

7. Incorporated Research Institutions for Seismology. Global Seismographic Network. 20 August 2009 <http://www.iris.edu/hq/programs/gsn>.

8. Incorporated Research Institutions for Seismology. "How Often Do Earthquakes Occur?" Education and Outreach Series – Educational One-Pagers. 4 August 2009 <http://www.iris.washington.edu/hq/files/publications/brochures_onepagers/doc/no3.pdf>.

9. Missouri State Emergency Management Agency. Projected Earthquake Intensities Map. 31 August 2009 <http://sema.dps.mo.gov/EQ%20Map.pdf>.

10. St. Louis University. Department Earth and Atmospheric Sciences. Earthquake Center. "Introduction to the New Madrid Seismic Zone." Central U.S. Earthquake History. 4 September 2009 <http://www.eas.slu.edu/Earthquake_Center/SEISMICITY/NewMadridGeneral.html>.

11. University of Memphis. Center for Earthquake Research and Information. "Mag 5.2 Earthquake Near Bellmont IL." Recent Earthquakes in the Central U.S. 31 August 2009 <http://www.ceri.memphis.edu/mag5-2_041808/index.html>.

12. University of Memphis. Center for Earthquake Research and Information. "June 10, 1987 New Madrid Earthquake Catalog Search." Data Searches – CERI Catalog. 4 September 2009 <http://folkworm.ceri.memphis.edu/catalogs/scratch/cat_s_4627>.

13. University of Nevada, Reno. Nevada Seismological Lab. Earthquake Effects in Kobe, Japan. 5 August 2009 <http://www.seismo.unr.edu/ftp/pub/louie/class/100/effects-kobe.html>.

14. U. S. Geological Survey. "Earthquake Catalog." Earthquakes in the Central United States – 1699 – 2002. Map. Investigations Series I-2812. By Russell L. Wheeler, et al. 2003. 26 July 2010 <http://pubs.usgs.gov/imap/i-2812/catalog.txt>.

15. U. S. Geological Survey. Earthquakes – General Interest Publication. By Kay M. Shedlock and Louis C. Pakiser. 1995. 22 July 2009 <http://pubs.usgs.gov/gip/earthq1/index.html>.

16. U. S. Geological Survey. Earthquake Hazards Program. "1987 06 10 – Near Olney, Illinois – 5.1." Historic United States Earthquakes. 3 September 2009 <http://earthquake.usgs.gov/regional/states/events/1987_06_10.php>.

17. U. S. Geological Survey. Earthquake Hazards Program. Earthquake Hazard in the Heartland of the Homeland. By Joan Gomberg and Eugene Schweig. January 2007. 31 August 2009 <http://pubs.usgs.gov/fs/2006/3125/pdf/FS06-3125_508.pdf>.

18. U. S. Geological Survey. Earthquake Hazards Program. Earthquake Hazard in the New Madrid Seismic Zone Remains a Concern. August 2009. 31 August 2009 <http://pubs.usgs.gov/fs/2009/3071/pdf/FS09-3071.pdf>.

19. U. S. Geological Survey. Earthquake Hazards Program. "fault." Visual Glossary. 22 July 2009 <http://earthquake.usgs.gov/learning/glossary.php?termID=67>.

20. U. S. Geological Survey. Earthquake Hazards Program. Illinois: Earthquake History. 26 July 2010 < http://earthquake.usgs.gov/ earthquakes/states/illinois/history.php>.

21. U. S. Geological Survey. Earthquake Hazards Program. Largest Earthquakes in the United States. 31 August 2009 <http://earthquake.usgs.gov/regional/states/10_largest_us.php>.

22. U.S. Geological Survey. Earthquake Hazards Program. "Magnitude 5.4 Illinois April 18, 2008." Historic Earthquakes. 3 September 2009 <http://earthquake.usgs.gov/eqcenter/eqinthenews/2008/us2008qza6/>.

23. U. S. Geological Survey. Earthquake Hazards Program. Magnitude/Intensity Comparison. 20 August 2009 <http://earthquake.usgs.gov/learning/topics/mag_vs_int.php>.

24. U. S. Geological Survey. Earthquake Hazards Program. The Modified Mercalli Intensity Scale. 21 July 2009 <http://earthquake.usgs.gov/learning/topics/mercalli.php>.

25. U. S. Geological Survey. Earthquake Hazards Program. The Science of Earthquakes. By Lisa Wald. 22 July 2009 <http://earthquake.usgs.gov/learning/kids/eqscience.php>.

26. U. S. Geological Survey. Earthquake Hazards Program. The Severity of an Earthquake. 21 July 2009 <http://pubs.usgs.gov/gip/earthq4/severitygip.html>.

27. U. S. Geological Survey. Earthquake Hazards Program. "What are the different magnitude scales, and why are there so many?" FAQs – Measuring Earthquakes. 21 July 2009 <http://earthquake.usgs.gov/learning/faq/?faqID=112>.

28. U. S. Geological Survey. Earthquake Hazards Program. "What are the earthquake magnitude classes?" FAQs – Measuring Earthquakes. 21 August 2009 <http://earthquake.usgs.gov/learning/faq/?faqID=24>.

29. U. S. Geological Survey. Earthquake Hazards Program. "What is the biggest earthquake in the United States?" FAQs – Historic Earthquakes and Earthquake Statistics. 21 August 2009 <http://earthquake.usgs.gov/learning/faq/?faqID=65>.

30. U. S. Geological Survey. Earthquake Hazards Program. "What is a fault and what are the different types?" FAQs – Earthquakes, Faults, Plate Tectonics, Earth Structure. 22 July 2009 <http://earthquake.usgs.gov/learning/faq/?faqID=55>.

31. U. S. Geological Survey. Earthquake Hazards Program. "Where do earthquakes occur?" FAQs – Historic Earthquakes and Earthquake Statistics. 29 July 2009 <http://earthquake.usgs.gov/learning/faq/?categoryID=11&faqID=95>.

32. U. S. Geological Survey. Uncovering Hidden Hazards in the Mississippi Valley. By Thomas G. Hildenbrand, et al. 1996. 31 August 2009 <http://quake.wr.usgs.gov/prepare/factsheets/HiddenHazs/>.

3.9 Dams

1. Diedrichsen, Mike. Illinois Department of Natural Resources. Office of Water Resources. List of Classified Dams in Greene County. Fax to Greg Michaud. 15 July 2010.

2. Federal Emergency Management Agency. Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams. April 2004. 16 October 2009 <http://www.fema.gov/library/viewRecord.do?id=1830&fromSearch=fromsearch>.

3. Federal Emergency Management Agency. Multi Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy. 1997. 29 September 2009 < http://www.fema.gov/library/viewRecord.do?id=2214>.

4. Federal Emergency Management Agency. Risk Prioritization Tools for Dams: Users Manual. By URS Group, Inc. 3 March 2008. 29 September 2009 <http://www.fema.gov/library/viewRecord.do?id=3296>.

5. Illinois Administrative Code. Title 17: Conservation. Chapter I: Department of Natural Resources. Subchapter h: Water Resources. Part 3702: Construction and Maintenance of Dams. Section 3702.30 Applicability. 29 September 2009 <http://www.ilga.gov/commission/jcar/admincode/017/017037020000300R.html>.

6. U.S. Army Corps of Engineers. National Dam Safety Program. National Inventory of Dams (NID). PowerPoint Presentation. By Rebecca Ragon, Project Manager. 8 & 11 June 2009. 2 October 2009 <https://rsgis.crrel.usace.army.mil/apex/NID.downloadFile?InFileName=NID_Overview_June09WebMeetings.ppt>.

7. U.S. Army Corps of Engineers. National Inventory of Dams. Illinois. 3 August 2011 <http://geo.usace.army.mil/pgis/f?p=397:3:3599878675111736::NO::P3_STATES:IL>.

8. U.S. Army Corps of Engineers. National Inventory of Dams. National. 3 August 2011 <http://geo.usace.army.mil/pgis/f?p=397:3:3599878675111736 ::NO>.

9. U.S. Army Corps of Engineers. National Inventory of Dams. Introduction. 2 October 2009 <https://rsgis.crrel.usace.army.mil/apex/f?p=397:1:4263121257641321::NO>.

10. U.S. Army Corps of Engineers. National Inventory of Dams Interactive Report. Illinois. Greene County. Database. 3 August 2011 <https://rsgis.crrel.usace.army.mil/apex/f?p=397:4:2425740124036092::NO>.

9.0 TABLES

Table 1
Thunderstorm & High Wind Events Reported in Greene County
1955 through 2010

Date	Time	Location	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage
5/26/1955	12:55 p.m.	Eldred^	0 kts	0	0	$0	$0
10/6/1955	1:00 p.m.	Greenfield^	0 kts	0	0	$0	$0
7/19/1958	6:12 p.m.	Greenfield^	0 kts	0	0	$0	$0
6/3/1962	9:05 p.m.	Eldred^	0 kts	0	0	$0	$0
1/24/1967	6:10 p.m.	Rockbridge^	0 kts	0	0	$0	$0
4/18/1975	6:15 p.m.	Roodhouse	56 kts	0	0	$0	$0
2/16/1976	2:05 p.m.	Carrollton^	0 kts	0	0	$0	$0
5/10/1980	8:25 p.m.	Carrollton	0 kts	0	0	$0	$0
5/10/1980	8:45 p.m.	Rockbridge	0 kts	0	0	$0	$0
6/7/1982	8:45 a.m.	Carrollton^	0 kts	0	0	$0	$0
8/5/1983	3:25 p.m.	Carrollton	0 kts	0	0	$0	$0
4/29/1984	7:00 p.m.	Carrollton^	52 kts	0	0	$0	$0
4/29/1984	7:20 p.m.	Carrollton^	52 kts	0	0	$0	$0
7/4/1985	8:45 p.m.	Carrollton	0 kts	0	0	$0	$0
7/29/1986	1:30 a.m.	Carrollton	0 kts	0	0	$0	$0
9/19/1986	2:40 p.m.	Roodhouse	0 kts	0	0	$0	$0
8/3/1987	6:56 p.m.	Carrollton^	0 kts	0	0	$0	$0
5/8/1988	4:30 p.m.	White Hall	0 kts	0	0	$0	$0
7/25/1988	1:15 p.m.	Carrollton	0 kts	0	0	$0	$0
11/15/1988	9:00 p.m.	Greenfield	0 kts	0	0	$0	$0
10/17/1990	4:00 p.m.	Carrollton^	0 kts	0	0	$0	$0
4/28/1991	2:15 a.m.	Hillview	0 kts	0	0	$0	$0
7/2/1992	4:25 p.m.	Carrollton	0 kts	0	0	$0	$0
7/2/1992	7:20 p.m.	Carrollton	0 kts	3	0	$0	$0
9/9/1992	5:30 p.m.	White Hall	0 kts	0	0	$0	$0
9/9/1992	6:13 p.m.	Carrollton	0 kts	0	0	$0	$0
6/12/1994	3:00 p.m.	Roodhouse	0 kts	0	0	$500	$0
4/18/1995	9:30 a.m.	countywide	52 kts*	0	0	$400,000†	$0
6/8/1995	6:30 a.m.	Carrollton	0 kts	0	0	$200	$0
7/25/1995	7:54 p.m.	White Hall	52 kts	0	0	$300	$0
4/30/1997	1:00 p.m.	countywide	45 kts*	0	0	$0	$0

^ Thunderstorm/high wind event verified in the vicinity of this location(s).

* Denotes High Wind Event.

† The property damage total of $400,000 for the high wind event on April 18, 1995 represents losses sustained in 16 counties (including Greene County). A breakdown by county was not available.

Table 1 Continued…
Thunderstorm & High Wind Events Reported in Greene County
1955 through 2010

Date	Time	Location	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage
5/22/1998	3:05 a.m.	Greenfield[^]	56 kts	0	0	$0	$0
5/22/1998	3:10 a.m.	Carrollton	56 kts	0	0	$0	$0
6/18/1998	7:00 p.m.	Carrollton	53 kts	0	0	$0	$0
6/18/1998	7:15 p.m.	White Hall	53 kts	0	0	$0	$0
6/29/1998	5:05 p.m.	Carrollton[^]	55 kts	0	0	$0	$0
11/10/1998	4:05 a.m.	White Hall	58 kts	0	0	$0	$0
6/4/1999	4:34 p.m.	Roodhouse	55 kts	0	0	$0	$0
8/23/1999	6:40 p.m.	Roodhouse	55 kts	0	0	$0	$0
4/20/2000	4:10 a.m.	Eldred	60 kts	0	0	$0	$0
4/20/2000	4:15 a.m.	Carrollton	60 kts	0	0	$0	$0
4/20/2000	4:20 a.m.	Greenfield	60 kts	0	0	$0	$0
5/26/2000	10:30 p.m.	White Hall	55 kts	0	0	$0	$0
6/23/2000	6:30 p.m.	White Hall	52 kts	0	0	$0	$0
7/11/2000	7:05 p.m.	Hillview[^]	52 kts	0	0	$0	$0
8/22/2000	8:30 p.m.	White Hall	51 kts	0	0	$0	$0
9/11/2000	10:05 p.m.	Roodhouse	56 kts	0	0	$0	$0
2/25/2001	12:00 a.m.	countywide	40 kts*	0	0	$0	$0
3/13/2001	9:00 a.m.	countywide	45 kts*	0	0	$0	$0
7/17/2001	5:40 p.m.	Greenfield[^]	55 kts	0	0	$0	$0
7/17/2001	5:45 p.m.	Greenfield	55 kts	0	0	$0	$0
7/17/2001	5:50 p.m.	Greenfield[^]	55 kts	0	0	$0	$0
8/30/2001	5:10 p.m.	Carrollton	52 kts	0	0	$0	$0
3/9/2002	6:00 a.m.	countywide	43 kts*	0	0	$0	$0
4/19/2002	5:15 p.m.	Greenfield	54 kts	0	0	$0	$0
6/11/2002	2:35 p.m.	Hillview	55 kts	0	0	$0	$0
6/11/2002	2:45 p.m.	White Hall	55 kts	0	0	$0	$0
5/10/2003	5:30 a.m.	Roodhouse	61 kts	0	0	$0	$0
5/24/2004	11:10 p.m.	Carrollton	55 kts	0	0	$0	$0
5/31/2004	6:30 p.m.	Roodhouse	55 kts	0	0	$0	$0
10/29/2004	5:10 p.m.	Carrollton[^]	55 kts	0	0	$0	$0
6/13/2005	4:20 p.m.	Carrollton	52 kts	0	0	$0	$0
6/13/2005	5:00 p.m.	Greenfield[^]	52 kts	0	0	$0	$0
7/19/2006	5:05 p.m.	Roodhouse[^]	50 kts	0	0	$0	$0
8/18/2006	7:40 p.m.	Carrollton	52 kts	0	0	$0	$0
8/18/2006	7:45 p.m.	White Hall	52 kts	0	0	$10,000	$0

[^] Thunderstorm/high wind event verified in the vicinity of this location(s).

* Denotes High Wind Event.

Table 1 Continued…
Thunderstorm & High Wind Events Reported in Greene County
1955 through 2010

Date	Time	Location	Magnitude (Knots)	Injuries	Death	Property Damage	Crop Damage
8/12/2007	11:45 p.m.	Hillview	52 kts	0	0	$0	$0
8/16/2007	9:12 a.m.	Hillview	52 kts	0	0	$0	$0
8/16/2007	9:25 a.m.	Roodhouse	56 kts	0	0	$0	$0
8/16/2007	9:31 a.m.	White Hall	52 kts	0	0	$0	$0
8/16/2007	NA	Carrollton	0 kts	0	0	$63,000	$0
9/25/2007	5:56 p.m.	Eldred^ White Hall Roodhouse	52 kts	0	0	$0	$0
5/11/2008	5:00 a.m.	countywide	43 kts*	0	0	$0	$2,000
7/8/2008	3:38 p.m.	Roodhouse	52 kts	0	0	$0	$0
7/19/2010	11:10 a.m.	White Hall^	52 kts	0	0	$4,500	$0
10/26/2010	3:10 a.m.	Carrollton	52 kts	0	0	$0	$0
Totals:				**3**	**0**	**$478,500†**	**$2,000**

^ Thunderstorm/high wind event verified in the vicinity of this location(s).

* Denotes High Wind Event.

† The property damage total of $400,000 for the high wind event on April 18, 1995 represents losses sustained in 16 counties (including Greene County). A breakdown by county was not available.

Source: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center. Storm Events Database. Illinois: Greene County. 2011.

Hoots, Diane. Illinois Central Management Services Emergency Management Coordinator. "Greene County info." Email to Greg R. Michaud. May 13, 2010.

McCarthy, Steve. Public Water Supply Senior Operator, City of White Hall. "Storm Damage." Fax to Greg R. Michaud. April 13, 2011.

Table 2
Hail Events Reported in Greene County
1963 through 2010

Date	Time	Location	Magnitude (Diameter)	Injuries	Death	Property Damage	Crop Damage
6/10/1963	3:30 p.m.	White Hall[^]	1.00 in.	0	0	$0	$0
4/7/1980	5:58 p.m.	Greenfield	1.50 in.	0	0	$0	$0
4/22/1988	4:30 p.m.	Greenfield	1.50 in.	0	0	$0	$0
5/8/1988	NA	Carrollton	NA	0	0	$100,000	$0
5/25/1989	12:00 p.m.	Greenfield	1.75 in.	1	0	$0	$0
6/12/1994	1:30 p.m.	Roodhouse	1.25 in.	0	0	$0	$0
7/25/1995	7:15 p.m.	Patterson[^]	1.75 in.	0	0	$0	$0
4/19/1996	4:45 p.m.	Carrollton	1.75 in.	0	0	$0	$0
6/4/1998	7:40 p.m.	White Hall	1.00 in.	0	0	$0	$0
4/16/2000	4:27 p.m.	White Hall Roodhouse	1.75 in.	0	0	$0	$0
4/16/2000	5:45 p.m.	Rockbridge	1.00 in.	0	0	$0	$0
4/14/2002	12:32 p.m.	Roodhouse White Hall	1.00 in.	0	0	$0	$0
4/14/2002	12:47 p.m.	Carrollton[^]	1.75 in.	0	0	$0	$0
4/14/2002	12:58 p.m.	Greenfield	1.75 in.	0	0	$0	$0
4/24/2002	12:30 p.m.	Carrollton	1.75 in.	0	0	$750,000	$0
4/24/2002	1:10 p.m.	Greenfield	1.75 in.	0	0	$466,930	$0
4/4/2003	1:50 p.m.	Greenfield	1.00 in.	0	0	$0	$0
5/9/2003	6:35 p.m.	White Hall[^]	1.00 in.	0	0	$0	$0
5/9/2003	6:40 p.m.	White Hall	2.50 in.	0	0	$0	$0
5/10/2003	5:30 a.m.	Hillview	1.75 in.	0	0	$0	$0
5/17/2004	3:20 p.m.	Rockbridge	1.00 in.	0	0	$0	$0
5/27/2004	2:55 p.m.	Rockbridge	1.00 in.	0	0	$0	$0
6/13/2005	4:10 p.m.	Kane	1.00 in.	0	0	$0	$0
3/13/2006	1:15 a.m.	White Hall	1.00 in.	0	0	$0	$0
4/4/2010	9:06 p.m.	Whitehall[^] Roodhouse[^]	1.00 in.	0	0	$0	$0
Totals:				**1**	**0**	**$1,316,930**	**$0**

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

Source: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center. Storm Events Database. Illinois: Greene County. 2011.

Campbell, Deborah. Boyd Healthcare Services. "RE: Greene Co. Hazard Mitigation Plan – Damage to Critical Facilities." Email to Andrea J. Bostwick. April 12, 2011.

Table 3
Lightning Events Reported in Greene County
2003 through 2010

Date	Time	Location	Injuries	Death	Property Damage	Crop Damage
12/2/2003	NA	Carrollton	0	0	$1,198	$0
5/25/2004	NA	Carrollton	0	0	$2,731	$0
7/17/2006	NA	Carrollton	0	0	$4,929	$0
5/17/2007	NA	Carrollton	0	0	$3,804	$0
7/17/2007	NA	Carrollton	0	0	$1,708	
7/11/2008	NA	Carrollton	0	0	$12,398	$0
6/10/2009	NA	Carrollton	0	0	$277	$0
4/30/2010	NA	Athensville Township	0	0	$68,887	$0
6/4/2010	NA	White Hall	0	0	$10,000	$0
7/10/2010	NA	Carrollton	0	0	$6,364	$0
Totals:			**0**	**0**	**$112,296**	**$0**

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center. Storm Events Database. Illinois: Greene County. 2011.

Gross, Terry. Chief of Police, City of Carrollton. Damage information for select lightning strike events. Fax to Greg R. Michaud. December 6, 2010.

McMillen, Rob. Chief of Police, City of White Hall. Damage information for select lightning strike events. Provided at Planning Committee Meeting on August 5, 2010.

Rhoads, Julie. Whitworth-Horn-Goetten Insurance Agency, Inc. Damage information for select lightning strike events. Provided at Planning Committee Meeting on August 5, 2010.

Varble, Mary K. Greene County Rural Water District. Damage information for select lightning strike events. Emails to Greg R. Michaud. August 2 & 3, 2010.

Table 4
Heavy Rain Events Reported in Greene County
2002 through 2010

Date	Time	Location	Magnitude (inches)	Injuries	Death	Property Damage	Crop Damage
5/29/2002	NA	county	NA	0	0	$16,327	$0
11/17/2003	7:00 a.m.	countywide	2” – 5”	0	0	$0	$0
1/5/2005	10:00 a.m.	countywide	3” – 6”	0	0	$0	$0
Totals:				**0**	**0**	**$16,327**	**$0**

Source: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database. Illinois: Greene County. 2011.

Varble, Mary K. Greene County Rural Water District. Damage information for heavy rain event. Emails to Greg R. Michaud. August 2 & 3, 2010.

Table 5
Snow & Ice Events Reported in Greene County
1995 through 2010

Date	Time	Event (Magnitude)	Injuries	Death	Property Damage
1/6/1995	2:00 a.m.	Glaze Ice ice accumulations ranged from ¼ & ¾ inch	0	0	$4,500*
1/8/1997 thru 1/9/1997	6:00 p.m.	Winter Storm 5" – 8" snow; blowing snow; low temperatures & very low wind chills	0	0	$0
1/15/1997 thru 1/16/1997	11:00 p.m.	Winter Storm freezing rain & sleet; 3" – 7" snow	0	0	$0
4/10/1997	8:00 a.m.	Winter Storm 4" – 6" heavy, wet snow	0	0	$0
1/8/1998	8:00 a.m.	Winter Storm 2" – 5" snow	0	0	$0
1/12/1998	2:00 a.m.	Winter Storm freezing drizzle	0	0	$0
3/8/1998 thru 3/9/1998	11:00 p.m.	Winter Storm 1" – 8" snow	0	0	$0
12/21/1998 thru 12/22/1998	12:00 a.m.	Winter Storm freezing drizzle, sleet & snow; low temperatures	0	0	$0
1/1/1999 thru 1/2/1999	6:00 p.m.	Winter Storm 1" freezing rain & sleet; 6" – 14" snow; low temperatures	0	0	$0
1/13/1999	4:30 a.m.	Ice Storm ice accumulations of at least ¼"	0	0	$0
1/28/2000 thru 1/29/2000	6:00 p.m.	Winter Storm 3" – 5" snow	0	0	$0
3/11/2000	5:00 a.m.	Winter Storm 6" – 10" snow	0	0	$0
12/13/2000	6:00 a.m.	Heavy Snow 6" – 10" snow; low temperatures	0	0	$0
1/26/2001	1:00 a.m.	Winter Storm freezing rain	0	0	$0

* The property damage total of $4,500 for the glaze ice event on January 6, 1995 represents losses sustained in 8 counties (including Greene County). A breakdown by county was not available.

Table 5 Continued…
Snow & Ice Events Reported in Greene County
1995 through 2010

Date	Time	Event (Magnitude)	Injuries	Death	Property Damage
2/25/2002 thru 2/26/2002	8:00 p.m.	Winter Storm 1" – 4" snow; blowing & drifting snow	0	0	$0
3/25/2002 thru 3/26/2002	6:00 p.m.	Winter Storm 1" sleet; 3" – 4" snow	0	0	$0
12/24/2002	6:00 a.m.	Winter Storm 4" – 8" snow	0	0	$0
2/23/2003 thru 2/24/2003	5:00 p.m.	Winter Storm 3" – 6" snow	0	0	$0
12/13/2003	12:00 p.m.	Winter Storm 2" – 3" snow	0	0	$0
1/25/2004	6:00 a.m.	Winter Storm ¼" to ½" freezing rain; 1" – 2" sleet; 1" – 2" snow	0	0	$0
11/24/2004	6:00 a.m.	Winter Storm 2" -4" snow	0	0	$0
12/8/2005	10:00 a.m.	Winter Storm 2" – 5" snow	0	1[A]	$0
11/29/2006 thru 12/1/2006	10:00 p.m.	Winter Storm 12" snow; 1" ice and sleet accumulations	0	0	$0
1/12/2007 thru 1/14/2007	10:00 p.m.	Ice Storm low temperatures, ice accumulations ranged from ¼" to ½"; sleet accumulations ranged up to 1 ½"	0	0	$0
2/13/2007	12:00 a.m.	Heavy Snow 6" – 10" snow	0	0	$0
12/6/2007	12:00 p.m.	Winter Storm 2" – 4" snow	0	0	$0
12/8/2007 thru 12/12/2007	11:00 p.m.	Ice Storm ice accumulations ranged up to ½"; sleet accumulations ranged up to 1"	0	0	$1,228

[A] Information was not available on the location of the severe winter storm- related fatality. The data provided for this event covered 16 counties including Greene County.

Table 5 Continued…
Snow & Ice Events Reported in Greene County
1995 through 2010

Date	Time	Event (Magnitude)	Injuries	Death	Property Damage
12/15/2007	6:00 a.m.	Heavy Snow 8" snow	0	0	$0
1/31/2008 thru 2/1/2008	12:00 p.m.	Heavy Snow 11" snow	0	0	$0
1/6/2010 thru 1/7/2010	8:00 p.m.	Winter Storm 3" – 5" snow; blowing & drifting snow	0	0	$0
Totals:			**0**	**1^**	**$5,728***

^ Information was not available on the location of the severe winter storm- related fatality. The data provided for this event covered 16 counties including Greene County.

* The property damage total of $4,500 for the glaze ice event on January 6, 1995 represents losses sustained in 8 counties (including Greene County). A breakdown by county was not available.

Source: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center. Storm Events Database. Illinois: Greene County. 2011.

Gross, Terry. Chief of Police, City of Carrollton. Damage information for severe winter storm event. Fax to Greg R. Michaud. December 6, 2010.

Table 6
Extreme Cold Events Reported in Greene County
2000 through 2010

Date	Time	Event (Magnitude)	Injuries	Death	Property Damage
12/16/2000 thru 12/17/2000	8:00 a.m.	Extreme Cold/Wind Chill low temperatures & very low wind chills (-20°F to -40°F)	0	0	$0
Totals:			**0**	**0**	**$0**

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center. Storm Events Database. Illinois: Greene County. 2011.

Table 7
Extreme Heat Events Reported in Greene County
1995 through 2010

Date	Temperature (°F)	Heat Index (°F)	Impacts (Severity)
7/11/1995 thru 7/17/1995	near 100°F	approaching 120°F	• 2 heat-related deaths and 95 heat-related injuries* • $50,000 in property damage (road buckling)^ • $200,000 in crop damage^
7/28/1995 thru 7/31/1995	---	110°F	• 30 heat-related injuries* • $5,000 in property damage^ • $10,000 in crop damage^
8/9/1995 thru 8/24/1995	near 100°F	≥ 110°F	• 2 heat-related deaths and 97 heat-related injuries*; • $200,000 in crop damage^
7/18/1999 thru 7/31/1999	middle to upper 90s with a few days topping 100°F	105°F - 115°F	• 8 heat-related deaths and 119 heat-related injuries*
7/7/2001 thru 7/10/2001	middle to upper 90s	105°F – 110°F	
7/17/2001	lower to middle 90s	110°F - 115°F	
7/29/2001 thru 8/2/2001	lower to middle 90s	105°F – 110°F	
8/7/2001 thru 8/9/2001	lower to upper 90s	102°F – 110°F	
8/21/2001 thru 8/22/2001	middle 90s to 100°F	105°F – 110°F	
7/8/2002 thru 7/9/2002	middle to upper 90s	105°F – 110°F	
7/20/2002 thru 7/22/2002	middle to upper 90s	105°F - 115°F	

* The heat-related deaths and injuries reported did not occur in Greene County. The data provided for each event covered multiple counties. The injuries and deaths reported took place in the St. Louis metropolitan area.

^ The property and crop damage totals represents losses sustained in 21 counties (including Greene County). A breakdown by county was not available.

Table 7 Continued…
Extreme Heat Events Reported in Greene County
1995 through 2010

Date	Temperature (°F)	Heat Index (°F)	Impacts (Severity)
7/26/2002 thru 8/6/2002	middle/upper 90s to 100°F	105°F - 115°F	
8/15/2003 thru 8/21/2003	middle to upper 90s	105°F – 110°F	• early school dismissals and school closings
8/24/2003 thru 8/28/2003	middle 90s to 100°F	105°F – 110°F	• 1 heat-related death*
7/20/2004 thru 7/22/2004	lower to middle 90s	105°F – 110°F	
7/20/2005 thru 7/26/2005	upper 90s to 100°F	---	• 1 heat-related death*
7/17/2006 thru 7/21/2006	middle 90s to 100°F	100°F – 110°F	
7/30/2006 thru 8/2/2006	upper 90s to 100°F	105°F – 110°F	• 1 heat-related death*
8/5/2007 thru 8/16/2007	middle 90s to 100°F	105°F – 110°F	• 3 heat-related deaths* • early school dismissals
6/21/2009 thru 6/27/2009	middle to upper 90s	105°F	
7/14/2010	middle 90s	105°F – 110°F	
7/17/2010	middle 90s	105°F	
7/22/2010 thru 7/24/2010	middle to upper 90s	105°F – 110°F	

* The heat-related deaths and injuries reported did not occur in Greene County. The data provided for each event covered multiple counties. The injuries and deaths reported took place in the St. Louis metropolitan area.

Source: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database, Illinois, Greene County, 2010.

Table 8
Flood & Flash Flood Events Reported in Greene County
1993 through 2010

Date	Time	Location	Type	Magnitude	Injuries	Death	Property/Crop Damage
4/13/1993 thru 10/22/1993	NA	western portion of the county	Flood	Illinois River rose 17.4' over flood stage	0	0	$4,156,835
4/12/1994	12:54 a.m.	countywide	Flash Flood	---	0	0	$5,000
5/9/1995 thru 5/31/1995	6:00 p.m.	west & central portions of the county	River Flood	approx. 15" of rain	0	0	P: $15,000,000* C: $12,000,000*
5/20/2001 thru 5/27/2001	4:48 p.m.	western portion of the county	Flood	Illinois River rose 5.2' over flood stage	0	0	$0
6/6/2001	3:00 a.m.	countywide	Flash Flood	4" – 6" rain	0	0	$0
4/27/2002 thru 5/31/2002	1:45 p.m.	western portion of the county	Flood	Illinois River 10.5' to 14.5' over flood stage	0	0	$0
5/7/2002	3:30 a.m. to 8:30 a.m.	countywide	Flash Flood	2" – 4" rain	0	0	$0
5/12/2002	5:00 a.m. to 9:30 a.m.	countywide	Flash Flood	3" – 6" rain	0	0	$0
5/12/2002 thru 5/13/2002	8:00 p.m. to 12:30 a.m.	countywide	Flash Flood	3" – 6" rain	0	0	$0
5/10/2003	8:30 a.m. to 12:00 p.m.	countywide	Flash Flood	3" – 6" rain	0	0	$0

* The property and crop damage totals of $17 million for the May 9, 1995 flood event represents losses sustained in 10 counties (including Greene County). A breakdown by county was not available.

Table 8 Continued…
Flood & Flash Flood Events Reported in Greene County
1993 through 2010

Date	Time	Location	Type	Magnitude	Injuries	Death	Property/Crop Damage
5/27/2004	5:00 p.m. to 8:30 p.m.	countywide	Flash Flood	2" – 3" rain	0	0	$0
5/10/2007	4:15 p.m. to 7:30 p.m.	Carrollton	Flash Flood	3" rain	0	0	$0
Totals					**0**	**0**	**$31,161,835***

* The property and crop damage totals of $17 million for the May 9, 1995 flood event represents losses sustained in 10 counties (including Greene County). A breakdown by county was not available.

Sources: National Weather Service, Advanced Hydrologic Prediction Service, Weather Forecast Office St. Louis, Missouri, North Central River Forecast Center, Illinois River at Hardin, 2011.

NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database, Illinois, Greene County, 2010.

Owen, Jared. Hazard Mitigation Planner. Illinois Emergency Management Agency. "Greene Co." Email to Greg R. Michaud. August 4, 2011.

Table 9
Tornadoes Reported in Greene County
1952 through 2010

Date	Time	Location	Magnitude (Fujita Scale)	Injuries	Deaths	Property Damage	Crop Damage
3/18/1952	6:07 p.m.	Kane	F1	1	0	$25,000	$0
5/6/1960	1:05 p.m.	Carrollton*	F1	0	0	$250,000^	$0
5/20/1960	7:40 p.m.	Eldred*	F0	0	0	$2,500	$0
4/30/1962	11:30 a.m.	Carrollton	F1	0	0	$25,000	$0
6/1/1970	5:35 p.m.	Rockbridge*	F1	0	0	$0	$0
5/20/1975	10:30 p.m.	Roodhouse*	F2	0	0	$250,000	$0
5/1/1983	4:30 p.m.	Greenfield	F3	15	0	$2,500,000	$0
11/15/1988	9:30 p.m.	Greenfield*	F2	0	0	$250,000	$0
5/27/1995	5:15 p.m.	White Hall Roodhouse	F1	0	0	$14,500	$0
7/25/1995	7:40 p.m.	Roodhouse*	F0	0	0	$200	$2,200
2/11/1999	2:19 p.m.	Hillview*	F1	0	0	$80,000	$0
3/12/2006	7:12 p.m.	Hillview Wilmington	F2	0	0	$0	$0
3/12/2006	7:20 p.m.	Barrow	F1	2	0	$0	$0
3/12/2006	7:25 p.m.	Barrow	F1	0	0	$0	$0
3/8/2009	10:10 a.m.	Athensville*	EF1	0	0	$0	$0
8/19/2009	1:10 p.m.	Roodhouse*	EF0	0	0	$0	$0
Totals:				**18**	**0**	**$3,397,200^**	**$2,200**

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

^ The property damage total of $250,000 for the tornado event on May 6, 1960 represents losses sustained in four counties (including Greene County). A breakdown by county was not available.

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Climatic Data Center, Storm Events Database, Illinois, Greene County, 2010.

NOAA, National Weather Service, Weather Forecast Office St. Louis, Missouri, Climatology & Weather Records, Greene County, Illinois, 2011.

APPENDIX A

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

WHEREAS; Greene 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; Greene County, Illinois must prepare a Natural Hazard Mitigation Plan to become eligible for grant money for mitigation projects; and

WHEREAS; this Plan will include a listing of potential projects and activities that can help reduce the damages caused by these natural events; and

WHEREAS; Greene 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 GREENE COUNTY BOARD does Hereby pass this resolution to pursue the preparation of a Natural Hazard Mitigation Plan.

Passed this 13 day of May, 2009

County Board Chairman

ATTEST:

County Clerk and Recorder

APPENDIX B

Attendance Sheet
Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting
May 18, 2010

	Name (Please Print)	Organization/Entity
1.	David Roe	Greene Co ESDA
2.	BJ Schild	Eldred DFL Carrollton Fire - Woodville Twp
3.	Don Roberts	Greene City Board
4.	David Marth	Greene Cty Hwy Dept.
5.	Jill Waldheuser	Greene County GCAO
6.	Connie Bugg	Greene Co-Village of Hillview
7.	Julie Rhoads	Whitworth-Horn-Goethen
8.	Brady Smith	Ameren CIPS
9.	Tempula Hers	Greene Co. SWCD
10.	Sue Thornton	Greene Co Health Dept.
11.		Greene Co Rural Water
12.		Green County Clerk
13.		Carrollton P.D.
14.		Illinois Rural Electric Coop
15.		Bluffdale, Hillview & Kench Drainage Dist
16.	Ricky Graham	Greene County Sheriff
17.	Deb Campbell	Boyd Healthcare Service
18.	Greg Michaud	JCG
19.	Andrea Bostwick	JCG
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Attendance Sheet
Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting
May 18, 2010

	Name (Please Print)	*Organization/Entity*
1.	Ruth Ann Flowers	Greene Co Health Department
2.	Joseph Mock	County Board Chairman
3.	Mike Gresham	General Public
4.	Dale Sorrells	Patterson
5.	LIZ KILLION	ROODHOUSE F.P.D.
6.	Mike Painter	Greene Co. Farm Bureau
7.	Mahnie Baumeyer	Greene Co Board
8.	Mary K Vaubel	Gr. Co Rural Water
9.	Kirby Ballard	Greene Co. Treasurer
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Attendance Sheet
Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting
August 5, 2010

	Name (Please Print)	*Organization/Entity*
1.	Leah Inman	Roodhouse Rep.
2.	Art Inman	Roodhouse Rep.
3.	Lin Wolsley	" "
4.	[illegible]	Roodhouse
5.	Greg Walters	Kane
6.	Joseph Ward	Carrollton County Board
7.	BJ Schley	ECDed DTC
8.	Jill Waldheuser	Greene County
9.	Brady Smith	Ameren CIPS
10.	Jeff York (Kellie)	Bluffdale - Hillview - Beach
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Attendance Sheet
Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting
August 5, 2010

	Name (Please Print)	Organization/Entity
1.	RICHARD NEWTON	GREENFIELD CITY
2.	Dwayne Bragg	Hillview Board
3.	Dale Sorrells	Patterson
4.	[illegible] Goodman	ROODHOUSE
5.	[illegible] M. Mart	Greene County
6.	Deborah Cupbell	Boyd Healthcare
7.	Rob McMillen	White Hall PD.
8.	Terry Walters	SWCD
9.	Julie Rhoads	WAC
10.	Jim BANGHART	CARROLLTON FIRE DIST
11.	Mike Painter	GCEB
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Attendance Sheet
Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting
December 9, 2010

	Name (Please Print)	*Organization/Entity*
1.	Andrea Bostwick	Johnson Depp & Quisenberry
2.	David Martin	Greene County
3.	Terry Walters	Greene County SWCD
4.	Ruth Ann Flowers	Greene County Health
5.	Jill Waldmeuser	Greene County
6.	Sue Thornton	Greene County Health Dept.
7.	Dale E. Sorrelle	Patterson
8.	Cale Hoey	Greene Co Sheriff
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Attendance Sheet
Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting
December 9, 2010

	Name (Please Print)	*Organization/Entity*
1.	GREG MICHAUD	JOHNSON, DEEP & QUISENBERRY
2.	RICHARD NEWTON	CITY OF GREENFIELD
3.	JOSEPH NOLEN	COUNTY BOARD
4.	Deb Campbell	Boyd Healthcare
5.	Julie Rhoads	
6.	Mike Painter	Farm Bureau
7.	Kirby Ballard	County Treasurer
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Attendance Sheet
Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting
June 9, 2011

	Name (Please Print)	Organization/Entity
1.	GREG MICHAUD	Johnson, Depp & Quisenberry
2.	BJ Schild	Elsberry Dispatch - Carrollton Fire - Woodville FPD
3.	Richard Newton	CITY GREENFIELD
4.	Pat Cooper	Ameren IL
5.	Dale Lowells	Patterson
6.	JERRY GROSS	City of CARROLLTON
7.	MARK STRAUB	GREENE CO BOARD
8.	Kellie York	~~Elsberg~~ Bluffdale, Kraeh, Hillview
9.	Ruth Ann Flowers	Greene Co Health Dept
10.	Ann Thomas	Greene Co Health Dept
11.	Kirby Ballard	Greene Co Treasurer
12.	Jack Wallis	White Hall Police Chief
13.	[illegible]	Greene Co Hwy
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Attendance Sheet
Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting
June 9, 2011

	Name (Please Print)	Organization/Entity
1.	Dwayne Bragg	Hillview Village
2.	AnDrea Bostwick	Johnson, Pepp & Quisenberry
3.	Cale Hoesman	Greene County
4.	John Schild	Village of Eldred
5.	Julie Rhoads	WHG Ins
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Attendance Sheet
Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting
August 18, 2011

	Name (Please Print)	Organization/Entity
1.	Dwayne Bragg	Hillview Village
2.	Susan Thornton	Greene Co Health Dept.
3.	John Schild	Village of Eldred
4.	Richard Newton	GREENFIELD
5.	Jerry Walters	Greene Co. SWCD
6.	Joseph Nard	Greene County Board
7.	JOHN JANVRIN	ROODHOUSE
8.	Candace Janvrin	Roodhouse
9.	BJ Schild	Eldred DDL - Woodville Twp - Carrollton Fire
10.	Julie Rhoads	WHG INS.
11.	Beth Pressler	Carrollton CUSD #1
12.	Cale Hoesman	Greene Co ESDA/Sher FF
13.	TERRY GROSS	CARROLLTON P.D.
14.	David Tarth	Greene Co. Hwy
15.	Deb Campbell	Boyd Hospital - Alton
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Attendance Sheet
Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting
August 18, 2011

	Name (Please Print)	Organization/Entity
1.	Greg Michaud	Johnson, Depp & Quisenberry
2.	Andrea Bostwick	JDQ
3.	Deb Banghart	County
4.	Ruth Ann Flowers	GCHD
5.	Chris Ford	Wilmington
6.	Luke Coultas	Whitehall Police Dept.
7.	Mike Painter	Greene Co. Farm Bureau
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APPENDIX C

Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

May 18, 2010
First Baptist Church
203 5th Street, Carrollton
1:00 p.m.

Meeting Minutes

Committee Members

Ameren CIPS
Bluffdale, Hillview & Keach Drainage District
Carrollton, City of
Eldred Drainage & Levee District
Greene County Ambulance (Boyd Memorial Hospital)
Greene County
- Assessor
- Board
- Clerk
- ESDA
- Farm Bureau
- GIS/Internet Technology
- Public Health Dept.

Greene County Continued…
- Highway Dept.
- Sheriff
- Soil & Water Conservation District
- Treasurer

Greene County Rural Water
Hillview, Village of
Illinois Rural Electric Cooperative
Mitigation Planning Consultants
- Johnson, Depp & Quisenberry

Roodhouse Fire Protection District
General Public
- Mike Grisham

Whitworth Horn & Goetten Insurance
Wilmington (Patterson), Village of

Welcome and Introductions

David Marth, Chairman of the Greene County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee, welcomed attendees. He thanked attendees for agreeing to serve on this Committee and he noted that through their attendance they will help make the municipalities they represent and Greene County eligible for grant money to help with projects and activities aimed at reducing damages caused by natural hazards. David 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?

Jared Owen, Illinois Emergency Management Agency, was scheduled to provide this presentation; however, he was unable to attend because of a family health matter. Greg Michaud, Johnson, Depp & Quisenberry, provided a summary of Jared's presentation.

The Federal Emergency Management Agency (FEMA) is encouraging counties throughout the United States to prepare natural hazard mitigation plans. Natural hazards 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. Mitigation refers to projects and activities that can reduce or eliminate damages from these natural hazards.

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.

Greene County and all participating municipalities should develop a Plan that identifies projects and activities to be taken before natural hazards occur. The Plan will help make Greene County and the participating municipalities eligible for money to conduct projects that might not otherwise get implemented. Another reason to prepare this Plan is to help improve cooperation between various offices.

The Planning Process

Greg Michaud noted that the persons participating on this Mitigation Planning Committee, whether elected or appointed, are all community leaders. They have the opportunity to do something that should have lasting benefits for current and future generations of Greene County residents.

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:

1st Committee meeting	Orientation to the Planning Process Begin identifying Critical Facilities & Relevant Documents
2nd Committee meeting	Discuss the Risk Assessment Develop Mission Statement Establish Goals Committee returns the Critical Facilities List and the List of Documents Relevant to the Natural Hazard Mitigation Plan
3rd Committee meeting	Begin discussing Mitigation Projects and Activities Develop a Mitigation Strategy Committee returns list of Mitigation Projects and activities
4th Committee meeting	Finish discussing Mitigation Projects and Activities Committee reviews and discusses the Draft Plan
5th Committee meeting	Present the Revised Plan for public review Committee helps answer questions from the public

Natural hazards that should be evaluated during development of the Greene County Plan include floods, severe "summer" storms, tornados, severe snow or ice storms, drought, extreme heat, earthquakes, and dam failures. Other hazards may be added pending the results of the Risk Assessment.

Andrea Bostwick, JDQ, is a certified risk assessor, 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 Documents Relevant to the Natural Hazard Mitigation Plan. This list includes Land Use Plans, Flood Ordinances, and related documents. If comprehensive municipal plans have been developed, copies 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. Once IEMA/FEMA approve the Plan, the County and each participating municipality must adopt the Plan to become eligible for funding to implement the mitigation projects identified.

Other highlights of this discussion include:

- Submitting a list of mitigation projects does not commit any municipality or the County to obligate funds. These lists help assure eligibility for funding. All mitigation projects and activities for which federal funding will be sought, must be included in the Plan.
- FEMA's intent is to encourage mitigation. FEMA has not used these Plans to "penalize" municipalities or counties who do not implement mitigation projects included in their Plans. Even if funding appears doubtful, it is better to include a project or activity in the Plan.

Mission Statement & Goals

A draft of a proposed mission statement and goals were 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:

- Severe winters storms in 1976 and 1977 that resulted in road, business and school closures.
- Countywide ice storm on Easter weekend, 1978, that caused prolonged power outages.
- Countywide hail storm in May, 1989, that caused extensive damage to crops, livestock, roofs, house siding, and vehicles.
- Flooding in August, 1993, that resulted in family relocations and crop damage in Hillview.
- Countywide hail storm on April 24, 2002, that caused catastrophic damage.

- Flooding in Roodhouse in 2003 that resulted in water well problems.
- Lightning strikes that damaged a drinking water distribution line and well in 2010.

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?

Greg told Committee members that the risk assessment, goal setting, and the mission statement would be the main topics of the next committee meeting.

Committee members were asked to complete a survey contained in their meeting materials before they left. Paper copies of this survey and a fact sheet titled "Frequently Asked Questions," are available for participating municipalities to make available to the public from their offices. Andrea can provide paper or electronic copies.

The second meeting of the Committee was set for:

Thursday, August 5
First Baptist Church of Carrollton
203 Fifth Street
1 p.m.

Public Comment

Public notice of this committee meeting clearly invited public attendance. An individual from the general public attended, and he was provided the opportunity to comment.

With no further comments or questions, David Marth thanked the Committee members for their attendance. He emphasized that their attendance counts for in-kind service which helps satisfy the grant requirement in addition to helping make their jurisdictions eligible for future funding.

He added two issues:

- CDAP grant money is available from the Illinois Department of Commerce and Economic Opportunity. Information about this grant money is available from him.
- Any Committee member who has file information, photos, or other documents that want to provide for this plan can be dropped off with David and he will mail it to the planning consultants.

The meeting was adjourned.

Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

August 5, 2010
First Baptist Church
203 Fifth Street, Carrollton
1:00 p.m.

Meeting Minutes

Committee Members

Ameren CIPS
Bluffdale, Hillview & Keach Drainage District
Carrollton Fire
Eldred Drainage & Levee District
Greene County Ambulance (Boyd Memorial Hospital)
Greene County
- Assessor
- Board
- Farm Bureau
- GIS/Internet Technology
- Highway Department
- Soil & Water Conservation District

Greenfield, City of
Hillview, Village of
Illinois Rural Electric Cooperative
Kane, Village of
Mitigation Planning Consultants
- Johnson, Depp & Quisenberry

Roodhouse, City of
General Public
- Al & Pat Inman

White Hall, City of
Whitworth Horn & Goetten Insurance
Wilmington (Patterson), Village of

Welcome and Introductions

Committee members introduced themselves and identified who they represent. To help expedite Committee meetings, Greg Michaud asked that any changes to the meeting minutes be provided to Andrea Bostwick after the meeting. Meeting minutes for future meetings will be attached to e-mail meeting reminders.

After describing the purpose of hazard mitigation planning, Greg thanked Committee members for their contributions following the kick-off meeting. He mentioned that Mary Kay Varble and Julie Rhodes provided information that is often difficult to obtain which will help strengthen the Greene County Plan.

Handout materials were distributed to each member.

Mission Statement

Greg Michaud referred Committee Members to the draft mission statement in their binders. He asked if there were any suggested changes to this statement.

A motion to accept the mission statement was made. The Committee voted unanimously to approve the mission statement, without any changes.

Risk Assessment

Greg began the presentation by asking Committee members if they could recall any damages done to critical facilities. Andrea distributed a one page form for members to share this information so that it can be included in the Plan.

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 was described. Greene County has had 12 Federal disaster declarations since 1965. Documented damages from severe storms and other natural hazards in Greene County reveal dollar losses exceeding $7.3 million with at least 64 injuries and one death. Multiple severe weather events have occurred during every decade since 1950.

Severe Storms
Over $1.6 million in damages has resulted from severe thunderstorms, hail, and high wind events since 1955. Severe storms are the most frequently occurring natural hazard in Greene County.

Severe Winter Storms
Thirty-six events involving excessive snow, ice, or extreme cold have been verified since 1995. At least 42 injuries can be attributed to severe winter storms and this number is likely to be much higher.

Floods
Floods contributed to eleven of the twelve Federal disaster declarations. At least 18 floods have been documented since 1973 causing substantial property and crop damage.

Tornadoes
Since 1950, Illinois has averaged 36 tornadoes per year. During this time 15 tornadoes have been verified in Greene County. Damages have exceeded $3.2 million including 18 injuries.

The worst tornado occurred in Greenfield on May 1, 1983. This tornado caused $2.5 million in damages including 15 injuries. Committee Member Richard Newton owned a business on the town square and vividly recalled the damages caused by this tornado.

Extreme Heat
Twenty extreme heat events have been reported since 1995. Road buckling and crop damage often occur, but crop damage is usually not measurable unless drought occurs.

Drought

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

	Corn	Soybeans
1983	48%	38%
1988	30%	22%
2005	24%	17%

Earthquakes

Earthquakes have been felt in Greene County but no damages have been reported.

Greg noted that information on severe winter storms and flooding prior to 1995 is lacking. While records of catastrophic floods between 1973 and 1994 have been identified, there may have been more floods than have been found in available records. Committee members were asked to provide information on events not included in the tables in the Risk Assessment handout.

Greg referred to a two page handout titled "**Critical Facilities**" that was distributed at the last meeting to County and municipal officials to be completed and returned at this meeting. This form needs to be completed so that the Vulnerability Assessment portion of the Risk Assessment can be prepared for the Plan.

Committee members were also asked to submit the **List of Relevant Documents** today or before the next meeting.

Goals

Greg described how goals are used in this Plan. Several members suggested that crops be added to the second goal and that levees be added to the third goal.

The draft goals will be revised to reflect these changes and presented for approval at the next Committee meeting.

Mitigation

Mitigation Projects

Greg reminded Committee Members that the purpose of the next meeting is to bring ideas for mitigation projects. Mike Painter, Terry Walters, Dwayne Bugg, and Vernon Goodman raised important questions about jurisdiction and type of projects that should be considered. Their questions led to a useful discussion about flooding and levees. Much of the information raised during this discussion should help the participating municipalities assemble their list of mitigation projects.

Greg referred everyone to the two handouts that lists examples of mitigation projects for the County and municipalities. For those participants in the NFIP – Carrollton, Eldred, Greenfield,

Greene County, and Hillview – there are three additional administrative activities that need to be added to their lists.

While ***structural projects*** typically are the most frequently mentioned category of mitigation projects, other categories should be considered including:

Public information/education: to alert people about how to protect themselves and their property.

Studies: to identify the cause of the problem.

Regulatory: 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.

He emphasized that ***long-term permanent solutions and studies*** should be considered when proposing mitigation actions. Tree trimming is helpful in reducing downed power lines during an ice storm and it should be included in your Plan, but it is not an activity that FEMA will fund because it is not considered a long-term permanent solution.

I. Projects **underway** or about to start
II. **Studies** to identify the cause of a problem
III. Projects/Activities you must do to **remain compliant with NFIP or are thinking about as a result of this planning process**

Project Prioritization

A project prioritization method is required by FEMA. Developing this method is more manageable as a small committee. Greg asked for candidates to serve on this subcommittee. Dwayne Bugg, Dale Sorrels, Mike Painter, and Terry Walters volunteered to serve.

What Happens Next?

After noting some potential conflicts, the Committee chose December 9 for their next meeting. The location and starting time will remain the same.

Public Comment

No additional questions or comments were raised and the meeting was adjourned.

Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

December 9, 2010
First Baptist Church
203 Fifth Street, Carrollton
1:00 p.m.

Meeting Minutes

Committee Members

Greene County Ambulance (Boyd Memorial Hospital)
Greene County Offices
- Assessor/GIS
- Board
- ESDA/Sheriff's Office
- Farm Bureau
- Public Health
- Highways
- Soil & Water Conservation District
- Treasurer

Greenfield, Village of
Mitigation Planning Consultants
- Johnson, Depp & Quisenberry

Whitworth Horn & Goetten Insurance
Wilmington (Patterson), Village of

Welcome and Introductions

David Marth, Chairman of the Greene County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee, welcomed attendees. David asked the Committee members to introduce themselves by providing their name and who they represent.

Cale Hoesman introduced himself as the new Greene County Emergency Services and Disaster Coordinator. He remains in the Sheriff's Office and he replaces David Roe.

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

Before beginning this presentation, Greg acknowledged thanks to Committee members who provided additional help. Terry Walters, Greene Co. Soil & Water Conservation District, provided historical photographs that will be added to the Plan. Julie Rhodes, Whitworth-Horn-Goetten Insurance, gathered claims information related to damages from storms that will help readers grasp the magnitude of how much damage can be caused by a single storm. Damages to critical facilities in Carrollton were provided by Terry Gross, damages to critical facilities in

White Hall were provided by Rob McMillen and damage to critical facilities in Roodhouse were provided by Vern Goodman. In addition, Deb Campbell provided damage information on Boyd Memorial Hospital.

Greg also provided a brief recap to help reorient Committee members as to what has been accomplished and what will be covered at this meeting. He noted that the Committee has accomplished all of its objectives up to this point and are ahead of schedule.

A two page form titled "**Critical Facilities**" was distributed to the municipalities and the County at the first Committee meeting. This form is needed because the information will be included in the Plan.

The Critical Facilities lists will be used along with the property tax assessment figures to conduct the Vulnerability Assessment. To strengthen this assessment, Greg asked the Committee to provide information on damages to critical facilities on a second form, "**Damages To Critical Facilities**," which was distributed at the previous Committee meeting. Greg asked Committee members to submit this form because the information will help complete the Vulnerability Assessment.

Project Prioritization Method

Dwayne Bugg, Mike Painter, Dale Sorrels, and Terry Walters served on the Project Prioritization Subcommittee. A Project Prioritization Method is required by FEMA in the Plan. He emphasized that the term Project Prioritization Method actually refers to a method to classify each project.

Greg referred Committee members to three pages in their packets about the proposed Project Prioritization Method developed for this Plan.

He 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 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. She used a sufficiently large-sized chart so that everyone in the room could read it from where they sat. She entered information about each

category describing various factors that will be used to make determinations about each project and activity.

She explained that all mitigation projects submitted will be organized by participating jurisdiction.

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

To remain in compliance with the National Flood Insurance Program, Andrea explained that there are two administrative activities that must be added to the Mitigation Projects list for each NFIP-participating municipality and the County. She described both activities.

Since most of the participants have not submitted their list of mitigation projects, the Committee discussed steps that should be taken before the next Committee meeting is scheduled. Committee members agreed that a letter should be sent under the signature of the County Board Chairman. This letter should include:

- A deadline when the list of mitigation projects is needed, and
- A reminder that two more Committee meetings will be held before the Plan is submitted to IEMA/FEMA and that participation is vital.

Maggie Bowman, Alton Telegraph, was mentioned as a reporter who might be interested in preparing newspaper stories about the mitigation plan process.

What Happens Next?

Letter: David Marth will coordinate the distribution of the letter to participants.

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, May 12th
First Baptist Church, Carrollton
1 p.m.

Public Comment

No non-Committee members attended this meeting. With no additional questions or comments, Chairman Marth adjourned the meeting.

Post-Meeting Note

The May 12th meeting was rescheduled to June 9th to accommodate those who were still planting due to inclement spring weather.

Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

June 9, 2011
First Baptist Church
203 Fifth Street, Carrollton
1:00 p.m.

Meeting Minutes

Committee Members

Ameren
Bluffdale, Hillview & Kratch Drainage & Levee Districts
Carrollton, City of
Carrollton Fire Protection District
Eldred, Village of
Eldred Drainage & Levee District
Greene County Offices
- Board
- ESDA/Sheriff's Office
- Public Health
- Highways
- Treasurer

Greenfield, Village of
Hillview, Village of
Mitigation Planning Consultants
- Johnson, Depp & Quisenberry

White Hall, City of
Whitworth Horn & Goetten Insurance
Wilmington (Patterson), Village of
Woodville Township

Welcome and Introductions

Greg Michaud welcomed attendees and asked the Committee Members to introduce themselves by providing their name and who they represent.

Materials were distributed to each member at the registration table.

Review of Meeting Minutes

For the sake of expediting the meeting, Committee Members will provide any changes to Andrea Bostwick before leaving.

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 50 projects and activities were described and prioritized in the Action Tables. He also thanked Dale Sorrells for providing an array of storm damage photographs that will be used in the Plan.

Committee members were provided approximately 20 minutes during the meeting to review the Action Tables containing the descriptions of mitigation projects and activities. Any clarifications or additions to these tables are to be given to the consultants within a month of today's meeting. 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.

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. 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. Floodplain information needed to complete this assessment was provided at this meeting.

Plan Maintenance and Update

Andrea described the Plan maintenance and update commitments that are described in the Plan. A subgroup of the Natural Hazard Mitigation Committee will meet annually under the direction of the Greene County ESDA to report on the progress of their projects and make any additions or edits to their list of projects. There is no penalty for not building any project. The intent of the planning process is to encourage mitigation, not to penalize municipalities or counties.

Every five years, the Plan is formally updated and resubmitted to IEMA/FEMA. At the five year update, any jurisdiction who wants to become part of the Plan may do so. Any new jurisdiction must supply the same information that all of the current jurisdictions supplied.

The first jurisdiction to formally adopt the Plan begins the five year clock. If a jurisdiction decides not to adopt the Plan, FEMA will still approve the Plan and those jurisdictions who adopt the Plan become eligible for state/federal funds.

What Happens Next?

Although much of today's meeting has focused on mitigation projects and activities, the primary purpose for preparing this Plan is to make sure the participating jurisdictions can be better prepared for natural hazards and in a position to receive all of the money that is due when the next federal declaration occurs. Greg noted that since the planning process in Greene County began, two federal declarations have occurred in Illinois.

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.

Committee Members were asked to select an evening date in August for the public forum. After a short discussion, the Committee agreed to schedule the next meeting on:

Thursday, August 18
First Baptist Church
Carrollton
5 p.m. to 7 p.m.

After this public forum, there are three important milestones:

1. **Submission of the Plan** to IEMA and FEMA for their approval;
2. **Adoption of the Approved Plan** by each participating jurisdiction through a resolution after IEMA and FEMA approve the Plan; and
3. **Submission of the resolutions to JDQ** so that each participating jurisdiction is eligible for state/federal funding.

Following the close of the ***two week public comment period***, the Plan will be readied for submission. When FEMA approves the Plan, an e-mail will be sent to the Committee Members asking them to adopt the Plan. A model adoption resolution will be attached to the e-mail for members to use. The Plan should **not** be adopted until after FEMA approval. Andrea will provide paper copies of a model resolution to the Committee members at the public forum.

Committee members were asked where copies of the draft Plan should be made available for public comment. Committee members asked that copies of the Plan be made available at the County Courthouse and in libraries in Carrollton, Greenfield, White Hall, and Roodhouse. Copies will also be made available in Eldred and Hillview.

Public Comment
No non-Committee members attended this meeting. With no additional questions or comments, Chairman David Marth adjourned the meeting.

APPENDIX D

QUESTIONNAIRE

Greene County Natural Hazards Mitigation Plan

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

1. Please indicate where you live in Greene County:

_____ Barrow
_____ Carrollton
_____ Eldred
_____ Greenfield
_____ Hillview
_____ Kane
_____ Old Kane
_____ Rockbridge
_____ Roodhouse
_____ West Roodhouse
_____ Wilmington (Patterson)
_____ White Hall
_____ Unincorporated area of Greene County
_____

_____ Other (please specify): _____

2. Please place a check mark next to each of the natural hazards listed below that you have experienced in Greene County. (Please check all that apply.)

_____ Severe Summer Storms (thunderstorms, hail and/or lightning strikes)
_____ Floods
_____ Severe Winter Storms (snow, sleet and/or ice)
_____ Extreme Heat
_____ Tornadoes
_____ Earthquakes
_____ Drought
_____ Other (please specify): _____

2a. Which of the natural hazards above have you encountered most frequently?

_____

3. Rank the natural hazards listed below from 1 to 7 based on which hazard you feel poses the greatest threat. (1 = greatest threat and 7 = least threat).

_____ Severe Summer Storms
_____ Floods
_____ Severe Winter Storms
_____ Extreme Heat
_____ Tornadoes
_____ Earthquakes
_____ Drought
_____ Other (please specify): _____

4. What types of mitigation projects or activities are most needed in Greene 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): _____

5. 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.

Greene County Natural Hazards Mitigation Planning Committee

APPENDIX E

Greene County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee

Frequently Asked Questions

1) What is the Greene County Natural Hazard Mitigation Plan?

The Greene County Natural Hazard Mitigation Plan evaluates damage to life and property from storms and other natural hazards in this county and identifies projects and activities that can reduce these damages. The Plan is considered to be multi-jurisdictional because it includes municipalities and institutions who want to participate.

2) What is natural hazard mitigation?

Natural hazard mitigation is any action taken to reduce or eliminate long-term risk to life and property from a natural hazard. Storms are the most frequently occurring natural hazards, but other natural hazards being considered in this Plan include drought and earthquakes.

3) Why is this Plan being developed?

The Plan fulfills federal planning requirements of Section 104 of the Disaster Mitigation Act of 2000 and the Stafford Act. Three key benefits this plan will provide Greene County are:

a) Funding following declared disasters.

b) Funding for mitigation projects and activities before disasters occur.

c) Increased awareness about natural hazards and closer cooperation among the various organizations and political jurisdictions involved with emergency planning and response.

4) Who is developing this Plan?

The Greene County Natural Hazards Mitigation Planning Committee is preparing the Plan with assistance from technical experts in emergency planning, environmental matters, and infrastructure. The Committee includes members from agriculture, business and economic development, emergency services, municipal, county and state government, health care, insurance, law enforcement, and institutions such as the American Red Cross.

5) How can I participate?

You are invited to attend public meetings of the Greene County Natural Hazards Mitigation Planning Committee. In addition you are encouraged to provide photographs, other documentation, and anecdotal information about damages you experienced with natural hazards in Greene County. Surveys will be available at participating municipalities and through Greene 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:

David Marth P.E., County Engineer
Greene County Highway Department
Rural Route 1, Box 15
Carrollton, Illinois 62016
Tel: (217) 942-6941

APPENDIX F

Countywide plan for disasters

Greene County will begin preparing a countywide plan that will identify activities and projects to reduce the damages caused by natural hazards such as tornadoes, floods, snow storms, thunderstorms and ice storms. The plan is call an Natural Hazard Mitigation Plan and will be funded through a grant from the Federal Emergency Management Agency (FEMA).

All Greene County municipalities are invited to participate in this planning process. Carrollton, Eldred, Greenfield, Hillview, Roodhouse and White Hall have already committed to participate. There is still time for other municipalities to join the process.

"Developing this plan will help us be better prepared before storms hit. 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," said David Marth, Greene County Highway Department.

Greene County is vulnerable to severe storms, flooding, and tornado damage. Since 1980, Greene County has had eight Federally declared disasters because of severe storms. These disasters occurred in 1982, 1983, 1985, 1993, 1994, 1995, 2002 and 2006.

A Greene County Hazard Mitigation Planning Committee has been created with representatives from each participating municipality along with technical partners and other stakeholders. Meetings of this committee will be conducted as working sessions so that any interested resident can attend and ask questions. The purpose of these working sessions is to gather and discuss information that will be used to prepare the plan.

The first meeting of this team will be held 1 p.m. at the First Baptist Church of Carrollton of 203 Fifth Street in Carrollton. The committee will meet periodically through the next several months to develop a draft plan. Greene 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," added David Marth.

Alton Telegraph
May 14, 2010

THETELEGRAPH.com
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Greene County sets pay raises for officials

By MAGGIE BORMAN
2010-05-14 18:55:13

CARROLLTON - The Greene County Board set the pay increases for some officeholders at Wednesday night's board meeting.

On a recommendation by the Board's Finance Committee and agreement with officeholders, the pay increases for county clerk, circuit clerk, sheriff, treasurer and supervisor of assessments were set as follows: no increase in fiscal year 2011, and a 2 percent increase for fiscal year 2012. For fiscal years 2013 and 2014, the pay increases will be based on those in union worker contracts.

With board member Charlie Helton absent, Board Chairman Joe Nord and members Doug Wagner, Mike Kiger, Mark Strang, Maxine Longmeyer and Don Roberts unanimously approved the pay increases as recommended by the Finance Committee.

In other business, Greene County Public Health Department Administrator Ruth Ann Flowers said her department is losing some money on its Home Health Service program because fewer clients are requesting the service.

"Though we still have grants, the state of Illinois still hasn't paid us," Flowers said. "About $75,000 is what they owe us now, though we are still better off than most school districts in the state and other social service agencies that the state owes money to."

Greene County Treasurer Kirby Ballard said he has heard from the State Comptroller's Office that the state's portion of county state's attorney and county public defender salaries would be paid through December, alleviating the burden of the county having to revert back to pre-shared salary pay.

Rick Keim, Greene County University of Illinois Extension director, said that under the Extension's reorganization plan necessitated by the state's budget cuts, mergers of county Extension offices have been under review.

"Right now, we have looked at a merger of Greene, Morgan, Scott and Cass county Extensions, as well as a merger of Greene, Calhoun, Jersey and Macoupin Extensions," Keim said. "We will learn on May 19 which way we are headed."

Nord named Greene County Highway Engineer David Marth as chairman of the Greene County Hazard Mitigation Plan Committee and reminded everyone to attend the committee's meeting at 1 p.m. Tuesday at the First Baptist Church in Carrollton.

Like many other counties, Greene County does not have a hazard mitigation plan developed, submitted and approved by the Federal Emergency Management Agency. Without approved hazard mitigation plans, counties are unable to qualify for some state and federal grants.

A natural hazard mitigation plan identifies projects developed by local governments to eliminate or reduce the loss of life and property damage from natural hazards.

FEMA grants fund 75 percent of projects, with 25 percent local match in funds or in-kind services funding the balance.

Last year, the County Board hired consulting firm Johnson, Depp and Quisenberry Inc. of Springfield to develop the county's natural hazard mitigation plan.

Marth said the more people in attendance at Tuesday's meeting, the more "in-kind" funding would be accumulated for the county.

Nord appointed Michael Springman of Kane and Micky Ornellas of Roodhouse to five-year terms on the Greene County Rural Water Board.

The County Board accepted the resignation of the Rev. George Rosales from the Greene County Department of Public Health Board, because he is moving out of the county.

Nord re-appointed Lois Pembrook of Greenfield to the Greene County Housing Authority Board and appointed Roodhouse resident Liz Killion to fill the unexpired term of the late Frank Hopkins on that board.

mborman@thetelegraph.com

Appendix F

Greene Prairie Press Wednesday, August 4th, 2010

Committee members to discuss how to prevent severe weather damage

By CARMEN ENSINGER
Greene Prairie Press

The heavy rains and severe storms encountered throughout the state this year raise many important questions. How vulnerable are Greene County residents to these storms? What are the most frequently occurring natural hazards in Greene County? How much damage do storms and other natural hazards, such as drought, cause?

These questions and other related issues will be discussed when representatives from Greene County and local municipalities meet Thursday, Aug. 5, at the First Baptist Church located at 203 Fifth St. in Carrollton.

This group, the Greene County Hazard Mitigation Committee, will meet through the next several months to prepare a plan to reduce damages caused by natural hazards. The committee meeting begins at 1 p.m. and all committee meetings are open to the public.

Carrollton, Eldred, Greenfield, Hillview, Roodhouse and White Hall have already committed to participate. There is still time for other municipalities to join the process.

"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," David Marth, Chairman for the Greene County Hazard Mitigation Committee said. "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 Greene County residents."

Developing public information materials, building storm shelters, designing roads, bridges, water supplies and other services to better withstand natural disasters, are some examples of the types of projects and activities that can reduce storm damages.

While the plan is being developed, at least four Mitigation Committee meetings will be conducted and these meetings are open to the public. Interested persons can provide input at these meetings, or submit their comments and questions to their municipal or county representatives.

Public comments will be used to develop a draft plan. After the draft plan is developed, a public forum will be held where the draft plan will be presented for review and comment. The draft plan will be revised based on comments from the public and the state and federal government agencies. Following these revisions, the plan will be presented for adoption at public meetings held by the county at each of the participating municipalities.

"By identifying the frequency of these natural hazards and their magnitude in our country, we can better develop a strategy to reduce damages caused by these events," Marth said.

Certificate of Publication in the Jacksonville Journal-Courier

STATE OF ILLINOIS
COUNTY OF MORGAN, SS.
CITY OF JACKSONVILLE

I, Kent A. Kilpatrick, do hereby certify that I am Publisher of the Jacksonville Journal-Courier. The principal office of the aforesaid newspaper is in the City of Jacksonville, and County of Morgan.

I further certify that the Jacksonville Journal-Courier is owned and published by Illinois Freedom Newspaper, Inc., a company authorized to do business in the state of Illinois.

I further certify that the Jacksonville Journal-Courier is a secular newspaper of general circulation which is now and for more than one year prior to the first publication here certified to has been printed and published regularly in the City, County and State aforesaid.

I further certify that as Publisher as aforesaid I am authorized and directed by the Board of Directors of Illinois Freedom Newspapers, Inc., to sign and execute certificates of publication for and in its behalf and to make and execute this certificate as aforesaid.

I further certify that a notice, of which the annexed notice is a true copy, has been regularly published in said Jacksonville Journal-Courier 1 times(s) for 1 successive day, and that the first publication thereof was on the 3 day of December, 2010, and the last publication thereof was on the 3 day of December, 2010.

Given under my hand this 3 day of December, A.D. 2010

By _____
Publisher

Printer's Fee, $ 183.00 #1

December 3, 2010

No. 8186 Folio 109

Reducing Damages Before Disasters Occur
Carrollton, IL
December 3, 2010

Steps to prevent injuries and deaths while maintaining vital services for Greene County residents when floods and severe storms hit will be discussed when the Greene County Natural Hazard Mitigation Planning Committee meets at 1pm on December 9 at the First Baptist Church on 203 Fifth Street in Carrollton. Committee meetings are open to the public.

This Committee began conducting working meetings in May to prepare a plan that will identify projects and activities to project Greene 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 disasters occur.

"Other emergency plans are directed at responding after a storm or natural disaster hits. By taking preventive measures, we can save money and lives. Our goal is to develop a plan that will help all participating jurisdictions-not just the County, but municipalities and drainage districts too-become eligible for federal and state funding," said David Marth, Committee Chairperson.

Carrollton, Eldred, Greenfield, Hillview, Kane, Roodhouse, Patterson (Wilmington), White Hall and Greene County along with some drainage and levee districts are participating in this planning process. These municipalities and various County departments will be identifying the kinds of projects that should be include in the Plan.

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

This plan will include important information to help interested persons and elected officials make decisions about how best to protect lives and property from damages caused by storms and other natural disasters.

Pub: 12/03/10

*May 12, 2011 Meeting Rescheduled to June 9, 2011 *

Alton Telegraph
May 12, 2011

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We deliver the River Bend - and more.

Greene residents urged to attend natural hazard meeting

2011-05-12 06:17:52

CARROLLTON - Greene County officials are urging county residents to attend the County's Natural Hazards Mitigation Planning Committee meeting at 1 p.m. today, May 12, at the First Baptist Church in Carrollton.

Greene County, like many other Illinois counties, does not have a hazard mitigation plan developed, submitted and approved. The lack of such a plan means that the county is not eligible to apply for state and federal grants.

To remedy that, in 2009 the Greene County Board heard presentations from entities that develop hazard mitigation plans and in 2010, retained Johnson, Depp and Quisenberry Inc., of Springfield, a firm recommended by Greene County Highway Engineer David Marth to develop Greene County's natural hazard mitigation plan.

A natural hazard mitigation plan identifies projects developed by local governments to eliminate or reduce the loss of life and property damage from natural hazards. The Federal Emergency Management Agency funds 75 percent of projects with 25 percent local match funds or in-kind services funding the balance.

The types of projects that are eligible for funding include: acquiring buildings and land located in floodplains; constructing retaining basins and culverts to manage storm water; building safe shelters to protect residents during and after severe storms such as tornadoes and ice storms; retrofitting existing infrastructure, such as roads, bridges, buildings, schools, utility lines, public works, burying utility and telephone lines, etc., to reduce the damage by a storm event.

Steps to protect Greene County residents and property from storms and other hazards will be discussed at the Greene County Natural Hazards Mitigation Planning Committee, which is open to the public.

Carrollton, Eldred, Greenfield, Hillview, Kane, Roodhouse, Patterson, White Hall and Greene County representatives are on the Greene County Natural Hazards Mitigation Planning Committee, and agriculture, insurance, levee and drainage districts and utilities are also represented.

"Severe storms frequently cause damages to buildings, crops, roads, and other critical infrastructure in this area and across Illinois," Greene County Emergency Services and Disaster Agency coordinator Cale Hoesman said. "Since 1970 Greene County has experienced at least two federal declared disasters every decade. Severe thunderstorms and floods have been the most frequently occurring natural disasters in the County."

Greene County has an emergency response plan, but not a mitigation plan.

"Emergency response plans prescribe what actions should be taken after a storm hits," Hoesman said. "This mitigation plan identifies actions that should be taken before a storm occurs."

Greene County and the participating municipalities have been assembling lists of mitigation projects and activities, and the County's mitigation plan is expected to be finished this summer. 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 form will be conducted this summer for interested persons to review the plan and ask questions

of Committee members," Greene County Natural Hazards Mitigation Planning Committee chairman David Marth said. "A two week public comment period will be established to accommodate interested persons who are unable to attend the forum. We want to make sure that anybody who is interested has an opportunity to review and comment on the draft plan."

Interested persons can submit questions and comments to the Committee members (see list that follows) or directly to David Marth at the Greene County Highway Department (217) 942-6941 or Cale Hoesman, Greene County Emergency Services and Disaster Agency, (217) 942-6901.

MEMBERS OF Greene County Natural Hazards Mitigation Planning Committee:
Greene County Treasurer Kirby Ballard, Greene County Clerk & Recorder Deborah Banghart, Greene County Supervisor of Assessments Jill Waldheuser, Greene County Sheriff Rob McMillen, Greene County Public Health Department administrator Ruth Ann Flowers, Greene County Public Health Department employee Susan Thornton, Greene County Rural Water District : Mary Kay Varble or Charlie Rives, Greene County Board chairman Joe Nord and member Don Roberts, Greene County Farm Bureau, Michael Painter, Greene County Soil & Water Conservation District, Terry Walters; Pat Cooper, of AmerenCIPS, Ronald Coultas of Illinois Rural Electric, Jim Banghart of Carrollton Fire Protection District, Dwayne or Brian Bugg of the Village of Hillview, Deborah Campbell, of Greene County Ambulance, Carrollton Police Chief Terry Gross, White Hall Police Chief Jack Wallis, Dale Sorrels, village of Patterson, Dixie Snyder, village of Hillview, Greg Walters or Jason Shaw, village of Kane, John Schild, village of Eldred, Jeff York, Bluffdale , Hillview & Kratch Drainage & Levee Districts, Liz Killion, Roodhouse Fire Protection District, Richard Newton, City of Greenfield, BJ Schild, Eldred Drainage & Levee District and Julie Rhoads, Whitworth-horne-Goetten Insurance.

Appendix F

Alton Telegraph
June 7, 2011

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We deliver the River Bend - and more.

Storm damage projects focus on flood, drainage problems

2011-06-07 19:09:46

CARROLLTON - Storm shelters and projects to protect residents and property against water damage caused by flooding and inadequate drainage have the highest priority, based on ideas developed through the Greene County Natural Hazard Mitigation Committee.

Projects to reduce and eliminate damages caused by severe weather and other natural hazards are being developed as part of the Greene County Natural Hazard Mitigation Plan.

More than half of the nearly 50 project ideas developed through the committee are directed at flood and drainage problems.

"Federal disaster declarations have occurred 12 times in Greene County since 1965, and flooding occurred in 11 of these declarations," said Cale Hoesman, coordinator of Greene County's Emergency Services and Disaster Agency.

"Consequently, it makes sense that the participating municipalities and county believe that most projects should be devoted to these problems," Hoesman said.

Nearly every participant voiced the need for storm shelters. It became clear during the committee meetings that many residents have no place to escape from tornadoes, floods, extreme cold when power has been lost, and extreme heat.

The committee has nearly completed its draft plan. The final committee meeting will be at 1 p.m. Thursday at the First Baptist Church in Carrollton. The public is welcome to attend this meeting and provide comment and ask questions.

When the draft plan is finished, a public forum will be conducted, so that the public will have an opportunity to see the entire document before it is submitted to the Federal Emergency Management Agency.

"We anticipate the plan be ready for review in August or September," said David Marth, chairman of the Greene County Natural Hazard Mitigation Committee. "The committee has been working since May 2010. This will be the first time that Greene County has had a plan to reduce damages before storms and other severe weather occurs."

Officials from Carrollton, Eldred, Greenfield, Hillview, Kane, Roodhouse, Patterson, White Hall and various Greene County representatives make up the Greene County Natural Hazards Mitigation Committee.

Appendix F

Press Release - August 18, 2011 Public Forum

FOR IMMEDIATE RELEASE

Contact: David Marth
942-6941

Public Forum on Plan to Reduce Storm Damages

Carrollton,IL (August 8, 2011)--Projects and activities to prevent injuries, deaths and property damage from major storms will be presented for public comment in the Greene County Natural Hazards Mitigation Plan. The Plan will be available for review at a public forum on August 18 from 5 p.m. to 7 p.m. at the First Baptist Church in Carrollton. Members from the Greene County Natural Hazards Mitigation Planning Committee will be available to discuss this Plan.

“Persons can come and go at their convenience to review the plan and comment. If an interested person 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 David Marth, Greene County Hazard Mitigation Committee Chairperson.

This Committee has been conducting working meetings open to the public since May, 2010, to prepare a plan that will identify projects and activities to protect Greene 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.

“We have received public input to develop this Plan since we began meeting 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 draft plan in its entirety,” added Marth.

“Attendees will find it easy to view the various projects that are being proposed to reduce storm damages. Projects are organized by jurisdiction so if someone wants to see the projects being proposed for Carrollton that can turn to that page rather than sift through the entire document,” said Cale Hoesman, Greene County Emergency Management Coordinator. For residents who want to see projects proposed for unincorporated Greene County, they can turn to those pages and see the projects listed,” added Hoesman.

Carrollton, Eldred, Greenfield, Hillview, Kane, Patterson, Roodhouse, and White Hall are participating in the planning process. These municipalities and various County departments have been identifying the kinds of projects that should be included in the Plan.

A public comment period will remain open until September 1. Comments can be directed to the Greene County Emergency Management Agency or Highway

Department. 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.

XXXXXXXXXXXXXXXXX

Newspapers Serving Greene County

Alton Telegraph (daily)
111 E. Broadway
Alton, IL 62002
(618) 463-2500
www.thetelegraph.com

Greene Prairie Press (once weekly)
516 N. Main Street
Carrollton, IL 62016
(217) 942-9100

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

APPENDIX G

GREENE COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

PUBLIC FORUM – OPEN HOUSE

AUGUST 18, 2011
CARROLLTON FIRST BAPTIST CHURCH
5:00 P.M. – 7:00 P.M.

Each year natural hazards (i.e., severe thunderstorms, tornadoes, severe winter storms, flooding, etc.) cause damage to property and threaten the lives and health of Greene County residents. Since 1965, Greene County has had 12 federally-declared disasters. In addition, in the past decade alone, there have been over 66 severe storms (thunderstorms, high winds, hail, lightning strikes, heavy rain etc.), 20 severe winter storms, 19 extreme heat events, nine flood and flash flood events, five tornadoes, one extreme cold event, one drought and one earthquake felt by residents in the County. While natural hazards cannot be avoided, their impacts can be reduced through effective hazard mitigation planning.

What is hazard mitigation planning?

Hazard mitigation planning is the process of determining how to reduce or eliminate the loss of life and property damage resulting from natural hazards. This process helps the County and participating municipalities reduce their risk from natural hazards by identifying vulnerabilities and developing mitigation actions to lessen and sometimes even eliminate the effects of a hazard. The results of this process are documented in a natural hazards mitigation plan.

Why prepare an all hazards mitigation plan?

By preparing and adopting a natural hazards mitigation plan, participating jurisdictions become eligible to apply for and receive federal hazard mitigation funds to implement mitigation actions identified in the Plan. These funds, made available through the Disaster Mitigation Act of 2000, can help provide local government entities with the opportunity to complete mitigation projects that would not otherwise be financially possible.

Who participated in the development of the Greene County Multi-Jurisdiction Natural Hazards Mitigation Plan?

Recognizing the benefits that could be gained from preparing a natural hazards mitigation plan, the Greene County Board passed a resolution on May 13, 2009 authorizing the development of the Greene County Multi-Jurisdictional Natural Hazards Mitigation Plan. The County then invited all the local government entities within Greene County to participate. The following jurisdictions chose to participate in the Plan's development:

- Bluffdale D & L District
- Carrollton
- Carrollton FPD
- Eldred
- Eldred D & L District
- Greenfield
- Hillview
- Hillview D & L District
- Keach D & L District
- Roodhouse
- White Hall
- Wilmington (Patterson)

How was the Plan developed?

The Greene County Multi-Jurisdictional Natural Hazards Mitigation Plan was developed through the Greene County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee. The Planning Committee included representatives from each participating jurisdiction, the general public as well as agriculture, business, emergency services (ambulance, fire and law enforcement), healthcare, GIS and insurance. The Planning Committee met five times between May, 2010 and August, 2011.

Which natural hazards are included in the Plan?

After much discussion, the Planning Committee chose to include the following natural hazards in this Plan:

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

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 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 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 hazard would have on the health and safety of the residents of Greene 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.

APPENDIX H

GREENE COUNTY
MULTI-JURISDICTIONAL ALL HAZARDS MITIGATION PLAN

PUBLIC FORUM – AUGUST 18, 2011
COMMENT SHEET

The Greene County Multi-Jurisdictional Natural Hazards Mitigation Plan evaluates damage to life and property from natural hazards that occur in the County. This Plan also identifies projects and activities submitted by the County and each participating jursidiction 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 September 2, 2011.

Place
Stamp
Here

David Marth
Greene County Highway Department
Rural Route 1, Box 15
Carrollton, IL 62016

APPENDIX I

Greene County Highway Department

Route 1 Box 15
Carrollton, IL 62016

Phone (217) 942-6941
(217) 942-6942
Fax (217) 942-9014

MEMORANDUM

TO: Scott County (Lorrie Koch); Morgan County ESDA (Bob Fitzsimmons); Macoupin County (James Pitchford); Jersey County (Larry Mead); Calhoun County EMA (Robert Breden); and Pike County (Herman Allensworth)

FROM: Greene County Highway Department

SUBJECT: Hazard Mitigation Planning

DATE: November 10, 2010

The purpose of this memorandum is to invite you to attend a planning meeting of the Greene 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. We are preparing this plan to meet the Federal Emergency Management Agency's (FEMA) prerequisite for hazard mitigation funds.

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, December 9
First Baptist Church of Carrollton
203 Fifth Street
Carrollton, IL
1 pm

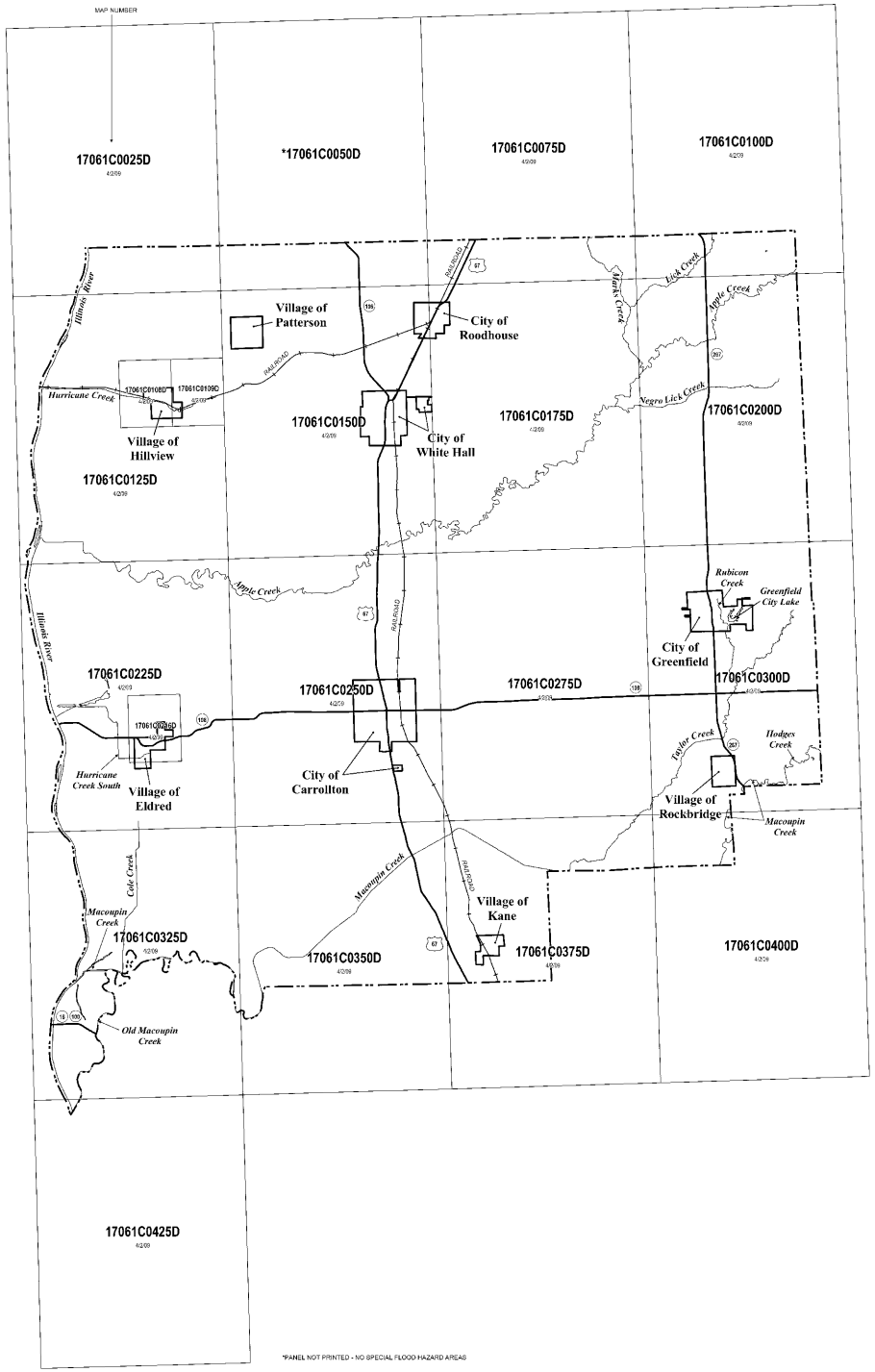
The Committee meetings are open to the public.

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

David M. Marth, P.E.

Greene County Engineer

APPENDIX J



*PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS

LISTING OF COMMUNITIES

COMMUNITY NAME	COMMUNITY NUMBER	LOCATED ON PANEL(S)	INITIAL NFIP MAP DATE	INITIAL FIRM DATE	MOST RECENT FIRM PANEL DATE
CARROLLTON, CITY OF	170250	0250	JUNE 7, 1974	APRIL 2, 2009	APRIL 2, 2009
ELDRED, VILLAGE OF	170251	0216, 0225	DECEMBER 17, 1973	MAY 5, 1981	APRIL 2, 2009
GREENE COUNTY (UNINCORPORATED AREAS)	170691	0025, 0050*, 0075, 0100, 0108, 0109, 0125, 0150, 0175, 0200, 0216, 0225, 0250, 0275, 0300, 0325, 0350, 0375, 0400, 0425	APRIL 7, 1978	AUGUST 5, 1985	APRIL 2, 2009
GREENFIELD, CITY OF	170252	0300	FEBRUARY 22, 1974	JUNE 17, 1986	APRIL 2, 2009
HILLVIEW, VILLAGE OF	170253	0108, 0109	DECEMBER 6, 1974	SEPTEMBER 16, 1981	APRIL 2, 2009
KANE, VILLAGE OF	171128	0375	N/A	N/A	N/A
PATTERSON, VILLAGE OF[1]	171131	0150	N/A	N/A	N/A
ROCKBRIDGE, VILLAGE OF[1]	171129	0300	N/A	N/A	N/A
ROODHOUSE, CITY OF[1]	171130	0150, 0175	N/A	N/A	N/A
WHITE HALL, CITY OF[1]	170254	0150	N/A	N/A	N/A

[1] NO SPECIAL FLOOD HAZARD AREAS IDENTIFIED
* PANEL NOT PRINTED

MAP DATES

This FIRM Index displays the map date for each FIRM panel at the time that this Index was printed. Because this Index may not be distributed to unaffected communities in subsequent revisions, users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website at http://msc.fema.gov or by calling the Map Service Center at 1-800-358-9616.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

NOTE TO USER

Future revisions to this FIRM Index will only be issued to communities that are located on FIRM panels being revised. This FIRM Index therefore remains valid for FIRM panels dated April 2, 2009, or earlier. Please refer to the "MOST RECENT FIRM PANEL DATE" column in the Listing of Communities table to determine the most recent FIRM Index date for each community.

MAP REPOSITORIES

(Maps available for reference only, not for distribution)

CARROLLTON, CITY OF:
Carrollton City Hall
621 South Main Street
Carrollton, Illinois 62016

ELDRED, VILLAGE OF:
Eldred Village Hall
Locust Street
Eldred, Illinois 62027

GREENE COUNTY (UNINCORPORATED AREAS):
Greene County Courthouse
519 North Main Street
Carrollton, Illinois 62016

GREENFIELD, CITY OF:
Greenfield City Hall
902 Mulberry Street
Greenfield, Illinois 62044

HILLVIEW, VILLAGE OF:
Hillview Village Hall
Railroad Street Main
Hillview, Illinois 62050

KANE, VILLAGE OF:
Kane Village Hall
Main Street
Kane, Illinois 62054

PATTERSON, VILLAGE OF:
Patterson Village Hall
Elizabeth Street
Patterson, Illinois 62078

ROCKBRIDGE, VILLAGE OF:
Rockbridge New Village Hall
Olive Street
Rockbridge, Illinois 62061

ROODHOUSE, CITY OF:
Roodhouse City Hall
115 West Palm
Roodhouse, Illinois 62082

WHITE HALL, CITY OF:
White Hall City Hall
116 East Sherman Street
White Hall, Illinois 62092

NFIP NATIONAL FLOOD INSURANCE PROGRAM

MAP INDEX

FIRM

FLOOD INSURANCE RATE MAP

GREENE COUNTY, ILLINOIS

AND INCORPORATED AREAS

(SEE LISTING OF COMMUNITIES TABLE)

MAP INDEX

PANELS PRINTED: 25, 75, 100, 108, 109, 125, 150, 175, 200, 216, 225, 250, 275, 300, 325, 350, 375, 400, 425

MAP NUMBER
17061CIND0A

EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or flood plain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or flood plain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

In the State of Illinois, any portion of a stream or watercourse that lies within the **floodway fringe** of a studied (AE) stream may have a state regulated floodway. The FIRM may not depict these state regulated floodways.

Floodways restricted by anthropogenic features such as bridges and culverts are drawn to reflect natural conditions and may not agree with the model computed widths listed in the Floodway Data table in the Flood Insurance Study report.

Multiple **topographic sources** may have been used in the delineation of Special Flood Hazard Areas. See Flood Insurance Study report for details on source resolution and geographic extent.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 15. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services, NOAA, N/NGS12
National Geodetic Survey SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the United States Geological Survey. Digital orthoimagery with a spatial resolution of 0.5 meter ground sample distance were photogrammetrically compiled from aerial photography acquired during the leaf-off period of spring 2005.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The Special Flood Hazard Areas and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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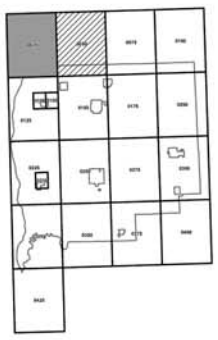
Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital version of this map. The FEMA Map Service Center may also be reached by fax at 1-800-358-9620 and its website at www.msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at www.fema.gov/business/nfip.

PANEL INDEX



Panel Not Printed

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A — Cross section line
23 — 23 — Transect line
45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
5000 mN — 1000-meter Universal Transverse Mercator grid values, zone 15
1569000 FT — 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPSZONE 1202) Transverse Mercator
DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0025D

FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 25 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0025	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0025D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

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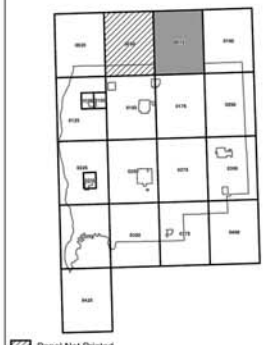
PANEL INDEX



Panel Not Printed

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 5000 m N — 1000-meter Universal Transverse Mercator grid values, zone 15
- 1565000 FT — 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPS)ZONE 1202 Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0075D

FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 75 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0075	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0075D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

Appendix J

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

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Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

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Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

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Silver Spring, Maryland 20910-3282
(301) 713-3242

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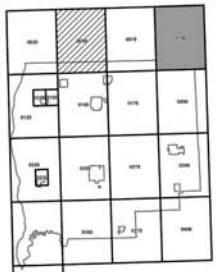

Panel Not Printed

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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FLOODWAY AREAS IN ZONE AE

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OTHER FLOOD AREAS

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OTHER AREAS

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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

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- 1% annual chance floodplain boundary
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- 513 — Base Flood Elevation line and value; elevation in feet*
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MAP REPOSITORIES
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APRIL 2, 2009

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0100D

FIRM

FLOOD INSURANCE RATE MAP

GREENE COUNTY, ILLINOIS AND INCORPORATED AREAS

PANEL 100 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0100	D

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MAP NUMBER
17061C0100D

EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

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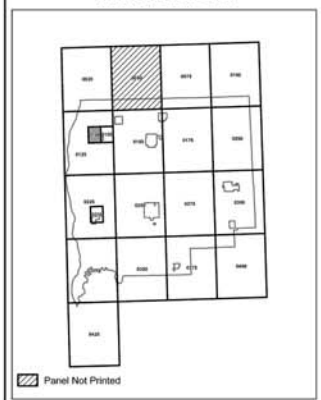

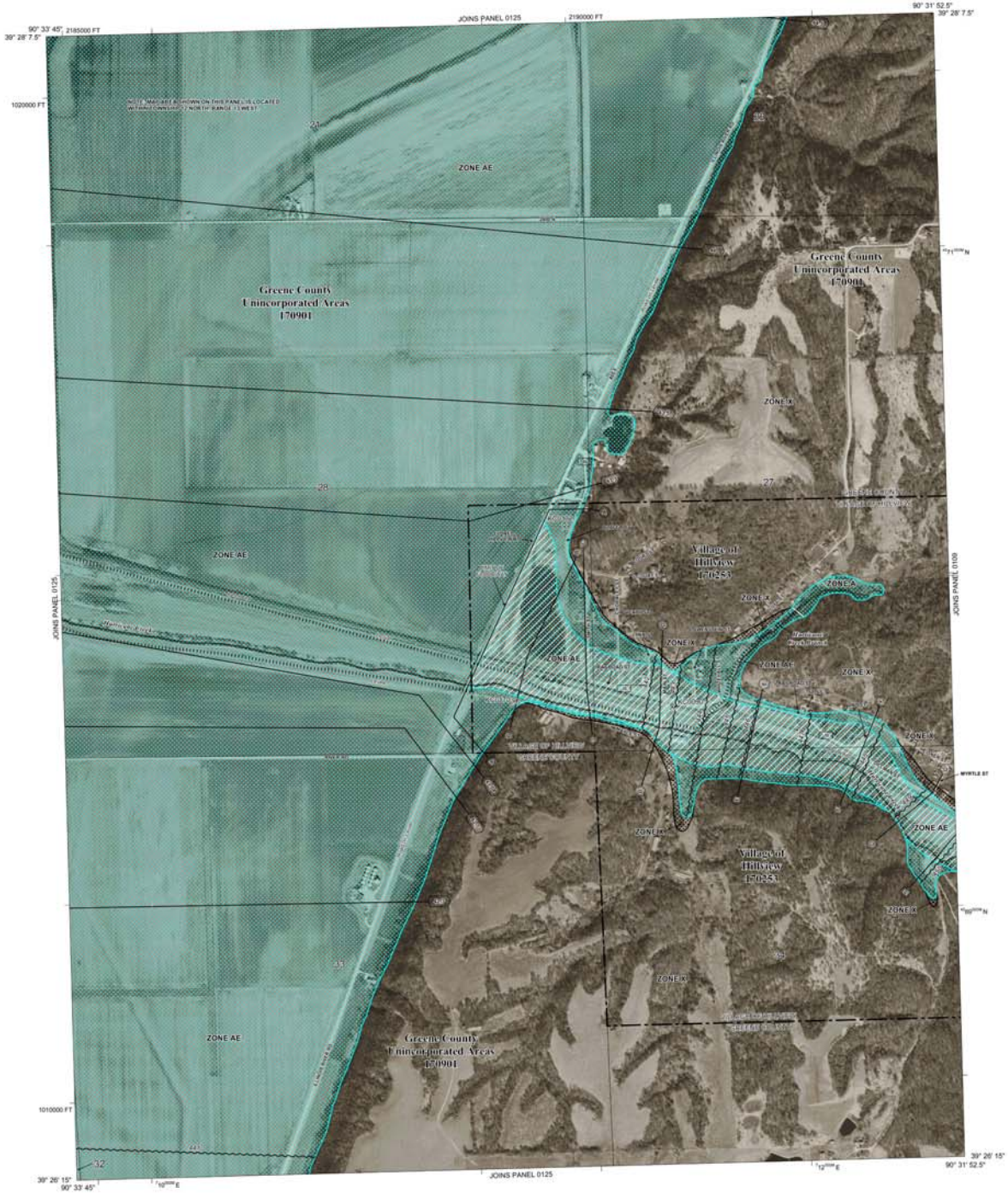

LEGEND

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FLOODWAY AREAS IN ZONE AE

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OTHER FLOOD AREAS

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MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

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MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0108D

FIRM

FLOOD INSURANCE RATE MAP

GREENE COUNTY, ILLINOIS AND INCORPORATED AREAS

PANEL 108 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0108	D
HILLVIEW, VILLAGE OF	170253	0108	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0108D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

Appendix J

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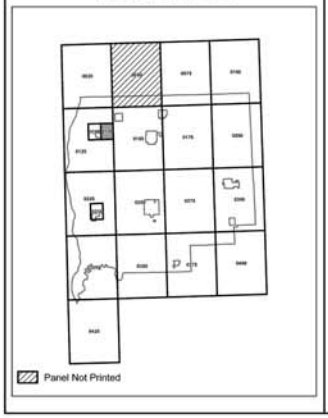
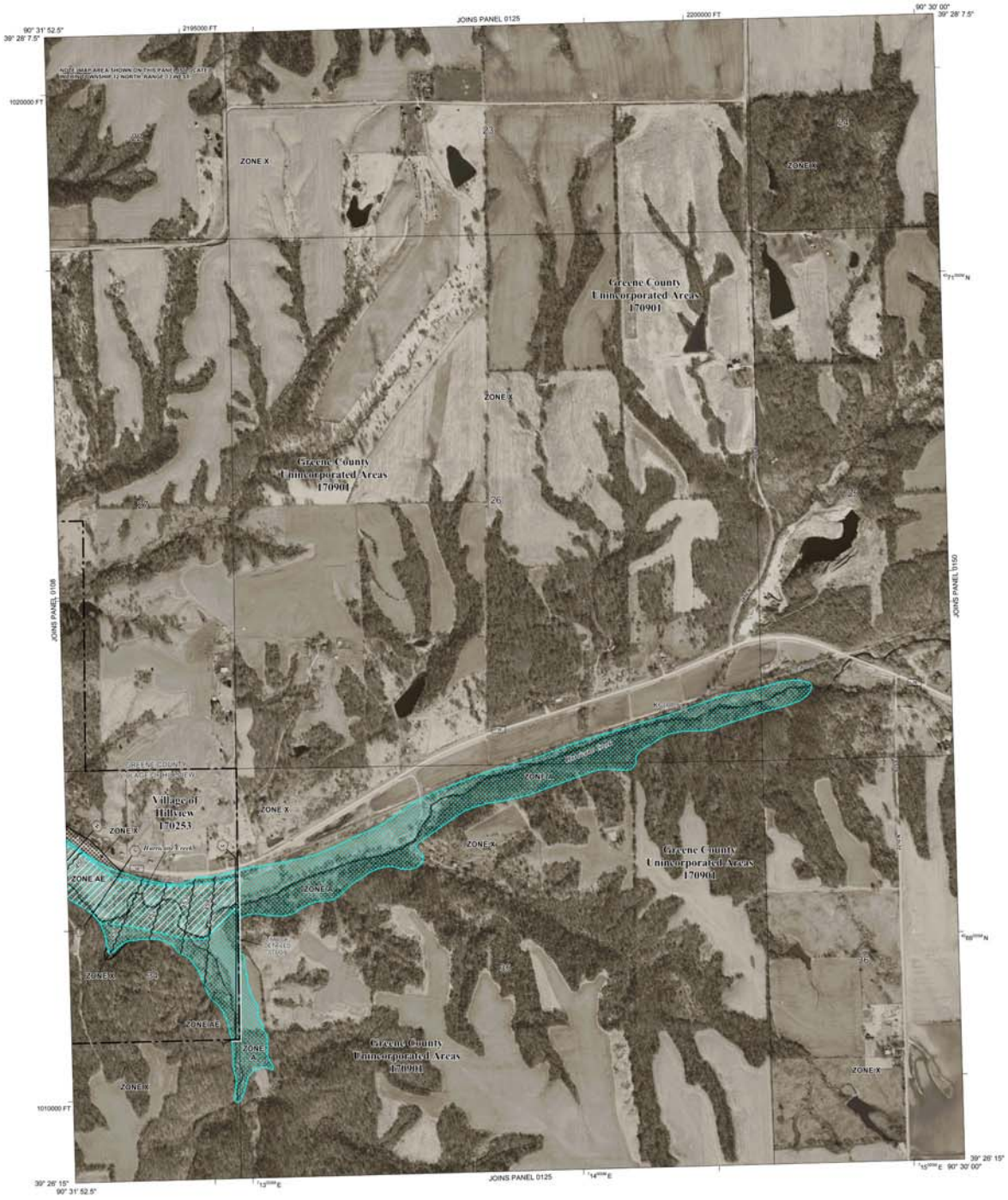
PANEL INDEX





LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4980000 mN — 1000-meter Universal Transverse Mercator grid values, zone 15
- 1565000 FT — 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPSZONE 1202) Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0109D

FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 109 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0109	D
HILLVIEW, VILLAGE OF	170253	0109	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0109D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or flood plain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or flood plain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

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Floodways restricted by anthropogenic features such as bridges and culverts are drawn to reflect natural conditions and may not agree with the model computed widths listed in the Floodway Data table in the Flood Insurance Study report.

Multiple **topographic sources** may have been used in the delineation of Special Flood Hazard Areas. See Flood Insurance Study report for details on source resolution and geographic extent.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 15. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services, NOAA, N/NGS12
National Geodetic Survey SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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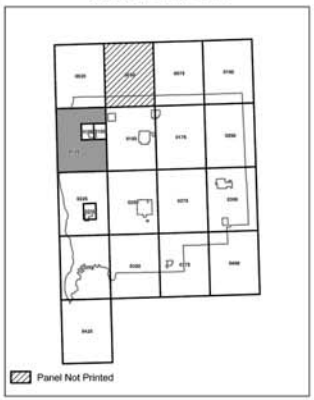

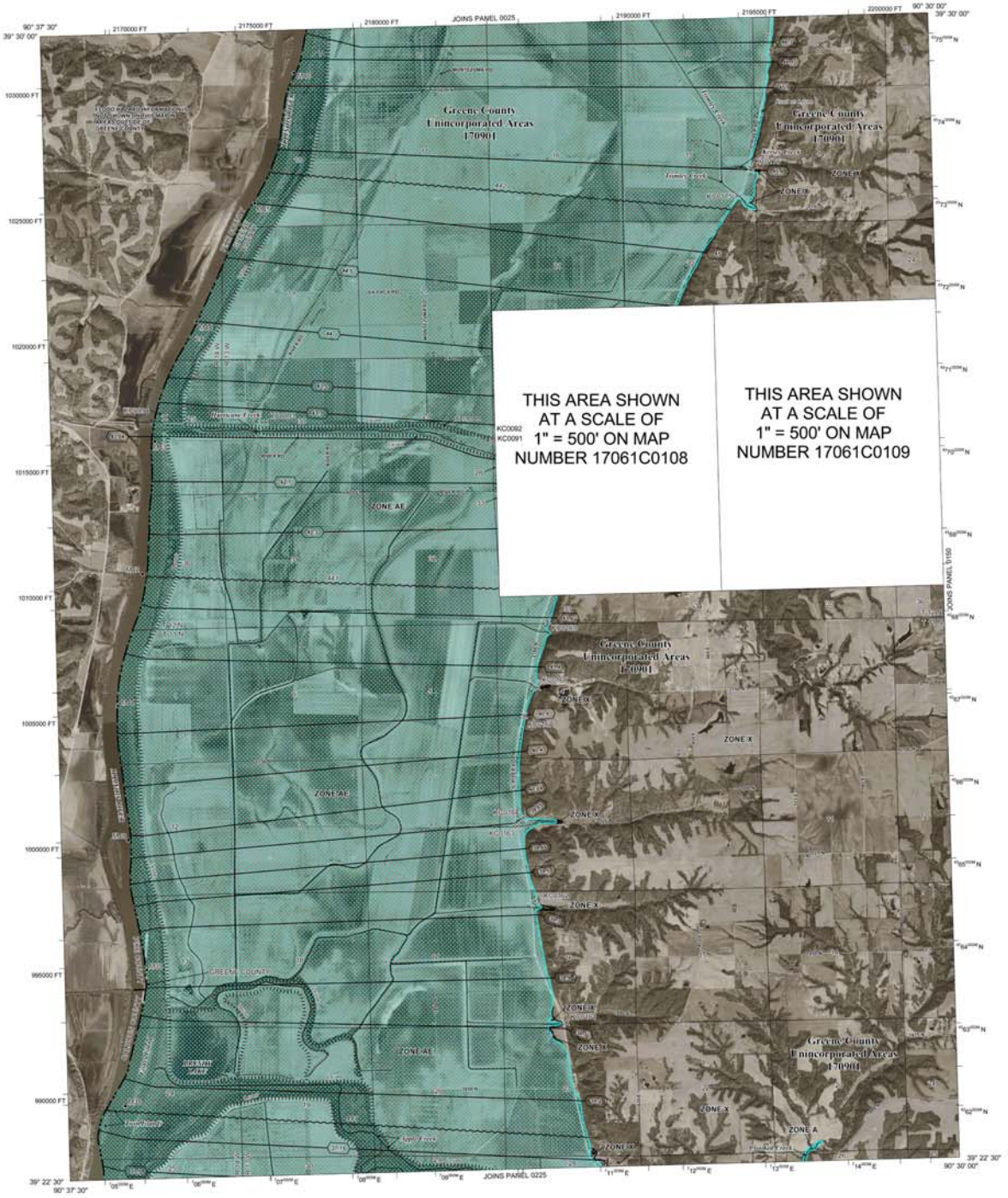

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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- 1% annual chance floodplain boundary
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- M1.5 — River Mile

MAP REPOSITORIES
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EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0125D

FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 125 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0125	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0125D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

Appendix J

NOTES TO USERS

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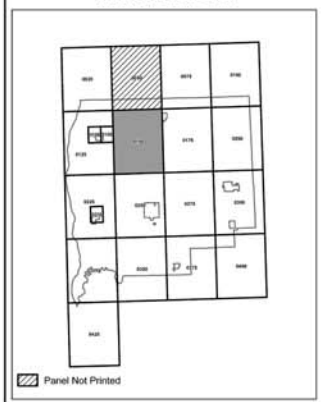

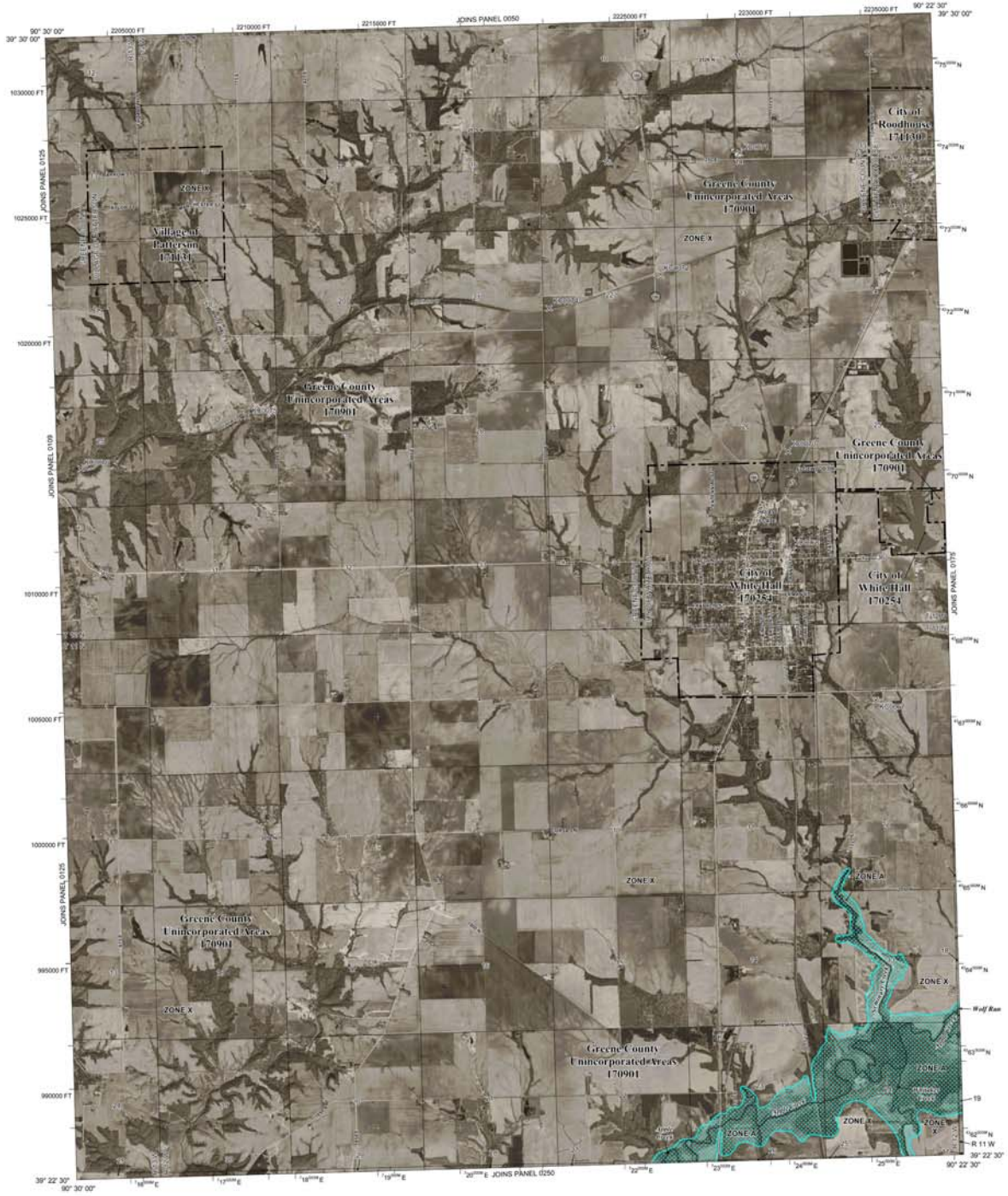

LEGEND

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FLOODWAY AREAS IN ZONE AE

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OTHER FLOOD AREAS

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MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0150D

FIRM

FLOOD INSURANCE RATE MAP

GREENE COUNTY, ILLINOIS AND INCORPORATED AREAS

PANEL 150 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0150	D
PATTERSON, VILLAGE OF	171131	0150	D
ROODHOUSE, CITY OF	171130	0150	D
WHITE HALL, CITY OF	170254	0150	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0150D

EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

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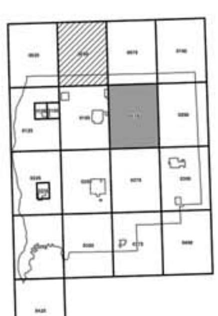
PANEL INDEX



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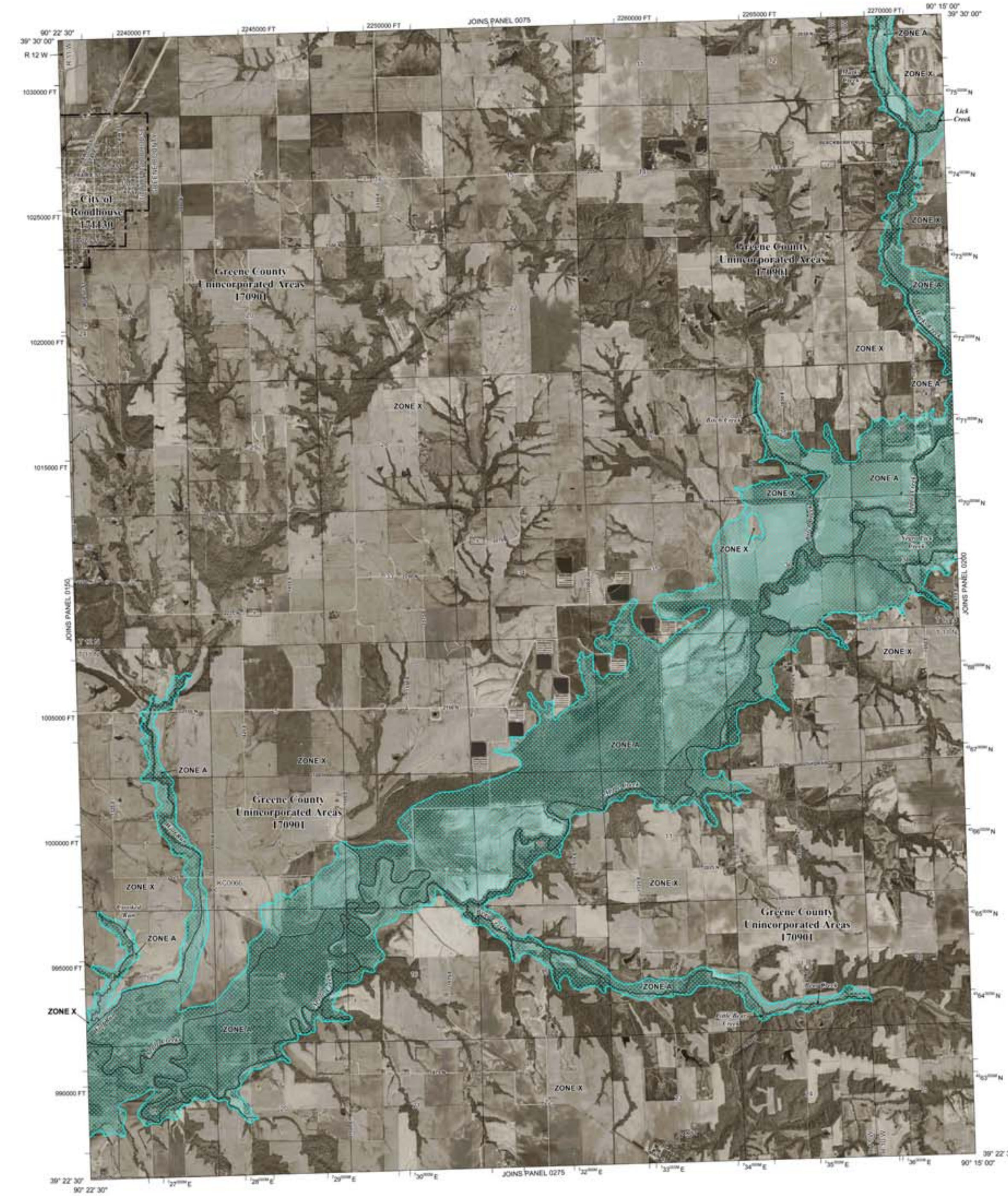

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

(A)—(A)	Cross section line
(23)- - - -(23)	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
$^{42}89^{000m}$N	1000-meter Universal Transverse Mercator grid values, zone 15
1565000 FT	5000-foot grid ticks: Illinois State Plane West Coordinate System, 3801 zone (FIPSZONE 1202) Transverse Mercator
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0175D

FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 175 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0175	D
ROODHOUSE, CITY OF	171130	0175	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0175D

EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or flood plain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

In the State of Illinois, any portion of a stream or watercourse that lies within the **floodway fringe** of a studied (AE) stream may have a state regulated floodway. The FIRM may not depict these state regulated floodways.

Floodways restricted by anthropogenic features such as bridges and culverts are drawn to reflect natural conditions and may not agree with the model computed widths listed in the Floodway Data table in the Flood Insurance Study report.

Multiple **topographic sources** may have been used in the delineation of Special Flood Hazard Areas. See Flood Insurance Study report for details on source resolution and geographic extent.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 15. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services, NOAA, N/NGS12
National Geodetic Survey SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at www.ngs.noaa.gov.

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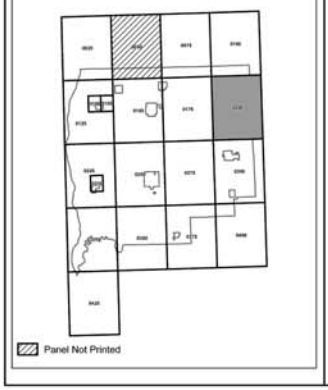
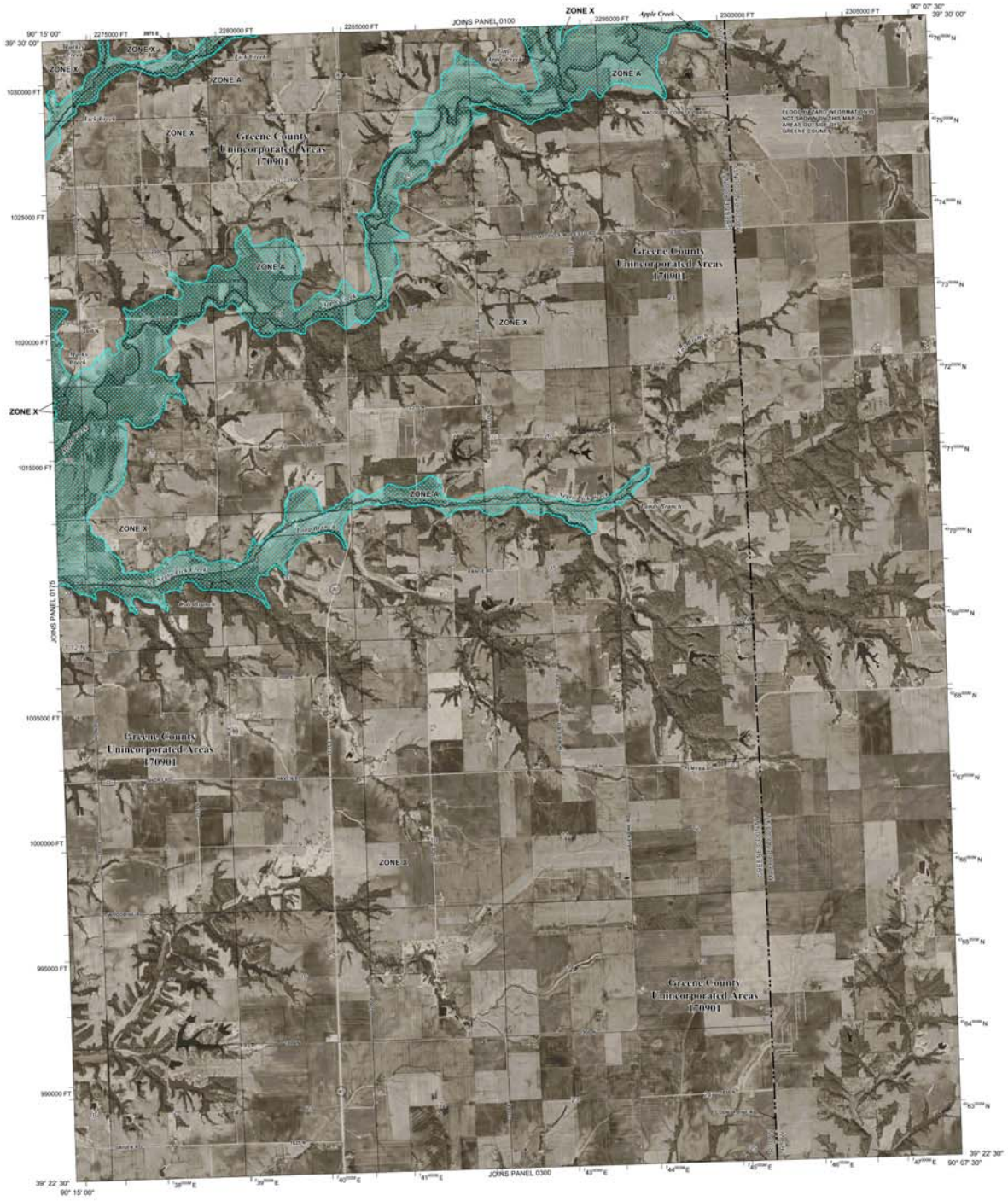
PANEL INDEX





LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
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ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 5000 m N — 1000-meter Universal Transverse Mercator grid values, zone 13
- 1569000 FT — 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPS0ZONE 1202) Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0200D

FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 200 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0200	D

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MAP NUMBER
17061C0200D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or flood plain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or flood plain management purposes when they are higher than the elevations shown on this FIRM.

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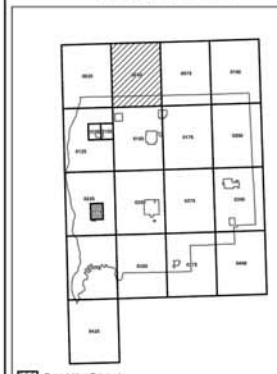

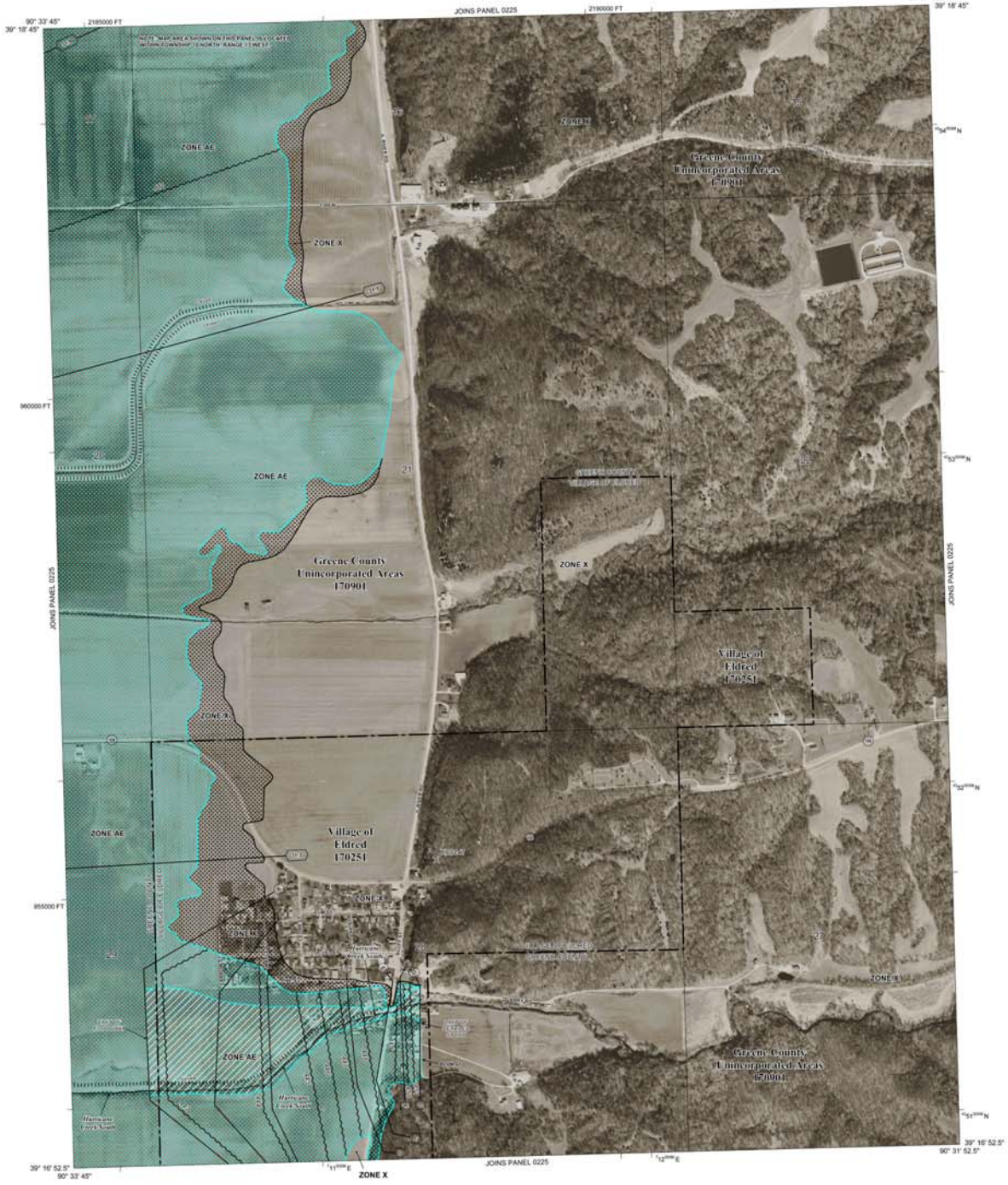

LEGEND

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ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
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FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

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Floodway boundary
Zone D boundary
CBRS and OPA boundary
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513 — Base Flood Elevation line and value; elevation in feet*
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*Referenced to the North American Vertical Datum of 1988

A — A — Cross section line
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4437000 mN — 1000-meter Universal Transverse Mercator grid values, zone 13
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DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0216D

FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 216 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ELDRED, VILLAGE OF	170251	0216	D
GREENE COUNTY	170901	0216	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0216D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

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1315 East-West Highway
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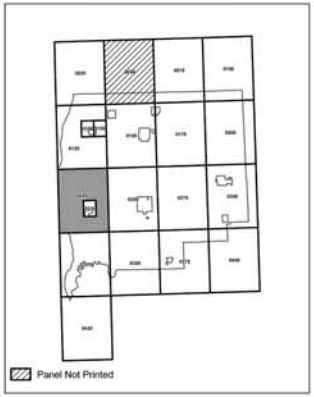
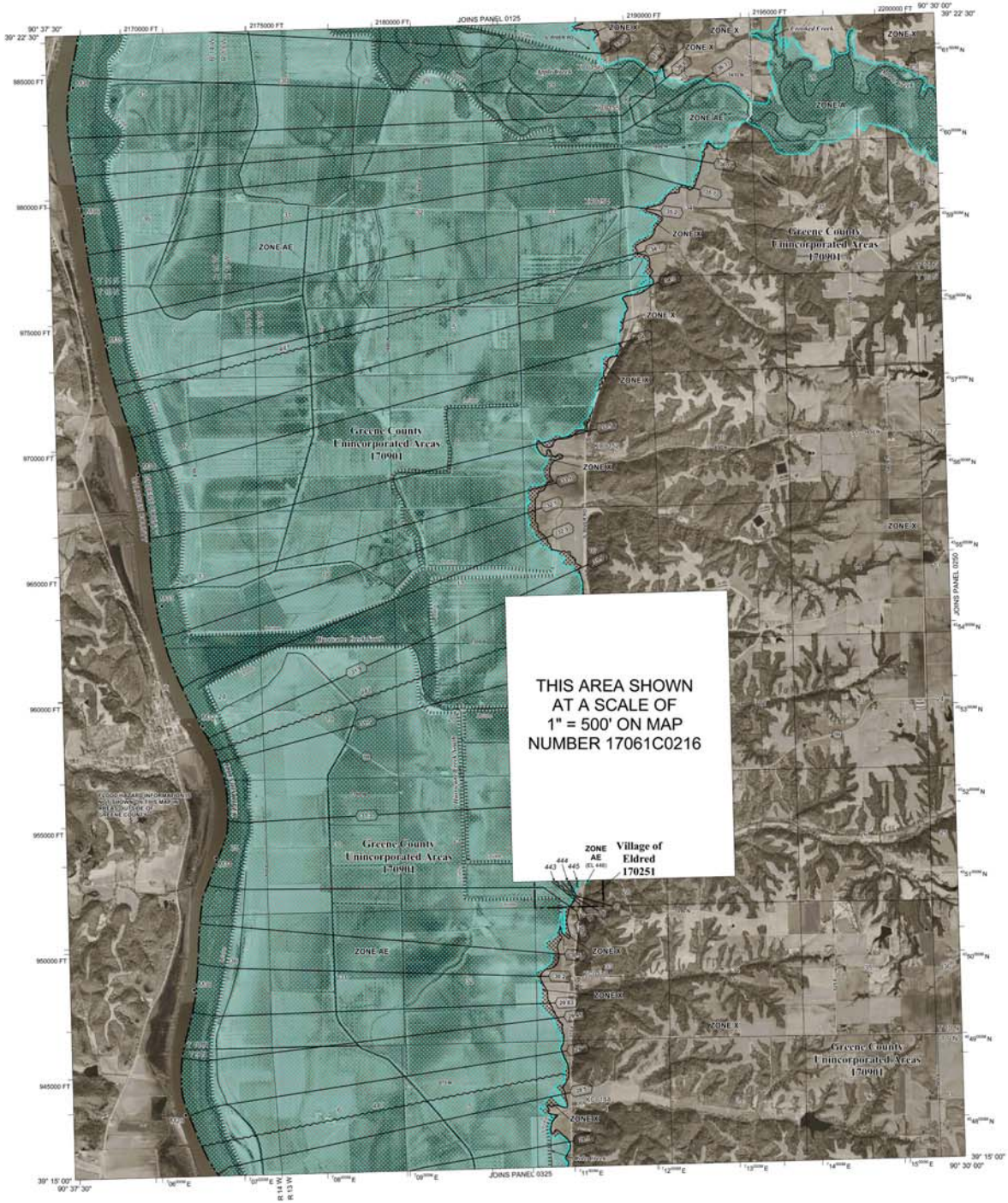
PANEL INDEX





LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 52" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 9807000 mN — 1000-meter Universal Transverse Mercator grid values, zone 15
- 1565000 FT — 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPS)2246 (202) Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0225D

FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 225 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ELDRED, VILLAGE OF	170251	0225	D
GREENE COUNTY	170901	0225	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0225D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

NOTES TO USERS

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Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

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Multiple **topographic sources** may have been used in the delineation of Special Flood Hazard Areas. See Flood Insurance Study report for details on source resolution and geographic extent.

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National Geodetic Survey SSMC-3, #9202
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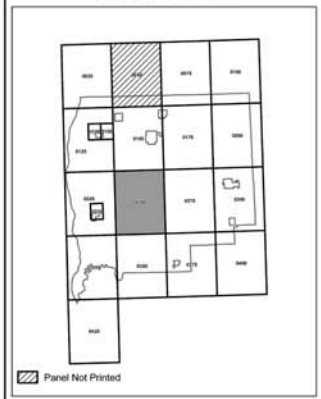

LEGEND

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FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

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- 513 — Base Flood Elevation line and value; elevation in feet*
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- M1.5 — River Mile

MAP REPOSITORIES
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APRIL 2, 2009

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1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0250D

FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 250 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CARROLLTON, CITY OF	170250	0250	D
GREENE COUNTY	170901	0250	D

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MAP NUMBER
17061C0250D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

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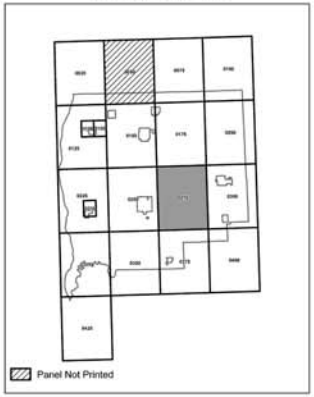

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APRIL 2, 2009

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600 0 600 1200 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0275D

FIRM

FLOOD INSURANCE RATE MAP

GREENE COUNTY, ILLINOIS AND INCORPORATED AREAS

PANEL 275 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0275	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0275D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

Appendix J

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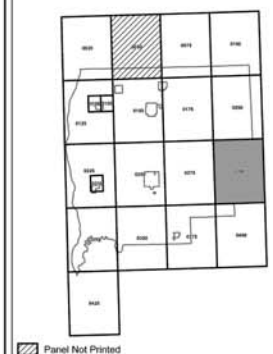
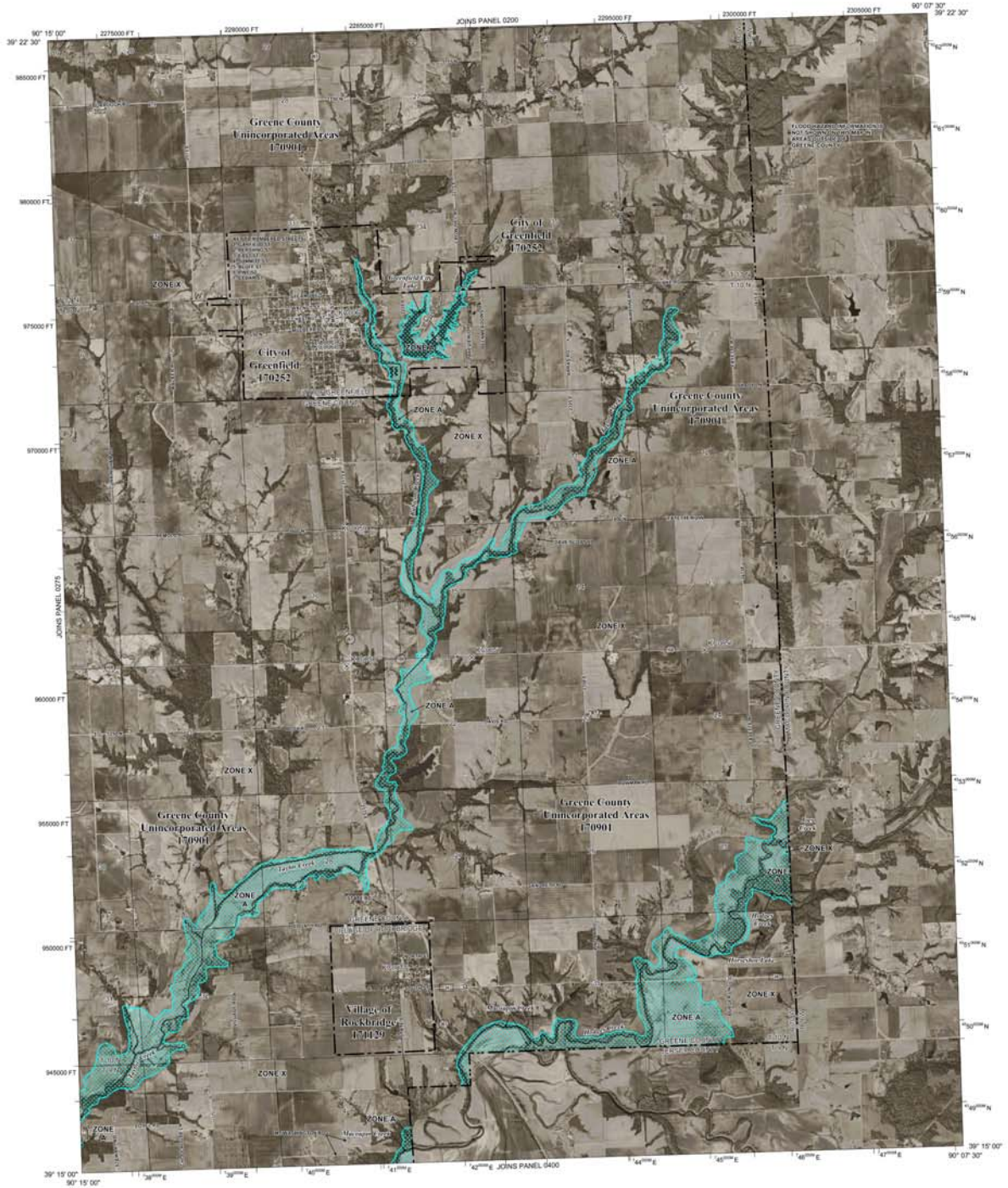
PANEL INDEX





LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4930000 mN — 1000-meter Universal Transverse Mercator grid values, zone 15
- 1565000 FT — 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPSZONE 1202) Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0300D

FIRM

FLOOD INSURANCE RATE MAP

GREENE COUNTY, ILLINOIS AND INCORPORATED AREAS

PANEL 300 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0300	D
GREENFIELD, CITY OF	170252	0300	D
ROCKBRIDGE, VILLAGE OF	171139	0300	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0300D

EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or flood plain management purposes when they are higher than the elevations shown on this FIRM.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or flood plain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

In the State of Illinois, any portion of a stream or watercourse that lies within the **floodway fringe** of a studied (AE) stream may have a state regulated floodway. The FIRM may not depict these state regulated floodways.

Floodways restricted by anthropogenic features such as bridges and culverts are drawn to reflect natural conditions and may not agree with the model computed widths listed in the Floodway Data table in the Flood Insurance Study report.

Multiple **topographic sources** may have been used in the delineation of Special Flood Hazard Areas. See Flood Insurance Study report for details on source resolution and geographic extent.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 15. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services, NOAA, N/NGS12
National Geodetic Survey SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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Base map information shown on this FIRM was provided in digital format by the United States Geological Survey. Digital orthoimagery with a spatial resolution of 0.5 meter ground sample distance were photogrammetrically compiled from aerial photography acquired during the leaf-off period of spring 2005.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The Special Flood Hazard Areas and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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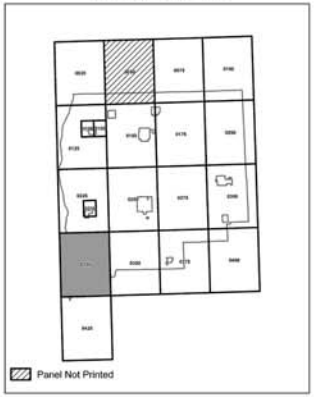
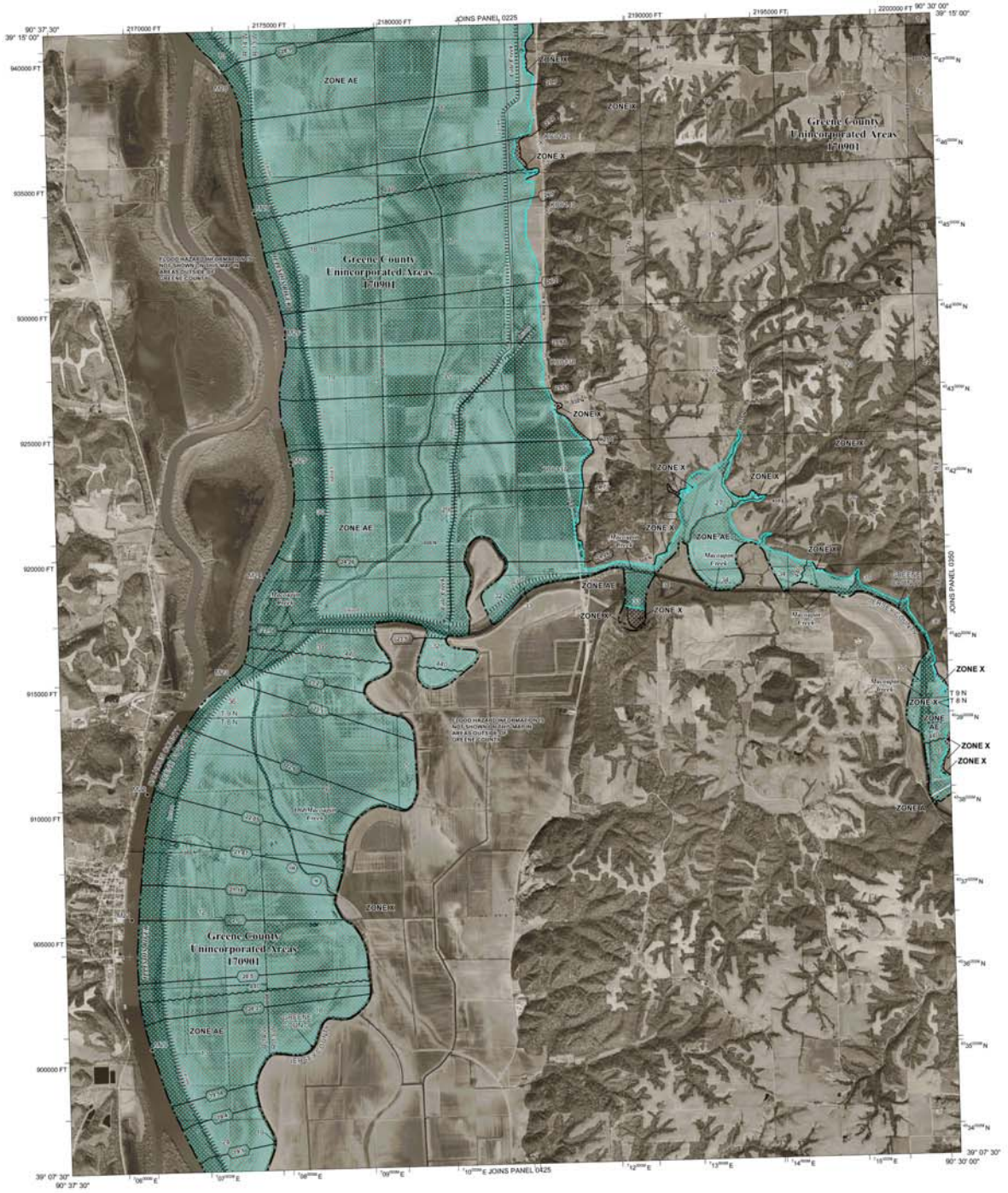
PANEL INDEX





LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
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ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 Base Flood Elevation line and value; elevation in feet*
(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A Cross section line
23 — 23 Transect line
45° 02' 08", 93° 02' 12" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4 390 000 m N 1000-meter Universal Transverse Mercator grid values, zone 15
1 569 000 FT 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPSZONE 1202) Transverse Mercator
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0325D

FIRM

FLOOD INSURANCE RATE MAP

GREENE COUNTY, ILLINOIS AND INCORPORATED AREAS

PANEL 325 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0325	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0325D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

NOTES TO USERS

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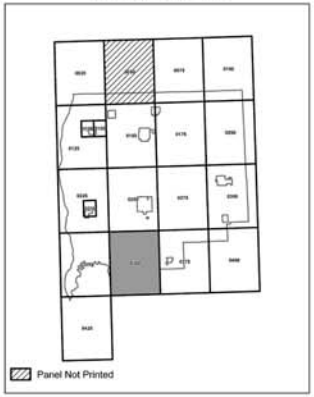

LEGEND

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ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

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- 0.2% annual chance floodplain boundary
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- Zone D boundary
- CBRS and OPA boundary
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*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
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- 9855000 mN — 1000-meter Universal Transverse Mercator grid values, zone 15
- 1565000 FT — 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPS)2246 (202) Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0350D

FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 350 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0350	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0350D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

Appendix J

NOTES TO USERS

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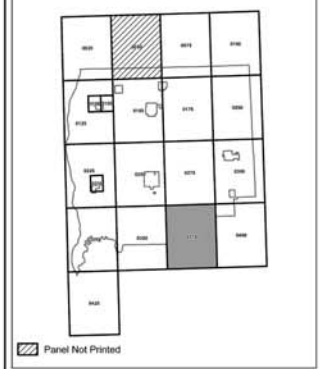
PANEL INDEX



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 5000000 m N — 1000-meter Universal Transverse Mercator grid values, zone 15
- 1569000 FT — 5000-foot grid ticks: Illinois State Plane West Coordinate System, 3601 zone (FIPSZONE 1202) Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0375D

FIRM

FLOOD INSURANCE RATE MAP

GREENE COUNTY, ILLINOIS AND INCORPORATED AREAS

PANEL 375 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0375	D
KANE, VILLAGE OF	171128	0375	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0375D

EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

In the State of Illinois, any portion of a stream or watercourse that lies within the **floodway fringe** of a studied (AE) stream may have a state regulated floodway. The FIRM may not depict these state regulated floodways.

Floodways restricted by anthropogenic features such as bridges and culverts are drawn to reflect natural conditions and may not agree with the model computed widths listed in the Floodway Data table in the Flood Insurance Study report.

Multiple **topographic sources** may have been used in the delineation of Special Flood Hazard Areas. See Flood Insurance Study report for details on source resolution and geographic extent.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 15. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services, NOAA, N/NGS12
National Geodetic Survey SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the United States Geological Survey. Digital orthoimagery with a spatial resolution of 0.5 meter ground sample distance were photogrammetrically compiled from aerial photography acquired during the leaf-off period of spring 2005.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The Special Flood Hazard Areas and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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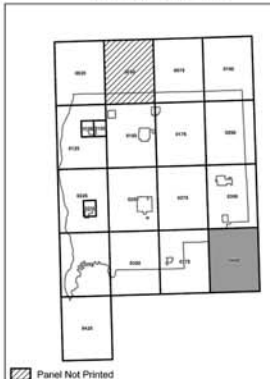
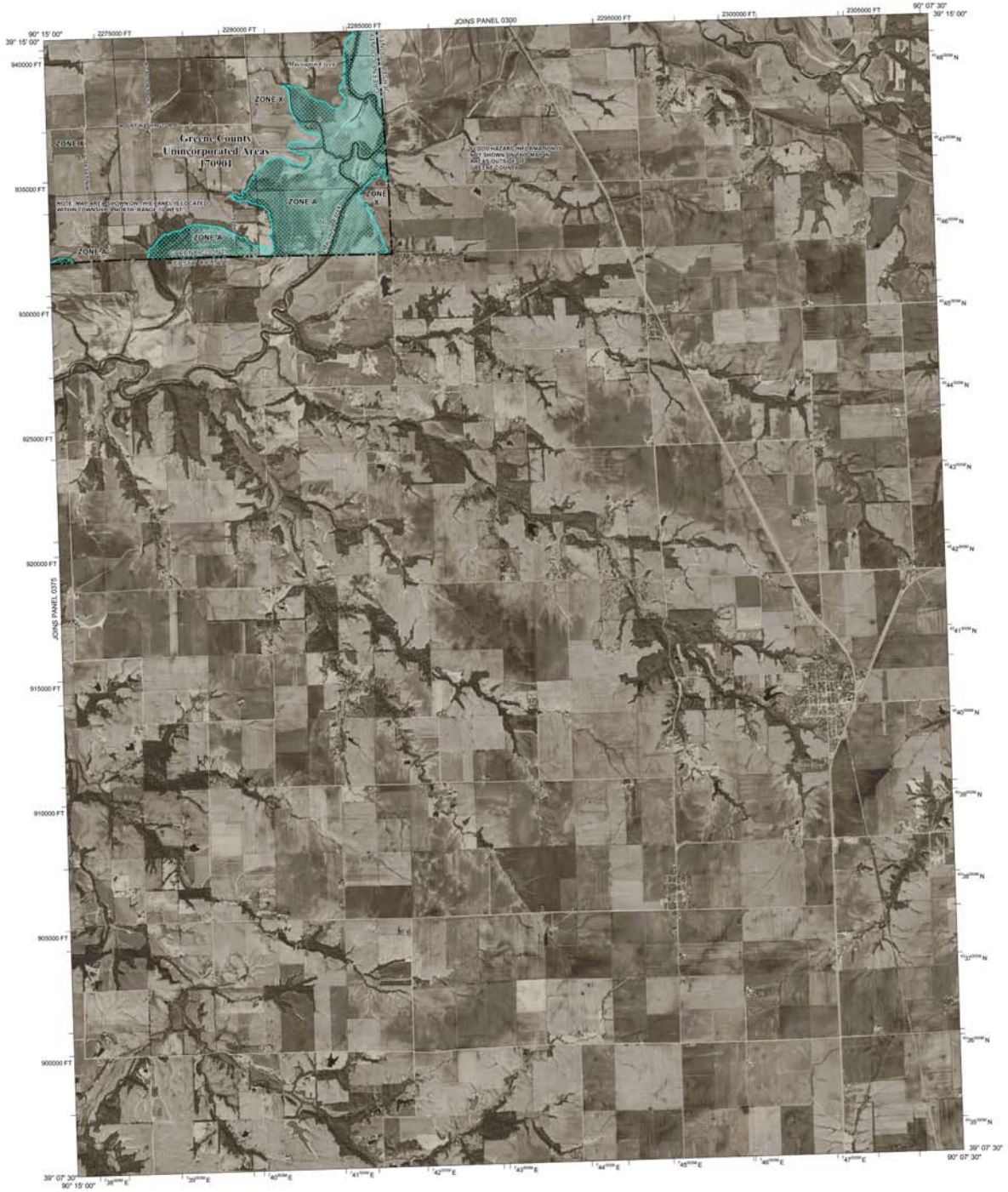
PANEL INDEX





LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
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ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

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- 23 — 23 — Transect line
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MAP REPOSITORIES
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EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0400D

FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 400 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0400	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0400D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

NOTES TO USERS

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To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or flood plain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or flood plain management purposes when they are higher than the elevations shown on this FIRM.

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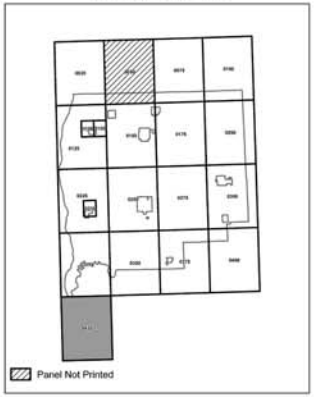
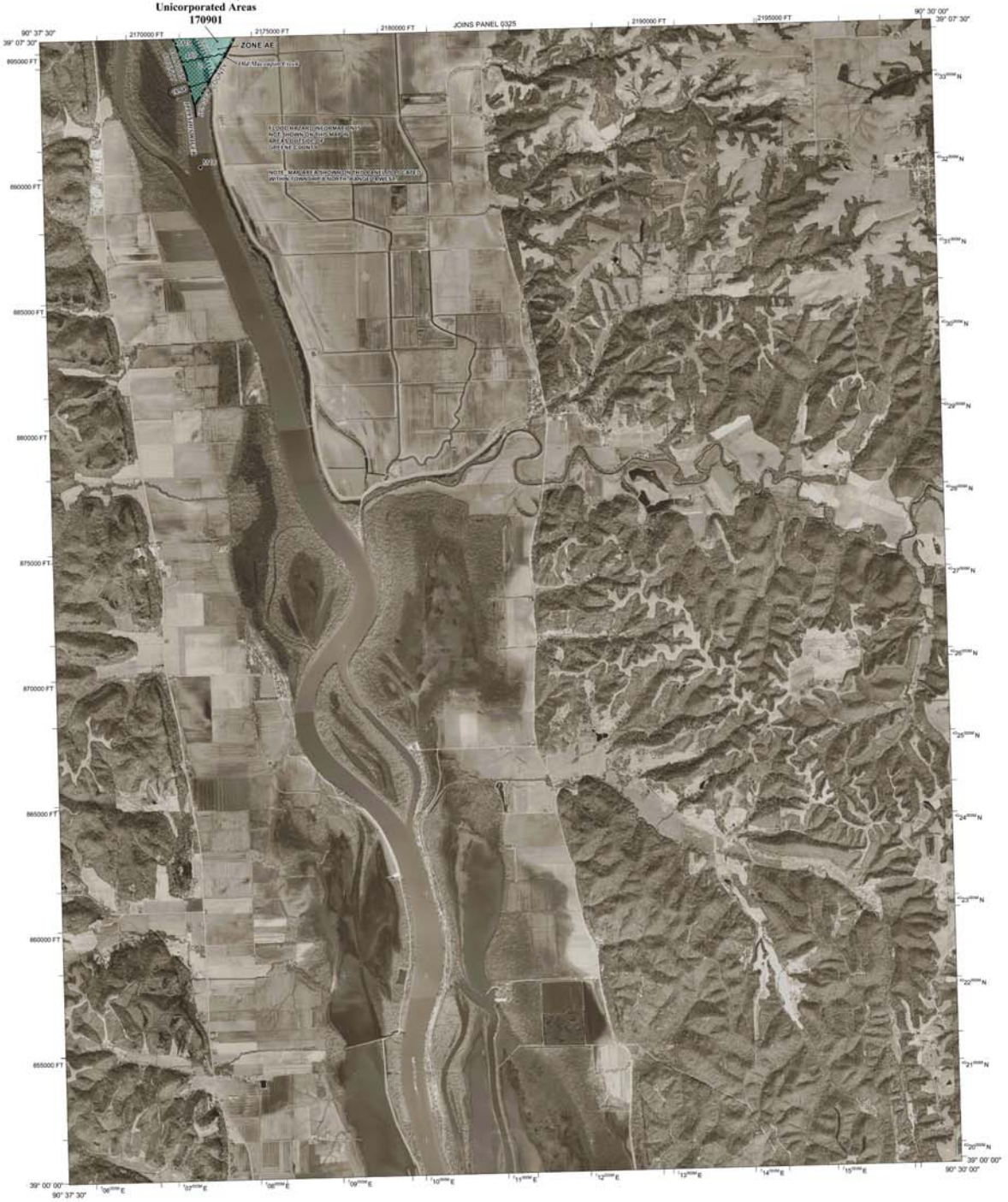
PANEL INDEX



Greene County
Unincorporated Areas
170901



LEGEND

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FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

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1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
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513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

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5000 m N — 1000-meter Universal Transverse Mercator grid values, zone 15
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M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 2, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0425D

FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 425 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	170901	0425	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17061C0425D
EFFECTIVE DATE
APRIL 2, 2009

Federal Emergency Management Agency

Appendix J

APPENDIX K