Draft

Clay County Multi-Jurisdictional Natural Hazards Mitigation Plan

Clay County, Illinois

Participants:

Clay City, Village of
Clay County
Clay County Hospital
Flora, City of
Flora CUSD #35
Louisville, Village of
North Clay CUSD #25
North Clay Fire Protection District
Xenia, Village of

May 2020

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

CLAY COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

CLAY COUNTY, ILLINOIS

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Researched and written for the Clay County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee by American Environmental Corporation

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 Clay County. Since 2002, Clay County has been included in two federally-declared disasters. **Figure I-1** identifies each declaration including the year the disaster was declared and the type of natural hazard that triggered the declaration. The natural hazard(s) recognized as contributing to the declaration for Clay County is identified in bold.

Figure I-1
Federal Disaster Declarations: Clay County

Declaration #	Year	Natural Hazard(s) Covered by Declaration
1416	2002	***severe storms; tornadoes; flooding***
1960	2011	***severe winter storm***; snowstorm

In the last 10 years alone (2010-2019), there have been 67 heavy rain events, 67 thunderstorms with damaging winds, 25 flash flood events, 21 excessive heat events 17 severe storms with hail one inch in diameter or greater, 15 severe winter storms, 11 riverine flood events, five lightning strikes, two droughts, two tornadoes, and one extreme cold event verified 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 these 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 develop a natural hazards mitigation plan?

By developing 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 and activities that would not otherwise be financially possible.

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

How is this plan different from other emergency plans?

A natural hazards mitigation plan is aimed at identifying projects and activities that can be conducted prior to a natural disaster, unlike other emergency plans which provide direction on how to respond to a disaster after it occurs. This is the first time that Clay County has developed a hazard mitigation plan. This plan describes in detail the 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 of developing a natural hazards mitigation plan, the Clay County Board authorized the development of the Clay County Multi-Jurisdictional Natural Hazards Mitigation Plan (hereto referred to as the Plan). The County then invited all the local government entities within Clay County to participate. **Figure I-2** identifies the participating jurisdictions represented in the Plan who sought Plan approval.

Figure I-2
Participating Jurisdictions Represented in the Plan

- Clay City, Village of
- Clay County
- Clay County Hospital
- Flora, City of
- Flora CUSD #35
- Louisville, Village of
- North Clay CUSD #25
- North Clay Fire Protection District
- Xenia, Village of

1.2 COUNTY PROFILE

Clay County is located in southeastern Illinois and covers approximately 470 square miles. **Figure I-3** provides a location map of the County and the participating municipalities while **Figures I-4** and **I-5** identify the community unit school district boundaries and fire protection district boundaries. The topography is mostly level with gently sloping areas. There are glacial deposits of sandstone, siltstone, limestone, and shale bedrock covering the County. In some parts of the County these deposits are at the surface modifying the landscape. The County is bounded on the north by Effingham and Jasper Counties, to the east by Richard and Jasper Counties, to the south by Wayne County and to the west by Fayette and Marion Counties. The Village of Louisville is the county seat.

Agriculture is the major industry in Clay County. According to the 2017 Census of Agriculture, there were 732 farms in Clay County occupying approximately 98.2% (294,311 acres) of the total land area in the County. The major crops include soybeans, corn and wheat while the major livestock includes mostly hogs and some cattle. The County ranks 62nd in the State for crop cash receipts and 61st for livestock cash receipts.

Manufacturing in the County is primarily located in Flora where such items as wood banjo parts, electronic components, plastic containers and automotive lighting systems are produced. The largest employment sectiors in Clay County include manufacturing and healthcare and social assistance according to the Illinois Department of Commerce and Economic Opportunity.

Figure I-3
Location Map

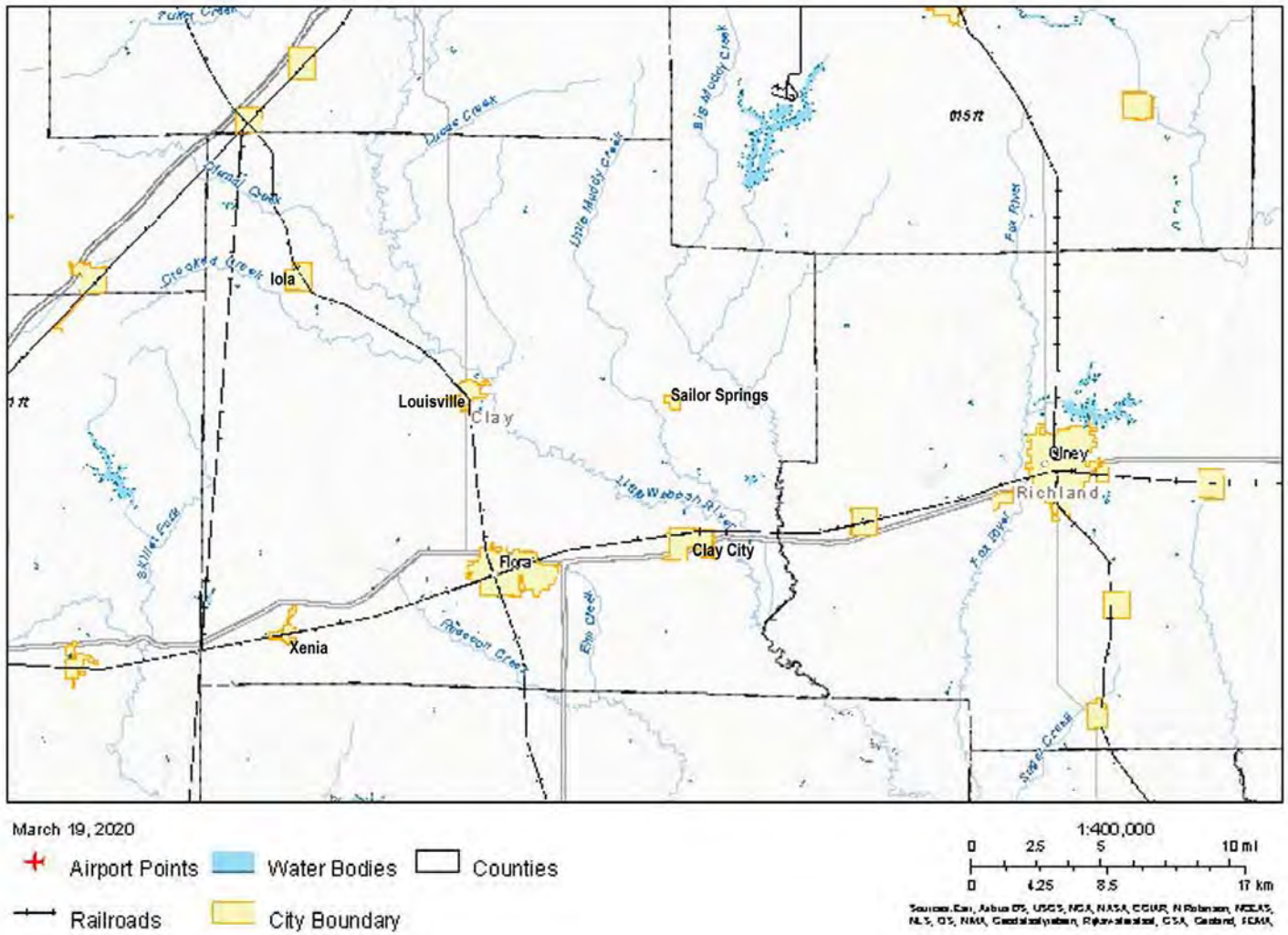


Figure I-4
Flora & North Clay Community Unit School District Boundary Map

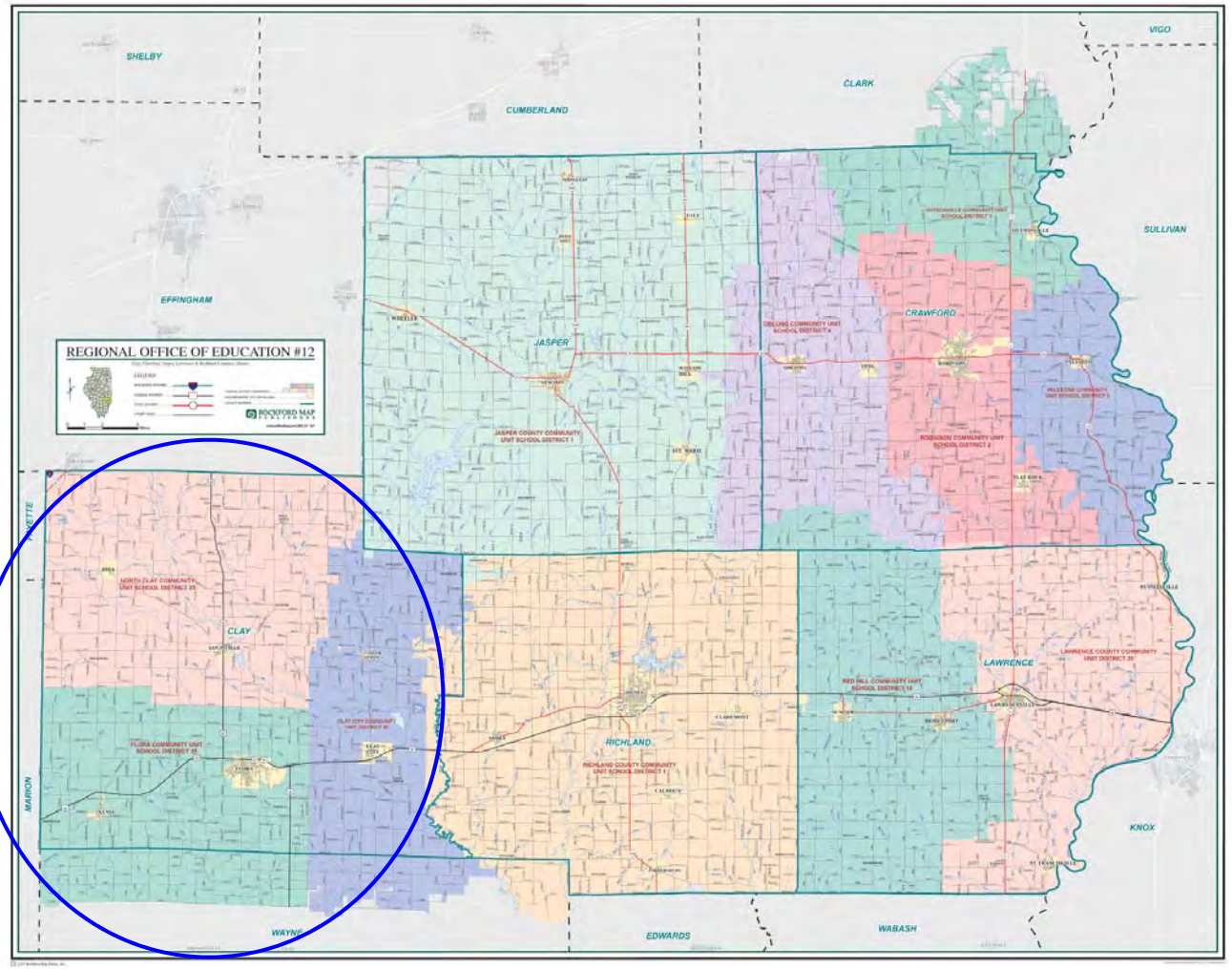


Figure I-5
North Clay Fire Protection District Boundary Map

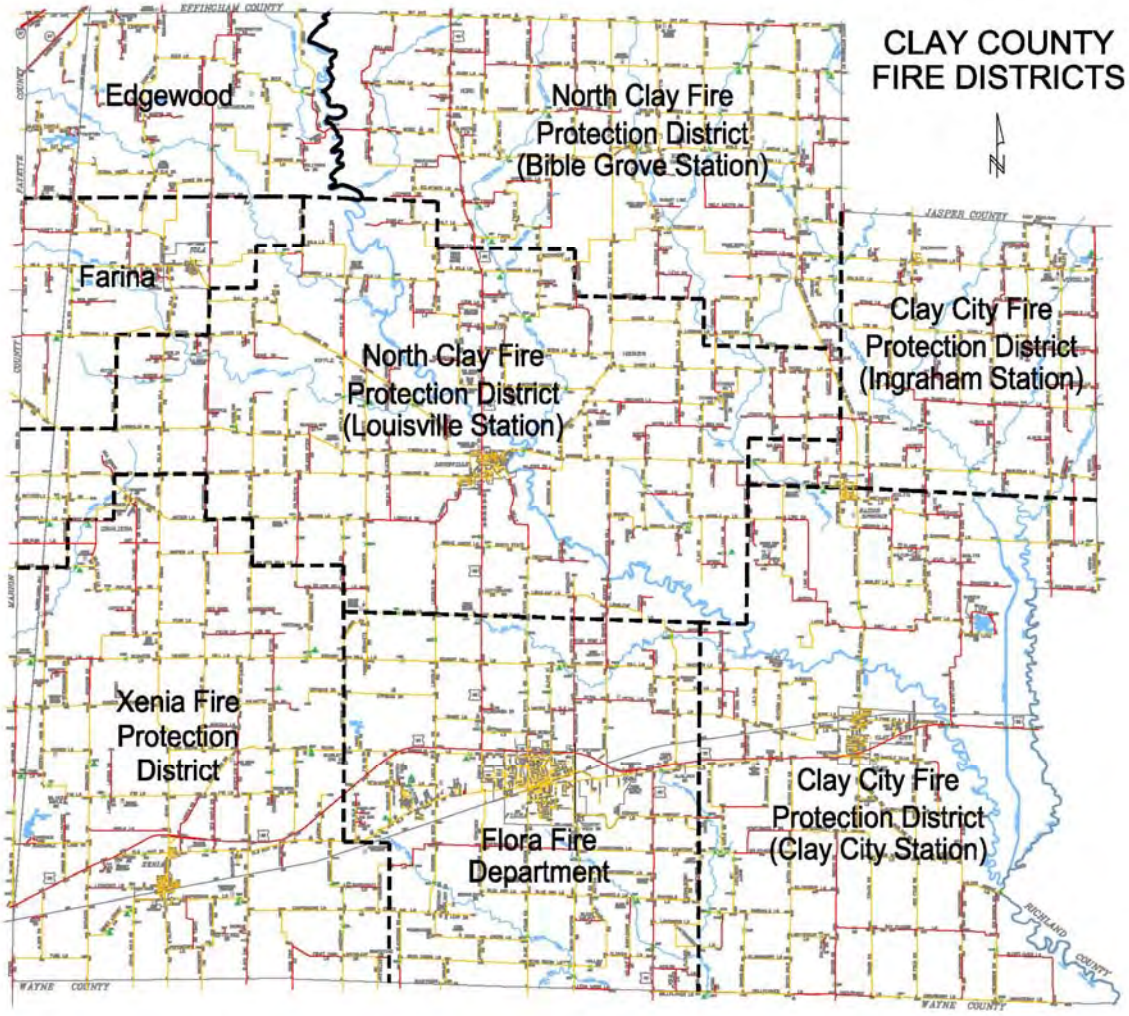


Figure I-6 provides demographic data on the County and each of the participating municipalities along with information on housing units and assessed values. The assessed values are for all residential structures and associated buildings (including farm homes and buildings associated with the main residence.) The assessed value of a residence in Clay County is approximately one-third of the market value.

Figure I-6
Demographic Data by Participating Jurisdiction

Participating Jurisdiction	Population (2010)	Projected Population (2025)	Total Area (Sq. Miles) (2010)	Number of Housing Units (2010)	Total Assessed Value of Housing Units (2018)
Clay County (unincorporated)	6,020	5,634	460.610	2,744	$30,486,104
Clay City	959	897	1.744	481	$5,774,193
Flora	5,070	4,745	4.730	2,355	$38,323,416
Louisville	1,139	1,066	0.747	513	$8,138,888
Xenia	391	366	0.537	193	$2,385,699

Sources: Kindal Eastin, Clay County Supervisor of Assessments.
Illinois Department Public Health, Population Projects for Illinois Counties 2010 to 2025.
U. S. Census Bureau, 2010 Census U.S. Gazetteer Files.
U.S. Census Bureau, American FactFinder.

1.3 LAND USE AND DEVELOPMENT TRENDS

Population growth and economic development are two major factors that trigger changes in land use. Clay County is almost entirely rural with a population that has seen a steady decline between 1900 and 2000 from 19,553 to 14,560. Between 2000 and 2010 the population decreased by 5.1% from 14,560 to 13,815. All the participating municipalities experienced a slight decrease in their populations between 2000 and 2010.

Land use in Clay County is primarily agricultural. As discussed in the previous section, approximately 98.2% of the land within the County is used for farming practices. Agriculture is and will continue to be a major industry within the County and a vital part of the County's economy.

According to the Clay County Emergency Services and Disaster Agency Director, several economic development initiatives are planned in the participating jurisdictions in the next five years, including additions to a subdivision on the west side of Flora, a Dollar Tree in Flora, a Dollar Store in Clay City and a solar farm southwest of Louisville.

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

2.0 PLANNING PROCESS

The Clay County Multi-Jurisdictional Natural Hazards Mitigation Plan (the Plan) was developed through the Clay 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 PP-1** provides a brief description of the process utilized to prepare this Plan.

Figure PP-1
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 updating the Plan.
Task Two: Public Involvement	Early and ongoing public involvement activities were conducted throughout the Plan's development to ensure the public was given every opportunity to participate and provide input.
Task Three: Coordination	Agencies and organizations were contacted to identify plans and activities currently being implemented that impact or might potentially impact hazard mitigation activities.
Task Four: Risk Assessment	The Consultant identified and profiled the natural hazards that have impacted the County and conducted a vulnerability assessment to evaluate the risk to each participating jurisdiction.
Task Five: Goal Setting	After reviewing existing plans and completing the risk assessment, the Consultant assisted the Planning Committee in updating the goals and objectives for the Plan.
Task Six: Mitigation Activities	The participating jurisdictions were asked to identify mitigation actions that had been started and/or completed since the original Plan was adopted. In addition, they were also asked to identify any new mitigation actions based on the results of the risk assessment. The new mitigation actions were then analyzed, categorized and prioritized.
Task Seven: Draft Plan	The draft Plan summarized the results of Tasks One through Six. In addition, it described the responsibilities to monitor, evaluate and update the Plan. The draft Plan was reviewed by the participants and a public forum was held to give the public an additional opportunity to provide input. Comments received were incorporated into the draft Plan and 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 again in five years.

The normal planning process generally takes 12 to 14 months to complete. Due to changes in the funding mechanism, the process was compressed and accelerated to ensure the draft Plan was completed and submitted to IEMA no later than May 31, 2020. To accommodate this schedule, three Planning Committee meetings instead of five were conducted and additional coordination was handled via verbal and written correspondence.

The accelerated schedule was further complicated by the Covid-19 outbreak in the winter/spring of 2020. Executive orders 2020-10, 2020-18 and 2020-32 issued and extended stay-at-home order

and prohibited any gatherings of more than 10 people from Saturday March 21 through Sunday, May 31, 2020. As a result the third Planning Committee meeting was not conducted in the traditional manner and was instead handled as a teleconference.

The Plan and development was led at the staff level by Steve Lewis, the Clay County Emergency Services and Disaster Agency (ESDA) Director. American Environmental Corp. (AEC), an environmental 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 one of the three Planning Committee meetings.
- Identify/submit a list of documents (i.e., plans, studies, reports, maps, etc.) relevant to the natural hazard mitigation planning process.
- Identify/submit a list of critical infrastructure and facilities.
- Review the risk assessment and provide additional information on events and damages when available.
- Participate in the of the mitigation goals.
- Submit a list of mitigation actions started and/or completed since the adoption of the original Plan.
- Identify and submit a list of new 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 Clay County Multi-Jurisdictional Natural Mitigation Planning Committee was formed to develop the hazard mitigation plan. The Planning Committee included representatives from each participating jurisdiction, as well as education, emergency services (911, fire and law enforcement), healthcare, insurance and local utilities.

Figure PP-2 details the entities represented on the Planning Committee and the individuals who attended on their behalf. The Planning Committee was chaired by the Clay County ESDA.

Figure PP-2
Clay County Planning Committee Member Attendance Record

Representing	Name	Title	11/18/2019	2/27/2020	5/19/2020
American Environmental Corp.	Bostwick, Andrea	Senior Project Manager	X	X	
American Environmental Corp.	Krug, Zachary	Environmental Specialist	X	X	
Clay City Township	Henry, Kevin	Highway Commissioner		X	
Clay City, Village of	Turner, Tyler	Utilities Supervisor	X	X	
Clay County - Assessment Office	Eastin, Kindal	Supervisor of Assessments	X	X	
Clay County - Board	Gilliland, Joe	Board Member		X	
Clay County - Board	McGrew, Barbara	Trustee	X		
Clay County - Board	Whitehead, Ted	Chairman	X		
Clay County - Coroner's Office	Miller, Wes	Coroner	X		
Clay County - Health Department	Holman, Rod	PHEP Coordinator	X	X	
Clay County - Health Department	Wille, Amber	Director of Environmental Health & PHEP	X		
Clay County - Highway Department	Koelm, Darin	County Engineer	X	X	
Clay County - State's Attorney Office	Hildebrand, Cole	Assistant State's Attorney	X		
Clay County 911	Brown, Jennifer	Coordinator		X	
Clay County Hospital	Mulvaney, Tammy	Vice President, Quality (Emerg. Prep.)	X		
Clay County Hospital	Utley, April	Facility Operations Director	X		
Clay County Hospital / EMS	Craft, Jessica	Paramedic		X	
Clay County Hospital / EMS	Hayes, Jason	Pre-Hospital Registered Nurse		X	
Clay Electric Cooperative	Johnson, Luke	CEO	X		
Flora / Clay County ESDA	Huff, Alan	Assistant Coordinator	X	X	
Flora / Clay County ESDA	Lewis, Steven	Coordinator	X	X	
Flora CUSD #35	Hackney, Dr. Joel	Superintendent	X		
Flora, City of	Durre, Guye	Police Chief	X	X	
Flora, City of	Rinehart, Toby	Public Works Director / Superintendent	X	X	
Harter Township	Tackitt, Jim	Road Commissioner	X		
North Clay CUSD #25	Wyatt, Travis	Superintendent	X	X	
North Clay Fire Protection District	Fender, Todd	District Chief	X	X	
Stanford Township	Leak, Tom	Highway Commissioner	X		
State Farm Insurance	Borrelli, Angie	Agent / Owner	X		
Xenia, Village of	Henson, Tom	Mayor	X		

Additional technical expertise was provided by the staff at the Illinois Emergency Management Agency, Illinois Department of Natural Resources Office of Water Resources and Illinois Environmental Protection Agency.

Mission Statement

Based on early communications with Planning Committee members, a draft mission statement was developed that described their objectives for the Plan and distributed electronically for review. The Planning Committee then reviewed the mission statement at the first meeting and approved it with no changes.

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

Planning Committee Meetings

The Planning Committee met three times between November 2019 and May 2020. **Figure PP-2** identifies the representatives present at each meeting. **Appendices A** and **B** contain copies of the attendance sheets and meeting minutes for each meeting. The purpose of each meeting, including the topics discussed, is provided below.

As mentioned previously, the process was compressed and accelerated to ensure the draft Plan was completed and submitted to IEMA no later than May 31, 2020. To accommodate this schedule, three Planning Committee meetings instead of five were conducted and additional coordination was handled via verbal and written correspondence.

As a result of the Covid-19 outbreak in the Winter/Spring 2020, the third Planning Committee meeting was not conducted in the traditional manner. Instead it was handled via teleconference to comply with the stay-at-home order and gathering restrictions.

First Planning Committee Meeting – 11/18/2019

At this meeting the planning process was explained to the Planning Committee members, including a brief overview of what a natural hazards mitigation plan is, why it needs to be developed, and the benefits. As part of the plan development, representatives for the County and the participating jurisdictions were asked to complete the forms entitled "List of Existing Planning Documents," "Critical Facilities" and "Identification of Severe Weather Shelters" and return them before the next meeting. Copies of a "Hazard Events Questionnaire," "Damages to Critical Facilities Damage Questionnaire" and "Citizen Questionnaire" were also distributed.

Committee members were asked to identify any natural hazard events that have occurred within the County. A discussion regarding the hazards to be included in the Plan was conducted and Committee members chose not to include landslides due to their limited impact on the people and infrastructure within the County. Portions of the draft natural hazard risk assessment section were then presented for review.

Following the review of risk assessment, the Planning Committee members participated in an exercise to help calculate the Risk Priority Index which can assist participants in determining hazards present the highest risks and therefore which ones to focus on when formulating mitigation projects and activities.

Next, mitigation actions were defined and examples were discussed. As part of the plan development, individual mitigation action lists will be created for each participating jurisdiction. Ideas for potential mitigation projects and activities were presented. Representatives for the County and the participating jurisdictions were asked to complete the form entitled "Hazard Mitigation Projects" and return them before the next meeting.

Drafts of the mission statement and mitigation goals were presented for review. After a discussion, the Planning Committee chose to finalize both with no revisions.

Finally, community participation was discussed. The County and participating jurisdictions were asked to make information available on the planning process at their offices and in their communities.

Second Planning Committee Meeting – 02/27/2020

At this meeting the Planning Committee members discussed vulnerable community assets and completed the form entitled "Critical Facilities Vulnerability Survey" which will be used in the vulnerability analyses. The results of the Risk Priority Index exercise conducted at the previous meeting were presented. Tornadoes scored the highest followed by thunderstorms with damaging winds, severe winter storms and lightning.

Next, an explanation of what a mitigation actions prioritization methodology is was provided. The various ways that mitigation actions can be prioritized and example methodologies were discussed. The Planning Committee chose to use a methodology based on hazard frequency and degree of mitigation.

A presentation on how the mitigation projects and activities identified by the participating jurisdictions would be presented in the Plan was provided. Then, the Planning Committee members reviewed the draft jurisdiction-specific mitigation action tables which identified and prioritized the new mitigation projects and activities submitted by the participants. Members were given the opportunity to add additional projects and activities to their tables.

The sections outlining the mitigation strategy and plan maintenance were also reviewed. The participating jurisdictions will meet annually to monitor the status of the mitigation projects and activities, evaluate the effectiveness of the Plan and provide information on the events that have occurred since the committee met previously. The Plan must be reviewed, revised and resubmitted to IEMA and FEMA at least once every five years. The public forum and adoption process were then discussed, and a date for the public forum was set.

Third Planning Committee Meeting – 05/19/2020

At this Planning Committee meeting the public was provided the opportunity to participate in a teleconference and given the opportunity to ask questions about the draft Plan which was made available online.

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
- cultivate 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 developed to gather facts and gauge public perceptions about natural hazards that affect Clay County. The questionnaire was distributed to the Planning Committee members who were encouraged to make it to their residents. A copy of the questionnaire is contained in **Appendix C**.

A total of eighteen (18) questionnaires were completed and returned to the Planning Committee. Questionnaires were completed by residents in each participating jurisdiction, with the exception of Xenia. These responses provide useful information to decision makers as they determine how best to disseminate information on natural hazards and safeguard the public. Additionally, these responses identify the types of projects and activities the public is most likely to support. The following provides a summary of the results.

- Respondents felt that severe summer weather was the most frequently encountered natural hazard in Clay County followed by flooding and severe winter storms. These results are consistent with the weather records compiled for the County and as described in this Plan.
- The most effective means of communication identified by respondents to disseminate information about natural hazards were social media (Facebook, Twitter, etc.) and the internet followed closely by radio and the Public Health Department. Information disseminated via Municipal / County Government, the mail and fact sheets/ brochures also received strong support among respondents.
- In terms of the most needed mitigation projects and activities, the following four categories received the strongest support:
  - maintain roadway passages during snow storms and heavy rains (80%);
  - maintain power during storms by burying power lines, trimming trees and/or purchasing backup generators (73%);
  - install/maintain sirens and other alert systems (67%);
  - provide flood or drainage protection (53%) – the respondents who selected this category felt that culvert and drainage ditch maintenance was the most needed activity followed by hydraulic studies.

FAQ Fact Sheet

A "Frequently Asked Questions" fact sheet was created and disseminated to help explain what a natural hazards mitigation plan is and briefly described the planning process. The fact sheet was

made available at the participating jurisdictions. A copy of the fact sheet is contained in **Appendix D**.

Press Releases

Press releases were prepared and submitted to local media outlets prior to each Planning Committee meeting. The releases announced the purpose of the meetings and how the public could become involved in the Plan's development. **Appendix E** contains a list of the media outlets that received the press releases while copies of the releases and any news articles published can be found in **Appendix F**.

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

Due to the Covid-19 outbreak, the final meeting of the Planning Committee which was to be held as an open house public forum on Monday, April 20, 2020 was cancelled. Executive Orders 2020-10, 2020-18 and 2020-32 issued and extended a stay-at-home order and prohibited any gatherings of more than 10 people from Saturday, March 21 through Sunday, May 31, 2020. Given the May 31 plan submission deadline and the extension of the stay-at-home order, IEMA and FEMA agreed to allow the County to conduct the public forum via teleconference and place the draft Plan for review and comment.

At the public forum teleconference, held on Tuesday, May 19, a brief summary of the planning process was provided; the Plan's availability was discussed and individuals were given the opportunity to ask questions or provide comments. Individuals participating in the public forum were provided a two-page handout summarizing the planning process and directed to an online comment survey that could be used to provide feedback on the draft Plan. **Appendices G** and **H** contain copies of these materials.

Public Comment Period

The draft Plan was made available for public review and comment on the County's website from May 19 through May 26, 2020. Those unable to access the Plan via the website were directed to contact the Clay County ESDA Coordinator to view a paper copy of the Plan. Individuals were encouraged to submit their comments electronically.

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.

- *Acquired additional information about natural hazards.* Verifiable hazard event and damage information was obtained from participants that presents a clearer assessment of the extent and magnitude of natural hazards that have impacted the County.

- *Obtained critical facilities damage information*. Data collection surveys soliciting information about critical facilities damaged by natural hazards were used to supplement information obtained from government databases. This information was vital to the preparation of the vulnerability analysis.
- *Increased awareness of the impacts associated with natural hazard events within the County*. Understanding how mitigation actions can reduce risk to life and property helped generate ***fifty (50) mitigation projects and activities*** at the local level that had not been previously identified in any other planning process. In addition, four municipalities, two school districts, one fire protection district and one hospital chose to participate in the Plan's development.

2.3 PARTICIPATION OPPORTUNITIES FOR INTERESTED PARTIES

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

Business Community

Input was sought from the business community to provide balance and context for discussions on property damages, not only to business, but also to residences. An experienced local insurance agent represented the insurance industry, helping to answer questions and provide information regarding storm damages. Utility companies serving the area were also invited to participate in the development of the Plan. A representative from the Clay Electric Cooperative served on the Planning Committee.

Schools

Representatives from Flora CUSD #35 and North Clay CUSD #25 served on the Planning Committee. Both superintendents coordinated with other members of their districts in considering what types of mitigation projects and activities would be most beneficial.

Healthcare

Input was sought from the healthcare community. Representatives from Clay County Hospital and the Clay County Health Department attended all the Planning Committee meetings and provided input into the planning process.

Neighboring Counties

The Fayette County Emergency Management Agency Director attended the Planning Committee meetings and provided input into the planning process.

A memo was sent to EMA/ESDA/OEM coordinators in the neighboring counties inviting them to participate in the mitigation planning process. The counties contacted included Effingham, Fayette, Jasper, Marion, Richland and Wayne. **Appendix I** contains a copy of the invitation memo.

2.4 INCORPORATING EXISTING PLANNING DOCUMENTS

As part of the planning process, the County and each participating municipality was asked to identify and provide existing documents (plans, studies, reports and technical information) relevant to the Plan update. **Figure PP-3**, located at the end of this section, summarizes the availability of existing planning documents by participating jurisdiction. These documents were reviewed and incorporated into the Plan update whenever applicable.

Clay County and most of the participating jurisdictions have limited resources and abilities to expand on and improve the existing policies and programs identified in Figure PP-3. This conclusion is based on an examination of their capabilities related to: staff and organization; technical capability; fiscal situation; policies and programs; present legal authority; and political resolve.

The lack of legal authority and policies/programs currently in place, especially with regards to building and zoning ordinances, hamper the participating jurisdictions' abilities to expand and strengthen existing policies and programs. While the County and three of the four municipalities have comprehensive plans, none of the entities have land use plans and only Flora has building codes in place. A general resistance from many residents towards these types of regulations has resulted in an unwillingness by county and municipal officials to implement such policies.

In addition, the fiscal and staffing situations of the participating jurisdictions are extremely limited, bordering on inadequate in some cases. The economy of Clay County is supported by revenue streams that are barely able to sustain the most critical of services. Many local government officials are part-time and lack the technical expertise and funds to expand or implement new programs and policies.

Overcoming these limitations will require time and a range of actions including, but not limited to: improved general awareness of natural hazards and the potential benefits that may come from the development of new standards in terms of hazard loss prevention and the identification of resources available to expand and improve existing policies and programs should the opportunity arise. These actions have been initiated through the planning process, and some of the initial results are noted below.

- ***Awareness***. Participants in the Plan development process now have more information that they are sharing with residents about the damages caused by natural hazards. Before the development of the NHMP in Clay County, knowledge about natural hazard damages was largely anecdotal and stored piecemeal in files not accessible by the general public. This shared information can help change attitudes and foster a collective understanding of the need to work on loss prevention.
- ***Planning & Economic Support***. Clay County is a member of the South Central Illinois Regional Planning and Development Commission. This Commission provides planning support and assists members in obtaining grants and loans. Participants were made aware of the services offered by the Commission and encouraged to contact them.
- ***State Government Support***. During the Plan development process, the Planning Committee was told repeatedly how support for existing programs as well as funding for mitigation actions can come from sources other than IEMA and FEMA. Specific examples were provided to all

participants. The Illinois Department of Agriculture (IDOA) and the Illinois Environmental Protection Agency (IEPA), and the Illinois Department of Natural Resources (IDNR), have helped other counties and municipalities with improving existing programs by filling the gaps when ordinances and funding is non-existent.

Figure PP-3
Existing Planning Documents by Participating Jurisdiction

Existing Planning Documents	Participating Jurisdiction								
	Clay County	Clay City	Flora	Louisville	Xenia	Clay County Hospital	Flora CUSD	North Clay CUSD	North Clay FPD
PLANS									
Municipal/County									
Comprehensive Plan	X	X	X	X					
Emergency Management Plan	X		X	X					
Land Use Plan									
Fire Protection Districts									
Pre-Planning of Structures & Facilities									
Tier II Reports									X
County Emergency Operations Plan									X
Safety Data Sheets									X
School Districts									
Strategic Plan							X	X	
Capital Improvement Plan									
Crisis Plan							X	X	
Hospitals									
Strategic Plan						X			
Capital Improvement Plan						X			
Risk Management Plan						X			
Emergency Operations Plan						X			
Severe Weather Plan						X			
CODES & ORDINANCES									
Municipal/County/Recreational Communities									
Building Codes			X						
Drainage Ordinances			X						
Historic Preservation Ordinance									
Subdivision Ordinance(s)		X	X	X					
Zoning Ordinances			X						
MAPS									
Municipal/County									
Existing Land Use Map			X	X	X				
Infrastructure Map			X	X					
Zoning Map	X		X						
Fire Protection Districts									
Floodplain Maps									
Pipeline Maps									
District Maps									X
Municipal/Special Residential Area Maps									X
Impassable Roads & Bridges Map									
Hazardous Facilities Maps									
Evacuation Zone Maps									
Water Supply System Maps									
School Districts									
District Boundary Map							X	X	
Floor Plan Map							X	X	
Hospitals									
Flood Plan Maps						X			
Facilities Map						X			
OTHER TECHNICAL DOCUMENTS									
Municipal/County									
Flood Ordinance(s)		X	X						
Flood Insurance Rate Maps		X	X						
Repetitive Flood Loss List									
Elevation Certificates for Buildings									

3.0 RISK ASSESSMENT

Overview

Risk assessment is the process of evaluating the vulnerability of people, buildings and infrastructure 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 in Clay County. The information contained in this section was gathered by evaluating local, state and federal records from the last 30 to 70 years.

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

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. Each natural hazard section contains three subsections: hazard identification, hazard profile and hazard vulnerability.

Hazard Selection

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

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

The Planning Committee chose not to include the following hazards in the Plan: levee failures, landslides and mine subsidence. According to the US Army Corps of Engineers, there are no levees located in Clay County or any adjoining counties that have the potential to cause adverse impacts. A review of the USGS Landslide Susceptibility Viewer indicates that a majority of the County has a low incidence of landslides. There a small portion in the southeast corner of the County with moderate landslide susceptibility but low incidence. The Illinois State Geological Survey's *Landslide Inventory of Illinois* do not contain any instances of landslide in Clay County and discussions with the Planning Committee did not reveal any isolated problems.

Sinkholes commonly occur in areas where carbonate rock formations characteristic of karst geology are present. Mapping prepared by the Illinois State Geological Survey (ISGS) shows that there are no karst geologic characteristics present in Clay County. In Illinois land subsidence general occurs in areas where coal mining has been conducted. ISGS's *Coal Mines and Underground Industrial Mines* map shows that virtual no underground or surface mining has occurred previously in the Clay County.

Risk Priority Index

After reviewing the preliminary results of the risk assessment at the second meeting, Planning Committee members and the participating jurisdictions were asked to complete a Risk Priority Index (RPI) exercise for the hazards that have the potential to impact the County and participating jurisdictions. The RPI provides quantitative guidance for ranking the hazards and offers participants with another tool to determine which hazards present the highest risk and therefore which ones to focus on when formulating mitigation actions.

Each hazard was scored on three categories: 1) frequency, 2) impacts on life and health and 3) impacts on property and infrastructure. A scoring system was developed that assigned specific factors to point values ranging from 1 to 4 for each category. The higher the point value, the greater the risk associated with that hazard. **Figure R-1**, located at the end of this section, identifies the factors and point values associated with each category. Participants were asked to score the selected hazards based on the perspective of the entity they represented on the Planning Committee.

The Consultant took the point values assigned to each category and averaged the remaining results and came up with an overall value for each category. The values for each category were then added together to calculate a RPI score for each hazard. A ranking was then assigned to each hazard based on the RPI score. **Figures R-2** and **R-3**, located at the end of this section, provides the RPI scores and rankings for the County and participating municipalities while **Figure R-3** provides the scores and rankings for the participating special districts (CUSDs, hospital & fire protection district.)

Critical Facilities & Infrastructure

Critical facilities and infrastructure are structures, institutions and systems that are critical for life safety and economic viability and necessary for a community's response to and recovery from emergencies. The loss of function of any of these assets can intensify the severity of the impacts and speed of recovery associated a hazard event. Critical facilities and infrastructure may include, but are not limited to the following:

- ***Essential Facilities***: Facilities essential to the health and welfare of the whole population including hospitals and other medical facilities, police and fire stations, emergency operations centers, evacuation shelters and schools.
- ***Government Facilities***: Facilities associated with the continued operations of government services such as courthouses, city/village halls, township buildings and highway/maintenance centers.

- ***Infrastructure Systems***: Infrastructure associated with drinking water, wastewater, transportation (roads, railways, waterways), communication systems, electric power, natural gas and oil.
- ***Housing Facilities***: Facilities that serve populations that have access and function needs such as nursing homes, skilled and memory care facilities, residential group homes and day care centers.
- ***High Potential Loss Facilities***: Facilities that would have an impact or high loss associated with them if their functionality is compromised such as nuclear power plants, dams, levees, military installations and facilities housing industrial or hazardous materials.
- ***Gathering Places***: Facilities such as parks, libraries, community centers and churches.

As part of the planning process each participating jurisdiction completed a questionnaire identifying the critical facilities and infrastructure located within their jurisdiction, both publicly and privately-owned. **Figure R-4**, located at the end of this section, identifies the number of critical facilities and infrastructure located in each participating jurisdiction for select categories. Identifying these assets makes local leaders more aware of the critical facilities and infrastructure located within their jurisdictions and helps them make informed choices on how to better protect these key resources.

While considered "local government entities" for planning purposes, neither the County Community Unit School Districts (CUSDs), Clay County Hospital or the North Clay Fire Protection District (FPD) have an extensive inventory of assets in which to consider when conducting the risk assessment. Flora and North Clay CUSDs' critical facilities are all located within a participating municipality (Flora and Louisville). Since the assets of the CUSDs are located within participating municipalities and are a subset of these municipality's critical facilities, their risk is considered to be the same or similar to the risk experienced by the municipalities for those hazards that either impact the entire planning area or can occur at any location within the planning area (i.e., severe storms, severe winter storms, etc.) The same is true for the Clay County Hospital and the North Clay FPD Louisville Station which are located in Flora and Lewisville. For those hazards where the risk to the CUSDs, Clay County Hospital and North Clay FPD Louisville Station varies from the risk facing the municipalities, a separate narrative assessment will be provided under the appropriate hazard's vulnerability subsection.

The North Clay FPD Bible Grove Station is located in unincorporated Clay County. Its risk is considered to be the same or similar to the risk experienced by the County for those hazards that either impact the entire planning area or can occur at any location within the planning area (i.e., severe storms, severe winter storms, etc.) For those hazards where the risk to North Clay FPD Bible Grove Station varies from the risk facing the planning area (i.e., County), a separate narrative assessment will be provided under the appropriate hazard's vulnerability subsection.

Critical Facilities Vulnerability Survey

The participating jurisdictions were also asked to complete a Critical Facilities Vulnerability Survey at the second meeting to assist in the preparation of an overall summary of each jurisdiction's vulnerability to the studied hazards. The Survey asked participants to describe their jurisdiction's greatest vulnerability. This information is summarized under the appropriate hazard's vulnerability subsection.

Figure R-1
Risk Priority Index Scoring System

Category	Factors	Point Value
Hazard Frequency	An event is anticipated to occur within the next year. Based on previous history, at least one event is expected to occur in any given year.	4
	An event is likely to occur in the next 1 to 3 years. Based on previous history, an event has at least a 33% chance of occurring in any given year.	3
	An event is possible in the next 3 to 10 years. Based on previous history, an event has a 10% to 33% chance of occurring in any given year.	2
	An event is unlikely to occur within the next 10 years. These events occur infrequently and based on previous history have a less than 10% chance of occurring in any given year.	1
Impacts on Life & Health	Fatalities are expected to occur during the event.	4
	While fatalities are unlikely, injuries, some requiring hospitalization, may occur during the event.	3
	Minor injuries not requiring hospitalization may occur during the event.	2
	Injuries or fatalities are unlikely to occur during the event.	1
Impacts on Property & Infrastructure	- Substantial property damage is likely to occur including damage to infrastructure and critical facilities. AND/OR - Loss of access/operations at multiple infrastructure and critical facilities (i.e., road & school closures, loss of power to drinking water/wastewater treatment facilities, municipal buildings, etc.) is anticipated for an extended period of time (i.e., a day or more).	4
	- Property damage is expected to occur including superficial damage to infrastructure and critical facilities. AND/OR - Loss of access/operations at multiple infrastructure and critical facilities is anticipated for a period of time (i.e., a day or less).	3
	- Some minor property damage is anticipated (i.e., shingles & siding torn off homes, windows broken, etc.) but no damage to infrastructure or critical facilities is anticipated. AND/OR - Loss of access/operations to infrastructure and critical facilities is anticipated but only for a short period of time (i.e. up to a couple hours).	2
	Property damage is likely to be negligible and no loss of access/operations is anticipated at any infrastructure/critical facilities during the event.	1

Figure R-2
Risk Priority Index Scores by Hazard by County & Participating Municipalities

Hazard	Participating Jurisdictions									
	Clay County		Clay City		Flora		Louisville		Xenia	
	RPI Score	Hazard Ranking	RPI Score	Hazard Ranking	RPI Score	Hazard Ranking	RPI Score	Hazard Ranking	RPI Score	Hazard Ranking
Dam Failures	4.9	12	3.0	12-14	3.0	12-14	3.0	12-14	3.0	12-14
Drought	5.6	11	4.0	11	5.0	11	6.0	6/7	9.0	8-10
Earthquakes	7.7	5-7	6.0	9/10	7.0	8-10	**9.0**	**1/2/3**	**12.0**	**1-7**
Excessive Heat	7.6	8	7.0	5-8	8.0	4-7	5.0	8-10	9.0	8-10
Extreme Cold	7.7	5-7	7.0	5-8	**9.0**	**2/3**	5.0	8-10	9.0	8-10
Floods	7.7	5-7	**9.0**	**3**	**9.0**	**2/3**	4.0	11	6.0	11
Hail	7.0	10	7.0	5-8	7.0	8-10	7.0	5	**12.0**	**1-7**
Heavy Rain	7.1	9	8.0	4	7.0	8-10	6.0	6/7	**12.0**	**1-7**
Landslides	4.3	13	3.0	12-14	3.0	12-14	3.0	12-14	3.0	12-14
Lightning	7.9	4	7.0	5-8	8.0	4-7	5.0	8-10	**12.0**	**1-7**
Mine Subsidence	3.9	14	3.0	12-14	3.0	12-14	3.0	12-14	3.0	12-14
Thunderstorms	**9.3**	**2**	**10.0**	**1/2**	**11.0**	**1**	**9.0**	**1/2/3**	**12.0**	**1-7**
Tornadoes	**10.0**	**1**	**10.0**	**1/2**	8.0	4-7	**9.0**	**1/2/3**	**12.0**	**1-7**
Winter Storms	8.1	3	6.0	9/10	8.0	4-7	8.0	4	**12.0**	**1-7**

Figure R-3
Risk Priority Index Scores by Hazard by Participating Special District

Hazard	Participating Jurisdictions							
	Flora CUSD#35		North Clay CUSD#25		Clay County Hospital		North Clay FPD	
	RPI Score	Hazard Ranking	RPI Score	Hazard Ranking	RPI Score	Hazard Ranking	RPI Score	Hazard Ranking
Dam Failures	7.0	6-11	3.0	11-14	7.0	9-12	3.0	12-14
Drought	7.0	6-11	7.0	9/10	5.0	14	6.0	8-11
Earthquakes	6.0	12	3.0	11-14	10.0	5/6	6.0	8-11
Excessive Heat	8.0	3/4/5	9.0	3-6	7.0	9-12	**8.0**	**1/2/3**
Extreme Cold	7.0	6-11	9.0	3-6	8.0	7/8	7.0	4-7
Floods	7.0	6-11	9.0	3-6	**12.0**	**1/2**	6.0	8-11
Hail	7.0	6-11	7.0	9/10	8.0	7/8	7.0	4-7
Heavy Rain	7.0	6-11	9.0	3-6	7.0	9-12	7.0	4-7
Landslides	3.0	13/14	3.0	11-14	7.0	9-12	3.0	12-14
Lightning	8.0	3/4/5	8.0	7/8	11.0	3/4	7.0	4-7
Mine Subsidence	3.0	13/14	3.0	11-14	6.0	13	3.0	12-14
Thunderstorms	**10.0**	**1/2**	8.0	7/8	11.0	3/4	**8.0**	**1/2/3**
Tornadoes	**10.0**	**1/2**	**11.0**	**1**	10.0	5/6	**8.0**	**1/2/3**
Winter Storms	8.0	3/4/5	**10.0**	**2**	**12.0**	**1/2**	6.0	8-11

Figure R-4
Critical Facilities & Infrastructure by Jurisdiction

Participating Jurisdiction	Critical Facilities				Critical Infrastructure						
	Government[1]	Emergency Protection[2]	Medical & Healthcare[3]	Schools	Drinking Water[4]	Wastewater Treatment[5]	Rail Lines	Bridges	Interstates US/State Routes & Key Roads	Power Plants	Comm. Systems
Clay County	3	3	1	---	---	---	1	7	8	---	4
Clay City	1	2	---	3	5	0	1	---	4	---	1
Flora	2	4	21	---	3	6	---	2	4	2	2
Louisville	2	2	4	---	2	3	---	---	1	---	---
Xenia	1	1	---	---	1	4	1	---	5	---	2
Flora CUSD #35	---	---	---	4	---	---	---	---	---	---	---
North Clay CUSD #25	---	---	---	3	---	---	---	---	---	---	---
Clay County Hospital	---	1	2	---	---	---	---	---	---	---	---
North Clay FPD	---	2	---	---	---	---	---	---	---	---	1

[1] Government includes: courthouses, city/village halls, township buildings, highway/road maintenance centers, libraries, etc.
[2] Emergency Protection includes: sheriff's department, police, fire, ambulance, emergency operations centers, jail/correctional facilities and evacuation shelters.
[3] Medical & Healthcare includes: public health departments, hospitals, urgent/prompt care and medical clinics, nursing homes, skilled nursing facilities, memory care facilities, residential group homes, etc.
[4] Drinking Water includes: drinking water treatment plants, drinking water wells and water storage towers/tanks.
[5] Wastewater Treatment includes: wastewater treatment plants and lift stations.
--- Indicates the jurisdiction does not own/maintain any critical facilities within that category.

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

HAZARD IDENTIFICATION

What is the definition of a severe storm?

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

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

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

What is a thunderstorm?

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

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

Single-cell Thunderstorm

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

Multi-cell Thunderstorm

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

Squall Line

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

Supercell Thunderstorm

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

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

What kinds of damaging winds are produced by a thunderstorm?

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

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

The NWS measures a storm's wind speed in knots or nautical miles. A wind speed of one knot is equal to approximately 1.15 miles per hour. **Figure SS-1** shows conversions from knots to miles per hour for various wind speeds.

Figure SS-1
Wind Speed Conversions

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

What is hail?

Hail is precipitation in the form of spherical or irregular-shaped pellets of ice that occur within a thunderstorm when strong rising currents of air (updrafts) carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice.

Hailstones grow by colliding with supercooled water drops. The supercooled water drops freeze on contact with ice crystals, frozen rain drops, dust, etc. Thunderstorms with strong updrafts continue lifting the hailstones to the top of the cloud where they encounter more supercooled

water and continue to grow. Eventually the updraft can no longer support the weight of the hail or the updraft weakens and the hail falls to the ground.

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

How is the severity of a hail event measured?

The severity or magnitude of a hail event is measured in terms of the size (diameter) of the hailstones. The hail size is estimated by comparing it to known objects. **Figure SS-2** provides descriptions for various hail sizes.

Figure SS-2
Hail Size Descriptions

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

Source: NOAA, National Severe Storm Laboratory.

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

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

The Hailstorm Intensity Scale identifies ten different categories of hail intensity, H0 through H10. **Figure SS-3** gives a brief description of each category. This scale is unique because it recognizes that, while the maximum hailstone size is the most important parameter relating to structural damage, size alone is insufficient to accurately categorize the intensity and damage potential of a hail event.

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

Figure SS-3
TORRO Hailstorm Intensity Scale

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

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

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

What is lightning?

Lightning, a component of all thunderstorms, is a visible electrical discharge that results from the buildup of charged particles within storm clouds. It can occur from cloud-to-ground, cloud-to-cloud, within a cloud or cloud-to-air. The air near a lightning strike is heated to approximately 50,000°F (hotter than the surface of the sun). The rapid heating and cooling of the air near the lightning strike causes a shock wave that produces thunder.

Lightning on average causes 60 fatalities and 400 injuries annually in the United States. Most fatalities and injuries occur when people are caught outdoors in the summer months during the afternoons and evenings. In addition, lightning can cause structure and forest fires. Many of the wildfires in the western United States and Alaska are started by lightning. According to the NWS lightning strikes cost more than $1 billion in insured losses each year.

Are alerts issued for severe storms?

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

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

HAZARD PROFILE

The following identifies past occurrences of severe storms; details the severity or extent of each event (if known); identifies the locations potentially affected; and estimates the likelihood of future occurrences.

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

Tables 1, 2, 3 and 4, located in **Appendix J,** summarize the previous occurrences as well as the extent or magnitude of severe storm events recorded in Clay County. Severe storm events are separated into four categories: thunderstorms with damaging winds, hail, lightning and heavy rain. In Clay County, severe storms are the most frequently occurring natural hazard.

Severe Storms Fast Facts – Occurrences

Number of recorded Thunderstorms with Damaging Winds (1973 - 2019): ***136***

Number of recorded Severe Hail Events (1984 - 2019): ***43***

Number recorded of Lightning Strike Events (2012-2019): ***5***

Number of recorded Heavy Rain Events (1990 – 2019): ***219***

Highest Recorded Wind Speed: ***78 knots (July 13, 2016)***

Largest Hail Recorded: ***2.75 inches (September 9, 1986, May 25, 1989, and May 3, 1996)***

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

Most Likely Months for Severe Hail to Occur: ***April and May***

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

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

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

Thunderstorms with Damaging Winds

NOAA's Storm Events Database was used to document 136 reported occurrences of thunderstorms with damaging winds in Clay County between 1973 and 2019. Of the 136 occurrences, 111 had reported wind speeds of 50 knots or greater. There were 25 occurrences, however, where the wind speed was not recorded.

The highest wind speed recorded in Clay County occurred near Ingraham on July 13, 2016 when winds reached 78 knots (90 mph) during a thunderstorm event. Thunderstorms with damaging winds have been *recorded* in every participating jurisdiction within the County on multiple occasions.

Figure SS-4 charts the reported occurrences of thunderstorms with damaging winds in Clay County by month. Of the 136 events, 103 (76%) took place in May, June, July, and August making

this the peak period for thunderstorms with damaging winds in Clay County. Of the 136 events, 39 (29%) occurred during June, making this the peak month for thunderstorms with damaging winds.

Figure SS-4
Thunderstorms with Damaging Winds by Month
1973 - 2019

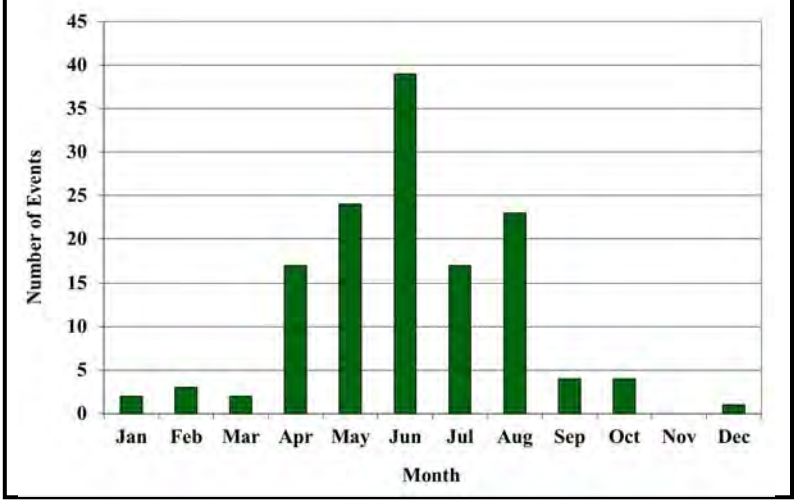
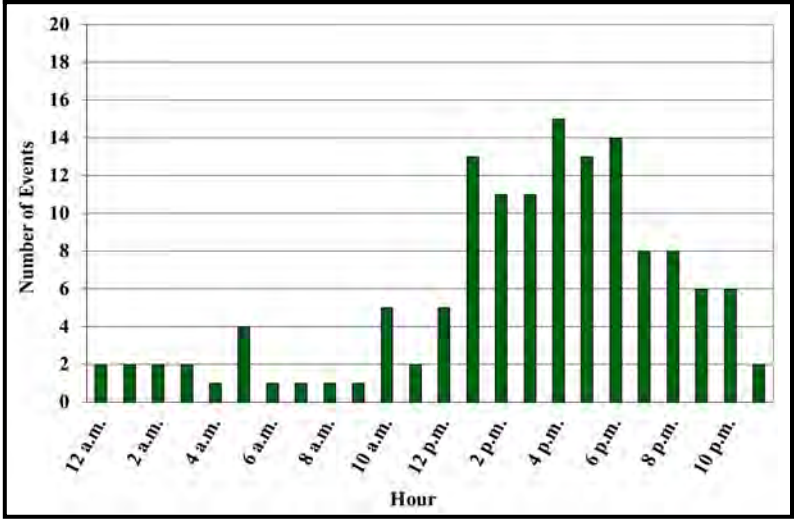


Figure SS-5 charts the reported occurrences of thunderstorms with damaging winds by hour. Of the 136 occurrences, approximately 82% of all thunderstorms with damaging winds occurred during the p.m. hours, with 77 of the events (57%) taking place between 1 p.m. and 7 p.m.

Figure SS-5
Thunderstorms with Damaging Winds by Hour
1973 - 2019



Hail

NOAA's Storm Events Database was used to document 43 reported occurrences of severe storms with hail one (1) inch in diameter or greater in Clay County between 1984 and 2019. Of the 43 occurrences, 24 produced hailstones 1.50 inches or larger in diameter.

The largest hail stones documented in Clay County measured 2.75 inches in diameter (baseball sized) and fell on three occasions: September 9, 1986 in Louisville, May 25, 1989 in Hord, and May 3, 1996 near Xenia. Hail one (1) inch in diameter or greater has been *recorded* in every participating jurisdiction on more than one occasion.

Figure SS-6 charts the reported occurrences of hail by month. Of the 43 occurrences, 35 (76%) took place in April, May, and June making this the peak period for hail in Clay County. Of the 43 events, 12 (28%) occurred during April and 12 (28%) occurred during May, making this the peak months for hail events.

Figure SS-6
Hail Events by Month
1984 - 2019

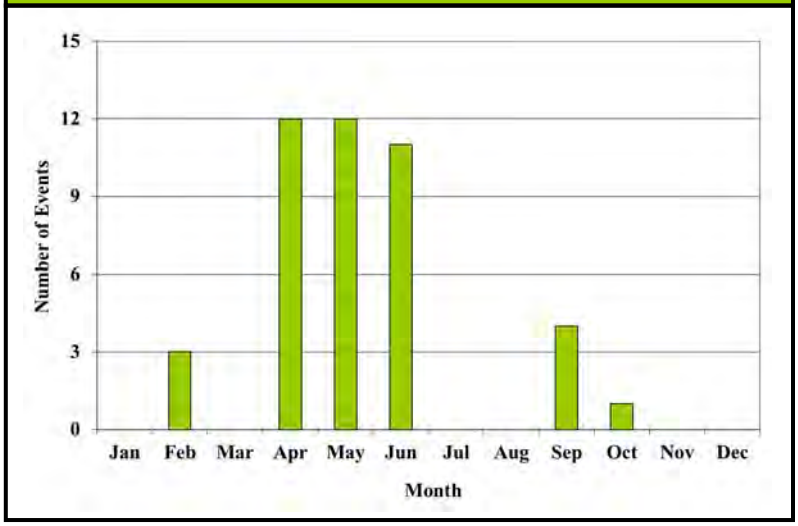
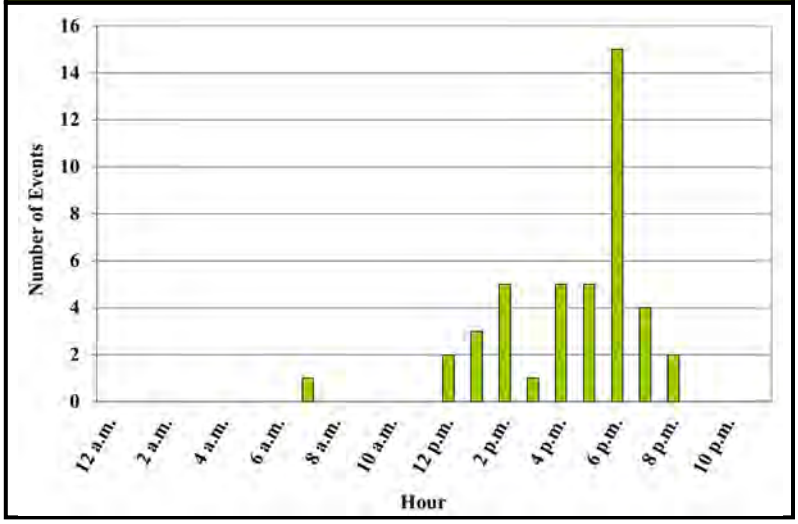


Figure SS-7 charts the reported occurrences of hail by hour. Approximately 98% of all the hail events occurred during the p.m. hours, with 25 of the events (58%) taking place between 4 p.m. and 6 p.m.

Lightning

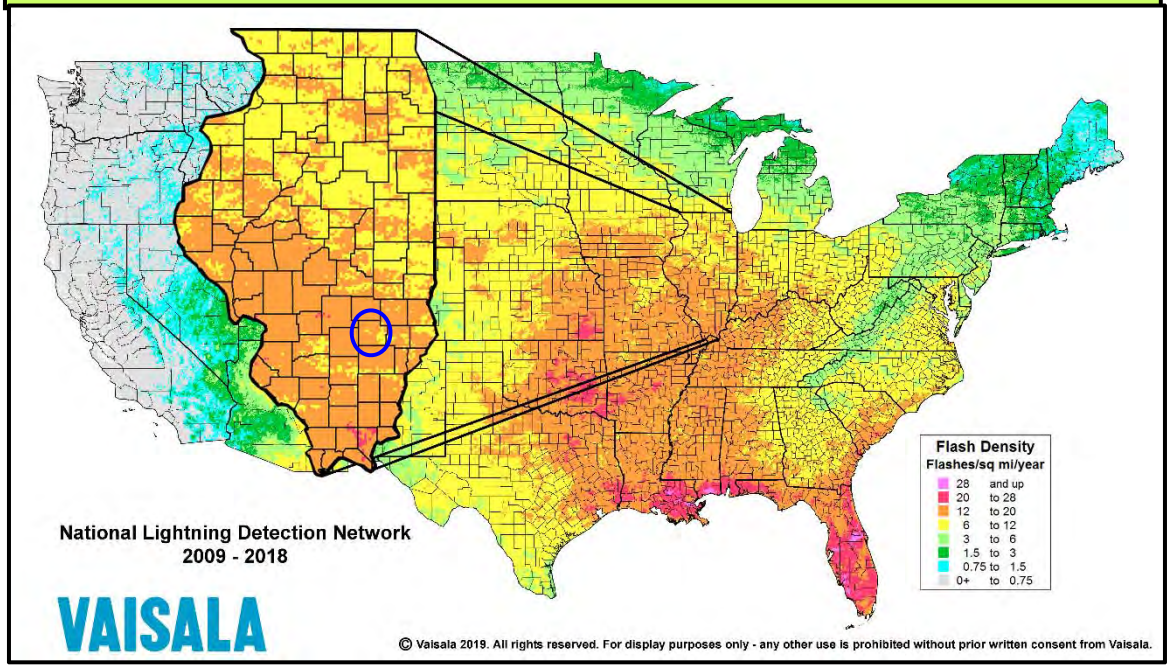
While lightning strike events occur regularly across south central Illinois, NOAA's Storm Events Database only identified five recorded occurrences of lightning strikes in Clay County between 2012 and 2019. This is almost certainly due to the rural nature of the County. Three of the events took place during August while the remaining two events took place in April and May. All of the events occurred during the p.m. hours.

Figure SS-7
Hail Events by Hour
1984 - 2019



According to data from Vaisala's National Lightning Detection Network, Clay County averaged close to 12 to 20 cloud-to-ground lightning flashes per square mile annually between 2009 and 2018. **Figure SS-8** illustrates the cloud-to-ground lightning flash density (number of cloud-to-ground flashes per square mile per year) by county for the continental United States. In comparison, Illinois averaged 12.7 cloud-to-ground lightning flashes per square mile from 2009 to 2018, ranking it eighth in the Country for lightning flash density.

Figure SS-8
Cloud-to-Ground Lightning Flash Density: Continental United States



Heavy Rain

National Weather Service's COOP data records have documented 219 reported occurrences of heavy rain in Clay County between 1990 and 2019. Of the 219 occurrences, 67 events (31%) produced three inches or more of rain.

Figure SS-9 charts the reported occurrences of heavy rain by month. Of the 219 events, 106 (48%) occurred in April, May, June, and July making this the peak period for heavy rains in Clay County. Of the 219 events, 33 (14%) occurred during June, making this the peak month for heavy rains.

Figure SS-9
Heavy Rain Events by Month
1990 - 2019

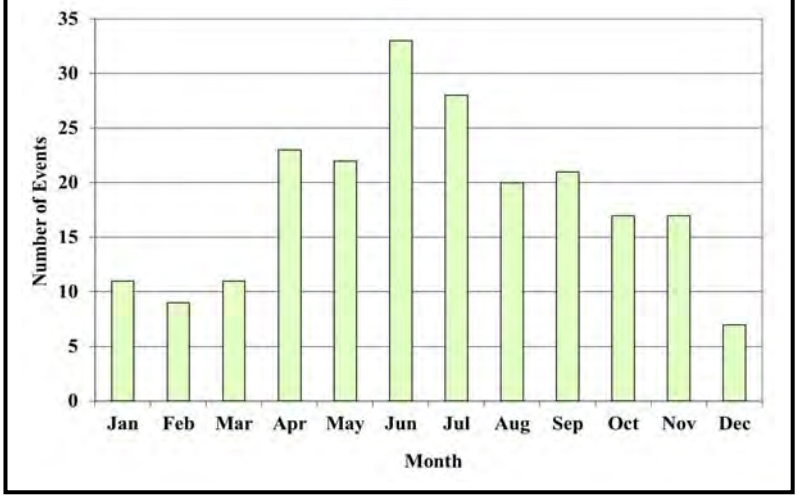
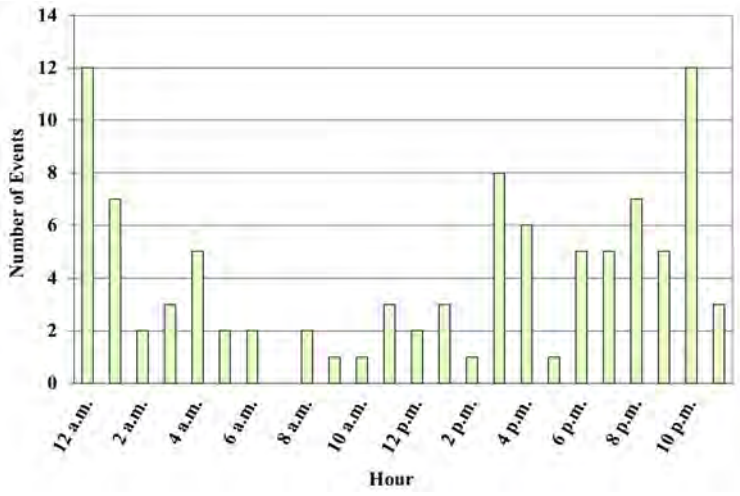


Figure SS-10 charts the reported occurrences of heavy rain by hour. Of the 219 occurrences, start times were unavailable for 121 events. Of the remaining 98 events with recorded times, approximately 59% occurred during the p.m. hours. Thirty-four of the events (35%) took place between 6 p.m. and 11 p.m.

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 *2018 Illinois Natural Hazard Mitigation Plan* prepared by the Illinois Emergency Management Agency (IEMA) classifies Clay County's hazard rating for severe storms as "severe." (IEMA's overall hazard rating system has five levels: very low, low, medium, high and severe.)

Figure SS-10
Heavy Rain Events by Hour
1990 - 2019



What is the probability of future severe storm events occurring?

Thunderstorms with Damaging Winds

Clay County has had 136 verified occurrences of thunderstorms with damaging winds between 1973 and 2019. With 136 occurrences over the past 47 years, Clay County should expect to experience approximately three thunderstorms with damaging winds each year. There were 19 years over the last 47 years where multiple (three or more) thunderstorms with damaging winds occurred. This indicates that the probability that multiple thunderstorms with damaging winds may occur during any given year within the County is 40%.

Hail

There have been 43 verified occurrences of hail one (1) inch in diameter or greater between 1984 and 2019. With 43 occurrences over the past 36 years, Clay County should expect to experience approximately at least one severe storm with hail each year. There were 12 years over the last 36 years where two or more hail events occurred. This indicates that the probability that more than one severe storm with hail may occur during any given year within the County is 33%.

Heavy Rain

Clay County has had 219 reported occurrences of heavy rain between 1990 and 2019. With 219 occurrences over the past 30 years, Clay County should expect to experience at least seven heavy rain events each year.

HAZARD VULNERABILITY

The following describes the vulnerability to participating jurisdictions, identifies the impacts on public health and property (if known) and estimates the potential impacts on public health and safety as well as buildings, infrastructure and critical facilities from severe storms.

Are the participating jurisdictions vulnerable to severe storms?

Yes. All of Clay 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 south central Illinois. Since 2010, Clay County has recorded 67 thunderstorms with damaging winds, 67 heavy rain events, 17 severe storms with hail one (1) inch in diameter or greater and five verified lightning strikes.

Figure SS-11 details the number thunderstorms with damaging winds and hail events that were recorded in or near each participating municipality while **Figure SS-12** details the number of thunderstorms with damaging winds and hail events that were recorded in or near unincorporated areas of Clay County. Three of the five lightning strikes recorded occurred in Flora.

Of the participating municipalities, Flora has had more recorded occurrences of thunderstorms with damaging winds and the greatest number of recorded hail events than any of the other municipalities. The difference in the number of recorded events may be due in part to the size of the municipalities as well as the fact that an active, long-term NWS COOP Observation Station is located in the Flora area.

Figure SS-11
Verified Severe Storm Events by Participating Municipality

Participating Municipality	Number of Events	
	Thunderstorm & High Wind	Severe Hail
Clay City	17	7
Flora	73	10
Louisville	17	7
Xenia	23	6

Figure SS-12
Verified Severe Storm Events in Unincorporated Clay County

Unincorporated Area	Number of Events	
	Thunderstorm & High Wind	Severe Hail
Bible Grove	4	2
Camp Travis	1	6
Hord	5	2
Ingraham	5	2
Kenner	5	2
Oskaloosa	2	0
Wendelin	2	0

Do Any of the participating jurisdictions consider severe storms to be among their community's greatest vulnerabilities?

Yes. Based on responses to a Critical Facilities Vulnerability Survey distributed to the participating jurisdictions, the following respondents considered severe storms to be among their jurisdiction's greatest vulnerabilities.

- *Clay City*: The water town communications array has been struck by lightning, damaging equipment.
- *Flora*: Heavy rains cause flooding that blocks roadways and entrance to Hospital.

- *Xenia*: Traffic has been hampered by heavy rains on the main road through the Village and caused flooding in low areas. Lightning has damaged the control panels and radio at water tower.
- *Clay County*: Damaging winds have taken out power, disrupting traffic (stop lights), the major industries in Flora and assisted living facilities.
- *Flora CUSD #35*: Our communication/technology is vulnerable to lightning strikes. Over the last couple of years the District has suffered damage to various facilities.
- *North Clay CUSD #25*: Lightning strikes to school buildings have affected technologyt needed to educate students.

What impacts resulted from the recorded severe storms?

Severe storms as a whole have caused an estimated $2.9 million in recorded property damages. The following provides a breakdown of impacts by category.

Thunderstorms with Damaging Winds

Data obtained from NOAA's Storm Events Database indicates that between 1973 and 2019, 80 of the 136 thunderstorms with damaging winds caused $2,550,250 in property damages and $2,500 in crop damages. Damage information was either unavailable or none was recorded for the remaining 56 reported occurrences.

NOAA's Storm Events Database documented seven injuries as the result of three separate thunderstorm with damaging wind events. The following provides a brief description of each event.

- On May 30, 2004, three people sustained minor injuries when a thunderstorm turned over several mobile homes and trailers.
- On June 13, 2011, three people sustained injuries when a thunderstorm blew a tree down onto their car.
- On July 13, 2016, a person was injured when their mobile home was blown over and destroyed.

Severe Storms Fast Facts – Impacts/Risk

Thunderstorms with Damaging Winds Impacts:
- Total Property Damage (80 events): ***$2,550,250***
- Total Crop Damage (1 event): ***$2,500***
- Injuries (3 events): ***7***
- Fatalities: ***n/a***

Severe Hail Impacts:
- Total Property Damage (4 events): ***$258,550***
- Total Crop Damage (2 events): ***$24,050***
- Injuries: ***n/a***
- Fatalities: ***n/a***

Lightning Strike Impacts:
- Total Property Damage (5 events): ***$160,000***
- Total Crop Damage: ***n/a***
- Injuries: ***n/a***
- Fatalities: ***n/a***

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

Hail

Data obtained from NOAA's Storm Events Database indicates that between 1984 and 2019, six of the 43 hail events caused $258,550 in property damages and $24,050 in crop damages. Damage information was either unavailable or none was recorded for the remaining 38 reported occurrences.

No injuries or fatalities were reported as a result of any of the recorded hail events.

Lightning
Data obtained from NOAA's Storm Events Database indicates that between 2012 and 2019, five lightning strike events caused $160,000 in property damage. No injuries or fatalities were reported as the result of any of the lightning strike events.

What other impacts can result from severe storms?
In Clay County, the greatest risk to health and safety from severe storms is vehicle accidents. Hazardous driving conditions resulting from severe storms (i.e., wet pavement, poor visibility, high winds, etc.) can contribute to accidents that result in injuries and fatalities. Traffic accident data assembled by the Illinois Department of Transportation from 2013 through 2017 indicates that wet road surface conditions were present for 8.3% to 14.7% of all crashes recorded annually in the County.

While other circumstances cause wet road surface conditions (i.e., melting snow, condensation, light showers, etc.), law enforcement officials agree that hazardous driving conditions caused by severe storms add to the number of crashes. **Figure SS-13** provides a breakdown by year of the number of crashes and corresponding injuries and fatalities that occurred when wet road surface conditions were present.

Figure SS-13
Severe Weather Crash Data for Clay County

Year	Total # of Crashes	Presence of Wet Road Surface Conditions		
		# of Crashes	# of Injuries	# of Fatalities
2013	285	39	10	0
2014	266	32	5	0
2015	273	40	6	0
2016	216	23	7	0
2017	218	18	6	2
Total:	**1,258**	**152**	**34**	**2**

Source: Illinois Department of Transportation.

What is the level of risk/vulnerability to public health and safety from severe storms?
For Clay County the level of risk or vulnerability posed by severe storms to public health and safety is considered to be ***low***. This assessment is based on the fact that despite their relative frequency, the number of injuries and fatalities is low. In addition, Clay County Hospital in Flora as well as hospitals in the region are equipped to provide care to persons injured during a severe storm.

Are existing buildings, infrastructure and critical facilities vulnerable to severe storms?
Yes. All existing buildings, infrastructure and critical facilities located in Clay County and the participating jurisdictions are vulnerable to damage from severe storms. Structural damage to buildings is a relatively common occurrence with severe storms. Damage to roofs, siding, awnings and windows can occur from hail, flying and falling debris and high winds. Lightning strikes can damage electrical components and equipment (i.e., appliances, computers etc.) and can cause fires

that consume buildings. If the roof is compromised or windows are broken, rain can cause additional damage to the structure and contents of a building.

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

The damage inflicted by severe storms often leads to disruptions in communication and creates power outages. Depending on the damage, it can take anywhere from several hours to several days to restore service. Power outages and disruptions in communications can impair vital services, particularly when backup power generators are not available.

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 Clay County, the amount of property damage previously reported and the potential for disruptions to power distribution and communication; the risk or vulnerability to buildings, infrastructure and critical facilities from severe storms is ***medium to high***.

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

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

In addition, infrastructure such as new communication and power lines will continue to be vulnerable to severe storms as long as they are located above ground. High winds, lightning and flying and falling debris can disrupt power and communication. Steps to bury all new lines would eliminate the vulnerability, but this action would be cost prohibitive in most areas.

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

Unlike other natural hazards, such as tornadoes, there are no standard loss estimation models or methodologies for severe storms. With only 89 of the 403 recorded events listing property damage numbers for all categories of severe storms, there is no way to accurately estimate future potential dollar losses. Since all existing structures within Clay County are vulnerable to damage, it is highly probable that there will be future dollar losses from severe storms.

3.2 SEVERE WINTER STORMS & EXTREME COLD

HAZARD IDENTIFICATION

What is the definition of a severe winter storm?

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

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

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

What is snow?

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

What is sleet?

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

What is freezing rain?

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

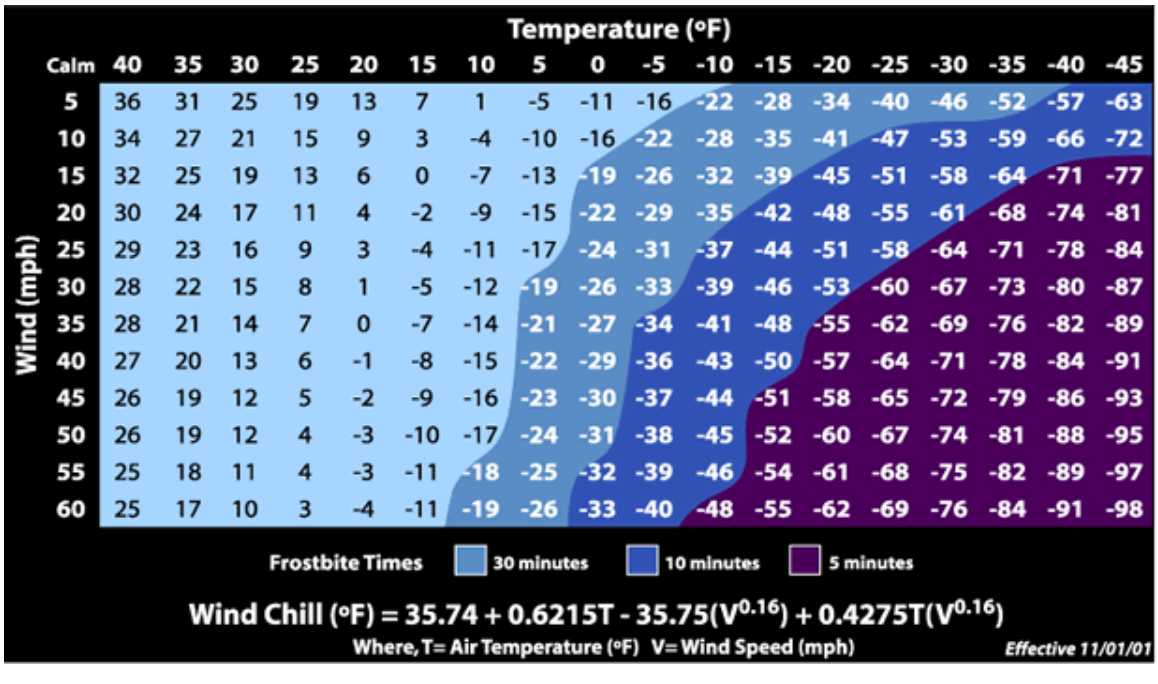
this melting fall through another thin layer of freezing air just above the surface they become "supercooled", but they do not have time to refreeze before reaching the ground. However, because the rain drops are "supercooled", they instantly refreeze upon contact with anything that is at or below 32°F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

What is wind chill?

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

The unit of measurement used to describe the wind chill factor is known as the wind chill temperature. The wind chill temperature is calculated using a formula. **Figure SWS-1** identifies the formula and calculates the wind chill temperatures for certain air temperatures and wind speeds.

Figure SWS-1
Wind Chill Chart



Source: NOAA, National Weather Service.

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

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

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

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

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

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

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

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

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

Are alerts issued for severe winter storms?

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

- **Watch.** The following watches are issued in advance of a storm and indicate the potential for significant winter weather within the next day or two.
  - **Winter Storm Watch**. A winter storm watch is issued when conditions are favorable for the development of a hazardous winter weather event which has the potential to threaten life or property.

- **Blizzard Watch**. A blizzard watch is issued when conditions are favorable for the development of blizzard conditions:
  - sustained winds or at least 35 mph and
  - reduced visibility of ¼ mile or less.

- **Advisories.** Winter advisories are issued for winter weather events that pose a significant inconvenience, especially to motorist, but should not be life-threatening if caution is exercised. The following advisories are generally issued 12 to 36 hours prior to an event.
  - **Freezing Rain Advisory.** A freezing rain advisory is issued when ice accumulations of up to ¼ inch are expected.
  - **Winter Weather Advisory.** A winter weather advisory is issued for one or more of the following:
    - snow accumulations of 3 to 5 inches in 12 hours or less;
    - sleet accumulations up to ¼ inch;
    - freezing rain in combination with sleet and/or snow; or
    - blowing and/or drifting snow.
  - **Wind Chill Advisory.** A wind chill advisory is issued when wind chill values are expected to be between -15°F and -24°F.

- **Warnings.** The following winter weather warnings are issued when severe winter weather conditions are expected to cause a significant impact to life or property and make travel difficult to impossible. Individuals are advised to avoid travel and stay indoors.
  - **Blizzard Warning.** A blizzard warning is issued when reduced visibility of less than ¼ mile due to falling and/or blowing snow and strong winds of at least 35 mph or greater are expected for at least three hours.
  - **Ice Storm Warning.** An ice storm warning is issued when ice accumulations of ¼ inch or greater are expected, resulting in hazardous travel conditions, tree damage and extended power outages.
  - **Winter Storm Warning.** A winter storm warning is issued when there is one or more of the following expected:
    - heavy snow accumulations of at least 6 inches in 12 hours or at least 8 inches in 24 hours; or
    - sleet accumulations of at least ½ inch.
  - **Wind Chill Warning.** A wind chill warning is issued when wind chill values are expected to be -25°F or below.

HAZARD PROFILE

The following identifies past occurrences of severe winter storms and extreme cold; details the severity or extent of each event (if known); identifies the locations potentially affected; and estimates the likelihood of future occurrences.

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

Tables 5 and **6**, located in **Appendix J**, summarize the previous occurrences as well as the extent or magnitude of severe winter storms (snow & ice) and extreme cold events recorded in Clay County.

Severe Winter Storms

NOAA's Storm Events Database and NWS's COOP Data records were used to document 79 reported occurrences of severe winter storms (snow, ice and/or a combination of both) in Clay County between 1950 and 2019. Of the 79 recorded occurrences there were:

- 49 heavy snow storms or blizzards;
- 25 combination events (freezing rain, sleet, ice and/or snow); and
- 5 ice or sleet storms.

Severe Winter Storm Fast Facts – Occurrences

Number of Severe Winter Storm Events Reported (1950 - 2019): ***79***

Number of Extreme Cold Events Reported (1996 - 2019): ***3***

Maximum 24-Hour Snow Accumulation: ***12.0 inches (January 14 & 15, 1918)***

Coldest Temperature Recorded in the County: ***-25°F (January 27, 1904 & February 20, 1982)***

Most Likely Month for Severe Winter Storms to Occur: ***January***

Most Likely Time for Severe Winter Storms to Occur: ***Early Morning***

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

Figure SWS-2 charts the reported occurrences of severe winter storms by month. Of the 79 events, 63 (80%) took place in December, January, and February. Of the 79 events, 25 (32%) occurred during January, making this the peak month for severe winter storms. There was one event that spanned two months; however, for illustration purposes only the month when the event started is graphed.

Figure SWS-2
Severe Winter Storms by Month
1950 - 2019

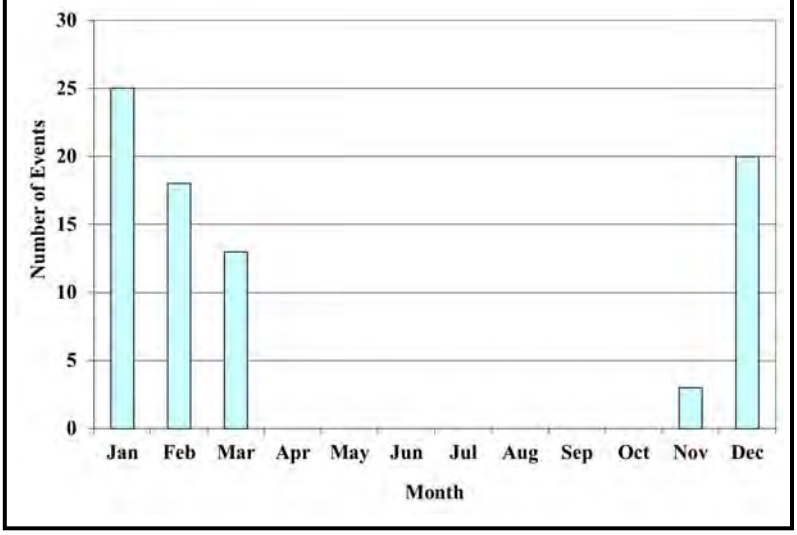
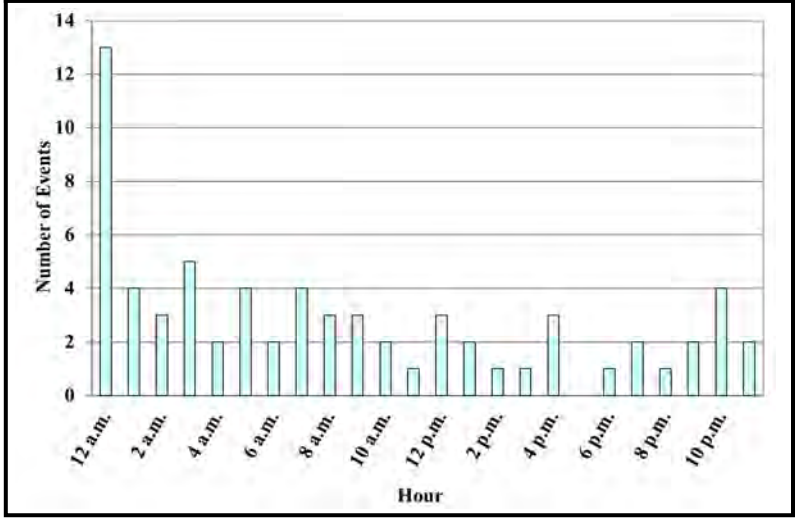


Figure SWS-3 charts the reported occurrences of severe winter storms by hour. Of the 79 occurrences, start times were unavailable for 11 events. Of the remaining 68 severe winter storm events with recorded times, approximately 68% began during the a.m. hours, with 25 (37%) beginning between 12 a.m. and 4 a.m.

Figure SWS-3
Severe Winter Storms by Hour
1950 - 2019



According to the NWS's COOP data records, the maximum 24-hour snow accumulation in Clay County is 12.0 inches, which occurred on January 14 and 15, 1918 at Flora.

Extreme Cold

While extreme cold events occur on a fairly regular basis across south central Illinois, NOAA's Storm Events Database has only three *recorded* occurrences of extreme cold (dangerously low temperatures and wind chill values) in Clay County between 1996 to 2019. These represent the ***reported occurrences*** of extreme cold. The NWS acknowledges that extreme cold events are not well recorded. Only those events with impacts are reported. As a result, extreme cold events often go unreported and therefore, more events have almost certainly occurred than are documented in this section.

Two of the three events (67%) took place in January, making this the peak month for extreme cold events. The remaining event took place in February. All the extreme cold events began during the a.m. hours.

According to the Midwestern Regional Climate Center, almost continuous temperature records for Clay County have been kept from 1893 to 2009 by the Flora NWS COOP Observer Station.

Based on the available records, the coldest temperature recorded in Clay County was -25°F on two dates, January 27, 1904 and February 20, 1982. **Figure SWS-4** lists the coldest days recorded at the Flora observation station.

Figure SWS-4
Coldest Days Recorded at Flora Observation Station

	Date	Temperature		Date	Temperature
1	1/27/1904	-25°F	7	12/22/1989	-21°F
2	2/10/1982	-25°F	8	2/10/1899	-20°F
3	1/19/1994	-24°F	9	1/12/1918	-20°F
4	1/7/1912	-23°F	10	2/13/1905	-19°F
5	1/17/1977	-22°F	11	1/18/1930	-19°F
6	2/9/1899	-21°F	12	1/18/1994	-19°F

Source: Midwest Regional Climate Center cli-MATE

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

Severe winter storms and extreme cold affect the entire County. All communities in Clay County have been affected by severe winter storms and extreme cold. Severe winter storms and extreme cold generally extend across the entire County and affect multiple locations. The *2018 Illinois Natural Hazard Mitigation Plan* prepared by IEMA classifies Clay County's hazard rating for severe winter storms as "high."

Do any of the participating jurisdictions have designated warming centers?

Yes. All of the participating municipalities and the Clay County Hospital have designated warming centers. A "designated" warming center is identified as any facility that has been *formally* identified by the juridiction (through emergency planning, resolution, Memorandum of Agreement, etc.) as a location available for use by residents during severe winter storms and extreme cold events. **Figure SWS-5** identifies the location of each warming center by jurisdiction. In addition to those designated warming centers identified by the participating jurisdictions, the Illinois Department of Human Services office located in Louisville also serves as warming center.

Figure SWS-5
Designated Warming Centers by Participating Jurisdiction

Name/Address	Name/Address
Clay City	*Louisville*
Clay City Community Bldg., 237 S. 2nd St., SE	K1 Building, 211 Lynn St.
Clay County Hospital	Community Center Building, 165 Broadway
Clay County Hospital, 911 Stacy Burke Drive, Flora	*Xenia*
Flora	Xenia Fire House, 108 North St.
First Christian Church, 100 W. 4th St.	Methodist Church, 102 3rd St.
Community of Christ Church, 751 Shadwell St.	Xenia Comm. Center, 601 Church St.
Flora High School, 600 S. Locust	

What is the probability of future severe winter storms occurring?

Severe Winter Storms

Clay County has had 79 verified occurrences of severe winter storms between 1950 and 2019. With 79 occurrences over the past 70 years, Clay County should expect at least one severe winter

storm each year. There were 24 years over the past 70 years where two or more severe winter storms occurred. This indicates the probability that more than one severe winter storm may occur during any given year within the County is 34%.

Extreme Cold Events

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

HAZARD VULNERABILITY

The following describes the vulnerability to participating jurisdictions, identifies the impacts on public health and property (if known) and estimates the potential impacts on public health and safety as well as buildings, infrastructure and critical facilities from severe winter storms and extreme cold.

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

Yes. All of Clay County, including the participating jurisdictions, is vulnerable to the dangers presented by severe winter storms and extreme cold. Severe winter storms are among the more frequently occurring natural hazards in Illinois. Since 2010, Clay County has experienced 15 severe winter storms and one extreme cold event.

Severe winter storms have immobilized portions of the County, blocking roads; downing power lines, trees and branches; causing power outages and property damage; and contributing to vehicle accidents. In addition, the County and participating jurisdictions must budget for snow removal and de-icing of roads and bridges as well as for roadway repairs.

Do Any of the participating jurisdictions consider severe winter storms to be among their community's greatest vulnerabilities?

Yes. Based on responses to a Critical Facilities Vulnerability Survey distributed to the participating jurisdictions, the North Clay CUSD #25 considers severe winter storms to be among its greatest vulnerabilities. Heavy snow accumulations and limited means of removal in the County make it difficult to return the community to regular life in a short period of time.

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

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

Severe Winter Storms

Data obtained from NOAA's Storm Events Database and Planning Committee member records indicates that between 1950 and 2019, one of the 79 severe winter storms caused $800,000 in property damages. Property damage information was either unavailable or none was recorded for the remaining 78 reported occurrences.

In comparison, the State of Illinois has averaged $102 million annually in winter storm losses according to the Illinois State Water Survey's Climate Atlas of Illinois, ranking winter storms

second only to flooding in terms of economic loss in the State. 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.

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

Severe Winter Storm (Snow & Ice) Impacts:
- Total Property Damage (1 event): ***$800,000***
- Injuries (1 event): ***1***
- Fatalities (2 events): ***2***

Extreme Cold Impacts:
- Total Property Damage: ***n/a***
- Injuries: ***n/a***
- Fatalities: ***n/a***

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

NOAA's Storm Events Database documented one injury and two fatalities as a result of three separate severe winter storms. Detailed information on the injuries and fatalities sustained were only available for the two fatalities. The following provides a brief description of each event.

- During the December 8, 2008 winter storm, an individual died in an automobile accident as a result of the slick road conditions.
- During the December 16 & 17, 2016 winter storm, an individual died in an automobile accident as a result of slick bridge conditions.

Extreme Cold

Damage information was either unavailable or none was recorded for any of the three reported extreme cold events between 1996 and 2019. No injuries or fatalities were reported as a result of any of the recorded extreme cold events either.

In comparison, the State of Illinois averages 18 cold-related fatalities annually according to the Illinois State Water Survey's Climate Atlas of Illinois.

What other impacts can result from severe winter storms?

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

Traffic accident data assembled by the Illinois Department of Transportation from 2013 through 2017 indicates that treacherous road conditions caused by snow/slush and ice were present for 0.5% to 12.3% of all crashes recorded annually in the County. **Figure SWS-6** provides a breakdown by year of the number of crashes and corresponding injuries and fatalities that occurred when treacherous road conditions caused by snow and ice were present.

Persons who are outdoors during and immediately following severe winter storms and extreme cold events can experience other health and safety problems. Frostbite to hands, feet, ears and nose and hypothermia are common injuries. Treacherous walking conditions also lead to falls which can result in serious injuries, including fractures and broken bones, especially in the elderly.

Over exertion from shoveling driveways and walks can lead to life-threatening conditions such as heart attacks in middle-aged and older adults who are susceptible.

Figure SWS-6
Severe Winter Weather Crash Data for Clay County

Year	Total # of Crashes	Presence of Treacherous Road Conditions caused by Snow/slush and Ice		
		# of Crashes	# of Injuries	# of Fatalities
2013	285	13	0	0
2014	266	30	10	0
2015	273	10	2	0
2016	216	9	5	1
2017	218	1	0	0
Total:	**1,258**	**63**	**17**	**1**

Source: Illinois Department of Transportation.

What is the level of risk/vulnerability to public health and safety from severe winter storms and extreme cold?

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

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

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

Based on the frequency with which severe winter storms and extreme cold events have occurred in Clay County; the damages described; 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***.

Winter Storm

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

In addition to affecting communication and power lines, snow and ice accumulations on state and local roads hampers travel and can cause dangerous driving conditions. Blowing and drifting snow can lead to road closures and increases the risk of automobile accidents. Even small accumulations

of ice can be extremely dangerous to motorists since bridges and overpasses freeze before other surfaces.

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

Extreme Cold

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

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

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

In addition, infrastructure such as new communication and power lines will continue to be vulnerable to severe winter storms, especially to ice accumulations, as long as they are located above ground. Rural areas of Clay County have experienced extended periods without power due to severe winter storms. Steps to bury all new lines would eliminate the vulnerability, but this action would be cost prohibitive in most areas. In terms of new roads and bridges, there is very little that can be done to reduce or eliminate their vulnerability to severe winter storms.

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

Unlike other natural hazards, such as tornadoes, there are no standard loss estimation models or methodologies for severe winter storms and extreme cold events. With only one of the 82 recorded events listing property damage numbers for severe winter storms and extreme cold, there is no way to accurately estimate future potential dollar losses. Since all existing structures within Clay County are vulnerable to damage, it is likely that there will be future dollar losses from severe winter storms and extreme cold.

3.3 FLOODS

HAZARD IDENTIFICATION

What is the definition of a flood?

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

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

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

What types of flooding occur in the County?

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

General Flooding – Riverine Flooding

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

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

General Flooding – Shallow Flooding

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

Flash Floods

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

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

What is a base flood?

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

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

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

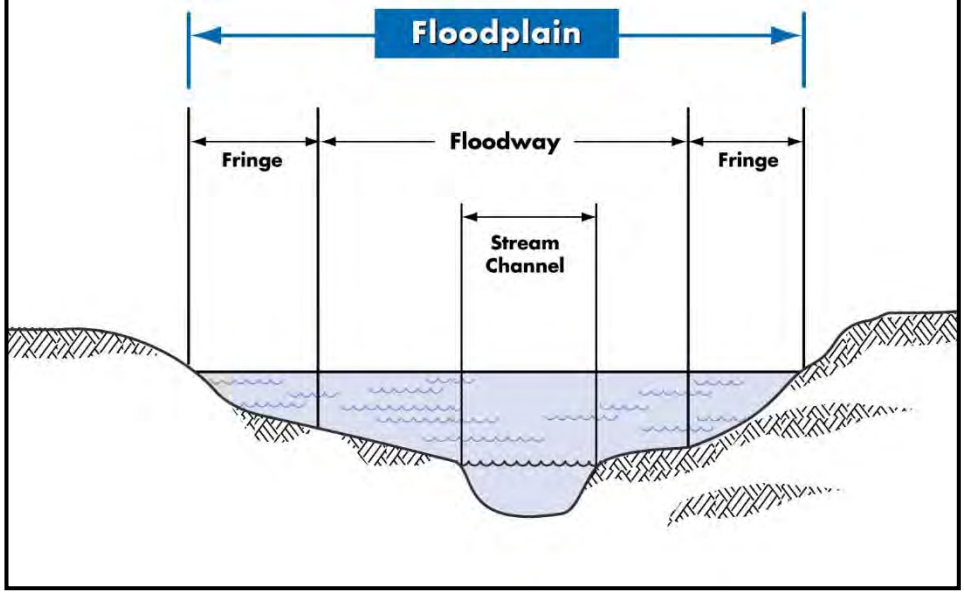
What is a floodplain?

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

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

A base floodplain is divided into two parts: the floodway and the flood fringe. **Figure F-1** illustrates the various components of a base floodplain.

Figure F-1
Floodplain Illustration



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

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

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

What is a Special Flood Hazard Area?

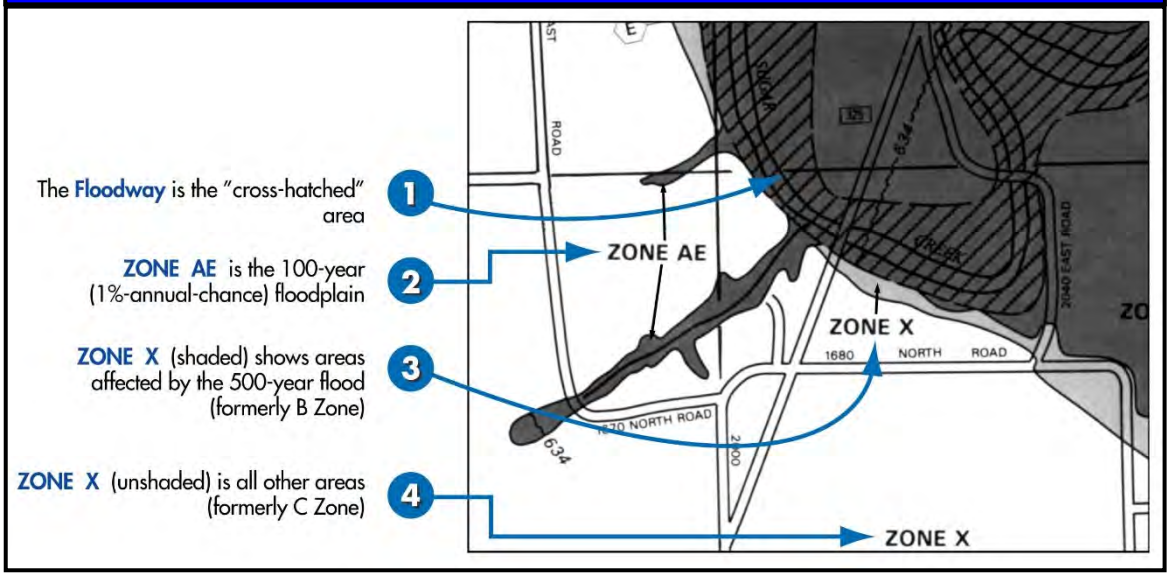
A Special Flood Hazard Area (SFHA) is the base floodplain. As discussed previously, this is the land area that is covered by the floodwaters of the base flood and has a 1% chance of flooding in any given year. The term SFHA is most commonly used when referring to the based floodplain on the Flood Insurance Rate Maps (FIRM) produced by FEMA. The SFHA is the area where floodplain regulations must be enforced by a community as a condition of participation in the NFIP and the area where mandatory flood insurance purchase requirements apply. SFHA are delineated

on the FIRMs and may be designated as Zones A, AE, A1-30, AO, AH, AR, and A99 depending on the amount of flood data available, the severity of the flood hazard or the age of the flood map.

What are Flood Insurance Rate Maps?

Flood Insurance Rate Maps (FIRMs) are maps that identify both the SFHA and the risk premium zones applicable to a community. These maps are produced by FEMA in association with the NFIP for floodplain management and insurance purposes. Digital versions of these maps are referred to as DFIRMs. **Figure F-2** shows an example of a FIRM.

Figure F-2
Example of a Flood Insurance Rate Map (FIRM)



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

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

What are flood zones?

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

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

During a 30-year period, the length of many mortgages, there is at least a 1 in 4 chance that flooding will occur in a SFHA. The purchase of flood insurance is mandatory for all buildings in SFHAs receiving federal or federally-related financial assistance.

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

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

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

What is a Repetitive Loss Structure or Property?

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

Currently, repetitive loss properties make up about 2% of all NFIP policies, and account for approximately $9 billion in claims or approximately 16% of the total claims paid over the history of the Program. These structures not only increase the NFIP's annual losses, they drain funds needed to prepare for catastrophic events. As a result, FEMA and the NFIP are working with states and local governments to mitigate these properties.

What is floodplain management?

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

What is the National Flood Insurance Program?

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

- mitigates future flood losses nationwide through community-enforced building and zoning ordinances; and

- provides access to affordable, federally-backed insurance protection against losses from flooding to property owners in participating communities.

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

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

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

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

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

What is the NFIP's Community Rating System?

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

Are alerts issued for flooding?

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

- **Flood Watches.** A flood watch is issued when flooding or flash flooding is possible. It does not mean that flooding will occur, just that conditions are favorable. Individuals need to be prepared.
- **Flood Advisories.** A flood advisory is issued when flooding may cause significant inconvenience but is not expected to be to pose an immediate threat to life and/or property. Individuals need to be aware.
- **Warnings.** Warnings indicate a serious threat to life and/or property.
  - **Flood Warning**. A flood warning is issued when flooding is occurring or will occur soon and is expected to last for several days or weeks.
  - **Flash Flood Warning.** A flash flood warning is issued when flash flooding is occurring or is imminent. Flash flooding occurs very quickly so individuals are advised to take action immediately.

HAZARD PROFILE

The following identifies past occurrences of floods; details the severity or extent of each event (if known); identifies the locations potentially affected; and estimates the likelihood of future occurrences.

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

Tables 7 and **8** located in **Appendix J**, summarize the previous occurrences as well as the extent or magnitude of flood events recorded in Clay County. The flood events are separated into two categories: general floods (riverine and shallow/overland) and flash floods.

General Floods

NOAA's Storm Events Database, NOAA's Storm Data Publications, NWS's River Observations and the U.S. Army Corps of Engineers' river gauge data have documented 29 occurrences of general flooding in Clay County between 1990 and 2019. Included in the 29 general flood events one event that contributed to a federally-declared disaster for Clay County.

Flash Floods

NOAA's Storm Events Database documented 43 reported occurrences of flash flooding in Clay County between 1999 and 2019. Included in the 43 flash flood events are three events that contributed to one federally-declared disasters in Clay County. ***One declared disaster, Declaration #1416, included both flash flood and general flood events.***

Flood Fast Facts – Occurrences

Number of General Floods Reported (1990 – 2019): ***29***

Number of Flash Floods Reported (1999 – 2018): ***43***

Most Likely Month for General Floods to Occur: ***January, April, or May***

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

Most Likely Time for Flash Floods to Occur: ***Afternoon/Evening***

Number of Federal Disaster Declarations Related to General and Flash Flooding: ***1***

Figure F-3 charts the reported occurrences of flooding by month. Of the 29 general flood events, 25 (86%) began in January, February, March, April, May, and June making this the peak period for general floods in Clay County. Of those 29 events, the months of January, April, and May had five events each (17%/month) with 52% of the general flood events happening during these months making these the peak months for general flooding. There were six events that spanned two or more months; however, for illustration purposes only the month the event started in is graphed.

In comparison, 31 of the 43 flash flood events (72%) took place between May, June and July making this the peak period for flash floods. Of the 43 events, 13 (30%) occurred in June making this the peak month for flash flooding.

Figure F-3
Flood Events by Month

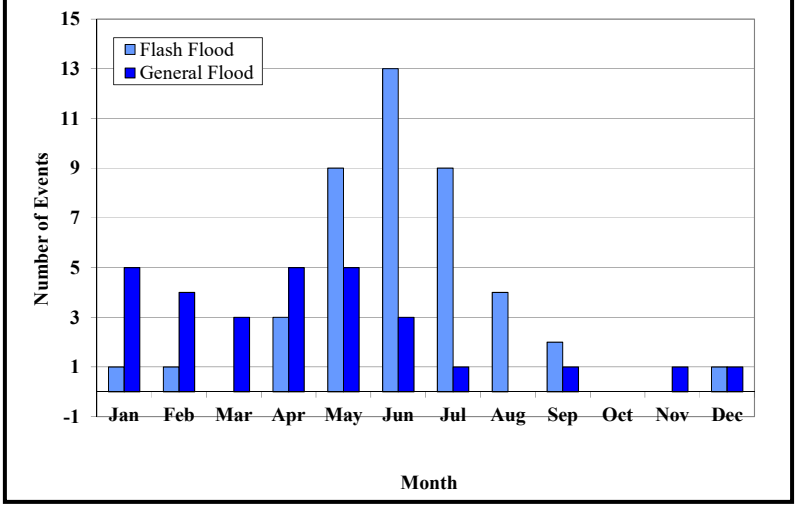
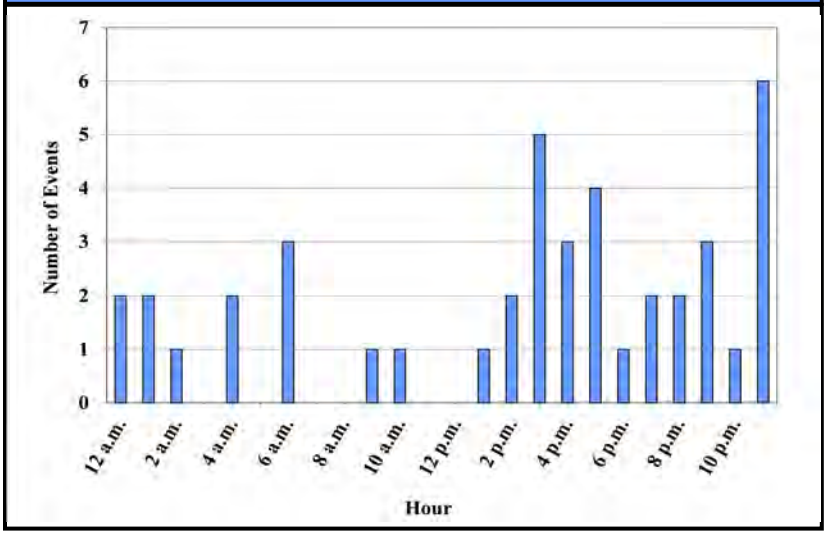


Figure F-4 charts the reported occurrences of flash flood events by hour. Approximately 70% of the 43 flash flood events began during the p.m. hours, with 14 of the events (33%) taking place between 2 p.m. and 5 p.m. In comparison 44% of general flood events with recorded times began during the p.m. hours.

Figure F-4
Flash Flood Events by Hour



What locations are affected by floods?

While specific locations are affected by general flooding, most areas of the County can be impacted by overland and flash flooding because of the topography and seasonally high-water table of the area. In Clay County approximately 12.0% of the area in County is designated as being within the base floodplain and susceptible to riverine floods. The *2018 Illinois Natural Hazard Mitigation Plan* classifies Clay County's hazard rating for floods as "medium."

FIRMs have only been developed for only two of the participating jurisdictions within Clay County. Clay City's map became effective in January 18, 1984 while Flora's maps became effective August 5, 1985. Copies of the FIRMs are located in **Appendix K**. While FIRMs have not been developed for the County, Flood Hazard Boundary Maps (FHBMs) were developed in 1980 and became effective on May 29, 1981. Copies of the County FHBMs are located in **Appendix K.**

No other FIRMs or FHBMs have been developed for any of the municipalities in Clay County. According to the Illinois State Water Survey's Countywide Digital FIRM Status Map updates the FIRMs are in progress.

Figure F-5 identifies the bodies of water within or immediately adjacent to participating jurisdictions that are known to cause flooding or have the potential to flood. Water bodies with Special Flood Hazard Areas are identified in bold.

Municipal and County officials have reported overland flood issues outside of the base floodplain in most of the participating municipalities and many unincorporated portions of the County. This overland flooding is known to impair travel.

Figure F-5 Bodies of Water Subject to Flooding in Clay County	
Participating Jurisdiction	**Water Bodies**
Clay City	**Little Wabash River Intermittent Tributary**
Flora	Elm Creek Tributary, Seminary Creek
Louisville	**Little Wabash River**
Xenia	---
Clay County (Unincorporated)	**Bear Creek, Big Muddy Creek**, Brush Creek, **Buck Creek**, Conners Branch, Cottonwood Creek, **Crooked Creek, Dismal Creek**, East Fork, **Elm Creek, Flat Branch Creek**, Ging Lake, Greendale Lake, **Grove Creek, Hurricane Creek, Indian Creek**, Limestone Creek, **, Little Muddy Creek,** Little Panther Creek, **Little Wabash River, Lucas Creek**, McArthur Lake, Nickolson Creek, **Panther Creek**, Patterson Lake, Pickle Creek, **Raccoon Creek**, Second Creek, Seminary Creek, **Skillet Fork,** Spring Branch, **Sugar Creek, Sutton Creek,** Sycamore Creek, Trago Lake, **Weather Creek**, West Fork, **Wet Weather Creek,**

Source: FEMA FIRMs/FHBMs.

What jurisdictions within the County take part in the NFIP?

Clay City and Flora both participate in the NFIP. **Figure F-6** provides information on each NFIP-participating jurisdiction, including the date each participant joined, the date of their current effective FIRM and the year of their most recently adopted floodplain zoning ordinance.

Figure F-6 NFIP Participating Jurisdictions				
Participating Jurisdictions	**Participation Date**	**Current Effective FIRM Date**	**CRS Participation**	**Most Recently Adopted Floodplain Zoning Ordinance**
Clay City	1/18/1984	1/18/1984	No	1984
Flora	8/5/1985	8/5/1985	No	1985

Sources: FEMA, Community Status Book Report: Illinois.

The Iola, Louisville, Sailor Springs and Xenia have no identified flood hazard boundaries within their corporate limits and are not required to participate in the NFIP. While the current effective FHBMs for Clay County identify SFHAs within its limits, the County has not adopted floodplain regulations and has chosen not to participate in the NFIP. As a result, Clay County is presently sanctioned by the Program.

Jurisdictions that participate in the NFIP are expected to adopt and enforce floodplain management regulations. Both Clay City and Flora have adopted the State of Illinois model floodplain ordinance. As a result, both participating jurisdictions are in compliance with NFIP requirements.

Participating jurisdictions will continue to comply with the NFIP by implementing mitigation projects and activities that enforce this ordinance to reduce future flood risks to new construction within the SFHA. At this time no new construction is planned within the base floodplain. Continued compliance with NFIP requirements is addressed in the Mitigation Action Tables of the participating jurisdictions found in Section 4.6.

What is the probability of future flood events occurring?

General Floods

Clay County has had 29 verified occurrences of general flooding between 1990 and 2019. With 29 occurrences over the past 30 years, the probability or likelihood of a general flood event occurring in Clay County in any given year is 97%. There were seven years over the past 30 years where two or more general flood events occurred. This indicates that the probability or likelihood that more than one general flood event may occur during any given year within the County 23%.

Flash Floods

There have been 43 verified flash flood events between 1999 and 2019. With 43 occurrences over the past 21 years, Clay County should expect at least two flash flood events each year. There were 11 years over the past 21 years where two or more flash flood events occurred. This indicates that the probability that more than one flash flood event may occur during any given year within the County is approximately 50%.

HAZARD VULNERABILITY

The following describes the vulnerability to participating jurisdictions, identifies the impacts on public health and property (if known) and estimates the potential impacts on public health and safety as well as buildings, infrastructure and critical facilities from floods.

Several factors including topography, precipitation and an abundance of rivers and streams make Illinois especially vulnerable to flooding. According to the Illinois State Water Survey's Climate Atlas of Illinois, since the 1940s Illinois climate records have shown an increase in heavy precipitation which has led to increased flood peaks on Illinois rivers.

Are the participating jurisdictions vulnerable to flooding?

Yes. Clay County and the participating jurisdictions are vulnerable to the dangers presented by flooding. Precipitation levels and topography are factors that cumulatively make virtually the entire County susceptible to some form of flooding. Flooding occurs along the floodplains of all the rivers, streams and creeks within the County as well as outside of the floodplains in low-lying areas where drainage problems occur. Since 2010, Clay County has experienced 25 flash flood events and 11 general flood events.

Figure F-7 details the number of *recorded* flash flood events by participating jurisdiction. Twenty-seven of the 29 general flood events impacted the entire County or a large portion of it and were not location specific. The remaining two events took place near Clay City.

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

Figure F-7 Verified Flash Flood Events by Participating Jurisdiction		
Participating Municipality	**Number**	**Year**
Clay City	1	2005
Flora	6	2001, 2002, 2004, 2015
Louisville	0	---
Xenia	1	2003*
Countywide	17	2000, 2002, 2003,2004, 2006, 2008, 2009, 2011, 2013, 2015, 2017
Central portion of the County	1	2015
Eastern portion of the County	1	2018
Northern portion of the County	5	2011, 2014, 2015, 2017
Northwestern portion of the County	2	2011, 2013
Southern portion of the County	3	1999, 2009, 2018
Southeastern of the County	2	2016, 2018
Southwestern of the County	4	2011, 2014, 2015, 2019

As described in Section 1.3 Land Use and Development Trends, 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.

Do any of the participating jurisdictions consider flooding to be among their community's greatest vulnerabilities?

Yes. Based on responses to a Critical Facilities Vulnerability Survey distributed to the participating jurisdictions, the following respondents considered flooding to be among their jurisdiction's greatest vulnerabilities.

- *Clay City*: Main roads through the Village are impacted by flooding during heavy rain events which adversely affects travel.
- *Louisville:* The Road to the sewer lagoon is impassable during flooding.
- *Xenia*: Traffic is adversely impacted when heavy rains cause the main road through town to flood as well as low lying areas.
- *Clay County Highway Department*: Flooding has damaged roads and bridges.
- *Flora/Clay County ESDA*: Being such a flat area severe flooding has been a problem.
- *Clay County Hospital*: Patients and EMS have a difficult time accessing the entrance to the hospital during flood events.
- *North Clay CUSD #25*: Road flooding in the District causes longer bus routes if the buses are able to get o the school.

What impacts resulted from the recorded floods?

Floods as a whole have caused a *minimum* of $9 million in property damages. The following provides a breakdown by category.

In comparison, the State of Illinois has averaged an estimated $257 million annually in property damage losses, making flooding the single most financially damaging natural hazard in Illinois.

General Floods

Damage information was either unavailable or none was recorded for any of the 29 general flood events experienced between 1990 and 2019. No injuries or fatalities were reported as a result of any of the recorded events either.

Flash Floods

Data obtained from NOAA's Storm Events Database indicates that between 1999 and 2018, three of the 43 flash flood events caused approximately $9.07 million in property damages. Damage information was either unavailable or none was recorded for the remaining 40 reported occurrences.

Flood Fast Facts – Impacts/Risk

General Flood Impacts:
- Total Property Damage: ***n/a***
- Total Crop Damage: ***n/a***
- Injuries: ***n/a***
- Fatalities: ***n/a***

Flash Flood Impacts:
- Total Property Damage (3 events): ***$9,070,000***
- Total Crop Damage: ***n/a***
- Injuries: ***n/a***
- Fatalities: ***n/a***

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

No injuries or fatalities were reported as a result of any of the recorded events.

What other impacts can result from flooding?

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

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

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

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

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 infiltrate lines and cause disruptions in power and communication.

What is the level of vulnerability to public health and safety from floods?

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

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

No. According to information obtained from FEMA, there are no repetitive or severe repetitive loss properties located in Clay County.

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

Yes. **Figure F-8** identifies the number of existing residential structures by participating jurisdiction located within a base floodplain. These counts were prepared by the Consultant and are based on a review of the limited number of current FIRMs and FHBMs.

Figure F-8
Existing Residential Structures Located within a Floodplain by Participating Jurisdiction

Participating Jurisdiction	Number of Residential Structures	Participating Jurisdiction	Number of Residential Structures
Clay City	81	Xenia	0
Flora	16	Unincorp. County	21
Louisville	0		

Source: FEMA FIRMs/FHBMs.

Aside from key roads and bridges and buried power and communication lines, Clay City is the only participating jurisdiction that has specific infrastructure/critical facilities located within or adjacent to a floodplain. The wastewater treatment lagoons for the Village are located in a tributary of the Little Wabash River base floodplain.

Only two of the participating jurisdictions (Clay City and Flora) within Clay County have current effective FIRMs. These FIRMs were prepared in 1984 and 1985. While Flood Hazard Boundary Maps (FHBMs) were developed in 1981 for the unincorporated portions of Clay County, FIRMs have yet to be developed.

While 12.0% of the land area in Effingham County lies within the base floodplain and is susceptible to riverine flooding, almost the entire County is vulnerable to flash flooding. As a result, a majority of the buildings, infrastructure and critical facilities that may be impacted by flooding are located outside of the base floodplain and are not easily identifiable.

The risk or vulnerability of existing buildings, infrastructure and critical facilities to all forms of flooding is considered to be ***medium*** based on: (a) the frequency and severity of recorded flood events within the County; (b) the County's proximity to the Little Wabash River and its tributaries; (c) the fact that most of the County is vulnerable to flash flooding; and (d) a majority of the buildings, infrastructure and critical facilities that may be impacted are located outside of the base floodplain.

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

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

Riverine Flooding

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

Flash Flooding

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

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

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

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

Assumptions

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

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

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

Type of Flood Event. The first step towards calculating the potential dollar losses to vulnerable residential structures is to determine the type of flood event that will be used for this scenario. While flash flooding has occurred more frequently and has caused more recorded flood damages in the County than riverine flooding, identifying residential structures vulnerable to flash flooding is problematic because most are located outside of the floodplain and the number of structures impacted can change with each event depending on the amount of precipitation received, the topography and the land use of the area.

Assumption #1

A riverine flood event will impact vulnerable residential structures.

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

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

Assumption #2

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

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

- ❖ all rivers, streams and creeks with base floodplains would overflow their banks, and
- ❖ the base floodplains of each river, stream and/or creek would experience the same degree of flooding.

This assumption results in the following conditions for jurisdiction:

- ➢ Louisville and Xenia would not experience any residential flooding since there are *no mapped* river, stream or creek base floodplains located within their municipal limits;
- ➢ *Clay City*: An Intermittent Tributary of the Little Wabash River would overflow its banks and flood a portion of the Village;
- ➢ *Flora*: Seminary Creek and Tributary of Elm Creek would overflow their banks and flood portions of the City; and
- ➢ *Unincorporated Clay County*: All the rivers, streams and creeks would overflow their banks and flood unincorporated portions of the County.

Number of Potentially-Damaged Housing Units. Since this scenario assumes that all the base floodplains will experience the same degree of flooding, the number of existing residential structures located within the base floodplain(s) can be used to determine the number of potentially-damaged housing units. **Figure F-8** identifies the total number of existing residential structures located within the base floodplains(s).

Assumption #3

The number of existing residential structures located within the base floodplain(s) will be used to determine the number of potentially-damaged housing units.

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

Assumption #4

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

To determine the average market value, the average assessed value must first be calculated. The average assessed value is determined by taking the total assessed value of residential buildings within a jurisdiction and dividing that number by the total number of housing units within the jurisdiction. The average market value is then determined by taking the averaged assessed value and multiplying that number by three (the assessed value of a structure in Clay County is approximately one-third of the market value). **Figure F-9** provides a sample calculation. The total assessed value is based on 2018 tax assessment information provided by the Clay County Supervisor of Assessments. **Figure F-10** provides the average assessed value and average market value for each jurisdiction.

Figure F-9
Sample Calculation of Average Assessed Value & Average Market Value – Clay City

Average Assessed Value

Total Assessed Value of Residential Buildings in the Jurisdiction÷ Total Housing Units in the Jurisdiction = Average Assessed Value

Clay City: $5,774,193 ÷ 481 housing units = $12,004.56

Average Market Value

Average Assessed Value x 3 = Average Market Value
(Rounded to the Nearest Dollar)

Clay City: $12,004.56 x 3 = $36,013.68
($36,014)

Figure F-10
Average Market Value of Housing Units by Jurisdiction

Participating Jurisdiction	Total Assessed Value of Residential Buildings (2018)	Total Housing Units (2010)	Average Assessed Values	Average Market Value
Clay City	$5,774,193	481	$12,005	$36,014
Flora	$38,323,416	2,355	$16,273	$48,820
Louisville	$8,138,888	513	$15,865	$47,596
Xenia	$2,385,699	193	$12,361	$37,083
Unincorp. Clay County	$30,486,104	2,744	$11,110	$33,330

Source: Clay County Supervisor of Assessments.

Damage Scenario. The final decision that must be made to calculate potential dollar losses is to determine the percent damage sustained by the structure and the structure's contents during the flood event. In order to determine the percent damage using FEMA's flood loss estimation tables, assumptions must be made regarding (a) the type of residential structure flooded (i.e., manufactured home, one story home without a basement, one- or two-story home with a basement, etc.) and (b) the flood depth. **Figure F-11** calculates the percent loss to a structure and its contents for different scenarios based on flood depth and structure type.

Assumption #5

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

Figure F-11
FEMA Flood Loss Estimation Tables

Flood Building Loss Estimation Table

Flood Depth (feet)	One Story No Basement (% Building Damage)	Two Story No Basement (% Building damage)	One or Two Story With Basement (% Building damage)	Manufactured Home (% Building damage)
-2	0	0	4	0
-1	0	0	8	0
0	9	5	11	8
1	14	9	15	44
2	22	13	20	63
3	27	18	23	73
4	29	20	28	78
5	30	22	33	80
6	40	24	38	81
7	43	26	44	82
8	44	29	49	82
>8	45	33	51	82

Flood Content Loss Estimation Table

Flood Depth (feet)	One Story No Basement (% Contents Damage)	Two Story No Basement (% Contents damage)	One or Two Story With Basement (% Contents damage)	Manufactured Home (% Contents damage)
-2	0	0	6	0
-1	0	0	12	0
0	13.5	7.5	16.5	12
1	21	13.5	22.5	66
2	33	19.5	30	90
3	40.5	27	34.5	90
4	43.5	30	42	90
5	45	33	49.5	90
6	60	36	57	90
7	64.5	39	66	90
8	66	43.5	73.5	90
>8	67.5	49.5	76.5	90

Source: FEMA, Understanding Your Risks: Identifying Hazards and Estimating Losses

For this scenario it is assumed that the potentially-damaged housing units are one or two-story homes with basements and the flood depth is two feet. With these assumptions the expected

percent damage sustained by the ***structure*** is estimated to be 20% and the expected percent damage sustained by the structure's ***contents*** is estimated to be 30%.

Potential Dollar Losses

Now that all of the decisions/assumptions have been made, the potential dollar losses can be calculated. First the potential dollar losses to the ***structure*** of the potentially-damaged housing units must be determined. This is done by taking the average market value for a residential structure and multiplying that by the percent damage (20%) to get the average structural damage per unit. Next the average structural damage per unit is multiplied by the number of potentially-damaged housing units. **Figure F-12** provides a sample calculation.

Figure F-12
***Structure:* Potential Dollar Loss Sample Calculation – Clay City**

Average Market Value of a Housing Unit with the Jurisdiction x Percent Damage = Average Structural Damage per Housing Unit

Clay City: $36,014 x 20% = $7,202.80 per housing unit

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

Clay City: $7,202.80 per housing unit x 81 housing unit = $583,426.80

($583,427)

Next the potential dollar losses to the ***content*** of the potentially-damaged housing units must be determined. Based on FEMA guidance, the value of a residential housing unit's content is approximately 50% of its market value. Therefore, start by taking one-half the average market value for a residential structure and multiply that by the percent damage (30%) to get the average content damage per unit. Then take the average content damage per unit and multiply that by the number of potentially-damaged housing units. **Figure F-13** provides a sample calculation.

Figure F-13
***Content:* Potential Dollar Loss Sample Calculation – Clay City**

½ (Average Market Value of a Housing Unit with the Jurisdiction) x Percent Damage = Average Content Damage per Housing Unit

Clay City: ½ ($36,014) x 30% = $5,402.10 per housing unit

Average Content Damage per Housing Unit x Number of Potentially-Damaged Housing Units within the Jurisdiction = *Content* Potential Dollar Losses (Rounded to the Nearest Dollar)

Clay City: $5,402.10 per housing unit x 81 housing unit = $437,570.10

($437,570)

Finally, the ***total potential dollar losses*** may be calculated by adding together the potential dollar losses to the structure and the content. **Figure F-14** provides a breakdown of the total potential dollar losses by jurisdiction.

Figure F-14
Estimated Potential Dollar Losses to Potentially-Damaged Housing Units from a Riverine Flood Event by Participating Jurisdiction

Participating Jurisdiction	Average Market Value (2018)	Potentially-Damaged Housing Units	Potential Dollar Losses		Total Potential Dollar Losses (Rounded to the Nearest Dollar)
			Structure	Content	
Clay City	$36,014	81	$583,427	$437,570	$1,020,997
Flora	$48,820	16	$156,224	$117,168	$273,392
Louisville	$47,596	0	$ 0	$ 0	$ 0
Xenia	$37,083	0	$ 0	$ 0	$ 0
Unincorp. Clay County	$33,330	21	$139,986	$104,990	$244,976

This assessment illustrates the *potential residential dollar losses* that should be considered when jurisdictions are deciding which mitigation projects to pursue. Potential dollar losses caused by riverine flooding to vulnerable residences within the participating municipalities would be expected to ***range from $273,392 to $1 million***. Louisville and Xenia do not have any residences considered vulnerable to riverine flooding in this scenario. Potential dollar losses to vulnerable structures in unincorporated Clay County would be expected to exceed $244,976.

Vulnerability of Infrastructure/Critical Facilities

The calculations presented above are meant to provide the reader with a sense of the scope or magnitude of a large riverine flood event in dollars. These calculations do not include the physical damages sustained by businesses or other infrastructure and critical facilities.

In terms of businesses, the impacts from a flood event can be physical and/or monetary. Monetary impacts can include loss of sales revenue either through temporary closure or loss of critical services (i.e., power, drinking water and sewer). Depending on the magnitude of the flood event, the damage sustained by infrastructure and critical facilities can be extensive in nature and expensive to repair. As a result, the cumulative monetary impacts to businesses and infrastructure can exceed the cumulative monetary impacts to residences. While average dollar amounts cannot be supplied for these items at this time, they should be taken into account when discussing the overall impacts that a large-scale riverine flood event could have on the participating jurisdictions.

In terms of specific infrastructure vulnerability, Clay City's wastewater treatment lagoons are located in the base floodplain of a tributary of the Little Wabash River. No other above-ground infrastructure within the participating jurisdictions, other than key roads and bridges, were identified as being vulnerable to riverine flooding.

Considerations

While the potential dollar loss scenario was only for a riverine flood event, the participating jurisdictions have been made aware through the planning process of the impacts that can result from flash flood events. Clay County has experienced multiple events over the last 20 years as have adjoining and nearby counties. These events illustrate the need for officials to consider the overall monetary impacts of all forms of flooding on their communities. All participants should

carefully consider the types of activities and projects that can be taken to minimize their vulnerability.

3.4 EXCESSIVE HEAT

HAZARD IDENTIFICATION

What is the definition of excessive heat?

Excessive heat is generally characterized by a prolonged period of summertime weather that is substantially hotter and more humid than the average for a location at that time of year. Excessive heat criteria typically shift by location and time of year. As a result, reliable fixed absolute criteria are not generally specified (i.e., a summer day with a maximum temperature of at least 90°F).

Excessive 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.

Excessive heat is a leading cause of weather-related fatalities in the United States. According to the Centers for Disease Control and Prevention, a total of 7,415 people died from heat-related illnesses between 1999 and 2010, an average of 618 fatalities a year.

What is the Heat Index?

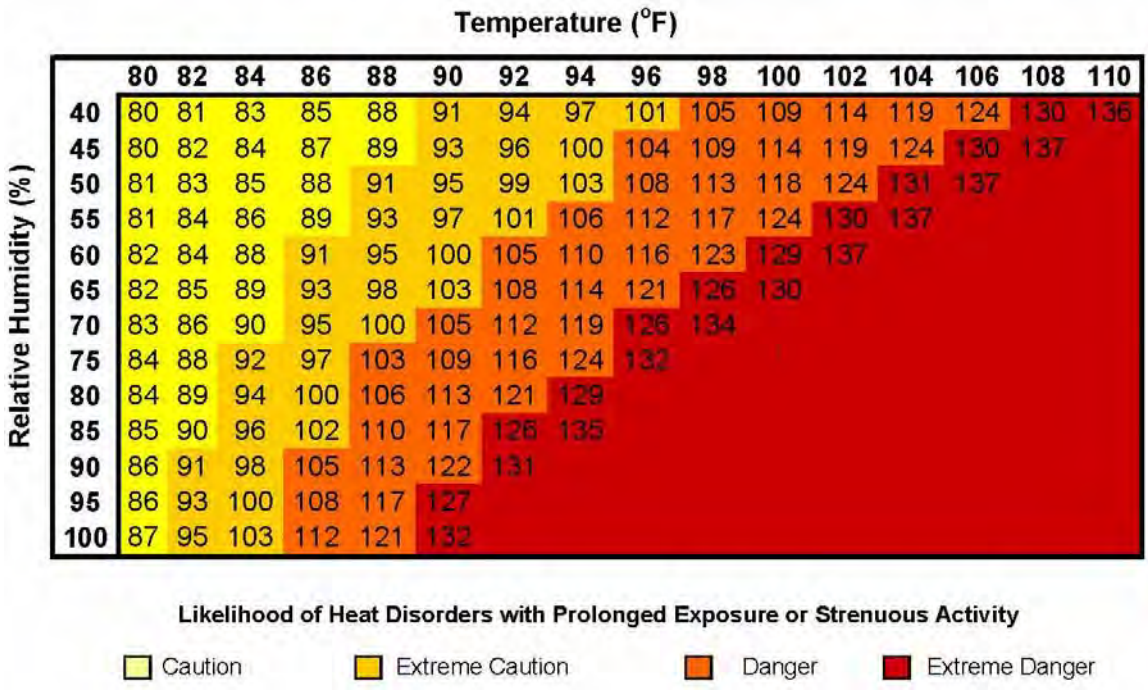
In an effort to raise the public's awareness of the hazards of excessive heat, the National Weather Service (NWS) devised the "Heat Index". The Heat Index, sometimes referred to as the "apparent temperature", is a measure of how hot it feels when relative humidity is added to the actual air temperature. **Figure EH-1** shows the Heat Index as it corresponds to various air temperatures and relative humidity.

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

What are heat disorders?

Heat disorders are a group of illnesses caused by prolonged exposure to hot temperatures and are characterized by the body's inability to shed excess heat. These disorders develop when the heat gain exceeds the level the body can remove or if the body cannot compensate for fluids and salt lost through perspiration. In either case the body loses its ability to regulate its internal temperature. All heat disorders share one common feature: the individual has been overexposed to heat, or over exercised for their age and physical condition on a hot day. The following describes the symptoms associated with the different heat disorders.

Figure EH-1
Heat Index



Source: NOAA, National Weather Service.

- **Heat Rash.** Heat rash is a skin irritation caused by excessive sweating during hot, humid weather and is characterized by red clusters of small blisters on the skin. It usually occurs on the neck, chest, groin or in elbow creases.
- **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 and can significantly retard the skin's ability to shed excess heat.
- **Heat Cramps.** Heat cramps are characterized by heavy sweating and muscle pains or spasms, usually in the abdomen, arms or legs that during intense exercise. 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, muscle cramps, tiredness, weakness, dizziness, headache, nausea or vomiting and faintness. Breathing may become rapid and shallow and the pulse thready (weak). The skin may appear cool, moist and pale. If not treated, heat exhaustion may progress to heat stroke.
- **Heat Stroke (Sunstroke).** Heat stroke is a life-threatening condition characterized by a high body temperature (106°F or higher). The skin appears to be red, hot and dry with very little perspiration present. Other symptoms include a rapid and strong pulse, throbbing headache, dizziness, nausea and confusion. There is a possibility that the individual will become 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 EH-2 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 NWS will initiate excessive heat alert procedures.

Figure EH-2
Relationship between Heat Index and Heat Disorders

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

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

What is an excessive heat alert?

An excessive heat alert is an advisory or warning issued by the NWS 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 excessive heat events. The following provides a brief description of each type of alert based on the ***excessive heat advisory/warning criteria*** established by NWS Weather Forecast Office in Lincoln, Illinois. The Lincoln Office is responsible for issuing alerts for Clay County.

- **Outlook.** An excessive heat outlook is issued when the potential exists for an excessive heat event to develop over the next three (3) to seven (7) days.
- **Watch.** An excessive heat watch is issued when conditions are favorable for an excessive heat event to occur within the next 24 to 72 hours.
- **Advisory.** An excessive heat advisory is issued within 12 hours of the onset of extremely dangerous heat conditions when the maximum heat index temperature is expected to be 100°F or higher for at least two (2) days and the night time air temperatures will not drop below 75°F.
- **Warning.** An excessive heat warning is issued within 12 hours of the onset of extremely dangerous heat conditions when the maximum heat index temperature is expected to be 105°F or higher for at least two (2) days and the night time air temperatures will not drop below 75°F.

HAZARD PROFILE

The following identifies past occurrences of excessive heat, details the severity or extent of each event (if known); identifies the locations potentially affected and estimates the likelihood of future occurrences.

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

Table 9, located in **Appendix J**, summarizes the previous occurrences as well as the extent or magnitude of excessive heat events recorded in Clay County. NOAA's Storm Events Database and NWS's COOP Data records were used to document 44 occurrences of excessive heat in Clay County between 1997 and 2019.

Excessive Heat Fast Facts – Occurrences

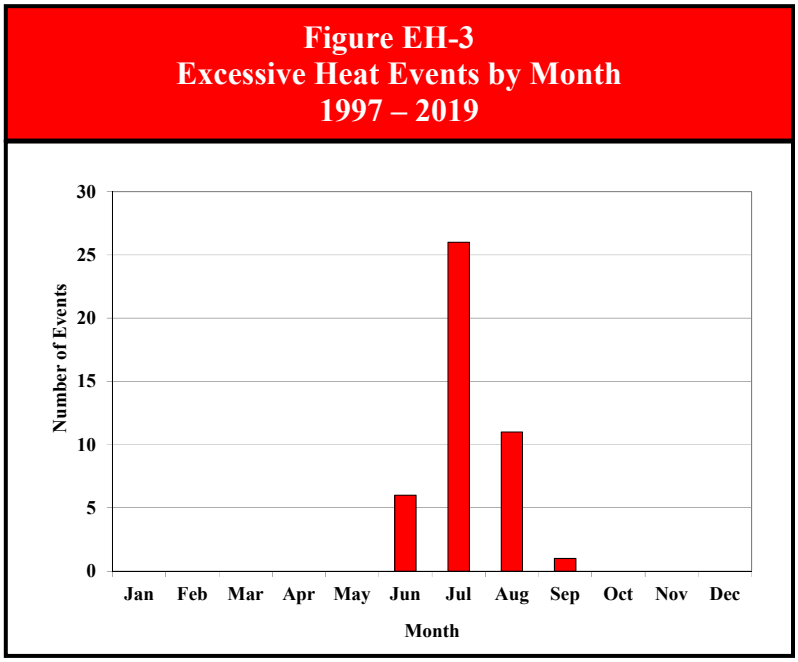
Number of Excessive Heat Events Reported (1997 – 2019): ***44***

Hottest Temperature Recorded in the County: ***111°F (July 28yh 1930)***

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

Figure EH-3 charts the reported occurrences of excessive heat events by month. Of the 44 events, 26 (59%) either began or took place in July making this the peak month for excessive heat events in Clay County. There were 8 events that spanned two months; however, for illustration purposes only the month the event started in is graphed. Of the 44 occurrences, 61% began during the p.m. hours, with 24 of the events (55%) beginning at 12:00 p.m.

Figure EH-3
Excessive Heat Events by Month
1997 – 2019



According to the Midwestern Regional Climate Center, continuous temperature records for Clay County have been kept from 1893 to 2009 by the Flora NWS COOP Observer Station. Based on the available records, the hottest temperature recorded in Clay County was 111°F at the Flora

COOP Station on July 28, 1930. **Figure EH-4** lists the hottest days recorded at the Flora observation station.

Figure EH-4
Hottest Days Recorded at Flora NWS COOP Observer Station

	Date	Temperature		Date	Temperature
1	7/28/1930	111°F	10	7/11/1930	108°F
2	7/15/1936	111°F	11	7/12/1930	108°F
3	7/27/1930	110°F	12	8/6/1930	108°F
4	7/14/1954	110°F	13	8/8/1930	108°F
5	8/9/1930	109°F	14	7/7/1936	108°F
6	7/14/1936	109°F	15	7/12/1936	108°F
7	7/22/1901	108°F	16	8/18/1936	108°F
8	7/12/1914	108°F	17	8/19/1936	108°F
9	7/13/1914	108°F	18	9/1/1953	108°F

Source: Midwest Regional Climate Center cli-MATE

What locations are affected by excessive heat?

Excessive heat affects the entire County. Excessive heat events, like drought and severe winter storms, generally extend across an entire region and affecting multiple counties. The *2018 Illinois Natural Hazard Mitigation Plan* classifies Clay County's hazard rating for excessive heat as "medium."

Do any of the participating jurisdictions have designated cooling centers?

Yes. All of the participating municipalities and the Clay County Hospital have designated cooling centers. A "designated" cooling center is identified as any facility that has been *formally* identified by the jurisdiction (through emergency planning, resolution, Memorandum of Agreement, etc.) as a location available for use by residents during excessive heat events. **Figure EH-5** identifies the location of each warming center by jurisdiction. In addition to those designated cooling centers identified by the participating jurisdictions, the Illinois Department of Human Services office located in Louisville also serves as cooling center.

Figure EH-5
Designated Cooling Centers by Participating Jurisdiction

Name/Address	Name/Address
Clay City	*Louisville*
Clay City Community Bldg., 237 S. 2nd St., SE	K1 Building, 211 Lynn St.
Clay County Hospital	Community Center Building, 165 Broadway
Clay County Hospital, 911 Stacy Burke Drive, Flora	*Xenia*
Flora	Xenia Fire House, 108 North St.
First Christian Church, 100 W. 4th St.	Methodist Church, 102 3rd St.
Community of Christ Church, 751 Shadwell St.	Xenia Comm. Center, 601 Church St.
Flora High School, 600 S. Locust	

What is the probability of future excessive heat events occurring?

Clay County has experienced 44 verified occurrences of excessive heat between 1997 and 2019. With 44 occurrences over the past 23 years, Clay County should expect to experience

approximately two excessive heat events a year. There were 11 years over the 23 years were two or more excessive heat events occurred. This indicates that the probability that more than one excessive heat event may occur during any given year within the County is 48%

HAZARD VULNERABILITY

The following describes the vulnerability to participating jurisdictions, identifies the impacts on public health and property (if known) and estimates the potential impacts on public health and safety as well as buildings, infrastructure and critical facilities from excessive heat.

Are the participating jurisdictions vulnerable to excessive heat?

Yes. All of Clay County, including the participating jurisdictions, is vulnerable to the dangers presented by excessive heat. Since 2010, Clay County has experienced 21 excessive heat events.

Do any of the participating jurisdictions consider excessive heat to be among their community's greatest vulnerabilities?

No. Based on responses to a Critical Facilities Vulnerability Survey distributed to the participating jurisdictions, none of the participating jurisdictions considered excessive heat to be among their community's greatest vulnerabilities. In addition, none of the jurisdictions identified any critical facilities or infrastructure within their communities as having a specific vulnerability to excessive heat.

What impacts resulted from the recorded excessive heat events?

Damage information was either unavailable or none was recorded for any of the excessive heat events. NOAA's Storm Events Database documented a total of one heat-related fatality as a result of 44 excessive heat events in Clay County. An 81-year old man died of heatstroke while doing yard work outdoors in Flora on July 18, 2019.

Excessive Heat Fast Facts – Impacts/Risk

Excessive Heat Impacts:

- Total Property Damage: n/a
- Total Crop Damage: ***n/a***
- Fatalities (44 events): ***1***
- Injuries: ***n/a***

Excessive Heat Risk/Vulnerability:

- Public Health & Safety – General Population: ***Low***
- Public Health & Safety – Sensitive Populations: ***Medium***
- Buildings/Infrastructure/Critical Facilities: ***Low***

In comparison, Illinois averages 74 heat-related fatalities annually according the Illinois State Water Survey's Climate Atlas of Illinois. Excessive heat has triggered more fatalities than any other natural hazard in Illinois. More fatalities are attributed to excessive heat than the combined number of fatalities attributed to floods, tornadoes, lightning and extreme cold.

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

What other impacts can result from excessive heat events?

Other impacts of excessive heat include road buckling, power outages, stress on livestock, early school dismissals and school closings. In addition, excessive heat events can also lead to an increase in water usage and may result in municipalities imposing water use restrictions. In Clay County, excessive heat has the ability to impact the drinking water supplies of several the participating municipalities. Flora, Louisville and Xenia, rely solely on surface water sources for their drinking water supplies.

What is the level of vulnerability to public health and safety from excessive heat?

Even if injuries and fatalities due to excessive heat were under reported in Clay County, the level of risk or vulnerability posed by excessive heat to the public health and safety of the *general population* is considered to be ***low***. This assessment is based on the fact that all the participating jurisdictions have designated cooling center and Clay County does not have any large urban areas where living conditions (such as older, poorly-ventilated high rise buildings and low-income neighborhoods) tend to contribute to heat-related injuries and fatalities.

The level of risk or vulnerability posed by excessive heat to the public health and safety of *sensitive populations* is considered to be ***medium***. Sensitive populations such as older adults (those 70 years of age and older) and small children (those 5 years of age and younger) are more susceptible to heat-related reactions and therefore their risk is elevated. **Figure EH-6** identifies the percent of sensitive populations by participating jurisdiction based on 2010 census data.

Figure EH-6
Sensitive Populations by Participating Jurisdictions

Participating Jurisdiction	% of Population 70 year of age & Older	% of Population 5 years age & Younger	Total % of Sensitive Population
Clay City	12.8	7.9	20.8
Flora	14.9	6.7	21.6
Louisville	12.5	6.9	19.4
Xenia	11.0	5.9	16.9
Unincorp. Clay County	11.5	5.4	16.8
Clay County	12.9	6.2	19.0
State of Illinois	8.8	6.5	15.3

Source: U. S. Census Bureau.

In addition, individuals with chronic conditions, those on certain medications, and persons with weight or alcohol problems are also considered sensitive populations. However, demographic information is not available for these segments of the population.

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

No. In general, existing buildings, infrastructure and critical facilities located in the County and the participating jurisdictions are not vulnerable to excessive heat. The primary concern is for the health and safety of those living in the County (including all of the jurisdictions).

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

Excessive heat has also been known to indirectly contribute to disruptions in the electrical grid. When the temperatures rise, the demand for energy also rises in order to operate air conditioners, fans and other devices. This increase in demand places stress on the electrical grid components, increasing the likelihood of power outages. While not common in Clay 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 excessive heat is considered ***low***, even taking into consideration the potential for damage to roadways and disruptions to the electrical grid.

Are future buildings, infrastructure and critical facilities vulnerable to excessive heat?

No. Future buildings, infrastructure and critical facilities within the County and participating jurisdictions are no more vulnerable to excessive heat events than the existing building, infrastructure and critical facilities. As discussed above, buildings do not typically sustain damage from excessive heat. Infrastructure and critical facilities may, in rare cases, be damaged by excessive heat, but very little can be done to prevent this.

What are the potential dollar losses to vulnerable structures from excessive heat?

Unlike other natural hazards there are no standard loss estimation models or methodologies for excessive heat. With none of the recorded events listing property damage figures, there is no way to accurately estimate future potential dollar losses from excessive heat.

3.5 TORNADOES

HAZARD IDENTIFICATION

What is the definition of a tornado?

A tornado is a narrow violently rotating column of air, often visible as a funnel-shaped cloud that extends from the base of a thunderstorm cloud formation to the ground. The most violent tornadoes can have wind speeds of more than 300 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. A typical tornado travels at around 10 to 20 mile per hour, but this may vary from almost stationary to 60 miles per hour. Tornadoes can occur at any time of the year and happen at any time of the day or night, although most occur between 4 p.m. and 9 p.m.

About 1,200 tornadoes hit the United States yearly, with an average 52 tornadoes occurring annually in Illinois. 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, injuries and fatalities. Tornadoes are known to blow roofs off buildings, flip vehicles and demolish homes. Typically, tornadoes cause the greatest damage to structures of light construction, such as residential homes. On average, tornadoes cause 60 to 65 facilities and 1,500 injuries in the United States annually.

How are tornadoes rated?

Originally tornadoes were rated using the Fujita Scale (F-Scale), which related the degree of damage caused by a tornado to the intensity of the tornado's wind speed. The Scale identified six categories of damage, F0 through F5. **Figure T-1** gives a brief description of each category.

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

The Enhanced Fujita Scale (EF-Scale) was created to remedy the flaws in the original scale. It continues to use the F0 through F5 categories, but it incorporates 28 different damage indicators (mainly various building types, towers/poles and trees) as calibrated by engineers and meteorologists. For each damage indicator there are eight degrees of damage ranging from barely visible damage to complete destruction of the damage indicator. The wind speeds assigned to each category are estimates, not measurements, based on the damage assessment. **Figure T-1** identifies the Enhanced Fujita Scale.

Figure T-1 Fujita & Enhanced Fujita Tornado Measurement Scales				
F-Scale		**EF-Scale**		**Description**
Category	**Wind Speed (mph)**	**Category**	**Wind Speed (mph)**	
F0	40 – 72	EF0	65 – 85	Light damage – some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; damage to sign boards
F1	73 – 112	EF1	86 – 110	Moderate damage – peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads
F2	113 – 157	EF2	111 – 135	Considerable damage – roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground
F3	158 – 207	EF3	136 – 165	Severe damage – roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off ground and thrown
F4	208 – 260	EF4	166 – 200	Devastating damage – well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated
F5	261 – 318	EF5	Over 200	Incredible damage – strong frame houses lifted off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 yards; trees debarked; incredible phenomena will occur

Source: NOAA, Storm Prediction Center.

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

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

Are alerts issued for tornadoes?

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

- **Watch.** A tornado watch is issued when tornadoes are possible in the area. Individuals need to be alert and prepared. Watches are typically large, covering numerous counties or even states.

- **Warning.** A tornado warning is issued when a tornado has been sighted or indicated by weather radar. Warnings indicate imminent danger to life and property for those who are in the path of the tornado. Individuals should see shelter immediately. Typically, warnings encompass a much smaller area, such as a city or small county.

HAZARD PROFILE

The following identifies past occurrences of tornadoes; details the severity or extent of each event (if known); identifies the locations potentially affected; and estimates the likelihood of future occurrences.

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

Table 10, located in **Appendix J**, summarize the previous occurrences as well as the extent or magnitude of tornado events recorded in Clay County. NOAA's Storm Events Database and the NWS Weather Forecast Office in Lincoln have documented 16 occurrences of tornadoes in Clay County between 1950 and 2019. In comparison, there have been 2,443 tornadoes statewide between 1950 and 2017 according to NOAA's Storm Prediction Center.

Tornado Fast Facts – Occurrences

Number of Tornadoes Reported (1957 - 2019): ***16***
Highest F-Scale Rating Recorded: ***F4 (June 2, 1990)***
Most Likely Month for Tornadoes to Occur: ***May***
Most Likely Time for Tornadoes to Occur: ***Evening***
Average Length of a Tornado: ***3.2 miles***
Average Width of a Tornado: ***91 yards***
Average Damage Pathway of a Tornado: ***0.17 sq. mi.***
Longest Tornado Path in the County: ***10.8 miles (F1 on March 6, 1961)***
Widest Tornado Path in the County: ***300 yards (F4 on June 2, 1990)***

Figure T-2 charts the reported occurrences of tornadoes by magnitude. Of the 16 reported occurrences there was: 1 – F4s, 1 – F3s, 2 – F2s, 3 – F1s, 6 – F0s, 1 – EF1s, and 2 – EF0s.

Figure T-2
Tornadoes by Magnitude
1950- 2019

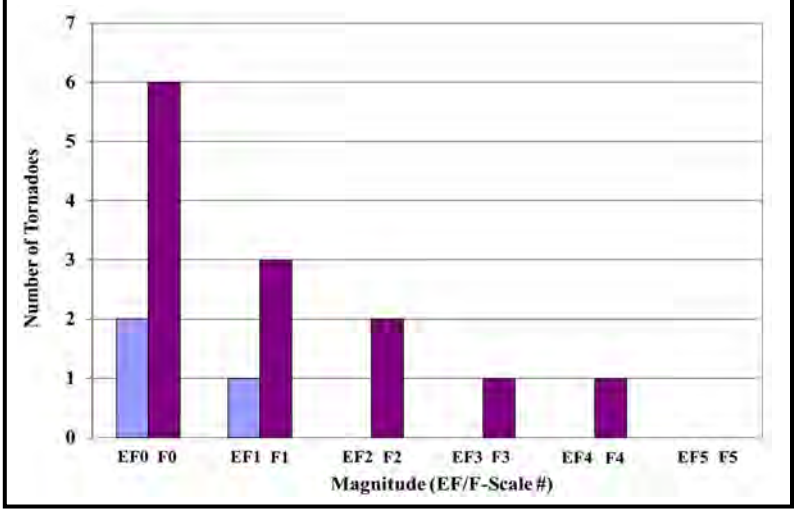


Figure T-3 charts the reported tornadoes by month. Of the 16 events, 13 (81%) took place in April, May, and June making this the peak period for tornadoes in Clay County. Of the 16 events, 6 (38%) occurred during May making this the peak month for tornadoes. In comparison, 1,584 of the 2,443 tornadoes (65%) recorded in Illinois from 1950 through 2017 took place in April, May and June.

Figure T-3
Tornadoes by Month
1950 - 2019

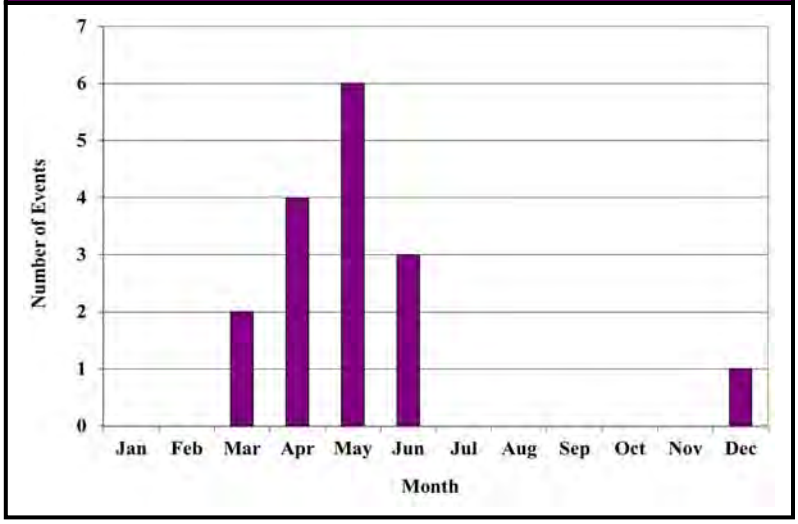
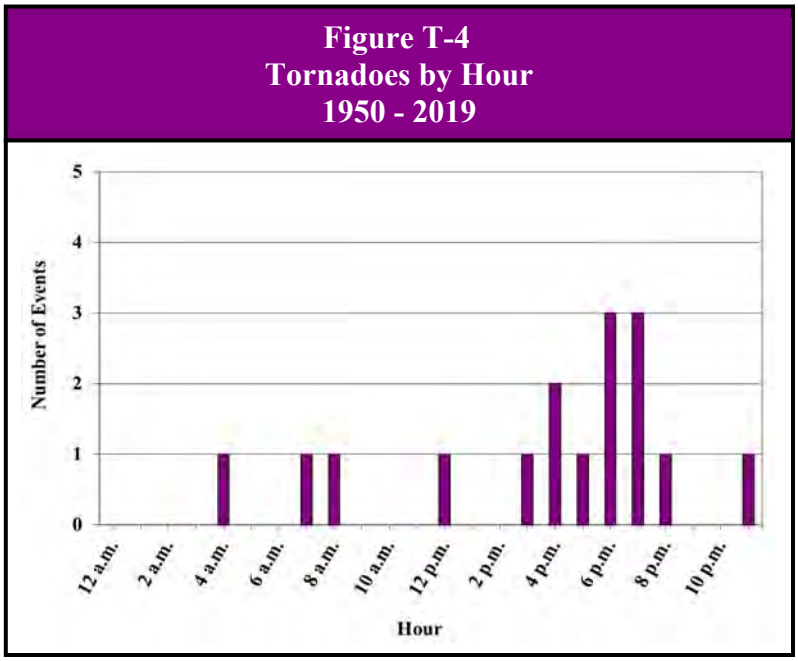


Figure T-4 charts the reported tornadoes by hour. Approximately 81% of all tornadoes occurred during the p.m. hours, with 9 of the events (56%) taking place between 4 p.m. and 8 p.m. In comparison, more than half of all Illinois tornadoes occur between 2 p.m. and 8 p.m.

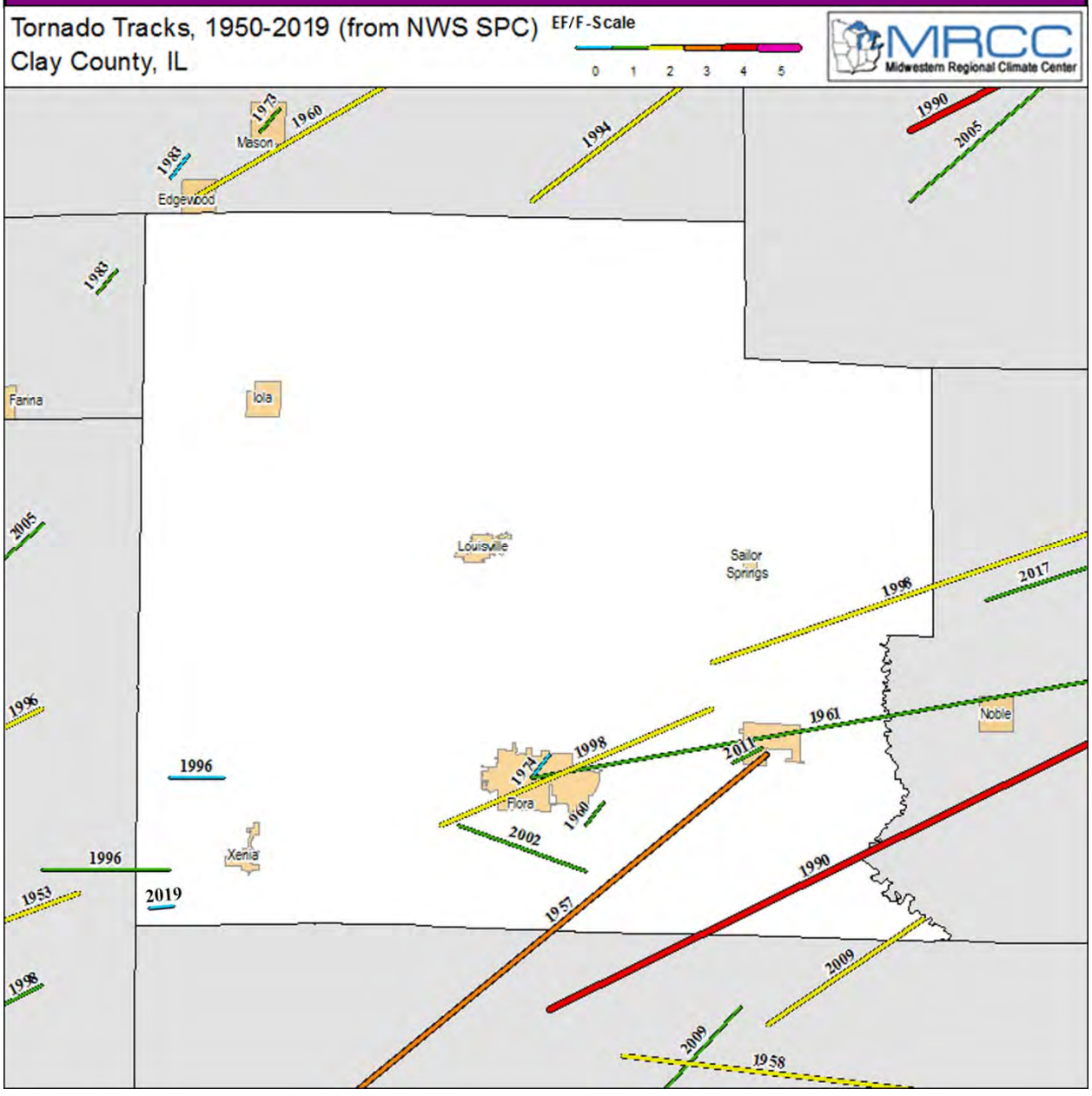
Figure T-4
Tornadoes by Hour
1950 - 2019



The tornadoes that have impacted Clay County have varied from 0.10 miles to 10.8 miles in length and from 10 yards to 300 yards in width. The average length of a tornado in Clay County is 3.2 miles and the average width is 91 yards (0.052 miles).

Figure T-5 shows the pathway of each reported tornado. Records indicate that most of these tornadoes generally moved from southwest to northeast across the County. Unlike other natural hazards (i.e., severe winter storms, drought and excessive heat), tornadoes impact a relatively small area. Typically, the area impacted by a tornado is less than four square miles. In Clay County, the average damage pathway or area impacted by a tornado is 0.17 square miles.

Figure T-5
Tornado Pathways in Clay County



The longest tornado recorded in Clay County occurred on March 6, 1961. This F1 tornado, measuring more than 24.6 miles in length and 10 yards in width, touched down in Flora and traveled east northeast through Clay City before lifting off northeast of Noble in Richland County. The tornado was on the ground in Clay County for approximately 10.8 miles.

The widest tornado recorded in Clay County occurred on June 2, 1990. This F4 tornado, measuring 300 yards wide and 23.0 miles long, touched down in near Rinard in Wayne County and traveled northeast across the southeastern corner of Clay County before lifting off in Olney in Richland County. The tornado was on the ground in Clay County for approximately 5.5 miles.

What locations are affected by tornadoes?

Tornadoes have the potential to affect the entire County. Of the four participating municipalities, Flora and Clay City have had reported occurrences of tornadoes within their corporate limits. The *2018 Illinois Natural Hazard Mitigation Plan* prepared by IEMA classifies Clay County's hazard rating for tornadoes as "medium."

What is the probability of future tornadoes occurring?

Clay County has had 16 verified occurrences of tornadoes between 1950 and 2019. With 16 tornadoes over the past 70 years, the probability or likelihood that a tornado will touchdown somewhere in the County in any given year is 23%. There were two years over the last 70 years where more than one tornado occurred. This indicates that the probability that more than one tornado may occur during any given year within the County is 3%.

HAZARD VULNERABILITY

The following describes the vulnerability to participating jurisdictions, identifies the impacts on public health and property (if known) and estimates the potential impacts on public health and safety as well as buildings, infrastructure and critical facilities from tornadoes.

Are the participating jurisdictions vulnerable to tornadoes?

Yes. All of Clay County, including the participating jurisdictions, is vulnerable to the dangers presented by tornadoes. According to NOAA's Storm Events Database and the NWS Weather Forecast Office in Lincoln, a majority of the tornadoes have touched down or passed through the southeastern part of the County. Since 2010, two tornadoes have been recorded in Clay County.

Of the participating municipalities, Clay City and Flora have had a tornado touch down or pass through their municipal boundaries. **Figure T-6** lists the verified tornadoes that have touched down in or near or passed through each participating municipality.

In terms of unincorporated areas vulnerable to tornadoes, Camp Travis has had two tornadoes touch down in or near their vicinity while Oskaloosa had one tornado touch down in or near its vicinity. **Figure T-7** details the verified tornadoes that have touched down in or near unincorporated areas of Clay County.

Figure T-6
Verified Tornadoes in or Near Participating Municipalities

Participating Municipality	Number of Verified Tornadoes	Year	
		Touched Down/Passed Through Municipality	Touched Down/Passed Near Municipality
Clay City	7	1957, 1961, 2004, 2011	1990, 1998, 1998
Flora	9	1960, 1961, 1974, 1998, 2004	1957, 1990, 1998, 2002
Louisville	0	---	---
Xenia	1	---	1996, 2019

Figure T-7
Verified Tornadoes in or near Unincorporated Areas of Clay County

Unincorporated Area	Number of Verified Tornadoes	Year	
		Touched Down/Passed ***Through*** Unincorporated Area	Touched Down/Passed ***Near*** Unincorporated Area
Camp Travis	2	---	1990, 2009
Oskaloosa	1	---	2003

Do Any of the participating jurisdictions consider tornadoes to be among their community's greatest vulnerabilities?

No. Based on responses to a Critical Facilities Vulnerability Survey distributed to the participating jurisdictions, none of the participating jurisdictions consider tornadoes to be among their community's greatest vulnerabilities.

What impacts resulted from the recorded tornadoes?

Data obtained from NOAA's Storm Events Database, NOAAs Storm Data Publications, the NWS Weather Forecast Office in Lincoln and Planning Committee member records indicates that between 1950 and 2019, eight of the 16 tornadoes caused $3.28 million in property. Four of the 16 tornadoes have property damage totals of at least $250,000. Property damage information was either unavailable or none was recorded for the remaining eight reported occurrences.

NOAA's Storm Events Database documented 13 injuries as a result of two tornado events. The following provides a brief description of each.

- Eight individuals were injured when an F2 tornado damaged multiple homes in Flora and Clay City on April 15, 1998.
- During the April 27, 2002 F1 tornado, five individuals sustained injuries when their Flora homes were damaged.

In comparison, Illinois averages roughly four tornado fatalities annually; however, this number varies widely from year to year.

Tornado Fast Facts – Impacts/Risk

Tornado Impacts:
- Total Property Damage (8 events): ***$3,280,000***
- Total Crop Damage: ***n/a***
- Injuries (2 events): ***13***
- Fatalities: ***n/a***

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

What other impacts can result from tornadoes?

In addition to causing damage to buildings and properties, tornadoes can damage infrastructure and critical facilities such as roads, bridges, railroad tracks, drinking water treatment facilities, water towers, communication towers, antennae, power substations, transformers and poles. Depending on the damage done to the infrastructure and critical facilities, indirect impacts on individuals could range from inconvenient (i.e., adverse travel) to life-altering (i.e., loss of utilities for extended periods of time).

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

According to the 2018 Illinois Natural Hazard Mitigation Plan, Clay County ***ranks in the bottom half of all counties in Illinois in terms of tornado frequency***. This fact alone suggests that the overall risk posed by tornadoes to public health and safety is low. While frequency is important, other factors must be examined when assessing vulnerability including population distribution and density, the ratings and pathways of previously recorded tornadoes, the presence of high-risk living accommodations (such as high-rise buildings, mobile homes, etc.) and adequate access to health care for those injured following a tornado.

Clay County

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

In terms of adequate access to health care, Clay County Hospital in Flora is equipped to provide continuous care to persons injured by a tornado assuming that it is not directly impacted.

Participating Municipalities

In general, if a tornado were to touch down or pass through any of the participating municipalities the risk to the public health and safety would be considered ***high***. This is based on the fact that the participating jurisdictions are small in size and have relatively dense and evenly distributed populations within their municipal boundaries. As a result, if a tornado were to touch down anywhere within the corporate limits of these municipalities it will have a greater likelihood of causing injuries or even fatalities.

Do any participating jurisdictions have community safe rooms?

Yes. Louisville, Flora CUSD #35 and Clay County Hospital all have community safe rooms. None of the remaining participating jurisdictions have community safe rooms. As a result, if a tornado were to touch down or pass through any of the population centers in the County, then there would be a greater likelihood of injuries and fatalities due to the lack of structures specifically designed and constructed to provide life-safety protection. Each jurisdiction should consider whether the potential impacts to public health and safety from a tornado are considered great enough to warrant the consideration of community safe rooms as a mitigation action.

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

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

While some buildings adjacent to a tornado's path may remain standing with little or no damage, all are vulnerable to damage from flying debris. It is common for flying debris to cause damage to roofs, siding, and windows. In addition, mobile homes, homes on crawlspaces, and buildings with large spans (i.e., schools, barns, airport hangers, factories, etc.) are more likely to suffer damage. Most workplaces and many residential units do not provide sufficient protection from tornadoes.

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

Assessing the Vulnerability of Existing Residential Structures

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

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

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

Assumption #1: Size of Tornado. To calculate the number of existing residential structures vulnerable to a tornado, the size (area impacted) by the tornado must first be determined. There are several scenarios that can be used to calculate the size, including the worst case and the average. For this analysis the area impacted by an average-sized tornado in Clay County will be used since it has a higher probability of recurring. In Clay County the area impacted by an average-sized tornado is 0.17 square miles. This average is based on more than 65 years of data.

Assumption #1

Size of Tornado = 0.17 sq. miles

Assumption #2: Method for Estimating the Area Impacted. Next, a method for determining the area within each jurisdiction impacted by the average-sized tornado needs to be chosen. There are several methods that can be used including creating an outline of the area impacted by the average-sized tornado and overlaying it on a map of each jurisdiction (most notably the municipalities) to see if any portion of the area falls outside of the corporate limits (which would require additional calculations) or just assume that the entire area of the average-sized tornado falls within the limits

Assumption #2

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

of each jurisdiction. For this discussion, it is assumed that the entire area of the average-sized tornado will fall within the limits of the participating jurisdictions.

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

Assumption #3: Method for Estimating Potentially-Damaged Housing Units. With the size of the tornado selected and a method for estimating the area impacted chosen, a decision must be made on an approach for estimating the number of potentially-damaged housing units. There are several methods that can be used including overlaying the average-sized tornado on a map of each jurisdiction and counting the impacted housing units or calculating the average housing unit density to estimate the number of potentially-damaged housing units.

Assumption #3

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

For this analysis, the average housing unit density will be used since it provides a realistic perspective on potential residential damages without conducting extensive counts. Using the average housing unit density also allows future updates to the Plan to be easily recalculated and provides an exact comparison to previous estimates.

Calculating Average Housing Unit Density

The average housing unit density can be calculated by taking the number of housing units in a jurisdiction and dividing that by the land area within the jurisdiction. **Figure T-8** provides a sample calculation.

Figure T-8
Calculation of Average Housing Unit Density – Clay County

Total Housing Units in the Jurisdiction ÷ Land Area within the Jurisdiction = Average Housing Unit Density
(Rounded Up to the Nearest Whole Number)

Clay County: 6,404 housing units ÷ 468.316 sq. miles = 13.675 housing units/sq. miles
(14 housing units)

Figure T-9 provides a breakdown of housing unit densities by participating municipality as well as for the unincorporated areas of the County and the County as a whole.

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

Figure T-9
Average Housing Unit Density by Participating Jurisdiction

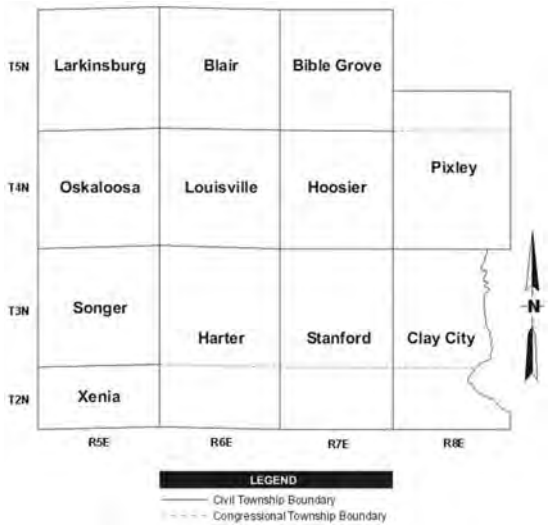
Participating Jurisdiction	Total Housing Units (2010)	Mobile Homes (2013-2017)*	Land Area (Sq. Miles) (2010)	Average Housing Unit Density (Units/Sq. Mi.) (Raw)
Clay City	481	109	1.744	275.803
Flora	2,355	258	4.727	498.202
Louisville	513	110	0.747	686.747
Xenia	193	58	0.537	359.404
Unincorp. County	2,744	652	459.337	5.974
County	6,404	1,236	468.316	13.675

* Information on additional housing characteristics, such as mobile homes, was not covered by the 2010 Census. Instead the U.S. Census Bureau has chosen to generate 5-year estimates from American Community Survey data. The 2013-2017 5-year estimate is the most recent year for which estimates were available.

Source: U. S. Census Bureau.

In Clay County, as well as many other south-central Illinois counties, there are pronounced differences in housing unit densities. Approximately 68% of all housing units are located in three of the County's 12 townships (Clay City, Harter, and Louisville) while approximately 74% of all mobile homes are located in four of the County's 12 townships (Clay City, Harter, Louisville, and Xenia). **Figure T-10** identifies the township boundaries. Tornado damage to buildings (especially mobile homes), infrastructure and critical facilities in these more densely populated townships is likely to be greater than in the rest of the County. While Clay City, Flora and Louisville all have ordinances that require anchoring systems for mobile home that should help limit the damage from lower rated tornadoes in these communities the County does not.

Figure T-10
Township Boundaries Clay County



Source: Illinois Secretary of State

This substantial difference in density skews the average *county* housing unit density in Clay County and is readily apparent when compared to the average housing unit densities for each of the townships within the County. **Figure T-11** provides a breakdown of housing unit densities by township and illustrates the differences between the various townships and the County as a whole.

Figure T-11
Average Housing Unit Density by Township

Township	Total Housing Units (2010)	Mobile Homes (2013-2017)*	Land Area (Sq. Miles) (2010)	Average Housing Unit Density (Units/Sq. Mi.) (Raw)
Bible Grove	168	10	35.492	4.733
Blair	268	51	36.224	7.398
Clay City	649	161	40.287	16.109
Harter	2,948	418	55.865	52.770
Hoosier	165	18	35.612	4.633
Larkinsburg	296	112	37.125	7.973
Louisville	758	152	36.418	20.814
Oskaloosa	134	27	37.367	3.586
Pixley	284	72	45.066	6.302
Songer	160	16	37.312	4.288
Stanford	269	15	52.976	5.078
Xenia	305	184	18.571	16.423
Townships - 3 most populated	4,355	731	132.570	32.851
Townships - 9 least populated	2,049	505	335.745	6.103

* Information on additional housing characteristics, such as mobile homes, was not covered by the 2010 Census. Instead the U.S. Census Bureau has chosen to generate 5-year estimates from American Community Survey data. The 2013-2017 5-year estimate is the most recent year for which estimates were available.

Source: U.S. Census Bureau.

For eight of the 12 townships, the *average county* housing unit density is greater (in some cases considerably greater) than the *average township* housing unit densities. However, the *average county* housing unit density is considerably less than the housing unit densities for two of the three most populated townships.

Estimating the Number of Potentially-Damaged Housing Units

Before an estimate of the number of potentially-damaged housing units can be calculated for the participating municipalities, an additional factor needs to be taken into consideration: the presence of commercial/industrial developments and/or large tracts of undeveloped land. Occasionally villages and cities will annex large tracts of undeveloped land or have commercial/industrial parks/developments located within their corporate limits. In many cases these large tracts of land include very few residential structures. Consequently, including these tracts of land in the calculations to determine the number of potentially-damaged housing units skews the results, especially for very small municipalities. Therefore, to provide a more realistic assessment of the number of potentially-damaged housing units, these areas need to be subtracted from the land area figures obtained from the U.S. Census Bureau.

In Clay County, all participating jurisdictions have commercial/industrial and undeveloped land areas within their municipal boundaries. These areas account for approximately 15% to 80% of the land area in these municipalities. If these areas are subtracted from the U.S. Census Bureau land area figures, then the remaining land areas have fairly consistent housing unit densities and contain a majority of the housing units. **Figure T-12** provides a breakdown of the refined land area figures for select municipalities. These refined land area figures will be used to update the average housing unit density calculations for these municipalities.

Figure T-12
Refined Land Area Figures for Participating Municipalities with Large Tracts of Commercial/Industrial and Open, Undeveloped Land Areas

Participating Jurisdiction	Land Area (Sq. Miles) (2010)	Estimated Open Land Area & Commercial/Industrial Tracts (Sq. Miles)	Refined Land Area (Sq. Miles)
Clay City	1.744	0.610	1.134
Flora	4.727	1.970	2.757
Louisville	0.747	0.120	0.627
Xenia	0.537	0.170	0.367

With updated average housing unit densities calculated it is relatively simple to provide an estimate of the number of existing potentially-damaged housing units. This can be done by multiplying the average housing unit density by the area impacted by the average-sized Clay County tornado. **Figure T-13** provides a sample calculation.

Figure T-13
Sample Calculation of Potentially-Damaged Housing Units – Clay County

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

Clay County: 13.675 housing units/sq. mile x 0.17 sq. miles = 2.32 housing units
(3 housing units)

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

To calculate the number of potentially-damaged housing units for these municipalities, the area impacted by the averaged-sized Clay County tornado is divided by the land area within the municipality to get the impacted land area. The impacted land area is then multiplied by the total number of housing units within the municipality to get the number of potentially-damaged housing units. **Figure T-14** provides a sample calculation. Since the refined land areas in Sailor Springs

is less than or equal to the average area impacted, it is assumed that all of the housing units within these villages will be potentially damaged.

Figure T-14
Sample Calculation of Potentially-Damaged Housing Units for Municipalities Covering Less Than One Square Mile – Louisville

Area Impacted by the Average-Sized Clay County Tornado ÷ Land Area within the Jurisdiction x Total Housing Units in the Jurisdiction = Potentially-Damaged Housing Units
(Rounded Up to the Nearest Whole Number)
Louisville: 0.17 sq. mile ÷ 0.627 sq. miles x 513 housing units = 139.09
(140 housing units)

Figures T-15 and **T-16** provide a breakdown of the number of potentially-damaged housing units by participating municipality as well as by township and for the unincorporated areas of the County and the County as a whole. It is important to note that for the three most densely populated townships, the estimated number of potentially-damaged housing units would only be reached if a tornado's pathway included the major municipality within the township. If the tornado remained in the rural portion of the township, then the number of potentially-damaged housing units would be considerably lower.

Figure T-15
Estimated Number of Housing Units by Participating Jurisdiction Potentially Damaged by a Tornado

Participating Jurisdiction	Total Housing Units (2010)	Land Area/Refined Land Area (Sq. Miles) (2010)	Average Housing Unit Density (Units/Sq. Mi.) (Raw)	Potentially-Damaged Housing Units (Units/0.17 Sq. Mi.) (Raw)	Potentially-Damaged Housing Units (Units/0.17 Sq. Mi.) (Rounded Up)
Clay City	481	1.134	424.162	72.11	73
Flora	2,355	2.757	854.189	145.21	146
Louisville	513	0.627	---	139.09	140
Xenia	193	0.367	---	89.40	90
Unincorp. County	2,744	459.337	5.974	1.02	2
County	6,404	468.316	13.675	2.32	3

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

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

Figure T-16 Estimated Number of Housing Units by Township Potentially Damaged by a Tornado					
Township	**Total Housing Units (2010)**	**Land Area (Sq. Miles) (2010)**	**Average Housing Unit Density (Units/Sq. Mi.) (Raw)**	**Potentially-Damaged Housing Units (Units/0.17 Sq. Mi.) (Raw)**	**Potentially-Damaged Housing Units (Units/0.17 Sq. Mi.) (Rounded Up)**
Bible Grove	168	35.492	4.733	0.80	1
Blair	268	36.224	7.398	1.26	2
Clay City	649	40.287	16.109	2.74	3
Harter	2,948	55.865	52.770	8.97	9
Hoosier	165	35.612	4.633	0.79	1
Larkinsburg	296	37.125	7.973	1.36	2
Louisville	758	36.418	20.814	3.54	4
Oskaloosa	134	37.367	3.586	0.61	1
Pixley	284	45.066	6.302	1.07	2
Songer	160	37.312	4.288	0.73	1
Stanford	269	52.976	5.078	0.86	1
Xenia	305	18.571	16.423	2.79	3
Townships - 3 most populated	4,355	132.570	32.851	5.58	6
Townships - 9 least populated	2,049	335.745	6.103	1.04	2

Clay County

For Clay County the level of risk or vulnerability posed by tornadoes to existing buildings, infrastructure, and critical facilities is considered ***low***. This assessment is based on the frequency with which tornadoes have occurred in the County as well as the amount of damage that has been sustained tempered by the differences in population density between the metro area and the rural/agricultural portions of the County and the relative absence of high-risk living accommodations. While previously recorded tornadoes have followed largely rural pathways, they have caused significant damage on several occasions.

Participating Municipalities

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

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

Yes. While Flora has building codes in place that will likely help lessen the vulnerability of new buildings and critical facilities to damage from tornadoes, the County and the other three municipalities do not. However, Clay City and Louisville both have tie-down ordinance that should lessen the damage to mobile homes from lower rated tornadoes.

Infrastructure such as new communication and power lines will continue to be vulnerable to tornadoes as long as they are located above ground. Flying debris can disrupt power and communication lines even if they are not directly in the path of the tornado. Steps to bury all new lines would eliminate the vulnerability, but this action would be cost prohibitive in most areas.

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

Unlike other hazards, such as flooding, there are no standard loss estimation models or methodologies for tornadoes. However, a rough estimate of potential dollar losses to the *potentially-damaged housing units* determined previously can be calculated if several additional decisions/assumptions are made regarding:

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

These assumptions represent a ***probable scenario*** based on the reported historical occurrences of tornadoes in Clay County. The purpose of providing a rough estimate is to help residents and municipal/county officials make informed decisions to better protect themselves and their communities. These estimates are meant to provide a ***general idea*** of the magnitude of the potential damage that could occur. The following provides a brief discussion of each decision/assumption.

Assumption #4: Value of Potentially-Damaged Housing Units. In order to determine the potential dollar losses to the potentially-damaged housing units, the monetary value of the units must first be calculated. Typically, when damage estimates are prepared after a natural disaster such as a tornado, they are based on the market value of the structure. Since it would be impractical to determine the individual market value of each potentially-damaged housing unit, the average market value of residential structures in each municipality will be used.

Assumption #4

The average market value for residential structures in each participating jurisdiction will be used to determine the value of potentially-damaged housing units.

To determine the average market value, the average assessed value must first be calculated. The average assessed value is calculated by taking the total assessed value of residential buildings within a jurisdiction and dividing that number by the total number of housing units within the jurisdiction. The average market value is then determined by taking the average assessed value and multiplying that number by three (the assessed value of a structure in Clay County is approximately one-third of the market value). **Figure T-17** provides a sample calculation. The total assessed value is based on 2018 tax assessment information provided by the Clay County Supervisor of Assessments.

Figures T-18 and **T-19** provide the average assessed value and average market value for each participating municipality as well as by township and for the unincorporated areas of the County and the County as a whole.

Figure T-17
Sample Calculation of Average Assessed Value & Average Market Value – Louisville

Average Assessed Value

Total Assessed Value of Residential Buildings in the Jurisdiction÷ Total Housing Units in the Jurisdiction = Average Assessed Value

Louisville: $8,138,888 ÷ 513 housing units = $15,865.28

Average Market Value

Average Assessed Value x 3 = Average Market Value
(Rounded to the Nearest Dollar)

Louisville: $15,865.28 x 3 = $47,595.84
($47,596)

Figure T-18
Average Market Value of Housing Units by Municipality

Participating Jurisdiction	Total Assessed Value of Residential Buildings (2018)	Total Housing Units (2010)	Average Assessed Values	Average Market Value
Clay City	$5,774,193	481	$12,005	$36,014
Flora	$38,323,416	2,355	$16,273	$48,820
Louisville	$8,138,888	513	$15,865	$47,596
Xenia	$2,385,699	193	$12,361	$37,083
Unincorp. County	$30,486,104	2,744	$11,110	$33,330
County	$86,067,775	6,404	$13,440	$40,319

Source: Clay County Supervisor of Assessments.

Assumption #5: Damage Scenario. Finally, a decision must be made regarding the percent damage sustained by the potentially-damaged housing units and their contents. For this scenario, the expected percent damage sustained by the structure and its contents is 100%; in other words, all of the potentially-damaged housing units would be completely destroyed. While it is highly unlikely that each and every housing unit would sustain the maximum percent damage, identifying and calculating different degrees of damage within the average area impacted is complex and provides an additional complication when updating the Plan.

Assumption #5

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

Structural Damage = 100%
Content Damage = 100%

Figure T-19
Average Market Value of Housing Units by Township

Township	Total Assessed Value of Residential Buildings (2018)	Total Housing Units (2010)	Average Assessed Values	Average Market Value
Bible Grove	$1,315,056	168	$7,828	$23,483
Blair	$2,709,988	268	$10,112	$30,336
Clay City	$7,140,101	649	$11,002	$33,005
Harter	$49,834,583	2,948	$16,905	$50,714
Hoosier	$1,091,025	165	$6,612	$19,837
Larkinsburg	$1,667,870	296	$5,635	$16,904
Louisville	$10,399,624	758	$13,720	$41,159
Oskaloosa	$887,413	134	$6,622	$19,867
Pixley	$2,474,364	284	$8,713	$26,138
Songer	$1,244,853	160	$7,780	$23,341
Stanford	$3,371,330	269	$12,533	$37,598
Xenia	$3,931,568	305	$12,890	$38,671
Townships - 3 most populated	$67,374,308	4,355	$15,471	$46,412
Townships - 9 least populated	$18,693,467	2,049	$9,123	$27,370

Source: Clay County Supervisor of Assessments.

Calculating Potential Dollar Losses

With all the decisions and assumptions made, the potential dollar losses can now be calculated. First, the potential dollar losses to the ***structure*** of a potentially-damaged housing unit must be determined. This is done by taking the average market value for a residential structure and multiplying it by the percent damage (100%) to get the average structural damage per unit. Next the average structural damage per unit is multiplied by the number of potentially-damaged housing units. **Figure T-20** provides a sample calculation.

Figure T-20
***Structure:* Potential Dollar Loss Sample Calculation – Louisville**

Average Market Value of a Housing Unit with the Jurisdiction x Percent Damage = Average Structural Damage per Housing Unit

Louisville: $47,596 x 100% = $47,596 per housing unit

Average Structural Damage per Housing Unit x Number of Potentially-Damaged Housing Units within the Jurisdiction = *Structure* Potential Dollar Losses (Rounded to the Nearest Dollar)

Louisville: $47,596 per housing unit x 140 housing units = $6,663,440

($6,663,440)

Next, the potential dollar losses to the ***content*** of a potentially-damaged housing unit must be determined. Based on FEMA guidance, the value of a residential housing unit's content is approximately 50% of its market value. Therefore, start by taking one-half the average market value for a residential structure and multiply by the percent damage (100%) to get the average content damage per unit. Next the average content damage per unit is multiplied by the number of potentially-damaged housing units. **Figure T-21** provides a sample calculation.

Figure T-21
***Content:* Potential Dollar Loss Sample Calculation - Louisville**

½ (Average Market Value of a Housing Unit) with the Jurisdiction x Percent Damage = Average Content Damage per Housing Unit

Louisville: ½ ($47,596) x 100% = $23,798 per housing unit

Average Content Damage per Housing Unit x Number of Potentially-Damaged Housing Units within the Jurisdiction = *Content* Potential Dollar Losses (Rounded to the Nearest Dollar)

Louisville: $23,798 per housing unit x 140 housing units = $3,331,720

($3,331,720)

Finally, the ***total potential dollar losses*** may be calculated by adding together the potential dollar losses to the structure and content. **Figures T-22** and **T-23** give a breakdown of the total potential dollar losses by municipality and township.

Figure T-22
Estimated Potential Dollar Losses to Potentially-Damaged Housing Units from a Tornado by Participating Jurisdiction

Participating Jurisdiction	Average Market Value (2018)	Potentially-Damaged Housing Units (Rounded Up)	Potential Dollar Losses		Total Potential Dollar Losses
			Structure	Content	
Clay City	$36,014	73	$2,629,022	$1,314,511	$3,943,533
Flora	$48,820	146	$7,127,720	$3,563,860	$10,691,580
Louisville	$47,596	140	$6,663,440	$3,331,720	$9,995,160
Xenia	$37,083	90	$3,337,470	$1,668,735	$5,006,205
Unincorp. County	$33,330	2	$66,660	$33,330	$99,990
County	$40,319	3	$120,957	$60,479	$181,436

This assessment illustrates why potential residential dollar losses should be considered when jurisdictions are deciding which mitigation projects to pursue. ***Potential dollar losses caused by an average tornado in Clay County would be expected to exceed at least $3.9 million in any of the participating municipalities***.

For comparison, an estimate of potential dollar losses was calculated for the entire County, the unincorporated portions of the County, the three most populated townships and the nine least populated townships. As discussed previously, the estimate for the entire County is skewed because it does not take into consideration the differences in the housing density.

Figure T-23
Estimated Potential Dollar Losses to Potentially-Damaged Housing Units from a Tornado by Township

Township	Average Market Value (2018)	Potentially-Damaged Housing Units (Rounded Up)	Potential Dollar Losses		Total Potential Dollar Losses
			Structure	Content	
Bible Grove	$23,483	1	$23,483	$11,742	$35,225
Blair	$30,336	2	$60,672	$30,336	$91,008
Clay City	$33,005	3	$99,015	$49,508	$148,523
Harter	$50,714	9	$456,426	$228,213	$684,639
Hoosier	$19,837	1	$19,837	$9,919	$29,756
Larkinsburg	$16,904	2	$33,808	$16,904	$50,712
Louisville	$41,159	4	$164,636	$82,318	$246,954
Oskaloosa	$19,867	1	$19,867	$9,934	$29,801
Pixley	$26,138	2	$52,276	$26,138	$78,414
Songer	$23,341	1	$23,341	$11,671	$35,012
Stanford	$37,598	1	$37,598	$18,799	$56,397
Xenia	$38,671	3	$116,013	$58,007	$174,020
Townships - 3 most populated	$46,412	6	278,472	139,236	417,708
Townships - 9 least populated	$27,370	2	54,740	27,370	82,110

Vulnerability of Commercial/Industrial Businesses and Infrastructure/Critical Facilities

The calculations presented above are meant to provide the reader with a sense of the scope or magnitude of an average-sized tornado in term of residential dollar losses. These calculations do not include damages sustained by businesses or other infrastructure and critical facilities within the participating jurisdictions.

In terms of businesses, the impacts from an average-sized tornado event can be physical and/or monetary. Monetary impacts can include loss of sales revenue either through temporary closure or loss of critical services (i.e., power, drinking water, and sewer). Depending on the magnitude of the event, the damage sustained by infrastructure and critical facilities can be extensive in nature and expensive to repair. As a result, the cumulative monetary impacts to businesses and infrastructure can exceed the cumulative monetary impacts to residences. ***While average dollar amounts cannot be supplied for these items at this time, they should be taken into account*** when discussing the impacts that an average-sized tornado could have on the participating jurisdictions.

3.6 DROUGHTS

HAZARD IDENTIFICATION

What is the definition of a drought?

While difficult to define, the National Drought Mitigation Center (NDMC) considers "drought" in its most general sense to be a deficiency of precipitation over an extended period of time, usually a season or more, resulting in a water shortage.

Drought is a normal and recurrent feature of climate and can occur in all climate zones, though its characteristics and impacts vary significantly from one region to another. Unlike other natural hazards, drought does not have a clearly defined beginning or end. Droughts can be short, lasting just a few months, or they can persist for several years. There have been 26 drought events with losses exceeding $1 billion each (CPI-Adjusted) across the United States between 1980 and 2018. This is due in part to the sheer size of the areas affected.

What types of drought occur?

There are four main types of drought that occur: meteorological, agricultural, hydrological and socioeconomic. 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 defined by the degree of dryness or rainfall deficit and the duration of the dry period. 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 refers to a period when rainfall deficits, soil moisture deficits, reduced ground water or reservoir levels needed for irrigation impact crop development and yields.
- **Hydrological Drought.** Hydrological drought refers to a period when precipitation deficits (including snowfall) impact surface (stream flow, reservoir and lake levels) and subsurface (aquifers) water supply levels.
- **Socioeconomic Drought.** Socioeconomic drought refers to a period when the demand for an economic good (fruit, vegetables, grains, etc.) exceeds the supply as a result of weather-related shortfall in the water supply.

How are droughts measured?

There are numerous quantitative measures (indicators and indices) that have been developed to measure drought. How these indicators and indices measure drought depends on the discipline affected (i.e., agriculture, hydrology, meteorology, etc.) and the region being considered. There is no single index or indicator that can account for and be applied to all types of drought.

Although none of the major indices are inherently superior to the rest, some are better suited than others for certain uses. The first comprehensive drought index developed in the United States was the Palmer Drought Severity Index (PDSI). The PDSI is calculated based on precipitation and temperature data, as well as the local Available Water Content of the soil. It is most effective

measuring drought impacts on agriculture. For many years it was the only operational drought index and it is still very popular around the world.

The Standardized Precipitation Index (SPI), developed in 1993, uses precipitation records for any location to develop a probability of precipitation for any time scale in order to reflect the impact of drought on the availability of different water resources (groundwater, reservoir storage, streamflow, snowpack, etc.) In 2009 the World Meteorological Organization recommended SPI as the main meteorological drought index that countries should use to monitor and follow drought conditions.

The first operational 'composite' approach applied in the United States was the U.S. Drought Monitor (USDM). The USDM utilizes five key indicators, numerous supplementary indicators and local reports from expert observers around the country to produce a drought intensity rating that is ideal for monitoring droughts that have many impacts, especially on agriculture and water resources during all seasons over all climate types. NOAA's Storm Events Database records include USDM ratings and utilized them along with additional weather information to describe the severity of the drought conditions impacting affected counties. Therefore, this Plan will utilize USDM ratings to identify and describe previous drought events recorded within the County. The following provides a more detailed discussion of the USDM to aid the Plan's developers and the general public in understanding how droughts are identified and categorized.

U.S. Drought Monitor (USDM)

Established in 1999, the USDM 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. It is unique in that it combines a variety of numeric-based drought indices and indicators with local expert input to create a single composite drought indicator, the results of which are illustrated via a weekly map that depicts the current drought conditions across the United States. The USDM is jointly produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the U.S. Department of Agriculture, and the National Oceanic and Atmospheric Administration.

The USDM has a scale of five intensity categories, D0 through D4, that are utilized to identify areas of drought. **Figure DR-1** provides a brief description of each category.

Because the ranges of the various indicators often don't coincide, the final drought category tends to be based on what a majority of the indictors show and on local observations. The authors also weight the indices according to how well they perform in various parts of the country and at different times of the year. It is the combination of the best available data, location observations and experts' best judgment that make the U.S. Drought Monitor more versatile than other drought indices.

In addition to identifying and categorizing general areas of drought, the USDM also identifies whether a drought's impacts are short-term (typically less than 6 months – agriculture, grasslands) or long-term (typically more than 6 months – hydrology, ecology). **Figure DR-2** shows an example of the USDM weekly map. The USDM is designed to provide a consistent big-picture

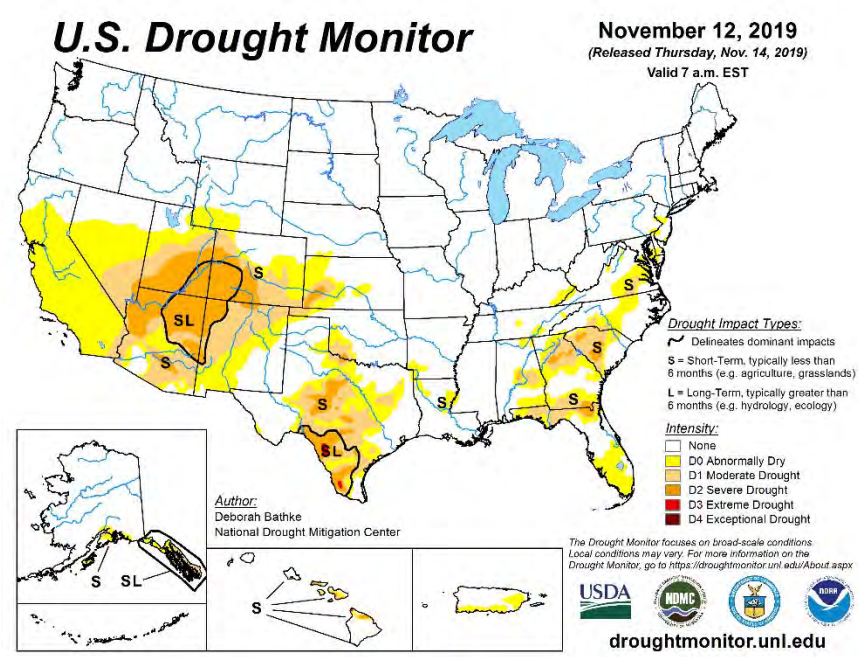
look at drought conditions in the United States. It is not designed to infer specifics about local conditions.

Figure DR-1
U.S. Drought Monitor – Drought Severity Classifications

Category	Possible Impacts
D0 (Abnormally Dry)	• Going into drought: - short-term dryness slowing planting, growth of crops or pastures. • Coming out of drought: - some lingering water deficits - pastures or crops not fully recovered
D1 (Moderate Drought)	• Some damage to crops, pastures • Streams, reservoirs, or wells low; some water shortages developing or imminent • Voluntary water-use restrictions requested
D2 (Severe Drought)	• Crop or pasture losses likely • Water shortages common • Water restrictions imposed
D3 (Extreme Drought)	• Major crop/pasture losses • Widespread water shortages or restrictions
D4 (Exceptional Drought)	• Exceptional and widespread crop/pasture losses • Shortages of water in reservoirs, streams, and wells creating water emergencies

Source: U.S. Drought Monitor.

Figure DR-2
U. S. Drought Monitor



The U.S. Drought Monitor is jointly produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Map Courtesy of NDMC.

HAZARD PROFILE

The following identifies past occurrences of drought, details the severity or extent of each event (if known); identifies the locations potentially affected and estimates the likelihood of future occurrences.

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

Drought Fast Facts – Occurrences

Number of Drought Events Reported (1980 – 2019): ***6***

Table 11, located in **Appendix J**, summarizes the previous occurrences as well as the extent or magnitude of the drought events recorded in Clay County. NOAA's Storm Events Database, the Illinois State Water Survey, the Illinois Emergency Management Agency (IEMA) and the USDA documented six official droughts for Clay County between 1980 and 2019.

The State of Illinois Drought Preparedness and Response Plan identified seven outstanding statewide droughts since 1900 based on statewide summer values of the PDSI provided by NOAA's National Center for Environmental Information. Those seven droughts occurred in 1902, 1915, 1931, 1934, 1936, 1954 and 1964; however, the extent to which Clay County was impacted was unavailable.

What locations are affected by drought?

Drought events affect the entire County. Droughts, like excessive heat and severe winter storms, tend to impact large areas, extending across an entire region and affecting multiple counties. The *2018 Illinois Natural Hazard Mitigation Plan* classifies Clay County's hazard rating for drought as "medium."

What is the probability of future drought events occurring?

Clay County has experienced six droughts between 1980 and 2019. With six occurrences over 40 years, the probability or likelihood that the County may experience a drought in any given year is 15%. However, if earlier recorded droughts are factored in, then the probability that Clay County may experience a drought in any given year decreases to 11%.

HAZARD VULNERABILITY

The following describes the vulnerability to participating jurisdictions, identifies the impacts on public health and property (if known) and estimates the potential impacts on public health and safety as well as buildings, infrastructure and critical facilities from drought.

Are the participating jurisdictions vulnerable to drought?

Yes. All of Clay County, including the municipalities, is vulnerable to drought. Neither the amount nor the distribution of precipitation; soil types; topography; or water table conditions provides protection for any area within the County. Since 2010, Clay County has experienced two droughts.

Do any of the participating jurisdictions consider drought to be among their community's greatest vulnerabilities?

No. Based on responses to a Critical Facilities Vulnerability Survey distributed to the participating jurisdictions, none of the participating jurisdictions considered drought to be among their community's greatest vulnerabilities. In addition, none of the jurisdictions identified any critical facilities or infrastructure within their communities as having a specific vulnerability to drought.

What impacts resulted from the recorded drought events?

Damage information was only available for one of the six drought events experienced between 1980 and 2019. According to NOAA's Storm Events Database, the 2012 drought caused an estimated $32.2 million in damages to the corn crop in Clay County. Damage information was either unavailable or none was recorded for the remaining four reported occurrences.

Of the six drought events, disaster relief payment information was only available for one of the events. In 1988, landowners and farmers in Illinois were paid in excess of $382 million in relief payments; however, a breakdown by county was unavailable.

Drought Fast Facts – Impacts/Risk

Drought Impacts:
- Total Property Damage: ***n/a***
- Total Crop Damage: ***$32.2 million (corn crop damage only – 2012 drought)***

Drought Risk/Vulnerability:
- Public Health & Safety: ***Low***
- Buildings/Infrastructure/Critical Facilities: ***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 drought events in Illinois include reductions in crop yields and drinking water shortages.

Crop Yield Reductions

Agriculture is the major enterprise in Clay County. Farmland accounts for approximately 98.2% of all the land in the County. According to the 2017 Census of Agriculture, there were 732 farms in in the County occupying 294,311 acres. Of the land in farms, approximately 88% or 258,700 acres is in crop production.

According to the 2017 Census of Agriculture, crop sales accounted for $101 million in revenue while livestock sales accounted for $15.2 million. Clay County ranks 61st in Illinois for livestock cash receipts and 62nd for crop cash receipts. A severe drought would have a major financial impact on the large agricultural community, particularly if it occurred during the growing season. Dry weather conditions, particularly when accompanied by excessive heat, can result in diminished crop yields and place stress on livestock.

A reduction in crop yields was seen as a result of the 1983, 1988, 2005, 2007, 2011 and 2012 droughts. **Figure DR-3** illustrates the reduction yields seen for corn and soybeans during the six recorded drought events. The USDA's National Agricultural Statistics Service records show that yield reductions were most severe for the 1983 drought when there was an 82.5% reduction in corn yields and a 58.1% reduction in soybean yields.

Figure DR-3
Crop Yield Reductions Due to Drought – Clay County

Year	Corn		Soybeans	
	Yield (bushel)	% Reduction Previous Year	Yield (bushel)	% Reduction Previous Year
1982	114	---	31	---
1983	**20**	**82.5%**	**13**	**58.1%**
1984	77	---	22	---
1987	124	---	29	---
1988	**62**	**50.0%**	**20.5**	**29.3%**
1989	102	---	30.5	---
2004	154	---	43	---
2005	**116**	**24.7%**	**40**	**7.0%**
2006	130	---	39	2.5%
2007	**123**	**5.4%**	**29**	**25.6%**
2008	133	---	41	---
2010	145.9	---	44.2	---
2011	**121.5**	**16.7%**	**31.9**	**27.8%**
2012	n/a	n/a	**22.6**	**29.2%**
2013	153.5	---	40.7	---

Source: USDA, National Agricultural Statistics Service.

Drinking Water Shortages

Municipalities that rely on surface water sources for their drinking water supplies are more vulnerable to shortages as a result of drought. In Clay County ***three participating municipality relies on a surface water source*** for their drinking water supply. Flora, and Xenia purchase their water from Gateway Regional Water Company while Louisville purchases its water from EJ Water Coop.

Because Flora, Louisville, and Xenia receive all of their drinking water supply from a surface water source, they are more vulnerable to shortages as a result of a prolonged drought or a series of droughts in close succession. Those participants that obtain water from wells are less vulnerable to drinking water shortages, although a prolonged drought or a series of droughts in close succession do have the potential to impact water levels in aquifers used for individual drinking water wells in rural areas. This is because individual (private) water wells tend to be shallower than municipal (public) water wells.

What is the level of vulnerability to public health and safety from drought?

Unlike other natural hazards that affect the County, drought events do not typically cause injuries or fatalities. The primary concern centers on the financial impacts that result from loss of crop yields and livestock and potential drinking water shortages. Even taking into consideration the potential impacts that a water shortage may have on the general public, the risk or vulnerability to public health and safety from drought is ***low***.

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

No. In general, existing buildings, infrastructure and critical facilities located in Clay County and the participating municipalities are not vulnerable to drought. The primary concern centers on the financial impacts that result from loss of crop yields and livestock.

While buildings do not typically sustain damage from drought events, in rare cases infrastructure and critical facilities may be directly or indirectly impacted. While uncommon, droughts can contribute to roadway damage. Severe soil shrinkage can compromise the foundation of a roadway and lead to cracking and buckling.

Prolonged heat associated with drought can also increase the demand for energy to operate air conditioners, fans and other devices. This increase in demand places stress on the electrical grid, which increases the likelihood of power outages.

Additionally, droughts have impacted drinking water supplies. Reductions in aquifer water levels can cause water shortages that jeopardize the supply of water needed to provide drinking water and fight fires. While water use restrictions can be enacted in an effort to maintain a sufficient supply of water, they are only temporary and do not address long-term viability issues. Drinking water supplies vulnerable to drought, such as those that rely solely on surface water or shallow wells, need to consider mitigation measures that will provide long-term stability before a severe drought or a series of droughts occur. Effective mitigation measures include drilling additional wells, preferably deep wells, securing agreements with alternative water sources and constructing water lines to provide a backup water supply.

In general, the risk or vulnerability to buildings, infrastructure and critical facilities from drought is ***low***, even taking into consideration the potential impact a drought may have on drinking water supplies and the stress that prolonged heat may place on the electrical grid.

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

No. Future buildings, infrastructure and critical facilities within the County are no more vulnerable to drought than the existing building, infrastructure and critical facilities. As discussed above, buildings do not typically sustain damage from drought. Infrastructure and critical facilities may, in rare cases, be damaged by drought, but very little can be done to prevent this damage.

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

Unlike other natural hazards there are no standard loss estimation models or methodologies for drought. Since drought typically does not cause structure damage, it is unlikely that future dollar losses will be excessive. The primary concern associated with drought is the financial impacts that result from loss of crop yields and the potential impacts to drinking water supplies. 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 consumers as well as businesses and industries that are water-dependent (i.e., car washes, landscapers etc.).

3.7 EARTHQUAKES

HAZARD IDENTIFICATION

What is the definition of an earthquake?

An earthquake is a sudden shaking of the ground caused when rocks forming the earth's crust slip or move past each other along a fault (a fracture in the rocks). Most earthquakes occur along the boundaries of the earth's tectonic plates. These slow-moving plates are being pulled and dragged in different directions, sliding over, under and past each other. Occasionally, as the plates move past each other, their jagged edges will catch or stick causing a gradual buildup of pressure (energy).

Eventually, the force exerted by the moving plates overcomes the resistance at the edges and the plates snap into a new position. This abrupt shift releases the pent-up energy, producing vibrations or seismic waves that travel outward from the earthquake's point of origin. The location below the earth's surface where the earthquake starts is known as the hypocenter or focus. The point on the earth's surface directly above the focus is the epicenter.

The destruction caused by an earthquake may range from light to catastrophic depending on a number of factors including the magnitude of the earthquake, the distance from the epicenter, the local geologic conditions as well as construction standards and time of day (i.e., rush hour). Earthquake damage may include power outages, general property damage, road and bridge failure, collapsed buildings and utility damage (ruptured gas lines, broken water mains, etc.).

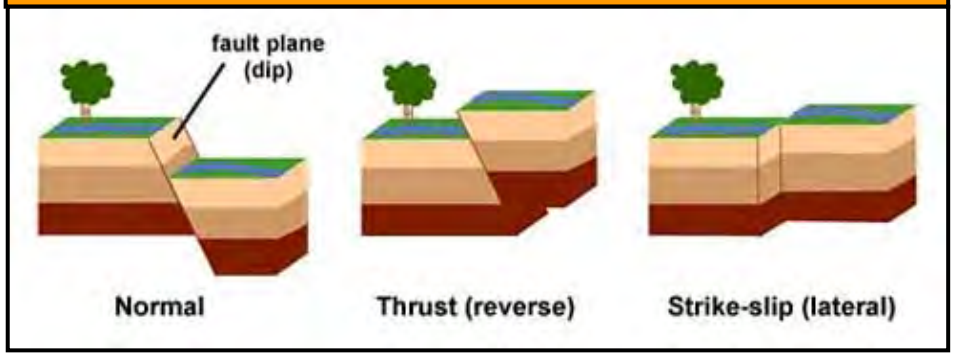
Most of the damage done by an earthquake is caused by its secondary or indirect effects. These secondary effects result from the seismic waves released by the earthquake and include ground shaking, surface faulting, liquefaction, landslides and, in rare cases, tsunamis.

According to the U.S. Geological Survey, more than 143 million Americans in the contiguous United States are exposed to potentially damaging ground shaking from earthquakes. Over 44 million of those Americans, located in 18 states, are exposed to very strong ground shaking from earthquakes. Illinois ranks 10th in terms of the number of individuals exposed to very strong ground shaking. The Federal Emergency Management Agency's Hazus analysis indicates that the annualized earthquake losses to the national building stock is $6.1 billion per year. A majority of the average annual loss is concentrated in California ($3.7 million). The central United States (including Illinois) ranks third in annualized earthquake losses at $480 billion, behind the pacific northwest (Washington and Oregon) with annualized earthquake losses at $710 billion.

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 EQ-1** provides an illustration of each type of fault.

Figure EQ-1
Fault Illustration



Source: U. S. Geological Survey.

Normal faults occur in response to pulling or tension along the two blocks of rock causing the overlying block to move down the dip of the fault plane. Most of the faults in Illinois are normal faults. Thrust or reverse faults occur in response to squeezing or compression of the two blocks of rock causing the overlying block to move up the dip of the fault plane. Strike-slip or lateral faults can occur in response to either pulling/tension or squeezing/compression causing the blocks to move horizontally past each other.

Geologists have found that earthquakes tend to recur along faults, which reflect zones of weakness in the earth's crust. Even if a fault zone has recently experienced an earthquake, there is no guarantee that all the stress has been relieved. Another earthquake could still occur.

What are tectonic plates?

Tectonic plates are large, irregularly-shaped, relatively rigid sections of the earth's crust that float on the top, fluid layer of the earth's mantle. There are about a dozen tectonic plates that make up the surface of the planet. These plates are approximately 50 to 60 miles thick and the largest are millions of square miles in size.

How are earthquakes measured?

The severity of an earthquake is measured in terms of its magnitude and intensity. A brief description of both terms and the scales used to measure each are provided below.

Magnitude

Magnitude refers to the amount of seismic energy released at the hypocenter of an earthquake. The magnitude of an earthquake is determined from measurements of ground vibrations recorded by seismographs. As a result, magnitude is represented as a single, instrumentally determined value. A loose network of seismographs has been installed all over the world to help record and verify earthquake events.

There are several scales that measure the magnitude of an earthquake. The most well-known is the Richter Scale. This logarithmic scale provides a numeric representation of the magnitude of an earthquake through the use of whole numbers and decimal fractions. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in ground

vibrations measured. In addition, each whole number increase corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number. It is important to note that the Richter Scale is used only to determine the magnitude of an earthquake, it does not assess the damage that results.

Once an earthquake's magnitude has been confirmed, it can be classified. **Figure EQ-2** 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 micro earthquake while any earthquake with a magnitude of 8.0 or greater on the Richter Scale is considered a "great" earthquake. Earthquakes with a magnitude of 2.0 or less are not commonly felt by individuals. The largest earthquake to occur in the United States since 1900 took place off the coast of Alaska in Prince William Sound on March 28, 1964 and registered a 9.2 on the Richter Scale.

Figure EQ-2
Earthquake Magnitude Classes

Class	Magnitude (Richter Scale)
micro	smaller than 3.0
minor	3.0 – 3.9
light	4.0 – 4.9
moderate	5.0 – 5.9
strong	6.0 – 6.9
major	7.0 – 7.9
great	8.0 or larger

Source: Michigan Technological University, Department of Geological and Mining Engineering and Sciences, UPSeis

Intensity

Intensity refers to the effect an earthquake has on a particular location. The intensity of an earthquake is determined from observations made of the damage inflicted on individuals, structures and the environment. As a result, intensity does not have a mathematical basis; instead it is an arbitrary ranking of observed effects. In addition, intensity generally diminishes with distance. There may be multiple intensity recordings for a region depending on a location's distance from the epicenter.

Although numerous intensity scales have been developed over the years, the one currently used in the United States is the Modified Mercalli Intensity Scale. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. The lower numbers of the intensity scale are based on human observations (i.e., felt only by a few people at rest, felt quite noticeably by persons indoors, etc.).

The higher numbers of the scale are based on observed structural damage (i.e., broken windows, general damage to foundations etc.). Structural engineers usually contribute information when assigning intensity values of VIII or greater. **Figure EQ-3** provides a description of the damages associated with each level of intensity as well as comparing Richter Scales values to Modified Mercalli Intensity Scale values.

Generally, the Modified Mercalli Intensity value assigned to a specific site after an earthquake is a more meaningful measure of severity to the general public than magnitude because intensity refers to the effects actually experienced at that location.

Figure EQ-3
Comparison of Richter Scale and Modified Mercalli Intensity Scale

Richter Scale	Modified Mercalli Scale	Observations
1.0 – 1.9	I	Felt by very few people; barely noticeable. No damage.
2.0 – 2.9	II	Felt by a few people, especially on the upper floors of buildings. No damage.
3.0 – 3.9	III	Noticeable indoors, especially on the upper floors of buildings, but may not be recognized as an earthquake. Standing cars may rock slightly; vibrations similar to the passing of a truck. No damage.
4.0	IV	Felt by many indoors and a few outdoors. Dishes, windows, and doors disturbed. Standing cars rocked noticeably. No damage.
4.1 – 4.9	V	Felt by nearly everyone. Small, unstable objects displaced or upset; some dishes and glassware broken. Negligible damage.
5.0 – 5.9	VI	Felt by everyone. Difficult to stand. Some heavy furniture moved. Weak plaster may fall and some masonry, such as chimneys, may be slightly damaged. Slight damage.
6.0	VII	Slight to moderate damage to well-built ordinary structures. Considerable damage to poorly-built structures. Some chimneys may break. Some walls may fall.
6.1 – 6.9	VIII	Considerable damage to ordinary buildings. Severe damage to poorly built buildings. Some walls collapse. Chimneys, monuments, factory stacks, columns fall.
7.0	IX	Severe structural damage in substantial buildings, with partial collapses. Buildings shifted off foundations. Ground cracks noticeable.
7.1 – 7.9	X	Most masonry and frame structures and their foundations destroyed. Some well-built wooden structures destroyed. Train tracks bent. Ground badly cracked. Landslides.
8.0	XI	Few, if any structures remain standing. Bridges destroyed. Wide cracks in ground. Train tracks bent greatly. Wholesale destruction.
> 8.0	XII	Total damage. Lines of sight and level are distorted. Waves seen on the ground. Objects thrown up into the air.

Sources: Michigan Technological University, Department of Geological and Mining Engineering and Sciences, UPSeis.
U.S. Geological Survey.

When and where do earthquakes occur?

Earthquakes can strike any location at any time. However, history has shown that most earthquakes occur in the same general areas year after year, principally in three large zones around the globe. The world's greatest earthquake belt, the circum-Pacific seismic belt (nicknamed the "Ring of Fire"), is found along the rim of the Pacific Ocean, where about 81 percent of the world's largest earthquakes occur.

The second prominent belt is the Alpide, which extends from Java to Sumatra and through the Himalayan Mountains, the Mediterranean Sea and out into the Atlantic Ocean. It accounts for about 17 percent of the world's largest earthquakes, including those in Iran, Turkey and Pakistan. The third belt follows the submerged mid-Atlantic Ridge, the longest mountain range in the world, nearly splitting the entire Atlantic Ocean north to south.

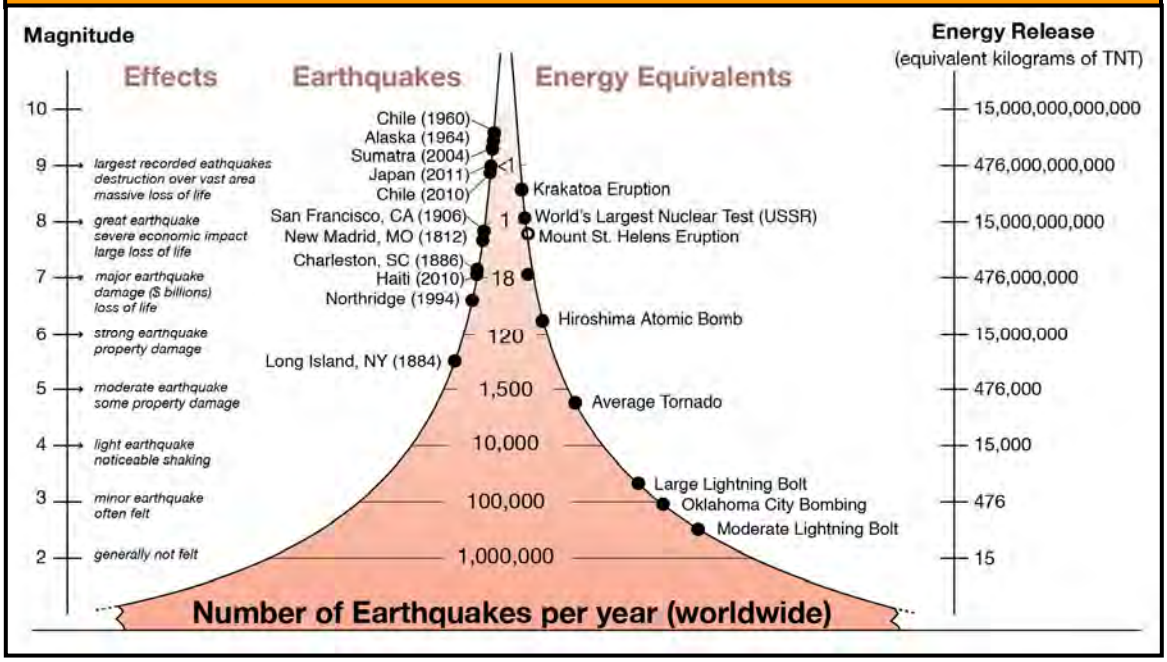
While most earthquakes occur along plate boundaries some are known to occur within the interior of a plate. (As the plates continue to move and plate boundaries change over time, weakened

boundary regions become part of the interiors of the plates.) Earthquakes can occur along zones of weakness within a plate in response to stresses that originate at the edges of the plate or from deep within the earth's crust. The New Madrid earthquakes of 1811 and 1812 occurred within the North American plate.

How often do earthquakes occur?

Earthquakes occur every day. Magnitude 2 and smaller earthquakes occur several hundred times a day worldwide. These earthquakes are known as micro earthquakes and are generally not felt by humans. Major earthquakes, greater than magnitude 7, generally occur at least once a month. **Figure EQ-4** 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 EQ-4
Approximate Number of Earthquakes Recorded Annually



Source: Incorporated Research Institutions for Seismology, Education and Outreach Series, "How Often Do Earthquakes Occur?"

HAZARD PROFILE

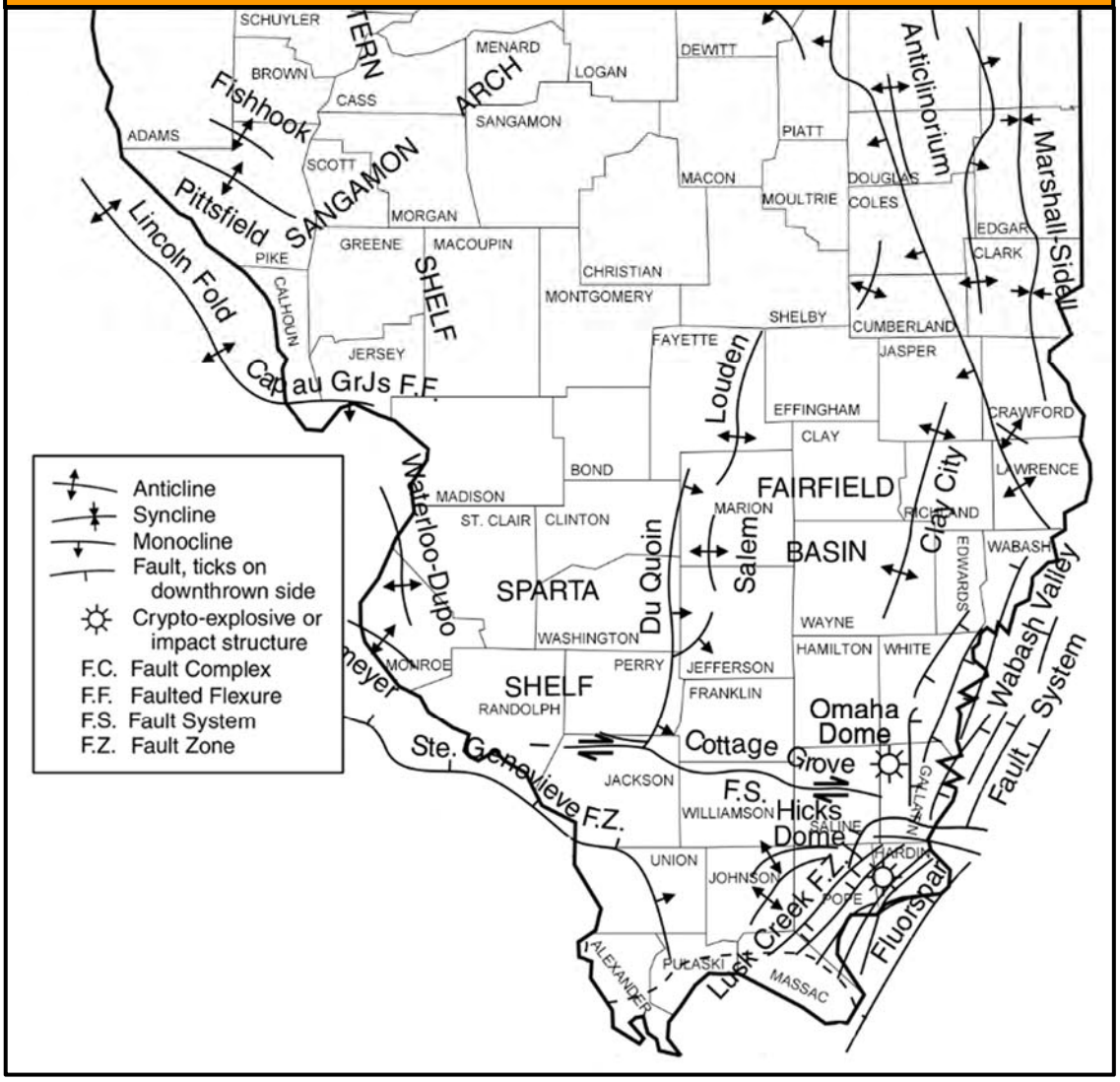
The following details the location of known fault zones and geologic structures, identifies past occurrences of earthquakes, details the severity or extent of each event (if known); identifies the locations potentially affected and estimates the likelihood of future occurrences.

Are there any faults located within the County?

There are no geological structures of significance, including faults, located in Clay County. However, there are several well-known faults in the immediate region: the Wabash Valley Fault System, the

Cottage Grove Fault System and the Rough Creek-Shawneetown Fault System. **Figure EQ-5** illustrates the location of these structures.

Figure EQ-5
Geological Structures in Central and Southern Illinois



Source: Illinois State Geological Survey.

- ***Wabash Valley Fault System***: The Wabash Valley Fault System straddles the southern Illinois-Indiana border and is about 55 miles long and as wide as 30 miles. This broad fracture system experiences moderate earthquake activity presently and there is evidence that strong earthquakes have occurred here within 10,000 years.
- ***Cottage Grove Fault System***: The Cottage Grove Fault System is a complex fracture zone comprised of a "master fault", subsidiary faults, and a belt of anticlines mostly to the south. The zone is approximately 70 miles long and greater than 10 miles wide in some areas, that trends slightly north of west across southern Illinois from Gallatin County to Jackson County.

- *Rough Creek-Shawneetown Fault System*: The Rough Creek-Shawneetown Fault System is one of the largest fault systems in the Midwest. This braided fracture system is about 130 miles long and more than 5 miles wide in some places trending from northeastern Pope County, Illinois to Grayson County, Kentucky.

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

Earthquake Fast Facts – Occurrences

Earthquakes Originating in the County (1795 – 2019): ***3***

Fault Zones Located within the County: ***None***

Fault Zones Located in Nearby Counties: ***3***

According to Illinois State Geological Survey, US Geological Survey and the U.S. Geological Survey and the Center for Earthquake Research and Information (CERI) at the University of Memphis, three earthquakes have originated in Clay County during the last 200 years. **Figure EQ-6** provides basic details on each event while **Figure EQ-7** illustrates the epicenter of these earthquake.

Figure EQ-6
Earthquakes Originating in Clay County

Date	Magnitude	Intensity	Location
5/21/1906	4.2	V	2 miles west-northwest of Clay City
12/5/1978	3.5	V	approx. 4 miles south of Clay City
3/27/1982	2.7	---	2 ½ miles southwest of Oskaloosa

Clay County residents, including those in the participating jurisdictions, have also felt ground shaking caused by earthquakes that have originated outside of the County. The following provides a brief description by region, of these events.

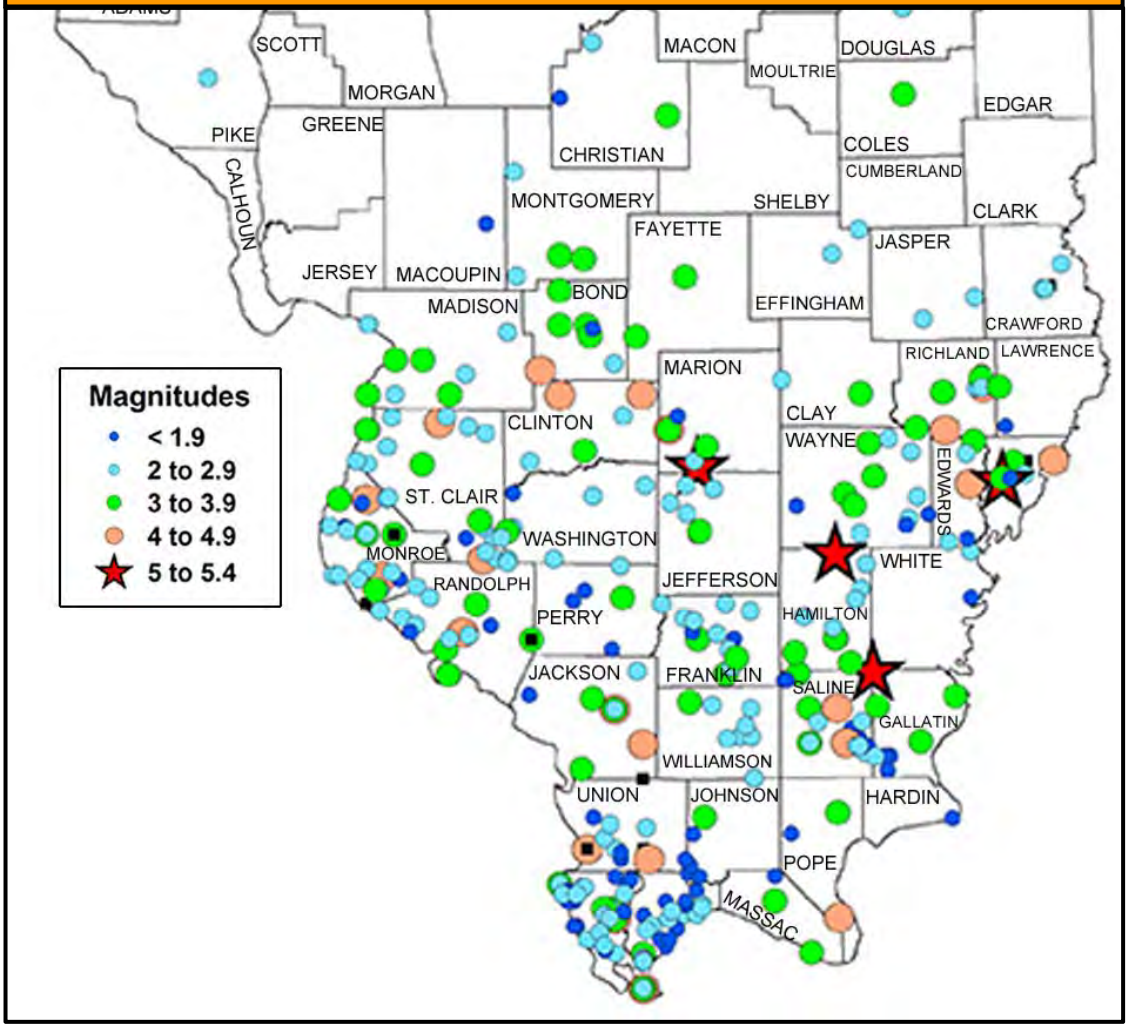
Southern Illinois

Clay County residents also felt ground shaking caused by several earthquakes that have originated in southern Illinois. The following provides a brief description of a few of the larger events that have occurred.

- 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.
- A magnitude 5.2 earthquake took place on June 10, 1987 in southeastern Illinois near Olney in Richland County. This earthquake was also located along the Wabash Valley seismic zone. Only minor structural damage was reported in several towns in Illinois and Indiana. Ground shaking was felt over all or parts of 17 states in the central and eastern United States and southern Ontario, Canada.
- The strongest earthquake in the central United States during the 20th century occurred along the Wabash Valley seismic zone in southeastern Illinois near Dale in Hamilton County. This magnitude 5.4 earthquake occurred on November 9, 1968 with an intensity estimated at VII for the area surrounding the epicenter. Moderate structural damage was reported in several towns in south-central Illinois, southwest Indiana and northwest Kentucky. Ground shaking

was felt over all or parts of 23 states in the central and eastern United States and southern Ontario, Canada.

Figure EQ-7
Earthquakes Originating in Southern Illinois



Source: Illinois State Geological Survey.

Three of the ten largest earthquakes ever recorded within the continental United States took place in 1811 and 1812 along the New Madrid seismic zone. This zone lies within the central Mississippi Valley and extends from northeast Arkansas through southeast Missouri, western Tennessee, western Kentucky and southern Illinois. These magnitude 7.5 and 7.3 major earthquakes were centered near the town of New Madrid, Missouri and caused widespread devastation to the surrounding region and were felt by people in cities as far away as Pittsburgh, Pennsylvania and Norfolk, Virginia.

The quakes locally changed the course of the Mississippi River creating Reelfoot Lake in northwestern Tennessee. These earthquakes were not an isolated incident. The New Madrid

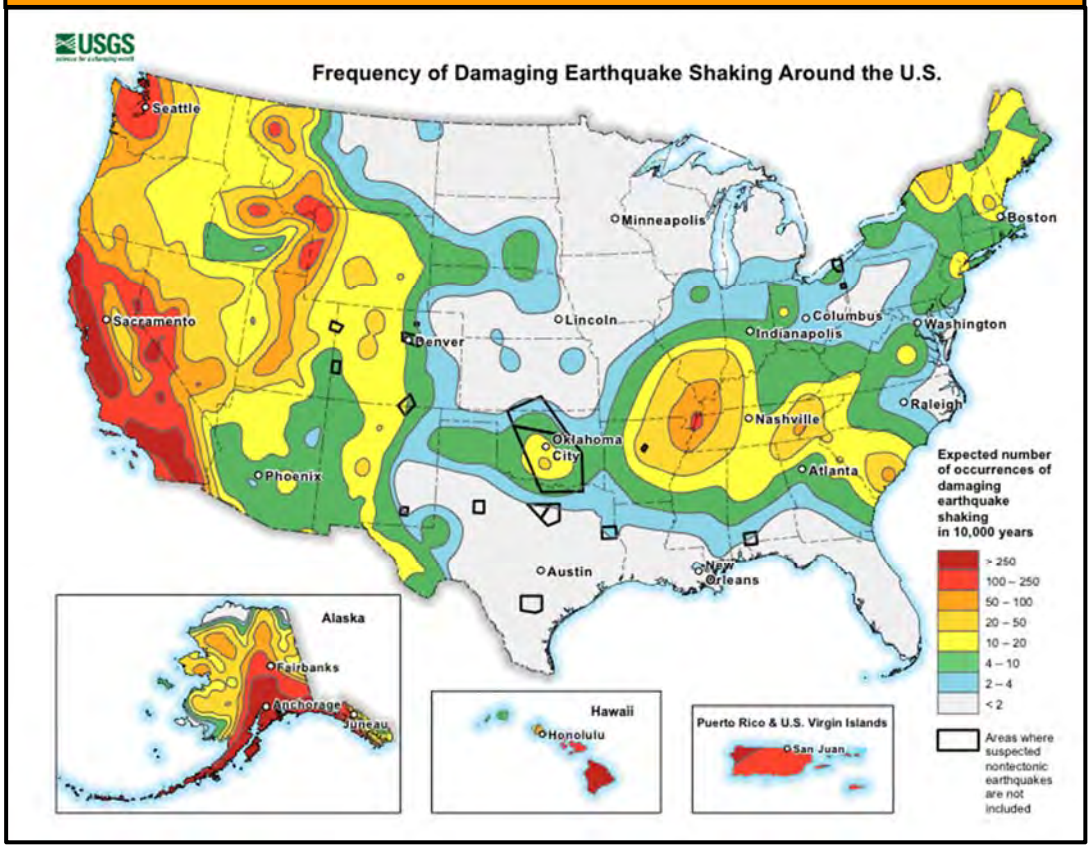
Seismic Zone is one of the most seismically active areas of the United States east of the Rockies. Since 1974 more than 4,000 earthquakes have been recorded within this seismic zone, most of which were too small to be felt.

What locations are affected by earthquakes? What is the extent of future potential earthquakes?

Earthquake events generally affect the entire County. Earthquakes, like drought and excessive heat, impact large areas extending across an entire region and affecting multiple counties. Clay County's proximity to the Wabash Valley Fault System, the Cottage Grove Fault System, the Rough Creek-Shawneetown Fault System, and the New Madrid Seismic Zone makes the entire area likely to be affected by an earthquake if these faults become seismically active. The *2018 Illinois Natural Hazard Mitigation Plan* classifies Clay County's hazard rating for earthquakes as "Medium."

According to the USGS, Clay County can expect 10 to 50 occurrences of damaging earthquake shaking over a 10,000-year period. **Figure EQ-8** illustrates the frequency of damaging earthquake shaking around the U.S.

Figure EQ-8
Frequency of Damaging Earthquake Shaking Around the U.S.



Source: United State Geological Survey.

What is the probability of future earthquake events occurring?

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

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

The general consensus among scientists is that earthquakes similar to the 1811-1812 earthquakes are expected to recur on average every 500 years. The U.S. Geological Survey and the Center for Earthquake Research and Information (CERI) at the University of Memphis estimates 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%.

HAZARD VULNERABILITY

The following describes the vulnerability to participating jurisdictions, identifies the impacts on public health and property (if known) and estimates the potential impacts on public health and safety as well as buildings, infrastructure and critical facilities from earthquakes.

Are the participating jurisdictions vulnerable to earthquakes?

Yes. All of Clay 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.

Earthquake Fast Facts – Impacts/Risk

Earthquake Risk/Vulnerability:

- Public Health & Safety – Light/Moderate Quake within the County or immediate region: ***Low***
- Public Health & Safety – Major Quake Wabash Valley/New Madrid seismic zone: ***Medium***
- Buildings/Infrastructure/Critical Facilities – Light/ Moderate Quake within the County or immediate region: ***Low***
- Buildings/Infrastructure/Critical Facilities – Major Quake in the region: ***Medium***

This vulnerability, found throughout most of Illinois and all of Clay 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 Clay 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.

Do any of the participating jurisdictions consider earthquakes to be among their community's greatest vulnerabilities?

No. Based on responses to a Critical Facilities Vulnerability Survey distributed to the participating jurisdictions, none of the participating jurisdictions considered earthquakes to be among their community's greatest vulnerabilities. In addition, none of the jurisdictions identified any critical facilities or infrastructure within their communities as having a specific vulnerability to earthquakes.

What impacts resulted from the recorded earthquake events?

Property damage information was either unavailable or none was recorded for the three documented earthquake that occurred in Clay County. While Clay County residents felt the earthquakes that occurred in central and southern Illinois, 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 Clay County felt those quakes; however historical records do not indicate the intensity or impacts that these quakes had on the County.

What other impacts can result from earthquakes?

Earthquakes can impact human life, health and public safety. **Figure EQ-9** details the potential impacts that may be experienced by the County should a magnitude 6.0 or greater earthquake occur in the region.

What is the level of vulnerability to public health and safety from earthquakes?

The risk or vulnerability to public health and safety from an earthquake is dependent on the intensity and location of the event. Since there are no known faults in Clay County, the likelihood that an earthquake will originate in the County is very small, decreasing the changes for catastrophic damages. However, if a light earthquake originates within the County or from the faults in the immediate region, the risk or vulnerability to public health and safety is considered ***low***. This risk is elevated from ***medium*** for a major earthquake originating along the Wabash Valley or New Madrid seismic zones.

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

Yes. All existing buildings, infrastructure and critical facilities located in Clay County and the participating jurisdictions are vulnerable to damage from earthquakes. Given the County's size (just over 13,000 individuals), it's population density and the fact that there are virtually no buildings higher than two stories (with the exception of grain elevators) tempered by the potential for magnitude 5.0 and above earthquakes to occur in the immediate region, the damage is anticipated to range from slight to considerable for well-built ordinary structures and considerable to severe for poorly-built structures.

Figure EQ-9
Potential Earthquake Impacts

Direct	Indirect
Buildings • Temporary displacement of businesses, households, schools and other critical services where heat, water and power are disrupted • Long-term displacement of businesses, households, schools and other critical services due to structural damage or fires *Transportation* • Damages to bridges (i.e., cracking of abutments, subsidence of piers/supports, etc.) • Cracks in the pavement of critical roadways • Increased traffic on US and State Routes (especially if the quake originates along the New Madrid seismic zone) as residents move out of the area to seek shelter and medical care and as emergency response, support services and supplies move south to aid in recovery • Misalignment of rail lines due to landslides (most likely near stream crossings), fissures and/or heaving *Utilities* • Downed power and communication lines • Breaks in drinking water and sanitary sewer lines resulting in the temporary loss of service • Disruptions in the supply of natural gas due to cracking and breaking of pipelines *Health* • Injuries/deaths due to falling debris and fires *Other* • Cracks in the earthen dams of the lakes and reservoirs within the County which could lead to dam failures	*Health* • Use of County health facilities to treat individuals injured closer to the epicenter • Emergency services (ambulance, fire, law enforcement) may be needed to provide aid in areas where damage was greater *Other* • Disruptions in land line telephone service throughout an entire region • Depending on the seasonal conditions present, more displacements may be expected as those who may not have enough water and food supplies seek alternate shelter due to temperature extremes that make their current housing uninhabitable

If a strong earthquake (6.0 – 6.9) were to occur in the region then unreinforced masonry buildings are most at risk during an earthquake because the walls are prone to collapse outward. Steel and wood buildings have more ability to absorb the energy from an earthquake while wood buildings with proper foundation ties have rarely collapsed in earthquakes. **Figure EQ-10** identifies the number of unreinforced masonry buildings that serve as critical facilities within the participating jurisdictions.

Figure EQ-10
Number of Unreinforced Masonry Buildings Serving as Critical Facilities by Jurisdiction in Clay County

Participating Jurisdiction	Government[1]	Law Enforcement	Fire Stations	Ambulance Service	Schools	Drinking Water	Wastewater Treatment	Medical[2]	Healthcare Facilities[3]
Clay County	3	---	---	1	---	---	---	7	2
Clay City	1	---	1	---	1	---	0	---	---
Flora	1	1	0	1	3	0	1	2	4
Louisville	2	1	1	---	3	---	0	2	2
Xenia	1	---	1	---	---	---	0	---	---
Clay County Hospital	---	---	---	0	---	---	---	0	---
Flora CUSD #35	---	---	---	---	3	---	---	---	---
North Clay CUSD #25	---	---	---	---	2	---	---	---	---
North Clay FPD	---	---	1	---	---	---	---	---	---

[1] Government includes: courthouses, city/village halls, township buildings, highway/road maintenance centers, etc.
[2] Medical includes: public health departments, hospitals, urgent/prompt care and medical clinics.
[3] Healthcare Facilities include: nursing homes, skilled care facilities, memory care facilities, residential group homes, etc.
--- Indicates jurisdiction does not own/maintain any critical facilities within that category.

If the epicenter of a magnitude 7.6 earthquake were to originate anywhere along the New Madrid seismic zone, the highest projected Modified Mercalli intensity felt in Clay County according to the *Projected Earthquake Intensities Map* prepared by the Missouri State Emergency Management Agency.

An earthquake also has the ability to damage critical infrastructure such as roads and utilities. In the event of a major 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. **Figure R-4** lists the number of each type of critical infrastructure by jurisdiction.

An earthquake may also down overhead power and communication lines causing power outages and disruptions in communications. Cracks or breaks may form in natural gas pipelines and drinking water and sewage lines resulting in temporary loss of service. In addition, an earthquake could cause cracks to form in the earthen dams located within the County, increasing the likelihood of a dam failure.

As with public health and safety, the risk or vulnerability to buildings, infrastructure and critical facilities is dependent on the intensity and location of the event. The risk to buildings, infrastructure and critical facilities is considered to be ***low*** for a light to moderate earthquake that originates within the County or immediate region. This risk is considered ***medium*** for a strong earthquake originating in the region.

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

Yes. All future buildings, infrastructure and critical facilities located in Clay County and the participating jurisdictions are vulnerable to damage from earthquakes. Only Flora has building code in place and these codes do not contain seismic provisions that address structural vulnerability for earthquakes. As a result, there is the potential for future buildings, infrastructure and critical facilities to 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?

Since property damage information was either unavailable or none was recorded for the documented earthquakes that impacted Clay County, there is no way to accurately estimate future potential dollar losses to vulnerable structures. However, according to the Clay County Supervisor of Assessments the total equalized assessed values of properties in the planning area is $216,876,872. Since all of the structures in the planning area are susceptible to earthquake impacts to varying degrees, this total represents the countywide property exposure to earthquake events.

Given Clay County's proximity to geologic structures and fault zones, both large and small, and the fact that all structures within the County are vulnerable to damage, it is likely that there will be future dollar losses from any earthquake ranging from strong to great. As a result, participating jurisdictions were asked to consider mitigation projects that could provide wide ranging benefits for reducing the impacts or damages associated with earthquakes.

3.8 DAMS

HAZARD IDENTIFICATION

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 U.S. Army Corps of Engineers' National Inventory of Dams (NID), there are approximately 91,468 dams in the United States and Puerto Rico, with 1,662 dams located in Illinois. (The NID is maintained by the U.S. Army Corps of Engineers and is updated approximately every two years.) Of the 1,662 dams in Illinois, approximately 93% are constructed of earth.

What is the definition of a dam failure?

A dam failure is the partial or total collapse, breach or other failure of a dam that causes flooding downstream. In the event of a dam failure, the people, property and infrastructure downstream could be subject to devastating damages. The potential severity of a full or partial dam failure is influenced by two factors:

- the capacity of the reservoir and
- the density, type and value of development/infrastructure located downstream.

There are two categories of dam failures, "flood" or "rainy day" failures and "sunny day" failures. A "flood" or "rainy day" failure usually results when excess precipitation and runoff cause overtopping or a buildup of pressure behind a dam which leads to a breach. Even normal storm events can lead to "flood" failures if debris plugs the water outlets. Given the conditions that lead to a "flood" failure (i.e., rainfall over a period of hours or days), there is usually a sufficient amount of time to warn and evacuate residents downstream.

Unlike a "flood" failure, there is generally no warning associated with a "sunny day" failure. A "sunny day" failure is usually the result of improper or poor dam maintenance, internal erosion, vandalism or an earthquake. This unexpected failure can be catastrophic because it may not allow enough time to warn and evacuate residents downstream.

No one knows precisely how many dam failures have occurred in the United States; however, it's estimated that hundreds have taken place over the last century. Some of the worst failures have caused catastrophic property and environmental damage and have taken hundreds of lives. The worst dam failure in the last 50 years occurred on February 26, 1972 in Buffalo Creek, West Virginia. A tailings dam owned by the Buffalo Mining Company failed, taking 125 lives, injuring 1,000 individuals, destroying 507 homes and causing property damage in excess of $50 million (approximately $298.6 million in 2017 based on the Bureau of Labor Statistics Consumer Price Index Inflation Calculator.)

Dam failures have been documented in every state, including Illinois. According to the Dam Incident Database compiled by the National Performance of Dams Program, there have been 10 reported dam failures with uncontrolled releases of the reservoir in Illinois since 1950.

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 listed on the National Inventory of Dams is assigned a hazard potential classification rating per the "Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams." The classification system is based on the potential for loss of life and damage to property in the event of a dam failure. There are three classifications: High, Significant and Low. **Figure DF-1** provides a brief description of each hazard potential classification. It is important to note that the hazard potential 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 DF-1
Dam Hazard Classification System

Hazard Potential Classification	Description
High	Those dams where failure or mis-operation result in probable loss of human life, regardless of the magnitude of other losses. The probable loss of human life is defined to signify one or more lives lost.
Significant	Those dams where failure or mis-operation result in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities or can impact other concerns. Significant hazard potential classification dams are often located in predominately rural or agricultural areas but could be located in areas with population and significant infrastructure.
Low	Those dams where failure or mis-operation results in no probable loss of human life and low economic and/or or environmental losses. Losses are principally limited to the dam owner's property.

Sources: Federal Emergency Management Agency
U.S. Army Corps of Engineers

HAZARD PROFILE

According to the USACE National Inventory of Dams, there are six classified dams located in Clay County. Of those six dams, only two are considered to be dams of significance. Dams of significance include: a) dams that have a hazard potential classification of "High"; b) dams with reservoirs of considerable storage capacity; c) dams located in densely populated areas that have the potential to impact a considerable number of structures and/or individuals; or d) those dams identified as having special importance to the participating jurisdictions. Due to the limited impacts on the population, land use and infrastructure associated with a majority of the classified dams, only the dams of significance will be analyzed as part of this Plan update.

The following details the dams of significance located in the county; identifies the location of dams of significance; details past occurrences of dam failures associated with the dams of significance studied; describes the severity or extent of future potential failures (if known); identifies the locations potential affected and estimates the likelihood of future occurrences of dam failures.

Do any of the participating jurisdictions own classified dams of significance?
Yes. Both classified dams of significance are owned by Clay City and Flora. **Figure DF-2** provides a brief description of each dam.

Dam Failure Fast Facts – Occurrences

Number of Classified Dams of Significance Located in the County: ***2***

Number of Classified Dams owned by Participating Jurisdictions: ***2***

Number of Dam Failures Reported: ***0***

Probability of Future Dam Failure Events: ***Low***

Are there any other publicly or privately-owned classified dams of significance within the County?
No. There are no other publicly or privately-owned classified dams of significance within Clay County.

When have dam failures occurred previously? What is the extent of these previous dam failures?
According to data from Stanford University's National Performance of Dams Incident Database and discussions with Planning Committee members, there are no known recorded dam failures associated with the classified dams of significance in Clay County.

What is the extent of future potential dam failures?
According to the National Inventory of Dams (NID), Emergency Action Plans (EAPs) defining the extent or magnitude of potential dam failures (water depth, speed of onset and warning times) were not required to be developed for the Charley Brown Park Lake Dam and the Clay City Side Channel Reservoir Dam. As a result, a data deficiency exists for these dams.

Figure DF-2
Classified Dams of Significance Located in Clay County

Dam Name	Hazard Classification	Associated Waterway	Owner	Type	Primary Purpose	Completion Year	Height (feet)	Length (feet)	Storage (acre-feet)	Impoundment Surface Area (acres)	Drainage Area (square miles)	Emergency Action Plan
Publicly-Owned												
Charley Brown Park Lake Dam	Significant	Tributary Raccoon Creek	City of Flora	Earth	Recreation	1936	19 ft.	350 ft.	79 ac.-ft.	n/a	n/a	No
Clay City Side Channel Reservoir Dam	Low	Tributary Little Wabash River	Village of Clay City	Earth	Water Supply	1998	11 ft.	3500 ft.	170 ac.-ft.	15 ac.	0.02 sq. mi.	No

Sources: U.S. Army Corps of Engineers, National Inventory of Dams Interactive Report.

What locations are affected by dam failure?

Figure DF-3 shows the locations of the ***classified dams of significance*** in Clay County. Dam failures have the potential to impact the following municipalities/unincorporated areas:

- Charlie Brown Memorial Park approximately one and one-half miles west of Flora (north of Old Highway 50 and west of Lincoln Road); and
- undeveloped and agricultural land approximately one-half mile north of Clay City (north of U.S. Route 50 and west of County Road 1875 E).

What is the probability of future dam failure events occurring?

Since neither of the classified dams of significance have experienced a dam failure, it is difficult to specifically establish the probability of a future failure. However, based on the capacity of the reservoirs and the scope and type of development and infrastructure located downstream, the probability is estimated to be ***low***. For the purposes of this analysis "low" is defined as having a less than 10% chance of occurring in any given year.

HAZARD VULNERABILITY

The following describes the vulnerability to participating jurisdictions, identifies the impacts on public health and property (if known) and estimates the potential impacts on public health and safety as well as buildings, infrastructure and critical facilities from dam failures.

Are the participating jurisdictions vulnerable to dam failures?

Yes. Only portions of unincorporated Clay County are vulnerable to the dangers presented by dam failures. However, most residents would not be impacted by a dam failure in these areas. None of the other participating municipalities or the remainder of the County are considered vulnerable.

Do any of the participating jurisdictions consider dam failures to be among their community's greatest vulnerabilities?

No. Based on responses to a Critical Facilities Vulnerability Survey distributed to the participating jurisdictions, none of the participating jurisdictions considered dam failures to be among their community's greatest vulnerability. In addition, none of the jurisdictions identified any critical facilities or infrastructure within their communities as having a specific vulnerability to dam failures.

What impacts resulted from the recorded dam failures?

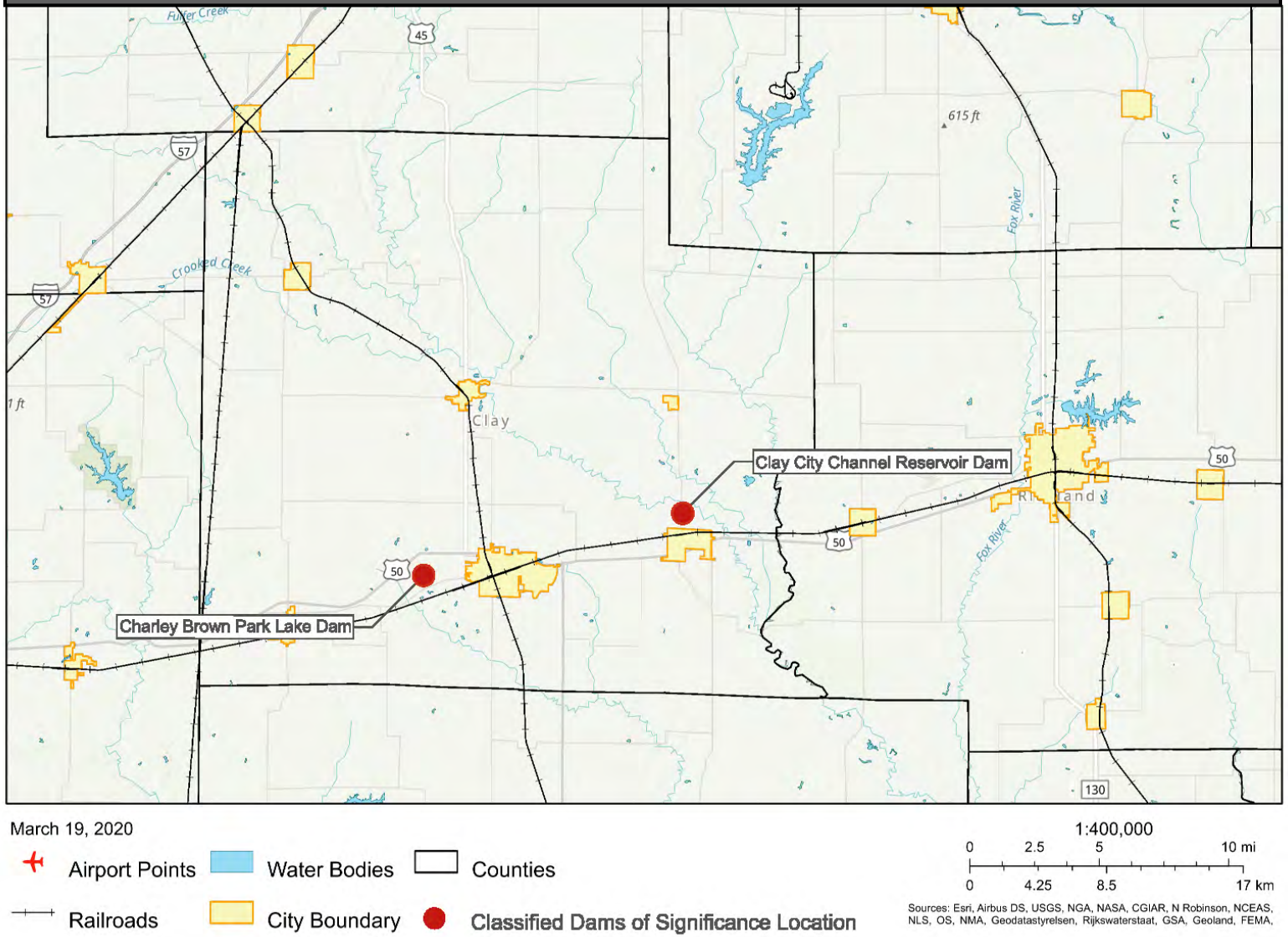
Since there have been no *recorded* dam failures associated with the classified dams of significance in Clay County, there are no recorded impacts to report.

Dam Failure Fast Facts – Risk

Dam Failure Risk/Vulnerability:

- Public Health & Safety: "Significant" and "Low" Hazard Classification Dams – ***Low***
- Buildings/Infrastructure/Critical Facilities: "Significant" and "Low" Hazard Classification Dams – ***Low***

Figure DF-3
Location of Classified Dams of Significance in Clay County



What other impacts can result from dam failures?

The impacts from a dam failure are similar to those of a flood. There is the potential for injuries, loss of life, property damage and crop damage. Depending on the type of dam failure, there may be little, if any warning that an event is about to occur, similar to flash flooding. As a result, one of the primary threats to individuals is from drowning. Motorists who choose to drive over flooded roadways run the risk of having their vehicles swept off the road and downstream. Flooding of roadways is also a major concern for emergency response personnel who would have to find alternative routes around any section of road that becomes flooded due to a dam failure.

In addition to concerns about injuries and death, the water released by a dam failure poses the same biological and chemical risks to public health as floodwaters. The flooding that results from a dam failure has the potential to force untreated sewage to mix with floodwaters. The polluted floodwaters then transport the biological contaminants into buildings and basements and onto roads and public areas. If left untreated, the floodwaters can serve as breeding grounds for bacteria and other disease-causing agents. Even if floodwaters are not contaminated with biological material, basements and buildings that are not properly cleaned can grow mold and mildew, which can pose a health hazard, especially for small children, the elderly and those with specific allergies.

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

What is the level of vulnerability to public health and safety from dam failures?

In terms of the risk or vulnerability to public health and safety from a dam failure, there are several factors that must be taken into consideration including the severity of the event, the capacity of the reservoir and the extent and type of development and infrastructure located downstream. When these factors are taken into consideration, the overall risk to public health and safety posed by a dam failure from the dams of significance studied in Clay County is considered to be ***low***.

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

As discussed previously, EAPs detailing the existing buildings, infrastructure and critical facilities vulnerable to a dam failure were not required to be developed for the Charley Brown Park Lake Dam and the Clay City Side Channel Reservoir Dam. As a result a data deficiency exists in terms of comprehensively identifying existing buildings, infrastructure and critical facilities vulnerable to dam failures.

While detailed information was not available, a visual inspection of the areas surrounding the classified dams indicates that there are buildings, infrastructure and critical facilities that are vulnerable to dam failures. **Figure DF-4** provides a ***rough estimate*** of the buildings, infrastructure and critical facilities by dam vulnerable to a dam failure.

Depending on whether there is a full or partial dam failure, all of the vulnerable buildings, infrastructure and critical facilities may be inundated by water and structural damage may result. Because none of the reservoirs within the County are immense in size, the damage sustained from

dam failure flooding may not be to the structure, but to the contents of the buildings or nearby infrastructure and critical facilities.

Figure DF-4
Buildings, Infrastructure & Critical Facilities Vulnerable to a Dam Failure

Dam Name	Location	Number of Vulnerable Buildings/Infrastructure			
		Residential	Commercial	Infrastructure	Critical Facilities
Charley Brown Park Lake Dam	1 ½ miles west of Flora	---	---	- Park Rd - Old US 50	---
Clay City Side Channel Reservoir Dam	½ mile north of Clay City	---	---	- CR 1875 E	---

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. When these factors are taken into consideration, the overall risk posed by a dam failure in Clay County is considered to be ***low*** for the dams of significance studied.

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

Yes. Any future buildings, infrastructure and critical facilities located within the flood path of a classified dam are vulnerable to damage from a dam failure. As a result, future buildings, infrastructure and critical facilities face the same vulnerabilities as those of existing buildings, infrastructure and critical facilities described previously.

What are the potential dollar losses to vulnerable structures from dam failures?

Unlike other hazards, there are no standard loss estimation models or methodologies for dam failures. Given that there have been no recorded dam failures in Clay 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

The mitigation strategy identifies how participating jurisdictions are going to reduce the potential loss of life and property damage that results from the natural hazards identified in the Risk Assessment section of this Plan. The strategy includes:

- Developing mitigation goals. Mitigation goals describe the objective(s) or desired outcome(s) that the participants would like to accomplish in term of hazard and loss prevention. These goals are intended to reduce or eliminate long-term vulnerabilities to natural and man-made hazards.
- Identifying a comprehensive range of jurisdiction-specific mitigation actions including those related to continued compliance with the National Flood Insurance Program (NFIP). Mitigation actions are projects, plans, activities or programs that achieve at least one of the mitigation goals identified.
- Analyzing the mitigation actions identified for each jurisdiction. This analysis ensures each action will reduce or eliminate future losses associated with the hazards identified in the Risk Assessment section.
- Developing the mitigation actions prioritization methodology. The prioritization methodology outlines the approach used to prioritize the implementation of each identified mitigation action.
- Identifying the entity(s) responsible for implementation and administration. For each mitigation action, the entity(s) responsible for implementing and administering that action is identified as well as the timeframes for completing the actions and potential funding sources.
- Conducting a preliminary cost/benefit analysis of each mitigation action. The qualitative cost/benefit analysis provides participants a general idea which actions are likely to provide the greatest benefit based on the financial cost and staffing efforts needed.

A detailed discussion of each aspect of the mitigation strategy is provided below.

4.1 MITIGATION GOALS REVIEW

Developing mitigation goals was the first step in creating the mitigation strategy. Based on early communications with the Planning Committee members, the consultant developed a preliminary list of eight hazard mitigation goals. This list of goals was distributed electronically to Committee members who were asked to review the list before the first meeting and consider whether any changes needed to be made or if additional goals should be included. At the Planning Committee's November 18, 2019 meeting, the group discussed the preliminary list of goals and approved them with no changes or additions. **Figure MIT-1** lists the approved mitigation goals.

Figure MIT-1 Mitigation Goals	
Goal 1	Educate people about the natural hazards they face and the ways they can protect themselves, their homes, and their businesses from those hazards.
Goal 2	Protect the lives, health, and safety of the individuals living in the County from the dangers of natural hazards.
Goal 3	Protect existing infrastructure and design new infrastructure (buildings, roads, bridges, utilities, water supplies, sanitary sewer systems, etc.) to be resilient to the impacts of natural hazards.
Goal 4	Incorporate natural hazard mitigation into existing as well as new 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, creeks 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 MITIGATION ACTION IDENTIFICATION

Following the development of the mitigation goals, the Planning Committee members were asked to consult with their respective jurisdictions to identify a comprehensive range of ***jurisdiction-specific mitigation actions***. Representatives from Clay City and Flora were also asked to identify mitigation actions that would ensure their continued compliance with the National Flood Insurance Program.

The compiled lists of new mitigation actions were then reviewed to assure the appropriateness and suitability of each action. Those actions that were not deemed appropriate and/or suitable were either reworded or eliminated.

4.3 MITIGATION ACTION ANALYSIS

The mitigation actions identified were then assigned to one of four broad mitigation action categories which allowed Planning Committee members to compare and consolidate similar actions. **Figure MIT-2** identifies each mitigation action category and provides a brief description.

Each mitigation action was then analyzed to determine:

- the hazard or hazards being mitigated;
- the general size of the population affected (i.e., small, medium or large);
- the goal or goals fulfilled;
- whether the action would reduce the effects on new or existing buildings and infrastructure; and
- whether the action would ensure continued compliance with the National Flood Insurance Program.

Figure MIT-2 Types of Mitigation Activities	
Category	**Description**
Local Plans & Regulations (LP&R)	Local Plans & Regulations include actions that influence the way land and buildings are being developed and built. Examples include: stormwater management plans, floodplain regulations, capital improvement projects, participation in the NFIP Community Rating System, comprehensive plans, and local ordinances (i.e., building codes, etc.)
Structure & Infrastructure Projects (S&IP)	Structure & Infrastructure Projects include actions that protect infrastructure and structures from a hazard or remove them from a hazard area. Examples include: acquisition and elevation of structures in flood prone areas, burying utility lines to critical facilities, construction of community safe rooms, install "hardening" materials (i.e., impact resistant window film, hail resistant shingles/doors, etc.) and detention/retention structures.
Natural System Protection (NSP)	Natural System Protection includes actions that minimize damage and losses and also preserve or restore natural systems. Examples include: sediment and erosion control, stream restoration and watershed management.
Education & Awareness Programs (E&A)	Education & Awareness Programs include actions to inform and educate citizens, elected officials and property owners about hazards and the potential ways to mitigate them. Examples include: outreach/school programs, brochures and handout materials, becoming a StormReady community, evacuation planning and drills, and 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.)

4.4 MITIGATION ACTION PRIORITIZATION METHODOLOGY

Next, the Planning Committee worked with the Consultant to develop a method to prioritize mitigation actions. Various methodologies were discussed with the Committee members at the second meeting held on February 27, 2020. **Figure MIT-3** identifies and describes the four-tiered prioritization methodology adopted by the Planning Committee.

This methodology is based on two key factors: 1) the frequency of the hazard and 2) the degree of mitigation attained. The methodology developed provides a means of objectively determining which actions have a greater likelihood of reducing the long-term vulnerabilities associated with the most frequently-occurring natural hazards.

While prioritizing the actions is useful and provides participants with additional information, it is important to keep in mind that implementing any the mitigation actions is desirable regardless of which prioritization category an action falls under.

4.5 MITIGATION ACTION IMPLEMENTATION, ADMINISTRATION & COST/BENEFIT ANALYSIS

Finally, each participating jurisdiction was asked to identify how the mitigation actions will be implemented and administered. This included:

- Identifying the party or parties responsible for oversight and administration.
- Determining what funding source(s) are available or will be pursued.

- Describing the time frame for completion.
- Conducting a preliminary cost/benefit analysis.

Figure MIT-3
Mitigation Action Prioritization Methodology

		Hazard	
		Most Frequent Hazard **(M)** (i.e., severe storms, severe winter storms/extreme cold, floods, excessive heat)	Less Frequent 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 injuries and fatalities from the most frequently-occurring hazards	**HL** mitigation action will virtually eliminate damages and/or significantly reduce the probability of injuries and fatalities from the less frequently-occurring hazards
	Mitigation Action with the Potential to Reduce Impacts **(L)**	**LM** mitigation action has the potential to reduce damages, injuries and/or fatalities from the most frequently-occurring hazards	**LL** mitigation action has the potential to reduce damages, injuries and/or fatalities from the less frequently-occurring hazards

Oversight & Administration

It is important to keep in mind that the County and all the participating jurisdictions have extremely limited capabilities related to organization and staffing for oversight and administration of the identified mitigation actions. Two of the four participating municipalities are small in size, with populations of less than 1,000 individuals. Flora, the largest municipality in Clay County, has approximately 5,000 residents. In most cases these municipalities have minimal staff who are only employed part-time. Their organizational structure is such that most have very few offices and/or departments, generally limited to public works. Those in charge of the offices/departments often lack the technical expertise needed to individually oversee and administer the identified mitigation actions. As a result, most of the participating jurisdictions identified their governing body (i.e., village board, city council or board) as the entity responsible for oversight and administration simply because it is the only practical option given their organizational constraints. Other participants felt that oversight and administration falls under the purview of the entity's governing body (board/council) and not individual departments.

Funding Sources

While the South Central Illinois Regional Planning and Development Commission has the ability to provide grant writing services to Clay County, many of the participating jurisdictions do not have administrators with grant writing capabilities. As a result, assistance was needed in identifying possible funding sources for the identified mitigation actions. The consultant provided written information to the participants about FEMA and non-FEMA funding opportunities that

have been used previously to finance mitigation actions. In addition, funding information was discussed with participants during planning committee meetings and in one-on-one contacts so that an appropriate funding source could be identified for each mitigation action.

A handout was prepared and distributed that provided specific information on the non-FEMA grant sources available including the grant name, the government agency responsible for administering the grant, grant ceiling, contact person and application period among other key points. Specific grants from the following agencies were identified: United State Department of Agricultural – Rural Development (USDA – RD), Illinois Department of Agriculture (IDOA), Illinois Department of Commerce and Economic Opportunity (DCEO), Illinois Environmental Protection Agency (IEPA), Illinois Department of Natural Resources (IDNR) and Illinois Department of Transportation (IDOT).

The funding source identified for each action is the most likely source to be pursued. However, if grant funding is unavailable through the most likely or other suggested sources, then implementation of medium and large-scale projects and activities is unlikely due to the budgetary constraints experienced by all the participants due to their size, projected population growth and limited revenue streams. It is important to remember that the population for the entire County is just under 14,000 individuals. Two of the four participating municipalities have populations of less than 1,000 individuals. Most of the jurisdictions struggle to maintain and provide the most critical of services to their residents. Additional funding is necessary if implementation is to be achieved.

Time Frame for Completion

The time frame for completion identified for each action is the timespan in which participants would like to see the action successfully completed. In many cases, however, the time frame identified is dependent on obtaining the necessary funding. As a result, a time range has been identified for many of the mitigation actions to allow for unpredictability in securing funds.

Cost/Benefit Analysis

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.

This 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 was repeatedly communicated to the Planning Committee members that when a grant application is submitted to IEMA/FEMA for a specific action, a detailed cost/benefit analysis will be required to receive funding.

4.6 RESULTS OF MITIGATION STRATEGY

Figures MIT-4 through **MIT-12**, located at the end of this section, summarize the results of the mitigation strategy. The mitigation actions are arranged alphabetically by participating jurisdiction following the County and include both existing and new actions.

Figure MIT-4
Clay County Hazard Mitigation Actions
(Sheet 1 of 3)

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)†	Cost/Benefit Analysis
						New	Existing				
County Board											
HM	Purchase and install storm warning sirens in unincorporated communities and subdivisions in the County.	SS, T	S&IP	Medium	2	n/a	n/a	Chairman / County Board	5 years	County / USDA – RD Critical Facilities Programs	Medium/High
LM	Secure Memorandums of Agreement with incorporated municipalities to purchase and install storm warning sirens in areas that do not have sirens or that do not have adequate coverage with existing sirens.	SS, T	LP&R	Medium	2	n/a	n/a	Chairman / County Board	2-5 years	County	Low/Medium
HM	Purchase and install new storm warning sirens in areas that do not have sirens or that do not have adequate coverage with existing sirens within the incorporated municipalities in the County.	SS, T	S&IP	Medium	2	n/a	n/a	Chairman / County Board	5 years	County / USDA – RD Critical Facilities Programs	Medium/High
County Board / 911											
HM	Purchase/subscribe to an automated emergency message notification system (i.e., reverse 911/Nixle) to notify residents/responders of natural hazard event information.	EC, EH, EQ, F, SS, SWS, T	E&A	Large	2	n/a	n/a	Chairman County Board / 911 Coordinator / Flora Mayor City Council	2 years	County / FEMA Emergency Management Performance Grant	Medium/High

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the County's size (just under 14,000 individuals), projected population growth and budgetary constraints. The County works hard to maintain critical services to its residents. Additional funding is necessary if implementation is to be achieved within the time frames specified.

Acronyms

Priority

HM	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the most frequent hazards
LM	Mitigation action with the potential to reduce impacts from the most frequent hazards
HL	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the less frequent hazards
LL	Mitigation action with the potential to reduce impacts from the less frequent hazards

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-4
Clay County Hazard Mitigation Actions
(Sheet 2 of 3)

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	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				
Emergency Services & Disaster Agency											
HM	Purchase and install electrical hookups (pigtails) at all designated shelters within the County for use with portable emergency backup generators to maintain operations during prolonged power outages.	F, SS, SWS, T	S&IP	Medium	2, 3, 5	n/a	Yes	Flora-Clay County ESDA Coordinator	2 years	County / USDA – RD Critical Facilities Programs	Medium/High
HM	Make sure appropriate signage is available at all designated shelters within the County informing residents of where to go and check-in procedures.	F, SS, SWS, T	E&A	Medium	2	n/a	n/a	Flora-Clay County ESDA Coordinator	2 years	County	Low/Medium
LL	Partner with classified dam owners to develop Emergency Action Plans (EAPs) that identify the extent (water depth, speed of onset, warning times, etc.) and location (inundation area) of potential dam failures to address data deficiencies.	DF	E&A	Small	2, 3, 5	Yes	Yes	Flora-Clay County ESDA Coordinator	5 years	County / Classified Dam Owners	Low/Low
Health Department											
HM	Purchase and install an automatic emergency backup generator at the Clay County Health Department to provide uninterrupted power to the Emergency Operations Center and maintain full operational capacity during power outages.	EH, F, SS, SWS, T	S&IP	Large	2, 3, 5	n/a	Yes	Health Department Administrator	1-3 years	County / USDA – RD Community Facilities Programs	Medium/High
HM	Provide additional training and resources to the Clay County Medical Reserve Corps volunteer network to assist individuals with access and function needs as well as the general population during natural hazard events.	DF, EC, EH, EQ, F, SS, SWS, T	E&A	Large	1, 2	n/a	n/a	Health Department Administrator	1-3 years	County	Low/High

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the County's size (just under 14,000 individuals), projected population growth and budgetary constraints. The County works hard to maintain critical services to its residents. Additional funding is necessary if implementation is to be achieved within the time frames specified.

Acronyms

Priority

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Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-4
Clay County Hazard Mitigation Actions
(Sheet 3 of 3)

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	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				
Health Department Continued…											
HM	Design and construct a community safe room equipped with emergency backup generators and HVAC units that can also serve as a warming/cooling center for area residents as part of a new health department building.	EC, EH, SS, T	S&IP	Small	2	Yes	n/a	Health Department Administrator	5-10 years	County / FEMA Pre-Disaster Mitigation / USDA – RD Community Facilities Programs	High/High
HM	Construct facilities and purchase appropriate equipment to obtain enough capacity so the Health Department can serve as a drop-site location for Strategic National Stockpile shipments. The Strategic National Stockpile is the nation's largest supply of potentially life-saving pharmaceuticals and medical supplies for use in a public health emergency severe enough to cause local supplies to run out.	EQ, F, SS, SWS, T	S&IP	Large	2	n/a	n/a	Health Department Administrator	5-10 years	County / USDA – RD Community Facilities Programs	High/High
Highway Department											
HM	Purchase and install an automatic emergency backup generator at the Highway Department Maintenance Building to provide uninterrupted power and maintain operational capacity during power outages.	EH, F, SS, SWS, T	S&IP	Large	2, 3, 5	n/a	Yes	County Highway Engineer	2-5 years	County / USDA – RD Community Facilities Programs	Medium/High

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the County's size (just under 14,000 individuals), projected population growth and budgetary constraints. The County works hard to maintain critical services to its residents. Additional funding is necessary if implementation is to be achieved within the time frames specified.

Acronyms

Priority

HM	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the most frequent hazards
LM	Mitigation action with the potential to reduce impacts from the most frequent hazards
HL	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the less frequent hazards
LL	Mitigation action with the potential to reduce impacts from the less frequent hazards

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-5
Clay City Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	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&IP	Medium	2, 3, 5	Yes	Yes	Public Works Director	1-5 years	Village	Medium/High
HM	Repair/reline sewer line sections/mains where storm water infiltration is occurring to prevent sewage backups.	F, SS	S&IP	Small	2, 3, 5	Yes	Yes	Public Works Director	3-5 years	Village / USDA – RD Water & Waste Disposal Program	High/High
HM	Purchase and install additional storm warning sirens.	SS, T	E&A	Medium	2	n/a	n/a	President / Village Board	5 years	Village / USDA – RD Critical Facilities Programs	Medium/High
HM	Review the revised Flood Insurance Rate Maps (FIRMs) when they become available. Update the flood ordinance to reflect the revised FIRMs and present both for adoption. *	F	LP&R	Small	1, 2, 4 6, 7	Yes	Yes	President / Village Board	1-5 years	Village	Low/Medium
HM	Make the most recent Flood Insurance Rate Maps available to assist the public in considering where to construct new buildings. *	F	LP&R	Small	1, 2, 6, 7	Yes	Yes	President / Village Board	1-5 years	Village	Low/Medium
LM	Make City officials aware of the most recent Flood Insurance Rate Maps and issues related to construction in a floodplain. *	F	LP&R	Small	1, 2, 6, 7	Yes	Yes	President / Village Board	1-5 years	Village	Low/Medium

* Mitigation action to ensure continued compliance with NFIP.

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the budgetary constraints experienced by a village of this size (less than 1,000 individuals). The Village works hard to maintain critical services to its residents. Additional funding is necessary if implementation is to be achieved within the time frames specified.

Acronyms

Priority

HM	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the most frequent hazards
LM	Mitigation action with the potential to reduce impacts from the most frequent hazards
HL	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the less frequent hazards
LL	Mitigation action with the potential to reduce impacts from the less frequent hazards

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-6
Clay County Hospital Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)†	Cost/Benefit Analysis
						New	Existing				
HM	Replace all external window glass with shatter-resistant/shatter-proof glass to increase the building's resilience to the effects of natural hazard events.	EQ, SS, T	S&IP	Large	2, 3, 5	n/a	Yes	Facility Management / Safety Committee	1 year	Hospital / FEMA Pre-Disaster Mitigation	Medium/High
HM	Construct new drainage swale in the loading dock area to alleviate drainage/flooding problems experienced during heavy rain/flash flood events. During heavy rain events the area fills with standing water.	F, SSS	S&IP	Medium	2, 3, 5	n/a	Yes	Facility Management / Safety Committee	1 year	Hospital / USDA – RD Community Facilities Program	Medium/High

* Mitigation action to ensure continued compliance with NFIP.

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the budgetary constraints experienced by a small rural hospitals. Additional funding is necessary if implementation is to be achieved within the time frames specified.

Acronyms

Priority

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LM	Mitigation action with the potential to reduce impacts from the most frequent hazards
HL	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the less frequent hazards
LL	Mitigation action with the potential to reduce impacts from the less frequent hazards

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-7
Flora Hazard Mitigation Actions
(Sheet 1 of 4)

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	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 new storm warning sirens with tone and voice alert capabilities.	SS, T	E&A	Large	2	n/a	n/a	Mayor City Council / Chairman Clay County Board	5 years	City / USDA – RD Critical Facilities Programs	Medium/High
LM	Conduct hydrologic/hydraulic analysis to determine the cause of and identify design solutions to address recurring stormwater drainage problems in the City.	F, SS	E&A	Small	2, 3, 5	n/a	Yes	Mayor / City Council	1-2 years	City / IDOT Local Roads	Medium/Medium
LM	Upgrade of the Industrial Park's electric substation to increase capacity and improve system resilience and reliability.	EH, F, SS, SWS, T	E&A	Large	2, 3, 5	Yes	Yes	Mayor / City Council	1-3 years	City / USDA – RD Rural Utilities Service – Electric Programs	Low/Medium
HM	Design and a construct community safe room (equipped with an emergency backup generator) near the Industrial Parker for use by area business and residents.	EC, EH, SS, T	S&IP	Medium	2	Yes	n/a	Mayor / City Council	5 years	City FEMA Pre-Disaster Mitigation / USDA – RD Community Facilities Programs	High/High

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the budgetary constraints experienced by a city of this size (approximately 5,000 individuals). The City works hard to maintain critical services to its residents. Additional funding is necessary if implementation is to be achieved within the time frames specified.

Acronyms

Priority

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Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-7
Flora Hazard Mitigation Actions
(Sheet 2 of 4)

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	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/subscribe to an automated emergency notification system (i.e., reverse 911) to notify residents/responders of natural hazard event information.	EC, EH, EQ, F, SS, SWS, T	E&A	Large	2	n/a	n/a	Mayor City Council / Chairman Clay County Board / 911 Coordinator	5 years	City / County / FEMA Emergency Management Performance Grant	Medium/High
HM	Purchase five, 3-phase portable emergency backup generators for use at sewer lift stations to maintain operations during prolonged power outages.	EH, F, SS, SWS, T	S&IP	Medium	2, 3, 5	n/a	Yes	Mayor / City Council	3 years	City / USDA – RD Community Facilities Programs	Medium/High
LM	Secure a Memorandum of Agreement with the E.J. Water Cooperative to interconnect water systems to provide additional capacity in the event the area is impacted by a natural hazard and improve system resilience.	DR, EC, EH, F, SS, SWS, T	LP&R	Medium	2, 3, 5	n/a	Yes	Mayor City Council	1 year	City	Low/Medium
HM	Construct drinking water interconnection with E.J. Water Cooperative to provide additional capacity in the event the area is impacted by a natural hazard and improve system resilience.	DR, EC, EH, F, SS, SWS, T	S&IP	Medium	2, 3, 5	n/a	Yes	Mayor City Council	2-5 years	City / USDA – RD Water & Waste Disposal Program /	High/High

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the budgetary constraints experienced by a city of this size (approximately 5,000 individuals). The City works hard to maintain critical services to its residents. Additional funding is necessary if implementation is to be achieved within the time frames specified.

Acronyms

Priority

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Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-7
Flora Hazard Mitigation Actions
(Sheet 3 of 4)

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	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	Upgrade wastewater treatment plant to address infiltration and inflow problems experienced during heavy rain events.	SS	S&IP	Large	2, 3, 5	n/a	Yes	Mayor / City Council	2 years	City / IEPA – State Revolving Loan Fund / Clean Water Initiative	High/High
LL	Conduct generation phasing study for peak shaving generation to determine how to provide a seamless transition between power generation sources (regular and backup). Currently the when the power comes back on after an outage, the systems won't phase back together.	EH, EQ, SS, SWS, T	E&A	Large	2, 3, 5	n/a	Yes	Mayor /City Council	1-2 years	City	Low/Medium
HM	Purchase and install electrical hookups (pigtails) at City Hall and lift stations for use with portable emergency backup generators to maintain operations during prolonged power outages.	EH, F, SS, SWS, T	S&IP	Medium	2, 3, 5	n/a	Yes	Mayor / City Council	1-2 years	City / USDA – RD Community Facilities Programs	Medium/High
HM	Purchase and install an emergency backup generator at City Hall to provide uninterrupted power and maintain continuity of government and operations during power outages.	EH, F, SS, SWS, T	S&IP	Medium	2, 3, 5	n/a	Yes	Mayor / City Council	1-2 years	City / USDA – RD Community Facilities Programs	Medium/High

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the budgetary constraints experienced by a city of this size (approximately 5,000 individuals). The City works hard to maintain critical services to its residents. Additional funding is necessary if implementation is to be achieved within the time frames specified.

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Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-7
Flora Hazard Mitigation Actions
(Sheet 4 of 4)

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	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	Review the revised Flood Insurance Rate Maps (FIRMs) when they become available. Update the flood ordinance to reflect the revised FIRMs and present both for adoption. *	F	LP&R	Small	1, 2, 4 6, 7	Yes	Yes	Mayor / City Council	1-5 years	City	Low/Medium
HM	Make the most recent Flood Insurance Rate Maps available to assist the public in considering where to construct new buildings. *	F	LP&R	Small	1, 2, 6, 7	Yes	Yes	Mayor / City Council	1-5 years	City	Low/Medium
LM	Make City officials aware of the most recent Flood Insurance Rate Maps and issues related to construction in a floodplain. *	F	LP&R	Small	1, 2, 6, 7	Yes	Yes	Mayor / City Council	1-5 years	City	Low/Medium

* Mitigation action to ensure continued compliance with NFIP.

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the budgetary constraints experienced by a city of this size (approximately 5,000 individuals). The City works hard to maintain critical services to its residents. Additional funding is necessary if implementation is to be achieved within the time frames specified.

Acronyms

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HM	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the most frequent hazards
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LL	Mitigation action with the potential to reduce impacts from the less frequent hazards

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-8
Flora Community Unit School District #35 Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	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 automatic emergency backup generators at school buildings designated as warming centers/emergency shelters to provide uninterrupted power to critical systems and maintain continuity of operations during prolonged power outages.	EH, F, SS, SWS, T	S&IP	Large	2, 3, 5	n/a	Yes	Superintendent / School Board	1-2 years	School Board / USDA – RD Community Facilities Programs	Medium/High
HM	Identify and install "hardening" materials (i.e., shatter-proof glass, hail resistant shingles/doors, etc.) at each District school to increase infrastructure resilience to natural hazards.	EQ, SS, T	S&IP	Large	2, 3, 5	n/a	Yes	Superintendent / School Board	1-2 years	School Board / FEMA Pre-Disaster Mitigation	Medium/Medium

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the budgetary constraints experienced by small, rural school districts. Additional funding is necessary if implementation is to be achieved within the time frames specified.

Acronyms

Priority

HM	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the most frequent hazards
LM	Mitigation action with the potential to reduce impacts from the most frequent hazards
HL	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the less frequent hazards
LL	Mitigation action with the potential to reduce impacts from the less frequent hazards

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-9
Louisville Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)†	Cost/Benefit Analysis
						New	Existing				
HM	Purchase and install an automatic emergency backup generator at the sewer lagoons to increase system resilience and maintain operations during prolonged power outages.	EH, F, SS, SWS, T	S&IP	Medium	2, 3, 5	n/a	Yes	Superintendent	1-3 years	Village / USDA – RD Community Facilities Programs	Medium/High
HM	Purchase and install automatic emergency backup generators at lift stations to increase system resilience and maintain operations during prolonged power outages.	EH, F, SS, SWS, T	S&IP	Medium	2, 3, 5	n/a	Yes	Superintendent	1-3 years	Village / USDA – RD Community Facilities Programs	Medium/High
HM	Purchase and install storm warning sirens village wide.	SS, T	E&A	Large	2	n/a	n/a	Superintendent	1-2 years	Village / USDA – RD Critical Facilities Programs	Medium/High

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the budgetary constraints experienced by a village of this size (less than 1,000 individuals). The Village struggles to provide even the most critical of services to its residents. Additional funding is necessary if implementation is to be achieved within the time frames specified.

Acronyms

Priority

HM	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the most frequent hazards
LM	Mitigation action with the potential to reduce impacts from the most frequent hazards
HL	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the less frequent hazards
LL	Mitigation action with the potential to reduce impacts from the less frequent hazards

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-10
North Clay Community Unit School District #25 Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)†	Cost/Benefit Analysis
						New	Existing				
HM	Purchase and install grounding systems at each District building to protect critical systems (i.e., electrical, computer systems, HVAC, etc.) and improve each building's resilience to lightning strikes.	SS	S&IP	Large	2, 3, 5	n/a	Yes	Superintendent / School Board	5 years	School Board / USDA – RD Critical Facilities Programs	Medium/High

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the budgetary constraints experienced by small, rural school districts. Additional funding is necessary if implementation is to be achieved within the time frames specified.

Acronyms

Priority

HM	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the most frequent hazards
LM	Mitigation action with the potential to reduce impacts from the most frequent hazards
HL	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the less frequent hazards
LL	Mitigation action with the potential to reduce impacts from the less frequent hazards

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-11
North Clay Fire Protection District Hazard Mitigation Actions
(Sheet 1 of 2)

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)†	Cost/Benefit Analysis
						New	Existing				
HM	Purchase and install an automatic emergency backup generator at primary Fire Station to provide uninterrupted power and maintain continuity of operations during power outages.	EH, F, SS, SWS, T	S&IP	Medium	2, 3, 5	n/a	Yes	Fire Chief / Board	1-5 years	Fire Protection District / USDA – RD Community Facilities Programs	Medium/High
HM	Purchase and install grounding systems at communications tower to protect critical systems and improve the tower's ability to survive a lightning strike.	SS	S&IP	Small	2, 3, 5	n/a	Yes	Fire Chief / Board	1-3 years	Fire Protection District / USDA – RD Critical Facilities Programs	Medium/High
HM	Purchase and install an automatic emergency backup generator for the communications tower to provide uninterrupted power and maintain operations during power outages.	SS, T	S&IP	Large	2, 3, 5	Yes	Yes	Fire Chief / Board	1-3 years	Fire Protection District / USDA – RD Community Facilities Program	Medium/High

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the budgetary constraints experienced by a rural, all-volunteer fire protection district. Additional funding is necessary if implementation is to be achieved.

Acronyms

Priority

HM	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the most frequent hazards
LM	Mitigation action with the potential to reduce impacts from the most frequent hazards
HL	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the less frequent hazards
LL	Mitigation action with the potential to reduce impacts from the less frequent hazards

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-11
North Clay Fire Protection District Hazard Mitigation Actions
(Sheet 2 of 2)

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)†	Cost/Benefit Analysis
						New	Existing				
HM	Purchase and install storm warning sirens.	SS, T	E&A	Large	2	n/a	n/a	Fire Chief / Board	2-5 years	Fire Protection District / USDA – RD Community Facilities Program	Medium/High
HM	Retrofit the Fire Station building to include a community safe room (equipped with an emergency backup generator & HVAC units) that can also serve as a warming/cooling center for district residents.	EC, EH, SS, T	S&IP	Small	2	Yes	n/a	Fire Chief / Board	5 years	Fire Protection District / FEMA Pre-Disaster Mitigation / USDA – RD Community Facilities Programs	High/High

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the budgetary constraints experienced by a rural, all-volunteer fire protection district. Additional funding is necessary if implementation is to be achieved.

Acronyms

Priority

HM	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the most frequent hazards
LM	Mitigation action with the potential to reduce impacts from the most frequent hazards
HL	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the less frequent hazards
LL	Mitigation action with the potential to reduce impacts from the less frequent hazards

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

Figure MIT-12
Xenia Hazard Mitigation Actions

Priority	Activity/Project Description	Hazard(s) to be Mitigated	Type of Mitigation Activity	Size of Population Affected	Goal(s) Met	Reduce Effects of Hazard(s) on Buildings & Infrastructure		Organization / Department Responsible for Implementation & Administration	Time Frame to Complete Activity	Funding Source(s)†	Cost/Benefit Analysis
						New	Existing				
HM	Design and a construct community safe room equipped with emergency backup generator and HVAC units that can also serve as a warming/cooling center for area residents.	EC, EH, SS, T	S&IP	Medium	2	Yes	n/a	President / Village Board	2-5 years	Village / FEMA Pre-Disaster Mitigation / USDA – RD Community Facilities Programs	High/High
HM	Purchase and install automatic emergency backup generators at lift stations to increase system resilience and maintain operations during prolonged power outages.	EH, F, SS, SWS, T	S&IP	Medium	2, 3, 5	n/a	Yes	President / Village Board	1-3 years	Village / USDA – RD Community Facilities Programs	Medium/High
LM	Conduct sewer line reconnaissance study to identify locations where storm water infiltrates the lines.	F, SS	S&IP	Medium	2, 3, 5	Yes	Yes	President / Village Board	1-3 years	Village	Medium/High
HM	Replace/upsize select roadway culverts to increase carrying capacity and alleviate recurring drainage problems.	F, SS	S&IP	Small	2, 3, 5	Yes	Yes	President / Village Board	1-3 years	Village / IDOT Local Roads	Medium/Medium

† Identifies the most likely funding source to be pursued for the activity/project described. However, if funding is unavailable through the most likely or other suggested sources, then implementation of medium to large-scale activities/projects is unlikely due to the budgetary constraints experienced by a village of this size (less than 400 individuals). The Village struggles to provide even the most critical of services to its residents. Additional funding is necessary if implementation is to be achieved within the time frames specified.

Acronyms

Priority

HM	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the most frequent hazards
LM	Mitigation action with the potential to reduce impacts from the most frequent hazards
HL	Mitigation action with the potential to virtually eliminate or significantly reduce impacts from the less frequent hazards
LL	Mitigation action with the potential to reduce impacts from the less frequent hazards

Hazard(s) to be Mitigated:

DF	Dam Failure	F	Flood
DR	Drought	SS	Severe Storm
EC	Extreme Cold	SWS	Severe Winter Storm
EH	Excessive Heat	T	Tornado
EQ	Earthquake		

Type of Mitigation Activity:

E&A	Education & Awareness	NSP	Natural Systems Protection
LP&R	Local Plans & Regulations	S&IP	Structure & Infrastructure Projects

5.0 PLAN MAINTENANCE

This section focuses on the Federal Emergency Management Agency (FEMA) requirements for maintaining and updating the Plan once it has been approved by FEMA and adopted by the participating jurisdictions. These requirements include:

- establishing the method and schedule for monitoring, evaluating and updating the Plan;
- describing how the mitigation strategy will be incorporated into existing planning processes; and
- detailing how continued public input will be obtained.

These requirements ensure that the Plan remains an effective and relevant document. The following provides a detailed discussion of each requirement.

5.1 MONITORING, EVALUATING & UPDATING THE PLAN

Outlined below is a method and schedule for monitoring, evaluating and updating the Plan. This method allows the participating jurisdictions to review and adjust the planning process as needed, make necessary changes and updates to the Plan and track the implementation and results of the mitigation actions that have been undertaken.

5.1.1 Monitoring and Evaluating the Plan

The Plan will be monitored and evaluated by a Plan Maintenance Subcommittee on an annual basis. The Plan Maintenance Subcommittee will be composed of key members from the Planning Committee, including representatives from all the participating jurisdictions. The Subcommittee will be chaired by the Flora-Clay County Emergency Services & Disaster Agency (ESDA). All meetings held by the Subcommittee will be open to the public. The information gathered at each Subcommittee meeting will be documented and provided to all participating jurisdictions for their review and use in the Plan update.

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

Monitoring & Evaluating

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

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

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

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

5.1.2 Updating the Plan

The Plan must be updated within five years of the Plan approval date indicated on the signed FEMA final approval letter. (This date can be found in Section 6, Plan Adoption.) This ensures that all the participating jurisdictions will remain eligible to receive federal grant money to implement those mitigation actions identified in this Plan.

The Flora-Clay County ESDA, with assistance from the Plan Maintenance Subcommittee, will be responsible for updating 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 jurisdictions that did not take part in the previous planning process may do so at this time. It will be the responsibility of these jurisdictions to provide all of the information needed to be integrated into the Plan update.

Updating the Plan

- The Flora-Clay County ESDA, with assistance from the Plan Maintenance Subcommittee, will be responsible for updating the Plan.
- The Plan ***must be updated within 5 years of the Plan approval date indicated on the signed FEMA final approval letter***.
- Any jurisdictions that did not take part in the previous planning process who now wish to participate may do so.
- Once the Plan update has received FEMA/IEMA approval, each participating jurisdiction ***must re-adopt the Plan to remain eligible to receive federal monies.***

A public forum will be held to present the Plan update to the public for review and comment. The comments received at the public forum will be reviewed and incorporated into the Plan update. The Plan update will then be submitted to IEMA and FEMA for review and approval. ***Once the Plan update has received state and federal approval, FEMA requires that each of the participating jurisdictions re-adopt the Plan to remain eligible to receive federal monies to implement identified mitigation actions.***

5.2 Incorporating the Mitigation Strategy into Existing Planning Mechanisms

As part of the planning process, the Planning Committee identified current plans, policies/ordinances and maps that supplement or help support mitigation planning efforts. **Figure PP-3** identifies the existing planning mechanism available by jurisdiction. It will be the responsibility of each participating jurisdiction to incorporate, where applicable, the mitigation

strategy and other information contained in the Plan into the planning mechanisms identified for their jurisdiction.

Adoption of this Plan will trigger each participating jurisdiction to review and, where appropriate, integrate the Plan into other available planning mechanisms. The Plan Maintenance Subcommittee's annual review will help maintain awareness of the Plan among the participating jurisdictions and encourage them to actively integrate it into their day-to-day operations and planning mechanisms. Any time a mitigation action is slated for implementation by a participating jurisdiction, it will be integrated into their capital improvement plan/budget.

Currently several of the participating jurisdictions have limited capabilities to integrate the mitigation strategy and other information contained in the Plan into existing planning mechanisms. Although the County and three of the participating municipalities have comprehensive plans, only Flora has building codes. While the South Central Illinois Regional Planning and Development Commission is available to assist participating jurisdictions with planning and community development, a general reluctance by the participants to implement such policies may hinder implementation.

5.3 CONTINUED PUBLIC INVOLVEMENT

The County and participating jurisdictions understand the importance of continued public involvement and will seek public input on the Plan throughout the plan maintenance process. A copy of the approved Plan will be maintained and available for review at the Flora-Clay County ESDA Office. Individuals will be encouraged to provide feedback and submit comments for the next Plan update to the Flora-Clay County ESDA.

The comments received will be compiled and presented at the annual Plan Maintenance Subcommittee meetings where members will consider them for incorporation into the next Plan update. 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 the Plan update submittal to provide the public an opportunity to comment on the proposed revision to the Plan.

6.0 PLAN ADOPTION

The final step in the planning process is the adoption of the approved Plan by each participating jurisdiction. Each jurisdiction must formally adopt the Plan to remain eligible for federal grant monies to implement mitigation actions identified in this Plan.

6.1 PLAN ADOPTION PROCESS

Before the Plan could be adopted by the participating jurisdictions, it was made available for public review and comment through a public forum and comment period. Comments received were incorporated into the draft Plan and the Plan was then submitted to the Illinois Emergency Management Agency (IEMA) and the Federal Emergency Management Agency (FEMA) for their review and approval.

Upon review and approval by IEMA and FEMA, the Plan was presented to the County and participating jurisdictions for adoption. ***Each participating jurisdiction was required to formally adopt*** the Plan to become eligible to receive federal grant monies to implement the mitigation actions identified in this Plan. Any jurisdiction that chose not to adopt the Plan did not affect the eligibility of those who did.

Figure PA-1 identifies the participating jurisdictions and the date each formally adopted the Plan. Signed copies of the adoption resolutions are located in **Appendix L**. FEMA signed the final approval letter on (date) which began the five-year approval period and set the an expiration date of (date) for the Plan.

Figure PA-1
Plan Adoption Dates

Participating Jurisdiction	Plan Adoption Date
Clay County	
Clay City, Village of	
Clay County Hospital	
Flora, City of	
Flora CUSD #335	
Louisville, Village of	
North Clay CUSD #35	
North Clay Fire Protection District	
Xenia, Village of	

PLANNING COMMITTEE MEETING
ATTENDANCE SHEETS

APPENDIX A

Attendance Sheet

Clay County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

November 18, 2019

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	Zachary Krug	American Environmental	Specialist
2.	Jim Tackett	Harter Twp	Road Comm.
3.	Luke Johnson	Clay Electric	CEO
4.	Amber Wille	Clay Co. Health Dept	Env. Health + PHEP Director
5.	Ted Lee Rutledge	Clay County Board	Chairman
6.	Barbara McDrew	Clay Co. Board	Trustee
7.	DARIN A. KOELM	CLAY CO. HWY. DEPT	ENGINEER
8.	Tammy Mahoney	Clay County Hospital	EMERG. Prep.
9.	April Utley	CCH	Facility operations
10.	Gene Durre	Flora P.D.	Chief of Police
11.	Tom Dunson	Xenia	Mayor
12.	Tyler Turner	Village of Clay City	Utility Supervisor
13.	Travis Wyatt	North Clay #25	Supt.
14.	Toby Rinehart	Flora Public Utilities	Supt
15.	Todd Fender	North Clay FPD	District Chief
16.	Wesley E. Mullen	Coroner office	Coroner

Attendance Sheet

Clay County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

November 18, 2019

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	STEVEN LEWIS	Flora / Clay Co. ESDA	ESDA Coordinator
2.	ALAN HUFF	FLORA / CLAY Co. ESDA	ASST. COORDINATOR
3.	Andrea Bostwick	American Environmental	Sr. Project Manager
4.	Tom LEAK	STANFORD TWNP	Highway Commissioner
5.	Rod HOLMAN	CLAY CO. HEALTH DEPT	PHEP COORD.
6.	Cole Hildebrand	Clay Co. State's Attorney's Office	Assistant State's Attorney
7.	ANGIE BOCRELLI	STATE FARM INS.	AGENT
8.	Kindal Eastin	Clay Co. Sup. of Assessments	Sup of Assessments
9.	Joel Hackney	Flora CUSD #35	Superintendent
10.			
11.			
12.			
13.			
14.			
15.			
16.			

Attendance Sheet

Clay County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

February 27, 2020

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	Guye Durre	Flora Police	Chief
2.	Tyler Turner	Village of Clay City	Utilities Supervisor
3.	Kevin Henry	CLAY CITY TOWNSHIP	ROAD COMMISSIONER
4.	Jennifer Brown	Clay Co. 911	911 Coordinator
5.	Todd Fender	North Clay FPD	Chief
6.	Travis Wyatt (Travis Wyatt)	North Clay CUSD #25	Supt.
7.	Kindal Eastin	Clay Co Sup. of Assess.	CCHD
8.	ROD HOLMAN	CLAY CO H.D.	PHEP COOR.
9.	JOE GILLILAND	County Board	ESDA Committee
10.	Jason Hayes	Clay County Hospital/EMS	head Medic
11.	Jessica Crast	Clay County Hospital/EMS	Paramedic
12.	DARIN A. KOECH	CLAY CO HWY DEPT	ENGINEER
13.	STEVE LEWIS	Flora/Clay Co. ESDA	Coordinator
14.	ALAN HUFF	FLORA / CLAY CO ESDA	ASST COOR.
15.	Zachary Kay	American Environmental Corp	Specialist
16.			

Attendance Sheet

Clay County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee Meeting

February 27, 2020

	Name (Please Print)	Representing (Jurisdiction/Organization)	Title
1.	Toby Rinehart	City of Flora	Supt. of Utilities
2.	Andrea Bostwick	American Environmental	EMS Manager
3.			
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PLANNING COMMITTEE MEETING MINUTES

APPENDIX B

Meeting Minutes

Clay County Multi-Jurisdictional
Natural Hazards Mitigation Planning Committee

November 18, 2019
1 P.M.
Clay County Health Department
601 East 12th Street, Flora

Committee Members

Clay City, Village of
Clay County Offices:
- County Board
- Coroner
- Health Department
- Highway Department
- State's Attorney
- Supervisor of Assessments

Clay County Hospital
Clay Electric Cooperative
Flora/ Clay County ESDA
Flora CUSD #35
Flora, City of
Harter Township
North Clay CUSD #25
North Clay Fire Protection District
Stanford Township
State Farm Insurance
Xenia, Village of
American Environmental Corp.

Welcome and Introductions

Steve Lewis, Chairman of the Clay County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee, welcomed attendees. He indicated that the purpose of this Committee is to develop the Clay County Natural Hazards Mitigation Plan.

Handout materials were distributed to each member, including a Citizen Questionnaire. The questionnaire will help gauge residents and committee member understanding of the natural hazards that impact the County and also identifies communication preferences.

What is a Natural Hazards Mitigation Plan?

Andrea Bostwick, American Environmental Corporation (AEC) explained that a Natural Hazards mitigation plan details the natural hazard events that have previously impacted the County and identifies activities and projects that reduce the risk to people and property from these hazards before an event occurs. The natural hazards include floods; tornadoes; severe summer storms (including thunderstorms, hail and lightning events); severe winter storms (including ice and snow storms); extreme cold; excessive heat; drought; earthquakes and dam failures.

Why Should We Develop Our Natural Hazards Mitigation Plan?

Andrea, described why mitigation planning is needed and how participating jurisdictions can benefit. In addition, she detailed the NHMP process.

Since the early 1990s damages caused by weather extremes have risen substantially. In 2018 the United States experienced $90.7 billion in severe storm damages from fourteen (14) severe weather and natural hazard events. The losses experienced in 2018 were the 4th highest only behind 2017, 2015, and 2012. Consequently, the Federal Emergency Management Agency (FEMA) is encouraging counties throughout the United States to prepare and update natural hazard mitigation plans because what they found is that for every dollar spent on mitigation, $6 dollars can be reaped in savings.

Developing this plan provides several major benefits, including:

1.) Specific projects and recommendations will be developed through the planning process to help each participating jurisdiction reduce damages. By including these projects in this Plan, the participating jurisdictions will have an opportunity to receive state and federal funds to complete the projects.

2.) Verifiable information about the natural hazards that occur in Clay County will be gathered to help participants in municipal and county meetings make decisions about how to better protect citizens and property from storm damages.

The Planning Process

The goal of the Committee meetings is to develop a Plan to meet state and federal criteria so that it can be approved by the Illinois Emergency Management Agency (IEMA) and FEMA. Andrea explained that the schedule for this Plan development has been compressed and accelerated due to changes in the grant funding mechanisms. So instead of conducting five meetings, a three meeting process has been developed that will satisfy FEMA's criteria and still provide a draft plan to IEMA by May 1, 2020. Specific activities for the Committee meetings include:

1st Committee meeting	Orientation to the Planning Process Complete Critical Facilities & Existing Planning Documents Complete the Severe Weather Shelter Survey Discuss the Risk Assessment Approve Mission Statement & Goals
2nd Committee meeting	Complete Critical Facilities Vulnerability Survey Discuss Mitigation Projects and Activities Approve Mitigation Strategy Committee discusses approval/adoption of the Plan
3rd Committee meeting (Public Forum)	Present the Plan for public review Committee helps answer questions from the public

Information Needed from the Committee

Andrea explained that as part of the Plan development process, AEC would need information from each of the participating jurisdictions to help meet the state and federal criteria. Zachary Krug, AEC, distributed the following forms to each participating jurisdiction to complete:

Critical Facilities. Completed lists of Critical Facilities will be used to identify facilities vulnerable to natural hazards and will be provided to IEMA and FEMA as a

separate supplement. Copies of the Plan made available to the public will not include these lists for security reasons.

List of Existing Planning Documents. This list identifies planning documents (Land Use Plans, Flood Ordinances, and related documents) a jurisdiction already has in place.

Shelter Surveys. Identifies locations designated as severe weather shelters.

Contact Information. Committee members should provide contact information about themselves to help AEC staff during this planning process.

Andrea asked participants to return the completed forms by the next meeting and to let her know if anyone would like electronic copies of the forms.

Severe Weather Events

Committee members were asked to share their memories of severe weather events that have occurred in the County including any damages to critical infrastructure and facilities. Flooding, severe thunderstorms and lightning strikes were mentioned. Other hazard events related include:

- Committee Members talked about the damages from lightning strikes. Equipment at the ESDA office and WNOI repeater towers were damaged by strikes.
- The entire county experienced strong winds on Memorial Day 2004.
- In 2008 or 2009, Hord experienced straight-line winds.
- On August 6, 2008, 8-inches of rain caused road closures and water to leak into houses.
- Flash flooding has limited access to the Clay County Hospital entrance twice in the past 8 years.

Andrea asked participants to identify any hazard events that have impacted their jurisdiction by completing the forms titled "***Hazard Event Questionnaire and Critical Facilities Damage Questionnaire."*** The information provided will help supplement the information included in the risk assessment.

Andrea then asked the Committee about whether any instances of landslides had occurred in the County. Andrea asked the Committee if they would like to include landslides in the Plan and after a brief discussion the Committee decided landslides should not be included.

Risk Assessment

Andrea began the risk assessment presentation by noting that there have been two (2) federally-declared disasters in Clay County since 2002. Approximately 545 natural hazard events have been verified over approximately 50 years in Clay County. There have been a minimum of 21 injuries and 3 fatalities recorded from 9 natural hazard events. A minimum of $16.1 million in property damages and $32.2 million in crop damages have resulted from approximately 104 documented natural hazard events verified in Clay County. The actual damage amounts are actually much higher based on several facts:

1.) damage descriptions for many of the flood and thunderstorms event did not include dollar amounts;
2.) damages to roads from heat and freeze/thaws conditions were not included; and
3.) crop damage figures were unavailable for a majority of the events.

The frequency, magnitude and property damages for each category of natural hazard were described.

Severe Storms

Severe storms are the most frequently occurring natural hazard in Clay County with 323 events verified since 1973. The 2002 federal disaster declarations included severe storms. Approximately $3 million in property damages and $26,500 in crop damage has resulted from 91 severe storm events. At least 7 injuries can be attributed to 3 separate thunderstorm events.

The highest wind speed recorded in the County, not associated with a tornado, is 78 knots (90 mph) on July 13, 2016 near Ingraham. The largest hail recorded in the County is 2.75 inches in Louisville on September 19, 1986 and Hord on May 25, 1989.

Severe Winter Storms

At least 80 verified severe winter storms (snow, ice, or extreme cold) have occurred since 1950. Approximately $800,000 in damages resulted from the February 2011 ice storm. Two fatalities and one injury were recorded for three severe winter storm events.

Between 2000 and 2009 at least 13 severe winter storms took place. There has been 15 events in the current decade. The record maximum 24-hour snowfall in the County is 12.0 inches at the Flora COOP Station on March 15 & 16, 1918. The coldest recorded temperature is -25°F at Flora COOP Station on January 27, 1904 and again on February 10, 1982.

Floods

There have been a least 72 verified flood events in Clay County, 29 riverine/shallow flood events since 1990 and 43 flash food events since 1999. The 2002 federal disaster declaration included flooding. Approximately $9.1 million in property damages resulted from three flash flood events. No injuries or fatalities were recorded for any of the flood events.

Excessive Heat

There have been 45 *recorded* excessive heat events reported in Clay County since 1994. Damage information was unavailable for any of the events. One fatality was recorded as a result of the July 2019 excessive heat event.

The hottest temperature recorded in Clay County was 111°F at the Flora COOP Station on July 28, 1930 and again on July 15, 1936.

Drought

Six major droughts have occurred during the last four decades – 1983, 1988, 2005, 2007, 2011 and 2012. The County was designated a Primary Natural Disaster Area by the USDA for the 2005, 2011 and 2012 droughts. The 2012 drought caused an estimated $32.2 million in crop damages. Corn and soybean yield reductions were most severe for the 1983 drought when there was an 82.5% reduction in corn yields and a 58.1% reduction in soybean yields.

Year	Corn	Soybeans
1983	82.5%	58.1%
1988	50.0%	29.3%
2005	24.7%	7.0%
2007	5.4%	25.6%
2011	16.7%	27.8%
2012	------	29.2%

Tornadoes

Since 1950, 16 tornadoes have been verified in Clay County. The 2002 disaster declaration for Clay County included tornadoes. A minimum of $3.28 million in property damages has resulted from 8 tornadoes. Four of the tornadoes have recorded property damages of at least $250,000 per event. Thirteen injuries can be attributed to two separate tornado events in the County.

The average tornado in Clay County is approximately 3.2 miles long and 91 yards wide. The average area covered by a tornado in Clay County is 0.17 square miles.

The highest recorded F-Scale rating for a tornado in the County since 1950 is an F4 which occurred on June 2, 1990. The longest recorded tornado in the County was an F1 tornado that occurred on March 6, 1961 and was 10.8 miles long in Clay County alone. The widest tornado in the County was the F4 tornado from June 2, 1990 and was 300 yards wide.

Earthquakes

In the previous 200 years, three (3) earthquakes have originated in Clay County. The largest was a 4.2 magnitude earthquake with an intensity of V that occurred on May 21, 1906. Damage information was unavailable for any of the events and no injuries or fatalities were reported. While no fault zones or systems are located in Clay County, there a multiple geologic structures. There are also three known fault systems located in the immediate region: the Wabash Valley, the Cottage Grove and the Rough Creek-Shawneetown.

Dams

There are 6 classified (permitted) dams located in Clay County, according to the U.S. Army Corp of Engineers. Two (2) of these dams are publicly-owned, the Clay City Side Channel Reservoir Dam and the Charley Brown Park Lake Dam, while the 4 remaining dams are privately-owned. None of the dams have a “high” hazard classification rating. Three dams (including the Clay City Side Channel Reservoir Dam) have a hazard classification of “significant”. The remaining 3 dams have a

hazard classification of “low” or “undetermined”. There are no known dam failures recorded in the County.

Risk Priority Index Exercise

Following the risk assessment, Andrea led the Committee through an exercise that will help calculate the Risk Priority Index for the hazards that have the potential to impact the participating jurisdictions. She explained that the Risk Priority Index is a quantitative means of providing guidance for ranking the hazards. This ranking can assist participants in determining which hazards present the highest risks and therefore which ones to focus on when formulating mitigation projects and activities. The findings will be presented at the next meeting. The Committee elected to take the exercise home and submit it to Andrea at a later date.

Mitigation

Mitigation actions include activities and projects that reduce the long-term risk to people and property from the natural hazards discussed in the risk assessment. The purpose of the next meeting is to develop a list of mitigation projects for each participating jurisdiction.

The form titled **“Hazard Mitigation Projects”** was distributed and Andrea indicated this form should be used to submit projects and activities for the Plan. To help the jurisdictions think about and assemble their lists, a 2-page list of potential mitigation projects was included in the handout material along with mitigation project lists from jurisdictions in other counties and excerpts from a FEMA publication on mitigation ideas. A 1-page list of required projects for NFIP-participating jurisdictions was also handed out. These examples can be used to help Committee members when they prepare their list.

She emphasized that submitting a project does not obligate any jurisdiction to complete the project. FEMA is trying to stimulate mitigation to reduce the extraordinary amount of money being expended on storm damages.

Mitigation projects can include studies, structural projects, and information/education activities. She provided advice for completing the mitigation project list including providing a detailed description of the project, the jurisdiction responsible for the project and the time frame to complete the project.

Committee members were encouraged to contact Andrea if questions arise before they return to the next Committee meeting.

Mission Statement & Goals

Zak asked Committee members to review the draft mission statement and goals provided in the meeting materials. Both are necessary to satisfy required elements of the Plan. Zak asked if any revisions need to be made or if additional goals need to be added.

The draft mission statement was reviewed and no revisions were made to the wording.

Zak indicated that the mitigation goals are intended to reduce long-term vulnerabilities to natural hazards and that each action included in the Plan should be aimed at one or more of the goals developed by the committee. These goals were drafted in such a way that they covered all the mitigation projects and activities that were submitted.

The goals were reviewed and no revisions were made to the wording.

The mission statement and goals will be added to the Plan.

Community Participation

Zak stressed the importance of attending each committee meeting and indicated that member participation helps the County meet its 25% match for this grant in addition to assuring that member jurisdictions are eligible for IEMA/FEMA funds. He indicated that tag-teaming and designating substitute representatives is permissible when other obligations arise. Zak pointed out that a designated substitute representative does not have be an official or employee of the jurisdiction.

Providing the public with opportunities to have input is an important part of the planning process. Zak requested that each jurisdiction consider making the **"Frequently Asked Questions"** handout in the meeting packet available for public review within your jurisdiction as well as the **"Citizen Questionnaire"** passed out at the beginning of the meeting.

What Happens Next?

The mitigation project tables will be the main topic of the next committee meeting. Andrea also indicated that the project prioritization methodology would be discussed.

The second meeting of the Committee was scheduled for:

Monday, February 24, 2020
1 P.M.
Clay County Health Department
601 East 12th Street, Flora

With no further questions the meeting was adjourned.

Following the meeting, the ESDA Coordinator informed AEC that a scheduling conflict had occurred. As a result, an e-mail was sent out to the Committee to confirm whether the date of the meeting could be changed to Thursday, February 27th, 2020. The Committee Members agreed and the meeting date was moved to:

Thursday, February 27, 2020
2 P.M.
Clay County Health Department
601 East 12th Street, Flora

Meeting Minutes

Clay County's Multi-Jurisdictional Natural Hazards Mitigation Planning Committee

February 27, 2020
6:00 p.m.
Clay County Health Department
601 East 12th Street, Flora

Committee Members

Clay City Township
Clay City, Village of
Clay County Offices:
- 911
- County Board
- Health Department
- Highway Department
- Supervisor of Assessments

Clay County Hospital
Flora/ Clay County ESDA
Flora, City of
North Clay CUSD #25
North Clay Fire Protection District
American Environmental Corp.

Welcome

Steve Lewis, the Clay County ESDA Coordinator, welcomed attendees. He indicated that the purpose of this Committee is to develop the Clay County's Natural Hazards Mitigation Plan.

Handout materials, including the draft mitigation project tables, were distributed to each Committee member.

Andrea Bostwick, American Environment Corp. (AEC), provided a brief recap to reorient Committee Members as to what has been accomplished. She noted that the Committee has accomplished all of its objectives up to this point and is on schedule.

Critical Facilities Vulnerability

Andrea discussed critical facilities vulnerability and asked the Committee Members to complete a survey to help identify:

1.) What each jurisdiction's greatest vulnerabilities are and why; and
2.) Each jurisdiction's most vulnerable assets.

She also asked each participating jurisdiction to provide a list of permanent backup generators associated with critical infrastructure. Andrea explained this information would be used as part of the vulnerability analyses.

Risk Priority Index Exercise Results

Andrea then presented the results of the Risk Priority Index Exercise which was conducted at the November 18, 2019 meeting. She provided the Committee with a brief recap on what the Risk Priority Index is and how it can help participants determine which hazards present the highest risk and therefore which ones to focus on when formulating mitigation projects and activities.

Based on the Committee's responses, tornadoes scored the highest, followed thunderstorms with damaging winds, severe winter storms and lightning. The hazards that scored the lowest included mine subsidence, landslides and dam failures.

Mitigation Actions Prioritization Methodology

The Mitigation Actions Prioritization Methodology outlines the approach used to classify each mitigation action identified by the participating jurisdictions and is a required element of the Plan's mitigation strategy. As part of the Plan development process, a methodology needs to be selected.

Andrea explained that mitigation actions can be prioritized in a number of ways and provided information on two different methodologies. The Committee asked questions and after discussing the pros and cons of both options, the Committee chose the methodology based on two key factors:

1) Frequency of hazard—severe storms occur more frequently than earthquakes.
2) Degree of mitigation—some projects will *significantly reduce* damages while other projects only have the potential to reduce damages.

This methodology helps objectively identify which projects and activities have a greater likelihood to significantly reduce the long-term vulnerabilities associated with the most frequently-occurring natural hazards.

Andrea acknowledged that while this methodology does not take cost or politics into consideration, these factors may affect the order in which projects are implemented. She also noted that it is important to keep in mind that implementing all of the mitigation projects is desirable regardless of which prioritization category they fall under.

Mitigation Projects

Andrea reminded the Committee Members that mitigation actions are those projects and activities that reduce the long-term risk to people and property from the natural hazards that impact the County. She then described how the lists of mitigation actions provided by each jurisdiction, the Mitigation Actions Prioritization Methodology, the goals and other information were used to complete the Mitigation Actions Tables handout.

Andrea using a frequently requested project – a community safe room – to walk the Committee through how a typical project is prioritized and entered into the mitigation action tables. She described how each column in the Mitigation Action Table would be completed for this example project.

Andrea explained that the information in the Mitigation Action Tables handout was prepared by AEC. Andrea thanked the Committee Members for assembling their lists of mitigation projects and activities. The participants did a wonderful job preparing their lists. Committee members were then asked to review the Action Tables containing the descriptions of the mitigation projects and activities. Andrea moved throughout the room to discuss questions with each member. Some additional mitigation projects were provided and will be added to these tables. Andrea advised Committee Members who wished to add additional to provide them to her as soon as possible.

Participants were reminded that this is a list of projects and activities they would like to see accomplished if the money becomes available. Also, for a jurisdiction to be eligible for a project, it must be on its list.

Since this is a mitigation plan, some projects were either removed or not included if they were now consider mitigation. Projects associated emergency preparedness/response, recovery, and maintenance will not be included in the Plan.

Public Forum and Adoption

The final Committee meeting will be conducted as an open-house style public forum to present the draft Plan for review and comment. A paper copy of the draft Plan will be available for review at the meeting and posted online on the County's website. There will be a one-week public comment period following the public forum.

Unless otherwise specified, Committee members will receive an electronic copy of the draft plan to make available for public comment.

Once the comment period is over any comments received will be incorporated into the Plan and submit it to IEMA/FEMA. Following IEMA and FEMA review, any edits requested will be made and then FEMA will issue an Approval Pending Adoption (APA) letter. At this point an e-mail will be issued to all the participating jurisdictions with a copy of a model adoption resolution attached asking them to formally adopt the Plan by resolution and provide a copy of the signed resolution to Andrea or Mr. Lewis.

Plan Maintenance and Update

Zak then described the Plan maintenance and update commitments that are detailed in the Plan. A subgroup of the Planning Committee will meet annually, under the direction of the Flora/Clay County ESDA, to report on the progress of their projects, make any additions or edits to their project lists, evaluate the effectiveness of the Plan and provide information on any events that have occurred since the Committee met previously. The information gathered at these annual meetings will be provided to IESDA and will make the five year Plan update process easier.

Every five years, the Plan must be reviewed, revised and resubmitted to IEMA/FEMA to remain eligible for mitigation project funds. At the five year update, any jurisdiction that did not take part in the previous update but who now wished to become part of the Plan may do so. Any new jurisdiction must supply the same information that all of the current jurisdictions supplied.

What Happens Next?

The public forum will be held on:

Monday, April 20, 2020
Clay County Health Department
602 E. 12th Street, Flora
5 P.M. – 7 P.M.

Public Comment

With no additional questions or comments raised, Mr. Lewis adjourned the meeting.

After conversations between AEC and the Clay County ESDA, the public forum scheduled for Monday, April 20th was cancelled due to the COVID-19 outbreak and Executive Orders 2020-10, 2020-18 and 2020-32 which extends the stay-at-home order and prohibits any gathering of more than ten people through Sunday, May 31st. Given the May 31st Plan submission deadline and the extension of the stay-at-home order, IESDA and FESDA agreed to allow the County to place the draft Plan online for review and comment and conduct the Public Forum via teleconference. The Plan will be made available on the County's website from May 19 through May 26, 2020. The Public Forum will be held on May 19 at 2:00 P.M. The Committee members and public were notified of the change.

CITIZEN QUESTIONNAIRE

APPENDIX C

QUESTIONNAIRE

Clay County Multi-Jurisdictional Natural Hazards Mitigation Plan

You can help protect lives and property from natural hazard events in the County by taking a few moments to complete this questionnaire.

1. Please indicate where you live in the County:

   ☐ Bible Grove
   ☐ Clay City
   ☐ Flora
   ☐ Hord
   ☐ Ingraham
   ☐ Iola
   ☐ Louisville
   ☐ Sailor Springs
   ☐ Wendelin
   ☐ Xenia
   ☐ Unincorporated Clay County
   ☐ Other (please specify): _____

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

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

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

   _____

   _____

4. Rank the natural hazards listed below in order from 1 to 7 based on which hazard ***you feel*** poses the greatest threat. (1 = greatest threat and 7 = least threat).
   Each number should only be used once.

   _____ Severe Summer Storms
   _____ Floods
   _____ Severe Winter Storms
   _____ Excessive Heat
   _____ Tornadoes
   _____ Drought
   _____ Earthquakes

5. What types of mitigation projects or activities are most needed in the 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(s) of flood or drainage activity that is needed below.)
    - ☐ Culvert and drainage ditch maintenance
    - ☐ Retention pond construction
    - ☐ Dam or levee construction/maintenance
    - ☐ Hydraulic studies to determine cause of drainage problems
- ☐ Maintain power during storms by burying power lines, trimming trees and/or purchasing a back-up generator
- ☐ Tornado Safe Shelters
- ☐ Maintain roadway passage during snow storms and heavy rains
- ☐ Provide sufficient water supply during drought
- ☐ Identify residents with special needs in order to provide assistance during a natural hazard event
- ☐ Retrofit critical infrastructure (public water supplies, schools, sewage treatment facilities, bridges, hospitals and other important services) to reduce potential damages
- ☐ Other (please specify): _____

6. What are the most effective ways ***for you*** to receive information about how to make your household and property safer from natural disasters? (Please check all that apply.)

- ☐ Newspapers
- ☐ Television
- ☐ Radio
- ☐ Internet
- ☐ Schools
- ☐ Social Media (Facebook, Twitter, etc.)
- ☐ Mail
- ☐ Fact Sheet/Brochure
- ☐ Extension Service
- ☐ Public Workshops/Meetings
- ☐ 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 Hazards Mitigation Plan.

Clay County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee

FREQUENTLY ASKED QUESTIONS FACT SHEET

APPENDIX D

Frequently Asked Questions

Clay County Multi-Jurisdictional Natural Hazards Mitigation Plan

1) What is the Clay County Natural Hazards Mitigation Plan?

The Clay County Multi-Jurisdictional Natural Hazards Mitigation Plan evaluates damage to life and property from natural hazards in the County and identifies projects and activities that can reduce these damages. The Plan is considered to be multi-jurisdictional because it includes municipalities and other jurisdictions (fire protection districts, schools, hospitals, etc.) who want to participate.

2) What is hazard mitigation?

Hazard mitigation is any action taken to ***reduce*** the long-term risk to life and property from a natural hazard.

3) Why is this Plan being developed?

The Plan fulfills federal planning requirements of Section 104 of the Disaster Mitigation Act of 2000 and the Stafford Act. Developing this Plan fulfills federal requirements that provide these benefits:

- Funding ***following*** declared disasters.
- Funding for mitigation projects and activities ***before*** disasters occur.
- Increased awareness about natural hazards and closer cooperation among the various organizations and political jurisdictions involved in emergency planning and response.

4) Who is developing this Plan?

The Clay County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee is developing the Plan with assistance from technical experts in emergency planning, environmental matters, and infrastructure. The Committee includes members from education, emergency services, insurance, municipal, township and county government, health care, and law enforcement.

5) How can I participate?

You are invited to attend public meetings of the Clay County Natural Hazards Mitigation Planning Committee. In addition, you are encouraged to provide photographs, other documentation, and anecdotal information about damages you experienced from natural hazards in Clay County. Surveys will be available at participating municipalities and through Clay County to help gather specific information from residents. All of this information will be used to develop the Plan. The draft Plan will be presented at a public forum for further public input.

More information can be obtained by contacting:

Steve Lewis, Coordinator
Flora-Clay County Emergency Services and Disaster Agency
744 East North Avenue
Flora, Illinois 62839
(618) 662-8211

MEDIA OUTLETS SERVING THE COUNTY

APPENDIX E

Media Outlets Serving Clay County

Clay County Republican (weekly)
185 E. Broadway St.
Louisville, IL, 62858
618-665-3135

WNOI (103.9 FM)
101 N. Olive Rd.
Flora, IL, 62839
618-662-8331

PRESS RELEASES AND NEWS ARTICLES PUBLISHED

APPENDIX F

Flora/Clay County E.S.D.A.
P.O. Box 365
Flora, Illinois 62839

County Prepares For Natural Disasters

Flora, IL (November 4, 2019)—Clay County will begin developing a countywide plan that will identify activities and projects to reduce the damages caused by natural hazards such as thunderstorms, tornadoes, snow and ice storms, floods, and excessive heat among others. The plan is called a Natural Hazard Mitigation Plan and will be funded through a grant from the Illinois Emergency Management Agency (IEMA).

“Developing this Plan will help us be better prepared before severe weather strikes. The goal is to reduce the harm to residents and property. This Plan is different from an emergency response plan. A mitigation Plan focuses on ways to reduce and prevent damages before they occur,” said Steve Lewis, Clay County ESDA Coordinator.

The first meeting of this Committee will be on Monday, November 18th, 2019 at the Clay County Health Department, located at 601 E. 12th Street in Flora beginning at 1 p.m. The committee will meet periodically over the next several months to develop this Plan.

The Clay County Hazard Mitigation Planning Committee has been created with representatives from each participating municipality and the County, along with technical partners and other stakeholders. Meetings of this committee will be open to the public so that interested residents can attend and provide input. The purpose of these working sessions is to gather and discuss information that will be used to develop the Plan.

“At this meeting we will discuss the planning process, as well as identify how often severe weather events occur and the kinds of damages caused throughout our County. Based on this information we will begin developing lists of activities and projects to reduce the damages caused by these events”, said Lewis.

Once the draft Plan is prepared, it will be presented for review and comment at a public forum. Any comments received from the public and state and federal agencies will be incorporated into the Plan. Following these revisions, the Plan will be presented for adoption at public meetings held by the county and each participating municipality.

“This Plan will be our best resource for determining how to reduce damages from natural hazard events. Once 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 Clay County residents,” added Lewis.

Flora/Clay County E.S.D.A.
P.O. Box 365
Flora, Illinois 62839

Projects to Reduce Damages Caused By Storms

Flora, IL (February 10, 2020)—Projects and activities to protect residents and vital community services from severe storms and other natural hazards will be discussed at the Clay County Natural Hazards Mitigation Planning Committee meeting on Thursday, February 27, 2020 at 2:00 p.m. The meeting will be held at the Clay County Health Department, 601 E. 12th Street, in Flora and is open to the public.

“Severe storms frequently damage buildings, crops, roads, and other critical infrastructure in this area. At least $16.1 million in verified property damages and $32.2 million in crop damages were caused by 104 natural hazard events in the County. Taking preventative steps can reduce the dollar damages as well as protect public health,” according to Steve Lewis, Coordinator of the Flora/ Clay County Emergency Services and Disaster Agency.

The municipalities of Clay City, Flora, and Xenia, in addition to the County, Harter Township, Stanford Township, North Clay Fire Protection District, Clay County Hospital, Flora CUSD #35, North Clay CUSD #25, and the Clay Electric Cooperative have been participating in the planning process.

The Committee began work to develop the natural hazard mitigation plan for the County in November 2019. Projects and activities that can protect Clay County residents and property from storms and other natural disasters will be identified in the Plan. Building storm shelters, retrofitting critical facilities to better withstand natural disasters and developing public information materials are examples of projects and activities that might be included in the Plan.

“A public forum will be conducted later this spring for interested persons to review the plan and ask questions of Committee members. A public comment period will be held after the public forum to accommodate interested persons who are unable to attend. We want to provide anybody who is interested an opportunity to review and comment on the draft Plan,” said Lewis.

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

Flora/Clay County E.S.D.A.
P.O. Box 365
Flora, Illinois 62839

CONTACT: Steve Lewis
618-662-8211

FOR IMMEDIATE RELEASE

Clay County's Plan to Reduce Severe Weather Damages Ready for Public Review

May 11, 2020—The Clay County Multi-Jurisdictional Natural Hazards Mitigation Plan outlining projects and activities to reduce damages caused by severe weather and other natural hazards will be available for public review and comment from May 19 through May 26, 2020. The Plan, along with a summary sheet and a comment survey, can be viewed on the Emergency Services page of the Clay County Website. If you are unable to access the Plan via the website, please contact Steve Lewis, Emergency Services and Disaster Agency (ESDA) Coordinator at (618)-662-8211 to schedule an appointment to view a paper copy of the Plan. The comment period will remain open through Tuesday, May 26, 2020. Public comments will be used to make any revisions needed before this Plan is submitted to the Illinois Emergency Management Agency and FEMA.

A public forum will also be conducted on May 19 at 2 P.M. Due to the COVID-19 crisis which prohibits any gatherings of more than ten people, the public forum will be conducted via teleconference. Persons interested in participating in the public forum should contact Steve Lewis, ESDA Coordinator at (618)-662-8211. Individuals can still review this Plan and comment without participating in the public forum.

"This Plan describes how the County and the participating jurisdictions have been impacted by severe weather and other natural hazards and identifies specific mitigation actions that can be taken to reduce damages to life and health, infrastructure, and property before events occur," according to Mr. Lewis.

The Clay County Natural Hazards Mitigation Planning Committee prepared this draft Plan with technical assistance from state and federal agencies as well as a consultant specializing in emergency management planning. The Committee is comprised of representatives from various County departments in addition to Clay City, Flora, Louisville, Xenia, Clay County Hospital, Flora CUSD, North Clay CUSD and North Clay Fire Protection District. The Committee began meeting last fall to prepare this Plan.

PUBLIC FORUM – PLANNING PROCESS
SUMMARY HANDOUT

APPENDIX G

CLAY COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN PUBLIC FORUM TELECONFERENCE

MAY 19, 2020
2:00 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 Clay County residents. Since 2002, Clay County has been included in two federally-declared disasters and experienced at least $16.1 million in verified property and $32.2 million in crop damage within the County.

In the last 10 years alone (2010-2019), there have been 67 heavy rain events, 67 thunderstorms with damaging winds, 25 flash flood events, 21 excessive heat events 17 severe storms with hail one inch in diameter or greater, 15 severe winter storms, 11 riverine flood events, five lightning strikes, two droughts, two tornadoes, and one extreme cold event verified in the County. While natural hazards cannot be avoided, their impacts can be reduced through effective hazard mitigation planning.

What is hazard mitigation planning?

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

Why prepare a natural hazards mitigation plan?

By preparing and adopting a natural hazards mitigation plan, participating jurisdictions become eligible to apply for and receive federal hazard mitigation funds to implement mitigation actions identified in the Plan. These funds, made available through the Disaster Mitigation Act of 2000, can help provide local government entities with the opportunity to complete mitigation projects that would not otherwise be financially possible.

Who participated in the development of the Clay County Multi-Jurisdiction Natural Hazards Mitigation Plan?

Recognizing the benefits that could be gained from preparing a natural hazards mitigation plan, Clay County invited all the local government entities within the County to participate. The following jurisdictions chose to participate in the Plan development:

- Clay City, Village of
- Clay County
- Clay County Hospital
- Flora, City of
- Flora CUSD #35
- Louisville, Village of
- North Clay CUSD #25
- North Clay FPD
- Xenia, Village of

CLAY COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

How was the Plan developed?

The Clay County Multi-Jurisdictional Natural Hazards Mitigation Plan was developed through the Clay County Multi-Jurisdictional Natural Hazards Mitigation Planning Committee. The Planning Committee included representatives from each participating jurisdiction, as well as education, emergency services (911, fire and law enforcement), healthcare, insurance and local utilities. The Planning Committee met three times between November 2019 and May 2020.

Which natural hazards are included in the Plan?

After reviewing the risk assessment, the Planning Committee chose to include the following natural hazards in the Plan:

- severe storms (thunderstorms, hail, lighting & heavy rain)
- severe winter storms (snow, ice & extreme cold)
- floods
- excessive heat
- tornadoes
- earthquakes
- droughts
- dam failures

What is included in the Plan?

The Plan is divided into sections that cover the planning process; the risk assessment; the mitigation strategy, including lists of mitigation actions identified for each participating jurisdiction; and plan maintenance and adoption. Much of the Plan is devoted to the risk assessment and mitigation strategy.

This risk assessment identifies the natural hazards that pose a threat to the County and includes a profile of each natural hazard which describes the location and severity of past occurrences, reported damages to public health and property, and the likelihood of future occurrences. It also provides a vulnerability assessment that estimates the potential impacts each natural hazard would have on the health and safety of the residents of Clay County as well as the buildings, critical facilities and infrastructure in the County.

The key component of the mitigation strategy is a list of the projects and activities developed by each participating jurisdiction to reduce the potential loss of life and property damage that results from the natural hazards identified in the risk assessment. These projects and activities are intended to be implement *before* a hazard event occurs.

What happens next?

Any comments received during the public comment period will be incorporated into the draft Plan before it is submitted to the Illinois Emergency Management Agency (IEMA) and the Federal Emergency Management Agency (FEMA) for review. Once IEMA and FEMA have reviewed and approved the Plan, it will be presented to the County and each participating jurisdiction for formal adoption. After adopting the Plan, each participating jurisdiction can apply for federal mitigation funds and begin implementation of the mitigation actions identified in the Plan.

PUBLIC FORUM – PLAN COMMENT SURVEY

APPENDIX H

Clay County Natural Hazard Mitigation Plan Comment Survey

The Clay County Multi-Jurisdictional Natural Hazards Mitigation Plan evaluates damage to life and property from natural hazards that occur in the County. This Plan also identifies projects and activities submitted by the County and each participating jurisdiction that will help reduce these damages. This comment survey should be used to provide feedback on the draft Plan.

* 1. What comments, concerns or questions do you have regarding the draft Plan?

2. If you would like a follow-up to your comment, please provide your contact information below:

Name

Address

City/Town

State/Province

ZIP/Postal Code

Email Address

Phone Number

DONE

0 of 2 answered

HAZARD MITIGATION PLANNING MEMO SENT ADJACENT COUNTIES

APPENDIX I

Flora/Clay County E.S.D.A.
P.O. Box 365
Flora, Illinois 62839

To: Effingham County EMA, Pamela Jacobs (ema@co.effingham.il.us)
Fayette County EMA, Kendra Craig (fcesda@yahoo.com)
Jasper County EMA, Ed Francis (edfrancis20@hotmail.com)
Marion County ESDA, Donald Brooks (drb64@sbcglobal.net)
Richland County EMA, Kevin Parker (ka9tch@yahoo.com)
Wayne County EMA, Jeff Jake (waynecoema@frontier.com)

From: Steve Lewis, Clay County Emergency Services and Disaster Agency Coordinator

Subject: Hazard Mitigation Plan

Date: 5/5/2020

The purpose of this memorandum is to let you know that Clay County is developing a countywide Natural Hazards Mitigation Plan. Since we share common boundaries, you are invited to review this draft Plan and provide comments during the public comment period which runs from May 19th through May 26th, 2020. The Plan along with a summary sheet and a comment survey can be viewed on the Clay County Website.

The public forum has been scheduled for Tuesday, May 19 at 2 p.m. Due to the COVID-19 crisis, the public forum will be conducted via teleconference. You will receive a separate email invitation with the phone number and access code for the teleconference in the next couple of days.

If you have any questions, you can reach my office at 618-662-8211 or floraesda@florail.us.

American Environmental Corp., an emergency management and environmental consulting firm experienced in preparing these plans, is leading our planning process. If you have specific questions about the Plan, please contact Zachary Krug, our planning consultant at (217) 585-9517 Ext. 8 or zkrug@aecspfld.com

Steven Lewis, Coordinator
Flora/Clay Co. ESDA
618-662-8211 (office)
618-508-2716 (cell)
floraesda@florail.us

Steven Lewis, Coordinator
Flora/Clay Co. ESDA
618-662-8211 (office)
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floraesda@florail.us

HAZARD EVENT RISK ASSESSMENT TABLES

APPENDIX J

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 1 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
6/18/1973	8:45 p.m.	Clay City[^]	60 kts.	n/a	n/a	n/a	n/a	trees and power lines were downed
5/21/1974	11:53 a.m.	Flora	n/a	n/a	n/a	$250	n/a	
7/20/1981	4:45 p.m.	Louisville	60 kts.	n/a	n/a	n/a	n/a	uprooted trees and outbuilding damage reported across the area
7/19/1982	2:15 p.m.	Louisville[^]	n/a	n/a	n/a	n/a	n/a	
6/4/1985	10:35 a.m.	Xenia[^] Kenner[^] Flora[^]	56 kts.	n/a	n/a	n/a	n/a	winds toppled many trees
7/28/1987	5:05 p.m.	Flora	52 kts.	n/a	n/a	$25,000	n/a	winds toppled trees and caused power outages
5/9/1990	7:40 p.m.	Iola[^]	n/a	n/a	n/a	$25,000	n/a	4 power line poles were reported flattened like dominos
4/15/1994	5:57 a.m.	Flora	n/a	n/a	n/a	$500	n/a	large trees were blown down
4/15/1994	6:05 a.m.	Clay City	n/a	n/a	n/a	$5,000	n/a	a storage building was blown over and large trees were blown down
4/26/1994	10:40 p.m.	Hord[^] Louisville	n/a	n/a	n/a	$500,000	n/a	*Hord Area* - 2 barns were destroyed *Louisville* - large trees were blown down
5/18/1995	1:30 p.m.	countywide	n/a	n/a	n/a	$100,000	n/a	numerous trees were blown down across the County
7/31/1995	2:30 p.m.	Xenia[^] Flora[^] Clay City[^]	52 kts.	n/a	n/a	$10,000	n/a	several power lines and poles were blown down along IL Rte. 50
Subtotal:				**0**	**0**	**$665,750**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 2 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
4/19/1996	7:26 p.m.	Flora	n/a	n/a	n/a	n/a	n/a	several trees and power lines were blown over
6/21/1997	6:10 p.m.	Clay City[^]	n/a	n/a	n/a	n/a	n/a	2 large trees and numerous tree limbs were blown down
5/22/1998	5:05 a.m.	Flora	n/a	n/a	n/a	n/a	n/a	several trees were blown down
6/12/1998	6:08 p.m.	Xenia Kenner Flora Clay City	n/a	n/a	n/a	n/a	n/a	- numerous trees were blown down *Xenia* - a building was destroyed on IL Rte. 50 *Kenner* - a garage was destroyed *Flora* - some trees caused extensive damage to the high school, homes, and vehicles
6/14/1998	8:05 a.m.	Louisville[^]	n/a	n/a	n/a	n/a	n/a	2 vehicles were blown off of the road sustaining minor damage on US Hwy 45 two miles south of the City
6/18/1998	10:05 p.m.	Xenia Kenner Flora	n/a	n/a	n/a	n/a	n/a	numerous trees and power lines were blown down
6/22/1998	8:45 p.m.	Xenia[^] Kenner Flora	n/a	n/a	n/a	n/a	n/a	numerous power lines were blown down
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 3 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
6/29/1998	6:00 p.m.	countywide	52 kts.	n/a	n/a	n/a	n/a	- reports of blown down or uprooted trees, tree limbs, power poles and power lines - some trees fell on structures and vehicles causing damage
7/22/1998	7:11 p.m.	Sailor Springs Clay City	n/a	n/a	n/a	n/a	n/a	several large trees were blown down
5/5/1999	5:10 p.m.	Louisville	n/a	n/a	n/a	n/a	n/a	several trees were blown down near the County Courthouse
5/17/1999	3:35 p.m.	Flora	n/a	n/a	n/a	n/a	n/a	several power lines and large tree limbs were blown down
6/1/1999	8:15 p.m.	Iola	n/a	n/a	n/a	n/a	n/a	several trees were blown down
6/4/1999	5:55 p.m.	Flora[^] Flora	n/a	n/a	n/a	n/a	n/a	- several trees and several power lines were blown down - signs at a racetrack were blown down
5/9/2000	2:00 p.m.	countywide	n/a	n/a	n/a	n/a	n/a	- numerous trees were blown down *Bible Grove* - a shed was destroyed *Flora* - 2 homes sustained minor roof damage
5/12/2000	7:50 p.m.	Flora	n/a	n/a	n/a	n/a	n/a	a large tree and several power lines were blown down
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 4 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
6/16/2000	2:55 p.m.	Flora	n/a	n/a	n/a	n/a	n/a	- an unoccupied mobile home, which was not tied down, was destroyed - 21 other mobile homes sustained minor damage, mainly to skirting - numerous power lines were knocked down due to fallen trees
6/20/2000	10:35 p.m.	Louisville Clay City	n/a	n/a	n/a	n/a	n/a	- several large trees and tree limbs were blown down - a couple of houses sustained minor siding damage
7/5/2000	6:11 p.m.	Louisville	n/a	n/a	n/a	n/a	n/a	a large tree was uprooted
8/23/2000	11:32 p.m.	Xenia	n/a	n/a	n/a	n/a	n/a	a large tree was blown down
7/5/2001	12:40 a.m.	Flora[^]	50 kts.	n/a	n/a	n/a	n/a	2 large trees were blown over onto a county road
10/24/2001	2:20 p.m.	Flora Clay City[^]	50 kts.	n/a	n/a	n/a	n/a	- several trees, tree limbs and power lines were blown down *Flora* - one tree fell onto a house causing minor damage
4/21/2002	3:01 p.m.	Flora	50 kts.	n/a	n/a	n/a	n/a	several trees and power lines were blown down
4/27/2002	10:55 p.m.	Xenia[^] Flora[^] Clay City[^]	60 kts.	n/a	n/a	n/a	n/a	- numerous trees and power lines were blown down *Xenia Area* - a shed was destroyed
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 5 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
5/1/2002	1:45 p.m.	Flora Clay City[^]	51 kts.	n/a	n/a	n/a	n/a	- several large trees were blown down *Flora* - dugouts at the little league field were damaged
5/9/2002	1:58 a.m.	Flora	50 kts.	n/a	n/a	n/a	n/a	- several large tree limbs and 1 large tree were blown down - some homes sustained minor damage due to fallen limbs - power lines were knocked down
4/28/2003	1:00 p.m.	Flora[^] Flora	52 kts.	n/a	n/a	n/a	n/a	- several trees were blown down, 1 of which landed on a house causing minor damage - a couple of roofs were damaged - power lines were blown down
5/8/2003	3:25 p.m.	Iola Louisville[^] Flora	60 kts.	n/a	n/a	n/a	n/a	- several trees, power poles and power lines were blown down - a garage door, carport and dog pen were damaged
9/26/2003	7:15 p.m.	Louisville Flora	50 kts.	n/a	n/a	n/a	n/a	several power lines were blown down
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 6 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
5/27/2004	4:20 p.m.	Hord[^] Bible Grove[^] Ingraham[^] Wendelin[^]	55 kts.	n/a	n/a	n/a	n/a	- numerous trees, tree limbs and power lines were blown over *Hord Area* - a TV antenna was blown over *Ingraham Area* - the roof was blown off of a mobile home *Wendelin Area* - half of a roof of a barn was blown off and several windows on a home were blown out
5/30/2004	6:10 p.m.	countywide	65 kts.	3	n/a	n/a	n/a	- widespread damage occurred throughout the County with the hardest hit areas being Flora and Clay City - majority of damage was to trees and power lines - numerous structures sustained damage due to trees falling on them - several barns and grain bins were destroyed - a couple of mobile homes and trailers were flipped over - 3 people sustained minor injuries
3/30/2005	8:51 p.m.	Iola	50 kts.	n/a	n/a	n/a	n/a	a few trees were blown down
6/8/2005	5:10 p.m.	Flora[^]	55 kts.	n/a	n/a	n/a	n/a	5 power poles were blown down
Subtotal:				**3**	**0**	**$0**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 7 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
6/30/2005	6:29 p.m.	Flora[^] Flora	55 kts.	n/a	n/a	n/a	n/a	- numerous trees and power lines were blown down - a flag pole was bent over
7/26/2005	8:30 p.m.	Flora	50 kts.	n/a	n/a	n/a	n/a	several large tree limbs were blown down
8/13/2005	6:10 p.m.	Iola	50 kts.	n/a	n/a	n/a	n/a	a 2-foot diameter tree was blown down
8/26/2005	2:00 p.m.	Xenia	50 kts.	n/a	n/a	n/a	n/a	power lines and numerous tree limbs were blown down
2/16/2006	5:55 p.m.	Xenia	50 kts.	n/a	n/a	n/a	n/a	- numerous trees and power lines were blown down - awnings and underpinnings of several mobile homes were torn - a home received minor damage when a tree fell on it - a truck was damaged by a falling antenna
4/2/2006	5:45 p.m.	Flora Clay City	52 kts.	n/a	n/a	n/a	n/a	- a few trees were blown down *Clay City* - a grain bin was damaged
6/18/2006	5:09 p.m.	Flora[^]	60 kts.	n/a	n/a	n/a	n/a	a mobile home was flipped over, and several large tree limbs were blown down
8/10/2006	12:47 p.m.	Flora	50 kts.	n/a	n/a	n/a	n/a	large tree limbs were blown down
8/10/2006	12:51 p.m.	Louisville[^]	50 kts.	n/a	n/a	n/a	n/a	a few large tree limbs were blown down
8/10/2006	12:57 p.m.	Flora	50 kts.	n/a	n/a	n/a	n/a	a large tree limb was blown down
Subtotal:				**0**	**0**	**$0**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 8 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
7/17/2007	11:30 a.m.	Flora	50 kts.	n/a	n/a	n/a	n/a	a few tree limbs and power lines were blown down
8/3/2007	3:00 p.m.	Xenia[^]	55 kts.	n/a	n/a	$5,000	$2,500	- roof damage occurred to a shed and its doors were blown off - a tree was blown down - an area of corn was flattened
8/24/2007	3:50 p.m.	Hord[^] Hord	61 kts.	n/a	n/a	$170,000	n/a	- 26 homes received minor damage - 20 outbuildings were damaged and 6 were destroyed - 2 businesses had minor damage - 10 utility poles were destroyed - numerous trees and tree limbs were blown down - several corn fields were flattened
8/24/2007	3:50 p.m.	Flora	52 kts.	n/a	n/a	$8,000	n/a	- a few trees, tree limbs, and power lines were blown down - some roofing material was torn off a building downtown
8/24/2007	3:57 p.m.	Bible Grove	52 kts.	n/a	n/a	$15,000	n/a	trees, power poles and power lines were blown down
10/18/2007	3:00 a.m.	Flora[^]	61 kts.	n/a	n/a	$4,000	n/a	- a 10 by 12-foot shed was destroyed - a few power lines were blown down
1/29/2008	4:15 p.m.	Xenia Flora[^] Sailor Springs	53 kts.	n/a	n/a	$35,000	n/a	- numerous trees, tree limbs and power lines were blown down *Flora Area* - siding was torn off mobile homes *Sailor Springs* - a semi was blown over
Subtotal:				**0**	**0**	**$237,000**	**$2,500**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 9 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
2/5/2008	6:25 p.m.	Xenia Flora[^] Sailor Springs	61 kts.	n/a	n/a	$20,000	n/a	numerous trees and power lines were blown down
6/3/2008	7:30 a.m.	Flora[^]	61 kts.	n/a	n/a	$15,000	n/a	- a barn door was blown off - numerous tree limbs were blown down
6/27/2008	4:10 p.m.	Xenia	61 kts.	n/a	n/a	$55,000	n/a	- 5 homes sustained minor damage from falling trees and tree limbs - 1 home had some of its windows blown out - numerous trees and tree limbs were blown down
6/27/2008	4:30 p.m.	Flora	61 kts.	n/a	n/a	$80,000	n/a	- numerous trees, tree limbs and power lines were blown down; 1 falling tree caused severe damage to a pickup truck - several mobile homes had skirting and siding blown off
6/27/2008	4:44 p.m.	Camp Travis[^]	52 kts.	n/a	n/a	$15,000	n/a	numerous tree limbs were blown down
6/19/2009	7:10 p.m.	Iola[^]	52 kts.	n/a	n/a	$3,000	n/a	a large tree was blown down
6/19/2009	9:35 p.m.	Ingraham[^]	52 kts.	n/a	n/a	$3,000	n/a	a power pole was blown down
7/16/2009	9:53 p.m.	Xenia[^]	52 kts.	n/a	n/a	$15,000	n/a	numerous 6-inch diameter tree limbs were blown down
4/24/2010	6:25 p.m.	Flora	52 kts.	n/a	n/a	$2,000	n/a	a 30-foot tall tree was blown down
Subtotal:				**0**	**0**	**$208,000**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 10 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
4/30/2010	10:50 p.m.	Flora[^]	52 kts.	n/a	n/a	$8,000	n/a	*Old Rte. 50 & Mahogany Rd.* an 8-inch diameter tree limb was blown onto a garage; minor roof damage was reported
4/30/2010	10:55 p.m.	Flora	52 kts.	n/a	n/a	$14,000	n/a	- a tree was blown down across US Hwy 45 - a tree was blown down at Moore's Mill Bridge - 2-foot diameter tree limb was blown down - numerous power outages were reported on the south side of town
6/11/2010	2:50 p.m.	Flora	52 kts.	n/a	n/a	$5,000	n/a	- a 10-inch diameter tree limb was blown down onto a power line causing a power outage
6/14/2010	3:52 p.m.	Flora	52 kts.	n/a	n/a	$20,000	n/a	several trees and power lines were blown down
6/15/2010	2:45 p.m.	Xenia[^] Xenia	52 kts.	n/a	n/a	$5,000	n/a	a few tree limbs were blown down
6/15/2010	3:08 p.m.	Flora	52 kts.	n/a	n/a	$8,000	n/a	power lines were blown down
6/19/2010	1:55 a.m.	Flora	52 kts.	n/a	n/a	$3,000	n/a	a 2-foot diameter tree was uprooted
7/19/2010	1:55 p.m.	Flora	52 kts.	n/a	n/a	$24,000	n/a	several 10-inch diameter tree branches were blown down
10/26/2010	5:30 a.m.	Sailor Springs[^]	52 kts.	n/a	n/a	$25,000	n/a	an 18-inch diameter tree was blown onto a trailer
Subtotal:				**0**	**0**	**$112,000**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 11 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
10/26/2010	5:33 a.m.	Flora Louisville	52 kts.	n/a	n/a	$58,000	n/a	*Flora* - numerous trees were blown down - 2 of the trees fell on houses and another hit a parked vehicle - a grain trailer was blown 100 yards away from the Cargill building, and the siding was ripped off a garage *Louisville* - a utility pole was blown down
2/28/2011	12:55 a.m.	Flora[^]	52 kts.	n/a	n/a	$15,000	n/a	5 power poles were snapped along US Hwy 45
4/15/2011	5:50 p.m.	Flora	52 kts.	n/a	n/a	$12,000	n/a	a tree was blown down onto a house
4/19/2011	8:23 p.m.	Flora Xenia	52 kts.	n/a	n/a	$40,000	n/a	several trees were blown down
4/22/2011	12:05 p.m.	Ingraham[^]	61 kts.	n/a	n/a	$2,000	n/a	a 1-foot wide tree was blown over onto Ingraham Rd.
5/23/2011	1:24 p.m.	Flora[^]	52 kts.	n/a	n/a	$8,000	n/a	several tree limbs were blown down
5/23/2011	1:25 p.m.	Flora	52 kts.	n/a	n/a	$30,000	n/a	numerous 6-inch diameter tree branches and power lines were blown down on the northeast side of the City
5/23/2011	1:30 p.m.	Clay City	52 kts.	n/a	n/a	$1,000	n/a	a tree was blown down across Main St.
5/25/2011	6:10 p.m.	Flora	52 kts.	n/a	n/a	n/a	n/a	numerous trees and power lines were blown down; 1 tree fell on a house
5/25/2011	6:20 p.m.	Clay City[^]	70 kts.	n/a	n/a	n/a	n/a	numerous trees were blown down along IL Rte. 50 from 2 miles east of the Village to the Richland County line
Subtotal:				**0**	**0**	**$166,000**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 12 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
6/13/2011	7:55 p.m.	Flora[^]	52 kts.	3	n/a	$10,000	n/a	a large tree was blown down onto a car along IL Rte. 50; 3 people inside the car were injured
6/18/2011	2:41 a.m.	Ingraham[^]	52 kts.	n/a	n/a	$2,000	n/a	a tree was blown down onto Ingraham Rd.
6/19/2011	4:00 a.m.	Flora[^]	52 kts.	n/a	n/a	$3,000	n/a	a 16-inch diameter tree was blown down at the intersection of US Hwy 45 & IL Rte. 50
6/21/2011	3:00 p.m.	Flora[^]	52 kts.	n/a	n/a	$7,000	n/a	a power pole was blown down 4 miles west of the City
6/21/2011	4:00 p.m.	Flora[^]	52 kts.	n/a	n/a	$8,000	n/a	a tree was blown down and a metal roof was stripped off a shed
3/23/2012	1:15 p.m.	Xenia[^]	52 kts.	n/a	n/a	$25,000	n/a	numerous trees were blown down about 2 miles southeast of the Village
8/8/2012	4:18 p.m.	Flora	61 kts.	n/a	n/a	$4,000	n/a	a large tree was blown down onto a deck
8/8/2012	4:33 p.m.	Clay City	61 kts.	n/a	n/a	$42,000	n/a	- the roof of a building was blown off at the corner of 5th and Walnut St. - the roof of a trailer was also blown off - a tree was knocked down onto a house - several trees, tree limbs and power lines were blown down
8/8/2012	5:47 p.m.	Flora	61 kts.	n/a	n/a	$2,000	n/a	a 13-inch diameter tree was blown down on the 700 block of the West 12th St.
Subtotal:				**3**	**0**	**$103,000**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 13 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
8/16/2012	1:30 p.m.	Oskaloosa[^]	61 kts.	n/a	n/a	$2,000	n/a	a tree was blown down 1 mile northwest of Oskaloosa near the Clay and Marion County line
8/16/2012	1:50 p.m.	Louisville[^]	61 kts.	n/a	n/a	$2,000	n/a	a tree was blown down 1 mile west of the City
8/16/2012	1:55 p.m.	Flora Flora[^]	61 kts.	n/a	n/a	$3,000	n/a	a tree was blown down in the City and another was knocked down 1 mile northwest
9/5/2012	9:45 a.m.	Flora	52 kts.	n/a	n/a	$8,000	n/a	a tree was blown down onto a house
9/7/2012	6:03 p.m.	Louisville	52 kts.	n/a	n/a	$2,000	n/a	a large tree was blown down
9/7/2012	6:30 p.m.	Flora	52 kts.	n/a	n/a	$12,000	n/a	a tree and numerous large tree limbs were blown down
1/29/2013	9:50 p.m.	Bible Grove[^] Hord Iola[^]	61 kts.	n/a	n/a	$4,500	n/a	*Bible Grove Area* - 6 power poles were blown down *Iola Area* - 3 power poles were blown down
5/31/2013	11:15 p.m.	Flora[^]	52 kts.	n/a	n/a	$2,000	n/a	a small shed was blown across the road at US Hwy 45 & Hickory Hill Lane
6/17/2013	1:15 p.m.	Flora	52 kts.	n/a	n/a	$30,000	n/a	25 - 30-feet of hangar roof was blown off the Flora Airport and blocked the road on the west side of the airport
6/17/2013	4:40 p.m.	Louisville	52 kts.	n/a	n/a	$15,000	n/a	a tree was blown down onto a vehicle
8/31/2013	8:25 p.m.	Flora[^]	52 kts.	n/a	n/a	n/a	n/a	a 12-inch diameter tree branch was blown down across Long Leaf Lane
8/31/2013	8:28 p.m.	Flora[^]	52 kts.	n/a	n/a	n/a	n/a	a 5-inch diameter tree branch was blown down onto US Hwy 45
8/20/2014	9:20 p.m.	Flora	52 kts.	n/a	n/a	$3,000	n/a	2 trees were blown down
Subtotal:				**0**	**0**	**$83,500**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 14 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
8/20/2014	9:35 p.m.	Clay City	52 kts.	n/a	n/a	$30,000	n/a	numerous trees and tree branches were blown down
8/20/2014	9:45 p.m.	Xenia	52 kts.	n/a	n/a	$25,000	n/a	numerous trees and tree branches were blown down
8/23/2014	7:00 p.m.	Flora	52 kts.	n/a	n/a	$20,000	n/a	several large tree branches were blown down, including one that landed on a house
12/23/2015	12:10 p.m.	Xenia[^]	61 kts.	n/a	n/a	$30,000	n/a	a 40 by 80-foot barn was damaged on Butternut Rd. 4 miles north of the Village; the barn doors were blown in on the south side, the east wall was bowed out and the roof was partially torn off
4/26/2016	1:35 p.m.	Flora	61 kts.	n/a	n/a	$70,000	n/a	several trees and tree branches were blown down, knocking out power to half of the Village; one house was severely damaged by a falling tree
5/7/2016	5:05 p.m.	Louisville	61 kts.	n/a	n/a	$20,000	n/a	large tree limbs were blown down on the southwest side of the City
5/7/2016	5:08 p.m.	Flora	61 kts.	n/a	n/a	$40,000	n/a	- several large tree branches and power lines were blown down - shingles were blown off a roof on Austin Ave.
7/13/2016	4:05 p.m.	Iola Oskaloosa[^] Xenia	61 kts.	n/a	n/a	$70,000	n/a	numerous trees, tree branches and power lines were blown down
Subtotal:				**0**	**0**	**$305,000**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 15 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
7/13/2016	4:12 p.m.	Louisville	61 kts.	n/a	n/a	$110,000	n/a	- several houses sustained wind damage to their roofs near the high school - a large pole barn had half of its roof blown off - several trees were blown down
7/13/2016	4:15 p.m.	Ingraham[^]	78 kts.	1	n/a	$100,000	n/a	- a mobile home was blown over and destroyed, injuring 1 person inside - a grain bin was blown 200 feet
7/13/2016	4:15 p.m.	Flora	61 kts.	n/a	n/a	$55,000	n/a	- several trees were blown down - a large pole barn had half its roof blown off
7/13/2016	4:20 p.m.	Clay City	61 kts.	n/a	n/a	$60,000	n/a	numerous trees, tree branches, and power lines were blown down
4/26/2017	2:49 p.m.	Hord[^]	52 kts.	n/a	n/a	$10,000	n/a	power lines were blown down at US Hwy 45 and Cheetah Ln.
4/26/2017	3:08 p.m.	Clay City	52 kts.	n/a	n/a	$35,000	n/a	a tree was blown down onto a trailer
6/18/2017	2:19 a.m.	Flora Flora[^]	61 kts.	n/a	n/a	n/a	n/a	*Flora* - several trees were blown down, including 1 that fell through the roof of a house *Flora Area* - power poles and power lines were blown down on US Hwy 45 just south of the City
7/23/2017	3:52 a.m.	Xenia	52 kts.	n/a	n/a	n/a	n/a	multiple tree limbs were blown down; one mid-sized tree was snapped about halfway up
Subtotal:				**1**	**0**	**$370,000**	**$0**	

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

Table 1
Severe Storms – Thunderstorms with Damaging Winds Reported in Clay County
1973 – 2019
(Sheet 16 of 16)

Date(s)	Start Time	Location(s)	Maximum Magnitude (Knots)	Injuries	Fatalities	Property Damage	Crop Damage	Description
5/31/2018	10:01 a.m.	Flora	61 kts.	n/a	n/a	$175,000	n/a	numerous trees and power lines were blown down; some large trees fell onto houses
5/31/2018	10:03 a.m.	Xenia	61 kts.	n/a	n/a	$30,000	n/a	multiple trees were blown down
5/31/2018	10:22 a.m.	Louisville[^]	61 kts.	n /a	n/a	$45,000	n/a	- numerous small trees were blown down - a barn was severely damaged
6/1/2018	2:55 p.m.	Wendelin[^]	61 kts.	n/a	n/a	$25,000	n/a	a pole barn was severely damaged on Silver Ln. west of Beryl Rd.
6/1/2018	2:56 p.m.	Ingraham[^]	61 kts.	n/a	n/a	$10,000	n/a	a power pole was snapped, and power lines were knocked down
6/28/2018	5:36 p.m.	Kenner[^]	52 kts.	n/a	n/a	n/a	n/a	a tree was blown down on Oak Mound Ln.
6/28/2018	5:43 p.m.	Flora	52 kts.	n/a	n/a	n/a	n/a	a tree was blown down on the 500 block of E. 4th St.
6/30/2019	6:00 p.m.	Xenia	52 kts.	n/a	n/a	$15,000	n/a	a tree was blown onto a house
8/20/2019	10:50 a.m.	Bible Grove[^]	52 kts.	n/a	n/a	n/a	n/a	a few trees were blown down
Subtotal:				**0**	**0**	**$300,000**	**$0**	
GRAND TOTAL:				**7**	**0**	**$2,550,250**	**$2,500**	

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

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

Table 2
Severe Storms – Hail Events Reported in Clay County
1984 – 2019
(Sheet 1 of 3)

Date(s)	Start Time	Location(s)	Magnitude (Diameter)	Injuries	Fatalities	Property Damage	Crop Damage	Description
4/27/1984	6:30 p.m.	Iola	1.00 in.	n/a	n/a	n/a	n/a	
9/19/1986	4:15 p.m.	Louisville	2.75 in.	n/a	n/a	n/a	n/a	
9/19/1986	4:30 p.m.	Flora	1.25 in.	n/a	n/a	$2,500	n/a	
5/25/1989	2:00 p.m.	Hord	2.75 in.	n/a	n/a	$250,000	n/a	homes and automobiles were damaged
9/28/1990	5:27 p.m.	Sailor Springs[^]	1.75 in.	n/a	n/a	n/a	n/a	
10/1/1993	7:05 p.m.	Flora	1.00 in.	n/a	n/a	$50	$50	
5/3/1996	5:50 p.m.	Xenia[^]	2.75 in.	n/a	n/a	n/a	n/a	
9/6/1996	4:05 p.m.	Flora	1.00 in.	n/a	n/a	n/a	n/a	
6/12/1998	6:05 p.m.	Flora[^]	1.75 in.	n/a	n/a	n/a	n/a	
2/27/1999	2:36 p.m.	Flora[^] Flora	1.00 in.	n/a	n/a	n/a	n/a	
5/5/1999	1:27 p.m.	Xenia Kenner Flora	1.00 in.	n/a	n/a	n/a	n/a	
6/4/1999	6:20 p.m.	Clay City	1.00 in.	n/a	n/a	n/a	n/a	
4/12/2002	4:15 p.m.	Camp Travis[^]	1.75 in.	n/a	n/a	n/a	n/a	
4/24/2002	2:45 p.m.	Flora Louisville[^]	2.50 in.	n/a	n/a	n/a	n/a	*Flora* at least one windshield was broken
5/1/2002	1:30 p.m.	Louisville Flora	1.75 in.	n/a	n/a	n/a	n/a	***This event is part of a federally-declared disaster (Declaration #1416)*** *Louisville* 100 cars received hail damage at a car dealership; additional vehicles around the City sustained broken windows
4/4/2003	6:55 p.m.	Louisville[^] Louisville	1.75 in.	n/a	n/a	n/a	n/a	
Subtotal:				**0**	**0**	**$252,550**	**$50**	

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

Table 2
Severe Storms – Hail Events Reported in Clay County
1984 – 2019
(Sheet 2 of 3)

Date(s)	Start Time	Location(s)	Magnitude (Diameter)	Injuries	Fatalities	Property Damage	Crop Damage	Description
4/24/2003	7:22 p.m.	Louisville Bible Grove	1.75 in.	n/a	n/a	n/a	n/a	
5/26/2004	5:00 p.m.	Xenia[A]	1.50 in.	n/a	n/a	n/a	n/a	
5/27/2004	4:25 p.m.	Bible Grove[A]	1.75 in.	n/a	n/a	n/a	n/a	
5/27/2004	7:03 p.m.	Kenner[A] Flora	1.75 in.	n/a	n/a	n/a	n/a	
4/22/2005	2:19 p.m.	Clay City	1.00 in.	n/a	n/a	n/a	n/a	
5/19/2005	2:23 p.m.	Clay City	1.00 in.	n/a	n/a	n/a	n/a	
6/30/2005	6:16 p.m.	Clay City	1.00 in.	n/a	n/a	n/a	n/a	
6/9/2008	12:27 p.m.	Clay City[A]	1.75 in.	n/a	n/a	n/a	n/a	
6/9/2008	1:00 p.m.	Camp Travis[A]	1.00 in.	n/a	n/a	n/a	n/a	
6/9/2008	7:11 p.m.	Flora	1.00 in.	n/a	n/a	n/a	n/a	
4/22/2011	12:30 p.m.	Clay City	1.75 in.	n/a	n/a	n/a	n/a	
4/28/2012	6:18 p.m.	Louisville[A]	1.50 in.	n/a	n/a	n/a	n/a	
4/28/2012	6:18 p.m.	Iola	1.50 in.	n/a	n/a	n/a	n/a	
4/28/2012	6:20 p.m.	Iola	1.75 in.	n/a	n/a	n/a	n/a	
4/28/2012	6:20 p.m.	Louisville[A]	1.75 in.	n/a	n/a	n/a	n/a	
4/28/2012	6:56 p.m.	Clay City	1.00 in.	n/a	n/a	n/a	n/a	
5/4/2012	7:51 a.m.	Hord[A]	1.75 in.	n/a	n/a	n/a	n/a	
5/4/2012	6:45 p.m.	Camp Travis[A]	1.50 in.	n/a	n/a	n/a	n/a	
5/1/2016	6:45 p.m.	Ingraham[A]	1.75 in.	n/a	n/a	$6,000	n/a	hail damaged the shutters and cracked the windows of a house
5/1/2016	6:45 p.m.	Ingraham	1.00 in.	n/a	n/a	n/a	n/a	
2/28/2017	8:01 p.m.	Xenia	1.00 in.	n/a	n/a	n/a	n/a	
2/28/2017	8:07 p.m.	Xenia[A]	1.25 in.	n/a	n/a	n/a	n/a	
Subtotal:				**0**	**0**	**$6,000**	**$0**	

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

Table2
Severe Storms – Hail Events Reported in Clay County
1984 – 2019
(Sheet 3 of 3)

Date(s)	Start Time	Location(s)	Magnitude (Diameter)	Injuries	Fatalities	Property Damage	Crop Damage	Description
6/1/2018	3:05 p.m.	Sailor Springs[^]	1.00 in.	n/a	n/a	n/a	$24,000	major damaged occurred to a cornfield
6/11/2018	5:54 p.m.	Camp Travis[^]	1.00 in.	n/a	n/a	n/a	n/a	
6/11/2018	6:05 p.m.	Camp Travis[^]	1.50 in.	n/a	n/a	n/a	n/a	
6/11/2018	6:10 p.m.	Camp Travis[^]	1.75 in.	n/a	n/a	n/a	n/a	
6/26/2019	5:05 p.m.	Xenia	1.00 in.	n/a	n/a	n/a	n/a	
Subtotal:				**0**	**0**	**$0**	**$24,000**	
GRAND TOTAL:				**0**	**0**	**$258,550**	**$24,050**	

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

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

Table 3
Severe Storms – Lightning Events Reported in Clay County
2012 - 2019

Date(s)	Start Time	Location(s)	Injuries	Fatalities	Property Damage	Crop Damage	Description
8/8/2012	6:00 p.m.	Flora	n/a	n/a	$5,000	n/a	lightning struck US Hwy 50, creating a hole 12 inches wide and 6 inches deep
5/9/2013	4:30 p.m.	Ingraham^	n/a	n/a	$100,000	n/a	10 oil tank batteries were ignited by a lightning strike
8/31/2013	8:45 p.m.	Flora	n/a	n/a	$20,000	n/a	lightning struck a garage on E. 9th St.; the resulting fire caused significant damage to the garage
8/23/2014	7:00 p.m.	Flora	n/a	n/a	$5,000	n/a	lightning struck a house on the west edge of the City causing a small fire
4/26/2016	3:30 p.m.	Xenia	n/a	n/a	$30,000	n/a	lightning struck a garage; resulting in a fire completely destroying the garage
GRAND TOTAL:			**0**	**0**	**$160,000**	**$0**	

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

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 1 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
1/20/1990	n/a	Clay City	1.58 in.	n/a	n/a	n/a	n/a	
2/15/1990 thru 2/16/1990	n/a	Clay City	2.02 in.	n/a	n/a	n/a	n/a	
5/12/1990	1:00 a.m.	Flora Clay City	2.16 in.	n/a	n/a	n/a	n/a	
5/15/1990 thru 5/16/1990	4:30 a.m.	Flora Clay City	6.17 in.	n/a	n/a	n/a	n/a	
6/6/1990 thru 6/7/1990	11:30 a.m.	Clay City	1.90 in.	n/a	n/a	n/a	n/a	
6/20/1990	3:00 a.m.	Flora	1.97 in.	n/a	n/a	n/a	n/a	
9/8/1990 thru 9/9/1990	3:30 p.m.	Clay City	3.92 in.	n/a	n/a	n/a	n/a	
11/26/1990 thru 11/28/1990	7:00 p.m.	Flora Clay City	3.09 in.	n/a	n/a	n/a	n/a	
12/28/1990 thru 12/30/1990	10:00 p.m.	Flora Clay City	3.04 in.	n/a	n/a	n/a	n/a	
9/2/1991 thru 9/4/1991	10:00 p.m.	Flora Clay City	3.42 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 2 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
10/26/1991	12:30 a.m.	Flora Clay City	3.99 in.	n/a	n/a	n/a	n/a	
11/19/1991 thru 11/20/1991	3:00 p.m.	Flora Clay City	3.96 in.	n/a	n/a	n/a	n/a	
7/15/1992	n/a	Clay City	1.52 in.	n/a	n/a	n/a	n/a	
9/20/1992 thru 9/22/1992	9:00 a.m.	Flora	4.12 in.	n/a	n/a	n/a	n/a	
10/15/1992 thru 10/16/1992	6:30 a.m.	Flora	1.54 in.	n/a	n/a	n/a	n/a	
11/10/1992 thru 11/12/1992	8:00 p.m.	Flora Clay City	3.73 in.	n/a	n/a	n/a	n/a	
1/2/1993 thru 1/4/1993	2:00 p.m.	Flora Clay City	3.09 in.	n/a	n/a	n/a	n/a	
1/19/1993 thru 1/20/1993	10:00 p.m.	Flora Clay City	1.95 in.	n/a	n/a	n/a	n/a	
4/12/1993 thru 4/13/1993	8:00 p.m.	Flora	1.51 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 3 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
6/12/1993	n/a	Clay City	1.59 in.	n/a	n/a	n/a	n/a	
7/2/1993 thru 7/3/1993	3:00 p.m.	Clay City	2.18 in.	n/a	n/a	n/a	n/a	
7/13/1993 thru 7/14/1993	10:30 p.m.	Flora	1.61 in.	n/a	n/a	n/a	n/a	
7/15/1993 thru 7/16/1993	10:00 p.m.	Flora Clay City	3.81 in.	n/a	n/a	n/a	n/a	
9/2/1993 thru 9/3/1993	4:00 p.m.	Flora	2.92 in.	n/a	n/a	n/a	n/a	
9/22/1993 thru 9/23/1993	10:00 a.m.	Flora Clay City	3.85 in.	n/a	n/a	n/a	n/a	
11/13/1993 thru 11/14/1993	7:00 p.m.	Flora Clay City	5.76 in.	n/a	n/a	n/a	n/a	
11/16/1993 thru 11/17/1993	6:00 p.m.	Clay City	1.72 in.	n/a	n/a	n/a	n/a	
4/9/1994 thru 4/11/1994	5:00 p.m.	Flora	4.79 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 4 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
4/27/1994	n/a	Clay City	1.54 in.	n/a	n/a	n/a	n/a	
6/17/1994	n/a	Clay City	1.72 in.					
3/6/1995 thru 3/7/1995	n/a	Clay City	3.57 in.	n/a	n/a	n/a	n/a	
5/15/1995 thru 5/18/1995	11:00 p.m.	Flora Clay City	5.82 in.	n/a	n/a	n/a	n/a	
6/2/1995	n/a	Clay City	2.50 in.	n/a	n/a	n/a	n/a	
7/22/1995	1:00 p.m.	Flora	1.86 in.	n/a	n/a	n/a	n/a	
8/1/1995	3:00 p.m.	Flora	1.66 in.	n/a	n/a	n/a	n/a	
8/10/1995	n/a	Clay City	2.29 in.	n/a	n/a	n/a	n/a	
10/3/1995	n/a	Clay City	1.51 in.	n/a	n/a	n/a	n/a	
1/23/1996	2:30 a.m.	Flora	1.63 in.	n/a	n/a	n/a	n/a	
4/20/1996	n/a	Clay City	1.61 in.	n/a	n/a	n/a	n/a	
4/22/1996 thru 4/23/1996	12:00 a.m.	Flora	3.13 in.	n/a	n/a	n/a	n/a	
4/27/1996 thru 4/29/1996	4:00 p.m.	Flora Clay City	3.29 in.	n/a	n/a	n/a	n/a	
5/25/1996 thru 5/27/1996	9:30 p.m.	Flora	3.15 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 5 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
6/9/1996 thru 6/10/1996	6:30 p.m.	Flora Clay City	4.37 in.	n/a	n/a	n/a	n/a	
8/23/1996 thru 8/24/1996	n/a	Clay City	5.00 in.	n/a	n/a	n/a	n/a	
9/16/1996	n/a	Clay City	1.87 in.	n/a	n/a	n/a	n/a	
11/24/1996 thru 11/25/1996	11:00 a.m.	Flora	2.09 in.	n/a	n/a	n/a	n/a	
1/27/1997	4:00 a.m.	Flora Clay City	1.65 in.	n/a	n/a	n/a	n/a	
2/26/1997 thru 2/27/1997	1:00 a.m.	Flora	2.17 in.	n/a	n/a	n/a	n/a	
5/26/1997	n/a	Clay City	1.65 in.	n/a	n/a	n/a	n/a	
5/31/1997	n/a	Clay City	1.50 in.	n/a	n/a	n/a	n/a	
6/7/1997	n/a	Clay City	2.47 in.	n/a	n/a	n/a	n/a	
6/18/1997	n/a	Clay City	1.93 in.	n/a	n/a	n/a	n/a	
4/14/1998 thru 4/15/1998	7:00 p.m.	Flora Clay City	1.96 in.	n/a	n/a	n/a	n/a	
4/29/1998 thru 4/30/1998	9:30 p.m.	Flora Clay City	2.66 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 6 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
5/22/1998	1:00 p.m.	Flora Clay City	2.54 in.	n/a	n/a	n/a	n/a	
6/12/1998	7:00 p.m.	Flora	2.30 in.	n/a	n/a	n/a	n/a	
7/7/1998	n/a	Clay City	2.21 in.	n/a	n/a	n/a	n/a	
7/31/1998	n/a	Flora Clay City	1.82 in.	n/a	n/a	n/a	n/a	
9/25/1998	4:30 a.m.	Flora	1.55 in.	n/a	n/a	n/a	n/a	
10/6/1998 thru 10/7/1998	n/a	Clay City	2.89 in.	n/a	n/a	n/a	n/a	
1/21/1999 thru 1/22/1999	3:00 p.m.	Flora Clay City	3.10 in.	n/a	n/a	n/a	n/a	
1/30/1999 thru 1/31/1999	8:00 p.m.	Flora	2.15 in.	n/a	n/a	n/a	n/a	
2/6/1999 thru 2/7/1999	11:00 p.m.	Flora	2.38 in.	n/a	n/a	n/a	n/a	
4/2/1999 thru 4/4/1999	10:00 p.m.	Flora Clay City	2.40 in.	n/a	n/a	n/a	n/a	
5/5/1999 thru 5/6/1999	12:00 a.m.	Flora	2.05 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 7 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
6/1/1999 thru 6/2/1999	6:00 p.m.	Flora	1.75 in.	n/a	n/a	n/a	n/a	
6/14/1999	n/a	Clay City	4.00 in.	n/a	n/a	n/a	n/a	
7/1/1999 thru 7/2/1999	n/a	Clay City	6.09 in.	n/a	n/a	n/a	n/a	
8/24/1999	n/a	Clay City	1.59 in.	n/a	n/a	n/a	n/a	
2/12/2000 thru 2/13/2000	10:00 p.m.	Flora	1.50 in.	n/a	n/a	n/a	n/a	
2/18/2000	1:30 a.m.	Flora	1.71 in.	n/a	n/a	n/a	n/a	
6/16/2000 thru 6/17/2000	5:30 a.m.	Flora Clay City	3.26 in.	n/a	n/a	n/a	n/a	
6/24/2000	12:30 a.m.	Flora Clay City	3.40 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 8 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
7/5/2000	n/a	Clay City	2.68 in.	n/a	n/a	n/a	n/a	
7/12/2000	n/a	Clay City	1.68 in.	n/a	n/a	n/a	n/a	
7/19/2000	n/a	Clay City	2.06 in.	n/a	n/a	n/a	n/a	
7/29/2000	12:00 a.m.	Flora	2.55 in.	n/a	n/a	n/a	n/a	
8/23/2000 thru 8/24/2000	8:00 p.m.	Flora	3.02 in.	n/a	n/a	n/a	n/a	
9/25/2000	12:30 a.m.	Flora	2.49 in.	n/a	n/a	n/a	n/a	
11/24/2000 thru 11/25/2000	10:00 p.m.	Flora	1.52 in.	n/a	n/a	n/a	n/a	
7/9/2001	1:00 a.m.	Flora	2.50 in.	n/a	n/a	n/a	n/a	
8/24/2001	1:30 a.m.	Flora	2.95 in.	n/a	n/a	n/a	n/a	
9/18/2001	n/a	Clay City	2.15 in.	n/a	n/a	n/a	n/a	
10/12/2001	n/a	Clay City	1.85 in.	n/a	n/a	n/a	n/a	
10/13/2001 thru 10/14/2001	2:00 a.m.	Flora Clay City	2.45 in.	n/a	n/a	n/a	n/a	
12/17/2001	n/a	Clay City	1.50 in.	n/a	n/a	n/a	n/a	
3/8/2002 thru 3/9/2002	8:30 p.m.	Flora	2.08 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 9 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
4/27/2002	n/a	Flora Clay City	1.67 in.	n/a	n/a	n/a	n/a	***This event is part of a federally-declared disaster (Declaration #1416)***
5/1/2002	3:00 p.m.	Flora Clay City	1.65 in.	n/a	n/a	n/a	n/a	***This event is part of a federally-declared disaster (Declaration #1416)***
5/6/2002 thru 5/7/2002	3:00 a.m.	Flora Clay City	3.18 in.	n/a	n/a	n/a	n/a	***This event is part of a federally-declared disaster (Declaration #1416)***
5/13/2002	12:00 a.m.	Flora Clay City	3.00 in.	n/a	n/a	n/a	n/a	***This event is part of a federally-declared disaster (Declaration #1416)***
6/25/2002 thru 6/26/2002	n/a	Clay City	2.57 in.	n/a	n/a	n/a	n/a	
7/23/2002	n/a	Clay City	1.82 in.	n/a	n/a	n/a	n/a	
4/24/2003 thru 4/25/2003	7:00 p.m.	Flora	1.50 in.	n/a	n/a	n/a	n/a	
5/4/2003 thru 5/5/2003	4:00 a.m.	Flora Clay City	2.56 in.	n/a	n/a	n/a	n/a	
5/9/2003 thru 5/10/2003	n/a	Clay City	3.11 in.	n/a	n/a	n/a	n/a	
7/10/2003	12:30 a.m.	Flora	1.65 in.	n/a	n/a	n/a	n/a	
8/2/2003 thru 8/3/2003	12:30 p.m.	Flora Clay City	1.92 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 10 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
9/26/2003 thru 9/27/2003	12:00 a.m.	Flora Clay City	2.41 in.	n/a	n/a	n/a	n/a	
11/17/2003 thru 11/18/2003	3:00 p.m.	Flora	2.00 in.	n/a	n/a	n/a	n/a	
1/4/2004	12:00 a.m.	Flora	1.60 in.	n/a	n/a	n/a	n/a	
5/26/2004 thru 5/28/2004	1:00 p.m.	Flora Clay City	4.51 in.	n/a	n/a	n/a	n/a	
7/11/2004 thru 7/12/2004	8:30 p.m.	Flora Clay City	2.20 in.	n/a	n/a	n/a	n/a	
8/19/2004 thru 8/20/2004	6:30 p.m.	Flora	2.62 in.	n/a	n/a	n/a	n/a	
8/25/2004 thru 8/26/2004	9:00 p.m.	Flora Clay City	4.17 in.	n/a	n/a	n/a	n/a	
10/17/2004 thru 10/18/2004	10:00 p.m.	Flora Clay City	2.71 in.	n/a	n/a	n/a	n/a	
10/26/2004 thru 10/27/2004	8:00 a.m.	Clay City	2.64 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 11 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
11/2/2004	n/a	Clay City	1.63 in.	n/a	n/a	n/a	n/a	
1/4/2005 thru 1/5/2005	n/a	Flora Clay City	3.56 in.	n/a	n/a	n/a	n/a	
8/8/2005	n/a	Clay City	1.50 in.	n/a	n/a	n/a	n/a	
11/14/2005 thru 11/15/2005	n/a	Flora Clay City	2.95 in.	n/a	n/a	n/a	n/a	
3/7/2006 thru 3/9/2006	10:00 p.m.	Flora Clay City	3.76 in.	n/a	n/a	n/a	n/a	
3/12/2006	n/a	Clay City	2.15 in.	n/a	n/a	n/a	n/a	
5/11/2006	n/a	Clay City	1.64 in.	n/a	n/a	n/a	n/a	
6/2/2006	n/a	Clay City	2.05 in.	n/a	n/a	n/a	n/a	
7/12/2006 thru 7/13/2006	n/a	Flora	2.48 in.	n/a	n/a	n/a	n/a	
8/8/2006 thru 8/10/2006	11:00 p.m.	Flora Clay City	8.13 in.	n/a	n/a	n/a	n/a	
9/17/2006 thru 9/18/2006	4:30 p.m.	Flora	1.64 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 12 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
9/22/2006 thru 9/23/2006	4:30 p.m.	Flora	1.91 in.	n/a	n/a	n/a	n/a	
11/15/2006 thru 11/16/2006	4:00 p.m.	Flora	4.90 in.	n/a	n/a	n/a	n/a	
3/15/2007	12:00 a.m.	Flora	1.80 in.	n/a	n/a	n/a	n/a	
3/19/2007	12:00 a.m.	Flora	1.81 in.	n/a	n/a	n/a	n/a	
6/23/2007 thru 6/24/2007	6:00 p.m.	Flora	1.61 in.	n/a	n/a	n/a	n/a	
6/26/2007	6:30 a.m.	Flora Clay City	4.00 in.	n/a	n/a	n/a	n/a	
7/4/2007	4:00 p.m.	Flora	2.05 in.	n/a	n/a	n/a	n/a	
9/7/2007 thru 9/8/2007	n/a	Flora	2.13 in.	n/a	n/a	n/a	n/a	
10/16/2007 thru 10/17/2007	1:00 a.m.	Flora Clay City	4.00 in.	n/a	n/a	n/a	n/a	
10/17/2007 thru 10/18/2007	11:30 a.m.	Flora	2.72 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 13 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
1/7/2008 thru 1/8/2008	10:30 p.m.	Flora	1.78 in.	n/a	n/a	n/a	n/a	
2/6/2008	n/a	Clay City	1.67 in.	n/a	n/a	n/a	n/a	
3/18/2008 thru 3/19/2008	4:30 a.m.	Flora Clay City	5.35 in.	n/a	n/a	n/a	n/a	
3/26/2008 thru 3/27/2008	3:00 p.m.	Flora Clay City	3.53 in.	n/a	n/a	n/a	n/a	
4/10/2008 thru 4/11/2008	3:00 a.m.	Flora	1.98 in.	n/a	n/a	n/a	n/a	
5/7/2008 thru 5/8/2008	8:30 a.m.	Flora	5.60 in.	n/a	n/a	n/a	n/a	
5/13/2008 thru 5/14/2008	9:00 p.m.	Flora	1.70 in.	n/a	n/a	n/a	n/a	
6/10/2008	n/a	Clay City	1.73 in.	n/a	n/a	n/a	n/a	
7/12/2008 thru 7/13/2008	5:00 a.m.	Clay City	3.03 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 14 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
7/29/2008 thru 7/30/2008	8:00 p.m.	Flora Clay City	2.30 in.	n/a	n/a	n/a	n/a	
9/12/2008	1:00 a.m.	Flora	1.62 in.	n/a	n/a	n/a	n/a	
10/8/2008	n/a	Clay City	1.59 in.	n/a	n/a	n/a	n/a	
10/23/2008 thru 10/24/2008	12:30 p.m.	Flora	1.91 in.	n/a	n/a	n/a	n/a	
2/10/2009 thru 2/11/2009	9:30 p.m.	Flora	2.50 in.	n/a	n/a	n/a	n/a	
4/5/2009	n/a	Flora Clay City	1.96 in.	n/a	n/a	n/a	n/a	
4/9/2009 thru 4/10/2009	n/a	Flora Clay City	2.86 in.	n/a	n/a	n/a	n/a	
5/13/2009 thru 5/14/2009	10:00 p.m.	Flora Clay City	2.69 in.	n/a	n/a	n/a	n/a	
6/10/2009 thru 6/11/2009	n/a	Flora	3.80 in.	n/a	n/a	n/a	n/a	
6/16/2009	n/a	Flora	1.57 in.	n/a	n/a	n/a	n/a	
7/15/2009 thru 7/16/2009	n/a	Clay City	3.15 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 15 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
10/7/2009 thru 10/8/2009	n/a	Flora Clay City	4.50 in.	n/a	n/a	n/a	n/a	
12/25/2009	n/a	Clay City	1.60 in.	n/a	n/a	n/a	n/a	
6/15/2010	n/a	Clay City	1.59 in.	n/a	n/a	n/a	n/a	
8/20/2010	n/a	Flora	1.87 in.	n/a	n/a	n/a	n/a	
11/24/2010 thru 11/25/2010	n/a	Flora Clay City	4.17 in.	n/a	n/a	n/a	n/a	
3/4/2011	n/a	Flora Clay City	1.82 in.	n/a	n/a	n/a	n/a	
4/25/2011 thru 4/27/2011	n/a	Flora Clay City	5.28 in.	n/a	n/a	n/a	n/a	
5/2/2011	n/a	Clay City	1.75 in.	n/a	n/a	n/a	n/a	
6/17/2011 thru 6/18/2011	n/a	Flora Clay City	3.90 in.	n/a	n/a	n/a	n/a	
6/25/2011 thru 6/26/2011	n/a	Flora Clay City	3.18 in.	n/a	n/a	n/a	n/a	
7/7/2011	n/a	Flora	2.73 in.	n/a	n/a	n/a	n/a	
10/12/2011	n/a	Flora Clay City	1.72 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 16 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
11/29/2011	n/a	Clay City	1.66 in.	n/a	n/a	n/a	n/a	
5/5/2012	n/a	Clay City	1.64 in.	n/a	n/a	n/a	n/a	
7/3/2012	n/a	Clay City	2.83 in.	n/a	n/a	n/a	n/a	
9/1/2012 Thru 9/2/2012	n/a	Flora Clay City	5.71 in.	n/a	n/a	n/a	n/a	
9/7/2012	n/a	Flora Clay City	2.35 in.	n/a	n/a	n/a	n/a	
9/24/2012 thru 9/25/2012	n/a	Flora Clay City	5.32 in.	n/a	n/a	n/a	n/a	
1/12/2013	n/a	Flora Clay City	3.28 in.	n/a	n/a	n/a	n/a	
3/16/2013 thru 3/17/2013	n/a	Flora Clay City	2.31 in.	n/a	n/a	n/a	n/a	
4/18/2013	n/a	Flora	2.28 in.	n/a	n/a	n/a	n/a	
5/30/2013	n/a	Flora Clay City	2.48 in.	n/a	n/a	n/a	n/a	
6/23/2013 thru 6/24/2013	n/a	Clay City	1.95 in.	n/a	n/a	n/a	n/a	
6/30/2013 thru 7/2/2013	n/a	Flora Clay City	5.47 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 17 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
7/20/2013	n/a	Flora	1.73 in.	n/a	n/a	n/a	n/a	
10/5/2013	n/a	Clay City	2.15 in.	n/a	n/a	n/a	n/a	
11/1/2013	n/a	Clay City	2.55 in.	n/a	n/a	n/a	n/a	
12/20/2013 thru 12/21/2013	n/a	Clay City	3.36 in.	n/a	n/a	n/a	n/a	
4/2/2014 thru 4/3/2014	n/a	Flora Clay City	3.99 in.	n/a	n/a	n/a	n/a	
4/27/2014	n/a	Flora	2.35 in.	n/a	n/a	n/a	n/a	
8/7/2014 thru 8/8/2014	n/a	Flora	1.64 in.	n/a	n/a	n/a	n/a	
8/16/2014 thru 8/17/2014	n/a	Flora	2.59 in.	n/a	n/a	n/a	n/a	
8/20/2014 thru 8/21/2014	n/a	Flora	2.06 in.	n/a	n/a	n/a	n/a	
9/1/2014 thru 9/2/2014	n/a	Flora	1.82 in.	n/a	n/a	n/a	n/a	
10/2/2014 thru 10/3/2014	n/a	Flora Clay City	3.94 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 18 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
12/5/2014 thru 12/6/2014	n/a	Flora Clay City	2.40 in.	n/a	n/a	n/a	n/a	
3/14/2015	n/a	Clay City	1.60 in.	n/a	n/a	n/a	n/a	
4/7/2015 thru 4/8/2015	n/a	Clay City	2.84 in.	n/a	n/a	n/a	n/a	
6/7/2015 thru 6/8/2015	n/a	Flora Clay City	2.95 in.	n/a	n/a	n/a	n/a	
6/18/2015 thru 6/19/2015	n/a	Flora Clay City	5.89 in.	n/a	n/a	n/a	n/a	
6/21/2015 thru 6/22/2015	n/a	Flora	2.18 in.	n/a	n/a	n/a	n/a	
7/2/2015	n/a	Clay City	1.66 in.	n/a	n/a	n/a	n/a	
8/5/2015 thru 8/6/2015	n/a	Clay City	2.31 in.	n/a	n/a	n/a	n/a	
9/28/2015 thru 9/29/2015	n/a	Flora Clay City	2.43 in.	n/a	n/a	n/a	n/a	
11/16/2015 thru 11/17/2015	n/a	Flora	3.36 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 19 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
11/27/2015 thru 11/28/2015	n/a	Flora	1.87 in.	n/a	n/a	n/a	n/a	
12/23/2015 thru 12/24/2015	n/a	Flora	1.69 in.	n/a	n/a	n/a	n/a	
12/26/2015 thru 12/28/2015	n/a	Flora Clay City	5.00 in.	n/a	n/a	n/a	n/a	
2/24/2016	n/a	Clay City	1.60 in.	n/a	n/a	n/a	n/a	
4/20/2016 thru 4/21/2016	n/a	Flora	2.42 in.	n/a	n/a	n/a	n/a	
6/4/2016 thru 6/5/2016	n/a	Flora	2.00 in.	n/a	n/a	n/a	n/a	
7/14/2016	n/a	Clay City	2.05 in.	n/a	n/a	n/a	n/a	
8/13/2016 thru 8/15/2016	n/a	Flora Clay City	7.03 in.	n/a	n/a	n/a	n/a	
9/16/2016 thru 9/17/2016	n/a	Flora Clay City	3.28 in.	n/a	n/a	n/a	n/a	
4/17/2017	n/a	Clay City	2.22 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 20 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
4/26/2017	n/a	Flora	1.74 in.	n/a	n/a	n/a	n/a	
4/28/2017 thru 4/30/2017	n/a	Flora	6.39 in.	n/a	n/a	n/a	n/a	
5/10/2017 thru 5/11/2017	n/a	Flora	1.53 in.	n/a	n/a	n/a	n/a	
7/14/2017	n/a	Clay City	2.61 in.	n/a	n/a	n/a	n/a	
2/23/2018 thru 2/24/2018	n/a	Flora	2.71 in.	n/a	n/a	n/a	n/a	
6/11/2018 thru 6/12/2018	n/a	Flora Clay City	5.13 in.	n/a	n/a	n/a	n/a	
8/1/2018	n/a	Clay City	2.35 in.	n/a	n/a	n/a	n/a	
8/17/2018	n/a	Clay City	1.65 in.	n/a	n/a	n/a	n/a	
8/21/2018	n/a	Clay City	2.20 in.	n/a	n/a	n/a	n/a	
9/7/2018 thru 9/9/2018	n/a	Flora Clay City	9.82 in.	n/a	n/a	n/a	n/a	
11/1/2018	n/a	Clay City	1.70 in.	n/a	n/a	n/a	n/a	
6/15/2019 thru 6/16/2019	n/a	Flora	2.50 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	

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

Table 4
Severe Storms – Heavy Rain Events Reported in Clay County
1990 – 2019
(Sheet 21 of 21)

Date(s)	Start Time	Location(s)	Maximum Magnitude (inches)	Injuries	Fatalities	Property Damage	Crop Damage	Description
7/3/2019 thru 7/4/2019	n/a	Flora	3.98 in.	n/a	n/a	n/a	n/a	
10/27/2019	n/a	Clay City	2.15 in.	n/a	n/a	n/a	n/a	
SUBTOTAL:				**0**	**0**	**$0**	**$0**	
GRAND TOTAL:				**0**	**0**	**$0**	**$0**	

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

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Centers for Environmental Information, Cooperative Observation Forms.
NOAA, National Environmental Satellite, Data & Information Service, National Centers for Environmental Information, Storm Events Database.

Table 5
Severe Winter Storm Events Reported in Clay County
1950 – 2019
(Sheet 1 of 11)

Date(s)	Start Time	Event Type	Magnitude (Maximum)					Data Source[2]	Injuries	Fatalities	Property Damages	Description
			Snow	Freezing Rain[1]	Ice[1]	Sleet[1]	Strong Winds[1]					
12/6/1950 thru 12/7/1950	n/a	Heavy Snow	8.2 in.					COOP (Flora)	n/a	n/a	n/a	
1/31/1951	9:00 a.m.	Heavy Snow	4.0 in.					COOP (Flora)	n/a	n/a	n/a	
3/25/1955	9:30 a.m.	Heavy Snow	6.0 in.				X	COOP (Flora)	n/a	n/a	n/a	
11/27/1958 thru 11/28/1958	10:00 p.m.	Heavy Snow	6.8 in.					COOP (Flora)	n/a	n/a	n/a	
1/20/1959 thru 1/21/1959	12:00 a.m.	Winter Storm	1.7 in.	X	X	X		COOP (Flora)	n/a	n/a	n/a	COOP observer noted blizzard like conditions with blowing snow
2/25/1960	1:30 a.m.	Heavy Snow	5.5 in.					COOP (Flora)	n/a	n/a	n/a	
3/8/1960 thru 3/9/1960	6:30 p.m.	Heavy Snow	6.0 in.					COOP (Flora)	n/a	n/a	n/a	
12/20/1960	8:00 a.m.	Winter Storm	2.5 in.			X		COOP (Flora)	n/a	n/a	n/a	COOP observer noted blowing snow
3/1/1963	12:30 a.m.	Heavy Snow	5.5 in.					COOP (Flora)	n/a	n/a	n/a	
12/11/1963	9:00 a.m.	Winter Storm	2.5 in.	X		X		COOP (Flora)	n/a	n/a	n/a	COOP observer noted slick highways
Subtotal:									**0**	**0**	**$0**	

[1] An "X" in the freezing rain, ice, sleet and/or strong winds columns indicates the presences of that particular type of weather condition during a severe winter storm event.

[2] Observation Location information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 5
Severe Winter Storm Events Reported in Clay County
1950 – 2019
(Sheet 2 of 11)

Date(s)	Start Time	Event Type	Magnitude (Maximum)					Data Source[2]	Injuries	Fatalities	Property Damages	Description
			Snow	Freezing Rain[1]	Ice[1]	Sleet[1]	Strong Winds[1]					
1/11/1964 thru 1/12/1964	4:00 p.m.	Winter Storm	8.7 in.	X				COOP (Flora)	n/a	n/a	n/a	
2/15/1964	1:30 p.m.	Winter Storm	3.5 in.	X		X		COOP (Flora)	n/a	n/a	n/a	
3/4/1965	2:00 p.m.	Heavy Snow	5.2 in.					COOP (Flora)	n/a	n/a	n/a	
2/1/1966	12:00 a.m.	Heavy Snow	9.0 in.					COOP (Flora)	n/a	n/a	n/a	
1/12/1968 thru 1/14/1968	3:00 a.m.	Heavy Snow	7.0 in.					COOP (Flora)	n/a	n/a	n/a	COOP observer noted that roads were slick and hazardous
2/28/1969	12:00 a.m.	Heavy Snow	5.0 in.					COOP (Flora)	n/a	n/a	n/a	
12/23/1969	12:00 a.m.	Heavy Snow	6.0 in.					COOP (Flora)	n/a	n/a	n/a	COOP observer noted hazardous roads
12/30/1969 thru 12/31/1969	1:00 a.m.	Winter Storm	6.0 in.	X		X		COOP (Flora)	n/a	n/a	n/a	COOP observer noted that secondary roads were slick and snow packed
3/17/1970	1:30 a.m.	Heavy Snow	6.5 in.					COOP (Flora)	n/a	n/a	n/a	
2/12/1971	5:00 a.m.	Heavy Snow	5.0 in.					COOP (Flora)	n/a	n/a	n/a	
1/4/1972	2:00 a.m.	Winter Storm	4.0 in.	X	X			COOP (Flora)	n/a	n/a	n/a	COOP observer noted ice glazed and snow packed roads
Subtotal:									**0**	**0**	**$0**	

[1] An "X" in the freezing rain, ice, sleet and/or strong winds columns indicates the presences of that particular type of weather condition during a severe winter storm event.

[2] Observation Location information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 5
Severe Winter Storm Events Reported in Clay County
1950 – 2019
(Sheet 3 of 11)

Date(s)	Start Time	Event Type	Magnitude (Maximum)					Data Source[2]	Injuries	Fatalities	Property Damages	Description
			Snow	Freezing Rain[1]	Ice[1]	Sleet[1]	Strong Winds[1]					
12/19/1973 thru 12/20/1973	12:30 a.m.	Heavy Snow	12.0 in.					COOP (Flora)	n/a	n/a	n/a	
3/9/1975 thru 3/10/1975	7:30 p.m.	Heavy Snow	6.0 in.					COOP (Flora)	n/a	n/a	n/a	
11/26/1975	11:30 p.m.	Heavy Snow	4.0 in.					COOP (Flora)	n/a	n/a	n/a	COOP observer noted that roads were very slick, and there was drifting snow
1/16/1978 thru 1/17/1978	12:30 a.m.	Heavy Snow	10.0 in.					COOP (Flora) (Clay City)	n/a	n/a	n/a	
1/25/1978	11:30 a.m.	Winter Storm	3.0 in.	X			X	COOP (Flora) (Clay City)	n/a	n/a	n/a	COOP observer noted that roads were closed, and hazardous and high winds resulted in drifting snow
3/7/1978 thru 3/8/1978	12:30 a.m.	Ice Storm		X	0.25 in.			COOP (Flora)	n/a	n/a	n/a	COOP observer noted a ¼ inch thick ice covering on everything with roads slick and hazardous
1/27/1979 thru 1/28/1979	12:00 a.m.	Heavy Snow	6.0 in.					COOP (Flora) (Clay City)	n/a	n/a	n/a	
Subtotal:									**0**	**0**	**$0**	

[1] An "X" in the freezing rain, ice, sleet and/or strong winds columns indicates the presences of that particular type of weather condition during a severe winter storm event.

[2] Observation Location information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 5
Severe Winter Storm Events Reported in Clay County
1950 – 2019
(Sheet 4 of 11)

Date(s)	Start Time	Event Type	Magnitude (Maximum)					Data Source[2]	Injuries	Fatalities	Property Damages	Description
			Snow	Freezing Rain[1]	Ice[1]	Sleet[1]	Strong Winds[1]					
1/30/1980	3:30 a.m.	Heavy Snow	5.0 in.					COOP (Flora)	n/a	n/a	n/a	
1/13/1982	n/a	Heavy Snow	4.0 in.					COOP (Clay City)	n/a	n/a	n/a	
2/3/1982	7:30 a.m.	Heavy Snow	5.0 in.					COOP (Flora)	n/a	n/a	n/a	
2/8/1982 thru 2/9/1982	3:30 p.m.	Heavy Snow	6.6 in.					COOP (Flora) (Clay City)	n/a	n/a	n/a	COOP observer in Flora noted snow drifted and hazardous roads
2/27/1984 thru 2/28/1984	5:30 a.m.	Heavy Snow	10.0 in.					COOP (Flora) (Clay City)	n/a	n/a	n/a	COOP Observer in Flora noted roads that were drifted shut
3/12/1984	10:00 a.m.	Winter Storm	4.0 in.	X	X			COOP (Flora)	n/a	n/a	n/a	COOP observer noted snow drifts and hazardous roads
1/9/1987 thru 1/10/1987	7:30 a.m.	Heavy Snow	8.5 in.					COOP (Flora) (Clay City)	n/a	n/a	n/a	
1/18/1987 thru 1/19/1987	9:30 p.m.	Winter Storm	4.1 in.	X	X			COOP (Flora)	n/a	n/a	n/a	
12/21/1990 thru 12/23/1990	10:30 p.m.	Winter Storm	3.0 in.	X	X			COOP (Flora) (Clay City)	n/a	n/a	n/a	
Subtotal:									**0**	**0**	**$0**	

[1] An "X" in the freezing rain, ice, sleet and/or strong winds columns indicates the presences of that particular type of weather condition during a severe winter storm event.

[2] Observation Location information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 5
Severe Winter Storm Events Reported in Clay County
1950 – 2019
(Sheet 5 of 11)

Date(s)	Start Time	Event Type	Magnitude (Maximum)					Data Source[2]	Injuries	Fatalities	Property Damages	Description
			Snow	Freezing Rain[1]	Ice[1]	Sleet[1]	Strong Winds[1]					
12/26/1990 thru 12/27/1990	10:00 p.m.	Heavy Snow	6.1 in.					COOP (Clay City)	n/a	n/a	n/a	
2/15/1993 thru 2/16/1993	1:00 p.m.	Heavy Snow	7.0 in.					COOP (Flora) (Clay City)	n/a	n/a	n/a	
2/24/1993 thru 2/25/1993	11:00 p.m.	Heavy Snow	9.0 in.					COOP (Flora) (Clay City)	n/a	n/a	n/a	COOP observer in Flora noted drifting snow
1/2/1996 thru 1/3/1996	2:00 a.m.	Winter Storm	6.0 in.		X		40 mph gusts	COOP (Flora) (Clay City) SED	n/a	n/a	n/a	- gusty northwest winds created near whiteout conditions, making travel hazardous and closing numerous roads - numerous minor accidents were reported across the area
1/4/1996	3:00 a.m.	Winter Storm	2.0 in.		X			COOP (Flora) (Louisville) SED	n/a	n/a	n/a	numerous minor accidents were reported across the area
1/18/1996 thru 1/19/1996	10:00 a.m.	Winter Storm	X	X	X			COOP (Flora) SED	n/a	n/a	n/a	numerous power outages and minor accidents were reported across the area
Subtotal:									**0**	**0**	**$0**	

[1] An "X" in the freezing rain, ice, sleet and/or strong winds columns indicates the presences of that particular type of weather condition during a severe winter storm event.

[2] Observation Location information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 5
Severe Winter Storm Events Reported in Clay County
1950 – 2019
(Sheet 6 of 11)

Date(s)	Start Time	Event Type	Magnitude (Maximum)					Data Source[2]	Injuries	Fatalities	Property Damages	Description
			Snow	Freezing Rain[1]	Ice[1]	Sleet[1]	Strong Winds[1]					
3/19/1996 thru 3/20/1996	12:00 a.m.	Winter Storm	6.5 in.				X	COOP (Clay City) (Flora) SED	n/a	n/a	n/a	- badly snow drifted roads - numerous minor accidents were reported across the area
12/5/1996	3:00 a.m.	Heavy Snow	5.9 in.					COOP (Flora)	n/a	n/a	n/a	
12/16/1996 thru 12/17/1996	4:00 a.m.	Heavy Snow	6.5 in.					COOP (Flora) (Clay City)	n/a	n/a	n/a	
1/8/1997 thru 1/9/1997	9:00 p.m.	Heavy Snow	6.5 in.					COOP (Louisville) (Clay City) SED	n/a	n/a	n/a	numerous accidents were reported across the area
1/15/1997 thru 1/17/1997	3:00 a.m.	Winter Storm	1.0 in.	X		X	30 mph gusts	COOP (Flora) (Louisville) SED	n/a	n/a	n/a	numerous accidents were reported across the area
1/26/1997 thru 1/27/1997	5:00 a.m.	Winter Storm	1.0 in.	X		X		SED	n/a	n/a	n/a	numerous accidents were reported across the area, especially in the morning hours of the 27th
11/13/1997 thru 11/14/1997	11:30 a.m.	Winter Storm	5.0 in.	X		X		COOP (Flora) (Clay City) SED	1	n/a	n/a	
Subtotal:									**1**	**0**	**$0**	

[1] An "X" in the freezing rain, ice, sleet and/or strong winds columns indicates the presences of that particular type of weather condition during a severe winter storm event.

[2] Observation Location information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 5
Severe Winter Storm Events Reported in Clay County
1950 – 2019
(Sheet 7 of 11)

Date(s)	Start Time	Event Type	Magnitude (Maximum)					Data Source[2]	Injuries	Fatalities	Property Damages	Description
			Snow	Freezing Rain[1]	Ice[1]	Sleet[1]	Strong Winds[1]					
12/30/1997	8:00 a.m.	Heavy Snow	4.0 in.					COOP (Louisville) (Flora) SED	n/a	n/a	n/a	numerous traffic accidents were reported resulting from slick roadways
1/1/1999 thru 1/3/1999	12:00 p.m.	Winter Storm	5.0 in.	X	X		X	COOP (Louisville) (Flora) SED	n/a	n/a	n/a	- extensive blowing snow- and ice-covered roads created treacherous driving conditions - many locations sustained temporary or extended power outages
3/11/2000	2:30 a.m.	Heavy Snow	8.0 in.					COOP (Flora) (Clay City) SED	n/a	n/a	n/a	blowing and drifting snow resulted in several weather-related traffic accidents across the area
12/13/2000	6:00 a.m.	Winter Storm	8.0 in.	X		X		COOP (Flora) (Louisville) SED	n/a	n/a	n/a	
2/25/2002 thru 2/26/2002	4:00 p.m.	Winter Storm	4.0 in.	X				COOP (Flora)	n/a	n/a	n/a	
12/24/2002 thru 12/25/2002	5:30 a.m.	Heavy Snow	9.0 in.					COOP (Flora) (Louisville) SED	n/a	n/a	n/a	numerous vehicle related accidents were reported across the area
Subtotal:									**0**	**0**	**$0**	

[1] An "X" in the freezing rain, ice, sleet and/or strong winds columns indicates the presences of that particular type of weather condition during a severe winter storm event.

[2] Observation Location information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

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Table 5
Severe Winter Storm Events Reported in Clay County
1950 – 2019
(Sheet 8 of 11)

Date(s)	Start Time	Event Type	Magnitude (Maximum)					Data Source[2]	Injuries	Fatalities	Property Damages	Description
			Snow	Freezing Rain[1]	Ice[1]	Sleet[1]	Strong Winds[1]					
2/16/2003	12:00 a.m.	Sleet	X			2.0 in.		COOP (Louisville) (Flora) SED	n/a	n/a	n/a	
1/25/2004	8:30 a.m.	Ice Storm		X		0.50 in.		COOP (Flora) (Louisville) SED	n/a	n/a	n/a	numerous reports of power outages, downed tree limbs and traffic accidents across the area
12/22/2004 thru 12/23/2004	12:30 a.m.	Winter Storm	8.5 in.				25 mph gusts	COOP (Flora) (Clay City) (Louisville) SED	n/a	n/a	n/a	- considerable blowing and drifting snow; with snow drifts in excess of 3 ft. in some areas - numerous automobile accidents occurred across the area due to snow covered and slippery roads
12/8/2005 thru 12/9/2005	n/a	Heavy Snow	5.0 in.					COOP (Flora) (Clay City)	n/a	n/a	n/a	
2/21/2008 thru 2/22/2008	12:00 p.m.	Ice Storm	X	X	0.4 in.	X		COOP (Flora) SED	n/a	n/a	n/a	
Subtotal:									**0**	**0**	**$0**	

[1] An "X" in the freezing rain, ice, sleet and/or strong winds columns indicates the presences of that particular type of weather condition during a severe winter storm event.

[2] Observation Location information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

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Table 5
Severe Winter Storm Events Reported in Clay County
1950 – 2019
(Sheet 9 of 11)

Date(s)	Start Time	Event Type	Magnitude (Maximum)					Data Source[2]	Injuries	Fatalities	Property Damages	Description
			Snow	Freezing Rain[1]	Ice[1]	Sleet[1]	Strong Winds[1]					
3/4/2008	7:00 a.m.	Ice Storm		X	0.25 in.	X		COOP (Louisville) (Flora) SED	n/a	n/a	n/a	icing caused tree and power line damage and resulted in numerous traffic accidents
12/8/2008	12:00 a.m.	Winter Storm		X				COOP (Flora) (Clay City) SED	n/a	1	n/a	icy roads created hazardous travel conditions, and a 72-year-old woman died in a car accident as a result of the icy road conditions; the accident occurred on Blue Mound Rd. about 5 miles south of Flora
1/26/2009 thru 1/28/2009	7:30 p.m.	Heavy Snow	10.0 in.	X		X		COOP (Flora) (Louisville) SED	n/a	n/a	n/a	
2/14/2010	n/a	Heavy Snow	4.5 in.					COOP (Flora)	n/a	n/a	n/a	
1/20/2011	4:30 a.m.	Heavy Snow	7.0 in.					COOP (Flora) SED	n/a	n/a	n/a	due to snow-covered and icy roadways, numerous traffic accidents were reported
Subtotal:									**0**	**1**	**$0**	

[1] An "X" in the freezing rain, ice, sleet and/or strong winds columns indicates the presences of that particular type of weather condition during a severe winter storm event.

[2] Observation Location information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

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Table 5
Severe Winter Storm Events Reported in Clay County
1950 – 2019
(Sheet 10 of 11)

Date(s)	Start Time	Event Type	Magnitude (Maximum)					Data Source[2]	Injuries	Fatalities	Property Damages	Description
			Snow	Freezing Rain[1]	Ice[1]	Sleet[1]	Strong Winds[1]					
2/1/2011 thru 2/2/2011	12:00 p.m.	Ice Storm			0.50 in.			COOP (Flora) (Louisville) SED	n/a	n/a	$800,000	*Event Description Provided Below*
This event is part of a federally-declared disaster (Declaration #1960) - the heavy glaze of ice downed numerous trees and tree branches, resulting in power outages across the County - icy road conditions led to several traffic accidents - numerous county highways and several interstates were closed - schools were closed for at least 3 days												
12/26/2012	n/a	Heavy Snow	4.5 in.					COOP (Louisville)	n/a	n/a	n/a	
12/28/2012	n/a	Heavy Snow	5.5 in.					COOP (Louisville)	n/a	n/a	n/a	
3/24/2013	n/a	Heavy Snow	4.0 in.					COOP (Flora)	n/a	n/a	n/a	
12/5/2013 thru 12/6/2013	4:00 p.m.	Winter Storm	9.5 in.	X		X		COOP (Flora) (Clay City) SED	n/a	n/a	n/a	roadways were hazardous and significant travel issues resulted in numerous accidents
1/5/2014 thru 1/6/2014	7:00 a.m.	Heavy Snow	7.0 in.					COOP (Flora) SED	n/a	n/a	n/a	- many schools, businesses, and churches were shut down across the area - significant blowing and drifting snow caused numerous road closures and traffic accidents across the County
Subtotal:									**0**	**0**	**$800,000**	

[1] An "X" in the freezing rain, ice, sleet and/or strong winds columns indicates the presences of that particular type of weather condition during a severe winter storm event.

[2] Observation Location information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 5
Severe Winter Storm Events Reported in Clay County
1950 – 2019
(Sheet 11 of 11)

Date(s)	Start Time	Event Type	Magnitude (Maximum)					Data Source[2]	Injuries	Fatalities	Property Damages	Description
			Snow	Freezing Rain[1]	Ice[1]	Sleet[1]	Strong Winds[1]					
2/4/2014	n/a	Heavy Snow	4.0 in.					COOP (Flora)	n/a	n/a	n/a	
3/2/2014	6:00 a.m.	Sleet				1.25 in.		COOP (Flora) (Clay City) SED	n/a	n/a	n/a	
2/15/2015 thru 2/16/2015	8:00 p.m.	Heavy Snow	9.0 in.					COOP (Flora) (Clay City) SED	n/a	n/a	n/a	numerous traffic accidents occurred due to snow-covered and hazardous roadways
2/28/2015 thru 3/1/2015	n/a	Heavy Snow	7.0 in.					COOP (Flora) (Clay City)	n/a	n/a	n/a	
1/19/2016	n/a	Heavy Snow	4.0 in.					COOP (Flora)	n/a	n/a	n/a	
12/16/2016 thru 12/17/2016	10:00 p.m.	Winter Storm		X	0.10 in.			COOP (Flora) (Clay City) SED	n/a	1	n/a	freezing drizzle created slick and hazardous roadways; a vehicle slid off a bridge and landed upside down in a creek bed, killing one man
1/11/2019	n/a	Heavy Snow	5.0 in.					COOP (Flora) (Clay City)	n/a	n/a	n/a	
Subtotal:									**0**	**1**	**$0**	
GRAND TOTAL:									**1**	**2**	**$800,000**	

[1] An "X" in the freezing rain, ice, sleet and/or strong winds columns indicates the presences of that particular type of weather condition during a severe winter storm event.

[2] Observation Location information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Source: NOAA, National Environmental Satellite, Data & Information Service, National Centers for Environmental Information, Cooperative Observation Forms.
NOAA, National Environmental Satellite, Data & Information Service, National Centers for Environmental Information, Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 6
Extreme Cold Events Reported in Clay County
1996 – 2019

Date(s)	Start Time	Event Type	Magnitude (Temperature °F)			Data Source[1]	Injuries	Fatalities	Property Damages	Impacts/Event Description
			Low (Min)	High (Max)	Wind Chill (Max)					
2/2/1996 thru 2/4/1996	12:00 a.m.	Extreme Cold/ Wind Chill	-13°F	18°F	n/a	COOP (Flora) SED	n/a	n/a	n/a	
1/5/1999	5:00 a.m.	Extreme Cold/ Wind Chill	-9°F	23°F	n/a	COOP (Flora) SED	n/a	n/a	n/a	
1/6/2014 thru 1/7/2014	12:00 a.m.	Extreme Cold/ Wind Chill	-14°F	21°F	-45°F	COOP (Flora) SED	n/a	n/a	n/a	
Grand Total :							**0**	**0**	**$0**	

Source: NOAA, National Environmental Satellite, Data & Information Service, National Centers for Environmental Information, Cooperative Observation Forms.
NOAA, National Environmental Satellite, Data & Information Service, National Centers for Environmental Information, Storm Events Database.

Table 7
General Flood Events Reported in Clay County
1990 - 2019
(Sheet 1 of 10)

Date(s)	Start Time	Body of Water	Location(s) Impacted	Magnitude				Injuries	Fatalities	Property Damages	Crop Damages	Event Description
				Flood Crest Little Wabash River at Clay City[1]	Impacts							
					Home[2]	Business[2]	Infra-structure[2]					
5/17/1990	n/a	Little Wabash River, area creeks and streams	countywide	24.76 feet 5/17/1990 10th highest crest on record	n/a	n/a	X	n/a	n/a	n/a	n/a	
1/7/1993	n/a	Little Wabash River, area creeks and streams	countywide	22.61 feet 1/7/1993	n/a	n/a	X	n/a	n/a	n/a	n/a	
11/17/1993	n/a	Little Wabash River, area creeks and streams	countywide	24.06 feet 11/17/1993	n/a	n/a	X	n/a	n/a	n/a	n/a	
Subtotal:								**0**	**0**	**$0**	**$0**	

[1] Flood stage at the Little Wabash River gauge location below Clay City is 18.0 feet, moderate flood stage is 22.0 feet and major flood stage is 25.0 feet. At 16.0 feet minor flooding begins to agricultural land immediately. At 18.0 water begins to flood left bank farmland. At 22.0 feet the Road 1 mile east of the gage is inundated.

[2] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 7
General Flood Events Reported in Clay County
1990 - 2019
(Sheet 2 of 10)

Date(s)	Start Time	Body of Water	Location(s) Impacted	Magnitude				Injuries	Fatalities	Property Damages	Crop Damages	Event Description
				Flood Crest Little Wabash River at Clay City[1]	Impacts							
					Home[2]	Business[2]	Infra-structure[2]					
4/13/1994	n/a	Little Wabash River, area creeks and streams	countywide	22.68 feet 4/13/1994	n/a	n/a	X	n/a	n/a	n/a	n/a	
5/19/1995	n/a	Little Wabash River, area creeks and streams	countywide	26.19 feet 5/19/1995 4th highest crest on record	n/a	n/a	X	n/a	n/a	n/a	n/a	
5/1/1996	n/a	Little Wabash River, area creeks and streams	countywide	23.06 feet 5/1/1996	n/a	n/a	X	n/a	n/a	n/a	n/a	
Subtotal:								**0**	**0**	**$0**	**$0**	

[1] Flood stage at the Little Wabash River gauge location below Clay City is 18.0 feet, moderate flood stage is 22.0 feet and major flood stage is 25.0 feet. At 16.0 feet minor flooding begins to agricultural land immediately. At 18.0 water begins to flood left bank farmland. At 22.0 feet the Road 1 mile east of the gage is inundated.

[2] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 7
General Flood Events Reported in Clay County
1990 - 2019
(Sheet 3 of 10)

Date(s)	Start Time	Body of Water	Location(s) Impacted	Magnitude				Injuries	Fatalities	Property Damages	Crop Damages	Event Description
				Flood Crest Little Wabash River at Clay City[1]	Impacts							
					Home[2]	Business[2]	Infra-structure[2]					
5/11/1996	n/a	Little Wabash River, area creeks and streams	countywide	22.75 feet 5/11/1996	n/a	n/a	X	n/a	n/a	n/a	n/a	
3/2/1997	n/a	Little Wabash River, area creeks and streams	countywide	22.10 feet 3/2/1997	n/a	n/a	X	n/a	n/a	n/a	n/a	
1/8/1998 thru 1/10/1998	6:00 p.m.	Little Wabash River, area creeks and streams	Clay City	17.30 feet 1/9/1998	n/a	n/a	n/a	n/a	n/a	n/a	n/a	persistent rainfall created rises and subsequent flooding on the Little Wabash River; only minor flooding of low-lying areas adjacent to the river
Subtotal:								**0**	**0**	**$0**	**$0**	

[1] Flood stage at the Little Wabash River gauge location below Clay City is 18.0 feet, moderate flood stage is 22.0 feet and major flood stage is 25.0 feet. At 16.0 feet minor flooding begins to agricultural land immediately. At 18.0 water begins to flood left bank farmland. At 22.0 feet the Road 1 mile east of the gage is inundated.

[2] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 7
General Flood Events Reported in Clay County
1990 - 2019
(Sheet 4 of 10)

Date(s)	Start Time	Body of Water	Location(s) Impacted	Magnitude				Injuries	Fatalities	Property Damages	Crop Damages	Event Description
				Flood Crest Little Wabash River at Clay City[1]	Impacts							
					Home[2]	Business[2]	Infra-structure[2]					
2/18/1998 thru 2/21/1998	12:00 a.m.	Little Wabash River, area creeks and streams	Clay City	18.11 feet 2/19/1998	n/a	n/a	n/a	n/a	n/a	n/a	n/a	widespread heavy rainfall of 1 to 1.5 inches fell creating flooding on the Little Wabash River; only minor flooding of low land areas adjacent to the river with no damage noted
1/24/1999	n/a	Little Wabash River, area creeks and streams	countywide	23.74 feet 1/24/1999	n/a	n/a	X	n/a	n/a	n/a	n/a	
2/9/1999	n/a	Little Wabash River, area creeks and streams	countywide	22.14 feet 2/9/1999	n/a	n/a	X	n/a	n/a	n/a	n/a	
Subtotal:								**0**	**0**	**$0**	**$0**	

[1] Flood stage at the Little Wabash River gauge location below Clay City is 18.0 feet, moderate flood stage is 22.0 feet and major flood stage is 25.0 feet. At 16.0 feet minor flooding begins to agricultural land immediately. At 18.0 water begins to flood left bank farmland. At 22.0 feet the Road 1 mile east of the gage is inundated.

[2] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 7
General Flood Events Reported in Clay County
1990 - 2019
(Sheet 5 of 10)

Date(s)	Start Time	Body of Water	Location(s) Impacted	Magnitude				Injuries	Fatalities	Property Damages	Crop Damages	Event Description
				Flood Crest Little Wabash River at Clay City[1]	Impacts							
					Home[2]	Business[2]	Infra-structure[2]					
7/7/2000	n/a	Little Wabash River, area creeks and streams	countywide	23.86 feet 7/7/2000	n/a	n/a	X	n/a	n/a	n/a	n/a	
5/12/2002 thru 5/15/2002	7:00 p.m.	Little Wabash River, area creeks and streams	countywide	24.66 feet 5/15/2002 11th highest crest on record	n/a	n/a	X	n/a	n/a	n/a	n/a	***This event is part of a federally-declared disaster (Declaration #1416)***
1/7/2005	n/a	Little Wabash River, area creeks and streams	countywide	25.45 feet 1/7/2005 7th highest crest on record	n/a	n/a	X	n/a	n/a	n/a	n/a	
1/16/2007	n/a	Little Wabash River, area creeks and streams	countywide	22.10 feet 1/16/2007	n/a	n/a	X	n/a	n/a	n/a	n/a	
Subtotal:								**0**	**0**	**$0**	**$0**	

[1] Flood stage at the Little Wabash River gauge location below Clay City is 18.0 feet, moderate flood stage is 22.0 feet and major flood stage is 25.0 feet. At 16.0 feet minor flooding begins to agricultural land immediately. At 18.0 water begins to flood left bank farmland. At 22.0 feet the Road 1 mile east of the gage is inundated.

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Table 7
General Flood Events Reported in Clay County
1990 - 2019
(Sheet 6 of 10)

Date(s)	Start Time	Body of Water	Location(s) Impacted	Magnitude				Injuries	Fatalities	Property Damages	Crop Damages	Event Description
				Flood Crest Little Wabash River at Clay City[1]	Impacts							
					Home[2]	Business[2]	Infra-structure[2]					
3/18/2008 thru 3/25/2008	2:00 p.m.	Little Wabash River, area creeks and streams	countywide	23.61 feet 3/21/2008	n/a	n/a	X	n/a	n/a	n/a	n/a	
2/8/2009 thru 2/18/2009	2:45 a.m.	Little Wabash River, area creeks and streams	countywide	22.69 feet 2/14/2009	n/a	n/a	X	n/a	n/a	n/a	n/a	numerous county roads were flooded across the County; a few city streets in both Flora and Louisville had water flowing over them
4/22/2011 thru 5/6/2011	1:00 p.m.	Little Wabash River, area creeks and streams	countywide	24.40 feet 4/29/2011	n/a	n/a	X	n/a	n/a	n/a	n/a	
Subtotal:								**0**	**0**	**$0**	**$0**	

[1] Flood stage at the Little Wabash River gauge location below Clay City is 18.0 feet, moderate flood stage is 22.0 feet and major flood stage is 25.0 feet. At 16.0 feet minor flooding begins to agricultural land immediately. At 18.0 water begins to flood left bank farmland. At 22.0 feet the Road 1 mile east of the gage is inundated.

[2] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 7
General Flood Events Reported in Clay County
1990 - 2019
(Sheet 7 of 10)

Date(s)	Start Time	Body of Water	Location(s) Impacted	Magnitude				Injuries	Fatalities	Property Damages	Crop Damages	Event Description
				Flood Crest Little Wabash River at Clay City[1]	Impacts							
					Home[2]	Business[2]	Infra-structure[2]					
4/18/2013 thru 5/1/2013	10:30 a.m.	Little Wabash River, area creeks and streams	countywide	22.76 feet 4/21/2013	n/a	n/a	X	n/a	n/a	n/a	n/a	
6/23/2013 thru 6/30/2013	11:00 a.m.	Little Wabash River, area creeks and streams	southern portion of the county	21.94 feet 6/25/2013	X	n/a	X	n/a	n/a	n/a	n/a	*Event Description Provided Below*
- numerous thunderstorms produced 3 to 6 inches of rain on already saturated ground, which resulted in flooding - several people were evacuated from their flooded homes in Xenia and Flora - in the northwest part of the County from Iola to Hord all roads were closed, including US Hwy 45 - due to the magnitude of the flash flooding most creeks and roads remained flooded through the night of June 23rd into the early morning of June 24th												
4/3/2014 thru 4/10/2014	2:45 a.m.	Little Wabash River, area creeks and streams	countywide	23.18 feet 4/5/2014	n/a	n/a	X	n/a	n/a	n/a	n/a	
Subtotal:								**0**	**0**	**$0**	**$0**	

[1] Flood stage at the Little Wabash River gauge location below Clay City is 18.0 feet, moderate flood stage is 22.0 feet and major flood stage is 25.0 feet. At 16.0 feet minor flooding begins to agricultural land immediately. At 18.0 water begins to flood left bank farmland. At 22.0 feet the Road 1 mile east of the gage is inundated.

[2] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 7
General Flood Events Reported in Clay County
1990 - 2019
(Sheet 8 of 10)

Date(s)	Start Time	Body of Water	Location(s) Impacted	Magnitude				Injuries	Fatalities	Property Damages	Crop Damages	Event Description
				Flood Crest Little Wabash River at Clay City[1]	Impacts							
					Home[2]	Business[2]	Infra-structure[2]					
6/18/2015 thru 7/7/2015	10:30 p.m.	Little Wabash River, area creeks and streams	northern portion of the county	23.41 feet 6/20/2015	n/a	n/a	X	n/a	n/a	n/a	n/a	*Event Description Provided Below*
- several periods of rainfall occurred as a result of the remnants of Tropical Storm Bill; rainfall totals ranged from 2.50 to 5.00 inches on already saturated ground, which was flooded from previous thunderstorms 8 hours earlier - rural roads were impassable, and creeks flooded out of their banks from west of Louisville through Sailor Springs to the Richland County line - parts of US Hwy 45 near Louisville were closed due to high water - the periods of rainfall persisted through the rest of June 19th and into June 20th; this caused roadways and creeks to remain flooded												
12/24/2015 thru 1/4/2016	12:00 a.m.	Little Wabash River, area creeks and streams	countywide	25.97 feet 12/30/2015 5th highest crest on record	n/a	n/a	X	n/a	n/a	n/a	n/a	
Subtotal:								**0**	**0**	**$0**	**$0**	

[1] Flood stage at the Little Wabash River gauge location below Clay City is 18.0 feet, moderate flood stage is 22.0 feet and major flood stage is 25.0 feet. At 16.0 feet minor flooding begins to agricultural land immediately. At 18.0 water begins to flood left bank farmland. At 22.0 feet the Road 1 mile east of the gage is inundated.

[2] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 7
General Flood Events Reported in Clay County
1990 - 2019
(Sheet 9 of 10)

Date(s)	Start Time	Body of Water	Location(s) Impacted	Magnitude				Injuries	Fatalities	Property Damages	Crop Damages	Event Description
				Flood Crest Little Wabash River at Clay City[1]	Impacts							
					Home[2]	Business[2]	Infra-structure[2]					
4/28/2017 thru 5/16/2017	6:15 p.m.	Little Wabash River, area creeks and streams	countywide	23.69 feet 5/2/2017	n/a	n/a	X	n/a	n/a	n/a	n/a	*Event Description Provided Below*
- rain amounts of 2.50 to 5.00 inches in about a 3 hour period during the evening hours, on already saturated ground, resulted in flooding across much of the County - numerous rural roads, highways and creeks in the County were flooded, particularly in the northern part of the county from Iola to Bible Grove, and on US Hwy 45 from Hord to Louisville - numerous rural roads were closed from Bible Grove through Ingraham to Sailor Springs and Louisville - Parts of US Hwy 45 were covered with water from Louisville to the Effingham County Line - an additional 0.50 to 0.75 inches of rain during the early morning hours of May 11th kept flood waters from receding until the early afternoon												
3/25/2018 thru 4/10/2018	5:00 a.m.	Little Wabash River, area creeks and streams	countywide	22.88 feet 3/30/2018	n/a	n/a	X	n/a	n/a	n/a	n/a	
Subtotal:								**0**	**0**	**$0**	**$0**	

[1] Flood stage at the Little Wabash River gauge location below Clay City is 18.0 feet, moderate flood stage is 22.0 feet and major flood stage is 25.0 feet. At 16.0 feet minor flooding begins to agricultural land immediately. At 18.0 water begins to flood left bank farmland. At 22.0 feet the Road 1 mile east of the gage is inundated.

[2] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 7
General Flood Events Reported in Clay County
1990 - 2019
(Sheet 10 of 10)

Date(s)	Start Time	Body of Water	Location(s) Impacted	Magnitude				Injuries	Fatalities	Property Damages	Crop Damages	Event Description
				Flood Crest Little Wabash River at Clay City[1]	Impacts							
					Home[2]	Business[2]	Infra-structure[2]					
6/12/2018 thru 6/19/2018	11:00 a.m.	Little Wabash River, area creeks and streams	southern portion of the county	20.72 feet 6/14/2018	n/a	n/a	X	n/a	n/a	n/a	n/a	*Event Description Provided Below*
- heavy rainfall rates of 1.00 inch per hour for 3 hours before daybreak resulted in flooding in southern portions of the County - many rural roads were impassable - streets were flooded in Louisville and Flora - the rain began to taper off by the late morning of June 12th; however, flooding did not subside until the afternoon hours												
9/8/2018 thru 9/15/2018	11:30 a.m.	Little Wabash River, area creeks and streams	countywide	22.29 feet 9/10/2018	n/a	n/a	X	n/a	n/a	n/a	n/a	
2/6/2019 thru 2/15/2019	8:45 p.m.	Little Wabash River, area creeks and streams	countywide	22.06 feet 2/8/2019	n/a	n/a	X	n/a	n/a	n/a	n/a	
Subtotal:								**0**	**0**	**$0**	**$0**	
GRAND TOTAL:								**0**	**0**	**$0**	**$0**	

[1] Flood stage at the Little Wabash River gauge location below Clay City is 18.0 feet, moderate flood stage is 22.0 feet and major flood stage is 25.0 feet. At 16.0 feet minor flooding begins to agricultural land immediately. At 18.0 water begins to flood left bank farmland. At 22.0 feet the Road 1 mile east of the gage is inundated.

[2] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Centers for Environmental Information, Storm Data.
NOAA, National Environmental Satellite, Data & Information Service, National Centers for Environmental Information, Storm Events Database.
NOAA, National Weather Service, River Observations, North Central River Forecast Center, Illinois River at Little Wabash River below Clay City
United States Army Corps of Engineers, RiverGages.com, Data Mining.

Table 8
Flash Flood Events Reported in Clay County
1999 - 2019
(Sheet 1 of 12)

Date(s)	Start Time	Location(s) Impacted	Magnitude (Impacts)			Injuries	Fatalities	Property Damages	Crop Damages	Magnitude/Description
			Home[1]	Business[1]	Infra-structure[1]					
7/1/1999	3:30 p.m.	southern portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	numerous county roads were reported underwater across southern portions of the County
7/5/2000	12:30 a.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	between 5 - 6 inches of rain fell across most of the County; numerous roads were reported closed by flood waters, including IL Rte. 45, north of Hord
6/5/2001	5:20 p.m.	Flora Hord	n/a	n/a	X	n/a	n/a	n/a	n/a	street flooding was reported in Flora, as well as water over many rural roads near Hord
4/12/2002	4:02 p.m.	Flora	n/a	n/a	X	n/a	n/a	n/a	n/a	3 to 6 inches of water was reported over numerous roads in the City
4/21/2002	3:00 p.m.	Flora	n/a	n/a	X	n/a	n/a	n/a	n/a	***This event is part of a federally-declared disaster (Declaration #1416)*** due to heavy rains, several roads in town were blocked off by water flowing over them
5/1/2002	3:00 p.m.	Flora	n/a	n/a	X	n/a	n/a	n/a	n/a	***This event is part of a federally-declared disaster (Declaration #1416)*** several streets in the City were briefly flooded with 6 to 18 inches of water running over t hem
5/6/2002	2:00 p.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	***This event is part of a federally-declared disaster (Declaration #1416)*** the intersection of County Rd. 700N & IL Rte. 45 was flooded; several vehicles drove into the area and stalled; no one had to be rescued as they were able to get out of the water on their own, though the cars had to be towed
Subtotal:						**0**	**0**	**$0**	**$0**	

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

[1] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 8
Flash Flood Events Reported in Clay County
1999 - 2019
(Sheet 2 of 12)

Date(s)	Start Time	Location(s) Impacted	Magnitude (Impacts)			Injuries	Fatalities	Property Damages	Crop Damages	Magnitude/Description
			Home[1]	Business[1]	Infra-structure[1]					
5/6/2003 thru 5/7/2003	11:45 p.m.	Xenia[^]	n/a	n/a	X	n/a	n/a	n/a	n/a	very heavy rain fell on already saturated ground; US Hwy 50 was flooded for a time
8/2/2003 thru 8/3/2003	9:55 p.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	numerous county roads were briefly flooded due to heavy rains
5/26/2004 thru 5/27/2004	7:43 p.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	heavy rain caused numerous roads in the County to become flooded, including US Hwy 50 near Xenia
7/11/2004	8:00 p.m.	Flora	n/a	n/a	X	n/a	n/a	n/a	n/a	several roads were briefly flooded due to heavy rains in a short amount of time
1/13/2005	4:00 a.m.	Clay City	n/a	n/a	X	n/a	n/a	n/a	n/a	COOP observer reported water flowing across Wilcox Rd.
8/9/2006	4:35 a.m.	countywide	X	X	X	n/a	n/a	n/a	n/a	- rainfall amounts in excess of 7 inches were reported - the worst flooding was reported in Louisville and Flora where numerous roads, businesses and homes were flooded - many roads had to be closed due to high water, and several cars on these roads stalled
2/5/2008 thru 2/6/2008	6:30 p.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	several roads were flooded across the County; one car stalled in the high water in Flora
Subtotal:						**0**	**0**	**$0**	**$0**	

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

[1] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 8
Flash Flood Events Reported in Clay County
1999 - 2019
(Sheet 3 of 12)

Date(s)	Start Time	Location(s) Impacted	Magnitude (Impacts)			Injuries	Fatalities	Property Damages	Crop Damages	Magnitude/Description
			Home[1]	Business[1]	Infra-structure[1]					
5/13/2009	5:30 p.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	heavy rain of 2.50 to 3.50 inches within 2 hours produced widespread flash flooding in much of the County; all of the roads in the impacted area were flooded and several were closed to traffic due to high water
5/14/2009	1:30 a.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	heavy rain of 2.50 to 4.00 inches within 2 - 3 hours produced significant flash flooding of most roads across the County; many rural roads were closed to traffic due to high water
7/16/2009 thru 7/17/2009	11:00 p.m.	southern portion of the county	n/a	n/a	X	n/a	n/a	$50,000	n/a	- nearly 2.50 inches of rain in one hour created flash flooding - Popeberry Lane near Fairfield Rd., 1.5 miles south of Xenia, was washed out due to the flooding - several rural roads near Flora and Clay City had water flowing across them
6/10/2011	3:15 p.m.	northwest portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	thunderstorms with intense rainfall produced 3.00 to 4.00 inches of rain in one hour during the late afternoon causing creeks to rapidly spread out of their banks; numerous rural roads were flooded
6/18/2011	2:30 a.m.	northern portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	thunderstorms produced 5.00 to 6.00 of rain during the early morning hours of June 18th; US Hwy 45 was inundated, and almost all rural roads were impassable due to the high water
Subtotal:						**0**	**0**	**$50,000**	**$0**	

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

[1] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 8
Flash Flood Events Reported in Clay County
1999 - 2019
(Sheet 4 of 12)

Date(s)	Start Time	Location(s) Impacted	Magnitude (Impacts)			Injuries	Fatalities	Property Damages	Crop Damages	Magnitude/Description
			Home[1]	Business[1]	Infra-structure[1]					
6/25/2011 thru 6/26/2011	11:15 p.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	- thunderstorms during the late evening hours produced 2.50 to 5.00 of rain on extremely saturated ground and in locations which experienced flash flooding the previous week - rapid flash flooding of creeks and roads across most of the County - Streets in Flora, Clay City and Louisville were flooded and US Hwy 45 and 50 had standing water in spots; nearly all rural roads were flooded and closed due to flooding
7/12/2011	3:30 p.m.	southwest portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- heavy rain of 3.00 to 4.00 inches in a 2-hour period during the late afternoon produced flash flooding - many rural roads were inundated with water flowing over them, and US Hwy 50 was impassable in spots
5/31/2013 thru 6/1/2013	11:50 p.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	- thunderstorms produced 3.00 to 4.00 inches of rain on already saturated ground from late evening through the night across the County - heavy rains rapidly produced flash flooding, which made many rural roads impassable and flooded numerous streets in the City of Flora - flash flooding continued through the night and into June 1st
Subtotal:						**0**	**0**	**$0**	**$0**	

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

[1] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 8
Flash Flood Events Reported in Clay County
1999 - 2019
(Sheet 5 of 12)

Date(s)	Start Time	Location(s) Impacted	Magnitude (Impacts)			Injuries	Fatalities	Property Damages	Crop Damages	Magnitude/Description
			Home[1]	Business[1]	Infra-structure[1]					
6/22/2013	5:00 p.m.	northwestern portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- thunderstorms produced 2 to 4 inches of rain in a 2-hour period during the late afternoon - many rural roads and creeks, particularly from Bible Grove to Ingraham to Louisville, were flooded
6/23/2013	10:45 a.m.	countywide	X	X	X	n/a	n/a	$9,000,000	n/a	- numerous thunderstorms produced 3 to 6 inches of rain on already saturated ground - major flash flooding was reported in the town of Xenia and the City of Flora, where several people were evacuated from their flooded homes - several water rescues were made for stranded motorists in and near Flora - in the northwest part of the county from Iola to Hord all roads were closed, including US Hwy 45
7/1/2013	6:00 a.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	- periods of heavy rain on already saturated ground produced flash flooding; observers reported 3.00 to 5.00 inches of rain during the morning - flash flooding of many rural roads and low water crossings - the heaviest rainfall was reported between the village of Sailor Springs and the Richland County line
Subtotal:						**0**	**0**	**$9,000,000**	**$0**	

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

[1] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 8
Flash Flood Events Reported in Clay County
1999 - 2019
(Sheet 6 of 12)

Date(s)	Start Time	Location(s) Impacted	Magnitude (Impacts)			Injuries	Fatalities	Property Damages	Crop Damages	Magnitude/Description
			Home[1]	Business[1]	Infra-structure[1]					
8/20/2014 thru 8/21/2014	11:15 p.m.	southwest portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- a slow-moving thunderstorm produced 4.00 to 6.00 inches of rain in a 2-hour period during the late evening of August 20th - multiple streets in Flora and Xenia were flooded - nearly all rural roads were impassable; parts of Old Hwy 50 west of Flora were closed for a period of time around midnight
9/2/2014	12:00 a.m.	northern portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- heavy downpours, which produced 2 to 3 inches of rain per hour between 11:00 p.m. and midnight, resulted in flash flooding - numerous rural roads were impassable, streets were flooded in the town of Hord, and parts of US Hwy 45 from the Effingham County line to about Louisville were closed - the flooding subsided within 3 hours
6/8/2015	1:45 a.m.	northern portion of the county	n/a	n/a	X	n/a	n/a	$20,000	n/a	- thunderstorms produced 3.00 to 5.00 inches of rainfall, which resulted in flash flooding - many rural roads were impassable from Iola to Louisville - US Hwy 45 near Louisville was also flooded and was closed after floodwaters swept a car off the highway; the driver was rescued without injury
Subtotal:						**0**	**0**	**$20,000**	**$0**	

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

[1] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 8
Flash Flood Events Reported in Clay County
1999 - 2019
(Sheet 7 of 12)

Date(s)	Start Time	Location(s) Impacted	Magnitude (Impacts)			Injuries	Fatalities	Property Damages	Crop Damages	Magnitude/Description
			Home[1]	Business[1]	Infra-structure[1]					
6/18/2015	8:15 p.m.	central portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- a thunderstorm produced heavy rain amounts of 1.50 inches in 30 minutes and combined with already saturated ground to produce rapid flash flooding of several roadways - Sheriff's Department officials reported more than 6 inches of flowing water across parts of US Hwy 45 south of Louisville
6/19/2015	6:30 a.m.	northern portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- Several periods of rainfall occurred as a result of the remnants of Tropical Storm Bill - rainfall totals ranged from 2.50 to 5.00 inches on already saturated ground which was flooded from pervious thunderstorms 8 hours earlier - rural roads were impassable, and creeks flooded out of their banks from west of Louisville through Sailor Springs to the Richland County line - parts of US Hwy 45 near Louisville were closed due to high water
6/21/2015 thru 6/22/2015	11:00 p.m.	Flora	n/a	n/a	X	n/a	n/a	n/a	n/a	- slow moving thunderstorms produced up to 2.50 inches of rain in less than 1 hour in and near the City of Flora - flash flooding rapidly developed on City streets, parts of US Hwy 50, and rural roads west of the City
Subtotal:						**0**	**0**	**$0**	**$0**	

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

[1] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 8
Flash Flood Events Reported in Clay County
1999 - 2019
(Sheet 8 of 12)

Date(s)	Start Time	Location(s) Impacted	Magnitude (Impacts)			Injuries	Fatalities	Property Damages	Crop Damages	Magnitude/Description
			Home[1]	Business[1]	Infra-structure[1]					
7/1/2015 thru 7/2/2015	9:00 p.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	*Event Description Provided Below*
- slow moving thunderstorms produced 2.00 to 3.00 inches of rain in 90 minutes during the evening of July 1st - the ground was already saturated from periods of heavy rainfall in late June, so flash flooding developed quickly							- most rural roads from Flora to the Wayne County line and northwest of Iola to the Fayette County line were impassable through the late evening - part of US Hwy 45 two miles south southeast of Flora was also under water			
7/3/2015	4:00 p.m.	southwest portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- late afternoon thunderstorms produced heavy rain which resulted in flash flooding on ground already saturated from heavy rain 2 days prior - water was reported over rural roads form Xenia to Flora - US Hwy 50 was also impassable in spots from Xenia to Kenner - the flooding rapidly dissipated by early evening
12/27/2015 thru 12/29/2015	n/a	countywide	n/a	n/a	n/a	n/a	n/a	n/a	n/a	heavy rain of 4.88 inches fell on already saturated soils producing widespread flash flooding and fast rises on creeks and streams
Subtotal:						**0**	**0**	**$0**	**$0**	

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

[1] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 8
Flash Flood Events Reported in Clay County
1999 - 2019
(Sheet 9 of 12)

Date(s)	Start Time	Location(s) Impacted	Magnitude (Impacts)			Injuries	Fatalities	Property Damages	Crop Damages	Magnitude/Description
			Home[1]	Business[1]	Infra-structure[1]					
8/13/2016	1:15 p.m.	southeast portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- heavy rain of 2.50 to 3.50 inches in 2 hours during the early afternoon resulted in flash flooding - rural roads southeast of Flora and south of Clay City were flooded - parts of US Hwy 50 east of Clay City were also impassable - several creeks became bank-full in a few hours, including Elm Creek and numerous agricultural ditches
4/29/2017	7:00 p.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	- rain amounts of 2.50 to 5.00 inches in about a 3-hour period during the evening hours, on already saturated ground, resulted in flash flooding - several streets in Louisville and Flora were closed due to high water - numerous rural roads, highways and creeks in the county were flooded, particularly in the northern part of the County from Iola to Bible Grove and on US Hwy 45 from Hord to Louisville
Subtotal:						**0**	**0**	**$0**	**$0**	

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

[1] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 8
Flash Flood Events Reported in Clay County
1999 - 2019
(Sheet 10 of 12)

Date(s)	Start Time	Location(s) Impacted	Magnitude (Impacts)			Injuries	Fatalities	Property Damages	Crop Damages	Magnitude/Description
			Home[1]	Business[1]	Infra-structure[1]					
5/4/2017 thru 5/5/2017	9:15 a.m.	countywide	n/a	n/a	X	n/a	n/a	n/a	n/a	- heavy rainfall of 1.00 to 2.00 inches during the early morning hours of May 4th, on already saturated ground, resulted in flash flooding - officials reported that most rural roads were impassable, streets in Flora were flooded and numerous creeks rapidly flooded
5/10/2017 thru 5/11/2017	10:30 p.m.	northern portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- the 3rd heavy rain event to occur in less than 2 weeks resulted in rapid flash flooding - rainfall amounts ranged from 1.50 to 2.00 inches during the late evening of May 10th in areas where ditches were already full of water and soils were saturated - numerous rural roads were closed from Bible Grove through Ingraham to Sailor Springs and Louisville - parts of US Hwy 45 were covered with water from Louisville to the Effingham County line
6/11/2018 thru 6/12/2018	9:30 p.m.	southeast portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- heavy rainfall amounts of 3.00 to 5.00 inches during the late evening of June 11th resulted in flash flooding - numerous county roads were impassable southeast of Clay City - Wilcox Bridge Ln. was closed due to the flooding - flooding subsided shortly after midnight
Subtotal:						**0**	**0**	**$0**	**$0**	

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

[1] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available.

Table 8
Flash Flood Events Reported in Clay County
1999 - 2019
(Sheet 11 of 12)

Date(s)	Start Time	Location(s) Impacted	Magnitude (Impacts)			Injuries	Fatalities	Property Damages	Crop Damages	Magnitude/Description
			Home[1]	Business[1]	Infra-structure[1]					
6/12/2018	6:30 a.m.	southern portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- heavy rainfall rates of 1.00 inch per hour for 3 hours before daybreak resulted in flash flooding and renewed flash flooding in areas southeast of Clay City - many rural roads were impassable, and streets were flooded in Louisville and Flora
9/7/2018 thru 9/8/2018	2:00 p.m.	eastern portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- several bands of rain associated with the remnants of Tropical Strom Gordon; the ground was saturated with nearly 4.50 to 7.50 inches of rain when a particularly heavy band of rain moved into the County - an additional 2.00 inches of rain in less than 3 hours produced flash flooding in the early morning hours - many county roads were covered with water and streets in Clay City were flooded
Subtotal:						**0**	**0**	**$0**	**$0**	

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

[1] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available

Table 8
Flash Flood Events Reported in Clay County
1999 - 2019
(Sheet 12 of 12)

Date(s)	Start Time	Location(s) Impacted	Magnitude (Impacts)			Injuries	Fatalities	Property Damages	Crop Damages	Magnitude/Description
			Home[1]	Business[1]	Infra-structure[1]					
6/5/2019	5:30 p.m.	southwest portion of the county	n/a	n/a	X	n/a	n/a	n/a	n/a	- several thunderstorms with heavy rainfall resulted in flash flooding across the southwest portion of the County during the evening of June 5th - rainfall amounts of 1 to 2 inches in one hour on saturated ground led to the flash flooding - parts of U.S. Hwy 50, as well as roads near the town of Xenia, were impassable
7/3/2019	4:00 p.m.	countywide	n/a	n/a	n/a	n/a	n/a	n/a	n/a	numerous roads were closed due to flash flooding
Subtotal:						**0**	**0**	**$0**	**$0**	
GRAND TOTAL:						**0**	**0**	**$9,070,000**	**$0**	

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

[1] An "X" in the columns of Home, Business and Infrastructure indicates impacts occurred to those structure/infrastructure types during a general flood event. A detailed description of the type and magnitude of the impacts are included in the Event Description column if available

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Centers for Environmental Information, Storm Events Database.

Table 9
Excessive Heat Events Reported in Clay County
1994 - 2019
(Sheet 1 of 7)

Date(s)	Start Time	Magnitude (Temperature °F)			Data Source[1]	Injuries	Fatalities	Property Damages	Crop Damages	Impacts/Event Description
		Day (Max)	Night (Min)	Heat Index (Max)						
6/14/1994 thru 6/23/1994	12:00 a.m.	99°F	67°F	n/a	COOP (Flora) SED	n/a	n/a	n/a	n/a	numerous people were treated in area hospitals for heat related illnesses
7/11/1995 thru 7/17/1995	12:00 p.m.	99°F	65°F	n/a	COOP (Flora) SED	n/a	n/a	n/a	n/a	
7/27/1995 thru 8/4/1995	12:00 p.m.	95°F	66°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	several people were treated in area hospitals for heat related illnesses
8/8/1995 thru 8/19/1995	12:00 p.m.	98°F	68°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/2/1997	12:00 p.m.	93°F	75°F	n/a	COOP (Flora) SDP	n/a	n/a	n/a	n/a	
7/26/1997 thru 7/27/1997	9:00 a.m.	98°F	75°F	115°F	COOP (Flora) SED	n/a	n/a	n/a	n/a	- there were numerous reports of heat related injuries in most area hospitals - there were numerous reports of roads buckling due to the high temperatures
Subtotal:						**0**	**0**	**$0**	**$0**	

[1] Information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 9
Excessive Heat Events Reported in Clay County
1994 - 2019
(Sheet 2 of 7)

Date(s)	Start Time	Magnitude (Temperature °F)			Data Source[1]	Injuries	Fatalities	Property Damages	Crop Damages	Impacts/Event Description
		Day (Max)	Night (Min)	Heat Index (Max)						
6/26/1998 thru 6/28/1998	3:00 p.m.	95°F	73°F	110°F	COOP (Flora) SED	n/a	n/a	n/a	n/a	- several heat related illnesses were reported in area hospitals due to the heat - several highways in the area had sections of roadway buckle due to the excessive heat
7/20/1999 thru 7/26/1999	10:00 a.m.	96°F	68°F	110°F	COOP (Flora) SED	n/a	n/a	n/a	n/a	
7/28/1999 thru 7/31/1999	10:00 a.m.	99°F	74°F	110°F	COOP (Flora) SED	n/a	n/a	n/a	n/a	
7/7/2001	11:00 a.m.	94°F	65°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/29/2001 thru 8/3/2001	11:00 a.m.	95°F	69°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
8/8/2001 thru 8/10/2001	12:00 a.m.	93°F	70°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
6/30/2002 thru 7/9/2002	11:00 a.m.	94°F	69°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	-
Subtotal:						**0**	**0**	**$0**	**$0**	

[1] Information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 9
Excessive Heat Events Reported in Clay County
1994 - 2019
(Sheet 3 of 7)

Date(s)	Start Time	Magnitude (Temperature °F)			Data Source[1]	Injuries	Fatalities	Property Damages	Crop Damages	Impacts/Event Description
		Day (Max)	Night (Min)	Heat Index (Max)						
7/20/2002 thru 7/23/2002	11:00 a.m.	97°F	72°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/27/2002 thru 8/6/2002	11:00 a.m.	99°F	68°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
8/14/2003 thru 8/22/2003	12:00 p.m.	98°F	56°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
8/25/2003 thru 8/28/2003	12:00 p.m.	98°F	62°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/21/2004 thru 7/22/2004	12:00 p.m.	94°F	72°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/22/2005 thru 7/25/2005	12:00 p.m.	98°F	67°F	115°F	COOP (Flora) SED	n/a	n/a	n/a	n/a	
7/30/2006 thru 8/2/2006	11:00 a.m.	98°F	62°F	110°F	COOP (Flora) SED	n/a	n/a	n/a	n/a	
Subtotal:						**0**	**0**	**$0**	**$0**	

[1] Information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 9
Excessive Heat Events Reported in Clay County
1994 - 2019
(Sheet 4 of 7)

Date(s)	Start Time	Magnitude (Temperature °F)			Data Source[1]	Injuries	Fatalities	Property Damages	Crop Damages	Impacts/Event Description
		Day (Max)	Night (Min)	Heat Index (Max)						
8/7/2007 thru 8/10/2007	12:00 p.m.	98°F	70°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
8/21/2007 thru 8/24/2007	12:00 p.m.	98°F	72°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
6/19/2009 thru 6/27/2009	11:00 a.m.	93°F	68°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/15/2010 thru 7/18/2010	12:00 p.m.	96°F	71°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/22/2010 thru 7/25/2010	12:00 p.m.	96°F	71°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
8/3/2010 thru 8/4/2010	12:00 p.m.	101°F	72°F	105°F	COOP (Flora) SED	n/a	n/a	n/a	n/a	
8/9/2010 thru 8/14/2010	12:00 p.m.	101°F	70°F	105°F	COOP (Flora) SED	n/a	n/a	n/a	n/a	
Subtotal:						**0**	**0**	**$0**	**$0**	

[1] Information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 9
Excessive Heat Events Reported in Clay County
1994 - 2019
(Sheet 5 of 7)

Date(s)	Start Time	Magnitude (Temperature °F)			Data Source[1]	Injuries	Fatalities	Property Damages	Crop Damages	Impacts/Event Description
		Day (Max)	Night (Min)	Heat Index (Max)						
7/2/2011 thru 7/4/2011	12:00 p.m.	95°F	67°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/11/2011 thru 7/13/2011	12:00 p.m.	98°F	70°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/17/2011 thru 8/3/2011	12:00 p.m.	100°F	69°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
8/6/2011 thru 8/7/2011	12:00 p.m.	93°F	72°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
9/1/2011 thru 9/4/2011	12:00 p.m.	101°F	65°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
6/29/2012 thru 7/7/2012	1:45 p.m.	107°F	69°F	110°F	COOP (Flora) SED	n/a	n/a	n/a	n/a	
7/16/2012 thru 7/19/2012	12:00 p.m.	101°F	73°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
Subtotal:						**0**	**0**	**$0**	**$0**	

[1] Information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 9
Excessive Heat Events Reported in Clay County
1994 - 2019
(Sheet 6 of 7)

Date(s)	Start Time	Magnitude (Temperature °F)			Data Source[1]	Injuries	Fatalities	Property Damages	Crop Damages	Impacts/Event Description
		Day (Max)	Night (Min)	Heat Index (Max)						
7/22/2012 thru 7/28/2012	12:00 p.m.	106°F	65°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
8/30/2013 thru 9/1/2013	11:00 a.m.	99°F	68°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
8/22/2014 thru 8/30/2014	12:00 p.m.	94°F	67°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/12/2015 thru 7/14/2015	11:00 a.m.	96°F	70°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/18/2015 thru 7/19/2015	11:00 a.m.	96°F	74°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/27/2015 thru 7/29/2015	11:00 a.m.	96°F	72°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/18/2016 thru 7/25/2016	11:00 a.m.	95°F	70°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
Subtotal:						**0**	**0**	**$0**	**$0**	

[1] Information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Table 9
Excessive Heat Events Reported in Clay County
1994 - 2019
(Sheet 6 of 6)

Date(s)	Start Time	Magnitude (Temperature °F)			Data Source[1]	Injuries	Fatalities	Property Damages	Crop Damages	Impacts/Event Description
		Day (Max)	Night (Min)	Heat Index (Max)						
7/19/2017 thru 7/23/2017	12:00 p.m.	99°F	67°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
6/28/2018 thru 6/30/2018	3:00 p.m.	93°F	68°F	n/a	COOP (Flora)	n/a	n/a	n/a	n/a	
7/18/2019	12:00 p.m.	94°F	72°F	105°F	COOP (Flora) SED	n/a	1	n/a	n/a	an 81-year old man died of heatstroke while doing outdoor yard work in Flora
Subtotal:						**0**	**1**	**$0**	**$0**	
GRAND TOTAL:						**0**	**1**	**$0**	**$0**	

[1] Information obtained from National Weather Service's (NWS's) COOP Observation Station records as well as other officially-designated sources identified in NOAA's Storm Events Database.

Acronyms:
COOP NWS COOP Observation Station Records SED NOAA's Storm Events Database

Sources: NOAA, National Environmental Satellite, Data & Information Service, National Centers for Environmental Information, Cooperative Observation Forms.
NOAA, National Environmental Satellite, Data & Information Service, National Centers for Environmental Information, Storm Events Database.

Table 10
Tornadoes Reported in Clay County
1950 - 2019
(Sheet 1 of 4)

Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
12/18/1957	5:25 p.m.	Flora[↖] Clay City	F3	7.7	200	n/a	n/a	$250,000	n/a	*Touchdown/Liftoff - Two Counties* tornado touched down near Orchardville in Wayne County and traveled northeast lifting off near Clay City in Clay County - total length: 19.6 miles
5/6/1960	8:30 a.m.	Flora[↖] Flora	F1	1.0	100	n/a	n/a	$25,000	n/a	a hangar was damaged at the Flora Municipal Airport
3/6/1961	4:00 a.m.	Flora Clay City	F1	10.8	10	n/a	n/a	$25,000	n/a	*Event Description Provided Below*
Touchdown/Liftoff - Two Counties tornado touched in Flora and traveled east-northeast through Clay city into Richland County before lifting off east of Olney - total length: 24.6 miles						*Flora* an oil rig was tipped over				
6/8/1974	3:50 p.m.	Flora	F0	0.1	10	n/a	n/a	n/a	n/a	
6/2/1990	4:54 p.m.	Flora[↖] Camp Travis[↖] Clay City[↖]	F4	5.5	300	n/a	n/a	$250,000	n/a	*Event Description Provided Below*
Touchdown/Liftoff – Multiple Counties tornado touched near Rinard in Wayne Count and traveled northeast across the southeastern corner of Clay County before lifting in Olney in Richland County - total length: 23.0 miles						*Camp Travis Area* 2 mobile homes were thrown 200 feet and disintegrated; trees were leveled				
4/19/1996	7:10 p.m.	Xenia[↖]	F0	2.0	50	n/a	n/a	n/a	n/a	damage was limited to some downed trees on the north end of Greendale Lake
Subtotal:						**8**	**0**	**$550,000**	**$0**	

[1] The length provided is only for the portion of the tornado that occurred in Clay County.

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

Table 10
Tornadoes Reported in Clay County
1950 - 2019
(Sheet 2 of 4)

Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
4/15/1998	7:45 p.m.	Flora[^] Flora Clay City[^]	F2	9.5	150	8	n/a	$2,100,000	n/a	*Event Description Provided Below*
Flora Area - a set of crossing signals along a set of railroad tracks was destroyed *Flora* - 60 to 70 train cars of a moving CSX freight train were blown off the tracks; no injuries were reported with the train crew or anyone nearby - staying south of the railroad tracks, most of the structural damage to frame houses was relatively minor with roof/siding damage the most common; a few homes totally lost roofs, garages/storage sheds were destroyed - one unanchored home was destroyed and landed about 100 ft. from its foundation; 3 occupants sustained minor injuries - several vehicles in the area were damaged from falling trees and debris - the tornado briefly lifted and came down again on the east side of the City where it damaged or destroyed 40 to 50 condominiums; roof structures did not survive, with the rafters only consisting of 2x4s - light damage to an industrial park with power poles downed and 10 businesses sustaining damage *Clay City Area* - a mobile home was overturned before it lifted off - light damage to trees										
4/15/1998	8:00 p.m.	Clay City[^] Sailor Springs[^]	F2	6.5	150	n/a	n/a	$100,000	n/a	*Event Description Provided Below*
Touchdown/Liftoff - Two Counties tornado touched down between Sailor Springs and Clay City and traveled northeast into Richland County before lifting off south of Dundas - total length: 16.0 miles a mobile home was destroyed and spotty damage to trees occurred before travelling into Richland County										
6/14/1998	7:31 p.m.	Flora[^]	F0	0.1	10	n/a	n/a	n/a	n/a	
Subtotal:						**8**	**0**	**$2,200,000**	**$0**	

[1] The length provided is only for the portion of the tornado that occurred in Clay County.

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

Table 10
Tornadoes Reported in Clay County
1950- 2019
(Sheet 3 of 4)

Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
4/27/2002	11:05 p.m.	Flora[A]	F1	5.0	200	5	n/a	n/a	n/a	*Event Description Provided Below*
This event is part of a federally-declared disaster (Declaration #1416) *Intersection of County Rd. 1000E & 200N* - an unattached garage was turned on its foundation - a mobile home was destroyed; the 3 occupants sustained minor injuries; debris from the mobile home was blown up to a mile away - it damaged 3 additional homes and a mobile home - numerous trees were blown down and a propane tank was thrown a quarter of a mile *Intersection of County Rd. 1100E & 200N* - a car was rolled 3 times and thrown into a ditch; 2 occupants in the car had minor injuries - an outbuilding was destroyed *County Rd. 1500 E, just north of 200N* - several powerlines and trees were blown over causing minor damage to a house and a car										
5/8/2003	4:15 p.m.	Oskaloosa[A]	F0	0.1	10	n/a	n/a	n/a	n/a	
5/30/2004	6:13 p.m.	Flora	F0	0.2	50	n/a	n/a	n/a	n/a	a few buildings were damaged on the south side of the City, and trees and power lines were blown down
5/30/2004	6:19 p.m.	Clay City	F0	0.2	50	n/a	n/a	n/a	n/a	a few buildings were damaged on the south side of the Village, and trees and power lines were blown down
3/8/2009	12:03 p.m.	Camp Travis[A]	EF0	0.91	75	n/a	n/a	$20,000	n/a	*Event Description Provided Below*
Touchdown/Liftoff - Two Counties tornado touched down in Wayne County and traveled northeast into extreme southeast Clay County before lifting off - total length: 5.64 miles one home experienced minor damage, and numerous trees were blown down										
Subtotal:						**5**	**0**	**$20,000**	**$0**	

[1] The length provided is only for the portion of the tornado that occurred in Clay County.

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

Table 10
Tornadoes Reported in Clay County
1950 - 2019
(Sheet 4 of 4)

Date(s)	Start Time	Location(s)	Magnitude (Fujita Scale)	Length[1] (Miles)	Width (Yards)	Injuries	Deaths	Property Damage	Crop Damage	Description
5/25/2011	6:18 p.m.	Clay City	EF1	1.00	75	n/a	n/a	$510,000	n/a	structural damage along the path of the tornado included a barn and several garages, and 15 homes sustained minor to moderate roof damage; 1 concrete block storage building collapsed; numerous trees were also damaged
5/23/2019	7:15 a.m.	Xenia[^]	EF0	0.73	20	n/a	n/a	n/a	n/a	briefly touched down in an open field about 3.3 miles west-southwest of the Village
Subtotal:						**0**	**0**	**$510,000**	**$0**	
GRAND TOTAL:						**13**	**0**	**$3,280,000**	**$0**	

[1] The length provided is only for the portion of the tornado that occurred in Clay County.

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

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

Table 11
Drought Events Reported in Clay County
1980 – 2019
(Sheet 1 of 2)

Year	Date Range	Magnitude (Drought Intensity Category)					Percent Crop Yield Reduction from Previous Year		Designated USDA Primary Natural Disaster Area	Crop Damages	Impacts/Event Description
		D0	D1	D2	D3	D4	Corn	Soybeans			
1983	n/a						82.5%	58.1%	n/a	n/a	All 102 counties in Illinois were proclaimed state disaster areas because of high temperatures and insufficient precipitation beginning in mid-June
1988	June 1988 thru September 1989						50.0%	29.3%	n/a	n/a	Approximately half of all Illinois counties were impacted by drought conditions
2005	May 2005 thru August 2005	X	X				24.7%	7.0%	Yes	n/a	93 Illinois counties were designated as agricultural disaster areas due to drought
Subtotal:										$0	

[1] An "X" in a Drought Intensity Category column indicates that level of drought was reached by at least a portion of the County during the event.

Acronyms:

US Drought Monitor – Drought Intensity Categories			
D0	abnormally dry	D3	extreme drought
D1	moderate drought	D4	exceptional drought
D2	severe drought		

Table 11
Drought Events Reported in Clay County
1980 – 2019
(Sheet 2 of 2)

Year	Date Range	Magnitude (Drought Intensity Category)					Percent Crop Yield Reduction from Previous Year		Designated USDA Primary Natural Disaster Area	Crop Damages	Impacts/Event Description
		D0	D1	D2	D3	D4	Corn	Soybeans			
2007	June 2007 thru October 2007	X	X	X			5.4%	25.6%	No	n/a	
2011	August 2011 thru October 2011	X	X				16.7%	27.8%	Yes	n/a	44 Illinois counties were designated as agricultural disaster areas due to drought
2012	May 2012 thru January 2013	X	X	X	X		---	29.2%	Yes	$32,200,000	66 counties in Illinois were designated as primary natural disaster areas due to damage and losses caused by drought and extreme heat; a ban on open burning was in place
Subtotal:										**$32,200,000**	
GRAND TOTAL:										**$32,200,000**	

[1] An "X" in a Drought Intensity Category column indicates that level of drought was reached by at least a portion of the County during the event.

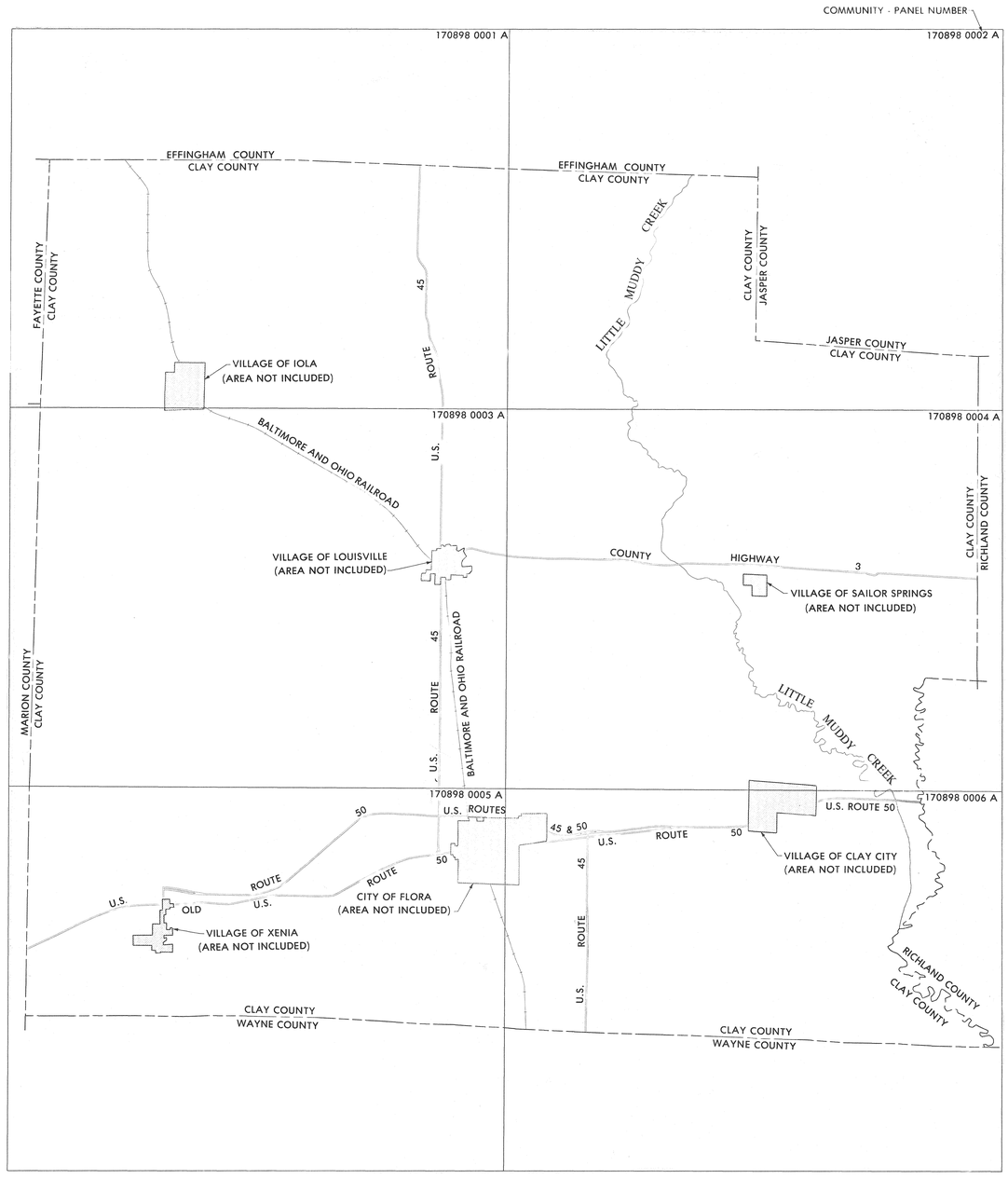
Sources: Illinois State Water Survey, Illinois State Climatologist.
National Drought Mitigation Center, United States Drought Monitor.
NOAA, National Environmental Satellite, Data & Information Service, National Centers for Environmental Information, Storm Events Database.

Acronyms:

US Drought Monitor – Drought Intensity Categories			
D0	abnormally dry	D3	extreme drought
D1	moderate drought	D4	exceptional drought
D2	severe drought		

FIRMS FOR PARTICIPATING JURISDICTIONS

APPENDIX K



KEY TO SYMBOLS

SPECIAL FLOOD HAZARD AREA — ZONE A

Note: These maps may not include all Special Flood Hazard Areas in the community. After a more detailed study, the Special Flood Hazard Areas shown on these maps may be modified, and other areas added.

"TO DETERMINE IF FLOOD INSURANCE IS AVAILABLE IN THIS COMMUNITY, CONTACT YOUR INSURANCE AGENT, OR CALL THE NATIONAL FLOOD INSURANCE PROGRAM, AT (800) 638-6620, OR (800) 424-8872."

INITIAL IDENTIFICATION DATE:
MAY 29, 1981

NATIONAL FLOOD INSURANCE PROGRAM

FHBM

FLOOD HAZARD BOUNDARY MAP

CLAY COUNTY, ILLINOIS

UNINCORPORATED AREA

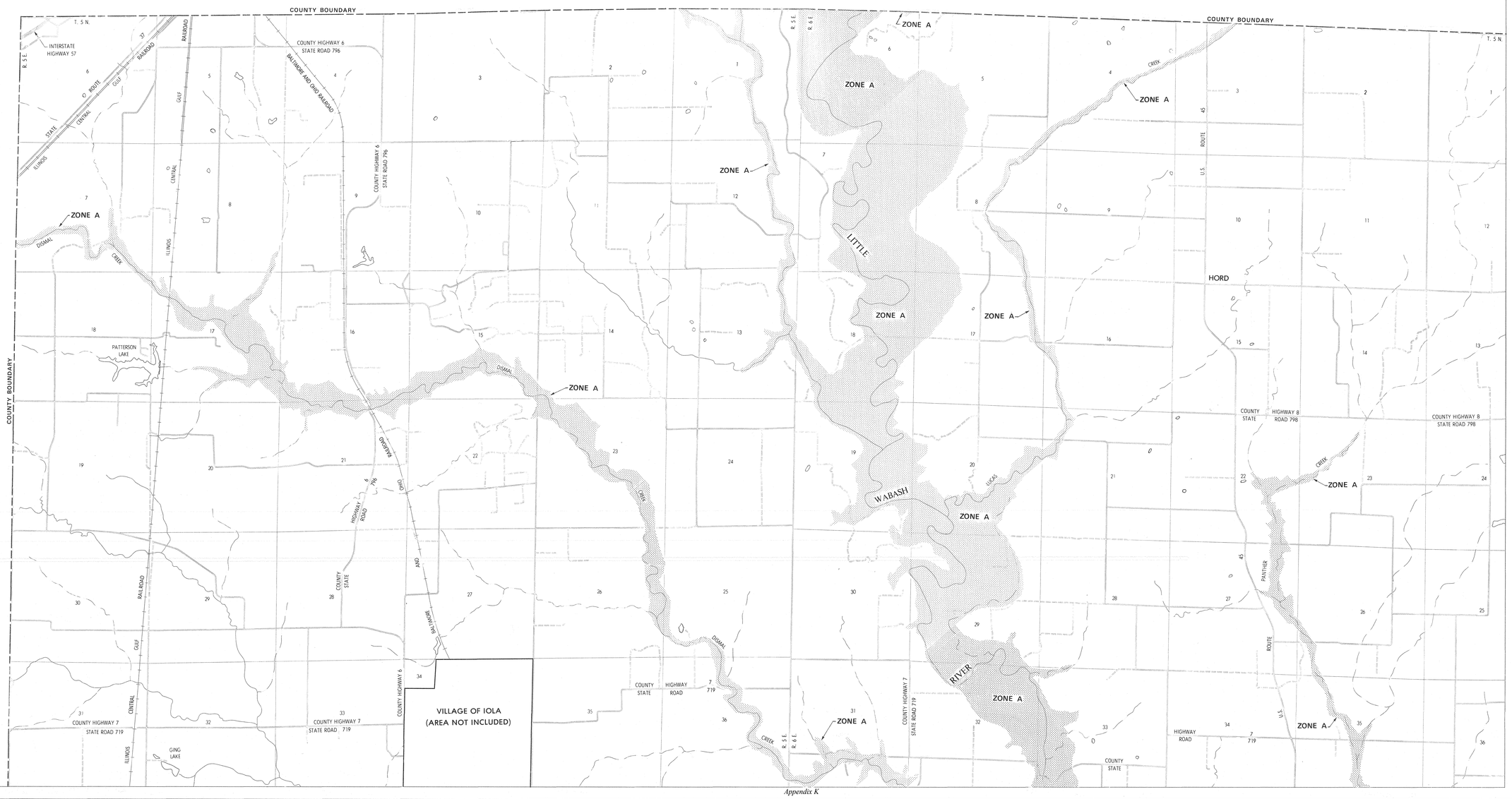
MAP INDEX

PANELS PRINTED: 1, 2, 3, 4, 5, 6

COMMUNITY-PANEL NUMBERS
170898 0001-0006

EFFECTIVE DATE:
MAY 29, 1981

federal emergency management agency
federal insurance administration



Appendix K

KEY TO SYMBOLS

SPECIAL FLOOD HAZARD AREA — ZONE A

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APPROXIMATE SCALE IN FEET:
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FHBM

FLOOD HAZARD BOUNDARY MAP

CLAY COUNTY, ILLINOIS

UNINCORPORATED AREA

PANEL 1 OF 6

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
170898 0001 A

EFFECTIVE DATE:
MAY 29, 1981

federal emergency management agency
federal insurance administration

KEY TO SYMBOLS

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APPROXIMATE SCALE IN FEET:
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FHBM

FLOOD HAZARD BOUNDARY MAP

CLAY COUNTY, ILLINOIS

UNINCORPORATED AREA

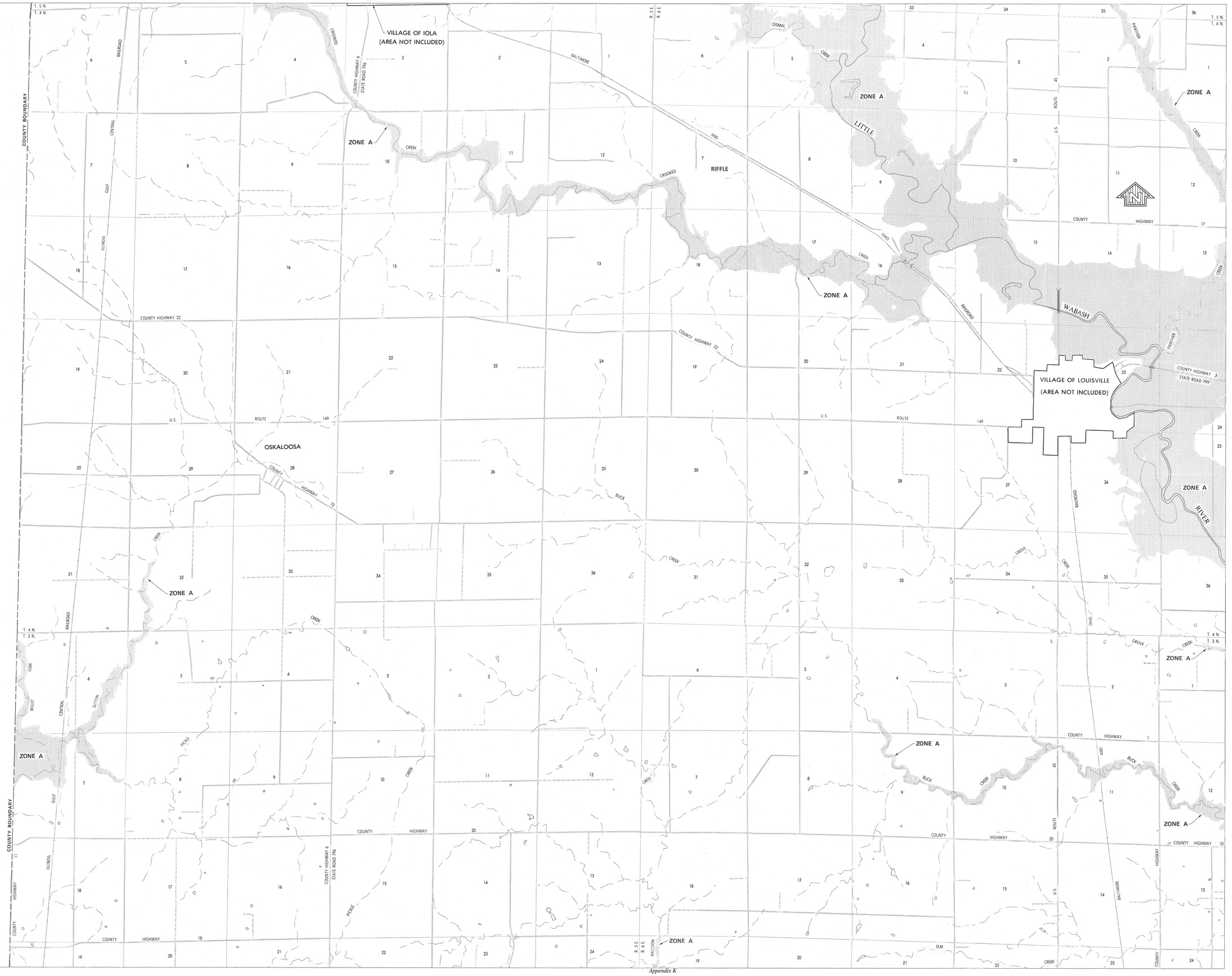
PANEL 2 OF 6

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
170898 0002 A

EFFECTIVE DATE:
MAY 29, 1981

federal emergency management agency
federal insurance administration



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APPROXIMATE SCALE IN FEET:
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FHBM

FLOOD HAZARD BOUNDARY MAP

CLAY COUNTY, ILLINOIS

UNINCORPORATED AREA

PANEL 3 OF 6

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
170898 0003 A

EFFECTIVE DATE:
MAY 29, 1981

federal emergency management agency
federal insurance administration

KEY TO SYMBOLS

SPECIAL FLOOD HAZARD AREA — ZONE A

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APPROXIMATE SCALE IN FEET:
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FHBM

FLOOD HAZARD BOUNDARY MAP

CLAY COUNTY, ILLINOIS

UNINCORPORATED AREA

PANEL 4 OF 6
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
170898 0004 A

EFFECTIVE DATE:
MAY 29, 1981

federal emergency management agency
federal insurance administration

KEY TO SYMBOLS

SPECIAL FLOOD HAZARD AREA — ZONE A

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APPROXIMATE SCALE IN FEET:
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FHBM

FLOOD HAZARD BOUNDARY MAP

CLAY COUNTY, ILLINOIS

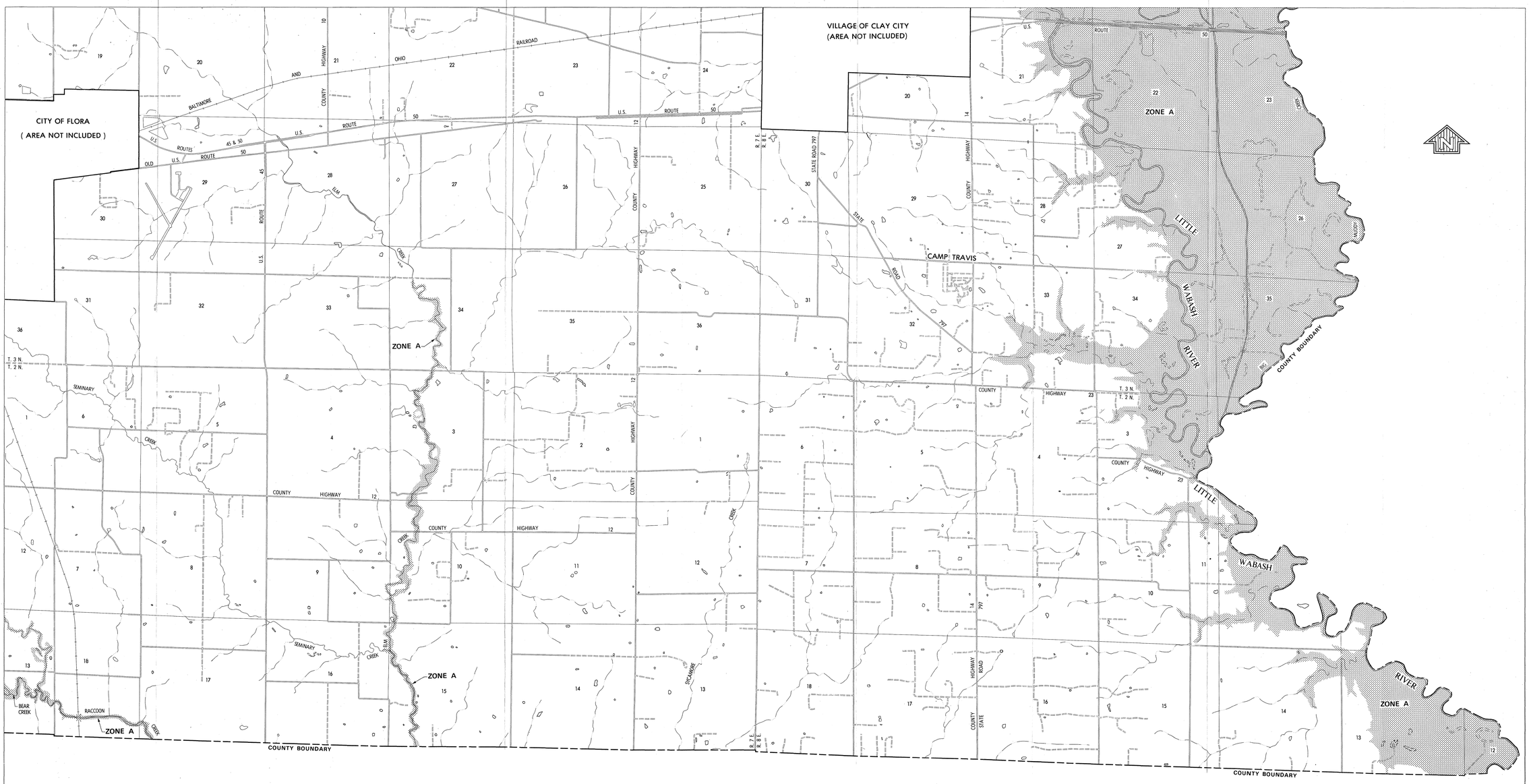
UNINCORPORATED AREA

PANEL 5 OF 6
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
170898 0005 A

EFFECTIVE DATE:
MAY 29, 1981

federal emergency management agency
federal insurance administration



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APPROXIMATE SCALE IN FEET:
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FHBM
FLOOD HAZARD BOUNDARY MAP

CLAY COUNTY, ILLINOIS
UNINCORPORATED AREA

PANEL 6 OF 6
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
170898 0006 A

EFFECTIVE DATE:
MAY 29, 1981

federal emergency management agency
federal insurance administration

KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	
Zone Designations*	ZONE A1 / ZONE A5
100-Year Flood Boundary	
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

INITIAL IDENTIFICATION:
MARCH 22, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
OCTOBER 17, 1975

FLOOD INSURANCE RATE MAP EFFECTIVE:
JANUARY 18, 1984

FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

APPROXIMATE SCALE
600 0 600 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

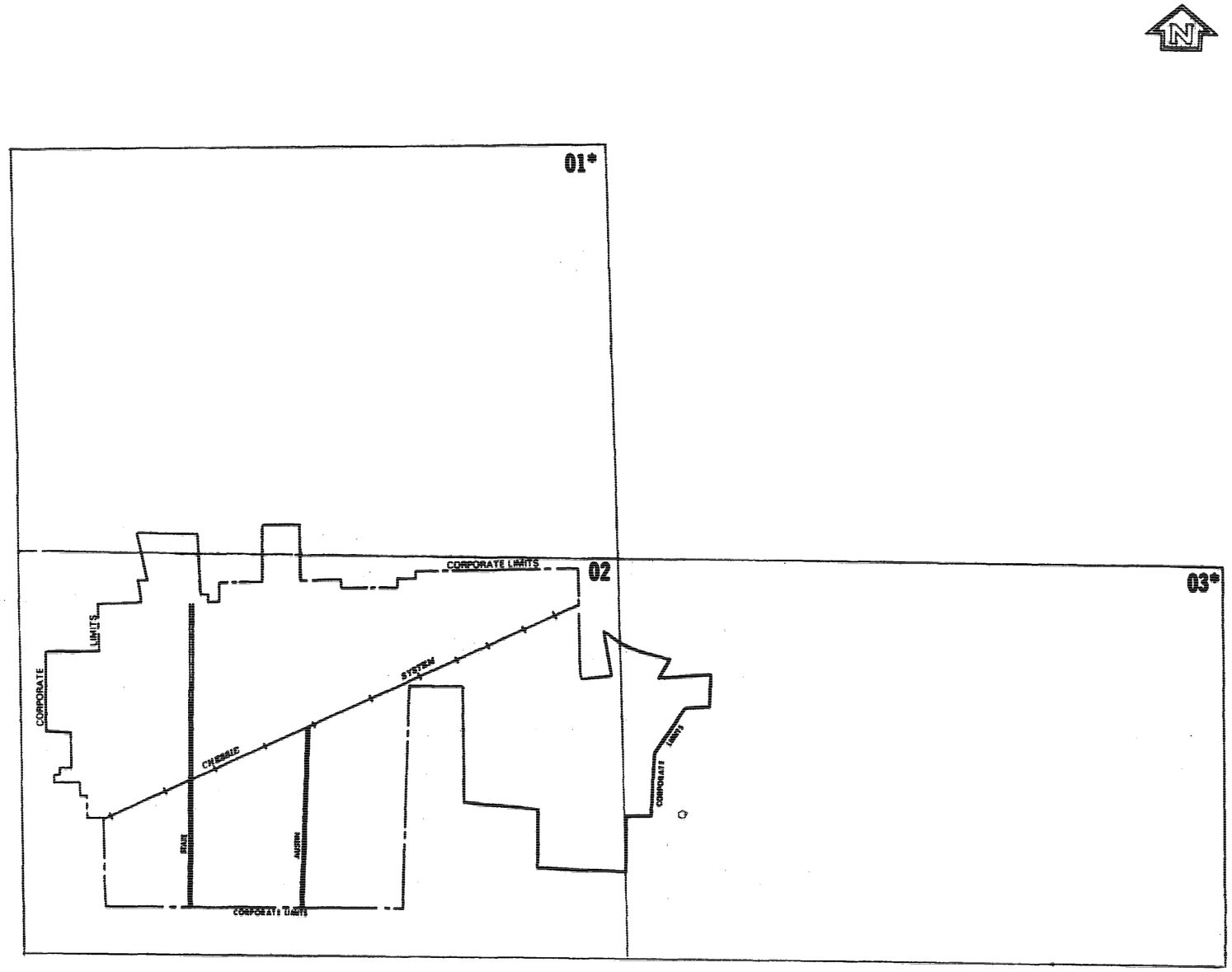
VILLAGE OF
CLAY CITY,
ILLINOIS
CLAY COUNTY

(ONLY PANEL PRINTED)

COMMUNITY-PANEL NUMBER
170042 0001 B

EFFECTIVE DATE:
JANUARY 18, 1984

Federal Emergency Management Agency



*PANEL NOT PRINTED – AREA IN ZONE C

KEY TO MAP

ZONE DESIGNATIONS*

ZONE C

ZONE A

ZONE C

Base Flood Elevation Line with elevation in feet — 513

Base Flood Elevation where uniform within zone — (EL 987)

Elevation Reference Mark — RM7x

River Mile — •M1.5

*EXPLANATION OF ZONE DESIGNATIONS

A flood insurance map displays the zone designations for a community according to areas of designated flood hazards. The zone designations used by FEMA are

ZONE	EXPLANATION
A	Areas of 100-year flood base flood elevations and flood hazard factors not determined
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet, average depths of inundation are shown, but no flood hazard factors are determined
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet, base flood elevations are shown, but no flood hazard factors are determined
A1-A30	Areas of 100-year flood, base flood elevations and flood hazard factors determined
A99	Areas of 100-year flood to be protected by flood protection system under construction, base flood elevations and flood hazard factors not determined
B	Areas between limits of the 100-year flood and 500-year flood, or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile, or areas protected by levees from the base flood (Medium shading)
C	Areas of minimal flooding (No shading)
D	Areas of undetermined, but possible flood hazards
V	Areas of 100-year coastal flood with velocity (wave action), base flood elevations and flood hazard factors not determined
V1-V30	Areas of 100-year coastal flood with velocity (wave action), base flood elevations and flood hazard factors determined

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only, it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

To determine if flood insurance is available in this community contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.

INITIAL IDENTIFICATION: MARCH 1, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS: JULY 25, 1975

FLOOD INSURANCE RATE MAP EFFECTIVE: AUGUST 5, 1985

FLOOD INSURANCE RATE MAP REVISIONS:

FEDERAL EMERGENCY MANAGEMENT AGENCY

FIRM

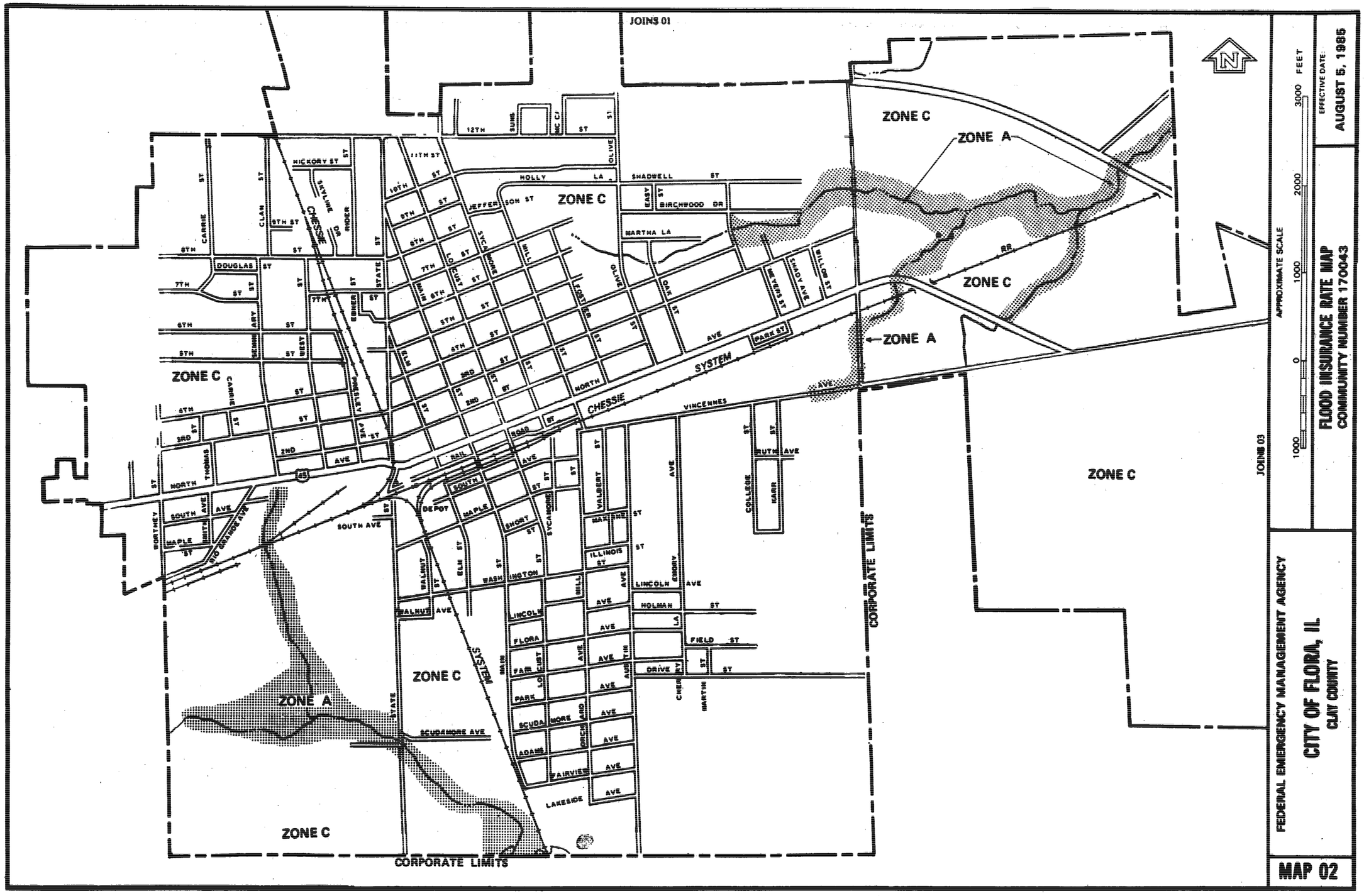
FLOOD INSURANCE RATE MAP 01-03

MAP INDEX

CITY OF FLORA, IL

CLAY COUNTY

COMMUNITY NUMBER 170043 B


JOINS 01
ZONE C
ZONE A
ZONE C
ZONE A
ZONE C
ZONE C
ZONE A
ZONE C
CORPORATE LIMITS
CORPORATE LIMITS
JOINS 03
APPROXIMATE SCALE
1000 0 1000 2000 3000 FEET
EFFECTIVE DATE:
AUGUST 5, 1985
FLOOD INSURANCE RATE MAP
COMMUNITY NUMBER 170043
FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF FLORA, IL
CLAY COUNTY
MAP 02

Appendix K

PLAN ADOPTION RESOLUTIONS

APPENDIX L